LAS VEGAS WASH MONITORING AND CHARACTERIZATION STUDY: ECOTOXICOLOGIC SCREENING ASSESSMENT OF SELECTED CONTAMINANTS OF POTENTIAL CONCERN IN SEDIMENT, WHOLE FISH, BIRD EGGS, AND WATER, 2007-2008

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for

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EXECUTIVE SUMMARY

Background. Since 1998, the Las Vegas Wash Coordination Committee has implemented long-term management strategies for the Las Vegas Wash (Wash). A series of projects was undertaken to control erosion, improve water quality, and enhance the ecosystem of the Wash. These projects include construction of several erosion control structures (Zhou et al. 2004) and a wetland park. While these projects have provided benefits for water quality improvements and ecosystem enhancements, their potential to change the flow regime of the Wash by creating ponds and slowing the flow of the Wash to Lake Mead has created concerns for possible effects on accumulation of contaminants in the Wash.

The Las Vegas Wash Monitoring and Characterization Study (Bioassessment) was initiated as a series of monitoring activities to assist in evaluating whether factors affecting the flow of the Wash might be causing undesired effects on environmental contaminant distribution or accumulation in the Wash and its fish and wildlife inhabitants. The monitoring program is intended to provide a series of snapshots of environmental contaminant levels in the Wash over time through repeated rounds of sampling and is also useful as a tool for resource managers to help identify potential sources of contaminants within the watershed. The Southern Nevada Water Authority (SNWA) and the United States Fish and Wildlife Service (USFWS) selected a list of contaminants of potential concern (COPCs) to be assessed. The list of COPCs, which includes both inorganic (trace metals, ions) and organic (organochlorine, organophosphorus, etc.) pollutants, was developed based on substances that may be harmful to wildlife and that are commonly found in environmental samples from industrial sites, mining operations, and other highly contaminated areas.

The current report presents, summarizes, and interprets data collected in the most recent (third) round of Bioassessment sampling conducted from 2007 to 2008. As in the previous two rounds of sampling (Intertox 2008, Intertox and B&V 2006), the SNWA and USFWS collected samples of sediment, whole fish, and bird eggs from the Wash and its tributaries, as well as whole fish and bird eggs from Pahranagat National Wildlife Refuge (PNWR), which was used as a regional reference location. The samples were analyzed for residues of the selected COPCs. Waterborne COPC concentration data from 2000-2008 were available through other monitoring programs conducted by SNWA. COPC concentrations were then compared to levels of concern (LOC) identified in previous Bioassessment reports. The current report differs from previous ones in that it also presents a comparison of data from all three Bioassessment sampling rounds conducted to date.

Summary of the 2007-2008 Study. LOCs were not available for many of the organic COPCs analyzed in water, sediment, fish and bird eggs. Only a few organic COPCs were analyzed in water and they were only assessed in the tributaries and seeps contributing to the Wash. The only organic COPC detected in water was gamma-HCH, found in one water sample taken at Flamingo Wash. This COPC should be investigated further with emphasis on potential for chronic effects. Only 21 of the 36 organic COPCs were analyzed in sediment, and none of these were detected, but lower reporting limits might be appropriate for several of these compounds. All 36 of the organic COPCs were analyzed in whole fish and bird eggs. To date, LOCs have been identified for only five of these in whole fish. All but five of the organic COPCs were detected in whole fish. Total PCBs was the only organic COPC to exceed an LOC for fish. At least two fish from each location exceeded the minimum LOC for protection of piscivorous wildlife, but only two fish exceeded a criterion for protection of fish. Most of the organic COPCs were detected in bird eggs, but only four exceeded LOCs. Concentrations of DDT and related chemicals appear to be elevated in bird eggs from Burns Street Channel (BSC) and Bird Viewing Preserve (BVP), indicating moderate concern based on number of eggs affected and severity of potential effects. However, the species of interest here may not be as sensitive as the species for which the LOCs were originally developed. Minor concern is indicated for dieldrin in bird eggs at Duck Creek (DC), and minor to moderate concern is warranted for heptachlor epoxide in bird eggs from BSC and BVP. For both whole fish and bird eggs, differences in species sampled (and their trophic status in the case of fish) and small sample sizes complicated interpretation of location-related differences in organic and inorganic COPC concentrations.

LOCs have not been identified for several inorganic COPCs in water, sediment, and bird eggs or for the majority of inorganic COPCs in fish. Waterborne concentrations of 12 of the 22 inorganic COPCs exceeded their LOCs. Concern for substantial effects is indicated for waterborne aluminum, arsenic, mercury, molybdenum, selenium, and zinc, and lesser concern is warranted for waterborne chromium, copper, iron, lead, perchlorate, and vanadium. Few of the inorganic COPCs exceeded LOCs for sediment. A moderate degree of concern is warranted for lead in sediment, a minor to moderate degree of concern is indicated for arsenic and copper in sediment, and concern for relatively minor effects is suggested for sediment manganese. Seven inorganic COPCs exceeded whole fish LOCs, with most indicating relatively minor concern (arsenic, cadmium, chromium, copper, and lead) and only two (selenium and zinc) warranting moderate concern. Mercury was the only inorganic COPC present in bird eggs at levels exceeding LOCs. A minor to moderate degree of concern is indicated for toxicity of mercury in brid eggs at DC, BSC, and BVP, based on number of eggs exceeding LOCs and severity of potential effects. However, mercury also exceeded LOCs at the reference location, so levels in eggs from the Wash might not be elevated relative to other areas and/or the source of mercury found in the eggs might not be local.

Locations and Contaminants of Greater Concern. Locations of greater concern are identified by higher numbers of COPCs exceeding LOCs, while contaminants of greater concern are identifed as those exceeding LOCs in more than one environmental medium at the same location. Multiple environmental media were analyzed for organic COPCs at six locations. At least one sample media type exceeded an LOC for an organic COPC at each of these locations. None of these locations were associated with more than one sample medium exceeding a LOC for the same organic COPC. Fish and bird eggs exceeded LOCs for different organic COPCs at the Nature Preserve (NP), Duck Creek/Pittman Wash (DC/PW), and mainstream Wash location LW6.05 (PB). For inorganic COPCs, multiple environmental media were sampled at eight locations. Multiple environmental media from most of these locations exceeded LOCs for one or more inorganic COPCs. The reference location was among these, but detections were less frequent and concentrations of inorganic COPCs were generally less than at the Wash locations. Two sample media exceeded LOCs for inorganic COPCs at each of the following locations: DC/PW, BSC, Las Vegas Bay (LVB), and the reference location. Three locations had two media that exceeded LOCs for the same inorganic COPC: DC/PW (selenium in water and fish), BSC (copper in water and sediment), and LVB (arsenic and lead in sediment and fish).

Changes in COPC Concentrations Over Time. Only eight of the organic COPCs monitored in water were also monitored in fish and bird eggs. Among these, only four (the four HCH isomers) were detected more than five times across all locations sampled for organic COPCs (only the tributaries and seeps, 267 samples, January 2000-2009). Percent of detections of HCH isomers was low (less than 12%), and the highest concentrations were reported for the less toxic isomers for which no LOCs are available. In water, gamma-HCH was detected with the lowest frequency and among the lowest concentrations of the four HCH isomers. Six of the nine samples containing detectable levels of gamma-HCH exceeded the minimum LOC. Inorganic COPCs that generally occurred in water at concentrations greater than their mininum LOCs included aluminum, copper, lead, perchlorate, selenium, and zinc.

Major Recommendations. Consideration should be given to exploring the possibility of achieving greater analytical sensitivity in the several cases in which analytical detection or reporting limits are greater than the minimum LOCs for COPCs in certain media.

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ATSDR	Agency for Toxic Substances and Disease Registry
CASRN	Chemical Abstracts Service Registry Number
COPC	Contaminant of potential concern
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
dw	Dry weight
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
LEL	Lowest effect level
ln	Lipid normalized
LOC	Level of concern
LVVWAC	Las Vegas Valley Watershed Advisory Committee
LVWCC	Las Vegas Wash Coordination Committee
MRL	Method reporting limit
NA	Not available, or not analyzed
nc	Not calculated
ND	Not detected
NDEP	Nevada Division of Environmental Protection
NEL	No-effect level
PCB	Polychlorinated biphenyl
PEC	Probable effect concentration
PNEC	Predicted no-effect concentration
ppb	Parts per billion (µg/kg, ng/g, µg/L)
ppm	Parts per million (mg/kg, mg/L)
QA/QC	Quality assurance/quality control
SAV	Secondary Acute Value
SQG	Sediment quality guideline
TEC	Threshold effect concentration
TDS	Total dissolved solids
TOC	Total organic carbon
TSS	Total suspended solids

U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
ww	Wet weight
WWTP	Wastewater treatment plant

1.0 INTRODUCTION

The Las Vegas Wash (Wash) is the sole drainage from the Las Vegas Valley watershed to Lake Mead. The four flow components in the Wash are tertiary treated municipal wastewater, urban runoff, shallow groundwater, and stormwater. Increased urbanization in the valley over the past two decades has resulted in increased flows through the Wash, which has caused significant erosion and wetland destruction.

Since 1998, the Las Vegas Wash Coordination Committee has implemented long-term management strategies for the Wash. A series of projects were undertaken to control erosion, improve water quality, and enhance the ecosystem of the Wash. These projects include construction of several erosion control structures (Zhou et al. 2004) and a wetland park. While these projects have provided benefits for water quality improvements and ecosystem enhancements, their potential to change the flow regime of the Wash by creating ponds and slowing the flow of the Wash to Lake Mead has created concern for the possible effects on accumulation of contaminants in the Wash. The pools and wetlands behind the erosion control structures provide habitat for a variety of fish and wildlife, particularly migratory birds. Wetlands located in areas of high urban or agricultural activity have the potential to be contaminant "sinks" or "hot spots" for exposure of fish and wildlife (both resident and migratory) to toxic contaminants, including pesticides (Beyer et al. 1996). In addition to erosion control activities, other factors might also alter the flow of water in the Wash and affect water quality conditions. Changing lake levels, erosion and formation of deltas, or increasing flows of municipal wastewater treatment plant (WWTP) effluent or diversion of these effluents might result in changes in water quality parameters that affect the cycling, degradation, accumulation, and toxicity of contaminants.

The Las Vegas Wash Monitoring and Characterization Study (Bioassessment) was initiated as a series of monitoring activities to assist in evaluating whether factors affecting the flow of the Wash might be causing undesired effects on environmental contaminant distribution or accumulation in the Wash and its fish and wildlife inhabitants. The monitoring program is intended to provide a series of snapshots of environmental contaminant levels in the Wash over time through repeated rounds of sampling and is also useful as a tool for resource managers to help identify potential sources of contaminants within the watershed. The Southern Nevada Water Authority (SNWA) and the United States Fish and Wildlife Service (USFWS) selected a suite of contaminants of potential concern (COPCs) to be assessed. USFWS routinely examines contaminants in wildlife by analyzing tissue residues for selected priority pollutants (i.e., COPCs) to ensure habitat quality. The list of COPCs, which includes both inorganic (trace metals, ions) and organic (organochlorine, organophosphorus, etc.) pollutants, was developed in cooperation with the federal Analytical Control Facility Laboratory in Shepherdstown, West Virginia, based on compounds that may be harmful to wildlife and that are commonly found in environmental samples from industrial sites, mining operations, and other highly contaminated areas.

In 2007 and 2008, the SNWA and USFWS collected samples of sediment, whole fish, and bird eggs from the Wash and its tributaries, as well as whole fish and bird eggs from Pahranagat National Wildlife Refuge (PNWR), which was used as a regional reference location. The samples were analyzed for compounds of the selected COPCs. Waterborne COPC concentration data from 2000-2008 were available through other monitoring programs conducted by SNWA. Like the reports for the two previous rounds of Bioassessment sampling (Intertox 2008, Intertox and

B&V 2006), the current report presents, summarizes, and interprets data collected in the most recent round of sampling. In addition, the current report presents a comparison of data from all three Bioassessment sampling rounds to date. ACT I was engaged to conduct this work.

ACT I was charged the following tasks related to data from the 2000-2003, 2005-2006, and 2007-2008 Las Vegas Wash Monitoring and Characterization Studies:

- Present and/or summarize in tables or figures the analytical data received from laboratories for samples collected in 2007 and 2008
- Screen selected COPCs in water, sediment, whole fish, and bird eggs to identify those contaminants occurring at concentrations exceeding levels of concern (LOCs) identified in previous reports. See Intertox (2008) for most recent LOCs.
- Identify spatial trends in contaminant concentrations in these samples that might indicate areas of greater contamination or sources of contamination.
- Compare results of 2000-2003 (Intertox and B&V 2006), 2005-2006 (Intertox 2008), and 2007-2008 (current) studies.
- Provide recommendations for future sampling efforts.
- Compile a final report.

The results of the first and second rounds of sampling for the Bioassessment are available elsewhere (Intertox 2008, Intertox & B&V 2006). The current report compiles and summarizes the results of a third round of monitoring conducted from 2007 to early 2008. As for the previous Bioassessment studies, SNWA and USFWS collected samples and arranged for analyses. ACT I was asked to perform the tasks listed above using data supplied by SNWA and USFWS.

2.0 Sample Media Selected for Analysis

Justification for selection of water, whole fish, bird eggs, and sediment for analysis in this study was provided in the two previous Bioassessment reports (Intertox 2008, Intertox and B&V 2006).

3.0 Contaminants of Potential Concern

The COPCs selected by SNWA and USFWS for this assessment are presented in **Table 1**. Both organic and inorganic contaminants are considered. Common synonyms and Chemical Abstracts Service Registry Numbers (CASRNs) for the organic COPCs are listed in **Appendix A**.

4.0 Methods

4.1 Locations of Interest

Locations of interest for this study were selected by SNWA and USFWS. This assessment was limited to COPC concentration data related to the sampling locations described in **Table 2** and depicted in the map in **Figure 1**. **Table 2** presents sampling locations along with their descriptions and constituents of their flows (i.e., WWTP effluent, groundwater, urban runoff, and stormwater). Sampling locations are listed in order (upstream to downstream) from the beginning to the end of the Wash, with tributaries and seeps ordered by their point of entry into the Wash. It can be assumed that all or most of the tributaries (particularly those further downstream) are influenced by shallow groundwater. The shallow groundwater aquifer in the Las Vegas Valley receives recharge from both rainfall and irrigation activities. Although the Nature Preserve (NP) is not intended to convey storm flows, the adjacent Monson Channel has overflowed into NP on several occasions, so the possible presence of stormflow constituents cannot be dismissed (Orsak 2006). In 2003, the inflows to NP consisted entirely of urban runoff from Monson Channel, with the possible exception of flood events during which the Wash might overflow its banks. In April 2004, flows to NP were comprised of approximately equal amounts of municipal wastewater effluent and Monson Channel urban runoff. By November 2005, NP was receiving only WWTP effluent; to reduce waterborne selenium levels for protection of wildlife, Monson Channel flows were no longer directed to NP.

In all three studies conducted to date, a regional reference location (PNWR) was used to facilitate evaluation of the degree of contamination observed in the Wash. PNWR is located approximately 90 miles north of Las Vegas and is less affected by anthropogenic activity and various forms of pollution than the Las Vegas Valley. Whole fish and bird egg samples from PNWR were collected to enhance data interpretation by allowing for comparison of concentrations of COPCs between urban impacted locations and the reference location. Water and sediment samples were not collected from PNWR.

4.2 Sources of Chemical Concentration Data and Descriptions of Sampling Methods

4.2.1 Water

SNWA periodically monitors waterborne contaminant concentrations in the mainstream Wash to evaluate the baseline conditions, to assess water quality variations over time, to quantify the effects of increased wetland vegetation on water quality, and to provide a long-term history of data that can be used to make watershed-based decisions. Data collected from January 2007 through March 2008 as part of that monitoring program were used to represent the current 2007-2008 study because these dates encompass the dates when the other media were sampled. Data describing COPC concentrations in the tributaries originated from the Tributary Water Quality Monitoring Program, which was designed to quantify the effects of the urban runoff component on water quality and the overall health of the Wash and its developing wetland ecosystem.

SNWA selected the laboratories to conduct the analyses. The following laboratories were used for the analyses of waterborne contaminants conducted for these two programs in 2007 and 2008:

- Weck Laboratories, Inc. (Industry, CA) - inorganic (metals, dissolved metals, nutrients) and organic contaminants,

- Oscar E. Olson Biochemistry Laboratories (South Dakota State University, Brookings, SD) - selenium analysis,

- Southern Nevada Water System (SNWS) Laboratories (Boulder City, NV) – conductance, dissolved oxygen (DO), pH, temperature, and perchlorate.

Waterborne COPC concentration data collected from 2000-2008 were provided to ACT I in electronic format. SNWA reviewed these data for quality assurance prior to delivery to ACT I. ACT I assumed that these data were correct as received and performed no additional quality assurance or quality control (QA/QC) reviews. From the spreadsheet provided, ACT I selected data from water samples collected from January 2007 to March 2008. SNWA collected montly water samples from the Wash and quarterly samples from tributaries and seeps entering the Wash. Organic contaminants data are available for tributaries and seeps that contribute to the Wash and locations in the mainstream Wash, however, organic data was only assessed for tributary and seep locations. Most of the organic COPCs in the current report were not included among the analytes. Aldrin; dieldrin; endrin; p,p'-DDD; and lindane and the HCH alpha-, beta-, gamma-, and delta- isomers were among the analytes. Nineteen of the 22 inorganic COPCs were analyzed in the water samples; boron, strontium, and titanium were not analyzed in water. Total recoverable inorganics were analyzed in all water samples, but dissolved inorganics were analyzed only in the mainstream Wash.

4.2.2 Sediment

Sediment samples were collected by SNWA on September 17, 2007, from the same locations from which sediment was sampled in the two previous rounds the Bioassessment, including LW10.75, NP, DC (i.e., DC_1), PB, LW0.8, and LVB. An additional sample was collected from the Burns Street Channel (BSC) location on October 11, 2007. A single composite sediment sample (representing 5 subsamples) was taken from each location. SNWA selected TestAmerica (Phoenix, AZ) as the analytical laboratory to measure sediment COPC concentrations. SNWA provided sediment COPC concentration data to ACT I in electronic format (PDF files and Microsoft Excel spreadsheets). These data were assumed to be correct, and ACT I performed no additional QA/QC reviews. Concentrations were reported by the laboratory on a wet weight basis. Because almost all of the criteria previously identified for sediments are tabulated on a dry weight basis, ACT I converted wet weight concentration data (C_{WW}) to dry weight based concentrations (C_{DW}) using the following equation: $C_{DW} = C_{WW} \times [100 / (100 - \%\ \text{moisture})]$. Twenty-one of the 22 inorganic COPCs were analyzed in sediment samples; perchlorate was not analyzed in sediment. Nineteen of the organic COPCs were analyzed in sediment. The following 17 organic COPCs were not analyzed in sediment: chlorpyrifos; o,p'-DDD; o,p'-DDE; o,p'-DDT; DDMU; total DDTs; hexachlorobenzene; lindane (total HCH); oxychlordane; cis- and trans-nonachlor; mirex; pentachloroanisole; pentachlorobenzene; 1,2,3,4-tetrachlorobenzene; 1,2,3,5-tetrachlorobenzene; and total PCBs. Although total PCBs were not analyzed, several Aroclor mixtures were analyzed in sediment. Lindane was not analyzed, but the 4 constituent HCH isomers were analyzed and summed to approximate total HCH. Including organic COPCs for which concentration data were based on sums of constituents, data were available for 21 of the 36 organic COPCs for comparison to LOCs.

4.2.3 Fish

SNWA collected fish for analysis of whole-body residues of COPCs from November 2007 through March 2008. The methodology used to sample fish is described in the document entitled "Bioassessment Monitoring Plan for Las Vegas Wash and Tributaries" (LVWCC 2001). In a 2002-2003 fish survey conducted to investigate species diversity in the Wash, seven species of fish were observed in the Wash including green sunfish (*Lepomis cyanellus*), mosquitofish (*Gambusia affinis*), common carp (*Cyprinus carpio*), black bullhead (*Ameiurus melas*), red shiner (*Cyprinella* *lutrensis*), fathead minnow (*Pimephales promelas*) and suckermouth catfish (family Laricariidae: *Hypostomus plecostomus*; an exotic aquarium fish species) (LVWCC 2008). None of these species is native to Nevada. When using fish tissue concentrations of chemicals to assess relative contamination among locations, fish of the same species and approximate size or age and sex are typically best used for comparison. Species and number of fish available for sampling vary among locations of interest for the current study, so sampling was opportunistic and not limited to a single species. Species of fish that were sampled for the 2007-2008 study include common carp (family Cyprinidae), green sunfish (family Centrarchidae), black bullhead (family Ictaluridae), and largemouth bass (*Micropterus salmoides*, family Centrarchidae).

SNWA and USFWS selected the laboratories that analyzed fish COPC residues. Concentrations of 36 organic COPCs in whole fish were analyzed by TDI-Brooks International, Inc. (College Station, TX). Concentrations of 19 inorganic COPCs were analyzed by Laboratory and Environmental Testing, Inc. (Columbia, MO). Fish COPC concentration data were provided by SNWA in electronic forrmat (Microsoft Excel spreadsheets and PDF files) to ACT I. The PDF files were used as a data source and were assumed to be correct; ACT I performed no additional QA/QC reviews on those data.

4.2.4 Bird Eggs

SNWA and USFWS collected bird eggs for analysis of COPCs from late March to early July 2007. The methodology used to sample bird eggs is described in the document entitled "Bioassessment Monitoring Plan for Las Vegas Wash and Tributaries" (LVWCC 2001). When using concentrations of contaminants in bird eggs to compare the degree of contamination among locations, eggs from birds of the same species provide the best basis for comparison. However, because the number of nests available for sampling is small, sampling was opportunistic and not limited to a single species. All species that were sampled for the current study are residents considered to be abundant or common in the Wash (**Table 3**).

SNWA and USFWS selected the laboratories that analyzed bird egg COPC residues. Concentrations of 36 organic COPCs in bird eggs were analyzed by the TDI Brooks International, Inc. (College Station, TX), and concentrations of 19 inorganic COPCs were analyzed by Laboratory and Environmental Testing, Inc. (Columbia, MO). SNWA provided bird egg COPC concentration data in electronic format (Microsoft Excel spreadhseets and PDF files) to ACT I. The PDF files were used and were assumed to be correct; ACT I performed no additional QA/QC reviews on those data.

4.3 Selection of Levels of Concern and Literature Search Strategies

The process for selection of LOCs and literature search strategies to locate this information were described in previous reports (Intertox 2008, Intertox and B&V 2006). In comparison with the first report, the 2005-2006 report described LOCs used for waterborne contaminants, including indicating whether criteria were based on dissolved concentrations or total concentrations when that information was available. Certain water quality criteria for metals can be adjusted for hardness, resulting in less stringent criteria as water hardness increases. Because the elevated water hardness in the Wash and its tributaries could significantly reduce the toxicity of some metals, reviewers of the 2000-2003 report indicated that they would like hardness-adjusted criteria presented in subsequent reports. Criteria adjusted for hardness were presented in an appendix to the 2005-2006 report, but the more conservative unadjusted values were still used for screening. Some of the NDEP criteria for metals are presented only as equations that consider hardness. In those cases, low estimates of hardness were used to calculate conservative LOCs. The hardness-adjusted LOCs for waterborne contaminants were not applied to the data from the 2000-2003 report due to lack of time.

4.4 Sources of Levels of Concern

Toxicity data were taken from selected standard literature compilations and databases. The current assessment did not involve critical reviews of those data sources, as such a task was outside of the limited scope of the current effort. Given the nature of the literature searches conducted for this assessment, it is acknowledged that some sources containing potentially relevant information might have been overlooked and that some toxicity values that are not entirely applicable might have been used. Sources of LOCs are cited in the notes associated with the tables that present the LOCs for each sample type. Books and reports that were used as source references were not reviewed in detail but were briefly reviewed or skimmed for relevant LOCs. For example, handbooks by Eisler (2000 a, 2000b, 2000c) were checked only for proposed criteria for protection of natural resources and not for levels associated with adverse effects in individual studies cited in the effects tables.

The initial search to identify LOCs (sediment quality guidelines [SQGs] or sediment quality criteria [SQC]) for COPCs in sediments focused on values reported by MacDonald et al. (2000). MacDonald et al. developed and evaluated consensus-based SQGs for freshwater ecosystems for 28 chemicals. For each contaminant, two consensus-based SQGs were developed: a threshold effect concentration (TEC) below which adverse effects are not expected to occur and a probable effect concentration (PEC) above which adverse effects are expected to occur more often than not. During this process, the authors reviewed and compiled sediment quality criteria published by other investigators and determined to be suitable to form the basis of their TECs and PECs. The previously established criteria were used in the current assessment along with the TECs and PECs. Criteria that were expressed on an organic carbon-normalized basis were converted to dry weight-normalized values at 1% organic carbon because previous studies have shown that they predicted toxicity as well or better than organic carbon-normalized sediment quality criteria in field-collected sediments (MacDonald et al. 2000). Consensus-based TECs or PECs were calculated by determining the geometric mean of the suitable sediment quality criteria published by other investigators, but only if three or more published criteria were available for a contaminant. The authors reported that "the consensus-based SQGs provide a unifying synthesis of the existing SQGs, reflect causal rather than correlative effects, and account for the effects of contaminant mixtures" (MacDonald et al. 2000). The consensus-based SQGs do not consider the potential for bioaccumulation in aquatic organisms (i.e., they do not incorporate bioaccumulation-based criteria) or associated hazards to animals that consume them. MacDonald et al. recommend that the consensus-based SQGs be used with bioaccumulation-based criteria and tissue residue guidelines.

Because organic COPCs were not detected in sediments (see Results), little additional effort was expended to identify additional LOCs for organic contaminants in sediment. The review article by MacDonald et al. did not include all of the COPCs in the current assessment, so the references cited in that article were collected for later review (in reports to follow the current one) to identify criteria for the remaining COPCs. The Risk Assessment Information System

(RAIS) Ecological Benchmark Values database (U.S. DOE 2006) also could be searched for SQGs in reports to follow the current one.

A single screening level not identified previously was found for aluminum. A screening-level ecological risk assessment (Parametrix 2001) reported an effects range-median (ERM) value of 58,000 µg/g (equal to 58,000 mg/kg) for sediment, citing Ingersoll et al. 1996 as the original source of that information. That value was used as an LOC for aluminum in sediment for the current report. The same authors compiled additional screening values for chemicals that are COPCs in the current report, but none of those screening values were less than the minumum LOCs identified here. However, the LOCs used in future bioassessments could be updated to reflect screening values compiled in the report by Parametrix (2001) and the references therein.

The Agency for Toxic Substances and Disease Registry (ATSDR) has published toxicological profiles for some of the chemicals evaluated in this report. These profiles sometimes contain data such as acceptable water concentrations and occurrence data for chemicals in food or animals. However, these data were found to be generally duplicative of other sources searched and not focused on ecological impacts, so they are not included in tables summarizing LOCs.

4.5 Identification of Contaminants Exceeding Levels of Concern, Spatial Trends in Contaminant Concentrations, and Potential Sources of Contamination

Concentrations of individual COPCs measured in water, sediment, whole fish, and bird egg samples as part of the 2007-2008 Las Vegas Wash Monitoring and Characterization Study were compared with previously established LOCs for individual contaminants. Evaluation of mixtures of contaminants requires more complicated and time-consuming methods and is not within the scope of this project. Spatial trends and potential sources or "hot spots" of contamination were assessed by noting which locations were associated with sample COPC concentrations exceeding LOCs. In some cases, patterns of detectable levels of COPCs versus non-detects or higher observed concentrations at certain locations were considered to assess whether specific locations might be associated with higher levels of contamination. However, in the absence of robust data enabling a more scientifically defensible statistical analysis and more time to consider the accessory data (e.g., size, age, and sex of fish), professional judgment and knowledge of the local conditions and potential sources of contamination were used to identify trends or hot spots based on concentrations rather than on exceedance of a LOC.

Certain contaminants are lipophilic, meaning that they tend to partition into fat. Lipid content data were provided for individual fish analyzed in this study so that lipid-normalized organic COPC concentrations could be calculated. Comparisons of lipophilic organic COPC contamination levels among locations included consideration of lipid-normalized fish tissue concentrations because fish of certain species and at certain locations might possess more body fat than others.

4.6 Comparisons Among 2000-2003, 2005-2006, and 2007-2008 Studies

Water sampling occurred at a sufficient frequency (i.e., either monthly or quarterly depending on the location) to provide a robust and continuous record from 2000 – 2008. Plots of COPC concentration versus sampling time were developed to visualize trends over time and readily identify locations that tended to differ widely from most other locations. For the inorganic CPOCs, time trend plots were developed for each COPC exhibiting a high frequency of detections exceeding the minimum LOC over the entire sampling period or a significant portion of this sampling period. Perchlorate was included in the time trend analysis due to the high levels that occurred at a few locations. Separate plots were generated for total and dissolved inorganic COPC measurements, with sampling dates ranging from 10/25/2000 to 10/29/2008 for total inorganic COPCs and from 12/18/2002 to 9/18/2008 for dissolved inorganic COPCs. Given the very limited set of organic COPCs and their low frequency of detection over the 2000 – 2008 time period, each organic COPC detected more than 5 times during the overall sampling period was plotted as function of time. To simplify the presentation of the data and facilitate interpretation, all non-detects (ND) and all samples designated as "not available" (NA) were deleted from the data set used for the time trend analysis. These deleted data points are depicted as as discontinuities in the time trend lines for each location.

A novel method was developed to visualize the change in sediment, fish, and bird egg COPC patterns over the three bioassessment studies. Color coded box plots were created so that general comparisons could be made among locations and studies. All fish samples and all bird egg samples are considered to be similar within sampling medium regardless of species even though multiple species at different trophic levels were collected. To understand the box plots presented in Section 7.0 of this report, the color codes are described as follows:

- Green box – COPC was not detected in any of the samples collected from the designated sampling location

- Yellow box – COPC was detected in at least one sample collected from designated sampling location

- Red box – COPC concentration exceeded minimum LOC in at least one sample collected from the designated location.

