OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT


# Risk Assessment of Seafood Consumption Following the Pipeline P00547 Incident, Orange and San Diego Counties, California

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Fish, Ecotoxicology, and Water Section
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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| BaPE | benzo[a]pyrene equivalent |
| CDFW | California Department of Fish and Wildlife (formerly California Department of Fish and Game, CDFG) |
| cPAH | carcinogenic polycyclic aromatic hydrocarbon |
| GC | gas chromatography |
| LOC | Level of Concern |
| MDL | method detection limit |
| MS | mass spectrometry |
| ng/g | nanogram per gram |
| NIST | National Institute of Standards and Technology |
| NOAA | National Oceanic and Atmospheric Administration |
| OEHHA | Office of Environmental Health Hazard Assessment |
| OSPR | Office of Spill Prevention and Response |
| QA | Quality Assurance |
| PAH | polycyclic aromatic hydrocarbon |
| ppb | parts per billion |
| QA | quality assurance |
| SCAT | Shoreline Cleanup Assessment Technique |
| SIM | selected ion monitoring |
| SRM | Standard Reference Material |
| WPCL | Water Pollution Control Laboratory |
| ∑BaPE | total benzo[a]pyrene equivalents |

# PREFACE

The Office of Environmental Health Hazard Assessment (OEHHA), a department within the California Environmental Protection Agency, is responsible for evaluating potential public health risks associated with seafood consumption following aquatic oil spills in California. This task includes making recommendations to the California Department of Fish and Wildlife on fisheries closures and re-openings. OEHHA's authority to conduct these activities are based on a mandate in the California Fish and Game Code, Section 5654.

This report presents the details of the risk assessment OEHHA performed that resulted in the California Department of Fish and Wildlife lifting the fisheries closure for the large October 2021 oil spill in Orange and San Diego Counties. This "Pipeline P00547 Incident" resulted from an offshore pipeline leak near oil processing Platform Elly off the Coast of Orange County on October 2, 2021. OEHHA recommended that fisheries be closed in the area impacted by the spill, and then on November 30, 2021, recommended reopening the fisheries based on the risk evaluation documented in this report.

The report provides data and analyses on carcinogenic polycyclic aromatic hydrocarbons in 417 mussel and 431 finfish and non-mussel invertebrate samples collected in the closure area between October 14 and October 30. The analyses show the cumulative levels of these chemicals were below levels of concern for each sample taken, and that the oil spill does not pose a health hazard for the consumption of fish taken from the affected area.

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# EXECUTIVE SUMMARY

On October 2, 2021, the Office of Environmental Health Hazard Assessment (OEHHA) was notified of an oil spill resulting from an offshore pipeline leak near Platform Elly off the coast of Orange County, California (subsequently referred to as the "Pipeline P00547 Incident"), with an initial, worst-case discharge estimated at 144,480 gallons. Adequate information was not immediately available to determine the potential threat to public health from consumption of seafood collected from the area affected by the spill. Thus, on October 3, OEHHA recommended to the California Department of Fish and Wildlife (CDFW) that a fisheries closure be initiated for coastal areas from Warner Avenue, Huntington Beach to Crown Valley Parkway, Dana Point, and extending six miles offshore. The closure boundaries were expanded on October 5 and again on October 7, based on aerial and satellite observations and the National Oceanic and Atmospheric Administration (NOAA) oil spill trajectory models. The expanded area, as of October 7, included coastal areas from the west jetty of Anaheim Bay to near the southern border of the San Onofre Nuclear Power Plant. The closure area extended along approximately 45 miles of coastline and approximately 23 miles offshore (at the widest point), covering about 650 square miles.

Fish and Game Code §5654 requires that, if a fisheries closure is in effect for more than 48 hours after notification of the spill, expedited testing of seafood is required to ensure that it is safe for human consumption before the closure can be lifted. A variety of finfish and invertebrate species were collected from the closure area on multiple occasions between October 14 and October 30 to inform fisheries re-opening decisions.

OEHHA has established a protocol for assessing the risk associated with consuming seafood following an oil spill. The contaminants of concern in seafood following an oil spill are specific polycyclic aromatic hydrocarbons (PAHs) that are considered to have the potential to cause cancer (cPAHs). OEHHA has developed a Level of Concern (LOC) for cPAHs, i.e., a concentration that is considered to pose an unacceptable health risk if consumed at the stated rate and for the predicted duration. The LOC for the most sensitive population, based on sensitivities related to age (which affects sensitivity to cancer) and seafood consumption rate, is 27 parts per billion (ppb) (wet weight) cPAH, expressed as total benzo[a]pyrene equivalents (∑BaPE). The total concentration of cPAH as ∑BaPE in each sample was compared to the LOC. Samples with less than 27 ppb (wet weight) ∑BaPE are considered safe to consume with respect to oil spill-related chemicals.

No samples of mussels or offshore finfish or non-mussel invertebrates had cPAH concentrations (as ∑BaPE) that exceeded the LOC. All samples had very low or non-detectable levels of ∑BaPE, with a maximum concentration of 3.14 ppb, wet weight. Following a recommendation from OEHHA, CDFW lifted the existing fisheries closure, effective November 30, 2021.

# INTRODUCTION

On October 2, 2021, the Office of Environmental Health Hazard Assessment (OEHHA) was notified of an oil spill off the coast of Orange County, California. According to a California Office of Emergency Services spill report (#21–5440), the spill was thought to result from an offshore pipeline leak near Platform Elly with an estimated worst-case discharge of 144,480 gallons of crude oil (subsequently referred to as the "Pipeline P00547 Incident"). Because adequate information was not then available to establish the safety of fish and shellfish consumption from the spill-impacted area, on October 3, 2021, OEHHA recommended to the Director of the California Department of Fish and Wildlife (CDFW) that a fisheries closure be implemented. OEHHA and CDFW's Office of Spill Prevention and Response (OSPR) jointly defined the closure boundaries to include coastal areas from Warner Avenue, Huntington Beach, to Crown Valley Parkway, Dana Point, extending six miles offshore. The closure area was significantly expanded on October 5 and again on October 7, based on aerial and satellite observations and National Oceanic and Atmospheric Administration (NOAA) oil spill trajectory models of where the oil had moved or was likely to move. The extended closure area as of October 7 included coastal areas from the west jetty of Anaheim Bay to near the southern border of the San Onofre Nuclear Power Plant, spanning approximately 45 miles of coastline. The closure area extended approximately 23 miles offshore (at the widest point), covering about 650 square miles. On October 7, the minimum estimated oil release was revised to 24,696 gallons.

Fish and Game Code §5654 requires that, if a fisheries closure is in effect for more than 48 hours after notification of the spill, expedited testing of seafood is required before the closure can be lifted. The sampling and analysis activities described below were based on the Protocol for Seafood Sampling and Analysis to Support Fisheries Re-Opening Decisions Following Aquatic Oil Spills in California (OEHHA and OSPR, 2020). These activities include the collection of onshore and offshore seafood species, their analysis for chemicals of concern, and the risk evaluation conducted on the laboratory results.

# CONTAMINANTS AND SPECIES OF CONCERN RELATED TO SEAFOOD CONSUMPTION FOLLOWING OIL SPILLS

## CONTAMINANTS OF CONCERN

Oil, as defined under California Government Code §8670.3, is "any kind of petroleum, liquid hydrocarbons, or petroleum products or any fraction or residues there from, including, but not limited to, crude oil, bunker fuel, gasoline, diesel fuel, aviation fuel, oil sludge, oil refuse, oil mixed with waste, and liquid distillates from unprocessed natural gas." The contaminants of concern relating to human consumption of seafood following an oil spill are specific polycyclic aromatic hydrocarbons (PAHs) that are considered to have the potential to cause cancer (cPAHs). Cancer is the effect of greatest concern related to human consumption of seafood contaminated by oil spill-related chemicals (for discussion, see OEHHA, 2015a).