In addition to the box plots, COPCs that exceeded their minimum LOC in sediment, fish, or bird eggs were also plotted graphically to further visualize spatial and temporal trends.

5.0 RESULTS AND DISCUSSION

The usefulness of the dataset provided to ACT I for this project is limited by small sample sizes and, for fish and bird eggs, sampling of animals of different species in particular. Smaller sample sizes are expected to be less representative of the full range of exposures than are larger sample sizes. Animals of different species, size, and sex may differ in their propensity for accumulating some contaminants. For example, larger and older fish tend to accumulate larger body burdens of certain contaminants. Female fish often contain smaller concentrations of lipophilic contaminants relative to male fish because females can eliminate these contaminants in their eggs. Fish and birds at higher trophic levels in food webs may be exposed to larger amounts of bioaccumulative chemicals than animals of lower trophic status. For these reasons, comparisons of contamination levels among locations on the basis of animal tissue concentrations are best accomplished by restricting the comparison to animals of the same species and size or age range and in some cases to animals of the same sex. Variation in these factors can have a particularly great influence when the number of samples is so small that a single animal may skew the results.

Because the numbers of sediment, fish, and bird egg samples collected for this monitoring program are small and because multiple species of fish and birds were sampled, these data are generally not amenable to statistical analyses. For example, sediment sampling was limited to one composite sample per location of interest. For COPCs other than perchlorate, water concentration data might be suitable for statistical analyses, but a more detailed evaluation of these data is outside the scope of the current project. Changing conditions in the Wash might indicate that only samples collected with specific time periods are comparable.

5.1 Water

Sample sizes for water were n=6 samples for organic COPCs in the tributaries; n=2 and n=5 samples, respectively, for the two seeps LWC6.3 and LWC3.7; n=13 for inorganic COPCs (total and dissolved concentrations) in the Wash; and n=6 for inorganic COPCs (total concentrations) in tributaries to the Wash. SNWA provided ACT I with data describing some basic water quality parameters (**Appendix B**). ACT I summarized that information in **Table 4**. Organic and inorganic COPC data are discussed below.

5.1.1 Organics

LOCs were not identified for 14 of the 36 organic COPCs in water (**Table 16**), including alpha- and gamma-chlordane; oxychlordane; cis- and trans-nonachlor; endosulfan sulfate, hexachlorobenzene; alpha-, beta-, and delta-HCH; pentachloroanisole; pentachlorobenzene; and 1,2,3,4- and 1,2,4,5-tetrachlorobenzene. Detection limits for analyses of organic contaminants in water are shown in **Table 5**. Whenever possible, analytical methods should be selected to allow detection and reporting limits (**Table 6**) less than the smallest LOC for each chemical. Based on data in the current report, lower detection/reporting limits might be appropriate for chlorpyrifos; dieldrin; endrin; p,p'-DDT; total chlordane; endosulfan I; heptachlor; heptachlor epoxide; total PCBs; and toxaphene.

For this report, organic contaminants were assessed only in tributaries and seeps that contribute to the flow of the Wash (**Table 6**). Among the organic COPCs, only aldrin; dieldrin; endrin; p,p'-DDD; the four constituent isomers of HCH; and lindane (total HCH) were detected. Concentrations of COPCs were less than the detection limits for all but one sample. HCH-gamma, was detected in a single water sample from the Flamingo Wash (FW_1) tributary at 0.24 µg/L. The concentration of gamma-HCH did not exceed the United States Environmental Protection Ageny (U.S. EPA) or Nevada Department of Environmental Protection (NDEP) acute criteria but did exceed the NDEP 24-hr average criterion of 0.080 µg/L.

5.1.2 Inorganics

LOCs were not identified for 6 of the 22 inorganic COPCs (**Table 16**): antimony, barium, beryllium, magnesium, perchlorate, strontium, and titanium. However, criteria have been proposed for perchlorate (see below) and were used as LOCs in this report. Detection limits for inorganic COPCs in water are shown in **Table 7**, and concentrations of inorganic COPCs in water are presented in **Table 8** (total concentrations, mainstream Wash and tributaries) and **Table 9** (dissolved concentrations, mainstream Wash locations only). For inorganic COPCs with identified LOCs, detection limits are lower than the minimum LOC for each chemical except cadmium, copper, mercury, and zinc. For each of these COPCs, the upper range of the detection limits exceeded the minimum LOC; i.e., the detection limits might not be low enough for all of the samples. Even the lowest detection limit for mercury was not less than the minimum LOC for that chemical.

Boron, strontium, and titanium were not assessed in water. Antimony, beryllium, cadmium, mercury, molybdenum, and vanadium were assessed only in water from the mainstream Wash locations. Beryllium, cadmium, and dissolved lead were not detected at any of the mainstream sampling locations. However, as noted above, the cadmium detection limit was not sufficiently low for some samples to ensure that the minimum LOC was not exceeded. Magnesium generally is not considered to be an environmental concern. Total magnesium concentrations can be found in **Appendix B**.

Total aluminum exceeded the minimum LOC (U.S. EPA chronic criterion of 87 µg/L total recoverable aluminum) and an effect level of 100 µg/L indicating concern for substantial effects (Tuttle and Thodal 1998) for all or most of the sampling time points at all of the mainstream Wash locations except LW10.75, where total aluminum exceeded the chronic criterion and the effect level only once. Total aluminum exceeded the minimum LOC once at each of the tributaries LW12.1 and BS-1 (where the concentration also exceeded the 100 µg/L effect level). Dissolved aluminum exceeded the minimum LOC once at LW6.85, LW3.1, and LW0.8, twice at LW5.5, three times at LW4.95, and four times at LW5.9 and reached the effect level of 100 µg/L during one sampling point each at LW 5.9, LW 5.5, and LW 0.8. The greatest concentrations of total and dissolved aluminum (and all of the sampling points where dissolved aluminum exceeded its minimum LOC) occurred during the winter of 2007-2008. The concentrations of total aluminum in the mainstream Wash locations downstream of LW10.75 appeared to be elevated relative to LW10.75 and all of the tributaries. This might suggest that elevated aluminum concentrations were associated with WWTP effluent. Overall, results indicate that waterborne aluminum should be investigated further due to the number of mainstream Wash locations that appear to have elevated aluminum concentrations and the identified potential for substantial effects at those locations.

Antimony was assessed only in the mainstream Wash locations, where the maximum total concentration was 0.71 µg/L and the maximum dissolved concentration was 0.7 µg/L. No LOCs have been identified for antimony. The concentration of antimony appeared to vary little from upstream to downstream locations. Comparison of total and dissolved concentrations indicates that antimony occurred primarily in the dissolved form at the mainstream Wash locations.

Waterborne total arsenic met or exceeded the minimum arsenic LOC (40 µg/L effect concentration indicating potential for substantial effects [Tuttle and Thodal 1998]) only in two of the tributaries. One water sample from Burns Street Channel contained 40 µg/L , and 5 of 6 samples from Duck Creek exceeded that effect level. Four of 6 water samples from Duck Creek also exceeded a lowest chronic value at 48 µg/L for As(V) in aquatic plants (USDI 1998). The significance of this exceedance is unclear because both arsenic (III) and arsenic (V) occur in natural waters (Stanić et al. 2009) and only total arsenic was analyzed in water samples for this study. The minimum LOC identified for dissolved arsenic was 150 µg/L (U.S. EPA chronic criterion). Dissolved arsenic concentrations were less than the LOCs for the dissolved form in all samples. Based on a comparison of dissolved and total arsenic concentrations, most of the arsenic in the mainstream Wash samples occurred in the dissolved form. Results indicate that total arsenic is a potential concern for substantial effects in two tributaries, Burns Street Channel and particularly Duck Creek.

Although LOCs were not identified for barium concentrations in water, according to ATSDR (2005), the highest average background level for surface waters in some regions of the U.S. is 0.3 ppm (300 µg/L). Waterborne barium concentrations did not exceed this background level at any of the sampling locations. Comparison of total and dissolved concentrations of barium indicate that most barium was in the dissolved form at the mainstream Wash locations.

Total chromium exceeded its minimum LOC of 21.5 µg/L once at BS-1 (24 µg/L). The minimum LOC is an effect level indicative of relatively minor concern (Tuttle and Thodal 1998). Total chromium concentrations at most locations, including all locations in the mainstream Wash, were 2 µg/L or less. Higher concentrations were reported for FW_0 (maximum 2.5 µg/L), SC_1 (maximum 4.0 µg/L), and BS-1 (up to 24 µg/L, median 14 µg/L). Criteria for dissolved chromium are available for chromium (III) and chromium (VI) rather than for total chromium. The minimum LOC for dissolved chromium (III) would be the U.S. EPA chronic criterion of 74 µg/L. The minimum LOC for dissolved chromium (VI) would be the U.S. EPA chronic criterion of 11 µg/L. Total dissolved chromium at all locations was less than either of these criteria for specific oxidation states of chromium, so the criteria for chromium (III) and chromium (VI) would not be exceeded. Results indicate that chromium is a potential minor concern only in one tributary, Burns Street Channel.

Total copper exceeded the minimum LOC (lowest chronic value for aquatic organisms at 0.23 µg/L [USDI 1998]) in all samples collected from the mainstream Wash and in all samples from the tributaries except Duck Creek, where 4 of 6 samples exceeded the minimum LOC, and Burns Street Channel, where 2 of 6 samples exceeded the minimum LOC. The total copper concentration in one or more samples from each mainstream Wash location and most tributaries (except LW12.1 and Duck Creek) also exceeded 3.4 µg/L, a concentration associated with a relatively minor level of concern (Tuttle and Thodal 1998). Neither total nor dissolved copper exceeded U.S. EPA or NDEP aquatic life criteria. One sample from Burns Street Channel tributary contained 11 µg/L total copper. The U.S. EPA chronic criterion is 9 µg/L dissolved copper. Dissolved metals were not analyzed in the tributaries, so it is not possible to determine whether the sample from the Burns Street Channel tributary contained dissolved copper at a concentration that exceeded that criterion. Based on a comparison of total and dissolved copper concentrations in the mainstream Wash, the majority of the copper at those locations occurred in the dissolved form. Given that total copper exceeded two criteria at most sampling locations, this COPC should be investigated further. However, the level of concern should probably be considered relatively minor.

Total iron did not exceed the minimum LOC (the U.S. EPA chronic criterion of 1,000 µg/L, which was adopted by NDEP) in any sample. Dissolved metals were not assessed in water samples taken from the tributaries. The results suggest that iron is not a concern.

Total lead exceeded its minimum LOC (concern level at 1 µg/L based on potential for minor effects [Tuttle and Thodal 1998]) in only one sample (1 of 6) taken at LW5.5. The minimum LOC for dissolved lead is 2.5 µg/L (U.S. EPA chronic criterion). Dissolved lead was below detection limits at all sampling locations. Results suggest that lead may present a potential minor concern at only one location, LW5.5.

Total and dissolved manganese were below the minimum LOC (a level of concern at 388 µg/L suggestive of minor effects [Tuttle and Thodal 1998]) in all water samples from all locations. The concentration of manganese is rarely greater than 2 mg/L (2,000 µg/L) in groundwater (Manahan 2000). Concentrations of dissolved manganese in natural waters that are essentially free of anthropogenic sources can range from 10 to >10,000 µg/L. Manganese concentrations in natural surface waters rarely exceed 1,000 µg/L and are usually <200 µg/L (WHO 2004). Dissolved manganese was within normal ranges for natural surface waters at all sampling locations.

Total and dissolved mercury were detected in only a few samples, i.e., only in samples collected on 8/22/2007 at LW6.85 and mainstream Wash locations downstream from that point. Mercury was not assessed in the tributaries. The highest level of mercury was 0.18 µg/L, and the concentrations varied little from the first upstream location where it was detected to downstream locations. Comparison of total and dissolved concentrations measured in samples from mainstream Wash locations indicates that waterborne mercury occurred primarily in the dissolved form. In all of the samples in which total mercury was detected, the concentration exceeded the minimum LOC of 0.00057 µg/L (24-hour average criterion [Eisler 1987]), a criterion of 0.00064 µg/L for protection of piscivorous species (USDI 1998), a maximum (not-to-exceed at any time) limit at 0.0017 µg/L (Eisler 1987), and NDEP's 96-hr average criterion of 0.012 µg/L. According to Eisler (1998), reports in the literature indicate that 0.1-2.0 µg/L mercury is fatal to sensitive aquatic species, and concentrations of 0.03-0.1 µg/L were associated with significant sublethal effects. Dissolved mercury did not exceed its minimum LOC in any samples. Although mercury was detected infrequently, this COPC should be investigated further because the few samples containing detectable mercury exceeded multiple LOCs, some indicating that more than minimal concern may be warranted. In particular, records should be searched for any uncommon events that might have resulted in elevated concentrations of mercury at these locations and sampling points.

Total molybdenum concentrations in one or more samples equaled or exceeded the NDEP criterion for aquatic life of 19 µg/L at locations LW10.75, LW5.9, LW5.5, LW4.95, LW3.1, and LW0.8. Many of these samples (except the one from location LW5.5) also equaled or exceeded a predicted no-effect concentration (PNEC) of 20 µg/L for fish based on the upper limit of natural background concentrations (USDI 1998). Total molybdenum was not assessed in the tributaries, and dissolved molybdenum was not assessed in any of the samples. These results suggest that molybdenum should be investigated further.

Total and dissolved nickel remained below the minimum LOCs of 11 µg/L and 52 µg/L, respectively. The highest total nickel level (7.9 µg/L) was observed at Duck Creek. Comparison of total and dissolved nickel concentrations reported for mainstream Wash locations indicates that most nickel occurred in the dissolved form.

The references used in this screening did not produce LOCs for perchlorate, but criteria or benchmarks have been proposed. U.S. EPA (2002) presented a draft toxicological review and risk characterization for perchlorate that includes a screening-level ecological risk assessment.

According to Bruce Rodan at U.S. EPA (Rodan 2006), "The 2002 ecotoxicological section remains unfinalized in an external review draft form. Given this draft status and the additional information that has been published in the interim, the 2002 ERD [External Review Draft] ecotoxicological section should not be sourced as an Agency conclusion on the ecological risks of perchlorate. Of course, it can be a valuable source of information up to that time." U.S. EPA calculated Tier II values, which are derived when data are not sufficient for deriving National Ambient Water Quality Criteria (AWQC). These values are intended to be protective of 95% of species and account for missing information with approximately 80% confidence. The 2002 report proposed a Secondary Acute Value (SAV) of 5 mg/L (as ClO_4^-) for short-term exposures and a Secondary Chronic Value (SCV) of 0.6 mg/L (as ClO_4^-) for long-term exposures. Dean et al. (2004) proposed freshwater water quality criteria developed to meet U.S. EPA requirements for setting AWQC, including a CMC (acute criterion) of 20 mg/L and a CCC (chronic criterion) of 9.3 mg/L. U.S. EPA has not reviewed or approved these criteria. Total perchlorate concentrations were far below the lowest of these proposed criteria (SCV of 0.6 mg/L or 600 µg/L) at all locations except the Burns Street Channel tributary, where perchlorate exceeded the SCV during 5 of the 6 sampling periods. Dissolved perchlorate was not analyzed, but due to the high water solubility of perchlorate, it can probably be assumed that all of the waterborne perchlorate occurred in the dissolved form. Perchlorate concentrations in the mainstream Wash appeared to increase with distance downstream. These results and the lack of a more formal and final criterion suggest that perchlorate should be investigated further. However, it should be emphasized that perchlorate exceeded the proposed criteria only at one tributary, Burns Street Channel.

Total and dissolved selenium exceeded the minimum LOC for water (1 µg/L [USDI 1998]) in nearly every sample at all locations. Almost every sample also exceeded a threshold for concern for minor effects at 1.5 µg/L (Tuttle and Thodal 1998) and a toxicity threshold (>2 µg/L) for impaired reproduction in fish and birds in the field (USDI 1998). All locations had at least one sample (and for all locations other than LW8.85, most samples) that exceeded an effect level indicative of substantial effects (Tuttle and Thodal 1998). Most samples from LW10.75, LVC_2, LW12.1, FW_0, SC_1, MC_1, DC_1, and BS-1 exceeded U.S. EPA's chronic criterion (5 µg/L) and NDEP's chronic criterion for protection of aquatic life (5 µg/L). Selenite and selenate concentration data are needed for comparison with U.S. EPA's acute criterion. Total concentrations of selenium at LW10.75, LW12.1, FW_0, SC_1, MC_1, DC_1, and BS-1 are particularly high (median > 10 µg/L). These results suggest that substantial effects due to selenium are possible throughout the Wash and its tributaries and indicate that further investigation is warranted.

U.S. EPA (2004) has released updated draft aquatic criteria for selenium that include a criterion maximum concentration (CMC, acute criterion) based on selenite and selenate (and sulfate) and a criterion continuous concentration (CCC, chronic criterion) based on fish tissue selenium residues rather than on a water concentration. Selenite and selenate data were not provided for review for this report but may be available in other reports and publications. According to the draft selenium criteria document (U.S. EPA 2004):

"…except possibly where an unusually sensitive species is important at a site, freshwater aquatic life should be protected if the following conditions are satisfied. A. The concentration of selenium in whole-body fish tissue does not exceed 7.91 µg/g dw (dry weight). This is the chronic exposure criterion. In addition, if whole-body fish tissue concentrations exceed 5.85

µg/g dw during summer or fall, fish tissue should be monitored during the winter to determine whether selenium concentration exceeds 7.91 µg/g dw. B. The 24-hour average concentration of total recoverable selenium in water seldom (e.g., not more than once in three years) exceeds 258 µg/L for selenite, and likewise seldom exceeds the numerical value given by exp(0.5812[ln(sulfate)]+3.357) for selenate. These are the acute exposure criteria."

Effort should be directed toward evaluating whether these draft criteria are exceeded by samples collected from the Wash and its tributaries.

Total vanadium was assessed only at the mainstream Wash locations and not at the tributaries. Total vanadium concentrations at mainstream Wash locations exceeded the minimum LOC (level of concern for potential minor effects at 9 µg/L [Tuttle and Thodal 1998]) twice at location LW10.75 (2 of 13 samples). The only other LOC identified for vanadium, a level of concern for substantial effects at 170 µg/L (Tuttle and Thodal 1998), was not exceeded. Dissolved vanadium was not assessed. The results suggest that total vanadium is a potential concern for relatively minor effects at LW10.75.

At all locations other than Duck Creek and Burns Street Channel, at least one (and usually multiple) samples exceeded the minimum LOC for total zinc at 4.9 µg/L for significant adverse effects to sensitive species (Eisler 1993). However, the detection limit for zinc was not adequately low to ensure that the minimum zinc LOC was not exceeded at the tributaries. Without further review it is not clear whether the minimum criterion was based on dissolved or total concentration, but it was assumed that it was based on total concentration. Multiple samples at all of the mainstream Wash locations other than LW10.75 and a single sample (1 of 6) from the tributary LVC_2 exceeded a no-effect level (NEL) of 30 µg/L representing the lowest chronic value for aquatic life (USDI 1998) and a concentration indicative of potential for substantial effects at 32 µg/L (Tuttle and Thodal 1998). Two samples from LW5.9 exceeded the upper end (51 µg/L) of a range of concentrations that cause significant adverse effects to sensitive species (Eisler 1993). Background concentrations of zinc in natural waters rarely exceed 40 µg/L (Eisler 1993). One or more samples from the following locations exceeded the usual background levels: LVC_2, LW8.85, LW6.85, LW5.9, and LW5.5. At most locations, dissolved zinc appeared to constitute the bulk of the total zinc. Dissolved concentrations did not exceed the U.S. EPA or NDEP acute or chronic criteria for dissolved zinc. Concentrations of total and dissolved zinc in the mainstream Wash seemed to be elevated at all locations downstream of LW10.75 and appeared to be greater than concentrations in the tributaries. At all locations downstream of LW10.75, concentrations of dissolved zinc exceeded a NEL for aquatic life (USDI 1998) and an effect concentration suggesting the potential for substantial effects (according to Tuttle and Thodal 1998). Normal background concentrations of 40 µg/L are typically observed in water; dissolved concentrations at the sampling locations in this study did not exceed that level, but total zinc did at several locations. These results suggest that the potential effects of zinc in the Wash and tributaries should be investigated further based on widespread exceedances of LOCs and exceedance of LOCs indicating that more than minimal concern may be warranted.

In summary, the following inorganic COPCs exceeded LOCs for water and should be investigated further: aluminum, arsenic, chromium, copper, iron, lead, mercury, molybdenum, perchlorate, selenium, vanadium, and zinc. Inorganic COPCs that might present relatively greater concerns based on the number of locations or sampling points that exceeded LOCs or based on the degree of concern or severity of potential effects include:

- Aluminum: widespread exceedance of LOCs indicating potential for substantial effects
- Arsenic: potential for substantial effects in two tributaries
- Copper: widespread exceedance of two LOCs indicating relatively minor concern
- Mercury: exceeded multiple LOCs, some indicating greater degree of concern
- Molybdenum: exceeded NDEP aquatic life criterion
- Selenium: widespread exceedance of multiple LOCs, some indicating potential for substantial adverse effects
- Zinc: widespread exceedance of LOCs, potential for substantial effects

5.2 Sediment

A single composite sample, each representing 5 subsamples, was taken from each location where sediment was sampled.

5.2.1 Organics

LOCs have not yet been identified for 11 of the 36 inorganic COPCs (**Table 16**): delta-HCH, alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, trans-nonachlor, chlorpyrifos, DDMU, pentachloroanisole, and tetrachlorobenzene (1,2,3,4- or 1,2,4,5-). Twenty-one of the 36 organic COPCs were analyzed in sediment or approximated by summing the concentrations of their constituent isomers in sediment, and none of these were detected in any of the samples. To make the best use of COPC concentration data generated for this study, the detection limit should be smaller than the lowest LOC for each COPC. Only the wet weight RLs were available in the original laboratory reports for organic COPCs in sediment, while the majority of the LOCs for sediment are presented in dry weight. Dry weight RLs were estimated based on the average moisture content for all sediment samples. RLs were greater than LOCs (indicating that lower detection limits might be appropriate) for the following organic COPCs: aldrin; dieldrin; p,p'-DDT; p,p'-DDE; p,p'-DDD; gamma-HCH; total chlordane; heptachlor epoxide; and total PCBs (based on RLs for Aroclor mixtures).

5.2.2 Inorganics

Concentrations of inorganic COPCs in sediments from the Wash and its confluence with the Las Vegas Bay are presented in **Table 10**. Minimum LOCs for inorganic COPCs in sediment are presented in **Table 10** and **Table 17**. Arsenic, copper, lead, and manganese were the only inorganic COPCs that exceeded LOCs for sediment. The concentration of arsenic in sediment from LW0.8 and LVB exceeded several LOCs: a consensus-based threshold effect concentration of 9.79 mg/kg, a threshold effect concentration at 5.9 mg/kg, a lowest effect level of 6 mg/kg, a minimal effect threshold of 7.0 mg/kg, a threshold effect level for the amphipod invertebrate *Hyallela azteca* in a 28-day test, and a no-effect level of 8.2 mg/kg. Overall, these exceedances suggest a minor to moderate degree of concern is appropriate for arsenic in sediment at LW0.8 and LVB. The concentration of copper in sediment from Burns Street Channel exceeded the minimum LOC, a lowest effect level (LEL) of 16 mg/kg dry weight, probably indicating that a minor to moderate degree of concern is warranted for potential toxicity of copper in sediment at BSC. The concentration of lead in sediment collected from LVB exceeded threshold effect, lowest effect, and minor effect concentrations. These findings probably suggest that a moderate degree of concern is warranted for potential toxicity of lead in sediment at LVB. The concentration of manganese in one of the LVB samples exceeded a lowest effect level based on the lower 5th percentile of sediment-based assays (Tuttle and Thodal 1998, citing Persaud et al. 1993; MacDonald et al. 2000 cited the same study), indicating concern for relatively minor effects at LVB.

No LOCs were identified for 9 of the 22 inorganic COPCs (**Table 16**): barium, beryllium, boron, magnesium, molybdenum, perchlorate, strontium, titanium, and vanadium. The NOAA Screening Quick Reference Tables (SQuiRTS) identified a background level of 0.7 mg/kg dw for barium, 49 mg/kg dw for strontium, and 50 mg/kg dw for vanadium (Buchman 1999). Concentrations of barium and strontium in sediment at all sampled locations were much greater than the identified background levels, but local background levels might be different due to natural input and/or anthropogenic influences. However, these findings suggest that the concentrations of barium and strontium should be evaluated further to determine whether these are typical concentrations for this region, whether there are local sources (natural or anthropogenic) that might be the cause of elevated concentration in sediment, and whether LOCs can be identified or derived. Vanadium concentrations in sediments from all locations were below identified background levels. For chemicals with identified LOCs or background levels in sediment, detection limits appear to be sufficiently low to detect concentrations below the minimum LOCs. The only exception is selenium, which has an LOC of 1 mg/kg dw and a reporting limit of 5.0 mg/kg dw in sediment.

5.3 Fish

Thirty-four fish were collected for this study, including 28 from the Las Vegas Valley (NP, n=9; DC, n=6; PB, n=7; LVB, n=6) and 6 from PNWR (5 carp and 1 largemouth bass). Green sunfish and common carp were the most common species sampled. Green sunfish was the main species sampled at NP and DC (all sunfish). Black bullhead were collected only at NP. Fish sampled at PB were approximately evenly split between green sunfish and common carp, and all of the fish sampled from LVB were common carp. Most fish collected from PNWR were common carp, with the addition of a single largemouth bass (the only fish of that species collected for this study). The preferred foods of green sunfish and common carp are different, so upstream-downstream trends in concentrations of contaminants found in fish may be related more to the food preferences and trophic status of the species than to other factors. Adult common carp are classified as omnivores, while adult green sunfish are considered to be insectivores (Gregory et al. 2002). Black bullheads are omnivores, and largemouth bass are piscivores (Gregory et al. 2002). Furthermore, the size of the fish and lipid-adjusted concentrations were not considered in this report, and these factors could significantly affect the interpretation of the results for lipophilic contaminants that accumulate to a greater degree with size and age in fish. Lipid-normalized concentrations are, however, presented in **Table 11** and could be considered further. Also, the sex of the fish was not considered. Female fish of reproductive age tend to eliminate lipophilic contaminants in their eggs and thus may have smaller body burdens of these contaminants. Given the small sample sizes in the study, a high proportion of fish of a single sex sampled at one location might skew the results. Refer to previous bioassessment reports for a more detailed discussion of the limitations these factors impose on the interpretation of data in this report.

5.3.1 Organics

Concentrations of organic COPCs in whole fish are provided in **Table 11**, and LOCs for those contaminants in fish are presented in **Table 18**. LOCs were identified for only a few of the organic COPCs (five of 36; see **Table 16**), probably in part due to the limited review that could be conducted for this project. For example, only the summary tables in the *Handbook of Chemical Risk Assessment* (Eisler 2000 a, 2000b, 2000c) were reviewed for proposed criteria. A more thorough review probably would yield some useful data. Also, searches of other databases or the primary literature are likely to identify toxicity or screening data of interest. However, when aquatic toxicology studies are conducted, toxicant concentration in the water is commonly used as a measure of exposure and tissue concentrations often are not analyzed. Consequently, water quality criteria and effect concentrations in water are more often available than similar values based on tissue concentrations.

The following organic COPCs were not detected in fish: aldrin; endrin; o,p'-DDT; heptachlor; endosulfan II; and toxaphene. LOCs were not identified for any of these undetected chemicals except toxaphene. For all organic COPCs with identified LOCs, detection limits were sufficiently low to detect concentrations less than the LOCs. Fish collected from PNWR contained detectable residues of far fewer organic COPCs than did fish from other locations. The only COPCs detected in fish from PNWR were o,p'-DDE; total DDT; 1,2,3,4-tetrachlorobenzene; hexachlorobenzene; pentachloroanisole; pentachlorobenzene; and total PCBs. The remainder of the discussion of organic COPCs in fish is based mainly on wet weight concentrations.

Fish from PB appeared to contain the greatest concentrations of dieldrin, alpha-chlordane, gamma-chlordane, total chlordane, heptachor epoxide and total PCBs. Fish from DC and PB appeared to have higher levels of cis-nonachlor than fish from other locations. Levels of heptachlor epoxide appeared to increase with distance downstream, but the two fish with the highest levels of heptachlor epoxide were common carp collected from PB.

Chlorpyrifos was detected in only four fish, all collected at NP, with only one of these fish (green sunfish) containing residues approaching the LOC.

No LOCs were identified for DDT and related chemicals in whole fish. Among the group of DDT-related chemicals, DDE residues generally occur most frequently and at the greatest concentrations in environmental samples. Accordingly, in the current study, p,p'-DDE was the predominant DDT related chemical detected in whole fish. Residues of o,p-DDE and p,p'-DDE in fish appear to show a trend of increasing concentration with distance downstream, with fish (all common carp) from LVB exhibiting the greatest concentrations and fish from PNWR (all common carp) containing the least. Fish from PNWR did not have detectable residues of any other DDT related chemicals. Residues of o,p'-DDD were detected only in fish from DC (1 of 6 fish), PB (3 of 7 fish), and LVB (all 6 fish), with the highest concentrations in fish from LVB, possibly indicating a trend of increasing o,p'-DDD concentrations with distance downstream. Likewise, residues of p,p'-DDD in whole fish appear to increase with distance downstream. DDMU residues appeared to be higher in fish from LVB and to a lesser degree PB relative to the other locations. Interestingly, residues of p,p'-DDT were detected only in fish from NP, DC, and PB, and not in fish from LVB or PNWR. Overall, these findings might indicate an upstream source of DDT that is converted to DDE, DDD, and DDMU appearing at downstream locations.

However, this pattern might also be related to trophic status and preferred food of fish collected at these locations, with green sunfish predominately sampled at the upstream locations and only common carp collected from LVB.

Endosulfan I residues appear to occur at higher concentrations in fish from DC and PB than in fish from other locations and were not detected in fish from PNWR. When lipid-normalized residues are considered, fish from LVB appear to contain less endosulfan I than those from other locations along the Wash. Endosulfan II was not detected in any fish, and endosulfan sulfate was detected in only three fish – two from DC with higher concentrations and one from LVB. When lipid-normalized concentrations are considered, the two fish (green sunfish) from DC cotain about 10-fold more endosulfan sulfate than the fish (common carp) from LVB.