### Species of Concern Relating to Seafood Consumption

The determination of species and locations to sample following an oil spill is dependent on knowledge of the environmental fate of oil and its constituents and the specific spill scenario (e.g., volume, product, location, shoreline type, trajectory, and weather). Fish and shellfish accumulate PAHs to varying degrees, depending on species, exposure, and chemical properties. Finfish, in particular, can often swim away from a spill, depending on the extent of the spill relative to their home range and the availability of suitable habitat. Attached bivalve mollusks such as mussels, on the other hand, are immobile and cannot escape the oil. Additionally, bivalves do not metabolize PAHs as rapidly as finfish and some other shellfish, and tend to accumulate higher molecular weight PAHs that are more likely to be carcinogens (Meador et al., 1995; NAS, 2003; Yender et al., 2002; OEHHA, 2015b; Webster et al., 2018). As a result of these factors, bivalve mollusks pose a greater likelihood of accumulating specific oil spill-related chemicals of human health concern (Eisler, 2000; Meador et al., 1995; Topping et al., 1997; Hwang et al., 2014). Mussels are also typically easier to harvest than finfish and offshore invertebrates. Thus, when present in the impacted area, mussels are used as an indicator species when assessing the risk of seafood consumption following an oil spill near the shoreline. However, if a spill is of significant size or impact, it is important to characterize the extent of contamination in additional seafood species as well. Given the estimated spill volume, large geographic area, and number of species potentially impacted following the Pipeline P00547 Incident, a wider variety of species from offshore as well as onshore locations were included in OEHHA's analysis.

## IDENTIFYING OIL SPILL-RELATED CONTAMINANT LEVELS IN FISH AND SHELLFISH FOLLOWING THE PIPELINE P00547 INCIDENT

### Sampling Activities

CDFW and OEHHA jointly developed sampling and analysis plans, based on the protocol by OEHHA and OSPR (2020), to assess concentrations of oil spill-related chemicals in onshore and offshore seafood species from the impacted area. Species were selected for sampling based on four factors:

1) potential to bioaccumulate PAHs,

2) commercial, recreational, and/or subsistence fishery importance,

3) habitat, and

4) likelihood of exposure to the oil.

For sampling purposes, the fisheries closure area was divided into three similar-sized sampling zones so that fisheries re-opening decisions could be made on a geographic basis if the data supported that decision. The fisheries closure area and sampling zones are shown in Figure 1. Sampling timing was based on the considerations outlined in the OEHHA and OSPR protocol (2020).

Mussels were collected by hand along the shoreline throughout the closure area in locations likely to have the highest degree of oiling, based on Shoreline Cleanup Assessment Team (SCAT) data. A total of 417 mussels were collected and analyzed from eight sites along the affected shoreline in the two sampling events (October 14–15 and October 22–23, 2021), as shown in Figure 1. A summary of mussel samples analyzed for fisheries closure purposes, including location, sample identification number, date collected, number of individuals per composite, and sample location coordinates, is shown in Table 1.

Finfish and other invertebrate species were collected from all three zones by hook and line, trawl, trap, or diver from October 14 to October 30, 2021. The locations of species collected and analyzed from each zone are shown in Figure 2 (Zone 1), Figure 3 (Zone 2), and Figure 4 (Zone 3). The total number of finfish and (non-mussel) invertebrate samples collected and analyzed from Zones 1, 2, and 3 were 175, 111, and 145, respectively. A summary of finfish and other invertebrate samples analyzed for fisheries closure purposes, including location, species, sample identification number (ID), date collected, number of individuals per composite, and sample location coordinates, is shown in Table 2.

### Sampling Methods, Documentation, and Custody

For all sampling activities, collection was documented with GPS, photographs, and photo and sample log forms. Samplers wore nitrile gloves to collect samples and changed gloves between sample locations. Samples were double wrapped in foil, dull side to the samples, before being placed in a heavy duty sealed plastic bag. The sample ID, date and time of collection, site name, sampler, and coordinates of the sampling locations were written in indelible ink on an adhesive label, which was placed on the sealed plastic bag. This sealed bag was then put in a second sealed plastic bag, and placed on ice in a cooler. Samples were frozen prior to submission via expedited shipping to the B&B Laboratories (a TDI Brooks affiliate) in College Station, Texas, for chemical analysis.

Standard CDFW chain of custody procedures were followed. Chain of custody forms were filled out at the end of each sampling event and enclosed inside each cooler in a sealed plastic bag prior to transport.

### Laboratory Methods

B&B Laboratories received, processed, analyzed, and stored the tissue samples in accordance with their standard operating procedures. Tissues were removed from shells (bivalves and Kellet's Whelk) and carapace (lobster and crabs). Soft-bodied invertebrates were evaluated as whole body, except sea urchin roe. Crabs and lobsters were evaluated as meat and viscera combined. Fish were dissected and analyzed as skinless fillets. Composites were prepared by combining the tissues described above for each species from each location (mussels) or zone (finfish, crustaceans, and other non-mussel invertebrates) and analyzed as one sample. Tissues were extracted by pressurized fluid extraction, followed by silica/alumina clean-up and gel permeation chromatography when needed, and then analyzed for PAHs/alkylated homologs and

hopanes by gas chromatography/mass spectrometry in selected ion monitoring mode (GC/MS-SIM, SW846 EPA Method 8270 Mod).

Results for 91 individual compounds or groups of compounds (e.g., alkylated homolog groups) were reported. Of those, OEHHA considers eight to be carcinogens (cPAHs): chrysene, benz[a]anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, naphthalene, and benzo[a]pyrene. The method detection limits (MDLs) for all cPAHs were approximately 1 part per billion (ppb), or less, for most samples. For some samples, the MDLs for certain napthalene compounds (usually C2–C4 alkylated homologs) were higher than requested. In those instances where a cPAH was non-detect with a higher MDL, then ∑BaPE for that sample was calculated by OEHHA as described below.

B&B Laboratories provided associated quality assurance (QA) documentation for all samples, including controls, demonstrating that sample processing was reproducible, accurate, and free from cross-contamination. A certified, standard reference material (SRM) from the National Institute of Standards and Technology (NIST) for organics in mussels (SRM 1974c) was included in sample processing to provide an additional measure of analytical comparability. CDFW OSPR Water Pollution Control Laboratory staff reviewed the QA documentation and determined that SRMs and analytical quality controls were within acceptable ranges. All results passed QA review.

## CONTAMINANT LEVELS IN FISH AND SHELLFISH TISSUE THAT POSE NO SIGNIFICANT RISK

OEHHA has established a protocol for assessing the risk to human health associated with consuming seafood following an oil spill (OEHHA, 2015a). OEHHA has developed a Level of Concern (LOC) for cPAHs, i.e., a concentration that is considered to pose an unacceptable health risk if consumed at the stated rate and for the predicted duration. LOCs were developed for three sensitive populations, defined by sensitivities related to age (which affects sensitivity to cancer) and seafood consumption rates. Of these three, the most health protective LOC was 27 nanograms per gram (ng/g) or ppb (wet weight) cPAH, expressed as total benzo[a]pyrene equivalents (∑BaPE) (for details, see OEHHA, 2015a):

LOC (cancer) = 27 ng/g or ppb (wet weight) for ∑BaPE

The total concentration of cPAH as ∑BaPE in each sample was compared to the LOC. Samples with less than 27 ppb (wet weight) ∑BaPE are considered safe to consume with respect to oil spill-related chemicals.