Hexachlorobenzene was detected in every fish collected for this study. Concentrations of hexachlorobenzene might be higher in fish from PB and LVB.

The dominant HCH isomer detected in fish was beta-HCH. Because beta-HCH is the most persistent HCH isomer in the environment, this finding suggests that the source is not local or that it is weathered. None of the HCH isomers were detected in fish from NP or PNWR. Only the beta- and gamma- isomers of HCH were detected in fish from DC and in only 2 of 6 fish collected at that location. Residues of alpha- and delta- HCH were detected only in fish from PB and LVB.

Mirex was detected in most fish collected along the Wash (except the three black bullheads from NP) but was not detected in fish from PNWR. There was no obvious trend in concentrations (wet weight based or lipid-normalized) among locations along the Wash.

The only organic COPC detected in fish tissue at levels that exceeded an LOC was total PCBs. PCBs were found in fish from all sampling locations. At least two fish collected from all locations other than PNWR contained total PCBs at concentrations that exceeded the minimum LOC. All of the fish at PB and none of the fish from PNWR exceeded the minimum LOC for total PCBs. The minimum LOC is a maximum allowable level in fish tissue (0.1 mg/kg) for protection of piscivorous wildlife rather than a criterion for protection of fish. Only two fish, a carp from PB and a carp from LVB, contained levels of total PCBs that exceeded a criterion for protection of fish at 0.4 mg/kg. Total PCB concentrations in fish collected from the reference location PNWR were generally an order of magnitude lower than concentrations observed in fish from the other sampling locations. The greatest total PCB concentrations were observed in fish from PB and LVB.

Pentachloroanisole residues in fish appear to exhibit a trend of increasing concentrations at downstream locations, with the greatest concentrations in fish from PB. This same trend appears to be present when lipid-normalized concentrations are considered. Concentrations in fish from PNWR appear to be greater than those in fish from NP and DC. However, when lipid-normalized concentrations are considered, PB and PNWR appear to have elevated levels compared to the other locations.

Pentachlorobenzene was detected in all but one fish sampled for this study, but there is not obvious trends among concentrations at different locations when either wet-weight based concentrations or lipid-normalized concentrations are considered.

Residues of 1,2,3,4-tetrachlorobenzene were detected only in one green sunfish from DC, one carp from PB, and two carp from PNWR. Residues of 1,2,4,5-tetrachlorobenzene were detected in all fish from NP and PB, in only one fish from DC, and in none of the fish from LVB or PNWR. Fish from PB show the greatest concentrations of 1,2,4,5-tetrachlorobenzene, but this trend is not obvious among lipid-normalized concentrations.

5.3.2 Inorganics

Concentrations of inorganic COPCs (19 of the 22) in whole fish are provided in **Table 12**, and LOCs for the inorganic COPCs in fish are presented in **Table 19**. LOCs for residues in whole fish were not identified for 14 of the 22 inorganic COPCs (**Table 16**), including aluminum, antimony, barium, beryllium, boron, iron, lead, magnesium, manganese, molybdenum, nickel, perchlorate, strontium, titanium, and vanadium. Antimony, perchlorate, and titanium were not analyzed in fish. Arsenic, cadmium, chromium, copper, lead, selenium, and zinc concentrations in fish tissue exceeded LOCs for those chemicals. Beryllium and molybdenum were not detected in any of the fish collected for this study. Comparison of method reporting limits (MRLs) for fish tissue with available LOCs indicates that MRLs were less than the minimum LOC for each chemical. The remainder of the discussion of inorganic COPCs in fish is based mainly on wet weight concentrations.

Fish collected at PB and PNWR appeared to have the lowest levels of aluminum. Fish from NP and DC seemed to have higher levels, and those from LVB appeared to contain the greatest levels of aluminum.

Total arsenic exceeded the minimum LOC in 1 of 7 fish collected from PB and in 2 of 6 fish taken from LVB. All of these fish were common carp. The minimum LOC was a concern concentration based on the 85th percentile of arsenic concentrations in whole fish concentrations in a national monitoring study. The two carp from LVB also exceeded the LOC of 1 mg/kg dw based, which was reported as a NEL based on the 85th percentile of concentrations in whole fish in a monitoring study. None of the fish contained arsenic at concentrations exceeding LOCs based on effect levels, and none of the fish concentrations exceeded the limit of 1 mg As/kg ww that would constitute presumptive evidence of arsenic pollution. Overall, these findings indicate a minor level of concern related to arsenic in fish tissue.

Fish collected from LVB appeared to contain the greatest concentrations of barium, followed by those from PNWR. Fish from DC seemed to contain the least barium. Boron was detected only in fish from NP and DC.

Cadmium was detected only in fish from LVB (3 of 6), and two of those fish contained cadmium at a concentration exceeding the minimum LOC. The LOC is a concentration indicating concern for relatively minor effects based on the 85th percentile of whole fish concentrations in a national monitoring program. No LOCs based on effect levels have been identified yet for cadmium in whole fish.

Only two fish, both from NP, contained chromium at concentrations exceeding the minimum LOC of 4 mg/kg dw. The LOC is a concern concentration suggestive of chromium contamination. No LOCs based on effects have been identified to date. Only two fish from PNWR contained detectable chromium.

The LOC for copper was exceeded in at least one or more fish collected from NP, PB, LVB and PNWR. The LOC is a concern concentration (indicating concern for relatively minor effects) based on the 85th percentile of whole fish concentrations in a national monitoring program. No LOCs based on effects were found to date for copper in whole fish.

Iron was detected in every fish collected for this study. Fish from LVB contained the greatest concentrations of iron, while fish from DC appeared to have the lowest concentrations.

Lead was detected in at least one fish from each location except DC and PNWR. Lead was detected in all of the fish from LVB and exceeded the minimum LOC in 5 of the 6 fish sampled from that location. The LOC is a concern concentration (indicating concern for relatively minor effects) based on the 85th percentile of whole fish concentrations in a national monitoring program. No LOCs based on effects were found to date for lead in whole fish.

Magnesium and manganese seemed to occur at the lowest concentrations in fish from PNWR. Nickel was detected in at least one fish from each location and in all fish from LVB. Mercury was detected in only a few fish collected for this study: one from NP, three from LVB, and one (the largemouth bass) from PNWR. None of these fish contained mercury at concentrations exceeding the minimum LOC.

The majority of the fish collected from locations along the Wash contained selenium at levels that exceeded the minimum LOC identified for whole fish, while none of the fish from PNWR exceeded the minimum LOC. The minimum LOC is 2-4 mg/kg dw for cold water species. However, none of the species sampled are considered cold water species. Most fish collected from locations along the Wash also exceeded or fell within the range specified by the following criteria:

- 3 mg/kg dw - a concentration in food web organisms that is potentially lethal to fish and aquatic birds;
- 3-4 mg/kg dw - a level of concern in warm water fish species at which effects are reported to be rare but at which levels are considered to be elevated above background;
- 4 mg/kg dw – a threshold for tissue concentrations that affects health and reproductive status of freshwater fishes;
- 4 mg/kg dw – acceptable whole body tissue residues; and
- 4-10 mg/kg dw – concentration suggesting concern for minor effects based on the estimated true threshold for reproductive impairment of sensitive species.

According to the U.S. EPA’s current draft freshwater chronic criterion for selenium, if whole-body fish tissue samples exceed 5.85 mg/kg dw in summer or fall, fish should be monitored in winter to determine whether the criterion of 7.91 mg/kg dw is exceeded in winter (U.S. EPA 2004). All of the fish included in the current study were collected in the fall with the exception of the fish collected at the reference location PNWR and two fish collected from LVB (LVBCC05 and LVBCC06). All of the fish collected from DC, two fish from PB and one fish from LVB contained levels of selenium exceeding the summer/fall standard that triggers winter monitoring, and two fish collected from DC exceeded the draft criterion itself. Furthermore, selenium concentrations in two fish collected from DC exceeded an LOC at 10 mg/kg dw, an effect concentration based on the estimated true potential for reproductive impairment of sensitive species. Selenium concentrations in these same two fish from DC also fell within the range of 10-20 mg/kg dw, which is reported to be the threshold for toxicity for sensitive and moderately sensitive taxa and for teratogenesis. Overall, these findings indicate that at least a moderate degree of concern for adverse effects (particularly reproductive effects, teratogenesis, and mortality) is warranted.

Strontium was detected in all fish collected for this study, and concentrations in fish appeared to decrease with distance downstream along the Wash. Vanadium was detected in only a few fish, and only in fish from NP and LVB, with greater concentrations in fish from LVB. Vanadium was not detected in fish from DC, PB, or PNWR.

Concentrations of zinc appeared to be elevated at PB and LVB relative to NP and DC. Upon further review, the minimum LOC of 20 mg/kg for zinc (toxicity threshold for white sucker) identified in previous bioassessment reports was determined to be unsuitable because it is based on dry weight residues in muscle tissue rather than on whole body residues. According to Irwin et al. (1998), "Zinc whole-body levels above 40.1 mg/kg are higher than 85% of all fish in a national survey... A more recent (1976-1984) NCBP survey report gave the national geometric mean level for zinc in whole-body fish as 21.7 mg/kg, the maximum level as 118.4 mg/kg, and the 85th percentile as 34.2 mg/kg wet weight..." The majority of fish (all locations) contained zinc at a concentration that exceeded the geometric mean concentration for fish analyzed nationwide. One fish from NP, three from PB, all of the fish from LVB, and all but one fish from PNWR exceeded an LOC at 34.2 mg/kg ww for mortality and malformation of fish and amphibian embryos and larvae as well as the 85th percentile of zinc concentrations in fish in a nationwide survey. Given the severity of potential effects at concentrations greater than 34.2 mg/kg ww and the number of fish exceeding this zinc level, it would appear that a moderate level of concern for zinc toxicity, particularly in LVB, is warranted. However, five of the six fish collected from PNWR also contained zinc that exceeded this level.

Seven inorganic COPCs were identified as deserving further attention, with relatively minor concern for toxicity of arsenic, cadmium, chromium, copper, and lead and moderate concern for selenium and zinc. However, LOCs were not identified for 14 of the 22 COPCs, so further review may be needed to identify existing LOCs, to derive LOCs, or to determine that they are not needed (e.g., because the contaminant of interest is not accumulated in fish tissue, that whole body residues are not a good indicator of potential for effects, etc.).

5.4 Bird Eggs

Twenty-six bird eggs were collected for this study, including 23 from five locations in the Las Vegas Valley (NP, n=3; DC, n=4; BSC, n=4; BVP, n=6; PB, n=6) and 3 from PNWR. At least one killdeer egg was taken from most locations except NP and PNWR. All eggs collected at DC/PW and BSC were killdeer eggs. Red-winged blackbird and marsh wren eggs were collected only at PB (3 red-winged blackbirds, 2 marsh wren). American coot eggs were taken from NP (3 of 3 eggs), BVP (3 of 6 eggs), and PNWR (3 of 3 eggs). Unfortunately, at most locations the number of bird eggs per location is exceptionally small (less than 6), and, particularly given the variation in species collected among locations, the small sample sizes make any interpretation of differences among locations extremely tenuous.

5.4.1 Organics

Concentrations of organic COPCs in bird eggs are provided in **Table 13**, and LOCs for those contaminants in bird eggs are presented in **Table 20**. No LOCs were identified for the majority (24 of 36) of the organic COPCs (**Table 16**): aldrin; total chlordane; alpha-chlordane; gamma-chlordane; oxychlordane; cis-nonachlor; trans-nonachlor; heptachlor; o,p'-DDD; 2,4'-DDE; 2,4'-DDT; chlorpyrifos; DDMU; endosulfan I and II; endosulfan sulfate; hexachlorocyclohexane or its individual isomers other than lindane (gamma-HCH); pentachloroanisole; pentachlorobenzene; 1,2,3,4-tetrachlorobenzene; and 1,2,4,5-tetrachlorobenzene.

The following organic COPCs were not detected in bird eggs: alpha-chlordane; alpha-HCH; delta-HCH; gamma-HCH; pentachloroanisole; endosulfan II; endosulfan sulfate; and toxaphene. For all chemicals with identified LOCs, detection limits were sufficient to detect concentrations less than the minimum LOC. Among the organic COPCs for which LOCs have been identified, endrin; p,p'-DDT; hexachlorobenzene; gamma-HCH (lindane); mirex; total PCBs; and toxaphene were not detected at levels exceeding their minimum LOC for bird eggs. Only four organic COPCs (dieldrin, heptachlor epoxide, p,p'-DDD and p,p'-DDE) occurred in bird eggs at levels that exceeded their LOCs.

DDT can affect the reproductive success of birds, primarily through its major metabolite DDE, by more than one toxic mode of action. Eggshell thinning is one of the major ways in which DDT can adversely affect reproductive success of birds. While there is evidence that some other contaminants and physiologic conditions can induce eggshell thinning, the burden of proof overwhelmingly indicates that DDE is the major cause of eggshell thinning (Beyer et al. 1996). When assessing the potential for a chemical to cause adverse effects in fish and wildlife, concern is generally for effects that might ultimately cause population declines rather than those that affect only individuals. With few exceptions, most scientists who have studied eggshell thinning believe that 18% thinning is an accurate indicator of potential population declines (Beyer et al. 1996). Accordingly, in the current analysis, concentrations of DDE or related chemicals associated with eggshell thinning of 18% or greater were considered to be benchmarks of adverse effects. Both eggshell thickness and eggshell thickness index are considered to be accurate indicators of eggshell thinning, though thickness is usually the measure of choice (Beyer et al. 1996). LOCs based on both endpoints were considered, though neither of these endpoints was examined for bird eggs collected in this study.

Studies of the relationships between DDE and eggshell thickness or eggshell thickness index have revealed marked interspecific and intraspecific differences in sensitivity (Beyer et al. 1996). The brown pelican seems to be the most sensitive bird species, with eggshell thinning and depressed productivity occurring at 3.0 mg/kg ww DDE in the egg, and total reproductive failure at concentrations greater than 3.7 mg/kg (Beyer et al. 1996). Peregrine falcons appear to experience adverse reproductive effects at concentrations about 10-fold greater, or 30 mg/kg ww (Beyer et al. 1996). Refinement of the screening-level risk assessment for DDT and DDE in bird eggs will yield a better estimate of the potential for adverse effects. The USFWS provided references describing LOCs for DDT and DDE. These should be reviewed and included in future reports.

At each sampling location, including PNWR, p,p'-DDE was detected in one or more bird eggs at concentrations exceeding the minimum LOC (calculated NEL for eggshell thinning in the brown pelican). Only 4 bird eggs (2 from NP and 2 from PNWR, all from American coot nests) collected for this study contained p,p'-DDE concentrations that did not exceed the minimum LOC. At least one egg at each location except NP and PNWR also exceeded a calculated NEL for eggshell thinning (0.2 mg/kg ww) in the peregrine falcon. Several eggs (4 from BSC, 2 from BVP, and 2 from PB) contained p,p'-DDE at concentrations reported to cause egg breakage in common goldeneye and hooded merganser. Eggs with the greatest concentrations of p,p'-DDE, all killdeer, were found at BSC and BVP. Levels in most killdeer eggs from those two locations were in the range that causes reproductive problems in several species of birds and near total reproductive failure in the brown pelican. One egg killdeer egg collected from BVP contained 15.8 mg/kg ww, which exceeds the LOC for bald eagle that indicates a concentration at which few or no young are produced. Overall, levels of DDT and related chemicals in bird eggs from BSC and BVP appear to be elevated relative to eggs taken from other sampled locations. Toxicity data should be extrapolated among species with caution because it is not clear, based on information gathered to date, whether the species with eggs exceeding LOCs in this study are representative of potential for uptake into eggs of other species or whether effects reported in exceptionally sensitive species like the brown pelican might be expected to occur in the species sampled for the current study.

Only one egg, a killdeer egg from BSC, contained p,p'-DDE at a level that exceeded the minimum LOC for that chemical. The concentration in that egg (0.193 mg/kg ww) exceeded an LOC of 0.1 mg/kg ww, a concentration associated with decreased eggshell thickness in pelicans and cormorants (degree of adversity unknown based on information compiled to date) and an LOC of 0.17 mg/kg ww, a concentration at which double-crested cormorant eggs exhibit decreased shell thickness and are lost or broken before hatching and which is associated with decreased mean hatching and fledging success in that species. It is not clear based on information gathered to date whether cormorants would accumulate p,p'-DDE to a similar degree as killdeer or whether effects reported in cormorants might also occur in killdeer at similar concentrations in eggs.

Particulary given that cormorants, bald eagles, pelicans, and other sensitive species are observed in the Wash, even if only rarely or seasonally, these findings suggest that a moderate degree of concern might be warranted for DDT related chemicals, particularly p,p'-DDE and p,p'-DDD. In any case, the potential for these chemicals to cause adverse effects to species observed in the Wash should be investigated further. These findings also suggest that BSC and BVP might be locations associated with greater risk of exposure of birds to DDT related chemicals.

The concentration of dieldrin in two killdeer eggs from DC exceeded the minimum LOC for that chemical. The LOC was based on 5% eggshell thinning in the American kestrel. Whether this degree of eggshell thinning constitutes a risk to eggs is not known based on information gathered to date, but based on the discussion regarding DDT or DDE and eggshell thinning, it appears that most scientists agree that 18% thinning is an accurate indicator of population declines. These findings probably warrant a minor degree of concern for potential effects of dieldrin on birds and might suggest that DC is a location associated with elevated risk of exposure of birds to this chemical.

One killdeer egg from BSC and two killdeer eggs from BVP exceeded the minimum LOC for heptachlor epoxide. The minimum LOC of 0.04 mg/kg ww is reported to be associated with eggs lost or broken before hatching, decreased eggshell thickness, and decreased mean hatching and fledging success in double-crested cormorants. Two killdeer eggs from BVP also exceeded the NEL (0.2 - 0.4 mg/kg ww) for reproductive effects in the praire falcon. Again, the caveats about extrapolation among species apply here. These findings suggest that a minor to moderate degree of concern is warranted based on severity of potential effects and that BSC and BVP are locations possibly associated with greater risk of exposure of birds to these chemicals.

5.4.2 Inorganics

Concentrations of inorganic COPCs in bird eggs are presented in **Table 14**, and LOCs for COPCs in bird eggs are provided in **Table 21**. No LOCs for bird egg residues were identified for 16 of the 22 inorganic COPCs (**Table 16**), including aluminum, antimony, barium, beryllium, cadmium, chromium, copper, iron, lead, magnesium, manganese, nickel, perchlorate, strontium, titanium, and vanadium. Antimony, perchlorate, and titanium concentrations were not analyzed in bird eggs. Aluminum, beryllium, cadmium, molybdenum, nickel, lead, and vanadium were not detected in any bird eggs. Chromium was detected in only one bird egg, an American coot egg from PNWR. For inorganic COPCs with identified LOCs in bird eggs, detection limits appear to be appropriately low. Mercury was the only inorganic COPC detected in bird eggs at levels greater than LOCs.

Mercury was detected at levels greater than the minimum LOC in bird eggs taken from DC, BSC, BVP and PNWR. The concentrations of mercury in those eggs were greater than the lower end of the range of levels that cause no adverse reproductive effects in osprey and in some cases exceeded the range associated with no effects. One killdeer egg from BVP also contained mercury at a level within the range of concentrations reported to reduce productivity of half of merlin populations. However, based on information gathered to date, it is uncertain whether raptors in the Wash might accumulate similar concentrations of mercury within their eggs as do killdeer or whether effects observed in raptors at those concentrations might also be expected in killdeer. DC, BSC, and BVP are locations that might be associated with greater risk of exposure of birds to mercury, but given that two of the bird eggs sampled from PNWR also exceeded the minimum LOC, mercury exposure might not be elevated in the Wash relative to other locations and/or the source of exposure might not be local. Overall, these findings suggest that a minor to moderate degree of concern for mercury toxicity might be warranted.

5.5 Pahranagat National Wildlife Refuge as a Regional Reference Location

The selection of PNWR as the regional reference location was based on the premise that the Pahranagat Valley is believed to be less affected by anthropogenic activity and various forms of pollution compared to the Las Vegas Valley. The results of the 2007-2008 study appeared to support this assumption. Generally, chemical residues in fish and bird eggs collected from PNWR were, with few exceptions, detected less often and at similar or lower concentrations when compared to samples from the Las Vegas Valley. Water and sediment samples were not collected from PNWR.

Of the organic COPCs that were analyzed in fish, only 4,4’-DDE, total DDT, hexachlorobenzene, pentachloroanisole, pentachlorobezene, and total PCB were detected in fish collected from the reference location. Generally, these COPCs appeared at concentrations similar to those observed in fish from the Las Vegas Valley with exception of 4,4'-DDE and total PCBs, which occurred at levels an order of magnitude lower in fish from PNWR. When inorganic COPCs were detected in fish, their concentrations were similar to or less than (e.g., selenium) those observed in fish from the Las Vegas Valley. Whole fish samples from PNWR exceeded LOCs identified for chromium, copper, and zinc.

Many of the organic COPCs that were detected in bird eggs collected from the Las Vegas Valley were also detected in at least a few eggs collected from PNWR. Levels of heptachlor epoxide, oxychlordane, trans-nonachlor, mirex, and total PCBs in eggs from PNWR were an order of magnitude lower than levels of these contaminants in eggs from the Wash. Only one bird egg from PNWR exceeded any LOC for an organic COPC (the minimum LOC identified for 4,4'-DDE in bird eggs). When inorganic COPCs were detected in bird eggs from PNWR, their concentrations were similar to those observed in eggs from the Las Vegas Valley. Bird eggs from PNWR exceeded only one LOC for an inorganic COPC: two of the eggs collected from PNWR exceeded the minimum LOC identified for mercury.

Overall, the COPCs detected in whole fish and bird eggs from PNWR are widespread in the environment and commonly found in fish and bird eggs from many locations in the U.S.

6.0 SUMMARY AND CONCLUSIONS FOR THE 2007-2008 STUDY

6.1 Organic Contaminants of Potential Concern

6.1.1 Organics in Water

LOCs were not available for 14 of 36 organic COPCs analyzed in water. Only a few organic COPCs were analyzed in water, and these were assessed only in the tributaries and seeps and not in the mainstream Wash locations. Lower detection limits might be appropriate for several organic COPCs in water. The only organic COPC detected in water was gamma-HCH. It was detected in one water sample taken at Flamingo Wash, and the concentration exceeded NDEP's chronic criterion for protection of aquatic life. This chemical should be investigated further with emphasis on potential for chronic effects.

6.1.2 Organics in Sediment

LOCs have not been identified for several organic COPCs in sediment. Only 21 of the 36 organic COPCs were analyzed in sediment, and none of these were detected. Lower reporting limits might be appropriate for several of the organic COPCs in sediment.

6.1.3 Organics in Fish

All 36 of the organic COPCs were analyzed in whole fish. To date, LOCs have been indentified for only five of the organic COPCs. For all organic COPCs with identified LOCs in whole fish, analytical detection limits were less than the LOCs and thus were appropriately low for this study. All but five of the organic COPCs were detected in whole fish. Differences in species sampled (and their trophic status) among locations confounded interpretation of location-related differences in organic COPC concentrations. Total PCBs was the only organic COPC to exceed an LOC for fish. At least two fish from each sampled location other than PNWR exceeded a criterion for protection of piscivorous wildlife, but only two fish (carp from PB and LVB) exceeded a criterion for protection of fish based on their own body burdens. Levels of PCBs in fish from PNWR were generally an order of magnitude lower than levels in fish from the Wash.

6.1.4 Organics in Bird Eggs

LOCs have not yet been identified for the majority (24 of 36) of the organic COPCs in bird eggs. For those organic COPCs with identified LOCs, detection limits were less than LOCs and thus were appropriately low for this study. All 36 of the organic COPCs were analyzed in bird eggs. Differences in species sampled and small sample sizes complicate comparisons of organic COPC levels in bird eggs among locations. Most of the organic COPCs (all but eight) were detected in bird eggs sampled for this study. Only four organic COPCs exceeded LOCs for bird eggs. DDT and related chemicals appear to occur at elevated concentrations at BSC (DDD, DDE) and BVP (DDE). Moderate concern for DDT related chemicals may be indicated based on the number of eggs affected and the potential for severe effects. However, this conclusion should be tempered by the knowledge that the species sampled often were not the same as the species upon which the LOCs were based, and extrapolation among species should be done with caution. Minor concern for dieldrin is indicated based on potential for eggshell thinning at Duck Creek, and minor to moderate concern is indicated based on severity of potential effects at BSC and BVP.

6.2 Inorganic Contaminants of Potential Concern

6.2.1 Inorganics in Water

LOCs have not yet been identified for several inorganic COPCs in water. Among those with identified LOCs, lower detection limits might be appropriate for 4 inorganic COPCs. Total recoverable inorganics were analyzed in all water samples collected for this study, but dissolved inorganics were assessed only in the mainstream Wash samples. Nineteen of the 22 inorganic COPCs were analyzed in water. Several of the inorganic COPCs were analyzed only in water from the mainstream Wash. Beryllium, cadmium, and dissolved lead were not detected at any of the sampling locations, but these chemicals were assessed only in the mainstream Wash. The cadmium detection limit was not sufficiently low to determine whether water samples exceeded the minimum LOC for cadmium in water.

Waterborne concentrations of 12 of the 22 inorganic COPCs exceeded their LOCs. A number of mainstream Wash locations appear to have elevated concentrations of aluminum in water, with levels sufficient to indicate the potential for substantial effects at those locations. Waterborne arsenic levels at Burns Street Channel and particularly at Duck Creek were high enough to indicate potential for substantial effects at these locations. Chromium levels in water suggested a potential minor concern only in one tributary, Burns Street Channel. Copper exceeded two LOCs for water at most sampling locations, with concentrations indicating that a relatively minor degree of concern is warranted. Waterborne iron might be a concern at only one tributary, Monson Channel. Levels of lead at LW5.5 indicated a potential minor concern. Mercury was detected infrequently in water, but the few samples containing detectable mercury exceeded multiple LOCs, some indicating potentially more serious concerns. A number of water samples exceeded LOCs for molybdenum, including the NDEP aquatic life criterion. Perchlorate exceeded proposed criteria at only one location, the Burns Street Channel tributary. A final criterion is still needed for perchlorate. Waterborne selenium levels are sufficiently great to indicate potential for substantial effects throughout the Wash and its tributaries. Additional effort should be directed toward evaluation of selenium levels based on the recent draft criteria for fish tissue concentrations and waterborne selenite and selenate. Levels of vanadium in water indicated a concern for relatively minor effects at LW10.75. Waterborne zinc levels exceeded LOCs at multiple locations in the Wash and tributaries, with concentrations sometimes exceeding LOCs indicating that more than minimal concern may be warranted.

6.2.2 Inorganics in Sediment

LOCs have not yet been identified for several inorganic COPCs in sediment, though background levels identified for some can be used for comparison. For inorganic COPCs with identified LOCs or background levels, analytical reporting limits appear to be appropriately low for comparison with LOCs. The only exception is selenium, for which lower reporting limits should be explored. Twenty-one of the 22 inorganic COPCs were analyzed in sediment, and seven were not detected (antimony, beryllium, boron, cadmium, mercury, molybdenum, and selenium). Only four of the inorganic COPCs exceeded LOCs for sediment. Arsenic levels in sediment indicated that minor to moderate degree of concern might be warranted based on exceedance of several threshold effect levels and one LEL at LW0.8 and LVB. Sediment copper concentrations indicated a minor to moderate degree of concern based on exceedance of a LEL at Burns Street Channel. A moderate degree of concern might be warranted, based on exceedance of an LEL, for lead levels in sediment at LVB. Concern for relatively minor effects is indicated for manganese concentrations in one of the samples from LVB based on exceedance of a LEL.

6.2.3 Inorganics in Fish

To date, LOCs for whole fish have been identified for only eight of the 22 inorganic COPCs. For each inorganic COPC with an identified LOC, the MRL was less than the minimum LOC. Nineteen of the twenty-two inorganic COPCs were analyzed in fish; antimony, titanium, and perchlorate were not analyzed. Beryllium and molybdenum were not detected in whole fish.

LOCs for seven inorganic COPCs were exceeded, with most indicating minor concern and two (for selenium and zinc) indicating moderate concern. Arsenic concentrations in fish indicated that minor concern is warranted based on three carp from PB and LVB that exceeded LOCs based on the 85th percentile of concentrations in fish in a national monitoring study. Cadmium was detected in only three fish, all from LVB, with two exceeding an LOC indicating minor concern based on the 85th percentile of concentrations in fish in a national monitoring study. Minor concern may be warranted for chromium in fish based on two fish from NP that exceeded a concentration indicative of environmental chromium contamination rather than on effects in fish. Copper concentrations in a few fish from NP, PB, LVB, and PNWR exceeded a LOC based on the 85th percentile of concentrations in fish in a national monitoring program, suggesting minor concern for copper in fish. Lead levels in five of six fish from LVB exceeded a LOC based on the 85th percentile of concentrations in fish in a national monitoring program, indicating that a minor level of concern might be warranted for lead in fish at that location. At least a moderate degree of concern is indicated for selenium in fish because the majority of fish exceeded LOCs suggestive of minor concern and a few exceeded effects thresholds for potentially severe effects such as reproductive impairment, teratogenesis, and mortality. Moderate concern is also indicated for zinc levels in fish, particularly those from LVB, based on potential mortality and malformation of fish and amphibian embryos and larvae.

It is important to note that concentrations in fish reported to be indicative of environmental contamination or LOCs based on the 85th percentile of concentrations in a monitoring study are not based on health effects reported in fish at those levels and thus are considered to be suggestive of minor concerns in the current report.