## RESULTS AND CONCLUSIONS

Laboratory results were received in six batches from November 2 until November 29, 2021. Individual cPAH concentrations (including alkylated homologues, when detected) were converted to BaPE using cPAH-specific potency equivalency factors, and summed (see OEHHA, 2015a). In those instances when the MDL was 4 ppb or greater, ∑BaPE were calculated by OEHHA in two separate ways: with non-detects set to 1) zero and

2) at the MDL. Calculating ∑BaPE with non-detects at the MDL had minimal impact on the results and did not approach the LOC for any sample. ∑BaPE are reported in Tables 1 and 2 with all non-detects assumed to be zero. All ∑BaPE values (in ppb) were rounded to the nearest hundredth.

∑BaPE concentrations in mussels are presented in Table 1. Individual cPAH concentrations in mussel species from which ∑BaPE concentrations were calculated are presented in Appendix 1. No samples of mussels had ∑BaPE concentrations that exceeded the LOC in either sampling event. All mussel samples had very low ∑BaPE concentrations (0.12 – 3.14 ppb).

∑BaPE concentrations in offshore finfish, crustaceans, and non-mussel invertebrates are presented in Table 2 for zones 1, 2, and 3. Individual cPAH concentrations in offshore species from which ∑BaPE were calculated are presented in Appendix 2 – 4 for Zones 1, 2 and 3, respectively. All species had very low or non-detectable levels of ∑BaPE throughout the closure area (ND – 1.01 ppb).

Upon receipt and analysis of the final set of analytical data on November 29, 2021, OEHHA recommended that CDFW rescind the fisheries closure order. CDFW lifted the existing fisheries closure, effective at 11:59 a.m. on November 30, 2021.

In conclusion, a fisheries closure was in place from October 3 to November 30, 2021, to protect human health from consumption of oil-related contaminants in seafood following the Pipeline P00547 Incident in Orange County. Based on a recommendation by OEHHA, CDFW declared a fisheries closure on October 3, 2021. The closure area was increased on October 5 and again on October 7 based on aerial and satellite observations and NOAA oil spill trajectory modeling. Sampling activities for fisheries closure purposes were conducted on multiple occasions between October 14 and October 30. Final analytical results were made available to OEHHA on November 29, 2021. Results were compared to the LOC and no samples had ∑BaPE that exceeded this concentration. OEHHA recommended to CDFW that consumption of seafood from the area posed no significant ongoing oil spill-related human health risk. On November 29, CDFW issued a declaration that the fisheries would re-open at 11:59 a.m. on November 30, 2021.

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FIGURE 1. FISHERIES CLOSURE AREA, SAMPLING ZONES, AND MUSSEL SAMPLING SITES