6.2.4 Inorganics in Bird Eggs

No LOCs for bird egg residues were identified for 16 of the 22 inorganic COPCs. Aluminum, beryllium, cadmium, molybdenum, nickel, lead, and vanadium were not detected in any bird eggs. Chromium was detected in only one bird egg, an American coot egg from PNWR. For inorganic COPCs with identified LOCs in bird eggs, detection limits appear to be appropriately low. Mercury was the only inorganic COPC detected in bird eggs at levels greater than LOCs. Mercury was detected at levels greater than the minimum LOC in bird eggs taken from four locations, including PNWR. The concentrations of mercury in those eggs were greater than the lower end of the range of levels that cause no adverse reproductive effects in osprey and in some cases exceeded the range associated with no effects. One egg from BVP also contained mercury at a level within the range of concentrations reported to reduce productivity of half of merlin populations, but the applicability of the LOC is questionable. DC, BSC, and BVP are locations that might be associated with greater risk of exposure of birds to mercury, but given that two of the bird eggs sampled from PNWR also exceeded the minimum LOC, mercury exposure might not be elevated in the Wash relative to other locations and/or the source of exposure might not be local. Overall, these findings suggest that a minor to moderate degree of concern for mercury toxicity in bird eggs might be warranted.

6.3 Contaminants Exceeding Levels of Concern in Multiple Environmental Media

One of the goals of this study was to identify “hot spots” or sources of contamination in the Wash and its major tributaries. Another goal involves identification of COPCs for which greater concern might be warranted due to their identification as potential concerns in multiple environmental media. **Table 15a** (organic COPCs) and **Table 15b** (inorganic COPCs) summarize by sampling location the COPCs that exceeded LOCs in each sample medium.

Ideally, water, sediment, fish, and bird egg samples should be collected within the same limited time frame (e.g., within a few days or weeks, or within a season) to allow for the best use of the residue data and the strongest interpretation of their significance and potential relatedness. For example, if an LOC for a specific COPC is exceeded in water and in fish tissue collected during the same time frame at the same location and the contaminant is known to be bioconcentrated from water, this finding provides stronger evidence that waterborne concentrations of the chemical are related to elevated concentrations in fish. Evaluation of a relationship among concentrations in various media is more tenuous when the various sample types are collected at different times. Also, because water concentrations of COPCs might be expected to fluctuate more rapidly than concentrations in the other media, collection of water samples should begin before other samples are collected and should span the duration of time when other samples are collected.

For the current monitoring study, bird eggs were collected from March through July 2007, sediment samples were collected in September and October 2007, and fish were collected from November 2007 through March 2008. None of these media were sampled during overlapping time periods, so comparisons among their COPC concentrations should be made with caution. Water samples from January 2007 through March 2008 were selected from a larger data set because this time period encompassed all of the dates when sediment, fish, and bird eggs were collected. Thus, waterborne concentrations of COPCs might be more readily comparable to COPC concentrations measured in other media. However, given the small number of water samples - single samples collected quarterly (organics) or monthly (inorganics) – and the fact that the majority of the COPCs can be accumulated into other media, particularly fish and bird eggs, via routes other than water, conclusions about relationships among waterborne concentrations of COPCs and COPC concentrations in other sampled media remain tenuous. Regardless, for many of the COPCs, sediment and fish tissue might be considered media that integrate exposure to environmental burdens, including waterborne levels, over time. For example, although concentrations of many COPCs in water might fluctuate dramatically over short periods of time (e.g., hours or days), fish may require weeks or months to reach equilibrium with waterborne COPC concentrations, even when levels in water are stable. Likewise, concentrations of COPCs in bird eggs likely reflect exposure of adult females to these contaminants from various sources in the environment over time rather than instantaneous exposure to COPCs in water ingested just prior to reproduction.

For organic COPCs, multiple media were sampled at six locations (**Table 15a**), and at least one sample media type exceeded an LOC at each of these locations. None of these locations was associated with more than one sample medium exceeding an LOC for the same organic COPC. Fish and bird eggs exceeded LOCs for different organic COPCs at NP, DC/PW, and PB.

For inorganic COPCs, multiple media were sampled at eight locations, each of which was associated with at least one sample medium that exceeded an LOC. Two sample media at DC/PW, BSC, LVB, and PNWR exceeded LOCs. Three locations had two media that exceeded LOCs for the same inorganic COPC: at DC/PW, selenium exceeded LOCs in water and fish; at BSC, copper exceeded LOCs in both water and sediment; and at LVB, arsenic and lead exceeded LOCs for sediment and fish. Multiple media from the following locations exceeded LOCs for one or more COPCs: NP, DC/PW, BSC, PB, LVB, and PNWR. However, in general, fish and birds from PNWR contained fewer detectable levels and smaller concentrations of COPCs.

7.0 COMPARISONS OF STUDIES CONDUCTED 2000-2003, 2005-2006, AND 2007-2008

7.1 Changes in Water COPC Levels in the Wash and Its Tributaries Over Time

7.1.1 Organics

Close to 90 organic contaminants were monitored in water samples collected quarterly from tributaries and seeps. Eight of these approximately 90 chemicals overlap with those monitored in bird eggs and fish (**Table 22**). Among these, only four, the HCH isomers, were detected more than five times across all locations sampled for organic COPCs (i.e., only the tributaries and seeps) over the 2000–2008 time period (267 water samples collected from January 2000 through January 28, 2009). These four COPCs are constituent isomers in the technical lindane (HCH) mixture. The best characterized HCH isomer is gamma-HCH, also sometimes called lindane. Of the total number of samples collected from 2000-2008, the percent resulting in detections was quite low (< 12%), and the beta isomer was detected most frequently (**Table 22**).

The occurrence data for each of the HCH isomers are presented as a function of time and location in **Figures 2** and **3**. The highest concentrations were observed for the less active isomers (alpha-, beta-, and delta-HCH) in terms of their pesticidal activity (**Figure 2**). These isomers were detected at only three of the locations representing tributaries and seeps (LWC6.3, LWC3.7, and Burns Street Channel [BS_1]), with the highest concentration at 1.3 µg/L for delta-BHC at LWC6.3 in July 2002. LOCs are not available for these less active constituents of technical lindane.

The most active pesticidal isomer, gamma-HCH, had the lowest frequency of detection among the four HCH isomers and occurred at some of the lowest levels observed among the HCH isomers, particularly at LWC6.3. Six of the nine samples containing detectable levels of gamma-HCH exceeded the minimum LOC of 0.08 µg/L for that COPC (**Figure 3**).

7.1.2 Inorganics

Waterborne inorganic COPC concentrations from nine mainstream Wash locations (LW6.05, LW5.9, LW5.5, LW5.3, LW3.85, LW4.95, LW3.75, LW3.1, and LW0.8) and two seeps (LWC6.3 [Kerr McGee seep] and LWC3.7 [GCS-5 groundwater seep]) were plotted for long term comparison of total and dissolved inorganic concentrations. In the graphs, mainstream Wash locations are represented as a solid dot, and seeps are represented as a ring, or empty dot. Whenever possible, a common symbol color was used to visually connect the mainstream Wash locations corresponding to the nearest upstream seep locations. Locations LW6.05, LW5.5, LW3.85, and LW3.75 were sampled only until December, 2006. Locations LW5.9, LW5.5, and LW0.8 were sampled throughout the course of the study. In January 2007, locations LW4.95 and LW3.1 were added. Inorganic COPCs that generally occurred at concentrations greater than their minimum LOCs were selected to generate plots. Aluminum, copper, lead, perchlorate, selenium, and zinc were selected for review of the total inorganic concentrations at the previously listed locations. Aluminum, copper, and zinc were selected for review of the dissolved inorganic concentrations. Dissolved inorganic COPC data were not assessedfor tributaries or seeps. Graphs of total inorganic COPC concentrations include sampling times from October 2000 to December 2008, while graphs of dissolved concentrations encompass sampling times from December 2002 to December 2008.

Aluminum. As shown in **Figure 4,** total aluminum concentrations were close to or greatly above the minimum LOC (87 µg/L) throughout most of the sampling period. Total aluminum concentrations in Wash locations LW3.85, LW3.75, and LW0.8 seemed to periodically spike to levels >800 µg/L between the years 2000 and 2005. In June 2002, total aluminum concentrations spiked at Wash locations LW3.75 (6,000 µg/L) and LW5.9 (3,400 µg/L). In December 2004, total aluminum concentration spiked again at Wash location LW3.75 (4,200 µg/L). Total aluminum concentrations at location LW5.9 never exceeded 710 µg/L throughout the remaining course of sampling. LWC3.7 displayed several instances of exceptionally high total aluminum concentrations, most notably on July 23, 2003 (7,000 µg/L). Aluminum was detected only two times at LWC6.3, at concentrations below the minimum LOC.

In most samples from the majority of sampled locations, dissolved aluminum concentrations (**Figure 5)** were at or below the minimum LOC for dissolved aluminum. In early 2004, dissolved aluminum at locations LW3.85, LW4.95, LW5.3, LW5.5, and LW6.05 temporarily spiked, with all of these locations greatly exceeding the minimum LOC at concentrations ranging from 180 to 970 µg/L. Only two samples collected after 2004 contained dissolved aluminum at concentrations exceeding the minimum LOC: a sample collected from LW6.05 on August, 8, 2005 (110 µg/L) and a sample taken at LW6.85 on August 20, 2008 (250 µg/L). The remaining samples contained dissolved aluminum at or below the minimum LOC.

Copper. As shown in **Figure 6**, the total concentration of copper in both the mainstream Wash and seep samples exceeded the minimum LOC of 0.23 µg/L at all sampling locations. In the Wash, there appears to be a decreasing trend in total copper concentrations over time, with a few exceptions during mid-2003. Waterborne total copper at location LW3.75 spiked to 24 µg/L and reached 15 µg/L at LW0.8. Total copper levels at the two seeps were generally in the range of 5 to 15 µg/L, with levels at only one location (LWC3.7) exceeding 15 µg/L (twice). LWC6.3 seemed to exhibit a trend of decreasing levels of total copper over time, with concentrations from 2000 to 2002 in the range of 10 to 15 µg/L dropping into the range of 3 to 7 µg/L from 2003 to 2006.

Dissolved copper levels seemed to hold steady above the minimum LOC of 0.23 µg/L throughout the years sampled (2002 to 2008) (**Figure 7**). None of the samples contained dissolved copper concentrations at or below the minimum LOC. Most of the measured dissolved copper levels are within the range of 2 to 6 µg/L, with a slight decrease over time to within the 2 to 4 µg/L range. In early 2003 , dissolved copper at locations LW3.75 and LW10.75 exceeded 6 µg/L but decreased by the end of the year. Dissolved copper at locations LW5.3 and LW0.8 spiked in late 2003 to 11 µg/L. The dissolved copper concentration at location LW6.85 reached 12 µg/L once in August 2008.

Lead. As shown in **Figure 8**, many of the waterborne total lead samples, particularly those collected from 2000 to 2004, exhibited concentrations above the minimum LOC of 1 µg/L. Location LW0.8 experienced the most dramatic shifts in total lead, with concentrations ranging from a low of 0.52 µg/L to a high of 12 µg/L in August 2003. From 2006 later, levels of total lead at location LW0.8 seemed to become less erratic, and concentrations fell below the minimum LOC. After this time at LW0.8, as well as at the other sampled locations, total lead concentrations appeared to remain steadily below the minimum LOC. Total lead concentrations at LW3.85 displayed a similar erratic trend, though levels at this location were more often below the minimum LOC. The highest spike in total concentration at this location (mid-2002) never exceeded 5 µg/L. Concentrations of total lead at LWC3.7 were generally much higher than concentrations at most of the mainstream Wash locations. The two highest total lead concentrations were measured in July 2003 (23 µg/L) and July 2004 (78 µg/L). Both points of those highest total lead concentrations are off-scale in **Figure 8**. No waterborne dissolved lead data were assessed.

Perchlorate. Total perchlorate concentrations measured at the mainstream Wash locations, the two seeps (LWC6.3 and LWC3.7), and the tributary Burns Street Channel (BS_1) are shown in **Figure 9**. Mainstream Wash samples collected between 2000 and late 2002 generally exhibited higher levels (500 to 1500 µg/L) than samples collected later. During this time frame (2000 to late 2002), locations LW5.9, LW5.3, LW3.85, and LW0.8 seemed to exhibit the highest perchlorate concentrations during the period from October to February of each year. Levels settled below 250 µg/L in the mainstream Wash from 2003 to 2008. Perchlorate concentrations in tributary or seep samples were much higher than those found in the mainstream Wash. Waterborne perchlorate at location LWC6.3 reached levels greater than 120,000 µg/L in March 2001. A trend of decreasing perchlorate concentrations was observed at this location thereafter. Perchlorate concentrations decreased to 40,000 to 80,000 µg/L between 2001 and 2003, then continued to drop to levels around 10,000 to 20,000 µg/L by mid-2004 to mid-2005. The seep location LWC3.7 also displayed a trend of decreasing perchlorate concentrations early in the series of bioassessment studies, though concentrations at this location were significantly lower than those observed at the LWC6.3 location. Perchlorate concentrations at LWC3.7 peaked around 2,041 µg/L in August 2001 and slowly decreased to 310 µg/L by May 2004. After this date, samples were no longer collected from LWC3.7. Sampling at the the Burns Street Channel (BS_1) location, slightly southwest of LWC3.7, commenced in January 2007. After the high perchlorate level (3,800 µg/L) observed in the initial sample followed by a lower level in the April 2007 sample, this location displayed a trend of increasing concentrations ranging from 740 µg/L to 3,100 µg/L. This trend is contrary to the observations of low perchlorate levels in the Wash downstream of the Burns Street Channel tributary.

Selenium. Total concentration data for selenium are shown in **Figure 10**. Waterborne selenium at all locations was above the minimum LOC (1 µg/L). With the exception of location LW10.75, levels of total waterborne selenium at the Wash locations were generally in the range of 1.5 to 5 µg/L. Location LW10.75 is located further upstream from the other Wash locations included in **Figure 10** and was observed to have much higher selenium concentrations in the range of 11 to 16 µg/L. On two occurrences, the total selenium concentration at the LW10.75 location spiked, to 20 µg/L in August 2001 and to 19.2 µg/L in February 2003. On three instances, the selenium concentration dropped substantially (to 3.82 µg/L in August 2003, to 3.78 µg/L in January 2005, and to 6.46 µg/L in October 2005) and then returned to the previously described range. The seep at LWC6.3 generally displayed higher selenium concentrations than most of the mainstream Wash locations, with concentrations of 5 to 9 µg/L from 2000 to late 2003. From 2004 later, the total selenium levels seemed to drop to 1.5 to 3 µg/L, with the exception of a spike to 19.5 µg/L in January 2005. Selenium levels at LWC3.7 remained within the same range as most of the mainstream Wash samples from 2000 to 2004. Dissolved selenium data available for 2006 to 2009 mirror the total concentration data indicating that most, if not all, of the selenium is present in the dissolved form (data not shown).

Zinc. **Figure 11** shows waterborne total zinc concentrations for the mainstream Wash and associated seeps. All samples exceeded the minimum LOC for zinc (4.6 µg/L). Levels of total zinc at the mainstream Wash were usually within the range of 20 to 90 µg/L throughout most of the sampling period. Total zinc concentrations in the mainstream Wash began to show a slight decrease after mid-2005, with levels at most of the locations falling to within the 20 to 60 µg/L range. Interestingly, the data seem to to exhibit a somewhat regular, cyclic pattern over time from 2005 to 2008, though a distinct seasonal pattern is not apparent. Total zinc levels at the mainstream Wash locations seem to cluster in the 60 to 80 µg/L range from October 2004 to February 2005. This is followed by a steady drop to approximately 30 µg/L prior to trending upward again. One very prominent spike (370 µg/L)occurred at location LW5.3 in March 2000. Total zinc concentrations at the two seeps, in the 5 to 30 µg/L range, were generally lower than those found at the mainstream Wash locations. The two seeps each had at least one high waterborne total zinc value, 54 µg/L at LWC3.7 in mid-2003 and 56 µg/L at LWC6.3 in late 2004.

Dissolved zinc concentrations mirrored the total zinc data, with all locations generally exhibiting concentrations within the range of 20 - 55 µg/L (**Figure 12**). This indicates that a majority of the total zinc is typically in the dissolved phase in these samples. As seen in the total zinc data, the highest dissolved zinc concentration was found at LW5.5 (66 µg/L) in late 2004, but the level quickly dropped to 36 µg/L at the next sample period. Interestingly, the timing and magnitude of this spike in dissolved zinc did not correspond to that observed in the total zinc time line. Dissolved zinc levels seem to have the same trend, starting in mid-2006, of increasing and decreasing that was observed among the total zinc concentration data.

7.2 Changes in Sediment COPC Levels in the Wash and Its Tributaries Over Time

Over the 3 study periods (2000-2003, 2005-2006, and 2007-2008), sediment samples were taken from locations LW10.75, NP, DC_1, PB, LW0.8, and LVB each year. Sampling of the Burns Street tributary (BSC) commenced in 2007. Organic COPCs were detected only in sediment samples collected for the 2005-2006 study and only in samples from DC (delta-HCH, gamma-chlordane, and heptachlor) and LVB (endrin, o,p'-DDE; p,p'-DDE; o,p'-DDD; and p,p'-DDD). However, in the 2005-2006 study, endrin was not analyzed at locations other than LVB with detection limits sufficiently low to determine whether it might exceed the minimum LOC. Also, in the 2005-2006 study, concentrations of o,p'-DDT; o,p'-DDE; and o,p'-DDD were not analyzed at locations other than LVB, and p,p'-DDT; p,p'-DDE; and p,p'-DDD were not analyzed at locations other than LVB with detection limits sufficiently low to evaluate whether these COPCs might exceed their LOCs. All of the COPCs detected at LVB exceeded their respective minimum LOCs. Throughout all three bioassessment studies, detection limits for some of the organic COPCs were not sufficiently low to detect concentrations less than their respective minimum LOCs. Due to the small numbers of sediment samples, frequently inadequate detection limits, and differences in analytical laboratories and detection limits among the three biossessment studies to date, it is difficult to glean any meaningful information about trends in concentrations of organic COPCs in sediments taken from the Wash and its tributaries.

The inorganic COPCs detected in sediment samples are summarized in **Table 17**. Throughout the three bioassessment studies conducted to date, aluminum, barium, chromium, copper, iron, magnesium, manganese, strontium, titanium, vanadium, and zinc were detected in all of the sediment samples that were analyzed, regardless of sampling year or sampling location. Perchlorate was not detected at any of the sampling locations during any of the study years. Of the inorganic COPCs that were detected, arsenic, copper, manganese, nickel, lead, and selenium exceeded their minimum LOCs in at least one sample. Antimony, boron, beryllium, and molybdenum were detected at all locations sampled for the 2000-2003 study, but concentrations of these inorganic COPCs in sediment were below detection limits at all locations sampled during the 2005-2006 and 2007-2008 studies. Arsenic levels in sediment exceeded the minimum LOC at all locations sampled for the 2000-2003 study but at none of the locations sampled for the 2005-2006 study and at only two locations (LW0.8 and LVB) sampled for the 2007-2008 study. Copper in sediment exceeded its LOC in only one sample (taken at BSC in 2007). Sediment samples were not collected at BSC prior to 2007, so whether copper in sediment at BSC was higher than the LOC in previous years is unknown. Lead, manganese, and selenium in sediment exceeded their respective LOCs only at LVB. Lead in sediment exceeded its LOC at LVB twice (in the 2000-2003 study and in the 2007-2008 study). Manganese exceeded its LOC in sediment in only one sample (LVB in 2007). Nickel levels in sediment exceeded the minimum LOC at four locations (DC, PB, LW0.8, and LVB) in 2005 but were below the minimum LOC at all locations sampled in the 2000-2003 and 2007-2008 studies. Selenium exceeded its LOC in sediment in only one sample, taken at LVB during the 2000-2003 study.

Overall, the results appear to indicate that most inorganic COPCs in sediment have generally either occurred at concentrations less than their minimum identified LOCs or were not detected. However, LOCs have not been identified for several of these COPCs. Several of the inorganic COPCs were detected in the 2000-2003 bioassessment study but not in subsequent rounds. This might indicate declining concentrations of these COPCs in sediment over time or might be related to differences in detection limits among studies. This should be evaluated further. Only manganese exceeded an LOC for sediment collected for the 2007-2008 study (at LVB) but not in previous years. However, the small number of sediment samples collected for this ongoing project severely limits any confidence in identification of trends in concentration over time.

7.3 Changes in Whole Fish COPC Levels in the Wash and Its Tributaries Over Time

Generally, it was difficult to compare organic COPC concentrations among the three bioassessment studies because the detection limits were an order of magnitude higher for COPCs analyzed in whole fish collected for the 2005-2006 study. This is well illustrated by data sets for dieldrin; oxychlordane; alpha-chlordane; cis-nonachlor; heptachlor epoxide; alpha-HCH; delta-HCH; gamma-HCH; o,p'-DDD; p,p'-DDT; and mirex. Each of these COPCs were detected in the 2000-2003 and 2007-2008 studies, but not in the 2005-2006 study (**Table 18**). Regardless, the general trend indicates that the majority of the COPCs were detected in fish collected in the lower reaches of the Wash and that levels remained somewhat consistent within locations throughout the three bioassessment rounds conducted to date. For example, mean concentrations of p,p'-DDE were similar for each year relative to each sampling location (i.e. LVB_2003, 0.12 mg/kg ww, n=4; LVB_2005, 0.13 mg/kg ww, n=7; LVB_2007, 0.16 mg/kg ww, n=6). During the three bioassessment studies conducted to date, only total PCBs exceeded its minimum LOC. PCBs were detected in all of the fish collected from the Las Vegas Valley, with the exception of seven fish collected from PB in 2005 (likely due to the higher detection limits reported by the laboratory for that study period). Regardless, PCB concentrations in these fish would still have been well below the minimum LOC. PCBs have been, and to date remain, a potential concern for fish at all locations sampled in the Las Vegas Valley, particularly at DC, PB, and LVB, where the majority of the fish collected contained levels of total PCBs that exceeded the minimum LOC regardless of fish species (**Appendix D**).

With regard to comparisons of inorganic COPC levels in fish among bioassessment rounds, a general trend in reduced detections of cadmium, lead, mercury, molybdenum, and vanadium was observed over time (**Table 19**). Arsenic, barium, chromium, copper, iron, manganese, selenium, strontium, and zinc were detected consistently in all fish collected from the Wash throughout the three study periods. Of the eight inorganic COPCs with identified LOCs for whole fish, five exceeded their minimum LOC values in at least one fish during each round of sampling. Fish whole-body concentrations of these COPCs, with the exception of zinc, decreased to near or below their minimum LOCs over time and in some cases below the COPC detection limit. This observed trend is supported in **Table 19**, which shows that cadmium levels in fish exceeded the minimum LOC of 0.05 mg/kg at all locations in 2005 but exceeded the LOC at only one location (LVB) in 2007. Furthermore, cadmium was not detected at any sampling locations other than LVB in 2007. This trend was also observed for arsenic, copper, and selenium levels in fish (**Appendix D**). Levels of zinc regularly exceeded the minimum LOC at each location during each round of the bioassessment (**Appendix D**).

7.4 Changes in Bird Egg COPC Levels in the Wash and Its Tributaries Over Time

In many cases, the average detected levels of organic COPCs measured in bird eggs collected from the Wash remained fairly consistent within similar locations over the three bioassessment rounds. This trend was evident for dieldrin; oxychlordane; trans-nonachlor; cis-nonachlor; heptachlor epoxide; beta-HCH; DDMU; p,p'-DDT; p,p'-DDD; p,p'-DDE; hexachlorobenzene; mirex; and total PCBs (**Table 20**). Interestingly, a trend of decreasing organic COPC concentrations in bird eggs among similar locations over the three sampling years was observed for alpha-chlordane; gamma-chlordane; alpha-HCH; delta-HCH; gamma-HCH; o,p'-DDD; pentachloroanisole; endosulfan II; endosulfan sulfate; and chlorpyrifos. Many of the organic COPCs listed above were not detected in bird eggs during the 2007-2008 sampling period. Over the three bioassessment rounds, only p,p'-DDE exceeded the minimum LOC in bird eggs. This COPC was detected in every bird egg collected, regardless of sample location (including PNWR) or bioassessment round, and the majority of the bird eggs collected for this ongoing study exceeded the mimimim LOC for p,p'-DDE (**Appendix D**). This was evident particularly for sampling locations DC, BSC, BVP, PB, and LVB, indicating that DC and downstream locations continue to be areas of concern for potential effects of p,p'-DDE in the Las Vegas Valley. Dieldrin and hepatachlor epoxide exceeded their minimum LOCs for bird eggs at two or more locations during the ongoing bioassessment. **Appendix D** presents COPC concentration data for bird eggs by location and bioassessment round. Levels of COPCs in the majority of the bird eggs sampled were well below their associated minimum LOCs (**Appendix D**).

For inorganic COPCs in bird eggs (**Table 21**), a general trend in reduced detections of aluminum, cadmium, chromium, molybdenum, nickel, and lead was observed over time. These inorganic COPCs were not detected in any bird eggs collected from the Las Vegas Valley in 2007-2008 (**Table 21**). Neither beryllium nor vanadium was detected in bird eggs taken from any location throughout the three bioassessment studies conducted to date. Barium, copper, iron, magnesium, manganese, selenium, strontium, and zinc were detected consistently in the majority of samples collected from the Las Vegas Valley throughout the three bioassessment study periods. Of the six inorganic COPCs with identified LOCs for bird eggs, concentrations of two (mercury and selenium) exceeded the minimum LOCs in one or more bird eggs collected during the completed bioassessment studies. Whenever mercury was detected in a bird egg sample collected at any location during any bioassessment round, the concentration exceeded the minimum LOC (**Table 21 and Appendix D**). Selenium levels exceeded the minimum LOC in individual bird eggs collected from NP and DC in 2000-2003 and in a single egg collected from DC in 2005-2006 (**Appendix D**).

8.0 CAVEATS

For all of the bioassessment study rounds conducted to date, the number of sediment, fish, and bird egg samples collected per location was generally very small. Interpretation of the results of fish and bird egg data is severely hampered by the selection of multiple species, which may accumulate the selected COPCs to varying degrees. For reasons discussed previously in this report, these factors limited the usefulness of the data provided to ACT I.

In studies of contaminant residues in fish, the parameters weight, standard and total length, and sex are typically recorded for fish collected for analysis because body size and sex can influence the concentrations of some contaminants in fish. For example, female fish may eliminate some lipophilic contaminants via their eggs, resulting in smaller whole-body concentrations of these contaminants than are found in males. Methylmercury typically is found at greater concentrations in larger, older fish than in smaller, younger fish. Particularly with the small sample sizes used in this study, it is possible that fish of just one sex might be sampled at a single location, skewing the results. Also, fish of different sizes or sexes might use different locations or habitats within locations in the Wash, and collection of a limited number of fish could easily result in selection of different size ranges or sexes from different locations. Some data that are necessary to assess the effects of these factors are available and could be evaluated later, particularly when location-related differences cannot be explained using other factors such as localized sources of contamination or differences in flow (e.g., pools versus riffles).

If a goal of a monitoring plan is to evaluate location-related differences in contamination on the basis of contaminants in fish or bird eggs, sampling locations should be selected to minimize the likelihood that animals move among them. For example, preferred sampling locations might be separated by physical barriers that prevent movement (e.g., dams) or might be separated by a distance that is large enough to make animal movement among locations unlikely. Sampling might also be restricted to species that are territorial or otherwise limited in their movements during the sampling period (e.g., nesting birds). This report does not include an assessment of the mobility of fish or birds among sampling locations, so readers are cautioned that this must be considered in drawing conclusions about differences in contaminant levels among locations based on fish or bird egg COPC concentrations. Elevated concentrations of a contaminant in different environmental media from the same location lend credibility to an assertion that body burdens of a contaminant in animals are location-related.

Most birds that have been sampled for the bioassessment studies are believed to be resident species. Because birds are inherently mobile, one cannot rule out the possibility that contaminants detected in tissue were accumulated from areas outside the Wash. However, due to the warm climate in the sampling area, most bird species sampled are likely year-round residents. Migrating individuals are considered the exception. Concentrations of mercury in bird eggs more closely reflect recent maternal dietary uptake (i.e., from local sources) of mercury than accumulated stores from maternal tissue (USDI 1998). Likewise, selenium concentrations in bird eggs generally are considered to have been accumulated from local sources due to the 6 to 8 weeks required by breeding birds to pair, court, mate, and nest (Skorupa 2006).

There can be significant intra-clutch variation in egg mercury concentrations. In one study, the first egg laid in a clutch contained as much as 39% more mercury than the second or third eggs laid (USDI 1998, p. 103). Bird egg samples were collected randomly by removing the egg nearest to the collector from the direction the nest was first approached. In addition, hens rotate eggs within the nest throughout gestation. Therefore, no attempt was made (nor would it be possible) to collect first-laid eggs. It also should be noted that residues of COPCs in bird eggs (including mercury) are expected to reveal accurate averages over time as sample numbers increase regardless of the sequence in which the eggs were laid. However, the number of eggs sampled within each bioassessment round is very small.

The discussion of the degree of concern warranted for various COPCs is limited in a number of ways. LOCs have not been identified for many of the COPCs in the media sampled. Also, to conduct a more objective comparison of degrees of concern warranted for various COPCs, there is a need to identify LOCs indicating potential for minor or threshold effects and LOCs suggestive of probable or substantial effects, and both types of LOCs are not available for many COPCs. Consequently, a finding that a minor degree of concern is warranted does not necessarily mean that a higher degree of concern is not warranted, particularly if no LOC indicating potential for substantial effects has been identified to date. This is a shortcoming of the current and past bioassessment reports. Readers may refer to the two previous bioassessment reports (Intertox and B&V 2006, Intertox 2008) for deeper discussion of the shortcomings of the LOCs selected for this ongoing work.

9.0 RECOMMENDATIONS

The following are recommendations to improve future iterations of the Las Vegas Wash Monitoring and Characterization (bioassessment) study.

Different benchmarks and criteria are developed for different purposes and using various methods. Ongoing work might benefit from a more critical review of toxicity benchmarks to determine which are most relevant and appropriate for the Wash. Furthermore, this report features some LOCs that might have been used in a manner for which they were not originally intended. For example, a criterion that was meant to be compared to a location mean might have been applied to individual samples for screening purposes. Particularly for contaminants that were identified during the screening process as exceeding LOCs, a closer review of the supporting literature should identify any benchmarks that would be better applied in a different manner or ignored for the purposes of this effort.