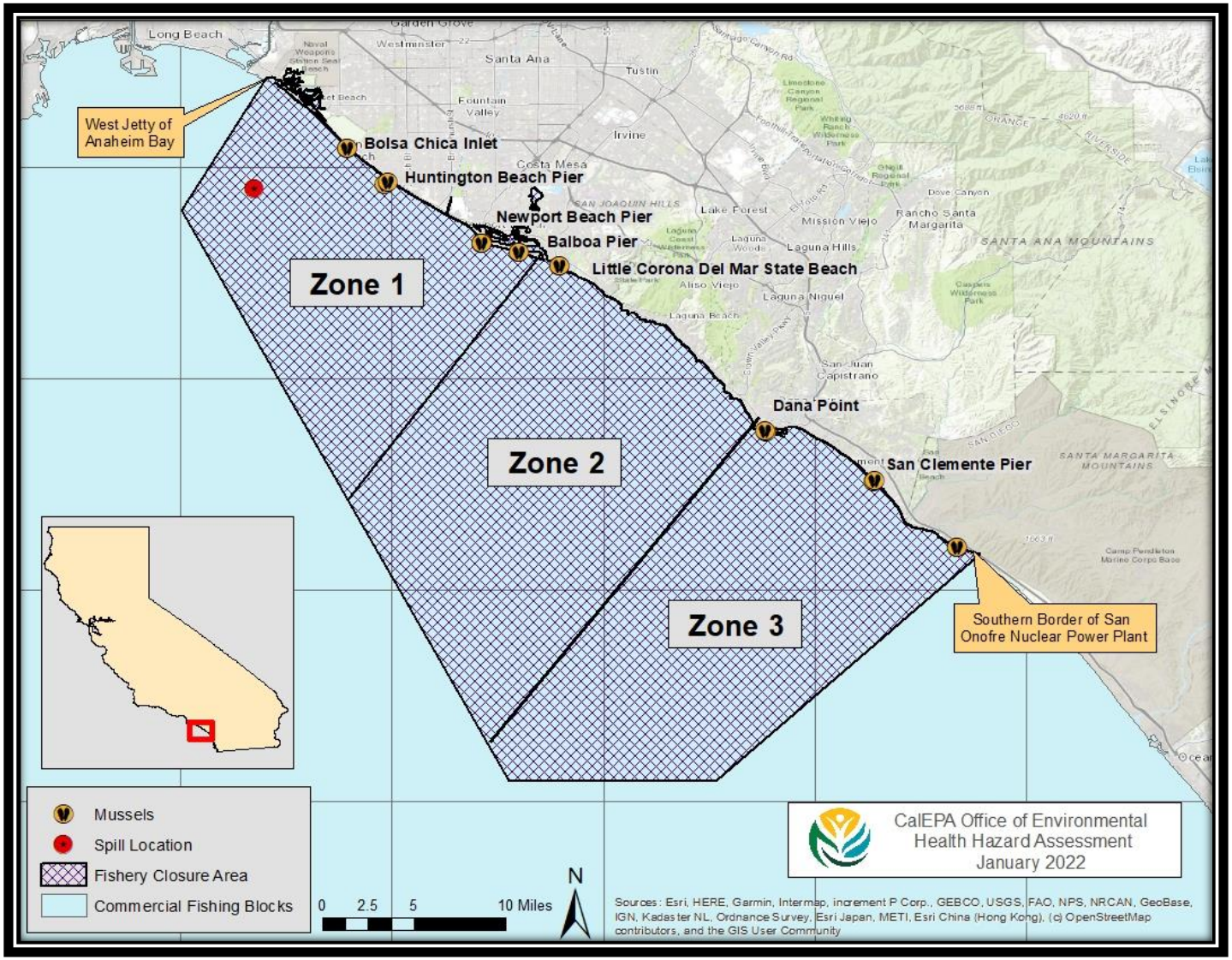

FIGURE 2. ZONE 1 SAMPLING SITES FOR FINFISH, CRUSTACEANS, AND OTHER (NON-MUSSEL) INVERTEBRATE SAMPLES

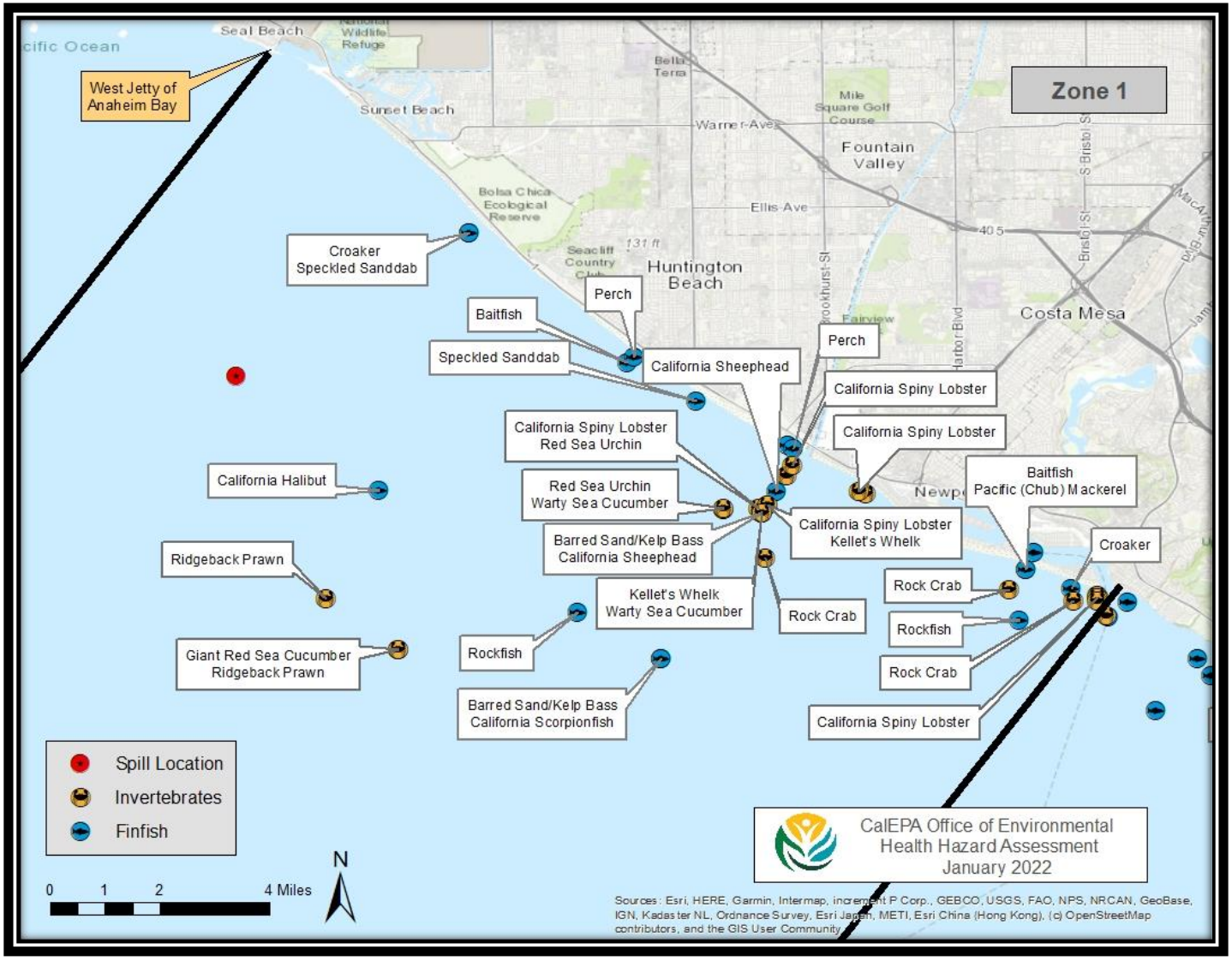

FIGURE 3. ZONE 2 SAMPLING SITES FOR FINFISH, CRUSTACEANS, AND OTHER (NON-MUSSEL) INVERTEBRATE SAMPLES

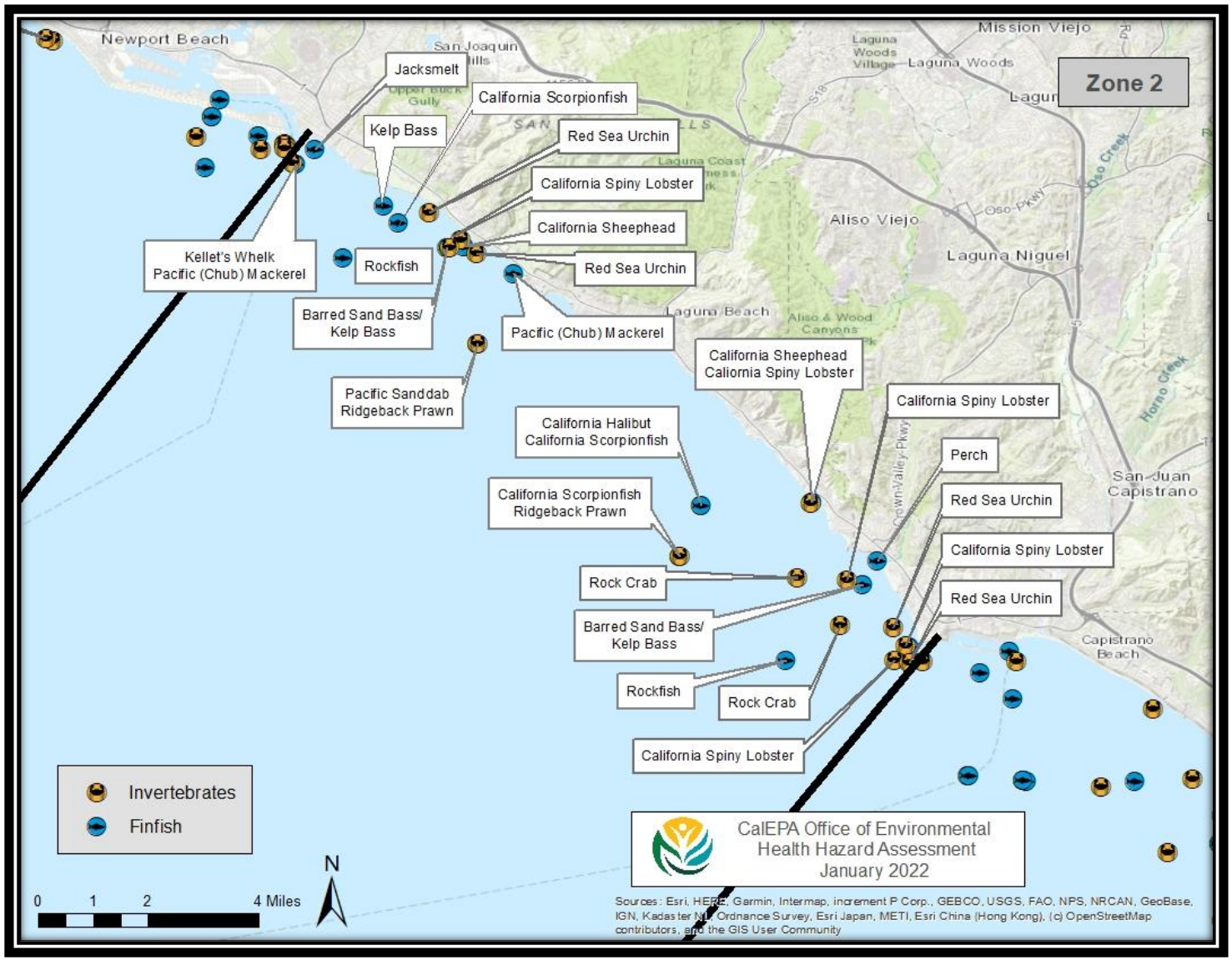

FIGURE 4. ZONE 3 SAMPLING SITES FOR FINFISH, CRUSTACEANS, AND OTHER (NON-MUSSEL) INVERTEBRATE SAMPLES

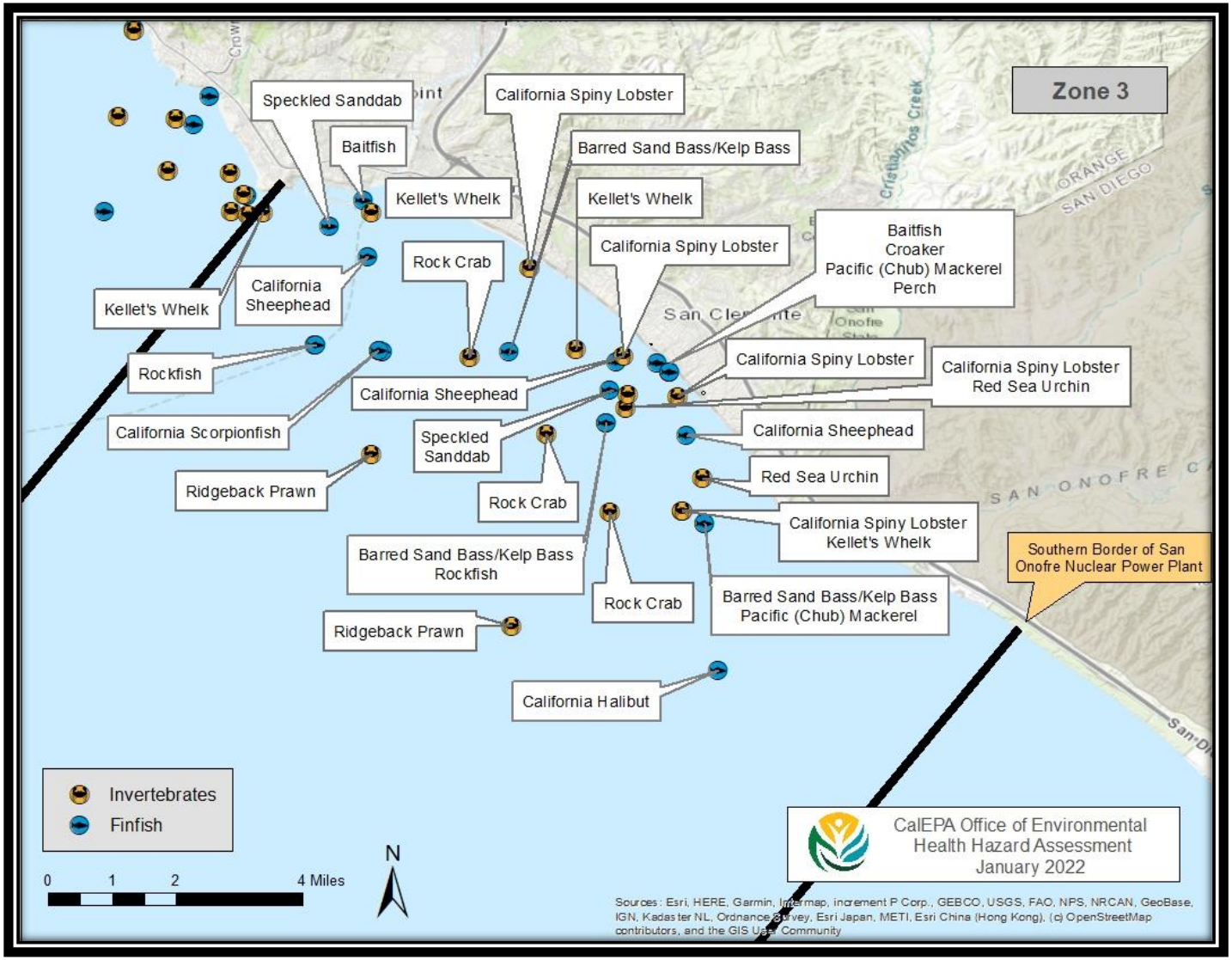

TABLE 1. ∑BAPE CONCENTRATIONS IN MUSSELS COLLECTED FROM THE FISHERIES CLOSURE AREA

| Location | Sample ID | Date Collected | Number of Individuals/ Composite* | GPS Coordinates (Decimal Degrees) | ∑BaPE ppb (wet weight)** |
|---|---|---|---|---|---|
| Bolsa Chica Inlet | 02A101421MUS04 | 10/14/2021 | 34 | 33.6824, -118.0360 | 0.86 |
| Huntington Beach Pier | 02101421MUS02 | 10/14/2021 | 25 | 33.6530, -118.0062 | 1.25 |
| San Clemente Pier | 01101421MUS03 | 10/14/2021 | 27 | 33.4194, -117.6206 | 1.44 |
| San Onofre Nuclear Power Plant | 01101421MUS01 | 10/14/2021 | 30 | 33.3675, -117.5547 | 0.30 |
| Newport Pier | 01101521MUS05 | 10/15/2021 | 25 | 33.6070, -117.9299 | 0.51 |
| Balboa Pier | 01101521MUS06 | 10/15/2021 | 25 | 33.6000, -117.9005 | 1.26 |
| Little Corona Del Mar State Beach | 01101521MUS08 | 10/15/2021 | 26 | 33.5891, -117.8685 | 0.31 |
| Harbor Point Conservation Park | 01101521MUS07 | 10/15/2021 | 25 | 33.4584, -117.7052 | 0.32 |
| Newport Pier | 06102221MUS01 | 10/22/2021 | 26 | 33.6071, -117.9298 | 1.43 |
| Balboa Pier | 06102221MUS02 | 10/22/2021 | 24 | 33.6001, -117.9005 | 1.15 |
| Little Corona Del Mar State Beach | 06102221MUS06 | 10/22/2021 | 25 | 33.5893, -117.8684 | 0.14 |
| Harbor Point Conservation Park | 06102221MUS04 | 10/22/2021 | 25 | 33.4597, -117.7065 | 0.13 |
| San Clemente Pier | 06102221MUS03 | 10/22/2021 | 23 | 33.4197, -117.6204 | 3.14 |
| San Onofre Nuclear Power Plant | 06102221MUS05 | 10/22/2021 | 25 | 33.3676, -117.5550 | 0.12 |
| Bolsa Chica Inlet | 06102321MUS07 | 10/23/2021 | 29 | 33.6823, -118.0360 | 0.56 |
| Huntington Beach Pier | 06102321MUS08 | 10/23/2021 | 23 | 33.6554, -118.0041 | 0.46 |

*The number of individual organisms analyzed as a single composite.

**∑BaPE is the sum of benzo[a]pyrene equivalents, a measure of the ability of oil-related chemicals to cause cancer. OEHHA's LOC for ∑BaPE is 27 ppb wet weight. ∑BaPE concentrations below 27 ppb are considered safe.

TABLE 2. ∑BAPE CONCENTRATIONS IN FINFISH, CRUSTACEAN, AND OTHER (NON-MUSSEL) INVERTEBRATE SAMPLES COLLECTED FROM ZONES 1, 2 AND 3

| Sample Location | Species | Sample ID | Date Collected | Number of Individuals/ Composite* | GPS Coordinates (Decimal Degrees) | ∑BaPE ppb (wet weight)** |
|---|---|---|---|---|---|---|
| Zone 1 | Baitfish Group*** | 02101421BAIT01 | 10/14/2021 | 9 | 33.6530, -118.0062 | 0.12 |
| | Baitfish Group*** | 02101521BAIT02 | 10/15/2021 | 11 | 33.5986, -117.9011 | 0.04 |
| | Baitfish Group (Sardines) | 02101421BAIT00 | 10/14/2021 | 9 | 33.6030, -117.8990 | 0.24 |
| | Perch Group*** | 02101521PER01 | 10/17/2021 | 4 | 33.6315, -117.9639 | 0.14 |
| | | | 10/15/2021 | 1 | 33.6304, -117.9622 | |
| | | 05101721PER04 | 10/17/2021 | 3 | 33.6547, -118.0044 | 0.08 |
| | Barred Sand/Kelp Bass | Z1-102821-BAS | 10/28/2021 | 9 | 33.5751, -117.9970; 33.6136, -117.9705 | 0.03 |
| | California Halibut | Z1-102821-CH | 10/28/2021 | 1 | 33.6196, -118.0716 | 1.01 |
| | California Scorpionfish | Z1-102821-CSF | 10/28/2021 | 9 | 33.5751, -117.9970 | 0.04 |
| | | | | 1 | 33.5694, 118.0518 | |
| | California Sheephead | Z1-102421-CSH | 10/24/2021 | 7 | 33.6143, -117.9702; 33.6193, -117.9669 | ND |
| | California Spiny Lobster (Shallow) | Z1-102421-CSLS | 10/24/2021 | 11 | 33.5917, -117.8822; 33.6187, -117.9432; 33.6191, -117.9450 | 0.18 |
| | California Spiny Lobster (Deep) | Z1-102421-CSLD | 10/24/2021 | 9 | 33.5903, -117.8822; 33.5908, -117.8816; 33.5913, -117.8822; 33.6147, -117.9716; 33.6157, -117.9692; 33.6234, -117.9640; 33.6260, -117.9627 | 0.09 |
| | Croaker Group*** | Z1-102221-CKR | 10/22/2021 | 5 | 33.5937, -117.8890; 33.6874, -118.0348 | 0.18 |
| | Giant Red Sea Cucumber | Z1-102821-GSC | 10/28/2021 | 2 | 33.5776, -118.0664 | 0.03 |
| | Kellet's Whelk | Z1-102421-KW | 10/24/2021 | 10 | 33.5864, -117.8800; 33.6139, -117.9706; 33.6157, -117.9692 | ND |
| | Pacific (Chub) Mackerel | 02101521 MKL01 | 10/15/2021 | 4 | 33.5986, -117.9011 | 0.16 |
| | Pacific (Chub) Mackerel | Z1-102821-PM | 10/28/2021 | 9 | 33.5861, -117.8793 | 0.05 |