Screening-level benchmarks commonly are not developed to be protective of all species of interest in a particular area, but rather for a certain subset or proportion of species. In some cases, species-specific benchmarks are available. If sensitive species of particular importance (e.g., endangered or threatened species, commercially or recreationally important species, or keystone species) inhabit an area, extra consideration for these species might be warranted. For example, toxicity and/or exposure data specific to the razorback sucker or largemouth bass might be particularly useful for assessing the potential impacts of contaminants on the Wash and Las Vegas Bay. A preliminary search for toxicity data identified several studies of the effects of some COPCs on razorback suckers. A detailed search for toxicity data for this species could be used to develop screening benchmarks specific for the razorback sucker.

LOCs for certain sample types were not identified for many of the COPCs in this study (see Table 24), possibly due to the limited scope of the search. Further review should facilitate identifying appropriate LOCs or determining that the chemicals are not likely to pose a risk based on what is known about their properties. For example, if a chemical is unlikely to be present in sediment at significant concentrations due to its physico-chemical properties, there should be less concern for sediment toxicity, and less effort could be expended to identify sediment LOCs. For the metals and metalloids, further investigation might yield more information regarding normal concentrations in environmental samples, particularly for those that are essential to biological systems. More in-depth reviews of references that were considered in this report, searches of additional databases, and reviews of the primary literature might identify levels of concern or background levels that are lacking for some of the COPCs. For example, handbooks by Eisler (2000a, 2000b, 2000c) were checked only for proposed criteria for protection of natural resources and not for levels associated with adverse effects in individual studies cited in the effects tables. This reference in particular should be reviewed in greater detail. Books by Hoffman et al. (2003) and Beyer et al. (1996) are other references that contain a wealth of useful information that might be addressed in greater detail. The Risk Assessment Information System (RAIS) Database (U.S. DOE 2006) includes a compilation of Ecological Benchmark Values from various sources. The sources used in the database were generally similar to the ones that were searched previously, but additional criteria appear to be available for some of the COPCs for which LOCs were not otherwise found.

Future efforts should include a more detailed assessment of the quality and availability of LOCs. For the COPCs with identified benchmarks, the sufficiency of those benchmarks for screening should be evaluated. If only severe or probable effects benchmarks are available, the potential for more subtle effects might be missed. A table could be generated to indicate whether available LOCs are based on consensus assessments or more limited single bioassays with individual species, to show whether both threshold or minor and probable or substantial effect levels have been identified for each LOC, and to indicate whether typical background levels have been identified for naturally occurring inorganic chemicals.

After a reasonable degree of effort has been directed at identifying additional and appropriate screening benchmarks or criteria in the literature for COPCs that are currently missing LOCs, searches of the primary literature could be conducted to identify and tabulate toxicity data that can be used to develop LOCs for the purposes of this ongoing work. Efforts could be focused on searches for specific types of data depending on the physico-chemical and toxicologic properties of each COPC.

Bioaccumulation-based criteria generally were not considered (or at least were not specifically targeted in literature searches) for sediments in the current analysis. Use of bioaccumulation-based criteria for future assessments will improve the assessment for bioaccumulative COPCs.

According to the U.S. EPA's current draft freshwater chronic criterion for selenium, if whole-body fish tissue samples exceed 5.85 mg/kg dw in summer or fall, fish should be monitored in winter to determine whether the criterion of 7.91 mg/kg dw is exceeded in winter (U.S. EPA 2004). Several fish collected in the fall for the current study contained levels of selenium exceeding the summer/fall standard that triggers winter monitoring, and two fish collected from DC exceeded the draft selenium criterion itself. Thus, in addition to sampling fish in the summer or fall to compare selenium levels in fish to levels in other media, fish should be monitored for selenium concentrations in the winter.

The toxicities of some waterborne metals may be influenced by water hardness. For this report, conservative assumptions were appropriately used to screen waterborne metals data, but less stringent criteria might be applicable if, for example, criteria for individual samples were adjusted to their specific hardness values rather than a minimum value for all samples. However, caution should be used because the hardness-adjusted criteria are often based on 24-hour or 4-day averages rather than the individual grab sample data used for this report.

To strengthen assumptions underlying comparisons of COPC concentrations and exceedences among sampled media, sampling of water, sediment, bird eggs, and fish should be coordinated (to the extent that it is possible) so that the samples are collected within the same limited time period, e.g., within the same season.

As this monitoring program progresses and develops, sampling plans should be reconsidered and refined to enable the best use of the data. In some cases, information regarding modifying factors is required or greatly enhances the ability to interpret contaminant concentration data. Sometimes this information can only be collected simultaneously with sampling for chemical concentrations, so knowledge of these modifying factors is required before sampling is conducted. Also, certain benchmarks or criteria require specific monitoring regimens (e.g., frequency and number of samples) to allow for the most appropriate comparison. Prior knowledge of these sampling requirements is necessary to meet the objectives of the criterion or benchmark. Some contaminants are selectively accumulated into specific tissues or life stages that might serve as better indicators of exposure to contaminants than whole-body or whole egg concentrations. For example, according to Beyer et al. (1996), cadmium is not accumulated to a significant extent in bird eggs, so sampling a tissue from adult birds might provide a better measure of exposure.

Whenever feasible, analytical methods should be sufficiently sensitive to produce a detection limit or reporting limit less than the lowest LOC, and this should be investigated prior to sampling. In the current study, some detection limits or reporting limits are still greater than minimum LOCs for certain COPCs in specific media. However, it is worthwhile to consider whether the cost and effort of pursuing lower detection or reporting limits will gain any important information. For example, if the LOC that is greater than the detection or reporting limit has limited utility for this study, it might not be critical to achieve greater sensitivity in relation to that LOC.

If LOCs are based on certain metal species or specific metabolites or degradation products of organic chemicals, efforts should be made to analyze the samples of interest to allow for comparison to the most appropriate available benchmarks. For example, because the U.S. EPA acute water quality criterion for selenium for protection of aquatic life (current and latest draft) is based on selenite and selenate concentrations, these selenium species should be analyzed in water samples in addition to total selenium. Sulfate concentration data should be collected from the same samples so that selenate toxicity can be corrected for sulfate exposure. Because some criteria or benchmarks for chromium are based on Cr(VI) or Cr(III) rather than total chromium, analysis of these species in water and possibly in other media should be considered.

USDI (1998) recommends that metal concentrations in sediments be compared to local background metal levels whenever possible. Some local data were gathered[1], but they appear

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[1] Landwell Restoration Project, Landwell Data Repository. Henderson, NV: Landwell Company.

to have limited utility due to questions regarding their potential to represent soil concentrations along the Wash, which vary considerably in composition and probably in background levels of inorganic COPCs. A more thorough search for background or normal concentrations for the inorganic COPCs in all of the sample types is recommended for future reports in this series.

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Figure 1. Map of Sampling Locations Used During the 2007-2008 Las Vegas Wash Monitoring and Characterization Study (Note: Location Codes and Descriptions Are Provided in Table 2)

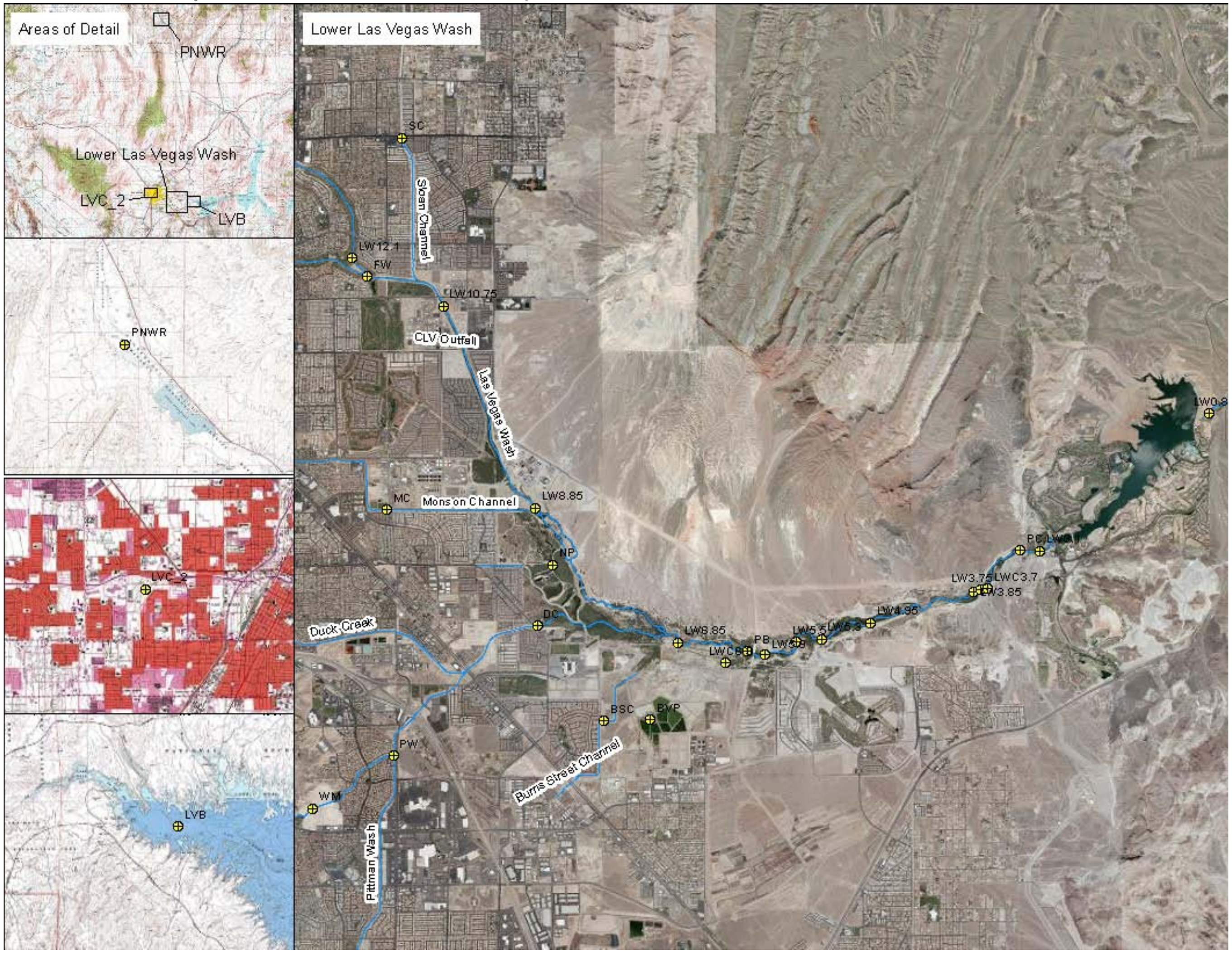
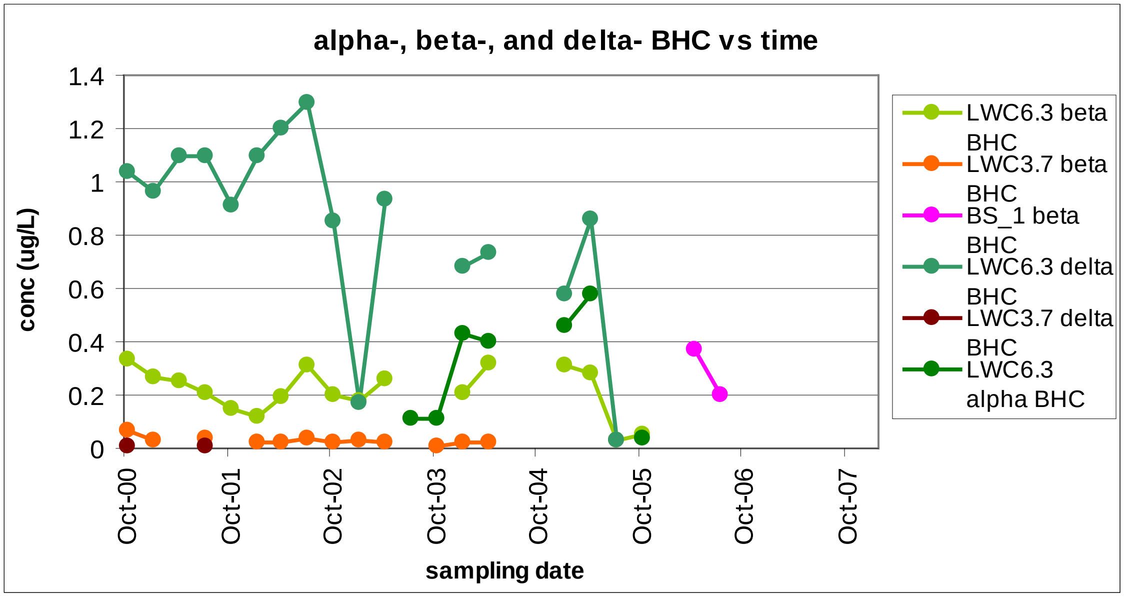
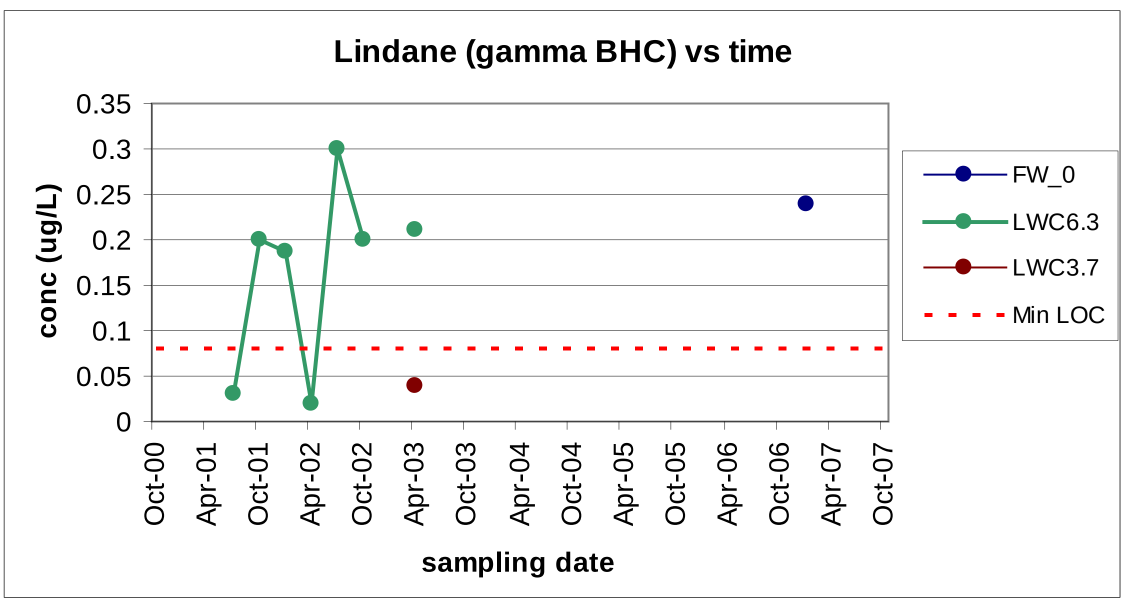


Figure 2. Waterborne Hexachlorocyclohexane (HCH) alpha-, beta-, and delta- Isomer Concentrations in Selected Tributaries and Seeps of the Las Vegas Wash



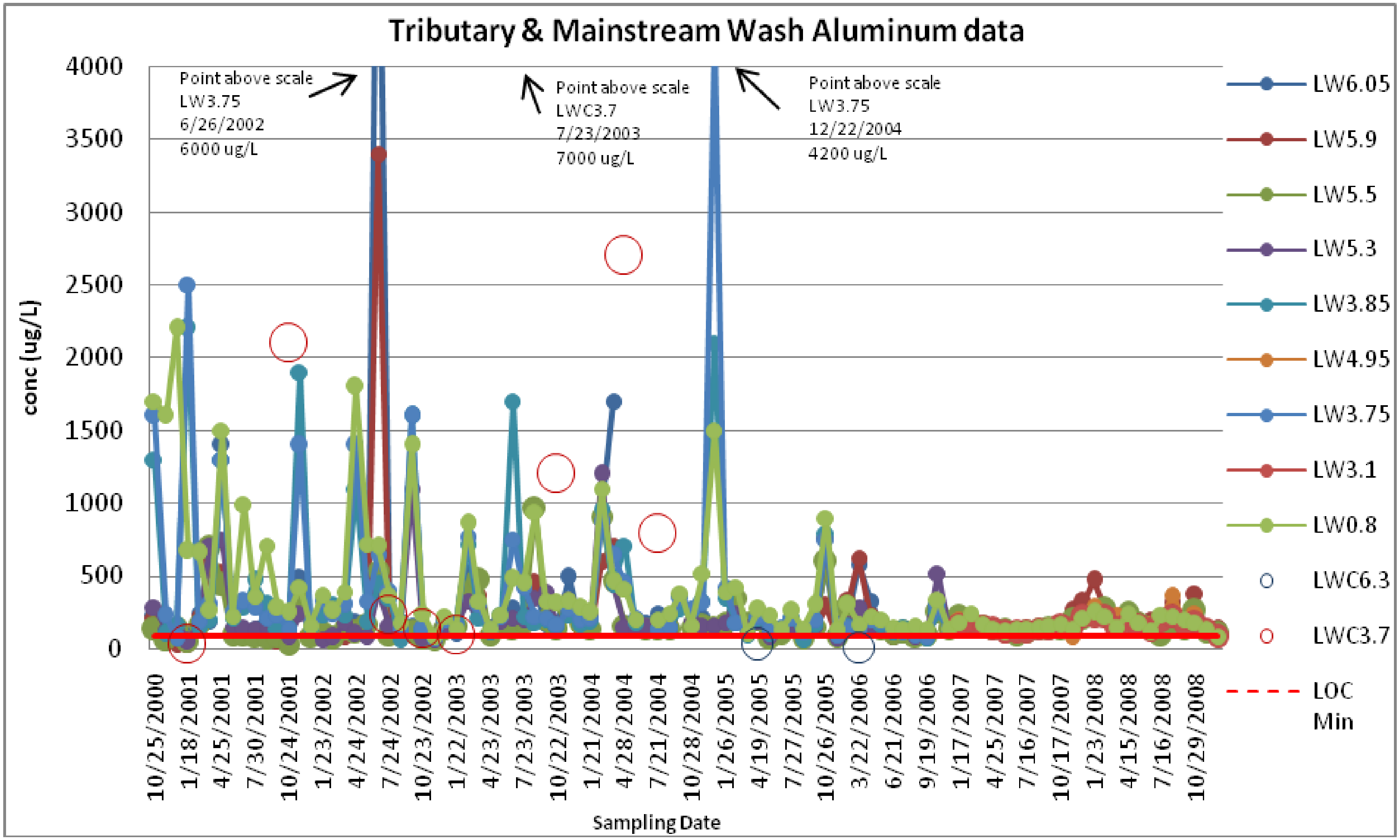
BHC, benzene hexachloride (hexachlorocyclohexane [HCH], or lindane); conc., concentration

Figure 3. Waterborne beta-Hexachlorocyclohexane (HCH, or Lindane) Concentrations in Selected Tributaries and Seeps of the Las Vegas Wash



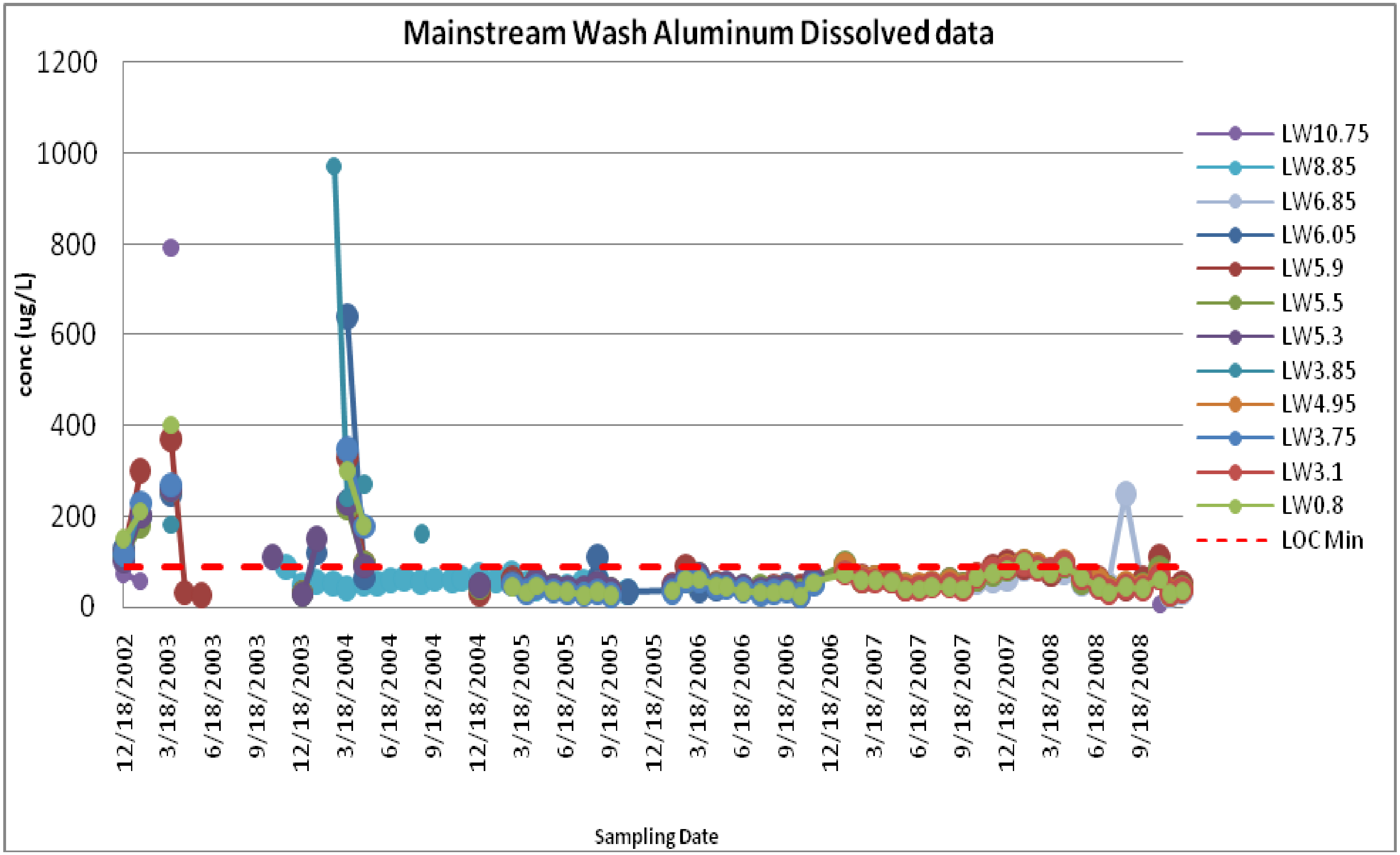
BHC, benzene hexachloride (hexachlorocyclohexane [HCH], or lindane); conc., concentration

Figure 4. Waterborne Total Aluminum Concentrations at Selected Locations in the Las Vegas Wash and Its Tributaries and Seeps



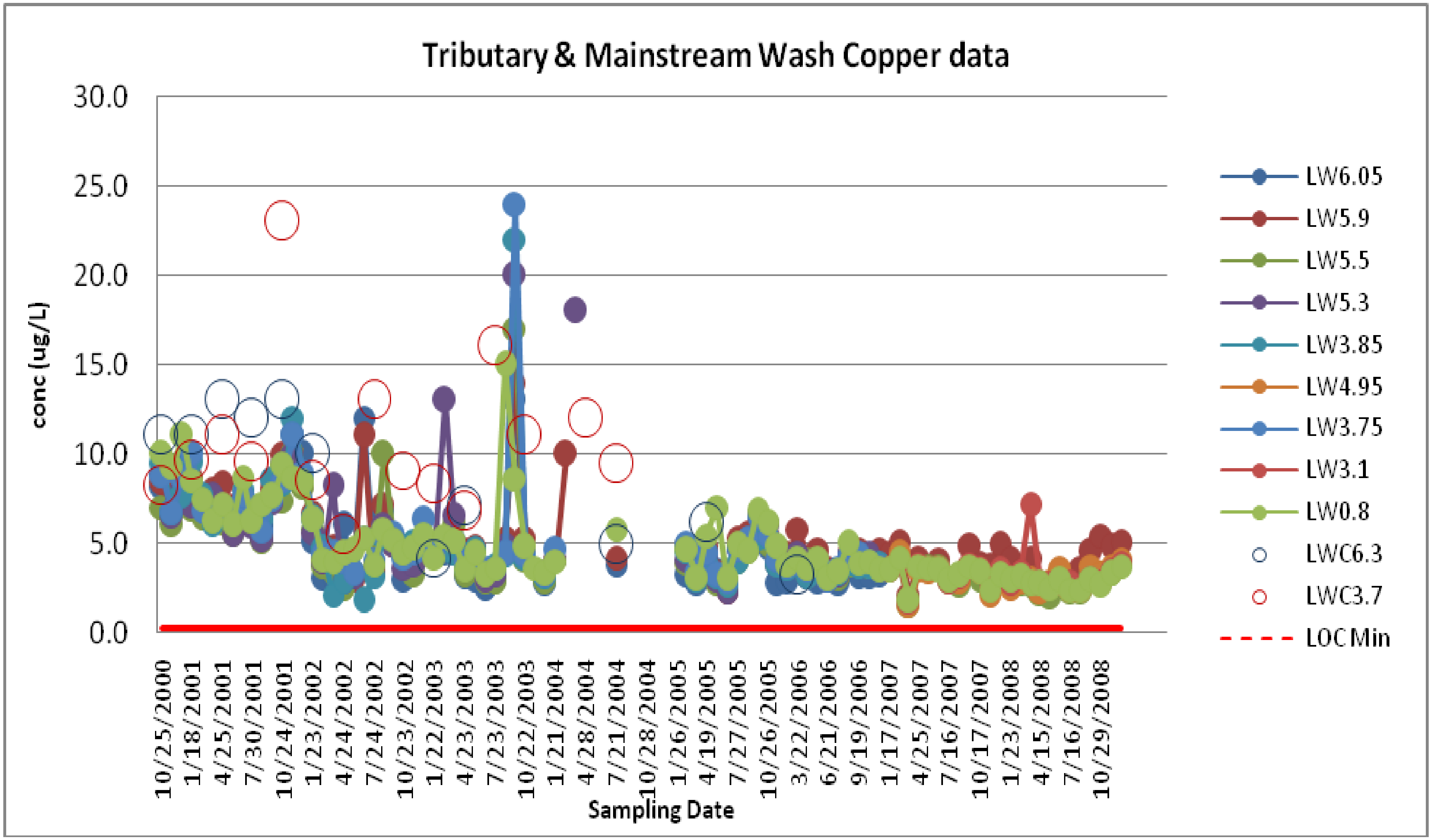
conc., concentration; LOC Min, minimum level of concern

Figure 5. Waterborne Dissolved Aluminum Concentrations at Selected Locations in the Las Vegas Wash



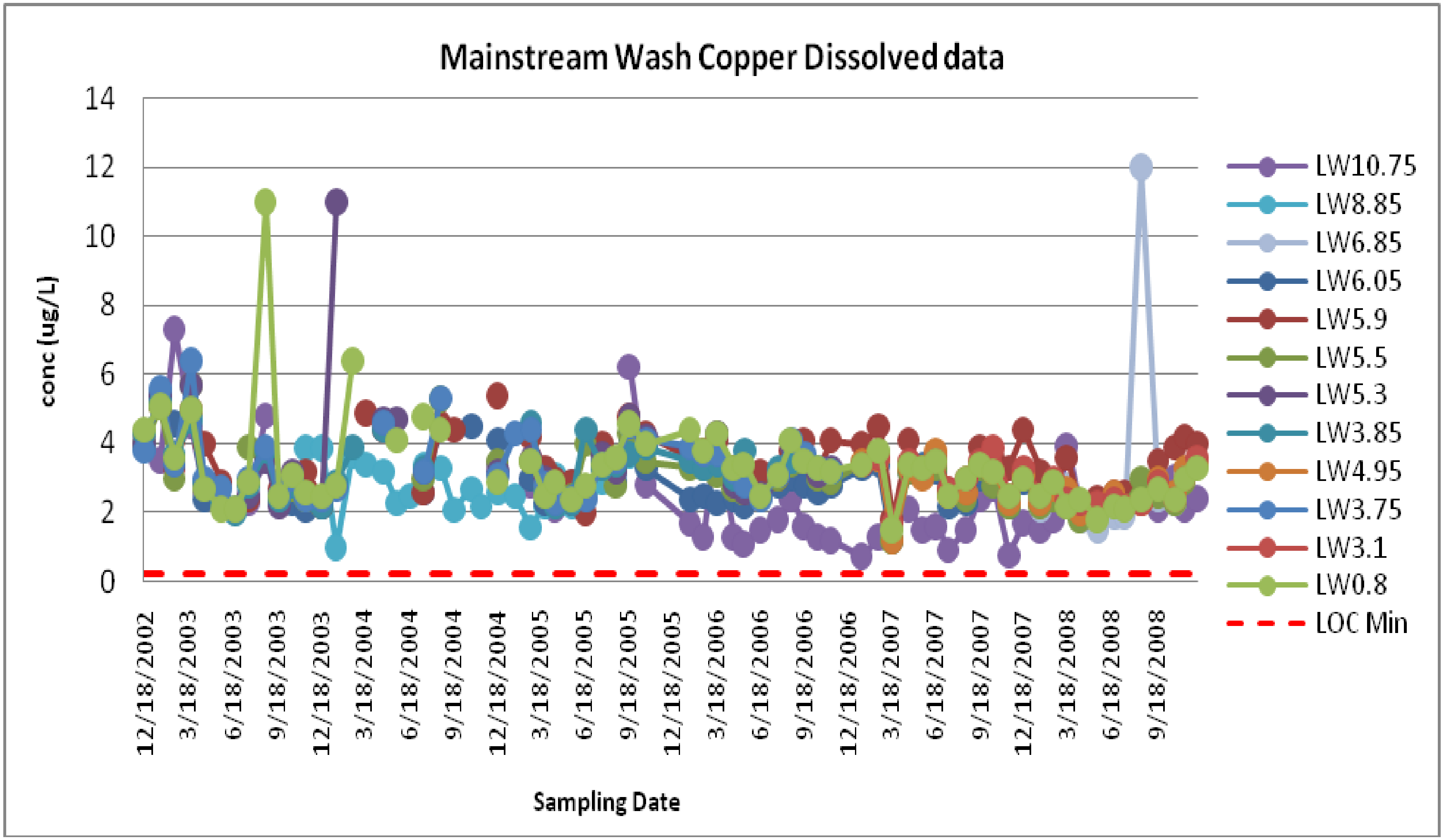
conc., concentration; LOC Min, minimum level of concern