| Sample Location | Species | Sample ID | Date Collected | Number of Individuals/ Composite* | GPS Coordinates (Decimal Degrees) | ∑BaPE ppb (wet weight)** |
|---|---|---|---|---|---|---|
| | Red Sea Urchin | Z1-103021-RSU | 10/30/2021 | 9 | 33.6136, -117.9707; 33.6143, -117.9807 | 0.08 |
| | Ridgeback Prawn | Z1-102821-RBP | 10/28/2021 | 18 | 33.5776, -118.0664; 33.5908, -118.0856 | 0.04 |
| | Rock Crab Group*** | Z1-102421-RC | 10/24/2021 | 10 | 33.5902, -117.8885; 33.5934, -117.9053; 33.6018, -117.9697 | 0.07 |
| | Rockfish Group*** | Z1-102821-RF | 10/28/2021 | 8 | 33.5872, -118.0191; 33.5852, -117.9028 | 0.05 |
| | Speckled Sanddab | Z1-102221-SSD | 10/22/2021 | 9 | 33.6430, -117.9879; 33.6874, -118.0478 | 0.13 |
| | Warty Sea Cucumber | Z1-103021-WSC | 10/30/2021 | 7 | 33.6136, -117.9707; 33.6143, -117.9807 | 0.05 |
| **Zone 2** | Barred Sand Bass/Kelp Bass | Z2-102821-BAS | 10/28/2021 | 2 | 33.5642, -117.8391; 33.5752, -117.8559 | 0.03 |
| | | | 10/28/2021 | 6 | 33.4754, -117.7298 | |
| | California Halibut | Z2-102821-CH | 10/28/2021 | 1 | 33.4964, -117.7722 | 0.05 |
| | California Scorpionfish | Z2-102821-CSF | 10/28/2021 | 1 | 33.5706, -117.8521 | 0.04 |
| | | | | 2 | 33.4964, -117.7722 | |
| | | | 10/29/2021 | 1 | 33.4830, -117.7780 | |
| | California Sheephead | Z2-102421-CSH | 10/24/2021 | 8 | 33.4590, -117.7176; 33.4972, -117.7433; 33.5645, -117.8348 | ND |
| | California Spiny Lobster (Shallow) | Z2-102421-CSLS | 10/24/2021 | 9 | 33.4594, -117.7184; 33.4968, -117.7433; 33.5661, -117.8356 | 0.10 |
| | California Spiny Lobster (Deep) | Z2-102421-CSLD | 10/24/2021 | 9 | 33.4555, -117.7213; 33.4766, -117.7339; 33.5641, -117.8387 | 0.09 |
| | Jacksmelt | Z2-102421-JSM | 10/24/2021 | 5 | 33.5900, -117.8741 | 0.12 |
| | Kellet's Whelk | Z2-102421-KW | 10/24/2021 | 6 | 33.4552, -117.7141 | ND |
| | Pacific (Chub) Mackerel | Z2-102421-MKL | 10/24/2021 | 9 | 33.5574, -117.8218 | ND |
| | Pacific Sanddab | Z2-102821-PSD | 10/28/2021 | 9 | 33.5389, -117.8311 | 0.05 |
| | Red Sea Urchin | Z2-102821-RSU | 10/28/2021 | 9 | 33.4643, -117.7216; 33.5627, -117.8316; 33.5732, -117.8441 | 0.04 |

| Sample Location | Species | Sample ID | Date Collected | Number of Individuals/ Composite* | GPS Coordinates (Decimal Degrees) | ∑BaPE ppb (wet weight)** |
|---|---|---|---|---|---|---|
| | Ridgeback Prawn | Z2-102821-RBP | 10/28/2021<br>10/29/2021 | 18 | 33.5389, -117.8311<br>33.4830, -117.7780 | 0.02 |
| | Rock Crab Group*** | Z2-102421-RC | 10/24/2021 | 3 | 33.4648, -117.7357;<br>33.4772, -117.7469 | 0.08 |
| | Rockfish Group*** | Z2-102821-RF | 10/28/2021 | 4 | 33.5615, -117.8668 | 0.04 |
| | | | | 6 | 33.4554, -117.7500;<br>33.4555, 117.7502;<br>33.4552, 117.7492 | |
| | Baitfish Group*** | 03101621BAIT03 | 10/16/2021 | 3 | 33.4189, -117.6214 | ND |
| **Zone 3** | Baitfish Group*** | 01101521BAIT09 | 10/15/2021 | 15 | 33.4580, -117.6910 | 0.40 |
| | Perch Group*** | 03101621PER02 | 10/16/2021 | 4 | 33.4818, -117.7260 | 0.07 |
| | Perch Group*** | 03101621PER03 | 10/16/2021 | 4 | 33.4189, -117.6214 | 0.10 |
| | Barred Sand Bass/Kelp Bass | Z3-102821-BAS | 10/28/2021 | 9 | 33.4235, -117.6580;<br>33.4074, -117.6358;<br>33.3845, -117.6133 | 0.73 |
| | California Halibut | Z3-102921-CH | 10/29/2021 | 1 | 33.3510, -117.6102 | 0.05 |
| | California Scorpionfish | Z3-102821-CSF | 10/28/2021 | 9 | 33.4239, -117.6875;<br>33.4239, -117.6873;<br>33.4235, -117.6867 | 0.04 |
| | California Sheephead | Z3-102421-CSH | 10/24/2021 | 8 | 33.4046, -117.6174;<br>33.4214, -117.6334;<br>33.4454, -117.6902 | ND |
| | California Spiny Lobster (Shallow) | Z3-102421-CSLS | 10/24/2021 | 9 | 33.4134, -117.6197;<br>33.4226, -117.6319;<br>33.4427, -117.6533 | 0.10 |
| | California Spiny Lobster (Deep) | Z3-102421-CSLD | 10/24/2021 | 8 | 33.3873, -117.6186;<br>33.4108, -117.6314 | 0.09 |
| | Croaker Group*** | Z3-102321-CKR | 10/23/2021 | 7 | 33.4211, -117.6243 | 0.07 |
| | Kellet's Whelk | Z3-102421-KW | 10/24/2021 | 9 | 33.4553, -117.6894;<br>33.3873, -117.6185;<br>33.4242, -117.6428 | ND |
| | Pacific (Chub) Mackerel | 03101621 MKL02 | 10/16/2021 | 4 | 33.4189, -117.6214 | ND |
| | Pacific (Chub) Mackerel | Z3-102821-PM | 10/28/2021 | 5 | 33.3846, -117.6133 | 0.06 |