Figure 6. Waterborne Total Copper Concentrations at Selected Locations in the Las Vegas Wash and Its Tributaries and Seeps



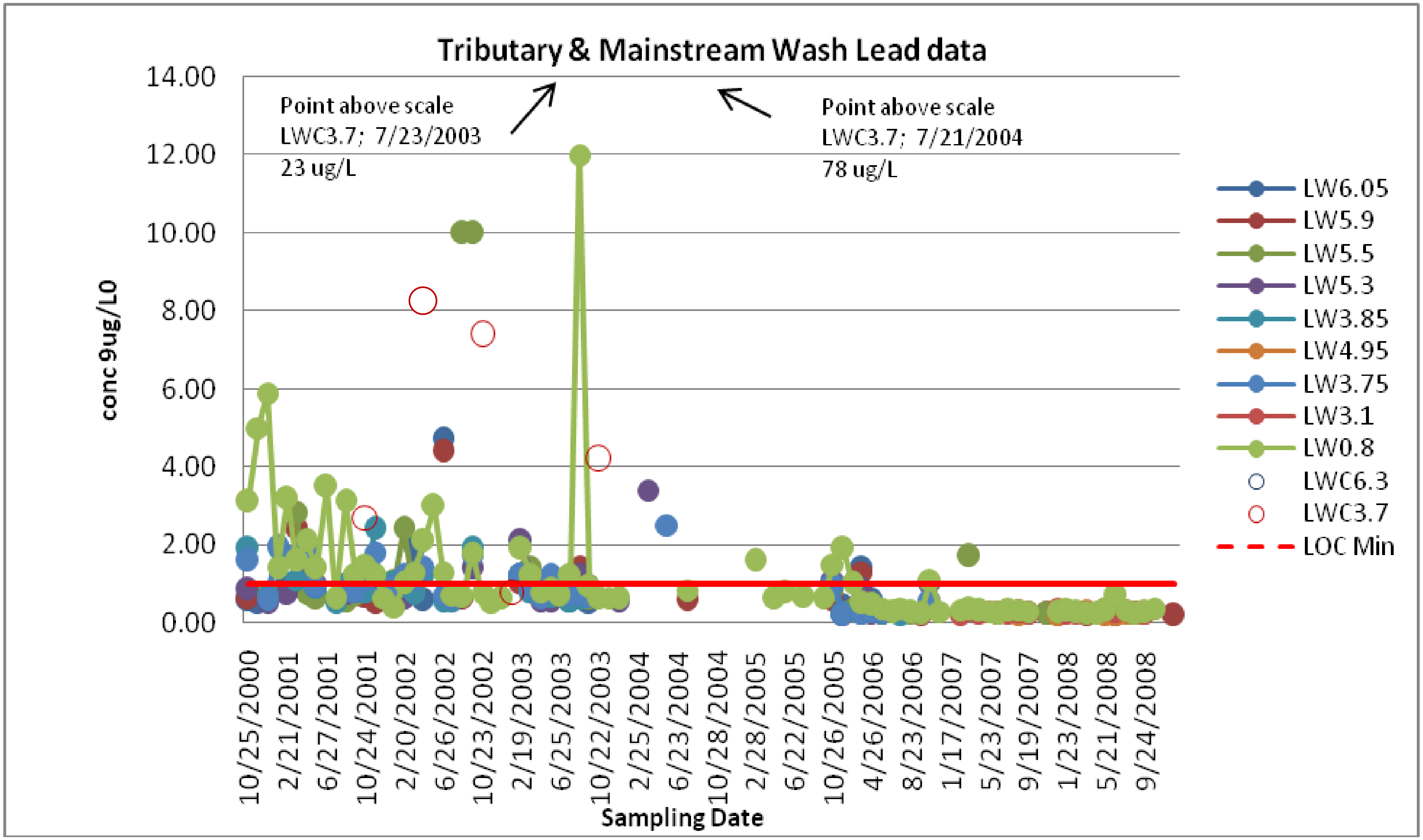
conc., concentration; LOC Min, minimum level of concern

Figure 7. Waterborne Dissolved Copper Concentrations at Selected Locations in the Las Vegas Wash



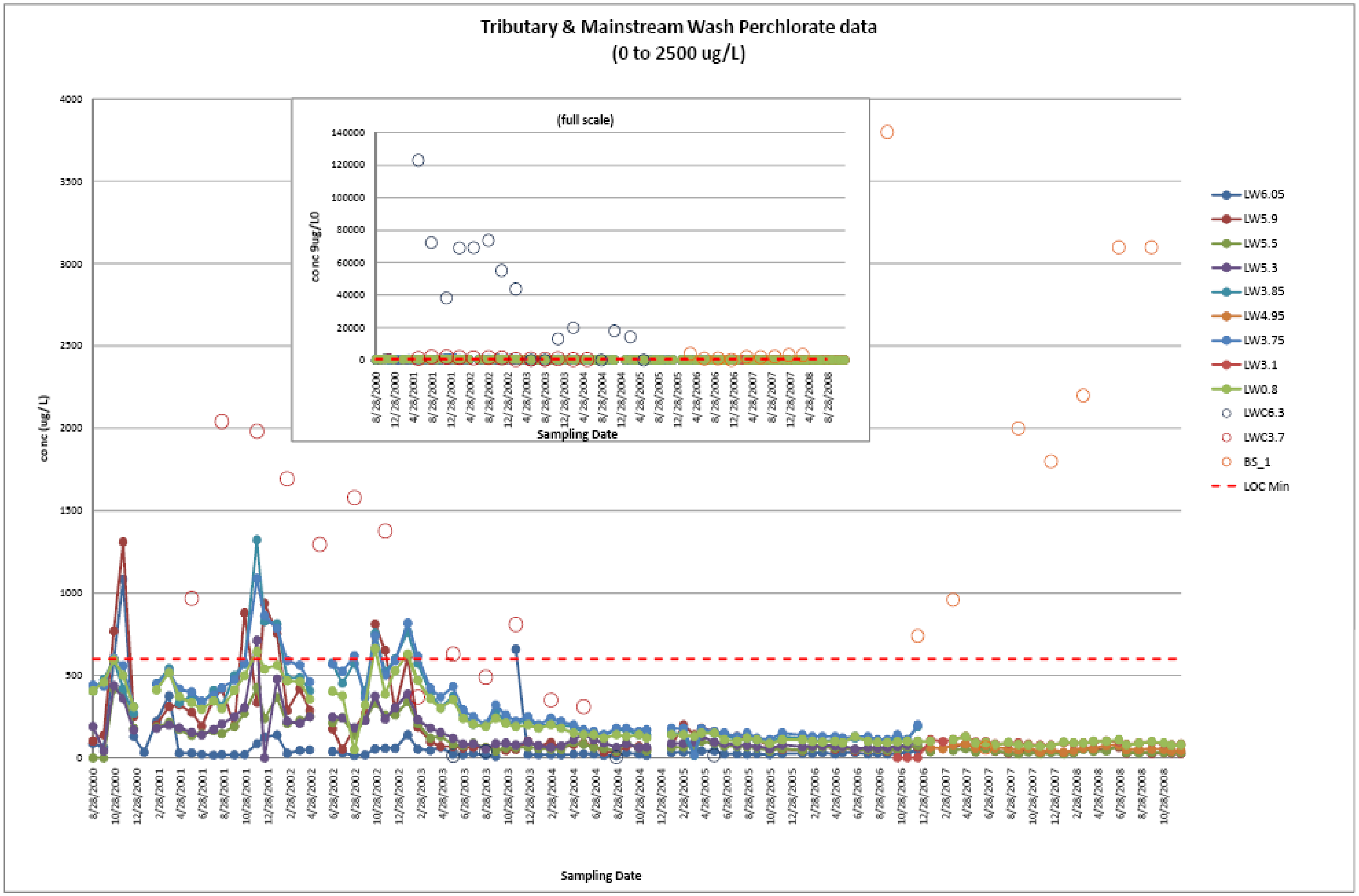
conc., concentration; LOC Min, minimum level of concern

Figure 8. Waterborne Total Lead Concentrations at Selected Locations in the Las Vegas Wash and Its Tributaries and Seeps



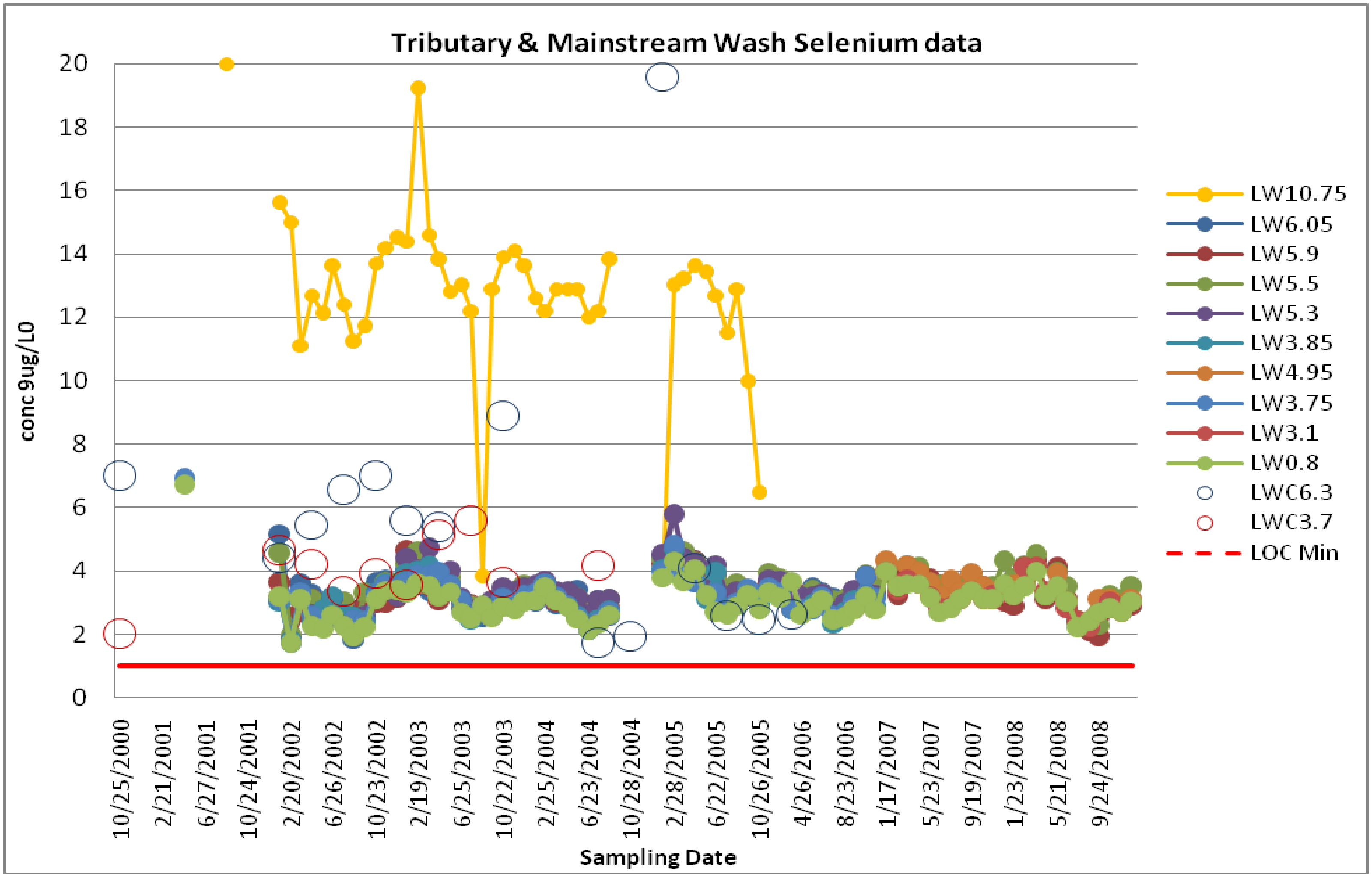
conc., concentration; LOC Min, minimum level of concern

Figure 9. Waterborne Total Perchlorate Concentrations at Selected Locations in the Las Vegas Wash and Its Tributaries and Seeps



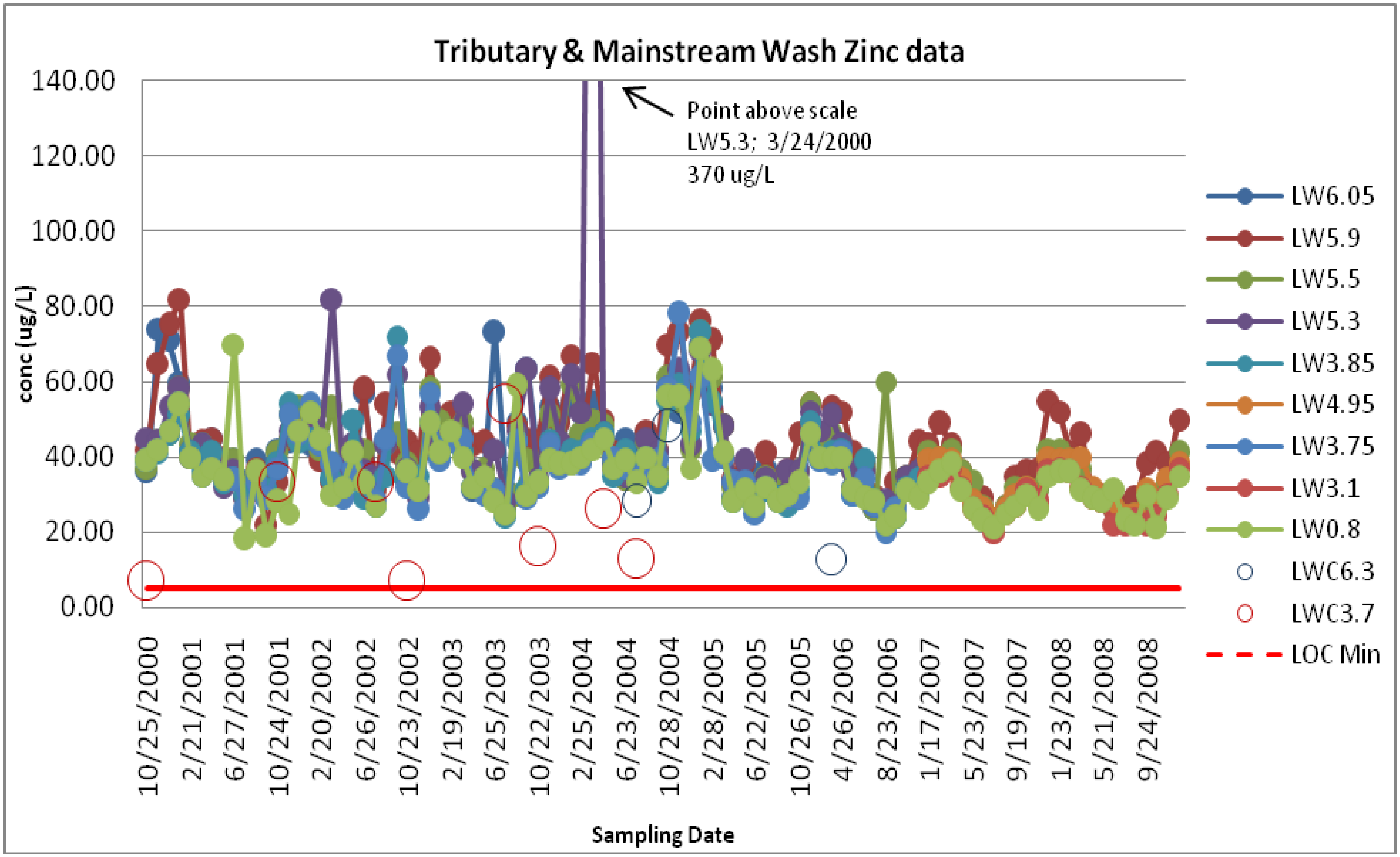
conc., concentration; LOC Min, minimum level of concern

Figure 10. Waterborne Total Selenium Concentrations at Selected Locations in the Las Vegas Wash and Its Tributaries and Seeps



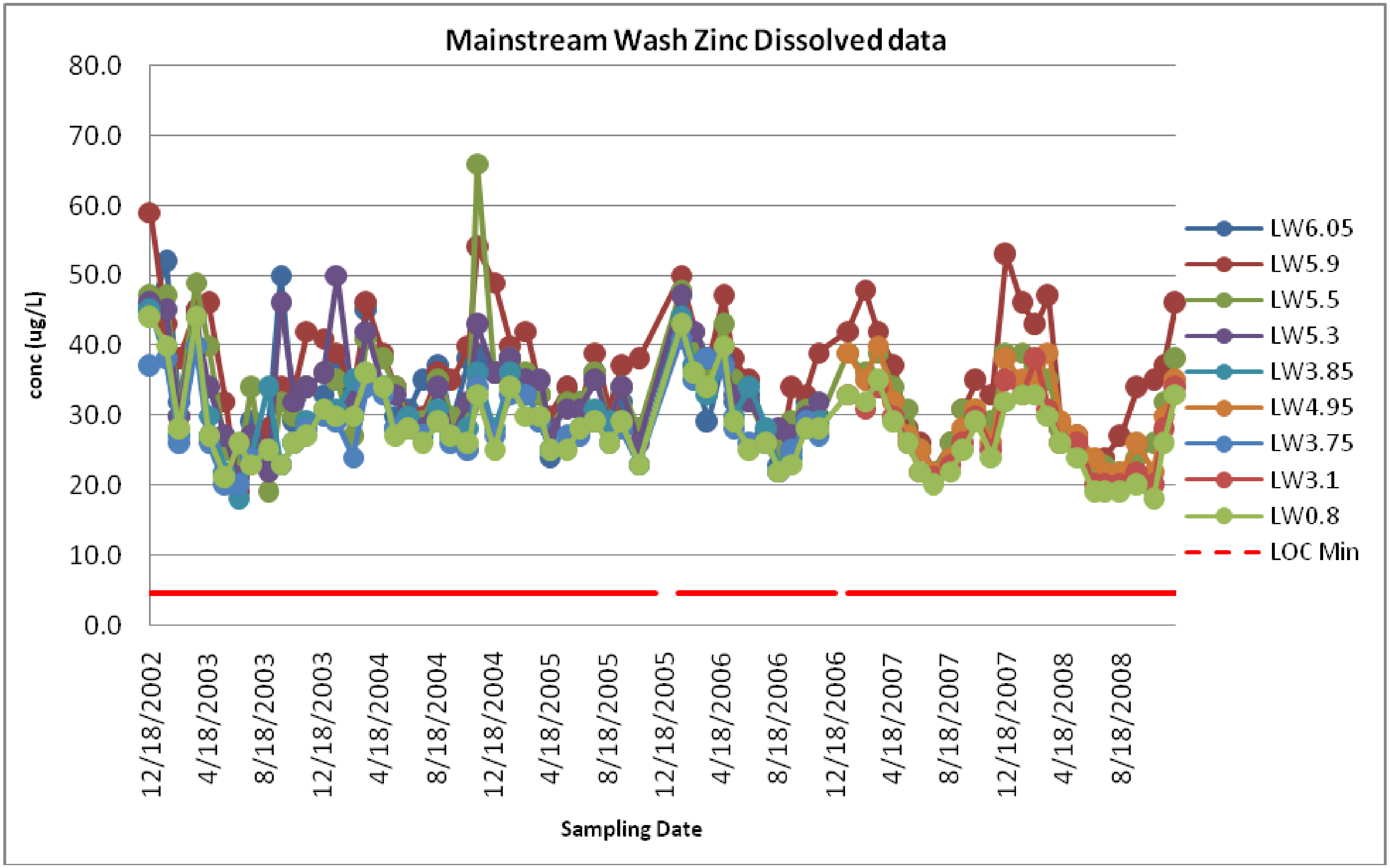
conc., concentration; LOC Min, minimum level of concern

Figure 11. Waterborne Total Zinc Concentrations at Selected Locations in the Las Vegas Wash and Its Tributaries and Seeps



conc., concentration; LOC Min, minimum level of concern

Figure 12. Waterborne Dissolved Zinc Concentrations at Selected Locations in the Las Vegas Wash



conc., concentration; LOC Min, minimum level of concern

Table 1. Contaminants of Potential Concern Specified for the Las Vegas Wash Monitoring and Characterization Study [See Appendix C for Analytes Measured in Specific Media.]

Organics		Inorganics
Aldrin		Aluminum (Al)
Dieldrin		Antimony (Sb)
Endrin		Arsenic (As)
Chlordane [*]	*Chlordane and related chemicals*	Barium (Ba)
alpha-Chlordane		Beryllium (Be)
gamma-Chlordane		Boron (B)
cis-Nonachlor		Cadmium (Cd)
Oxychlordane		Chromium (Cr)
trans-Nonachlor		Copper (Cu)
Heptachlor		Iron (Fe)
Heptachlor epoxide		Lead (Pb)
Chlorpyrifos		Magnesium (Mg)
Total DDT [*]	*DDT and its degradates*	Manganese (Mn)
o,p'-DDT		Mercury (Hg)
o,p'-DDE		Molybdenum (Mo)
o,p'-DDD		Nickel (Ni)
p,p'-DDT		Perchlorate (ClO_4^-)
p,p'-DDE		Selenium (Se)
p,p'-DDD		Strontium (Sr)
DDMU		Titanium (Ti)
Endosulfan I		Vanadium (V)
Endosulfan II		Zinc (Zn)
Endosulfan sulfate		
Hexachlorobenzene (HCB)		
total HCH [*][†]	*Lindane isomers*	
alpha-HCH		
beta-HCH		
delta-HCH		
gamma-HCH		
Mirex		
Pentachloroanisole		
Pentachlorobenzene		
Polychlorinated biphenyls (total PCBs) [*]		
1,2,3,4-Tetrachlorobenzene		
1,2,4,5-Tetrachlorobenzene		
Toxaphene		

DDT, dichlorodiphenyltrichloroethane; DDE, dichlorodiphenyldichloroethene; DDD, dichlorodiphenyldichloroethane; DDMU, di-(p-chlorophenyl)-2-chloroethylene; HCH, hexachlorocyclohexane.

Table 2. Sampling Locations Used During the 2001-2008 Las Vegas Wash Monitoring and Characterization Studies.
[Note: Locations are listed in order from upstream to downstream.]

Location	Description	Distance Along Wash (miles)	Flow Constituents			
			WWTP Effluent	Shallow Groundwater	Stormwater	Urban Runoff
LVC_2	Meadows Detention Basin. A tributary to the Las Vegas Wash was dammed to form Meadows Detention Basin, which is used for flood control. [*]	Tributary	No	Yes	Yes	Yes
LW12.1	Las Vegas Creek at Desert Rose Golf Course just below the golf cart bridge and above the culvert.	12.1	No	Yes	Yes	Yes
FW	Flamingo Wash (FW_0) at Desert Rose Golf Course, just upstream of the confluence with Las Vegas Creek.	Tributary	No	Yes	Yes	Yes
SC	Sloan Channel (SC_1), at East Charleston bridge.	Tributary	No	Yes	Yes	Yes

(Continued)

Table 2. Continued

Location	Description	Distance Along Wash (miles)	Flow Constituents			
			WWTP Effluent	Shallow Ground Water	Stormwater	Urban Runoff
LW10.75	Las Vegas Wash upstream of City of Las Vegas Water Pollution Control Facility and below confluence of Flamingo Wash, Las Vegas Creek historic channel, and Sloan Channel; where Vegas Valley Drive crosses the Wash. Upstream of all municipal WWTPs.	10.75	No [†]	Yes	Yes	Yes
LW8.85	Las Vegas Wash upstream of Duck Creek.	8.85	Yes	Yes	Yes	Yes
MC	Monson Channel upstream of Nature Preserve, including MC_1 and MC_2. Catches surface runoff from east side of Las Vegas.	Tributary	No	Yes	Yes	Yes
NP	Nature Preserve at Clark County Wetlands Park.	Off-channel wetland	Yes [‡]	Yes	Yes	Yes
LW6.85	Las Vegas Wash upstream of Pabco Weir.	6.85	Yes	Yes	Yes	Yes

(Continued)

Table 2. Continued

Location	Description	Distance Along Wash (miles)	Flow Constituents			
			WWTP Effluent	Shallow Groundwater	Stormwater	Urban Runoff
DC/PW	Duck Creek and related tributaries, including locations designated as DC, DC_1 (downstream of Broadbent Boulevard crossing), and Duck Creek-Pittman Wash (downstream of Stephanie Street). Catches surface runoff from south side of Las Vegas.	Tributary	No	Yes	Yes	Yes
WM	Whitney Mesa Channel below Sunset Road. Catches surface runoff from southwest side of Las Vegas, mainly Henderson.	Tributary	No	Yes	Yes	Yes
BSC	Burns Street Channel below Boulder Highway. Catches surface runoff from southeast side of Las Vegas, mainly Henderson and is also influenced by shallow groundwater in the area. [§]	Tributary	No	Yes	Yes	Yes
BVP	Bird Viewing Preserve. Ponds receive treated wastewater from the City of Henderson's Water Reclamation Facility and are used for bird habitat.	Off channel wetland	Yes	Possibly	No	No

(Continued)

Table 2. Continued

Location	Description	Distance Along Wash (miles)	Flow Constituents			
			WWTP Effluent	Shallow Groundwater	Stormwater	Urban Runoff
LWC6.3	Kerr-McGee seep, immediately upstream of the Kerr-McGee Perchlorate Treatment Facility north of the Henderson Ponds.	Tributary (6.3)	No	Yes	No	No
PB	Las Vegas Wash (LW 6.05). Pool upstream of Pabco Road Erosion Control Structure and downstream of all municipal WWTPs.	6.05	Yes	Yes	Yes	Yes
PB/PC	Las Vegas Wash from the pool upstream of Pabco Road Erosion Control Structure (LW6.05) to just upstream of the Powerline Crossing Erosion Control Structure. Downstream of all WWTPs.	$\leq$ 6.05	Yes	Yes	Yes	Yes
LW5.9	Las Vegas Wash downstream of Pabco Road Erosion Control Structure.	5.9	Yes	Yes	Yes	Yes
LW5.5	Las Vegas Wash upstream of Historic Lateral Erosion Control Structure.	5.5	Yes	Yes	Yes	Yes
LW5.3	Las Vegas Wash downstream of historic Lateral Weir.	5.3	Yes	Yes	Yes	Yes

(Continued)

Table 2. Continued

Location	Description	Distance Along Wash (miles)	Flow Constituents			
			WWTP Effluent	Shallow Groundwater	Stormwater	Urban Runoff
LW4.95	Las Vegas Wash upstream of Demonstration Weir.	4.95	Yes	Yes	Yes	Yes
LW3.85	Las Vegas Wash upstream of Demonstration Weir.	3.85	Yes	Yes	Yes	Yes
LW3.75	Las Vegas Wash downstream of Demonstration Weir.	3.75	Yes	Yes	Yes	Yes
LWC3.7	GCS-5 groundwater seeps downstream of crossing with Wiesner Way.	Tributary (3.7)	No	Yes	No	No
LW3.1	Las Vegas Wash downstream of Demonstration Weir.	3.1	Yes	Yes	Yes	Yes
LW0.8	Las Vegas Wash beneath bridge over Northshore Road, downstream of Lake Las Vegas. Represents the end of the Las Vegas Wash.	0.8	Yes	Yes	Yes	Yes

(Continued)

Table 2. Continued

Location	Description	Distance Along Wash (miles)	Flow Constituents			
			WWTP Effluent	Shallow Groundwater	Stormwater	Urban Runoff
LVB	Las Vegas Bay delta (as of April 2005).	0	Yes	Yes	Yes	Yes
PNWR	Pahranagat National Wildlife Refuge. Regional reference site with no urban influence. Potential contaminants arise from agriculture and livestock.	NA	No	No	No	No

NA, not applicable; WWTP, municipal wastewater treatment plant.

[*] Meadows Detention Basin has a normal surface area of 23 acres, and normal storage is 270 acre feet, equal to the storage capacity of the basin. (See http://findlakes.com/meadows_detention_basin_nevada~nv00233.htm).

[†] Due to the close proximity of this location to the water reclamation plant for the City of Las Vegas, bird egg and fish samples collected in the area cannot be presumed to be unaffected by wastewater constituents, but this location is upstream of the discharges of the municipal WWTP.

[‡] According to the SNWA (personal communication, September 30, 2009), to their knowledge the Nature Preserve (NP) did not receive municipal wastewater flows until after April 2004, with the possible exception of flood events during which the Wash might overflow its banks). By March 2005, NP was receiving 50% flow from wastewater and 50% flow from Monson Channel urban runoff and by November 2005 NP was receiving 100% flow from wastewater.

[§] Burns Street Channel is considered separately from Duck Creek and related tributaries because it is relatively spatially separated and is more affected by legacy contaminants associated with BMI.

Table 3. Bird Species Sampled During the 2005-2006 Las Vegas Wash Monitoring and Characterization Study

Common Name	Family Name	Scientific Name	Status	Abundance
American coot	Rails, Gallinules & Coots/ Rallidae	*Fulica americana*	Resident	Abundant
Killdeer	Plovers/ Charadriidae	*Charadrius vociferus*	Resident	Common
Marsh wren	Wrens/ Troglodytidae	*Cistothorus palustris*	Resident	Common
Red-winged blackbird	Blackbirds/ Icteridae	*Agelaius phoeniceus*	Resident	Abundant

Notes:

Information regarding the species of birds was taken from the Red Rock Audubon Society Bird List of the Las Vegas Wash (Titus 2004). Abundant – always found in suitable habitat, Common – usually found in suitable habitat.

Table 4. Summary of Basic Water Quality Parameters for Sampling Locations in the Las Vegas Wash and Its Major Tributaries
[Note: Median Values [*] - Complete Data Set Presented in **Appendix B.]**

Location [†]	Temp ºC	DO mg/L	pH units	Ca mg/L	Mg mg/L	Hardness [‡] mg/L	Sulfate mg/L	TSS mg/L	TDS mg/L	TOC mg/L	Cond. [§] µs/cm
LW10.75	14.74	11.66	8.14	270	210	1560	1700	8.5	2800	3.1	3688
LW8.85	24.55	7.32	7.24	110	57	520	510	5.5	1400	5.6	2044
LW6.85	23.22	8.41	7.87	140	77	670	660	13	1600	5.3	2437
LW5.9	23.44	7.82	7.62	140	69	630	660	5	1700	5.4	2546
LW5.5	23.80	8.02	7.84	150	74	670	670	7	1700	5.4	2467
LW4.95	23.27	7.67	7.92	150	76	670	670	8	1700	5.3	2524
LW3.1	23.08	8.65	8.17	140	72	650	650	8	1800	5.1	2505
LW0.8	22.72	8.29	8.26	150	72	670	660	8	1800	5.0	2535
LVC_2	9.90	11.81	8.24	140	120	840	740	NA	1650	4.7	2347.5
LW12.1	16.08	11.57	8.21	235	295	1800	1800	NA	3300	4.5	3934
FW_1	14.91	10.94	8.21	310	190	1560	1550	NA	2850	3.7	3439.5
SC_1	13.07	12.84	8.54	145	210	1230	1150	NA	2350	2.6	3063
MC_1	17.27	18.37	8.24	400	310	2280	2500	NA	4350	2.7	4801
DC_1	21.41	10.47	7.84	450	270	2240	2500	NA	5050	2.3	5828
LWC6.3	NS	NS	NS	NS	NS	NA	NS	NA	NS	NS	NS
LWC3.7	NS	NS	NS	NS	NS	NA	NS	NA	NS	NS	NS
BS_1	22.47	10.35	8.28	410	190	1810	1900	NA	4000	1.6	5062

Cond., conductivity; DO, dissolved oxygen; NA, not available; NS, not sampled; Temp., temperature; TSS, total suspended solids; TDS, total dissolved solids; TOC, organic carbon.

[*] ACT I identified median concentrations using only detected values, i.e., non-detects were ignored.

[†] Sampling locations are described in Table 2

[‡] Hardness was determined by calculation as described by APHA (1995), using the following equation:

Hardness (mg/L equivalent as $CaCO_3$) = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L].

Hardness estimates were based on averages of monthly (or quarterly) concentrations of calcium and magnesium.

[§] Specific electrical conductivity.

Table 5. Detection Limits for Organic Chemical Analyses in Various Sample Media Types (2007-2008) (Units: ppb - ng/g, µg/kg, or µg/L)

Chemical	Media Analyzed [1]	Water DL: Tributaries	Water RL: Tributaries	Sediment RL (dw) [2]	Fish DL (dw) [3]	Fish DL (ww) [4]	Bird Egg DL (dw) [3]	Bird Egg DL (ww) [4]
Aldrin	w, s, f, b	0.0037	0.01	2.36 - 2.41	0.46	0.11	1.38	0.37
Dieldrin	w, s, f, b	0.0044	0.01	2.36 - 2.41	1.70	0.41	2.60	0.70
Endrin	w, s, f, b	0.005	0.01	2.36 - 2.41	2.06	0.49	2.46	0.66
DDTs, total	f, b	NA	NA	NA	3.41	0.82	9.26	2.50
o,p'-DDT	f, b	NA	NA	NA	0.43	0.10	1.32	0.36
o,p'-DDE	f, b	NA	NA	NA	0.88	0.21	1.84	0.50
o,p'-DDD	f, b	NA	NA	NA	0.62	0.15	1.59	0.43
p,p'-DDT	s, f, b	0.0046	0.01	2.36 - 2.41	0.65	0.16	1.48	0.40
p,p'-DDE	s, f, b	0.0048 – 0.12 [7]	0.01 – 0.2 [7]	2.36 - 2.41	0.41	0.10	1.26	0.34
p,p'-DDD	w, s, f, b	0.0056	0.01	2.36 - 2.41	0.87	0.21	1.85	0.50
DDMU	f, b	NA	NA	NA	NA	NA	NA	NA
HCH, total	w, f, b	NA [6]	NA [6]	[5]	3.60	0.86	6.16	1.66
HCH, alpha-	w,s, f, b	0.0053	0.01	2.36 - 2.41	1.26	0.30	1.13	0.31
HCH, beta-	w, s, f, b	0.0053	0.01	4.57 - 4.65	1.16	0.28	2.20	0.59
HCH, delta-	w, s, f, b	0.0046	0.01	2.36 - 2.41	1.28	0.31	2.34	0.63
HCH, gamma-	w, s, f, b	0.005	0.01	2.36 - 2.41	0.62	0.15	1.72	0.46
Chlordane, total	s, f, b	0.045	0.1	92.4 - 94.1	4.02	0.96	10.57	2.85
Chlordane, alpha-	s, f, b	0.1	0.1	2.36 - 2.41	0.44	0.11	1.42	0.38
Chlordane, gamma-	s, f, b	0.1	0.1	2.36 - 2.41	0.51	0.12	1.41	0.38

(Continued)

Table 5. Continued

Chemical	Media Analyzed [1]	Water DL: Tributaries	Water RL: Tributaries	Sediment RL (dw) [2]	Fish DL (dw) [3]	Fish DL (ww) [4]	Bird Egg DL (dw) [3]	Bird Egg DL (ww) [4]
Oxychlordane	f, b	NA	NA	NA	0.66	0.16	1.83	0.49
Nonachlor, cis-	f, b	NA	NA	NA	0.61	0.15	1.48	0.40
Nonachlor, trans-	f, b	NA	NA	NA	0.49	0.12	1.67	0.45
Heptachlor	s, f, b	0.0052	0.01	2.36 - 2.41	0.38	0.091	1.68	0.45
Heptachlor epoxide	s, f, b	0.0058	0.01	2.36 - 2.41	1.35	0.32	1.67	0.45
Hexachlorobenzene	s, f, b	0.002 – 0.15 [7]	0.01 – 5 [7]	463 – 473	0.97	0.23	1.32	0.36
Mirex	f, b	NA	NA	NA	1.89	0.45	2.34	0.63
Aroclor 1016	s	0.097	0.1	45.8 - 46.8	NA	NA	NA	NA
Aroclor 1221	s	0.084	0.1	45.8 - 46.8	NA	NA	NA	NA
Aroclor 1232	s	0.064	0.1	45.8 - 46.8	NA	NA	NA	NA
Aroclor 1242	s	0.07	0.1	45.8 - 46.8	NA	NA	NA	NA
Aroclor 1248	s	0.049	0.1	45.8 - 46.8	NA	NA	NA	NA
Aroclor 1254	s	0.068	0.1	45.8 - 46.8	NA	NA	NA	NA
Aroclor 1260	s	0.069	0.1	45.8 - 46.8	NA	NA	NA	NA
PCBs, total	f, b	0.049	0.5	NA	14.34	3.44	53.01	14.31
Chlorpyrifos	f, b	0.041	0.1	NA	0.44	0.11	1.45	0.39
Endosulfan I	s, f, b	0.0047	0.01	2.36 - 2.41	1.72	0.41	2.24	0.60
Endosulfan II	s, f, b	0.0047	0.01	2.36 - 2.41	0.47	0.11	1.20	0.32
Endosulfan sulfate	s, f, b	0.0046	0.01	2.36 - 2.41	1.80	0.43	2.29	0.62

(Continued)

Table 5. Continued

Chemical	Media Analyzed [1]	Water DL: Tributaries	Water RL: Tributaries	Sediment RL (dw) [2]	Fish DL (dw) [3]	Fish DL (ww) [4]	Bird Egg DL (dw) [3]	Bird Egg DL (ww) [4]
Pentachloroanisole	f, b	NA	NA	NA	1.18	0.28	1.63	0.44
Pentachlorobenzene	f, b	NA	NA	NA	0.48	0.12	1.24	0.33
1,2,3,4-Tetrachlorobenzene	f, b	NA	NA	NA	0.46	0.11	1.80	0.49
1,2,4,5-Tetrachlorobenzene	f, b	NA	NA	NA	0.49	0.12	1.72	0.46
Toxaphene	s, f, b	0.031	1	92.4 - 94.1	44.64	10.71	113.64	30.68

dw, dry weight; DL, detection limit; NA, not available; RL, reporting limit; ww, wet weight.

[1] w, water (tributaries only – organic COPCs were not assessed in the mainstream Wash for this report); s, sediment; f, fish; b, bird egg

[2] Estimated sediment reporting limits (RLs) on a dry weight basis were calculated using average moisture content for all sediment samples.

[3] Dry weight method detection limits (MDLs) for bird egg and fish tissues were based on a 0.44 g and 1.12 g sample, respectively.

[4] Wet weight MDLs for bird egg and fish tissues were based on average moisture content.

[5] Total HCH was not analyzed in sediment but was estimated as the sum of the HCH alpha-, beta-, gamma- and delta- isomers. These four isomers make up 99% of technical HCH (lindane), so their sum approximates the concentration of technical HCH. Technical-grade HCH is a mixture of isomers containing 64% α-, 10% ß-, 13% γ-, 9% δ-, and 1% ε-hexachlorocyclohexanes. See National Toxicology Program (2005).

[6] Lindane (presumed to be total HCH) was reported as a separate analyte along with gamma-BHC (lindane) in the original laboratory report, but no RL is provided for the mixture.

[7] Detection limit ranges reflect those attained using various available EPA analytical methods.

References:

National Toxicology Program. (**2005**). Lindane (CAS No. 58-89-9) and Other Hexachlorocyclohexane Isomers. In: *Report on Carcinogens, Eleventh Edition*. Research Triangle Park, NC: United States Department of Health and Human Services, Public Health Service, National Toxicology Program. ntp.niehs.nih.gov/ntp/roc/eleventh/profiles/s102lind.pdf

Table 6. Concentrations of Organic Contaminants of Potential Concern in Individual Water Samples Collected from Major Tributaries to the Las Vegas Wash (Units: µg/L)

Location	Sample Date	Aldrin	Dieldrin	Endrin	HCH, alpha-	HCH, beta-	HCH, delta-	HCH, gamma-	Lindane [*]	p,p'-DDD
Minimum LOC		3	0.0019	0.0023	NA	NA	NA	0.08	NA	0.001
LVC_2 (Meadows Detention Basin)	1/23/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1/22/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/23/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
LW12.1 (Las Vegas Creek)	1/23/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1/22/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/23/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW_1 (Flamingo Wash)	1/23/2007	ND	ND	ND	ND	ND	ND	**0.24**	ND	ND
	4/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1/22/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/23/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND

(Continued)

Table 6. Continued

Location	Sample Date	Aldrin	Dieldrin	Endrin	HCH, alpha-	HCH, beta-	HCH, delta-	HCH, gamma-	Lindane [*]	p,p'-DDD
SC_1 (Sloan Channel)	1/23/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1/22/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/23/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
MC_1 (Monson Channel)	1/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1/22/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/23/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
DC_1 (Duck Creek)	1/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1/22/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/23/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND

(Continued)

Table 6. Continued

Location	Sample Date	Aldrin	Dieldrin	Endrin	HCH, alpha-	HCH, beta-	HCH, delta-	HCH, gamma-	Lindane [*]	p,p'-DDD
LWC6.3 (Kerr-McGee Seep)	1/23/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
LWC3.7 (GCS5 Seep)	1/23/2007	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/18/2007	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/18/2007	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/24/2007	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1/22/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA
BS_1 (Burns Street)	1/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7/18/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/24/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1/22/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4/23/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND

LOC, level of concern; NA, not available; ND, not detected.

[*] Lindane indicates a technical mixture analyzed by the laboratory and in this report is considered to approximate total HCH.

Notes:

Each data point represents an individual sample. Values in bold and within a shaded cell exceeded a level of concern (LOC) for this contaminant of potential concern (COPC) in water.

Table 7. Detection Limits for Inorganic Chemical Analyses in Various Sample Media Types

Chemical	Sediment RL (mg/kg) (dw) [*]	Fish MRL (mg/kg, dw) [†]	Fish MRL (mg/kg, ww) [‡]	Bird Egg DL (mg/kg, dw) [†]	Bird Egg DL (mg/kg, ww) [‡]	Water DL: Mainstream Wash (Total) (µg/L)	Water DL: Mainstream Wash (Dissolved) (µg/L)	Water DL: Tributary (Total) (µg/L)
Aluminum	71	2	0.4-0.7	2	0.4-0.7	0.19-5	0.56-5	0.19-5
Antimony	14	NA	NA	NA	NA	0.008-0.5	0.034-0.5	NA
Arsenic	7.1	0.2	0.04-0.1	0.2	0.04-0.1	0.014-0.4	0.066-0.4	0.014-0.4
Barium	1.4	0.2	0.04-0.07	0.2	0.04-0.07	0.024-0.5	0.042-0.5	0.024-0.5
Beryllium	0.57	0.1	0.02-0.03	0.1	0.02-0.03	0.022-0.1	0.035-0.1	NA
Boron	71	2	0.4-0.7	2	0.4-0.7	NA	NA	NA
Cadmium	0.71	0.1	0.02-0.03	0.1	0.02-0.03	0.013-0.1	0.019-0.1	NA
Chromium	1.4	0.5	0.1-0.2	0.5	0.1-0.2	0.012-0.2	0.016-0.2	0.012-0.2
Copper	2.9	0.3	0.06-0.1	0.3	0.06-0.1	0.022-0.5	0.085-0.5	0.022-0.5
Iron	85	2	0.4-0.7	2	0.4-0.7	0.68-20	0.68-20	0.68-20
Lead	7.1	0.2	0.04-0.07	0.2	0.04-0.07	0.017-0.2	0.018-0.2	0.017-0.2
Magnesium	71	2	0.4-0.7	2	0.4-0.7	1,000 (RL)	1,000 (RL)	1,000 (RL)
Manganese	2.9	0.5	0.1-0.2	0.5	0.1-0.2	0.015-0.2	0.015-0.2	0.015-0.2
Mercury	0.028	0.1	0.02-0.03	0.1	0.02-0.03	0.025-0.1	0.025-0.1	NA
Molybdenum	7.1	2	0.4-0.7	2	0.4-0.7	5	NA	NA
Nickel	7.1	0.5	0.1-0.2	0.5	0.1-0.2	0.011-0.8	0.014-0.8	0.011-0.8
Perchlorate	NA	NA	NA	NA	NA	0.2-2 [§]	0.2-2 [§]	0.2-2 [§]
Selenium	0.71	0.2-0.4	0.04-0.1	0.2-1	0.05-0.2	0.017-0.4	0.14-0.4	0.017-0.4
Strontium	14	0.2	0.04-0.07	0.2	0.04-0.07	NA	NA	NA
Titanium	7.1	NA	NA	NA	NA	NA	NA	NA
Vanadium	7.1	0.5	0.1-0.2	0.5	0.1-0.2	5	NA	NA
Zinc	7.1	NA	NA	0.5	0.1-0.2	0.3-5	0.35-5	0.3-5

DL, detection limit; dw, dry weight; MRL, method reporting limit; RL, reporting limit; ww, wet weight

[*] Estimated sediment detection limit on a dry weight basis was calculated using average moisture content for all sediment samples.

[†] Dry weight detection limits (DLs) for bird egg and fish tissue were based on a 0.44 g and 1.12 g sample, respectively.

[‡] Wet weight DLs for bird egg and fish tissue were based on average moisture content.

[§] SNWA began using ion chromatrography coupled with mass spectrometry (IC/MS) to analyze and report perchlorate in January 2005. The reporting limit declined from 4 ppb (4 μg/L) to 0.2 ppb when the laboratory switched from conductivity detection to mass spectrometric detection. The current reporting limit for perchlorate by EPA Method 332 (IC/MS) is 0.1 ppb. Water samples collected from the tributaries may have higher reporting limits if dilution is required to achieve a result within the calibrated range (0.1 to 10 ppb). For example if a 1/1,000 dilution is required, the reporting limit becomes 0.1 ppm (0.1 mg/L) or 100 ppb (100 μg/L) .

Table 8. Concentrations of Inorganic Contaminants of Potential Concern (Total Concentration) in Water Samples Collected From the Mainstream Las Vegas Wash and Its Major Tributaries (See Appendix B for magnesium data)