| Sample Location | Species | Sample ID | Date Collected | Number of Individuals/ Composite* | GPS Coordinates (Decimal Degrees) | ∑BaPE ppb (wet weight)** |
|---|---|---|---|---|---|---|
| | Red Sea Urchin | Z3-102921-RSU | 10/29/2021 | 9 | 33.3947, -117.6140; 33.4138, -117.6310; 33.4548, -117.7174 | 0.05 |
| | Ridgeback Prawn | Z3-102921-RBP | 10/29/2021 | 18 | 33.4001, -117.6894; 33.3610, -117.6575 | 0.03 |
| | Rock Crab Group*** | Z3-102421-RC | 10/24/2021 | 9 | 33.4049, -117.6493; 33.3871, -117.6351; 33.4222, -117.6670 | 0.08 |
| | Rockfish Group*** | Z3-102821-RF | 10/28/2021 | 9 | 33.4074, -117.6358; 33.4239, -117.6875; 33.4251, -117.7022; 33.4252, -117.7018 | ND |
| | Speckled Sanddab | Z3-102321-SSD | 10/23/2021 | 8 | 33.4523, -117.6988; 33.4148, -117.6350 | 0.08 |

*The number of individual organisms analyzed as a single composite.

**∑BaPE is the sum of benzo[a]pyrene equivalents, a measure of the ability of oil-related chemicals to cause cancer. OEHHA's LOC for ∑BaPE is 27 ppb wet weight. ∑BaPE concentrations below 27 ppb are considered safe.

***Groups include multiple species as noted below: Baitfish Group: Pacific Sardine and various Smelt and Anchovy species; Croaker Group: California Corbina, Queenfish, and White and Yellowfin Croaker; Perch Group: Barred Surfperch, Walleye Surfperch, and other perch species; Rockfish Group: members of the genus Sebastes; Rock Crab Group: Red Rock Crab, Brown Rock Crab, and Yellow Rock Crab.

ND = not detected.

## APPENDIX 1. CPAH CONCENTRATIONS (PPB, WET WEIGHT) IN MUSSEL SAMPLES BY IDENTIFICATION NUMBER

| Sample Identification | cPAH Concentration (ppb, wet weight) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Naphthalene | C1-Naphthalenes | C2-Naphthalenes | C3-Naphthalenes | C4-Naphthalenes | Benz(a)anthracene | Chrysene/Triphenylene | C1-Chrysenes | C2-Chrysenes | C3-Chrysenes | C4-Chrysenes | Benzo(b)fluoranthene | Benzo(k,j)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | C1-Dibenzo(a,h)anthracenes | C2-Dibenzo(a,h)anthracenes | C3-Dibenzo(a,h)anthracenes | ∑BaPE* |
| 01101421MUS01 | 1.39 | 1.05 | 1.09 | ND | ND | 0.151 | 0.237 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.30 |
| 02101421MUS02 | 1.75 | 1.58 | 1.70 | 2.90 | ND | 0.128 | 0.407 | 0.315 | ND | ND | ND | 0.184 | 0.125 | 0.199 | 0.100 | 0.095 | ND | ND | ND | 1.25 |
| 01101421MUS03 | 1.53 | 1.40 | 1.78 | ND | ND | 1.96 | 2.67 | 0.255 | ND | ND | ND | 0.329 | 0.614 | 0.140 | 0.130 | ND | ND | ND | ND | 1.44 |
| 02A101421MUS04 | 1.49 | 1.55 | 1.56 | 1.86 | ND | 0.173 | 0.391 | 0.242 | ND | ND | ND | 0.155 | 0.149 | 0.176 | ND | ND | ND | ND | ND | 0.86 |
| 01101521MUS05 | 1.71 | 1.36 | 1.15 | ND | ND | 0.278 | 0.562 | ND | ND | ND | ND | 0.122 | 0.129 | ND | ND | ND | ND | ND | ND | 0.51 |
| 01101521MUS06 | 1.41 | 1.20 | 1.21 | ND | ND | 1.81 | 2.22 | 0.339 | ND | ND | ND | 0.253 | 0.530 | 0.164 | ND | ND | ND | ND | ND | 1.30 |
| 01101521MUS07 | 1.42 | 0.999 | 1.29 | ND | ND | 0.122 | 0.259 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.32 |
| 01101521MUS08 | 1.51 | 1.25 | 1.09 | ND | ND | 0.087 | 0.181 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.31 |
| 06102221MUS01 | 2.07 | 1.47 | 1.09 | ND | ND | 1.56 | 2.67 | 0.181 | ND | ND | ND | 0.365 | 0.652 | 0.174 | 0.043 | ND | ND | ND | ND | 1.43 |
| 06102221MUS02 | 1.27 | 0.756 | ND | ND | ND | 1.76 | 2.17 | 0.357 | ND | ND | ND | 0.287 | 0.435 | 0.181 | ND | ND | ND | ND | ND | 1.15 |
| 06102221MUS03 | 1.44 | 1.66 | 1.48 | ND | ND | 6.02 | 5.44 | 0.722 | ND | ND | ND | 0.822 | 1.65 | 0.495 | 0.038 | ND | ND | ND | ND | 3.14 |

| Sample Identification | cPAH Concentration (ppb, wet weight) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Naphthalene | C1-Naphthalenes | C2-Naphthalenes | C3-Naphthalenes | C4-Naphthalenes | Benz(a)anthracene | Chrysene/Triphenylene | C1-Chrysenes | C2-Chrysenes | C3-Chrysenes | C4-Chrysenes | Benzo(b)fluoranthene | Benzo(k,j)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | C1-Dibenzo(a,h)anthracenes | C2-Dibenzo(a,h)anthracenes | C3-Dibenzo(a,h)anthracenes | ∑BaPE* |
| 06102221MUS04 | 0.653 | 0.363 | ND | ND | ND | 0.135 | 0.259 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.13 |
| 06102221MUS05 | 0.417 | 0.372 | ND | ND | ND | 0.187 | 0.269 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.12 |
| 06102221MUS06 | 0.847 | 0.572 | ND | ND | ND | 0.089 | 0.181 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.14 |
| 06102321MUS07 | 1.27 | 1.15 | 1.14 | ND | ND | 0.197 | 0.338 | ND | ND | ND | ND | 0.121 | 0.114 | 0.146 | ND | ND | ND | ND | ND | 0.56 |
| 06102321MUS08 | 0.477 | 0.771 | ND | ND | ND | 0.132 | 0.340 | ND | ND | ND | ND | 0.168 | 0.126 | 0.174 | 0.133 | ND | ND | ND | ND | 0.46 |

*∑BaPE is the sum of individual cPAH concentrations multiplied by the respective Potency Equivalency Factor (OEHHA, 2015a).

ND = not detected.

## APPENDIX 2. cPAH CONCENTRATIONS (PPB, WET WEIGHT) IN ZONE 1 FINFISH, CRUSTACEAN, AND OTHER (NON-MUSSEL) INVERTEBRATE SAMPLES BY IDENTIFICATION NUMBER

| Sample Identification | cPAH Concentration (ppb, wet weight) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Naphthalene | C1-Naphthalenes | C2-Naphthalenes | C3-Naphthalenes | C4-Naphthalenes | Benz(a)anthracene | Chrysene/Triphenylene | C1-Chrysenes | C2-Chrysenes | C3-Chrysenes | C4-Chrysenes | Benzo(b)fluoranthene | Benzo(k,j)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | C1-Dibenzo(a,h)anthracenes | C2-Dibenzo(a,h)anthracenes | C3-Dibenzo(a,h)anthracenes | ∑BaPE* |
| 02101421BAIT01 | 1.26 | 0.41 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.12 |
| 02101521BAIT02 | 0.63 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.04 |
| 02101421BAIT00 | 2.00 | 1.37 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.24 |
| Z1-102821-BAS | 0.42 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.03 |
| Z1-102821-CH-1 | 0.41 | 0.60 | 2.89 | 8.26 | 2.21 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.01 |
| Z1-102821-CSF | 0.350 | 0.24 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.04 |
| Z1-102421-CSH | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Z1-102421-CSLS | 1.37 | 1.25 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.18 |
| Z1-102421- CSLD | 0.710 | 0.58 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.09 |
| Z1-102221-CKR | 1.41 | 1.09 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.18 |
| Z1-102821-GSC | 0.18 | 0.11 | ND | ND | ND | 0.04 | 0.04 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.03 |

| Sample Identification | cPAH Concentration (ppb, wet weight) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Naphthalene | C1-Naphthalenes | C2-Naphthalenes | C3-Naphthalenes | C4-Naphthalenes | Benz(a)anthracene | Chrysene/Triphenylene | C1-Chrysenes | C2-Chrysenes | C3-Chrysenes | C4-Chrysenes | Benzo(b)fluoranthene | Benzo(k,j)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | C1-Dibenzo(a,h)anthracenes | C2-Dibenzo(a,h)anthracenes | C3-Dibenzo(a,h)anthracenes | ∑BaPE* |
| Z1-102421-KW | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 02101521 MKL01 | 1.22 | 1.02 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.16 |
| Z1-102821-PM | 0.38 | 0.39 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.05 |
| 02101521PER01 | 0.8 | 1.24 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.14 |
| 05101721PER04 | 0.650 | 0.430 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.08 |
| Z1-103021-RSU | 0.33 | 0.4 | ND | ND | ND | 0.06 | 0.13 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.08 |
| Z1-102821-RBP | 0.51 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.04 |
| Z1-102421-RC | 0.54 | 0.420 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.07 |
| Z1-102821-RF | 0.35 | 0.23 | ND | ND | ND | 0.02 | 0.03 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.05 |
| Z1-102221-SSD | 0.95 | 0.840 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.13 |
| Z1-103021-WSC | 0.25 | 0.16 | ND | ND | ND | 0.05 | 0.09 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.05 |

*∑BaPE is the sum of individual cPAH concentrations multiplied by the respective Potency Equivalency Factor (OEHHA, 2015a).

ND = not detected.

## APPENDIX 3. CPAH CONCENTRATIONS (PPB, WET WEIGHT) IN ZONE 2 FINFISH, CRUSTACEAN, AND OTHER (NON-MUSSEL) SAMPLES BY IDENTIFICATION NUMBER

| Sample Identification | cPAH Concentration (ppb, wet weight) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Naphthalene | C1-Naphthalenes | C2-Naphthalenes | C3-Naphthalenes | C4-Naphthalenes | Benz(a)anthracene | Chrysene/Triphenylene | C1-Chrysenes | C2-Chrysenes | C3-Chrysenes | C4-Chrysenes | Benzo(b)fluoranthene | Benzo(k,j)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | C1-Dibenzo(a,h)anthracenes | C2-Dibenzo(a,h)anthracenes | C3-Dibenzo(a,h)anthracenes | ∑BaPE* |
| 03101621BAIT03 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Z2-102821-BAS | 0.42 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.03 |
| Z2-102821-CH | 0.32 | 0.43 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.05 |
| Z2-102821-CSF | 0.34 | 0.209 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.04 |
| Z2-102421-CSH | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Z2-102421-CSLS | 0.86 | 0.624 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.10 |
| Z2-102421- CSLD | 0.72 | 0.540 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.09 |
| Z2-102421-JSM | 1.1 | 0.596 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.12 |
| Z2-102421-KW | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Z2-102421-MKL | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Z2-102821-PSD | 0.33 | 0.34 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.05 |

| Sample Identification | cPAH Concentration (ppb, wet weight) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Naphthalene | C1-Naphthalenes | C2-Naphthalenes | C3-Naphthalenes | C4-Naphthalenes | Benz(a)anthracene | Chrysene/Triphenylene | C1-Chrysenes | C2-Chrysenes | C3-Chrysenes | C4-Chrysenes | Benzo(b)fluoranthene | Benzo(k,j)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | C1-Dibenzo(a,h)anthracenes | C2-Dibenzo(a,h)anthracenes | C3-Dibenzo(a,h)anthracenes | ∑BaPE* |
| Z2-102821-RSU | 0.37 | 0.257 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.04 |
| Z2-102821-RBP | 0.31 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.02 |
| Z2-102421-RC | 0.72 | 0.44 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.08 |
| Z2-102821-RF | 0.35 | 0.203 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.04 |

*∑BaPE is the sum of individual cPAH concentrations multiplied by the respective Potency Equivalency Factor (OEHHA, 2015a).

ND = not detected.

## APPENDIX 4. cPAH CONCENTRATIONS (PPB, WET WEIGHT) IN ZONE 3 FINFISH, CRUSTACEAN, AND OTHER (NON-MUSSEL) INVERTEBRATE SAMPLES BY IDENTIFICATION NUMBER

| Sample Identification | cPAH Concentration (ppb, wet weight) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Naphthalene | C1-Naphthalenes | C2-Naphthalenes | C3-Naphthalenes | C4-Naphthalenes | Benz(a)anthracene | Chrysene/Triphenylene | C1-Chrysenes | C2-Chrysenes | C3-Chrysenes | C4-Chrysenes | Benzo(b)fluoranthene | Benzo(k,j)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | C1-Dibenzo(a,h)anthracenes | C2-Dibenzo(a,h)anthracenes | C3-Dibenzo(a,h)anthracenes | ∑BaPE* |
| 01101521BAIT09 | 3.14 | 2.56 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.40 |
| Z3-102821-BAS | 0.415 | 0.59 | 3.25 | 3.66 | 2.46 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.73 |
| Z3-102921-CH-1 | 0.360 | 0.30 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.05 |
| Z3-102821-CSF | 0.372 | 0.211 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.04 |
| Z3-102421-CSH | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Z3-102421-CSLS | 0.765 | 0.594 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.10 |
| Z3-102421- CSLD | 0.757 | 0.476 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.09 |
| Z3-102321-CKR | 0.488 | 0.546 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.07 |
| Z3-102421-KW | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 03101621 MKL02 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Z3-102821-PM | 0.342 | 0.45 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.06 |

| Sample Identification | cPAH Concentration (ppb, wet weight) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Naphthalene | C1-Naphthalenes | C2-Naphthalenes | C3-Naphthalenes | C4-Naphthalenes | Benz(a)anthracene | Chrysene/Triphenylene | C1-Chrysenes | C2-Chrysenes | C3-Chrysenes | C4-Chrysenes | Benzo(b)fluoranthene | Benzo(k,j)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | C1-Dibenzo(a,h)anthracenes | C2-Dibenzo(a,h)anthracenes | C3-Dibenzo(a,h)anthracenes | ∑BaPE* |
| 03101621PER02 | 0.636 | 0.395 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.07 |
| 03101621PER03 | 0.729 | 0.670 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.10 |
| Z3-102921-RSU | 0.422 | 0.266 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.05 |
| Z3-102921-RBP | 0.395 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.03 |
| Z3-102421-RC | 0.766 | 0.416 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.08 |
| Z3-102821-RF | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Z3-102321-SSD | 0.703 | 0.374 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.08 |

*∑BaPE is the sum of individual cPAH concentrations multiplied by the respective Potency Equivalency Factor (OEHHA, 2015a).

ND = not detected.