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
LW10.75	3/21/2007	6	ND	5.7	35	ND	ND	1.1	**0.55**	ND	ND	1.3	ND	NA	1.2	**15**	NA	**9.5**	11
	4/25/2007	8.7	0.57	5.7	41	ND	ND	1.1	**2.2**	ND	ND	7.8	ND	NA	1.5	**14**	NA	**5**	11
	5/23/2007	14	0.53	10	ND	ND	ND	1	**1.6**	ND	ND	6.9	ND	NA	1.1	**13**	NA	ND	9.8
	6/20/2007	26	ND	5.5	47	ND	ND	0.88	**2.9**	30	ND	14	ND	NA	1.5	**14**	NA	ND	9.2
	7/16/2007	51	ND	16	39	ND	ND	1.8	**1.3**	58	ND	7.9	ND	**25**	ND	**13**	**16**	ND	8.7
	8/22/2007	**120**	0.6	5.8	56	ND	ND	0.91	**1.9**	100	0.34	13	ND	**20**	1.5	**15**	7.2	**6.2**	9.9
	9/19/2007	29	ND	8	48	ND	ND	1.1	**2.8**	23	ND	6.3	ND	**25**	1.5	**16**	8.4	**5.5**	10
	10/17/2007	21	ND	5.7	49	ND	ND	1.2	**3.3**	67	ND	3.7	ND	**22**	1.4	**16**	6.1	**6.9**	10
	11/19/2007	5.2	ND	13	23	ND	ND	2	**0.75**	ND	ND	16	ND	**31**	2.7	ND	**23**	ND	9.5
	12/19/2007	31	ND	5.5	41	ND	ND	1.9	**2.3**	31	ND	9	ND	**22**	6.1	**14**	6.3	**7.9**	11
	1/23/2008	22	ND	5.2	36	ND	ND	1.4	**2.2**	ND	ND	9.7	ND	**19**	3.9	**13**	6	**5.8**	12
	2/20/2008	13	ND	4.6	46	ND	ND	1.3	**2.1**	ND	ND	3.7	ND	**15**	4.8	**14**	5.6	ND	9.9
	3/18/2008	14	0.68	5	46	ND	ND	0.92	**4.9**	ND	0.23	15	ND	**18**	4.8	**12**	6.4	**12**	9.6
	Median	*21*	*0.59*	*5.7*	*43.5*			*1.1*	*2.2*	*45*	*0.29*	*7.9*		*22*	*1.5*	*14*	*6.4*	*6.6*	*10*
	Maximum	*120*	*0.68*	*16*	*56*			*2*	*4.9*	*100*	*0.34*	*16*		*31*	*6.1*	*16*	*23*	*12*	*12*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
LW8.85	3/21/2007	**120**	0.57	2.3	65	ND	ND	0.43	**0.93**	70	ND	20	ND	NA	2.4	**2.9**	NA	**41**	ND
	4/25/2007	**120**	0.71	2.5	62	ND	ND	0.57	**3.7**	85	ND	22	ND	NA	2.4	**2.8**	NA	**40**	2.2
	5/23/2007	**140**	0.61	2.8	62	ND	ND	0.38	**3.4**	120	ND	24	ND	NA	2.3	**2.7**	NA	**35**	1.6
	6/20/2007	83	0.56	2.6	56	ND	ND	0.54	**4.1**	74	ND	23	ND	NA	2.2	**2.7**	NA	**32**	1.5
	7/16/2007	**100**	0.64	2.7	62	ND	ND	0.48	**2.6**	60	ND	23	ND	12	2.2	**2.9**	ND	**29**	1.7
	8/22/2007	**120**	ND	2.5	53	ND	ND	0.28	**2.4**	59	ND	13	ND	13	1.8	**2.6**	ND	**30**	1.6
	9/19/2007	**150**	0.6	2.4	60	ND	ND	0.23	**3.3**	83	ND	15	ND	13	2.2	**2.6**	ND	**39**	1.3
	10/17/2007	**120**	0.59	3	58	ND	ND	0.22	**3.7**	68	ND	15	ND	12	2.3	**2.9**	ND	**37**	1.4
	11/19/2007	**150**	0.58	1.8	50	ND	ND	0.46	**1.9**	63	ND	16	ND	10	3	**2.7**	ND	**31**	1.4
	12/19/2007	**180**	0.57	2.6	55	ND	ND	0.49	**3**	76	ND	35	ND	14	3.9	**3.6**	ND	**45**	2.5
	1/23/2008	**200**	0.59	1.9	60	ND	ND	0.43	**2.4**	70	ND	21	ND	10	3.5	**2.8**	ND	**45**	2.7
	2/20/2008	18	0.58	1.7	56	ND	ND	0.31	**3.2**	80	ND	24	ND	8.9	4	**3**	ND	**42**	2.3
	3/18/2008	**150**	0.61	2.2	49	ND	ND	0.3	**2.8**	68	ND	19	ND	14	3.5	**2.9**	ND	**41**	2.5
	Median	*120*	*0.59*	*2.5*	*58*			*0.43*	*3*	*70*		*21*		*12*	*2.4*	*2.8*		*39*	*1.7*
	Maximum	*200*	*0.71*	*3*	*65*			*0.57*	*4.1*	*120*		*35*		*14*	*4*	*3.6*		*45*	*2.7*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
LW6.85	3/21/2007	**150**	0.59	6.5	61	ND	ND	0.44	**1.1**	91	ND	39	ND	NA	2.8	**4.1**	NA	**40**	4.5
	4/25/2007	**130**	0.67	7.2	58	ND	ND	0.65	**3.4**	87	ND	37	ND	NA	2.9	**3.9**	NA	**36**	5.2
	5/23/2007	**110**	0.58	7.5	57	ND	ND	0.38	**3.3**	85	ND	37	ND	NA	2.9	**3.7**	NA	**35**	4.2
	6/20/2007	**100**	0.57	6.2	54	ND	ND	0.47	**3.4**	92	ND	33	ND	NA	2.5	**3.3**	NA	**28**	3
	7/16/2007	**100**	0.57	6.5	57	ND	ND	0.47	**2.4**	64	ND	30	ND	15	2.6	**3.6**	ND	**25**	3.4
	8/22/2007	**140**	ND	5.7	52	ND	ND	0.35	**2.4**	95	ND	29	**0.16**	15	2.2	**3.3**	ND	**27**	3
	9/19/2007	**200**	0.57	6.6	59	ND	ND	0.44	**3.4**	150	0.21	33	ND	16	2.7	**3.9**	ND	**36**	3.5
	10/17/2007	**110**	0.56	6.6	56	ND	ND	0.26	**2.8**	79	ND	28	ND	14	2.6	**3.7**	ND	**32**	3.7
	11/19/2007	**260**	0.53	4.1	50	ND	ND	0.79	**2.1**	180	0.39	33	ND	13	3.7	**3.1**	ND	**30**	3
	12/19/2007	**320**	0.53	7.3	54	ND	ND	0.96	**3.6**	260	0.53	39	ND	16	5.1	**4.2**	ND	**41**	4.1
	1/23/2008	**180**	0.52	5.3	59	ND	ND	0.58	**2.1**	78	ND	31	ND	13	4	**3.7**	ND	**38**	4.7
	2/20/2008	**200**	0.58	5	54	ND	ND	0.37	**2.3**	98	ND	31	ND	11	4	**3.8**	ND	**37**	3.9
	3/18/2008	**140**	0.56	7.1	46	ND	ND	0.28	**2.2**	77	ND	30	ND	15	5	**4**	ND	**38**	6.5
	Median	*140*	*0.57*	*6.5*	*56*			*0.44*	*2.4*	*91*	*0.39*	*33*	*0.16*	*15*	*2.9*	*3.7*		*36*	*3.9*
	Maximum	*320*	*0.67*	*7.5*	*61*			*0.96*	*3.6*	*260*	*0.53*	*39*	*0.16*	*16*	*5.1*	*4.2*		*41*	*6.5*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
	3/21/2007	**150**	0.56	7.5	66	ND	ND	0.76	**2.1**	99	ND	63	ND	NA	3.6	**3.9**	NA	**43**	4.5
	4/25/2007	**120**	0.66	8.6	61	ND	ND	1	**4.2**	82	ND	55	ND	NA	4.1	**4**	NA	**36**	5.2
	5/23/2007	**95**	0.53	8.4	58	ND	ND	1	**3.6**	180	ND	76	ND	NA	4.7	**3.7**	NA	**27**	4.2
	6/20/2007	**110**	0.53	7.9	59	ND	ND	0.74	**4.1**	120	ND	59	ND	NA	3.8	**3.6**	NA	**29**	3
	7/16/2007	**120**	0.55	7.9	57	ND	ND	0.55	**2.9**	130	ND	55	ND	**20**	4.1	**3.6**	6.5	**23**	3.4
	8/22/2007	**120**	ND	6.6	57	ND	ND	0.43	**2.8**	100	0.22	54	**0.16**	17	3	**3.5**	ND	**27**	3
LW5.9	9/19/2007	**160**	0.57	6.8	71	ND	ND	0.68	**4.8**	170	0.22	59	ND	**21**	3.8	**3.6**	6.1	**35**	3.5
	10/17/2007	**140**	0.56	7.7	71	ND	ND	0.54	**3.9**	64	ND	58	ND	**25**	4.7	**3.5**	5.7	**36**	3.7
	11/19/2007	**260**	0.57	4.1	67	ND	ND	0.65	**3.8**	90	0.24	36	ND	16	3.9	**3.1**	ND	**37**	3
	12/19/2007	**320**	0.57	6.6	71	ND	ND	1.7	**4.9**	78	0.24	53	ND	**30**	6	**3**	5	**55**	4.1
	1/23/2008	**470**	0.6	3.8	83	ND	ND	0.74	**4.2**	75	0.27	25	ND	17	3.8	**2.9**	ND	**52**	27
	2/20/2008	**260**	0.56	4.8	71	ND	ND	0.77	**3.4**	130	ND	48	ND	11	4.6	**3.6**	ND	**41**	32
	3/18/2008	**210**	0.56	7.5	69	ND	ND	1.4	**4.2**	92	0.2	62	ND	**22**	6.4	**4.3**	ND	**46**	62
	Median	*150*	*0.56*	*7.5*	*67*			*0.7*	*3.9*	*99*	*0.23*	*55*	*0.16*	*20*	*4.1*	*3.6*	*5.9*	*36*	*4.1*
	Maximum	*470*	*0.66*	*8.6*	*83*			*1.7*	*4.9*	*180*	*0.27*	*76*	*0.16*	*30*	*6.4*	*4.3*	*6.5*	*55*	*62*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
LW5.5	3/21/2007	**160**	0.57	7.4	62	ND	ND	0.56	**1.5**	100	**1.7**	54	ND	NA	3.4	**4.2**	NA	**42**	45
	4/25/2007	**140**	0.68	8.7	61	ND	ND	0.69	**3.7**	93	ND	52	ND	NA	3.7	**4.1**	NA	**36**	57
	5/23/2007	**120**	0.58	7.5	62	ND	ND	0.64	**3.7**	110	ND	55	ND	NA	3.5	**3.4**	NA	**33**	35
	6/20/2007	**94**	0.54	8	58	ND	ND	0.62	**3.7**	96	ND	51	ND	NA	3.6	**3.6**	NA	**27**	56
	7/16/2007	**110**	0.55	7.7	56	ND	ND	0.58	**2.8**	92	ND	49	ND	18	3.8	**3.6**	6.2	**23**	42
	8/22/2007	**140**	ND	6.7	55	ND	ND	0.41	**2.6**	100	ND	38	**0.16**	16	2.8	**3.4**	ND	**27**	32
	9/19/2007	**130**	0.58	7.2	61	ND	ND	0.36	**3.5**	100	ND	41	ND	16	3.1	**3.8**	ND	**32**	22
	10/17/2007	**140**	0.57	7.8	61	ND	ND	0.34	**2.9**	89	ND	43	ND	17	3.4	**3.4**	ND	**32**	35
	11/19/2007	**210**	0.56	4.7	55	ND	ND	0.46	**2.4**	130	0.22	33	ND	13	3.7	**3.5**	ND	**31**	22
	12/19/2007	**210**	ND	8	54	ND	ND	0.87	**3.4**	85	0.2	44	ND	**19**	5.4	**4.3**	ND	**42**	33
	1/23/2008	**240**	0.57	4.8	62	ND	ND	0.57	**2.7**	79	ND	31	ND	13	4.2	**3.8**	ND	**42**	23
	2/20/2008	**270**	0.56	5.4	58	ND	ND	0.57	**2.7**	120	ND	42	ND	11	4.8	**4.2**	ND	**39**	29
	3/18/2008	**170**	0.56	8.9	53	ND	ND	0.58	**2.6**	81	ND	46	ND	18	5.9	**4.5**	ND	**37**	52
	Median	*140*	*0.57*	*7.5*	*58*			*0.57*	*2.8*	*96*	*0.22*	*44*	*0.16*	*16*	*3.7*	*3.8*	*6.2*	*33*	*35*
	Maximum	*270*	*0.68*	*8.9*	*62*			*0.87*	*3.7*	*130*	*1.7*	*55*	*0.16*	*19*	*5.9*	*4.5*	*6.2*	*42*	*57*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
LW4.95	3/21/2007	**150**	0.56	9	63	ND	ND	0.64	**1.5**	92	ND	48	ND	NA	3.7	**4.2**	NA	**39**	80
	4/25/2007	**140**	0.64	10	61	ND	ND	0.78	**3.5**	89	ND	46	ND	NA	3.9	**4**	NA	**34**	85
	5/23/2007	**120**	0.56	9	61	ND	ND	0.74	**3.4**	130	ND	51	ND	NA	4	**3.6**	NA	**28**	61
	6/20/2007	**95**	0.52	7.5	58	ND	ND	0.71	**3.6**	92	ND	42	ND	NA	3.7	**3.2**	NA	**26**	78
	7/16/2007	**120**	0.57	8.6	61	ND	ND	0.74	**2.9**	91	ND	45	ND	**20**	4.1	**3.7**	6.4	**23**	62
	8/22/2007	**140**	ND	7.9	56	ND	ND	0.52	**2.8**	100	0.2	38	**0.18**	**20**	3.2	**3.4**	5.9	**26**	56
	9/19/2007	**140**	0.54	8.6	62	ND	ND	0.48	**3.7**	120	ND	47	ND	**21**	3.6	**3.9**	6.4	**30**	49
	10/17/2007	**150**	0.56	8.8	63	ND	ND	0.64	**3.4**	93	ND	51	ND	18	4	**3.5**	5	**32**	62
	11/19/2007	**87**	0.54	5.4	57	ND	ND	0.36	**2.1**	32	ND	28	ND	15	4	**3.4**	ND	**27**	35
	12/19/2007	**200**	0.54	8.7	57	ND	ND	0.83	**3.4**	91	0.21	48	ND	**21**	5.6	**3.4**	ND	**40**	51
	1/23/2008	**280**	0.57	5.7	62	ND	ND	0.7	**2.5**	120	0.25	38	ND	15	4.3	**3.6**	ND	**39**	34
	2/20/2008	**220**	0.56	5.9	60	ND	ND	0.57	**2.8**	110	ND	42	ND	12	5.7	**3.7**	ND	**39**	45
	3/18/2008	**230**	0.55	8.2	56	ND	ND	0.92	**2.9**	140	0.26	58	ND	14	5.9	**4.1**	ND	**40**	60
	Median	*140*	*0.56*	*8.6*	*61*			*0.7*	*2.9*	*93*	*0.23*	*46*	*0.18*	*18*	*4*	*3.62*	*6.2*	*32*	*60*
	Maximum	*280*	*0.64*	*10*	*63*			*0.92*	*3.7*	*140*	*0.26*	*58*	*0.18*	*21*	*5.9*	*4.2*	*6.4*	*40*	*85*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
LW3.1	3/21/2007	**160**	0.57	9.8	63	ND	ND	0.8	**1.7**	110	0.33	44	ND	NA	4.3	**3.7**	NA	**37**	110
	4/25/2007	**130**	0.63	11	59	ND	ND	0.84	**3.8**	83	0.22	36	ND	NA	4.5	**3.6**	NA	**32**	130
	5/23/2007	**110**	0.54	9.4	57	ND	ND	0.68	**3.6**	100	0.29	41	ND	NA	4.3	**3.2**	NA	**26**	95
	6/20/2007	**110**	ND	8.3	51	ND	ND	0.73	**3.6**	100	0.22	40	ND	NA	4	**2.8**	NA	**24**	98
	7/16/2007	**110**	0.52	8.4	54	ND	ND	0.75	**2.8**	86	0.25	36	ND	**21**	4	**2.9**	6.3	**20**	84
	8/22/2007	**140**	ND	9.3	54	ND	ND	0.55	**3.1**	100	0.28	33	**0.16**	**19**	3.7	**3.1**	5.6	**25**	88
	9/19/2007	**140**	0.54	10	57	ND	ND	0.55	**3.8**	110	0.25	40	ND	**23**	4.3	**3.4**	6.7	**27**	90
	10/17/2007	**170**	0.56	9.7	62	ND	ND	0.51	**3.5**	36	ND	36	ND	18	4.3	**3.1**	5	**31**	82
	11/19/2007	**150**	0.54	7.2	57	ND	ND	0.4	**2.5**	65	ND	30	ND	**19**	4.5	**3.2**	5.4	**28**	77
	12/19/2007	**220**	0.5	9.7	55	ND	ND	0.79	**3.5**	130	0.3	38	ND	**21**	5.7	**3.3**	ND	**36**	78
	1/23/2008	**220**	0.55	7	61	ND	ND	0.66	**2.7**	100	0.22	35	ND	18	4.8	**3.3**	ND	**37**	92
	2/20/2008	**220**	0.56	7.6	60	ND	ND	0.57	**3.3**	110	0.25	40	ND	14	6.4	**4.1**	ND	**36**	88
	3/18/2008	**150**	0.55	8.6	52	ND	ND	0.57	**7.2**	88	0.23	33	ND	**19**	6	**4.1**	ND	**32**	91
	Median	*150*	*0.55*	*9.3*	*57*			*0.66*	*3.5*	*100*	*0.25*	*36*	*0.16*	*19*	*4.3*	*3.3*	*5.6*	*31*	*90*
	Maximum	*220*	*0.63*	*11*	*63*			*0.84*	*7.2*	*130*	*0.33*	*44*	*0.16*	*23*	*6.4*	*4.1*	*6.7*	*37*	*130*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
LW0.8	3/21/2007	**170**	0.55	11	63	ND	ND	0.76	**1.8**	120	0.35	46	ND	NA	4.3	**3.6**	NA	**38**	110
	4/25/2007	**140**	0.63	11	59	ND	ND	0.89	**3.7**	98	0.31	38	ND	NA	4.5	**3.6**	NA	**31**	130
	5/23/2007	**110**	0.54	9.4	57	ND	ND	0.7	**3.6**	130	0.29	41	ND	NA	4.3	**3.1**	NA	**26**	89
	6/20/2007	**120**	ND	8.8	52	ND	ND	0.65	**3.5**	110	0.22	42	ND	NA	3.8	**2.7**	NA	**23**	92
	7/16/2007	**140**	0.53	8.8	56	ND	ND	0.78	**2.9**	110	0.3	42	ND	**22**	4.2	**2.8**	6.2	**21**	79
	8/22/2007	**150**	ND	9.7	54	ND	ND	0.57	**3.2**	120	0.33	35	**0.14**	18	3.8	**3.1**	5	**25**	93
	9/19/2007	**160**	0.61	10	59	ND	ND	0.55	**3.7**	130	0.29	41	ND	**22**	4.3	**3.4**	6.3	**27**	79
	10/17/2007	**170**	0.54	9.7	59	ND	ND	0.52	**3.4**	110	ND	35	ND	**19**	4.2	**3.1**	5	**30**	76
	11/19/2007	**140**	0.55	7.1	57	ND	ND	0.39	**2.4**	58	ND	30	ND	**19**	4.3	**3.1**	5.3	**26**	71
	12/19/2007	**210**	0.52	10	57	ND	ND	0.73	**3.2**	110	0.27	36	ND	**21**	5.4	**3.6**	ND	**35**	74
	1/23/2008	**250**	0.54	7.5	63	ND	ND	0.62	**2.9**	110	0.3	37	ND	17	4.7	**3.2**	ND	**36**	96
	2/20/2008	**220**	0.6	7.5	61	ND	ND	0.57	**3.1**	110	0.27	40	ND	14	5.8	**3.5**	ND	**36**	91
	3/18/2008	**150**	0.53	9.1	51	ND	ND	0.58	**2.7**	87	0.24	32	ND	**19**	5.8	**4**	ND	**31**	89
	Median	*150*	*0.54*	*9.4*	*57*			*0.62*	*3.2*	*110*	*0.29*	*38*	*0.14*	*19*	*4.3*	*3.2*	*5.3*	*30*	*89*
	Maximum	*250*	*0.63*	*11*	*63*			*0.89*	*3.7*	*130*	*0.35*	*46*	*0.14*	*22*	*5.8*	*4*	*6.3*	*38*	*130*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
LVC_2	1/23/2007	ND	NA	2.8	35	NA	NA	0.6	**1.6**	ND	ND	1.3	NA	NA	0.9	**7.9**	NA	4.7	16
	4/18/2007	29	NA	3.1	59	NA	NA	0.7	**5.3**	46	0.3	6	NA	NA	1.3	**5.9**	NA	**20**	9.8
	7/18/2007	44	NA	3.6	41	NA	NA	1.1	**5.5**	46	0.3	2	NA	NA	ND	**4.3**	NA	**8**	15
	10/24/2007	8.9	NA	1.6	130	NA	NA	ND	**0.8**	ND	ND	0.3	NA	NA	1	**2.8**	NA	**140**	3.7
	1/22/2008	11	NA	2.4	30	NA	NA	0.8	**2**	ND	ND	0.9	NA	NA	2.9	**8.4**	NA	ND	20
	4/23/2008	18	NA	2.3	32	NA	NA	0.4	**3.7**	ND	ND	1.1	NA	NA	0.8	**6.3**	NA	ND	11
	Median	*18*		*2.6*	*38*			*0.7*	*2.9*	*46*	*0.3*	*1.2*			*1*	*6.1*		*14*	*13*
	Maximum	*44*		*3.6*	*130*			*1.1*	*6*	*46*	*0.3*	*6*			*2.9*	*8.4*		*140*	*20*
LW12.1	1/23/2007	61	NA	6.4	28	NA	NA	0.9	**2.9**	65	0.3	28	NA	NA	1.4	**13**	NA	**5.6**	11
	4/18/2007	31	NA	6.9	57	NA	NA	0.6	**3.1**	33	ND	57	NA	NA	2	**9.6**	NA	**7.8**	7.7
	7/18/2007	**97**	NA	6.2	45	NA	NA	0.6	**1.4**	97	0.3	20	NA	NA	1.4	**8.2**	NA	**6.7**	6.1
	10/24/2007	70	NA	7.2	32	NA	NA	0.7	**1.4**	69	ND	26	NA	NA	1.5	**12**	NA	**15**	9.5
	1/22/2008	19	NA	7.6	24	NA	NA	0.9	**1.5**	22	ND	20	NA	NA	5	**14**	NA	ND	9.1
	4/23/2008	12	NA	6	27	NA	NA	0.4	**1.6**	ND	ND	6.9	NA	NA	1.2	**11.1**	NA	ND	8.9
	Median	*46*		*6.7*	*30*			*0.6*	*1.6*	*65*	*0.3*	*23*			*1.5*	*12*		*7.3*	*9*
	Maximum	*97*		*7.6*	*57*			*0.9*	*3.1*	*97*	*0.3*	*57*			*5*	*14*		*15*	*11*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
FW_0	1/23/2007	8	NA	4.1	35	NA	NA	2.1	**1.2**	ND	ND	1.3	NA	NA	1.3	**16**	NA	4	14
	4/18/2007	9.6	NA	4.9	57	NA	NA	1	**2.4**	ND	ND	12	NA	NA	1.6	**15**	NA	**11**	10
	7/18/2007	17	NA	5.5	59	NA	NA	1	**1.7**	28	ND	3.6	NA	NA	1.2	**14**	NA	**8.2**	9.7
	10/24/2007	19	NA	4.7	59	NA	NA	2.5	**2.1**	ND	ND	1.8	NA	NA	1.4	**16**	NA	**12**	13
	1/22/2008	31	NA	4.5	52	NA	NA	1.9	**1.8**	29	ND	3.4	NA	NA	5.6	**17**	NA	**8.6**	35
	4/23/2008	11	NA	4.5	50	NA	NA	0.9	**33**	84	0.9	11	NA	NA	1.2	**14.7**	NA	ND	9.6
	Median	*14*		*4.6*	*55*			*1.4*	*2*	*29*	*0.9*	*3.5*			*1.4*	*16*		*8.6*	*12*
	Maximum	*31*		*5.5*	*59*			*2.5*	*33*	*84*	*0.9*	*12*			*5.6*	*17*		*12*	*35*
SC_1	1/23/2007	8.9	NA	14	60	NA	NA	3.6	**0.9**	32	ND	2	NA	NA	ND	**12**	NA	**5.5**	7
	4/18/2007	11	NA	17	39	NA	NA	3.8	**1.8**	ND	ND	1.5	NA	NA	ND	**12**	NA	ND	6.1
	7/18/2007	17	NA	16	45	NA	NA	4	**2.2**	36	ND	1	NA	NA	ND	**13**	NA	ND	7.9
	10/24/2007	33	NA	14	60	NA	NA	1.3	**4.4**	62	ND	5.7	NA	NA	1	**20**	NA	**20**	110
	1/22/2008	8.4	NA	15	35	NA	NA	3.9	**1.1**	ND	ND	0.5	NA	NA	2	**13**	NA	ND	6.4
	4/23/2008	12	NA	16	35	NA	NA	3.7	**4.4**	ND	ND	0.9	NA	NA	ND	**11.2**	NA	ND	6.3
	Median	*12*		*16*	*42*			*3.8*	*2*	*36*		*1.3*			*1.5*	*13*		*13*	*6.7*
	Maximum	*33*		*17*	*60*			*4*	*4.4*	*62*		*5.7*			*2*	*20*		*20*	*110*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
MC_1	1/24/2007	9.3	NA	13	20	NA	NA	0.7	**1.8**	ND	ND	2.2	NA	NA	ND	**25**	NA	2.5	18
	4/18/2007	10	NA	14	21	NA	NA	0.7	**2.1**	ND	ND	0.9	NA	NA	ND	**25**	NA	ND	16
	7/18/2007	42	NA	15	30	NA	NA	0.6	**53**	45	ND	16	NA	NA	0.9	**24**	NA	**5.7**	13
	10/24/2007	21	NA	14	20	NA	NA	0.7	**1.1**	24	ND	1	NA	NA	ND	**26**	NA	ND	14
	1/22/2008	16	NA	15	20	NA	NA	0.6	**1.9**	ND	ND	5	NA	NA	6.6	**24**	NA	ND	13
	4/23/2008	25	NA	12	20	NA	NA	0.6	**3.2**	24	ND	0.6	NA	NA	ND	**19**	NA	ND	18
	Median	*19*		*14*	*20*			*0.7*	*2*	*24*		*1.6*			*3.8*	*25*		*4.1*	*15*
	Maximum	*42*		*15*	*30*			*0.7*	*53*	*45*		*16*			*6.6*	*26*		*6*	*18*
DC_1	1/24/2007	26	NA	**49**	21	NA	NA	1	**1**	23	ND	5.7	NA	NA	1.5	**23**	NA	ND	31
	4/18/2007	24	NA	**49**	26	NA	NA	1	ND	ND	ND	6.9	NA	NA	1.4	**22**	NA	ND	28
	7/18/2007	15	NA	**46**	27	NA	NA	1	**0.8**	ND	ND	5	NA	NA	1.2	**21**	NA	ND	29
	10/24/2007	9.6	NA	**66**	22	NA	NA	0.8	ND	ND	ND	16	NA	NA	1.7	**21**	NA	ND	22
	1/22/2008	49	NA	36	23	NA	NA	1.1	**1.9**	20	ND	6.3	NA	NA	7.9	**21**	NA	ND	24
	4/23/2008	23	NA	**69**	16	NA	NA	0.7	**1.4**	22	ND	8.3	NA	NA	1.6	**17**	NA	ND	30
	Median	*24*		*49*	*23*			*1*	*1.2*	*22*		*6.6*			*1.6*	*21*			*29*
	Maximum	*49*		*69*	*27*			*1.1*	*1.9*	*23*		*16*			*7.9*	*23*			*31*

(Continued)

Table 8. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Perchlorate (µg/L)
Minimum LOC		87	NA	40	NA	NA	0.051	21.5	0.23	1000	1	388	0.00057	19	11	1	9	4.9	600[*]
BS-1	1/24/2007	16	NA	38	37	NA	NA	13	ND	ND	ND	4.3	NA	NA	ND	**11**	NA	2.4	**3800**
	4/18/2007	9	NA	33	44	NA	NA	7.8	ND	ND	ND	0.7	NA	NA	ND	**9.9**	NA	$\boxed{\text{ND}}$	**740**
	7/18/2007	18	NA	37	42	NA	NA	13	**11**	ND	ND	1.4	NA	NA	ND	**11**	NA	ND	**960**
	10/24/2007	8.7	NA	**40**	39	NA	NA	15	ND	ND	ND	1.1	NA	NA	ND	**12**	NA	$\boxed{\text{ND}}$	62
	1/22/2008	67	NA	34	39	NA	NA	**24**	ND	29	ND	2.9	NA	NA	6.7	**13**	NA	ND	**2000**
	4/23/2008	**190**	NA	37	45	NA	NA	18	**1.3**	190	ND	20	NA	NA	0.9	**11**	NA	ND	**1800**
	Median	*17*		*37*	*41*			*14*	*6.2*	*110*		*2.2*			*3.8*	*11*		*2.4*	*1380*
	Maximum	*190*		*40*	*45*			*24*	*11*	*190*		*20*			*6.7*	*13*		*2.4*	*3800*

LOC, level of concern; NA, not available or not analyzed.

[*] The minimum proposed criterion identified for perchlorate is a Secondary Chronic Value (SCV) of 0.6 mg/L (600 µg/L).

Notes:

Sampling locations are described in Table 2.

Data points in normal font represent individual water sample data provided by SNWA to ACT I. Summary statistics calculated by ACT I are shown in italics.

Values in bold and shaded equaled or exceeded the minimum LOC.

$\boxed{\text{ND}}$ indicates that the detection limit was not sufficiently low to determine whether the LOC was exceeded.

Table 9. Concentrations of Dissolved Inorganic Contaminants of Potential Concern in Samples Collected From the Mainstream Las Vegas Wash

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
Minimum LOC		87 [†]	NA	150	NA	NA	2.2	11 [†]	9	1000 [†]	2.5	388 [†]	0.77	52	1 [†]	120
LW10.75	3/21/2007	ND	ND	5.5	33	ND	ND	0.99	ND	ND	ND	0.95	ND	1.1	**14**	8
	4/26/2007	ND	0.62	5.6	42	ND	ND	0.89	2.1	ND	ND	6.1	ND	1.5	**14**	5.3
	5/23/2007	ND	0.54	10	40	ND	ND	0.94	1.5	ND	ND	5.9	ND	1.1	**15**	ND
	6/20/2007	ND	ND	5.5	46	ND	ND	0.62	1.6	ND	ND	0.47	ND	1.4	**14**	ND
	7/16/2007	ND	0.52	16	36	ND	ND	1.4	0.91	ND	ND	4.6	ND	ND	**14**	ND
	8/22/2007	ND	0.56	5.6	52	ND	ND	0.7	1.5	ND	ND	0.24	ND	1.3	**14**	ND
	9/19/2007	ND	ND	8	47	ND	ND	1	2.4	22	ND	1.4	ND	1.4	**16**	5
	10/17/2007	ND	ND	5.8	47	ND	ND	1	2.7	20	ND	2.9	ND	1.3	**16**	5.1
	11/19/2007	ND	ND	13	21	ND	ND	1.9	0.77	ND	ND	0.31	ND	2.9	**13**	ND
	12/19/2007	ND	ND	5.4	43	ND	ND	1.9	1.7	ND	ND	7	ND	5.7	**14**	6.7
	1/23/2008	ND	ND	4.8	36	ND	ND	1.2	1.5	ND	ND	7.7	ND	4.2	**13**	ND
	2/20/2008	ND	ND	4.8	46	ND	ND	1.2	1.8	ND	ND	1.4	ND	4.4	**13**	ND
	3/18/2008	ND	0.66	5.6	45	ND	ND	0.93	3.9	ND	ND	14	ND	4.8	**14**	12
	Median		*0.56*	*5.6*	*43*			*1*	*1.7*	*21*		*2.9*		*1.5*	*14*	*6*
	Max		*0.66*	*16*	*52*			*1.9*	*3.9*	*22*		*14*		*5.7*	*16*	*12*

(Continued)

Table 9. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
Minimum LOC		87 [†]	NA	150	NA	NA	2.2	11 [†]	9	1000 [†]	2.5	388 [†]	0.77	52	1 [†]	120
LW8.85	3/21/2007	54	0.61	2.3	65	ND	ND	0.27	1	47	ND	18	ND	2.3	**2.8**	44
	4/26/2007	51	0.7	2.4	61	ND	ND	0.37	3.7	48	ND	20	ND	2.4	**2.8**	41
	5/23/2007	41	0.57	2.7	59	ND	ND	0.26	3.4	41	ND	19	ND	2.2	**2.8**	34
	6/20/2007	50	0.57	2.4	56	ND	ND	0.23	3.2	33	ND	1	ND	2.2	**2.4**	29
	7/16/2007	52	0.57	2.4	55	ND	ND	0.25	2.3	66	ND	16	ND	2	**2.7**	27
	8/22/2007	58	ND	2.4	53	ND	ND	0.22	2.5	32	ND	3.3	ND	1.8	**2.5**	30
	9/19/2007	61	0.61	2.4	58	ND	ND	ND	3.4	29	ND	4.2	ND	2.2	**2.6**	38
	10/17/2007	56	0.59	3	58	ND	ND	0.22	3.3	63	ND	14	ND	2.4	**2.9**	37
	11/19/2007	60	0.56	1.8	50	ND	ND	0.24	2.1	34	ND	6.3	ND	3.2	**2.3**	31
	12/19/2007	59	0.54	2.5	51	ND	ND	0.31	2.7	39	ND	18	ND	4.1	**3.5**	42
	1/23/2008	61	0.58	1.9	61	ND	ND	0.24	2.2	51	ND	20	ND	3.1	**2.8**	43
	2/20/2008	69	0.58	1.6	54	ND	ND	0.22	2.6	52	ND	24	ND	4	**2.9**	42
	3/18/2008	59	0.64	2.1	48	ND	ND	0.21	2.5	49	ND	17	ND	2.8	**2.7**	41
	Median	*58*	*0.58*	*2.4*	*56*			*0.24*	*2.6*	*47*		*17*		*2.4*	*2.8*	*38*
	Max	*69*	*0.7*	*3*	*65*			*0.37*	*3.7*	*66*		*24*		*4.1*	*3.5*	*44*

(Continued)

Table 9. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
Minimum LOC		87 [†]	NA	150	NA	NA	2.2	11 [†]	9	1000 [†]	2.5	388 [†]	0.77	52	1 [†]	120
LW6.85	3/21/2007	64	0.6	6.5	61	ND	ND	0.28	1.2	34	ND	25	ND	2.8	**4.1**	38
	4/26/2007	60	0.68	7.3	58	ND	ND	0.36	3.2	49	ND	25	ND	3	**3.9**	35
	5/23/2007	45	0.61	7.4	57	ND	ND	0.27	3.4	35	ND	26	ND	2.8	**4**	31
	6/20/2007	45	0.56	6.2	53	ND	ND	0.24	3.2	27	ND	0.69	ND	2.6	**3.3**	27
	7/16/2007	51	0.55	6	53	ND	ND	0.22	2.2	ND	ND	18	ND	2.4	**3.3**	22
	8/22/2007	60	ND	5.8	52	ND	ND	0.24	2.3	21	ND	3.6	0.17	2.3	**3.3**	27
	9/19/2007	47	0.57	6	55	ND	ND	ND	3	ND	ND	1.1	ND	2.5	**3.7**	31
	10/17/2007	56	0.56	6.5	55	ND	ND	0.22	2.8	56	ND	23	ND	2.5	**3.7**	31
	11/19/2007	59	0.56	4	50	ND	ND	0.23	2.2	23	ND	3	ND	3.9	**3.2**	28
	12/19/2007	61	0.53	6.9	49	ND	ND	0.33	2.9	35	ND	20	ND	6.3	**4.3**	36
	1/23/2008	85	0.57	5.2	58	ND	ND	0.4	2.1	38	ND	28	ND	4.4	**3.8**	38
	2/20/2008	**88**	0.55	5.2	53	ND	ND	0.29	2.5	40	ND	22	ND	4.3	**3.8**	27
	3/18/2008	73	0.55	7.5	45	ND	ND	0.27	2.8	41	ND	26	ND	5.1	**4.3**	44
	Median	*60*	*0.56*	*6.2*	*53*			*0.27*	*2.8*	*35*		*22*	*0.17*	*2.8*	*3.8*	*31*
	Max	*88*	*0.68*	*7.5*	*61*			*0.4*	*3.4*	*56*		*28*	*0.17*	*6.3*	*4.3*	*44*

(Continued)

Table 9. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
Minimum LOC		87 [†]	NA	150	NA	NA	2.2	11 [†]	9	1000 [†]	2.5	388 [†]	0.77	52	1 [†]	120
LW5.9	3/21/2007	63	0.62	7.2	67	ND	ND	0.5	1.8	26	ND	49	ND	3.8	**3.9**	42
	4/26/2007	60	0.68	8.6	61	ND	ND	0.55	4.1	26	ND	43	ND	4	**4**	37
	5/23/2007	41	0.54	8	58	ND	ND	0.51	3.1	58	ND	68	ND	4.8	**3.9**	28
	6/20/2007	46	0.54	7.3	56	ND	ND	0.35	3.6	25	ND	0.67	ND	3.6	**3.5**	26
	7/16/2007	50	0.56	7.4	55	ND	ND	0.25	2.7	ND	ND	33	ND	4	**3.5**	22
	8/22/2007	59	ND	6.3	54	ND	ND	0.23	2.5	22	ND	13	0.15	2.9	**3.5**	26
	9/19/2007	51	0.58	6.3	69	ND	ND	ND	3.9	26	ND	1.1	ND	3.5	**3.6**	31
	10/17/2007	63	0.55	7.6	70	ND	ND	0.36	3.6	38	ND	53	ND	4.6	**3.4**	35
	11/19/2007	**91**	0.57	3.7	64	ND	ND	0.25	3.3	ND	ND	11	ND	3.6	**3.1**	33
	12/19/2007	**100**	0.61	6.2	70	ND	ND	0.79	4.4	22	ND	44	ND	6.3	**3.4**	53
	1/23/2008	**87**	0.59	3.5	82	ND	ND	0.23	3.2	24	ND	22	ND	3.7	**2.4**	46
	2/20/2008	**91**	0.56	4.1	70	ND	ND	0.34	2.9	35	ND	42	ND	5.2	**3.9**	43
	3/18/2008	75	0.55	6.7	67	ND	ND	0.65	3.6	31	ND	60	ND	6.3	**4.1**	47
	Median	*63*	*0.57*	*6.7*	*67*			*0.36*	*3.3*	*26*		*42*	*0.15*	*4*	*3.5*	*35*
	Max	*100*	*0.68*	*8.6*	*82*			*0.79*	*4.4*	*58*		*68*	*0.15*	*6.3*	*4.1*	*53*

(Continued)

Table 9. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
Minimum LOC		87 [†]	NA	150	NA	NA	2.2	11 [†]	9	1000 [†]	2.5	388 [†]	0.77	52	1 [†]	120
LW5.5	3/21/2007	64	0.59	7.2	62	ND	ND	0.31	1.2	24	ND	35	ND	3.3	**4.3**	39
	4/26/2007	61	0.68	8.5	59	ND	ND	0.4	3.2	26	ND	35	ND	3.6	**3.9**	34
	5/23/2007	50	0.59	7.2	60	ND	ND	0.31	3.3	29	ND	33	ND	3.3	**3.7**	31
	6/20/2007	46	0.53	7.4	55	ND	ND	0.26	3.3	26	ND	0.83	ND	3.4	**3.4**	25
	7/16/2007	50	0.56	7.5	55	ND	ND	0.25	2.6	22	ND	28	ND	3.6	**3.5**	22
	8/22/2007	59	ND	6.5	53	ND	ND	0.24	2.4	23	ND	6	0.14	2.8	**3.4**	26
	9/19/2007	50	0.5	6.9	59	ND	ND	ND	3.3	ND	ND	0.82	ND	3	**3.8**	31
	10/17/2007	63	0.55	7.9	60	ND	ND	0.23	2.8	39	ND	37	ND	3.4	**3.6**	31
	11/19/2007	75	0.54	4.4	51	ND	ND	0.26	2.2	ND	ND	3.5	ND	3.8	**3.2**	29
	12/19/2007	85	0.53	6.9	54	ND	ND	0.4	3	28	ND	33	ND	5.3	**3.9**	39
	1/23/2008	**100**	0.58	4.7	63	ND	ND	0.28	2.2	28	ND	27	ND	3.8	**3.5**	39
	2/20/2008	**92**	0.58	4.9	60	ND	ND	0.3	2.4	28	ND	29	ND	4.7	**4.2**	37
	3/18/2008	82	0.54	8.8	51	ND	ND	0.37	2.5	32	ND	39	ND	5.4	**4.4**	35
	Median	*63*	*0.56*	*7.2*	*59*			*0.29*	*2.6*	*28*		*29*	*0.14*	*3.6*	*3.7*	*31*
	Max	*100*	*0.68*	*8.8*	*63*			*0.4*	*3.3*	*39*		*39*	*0.14*	*5.4*	*4.4*	*39*

(Continued)

Table 9. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
Minimum LOC		87 [†]	NA	150	NA	NA	2.2	11 [†]	9	1000 [†]	2.5	388 [†]	0.77	52	1 [†]	120
LW4.95	3/21/2007	64	0.58	8.8	62	ND	$\boxed{\text{ND}}$	0.42	1.2	ND	ND	31	ND	3.6	**4.3**	40
	4/26/2007	61	0.67	10	61	ND	$\boxed{\text{ND}}$	0.51	3.3	22	ND	28	ND	3.9	**4.2**	32
	5/23/2007	45	0.57	8.7	59	ND	$\boxed{\text{ND}}$	0.43	3	31	ND	30	ND	3.8	**3.9**	27
	6/20/2007	46	0.54	7.3	58	ND	$\boxed{\text{ND}}$	0.38	3.8	23	ND	0.66	ND	3.7	**3.3**	25
	7/16/2007	50	0.54	8.1	56	ND	ND	0.35	2.5	21	ND	24	ND	3.8	**3.6**	22
	8/22/2007	55	ND	7.6	54	ND	ND	0.33	2.6	ND	ND	6.4	0.18	3.1	**3.4**	24
	9/19/2007	45	0.57	8.5	59	ND	ND	0.27	3.4	ND	ND	7.5	ND	3.5	**3.8**	28
	10/17/2007	69	0.56	8.8	62	ND	ND	0.33	3.2	37	ND	41	ND	3.8	**3.6**	31
	11/19/2007	79	0.55	5.4	56	ND	ND	0.27	2.3	ND	ND	1	ND	4.1	**3.5**	26
	12/19/2007	**89**	0.53	8.5	55	ND	ND	0.51	3.1	44	ND	32	ND	5.5	**3.6**	38
	1/23/2008	**98**	0.57	5.4	61	ND	ND	0.28	2.3	29	ND	27	ND	4.1	**3.5**	35
	2/20/2008	**91**	0.59	6.3	60	ND	ND	0.33	2.7	25	ND	30	ND	5.1	**3.6**	35
	3/18/2008	77	0.56	8	54	ND	ND	0.41	2.7	29	ND	41	ND	5.9	**4.3**	39
	Median	*64*	*0.57*	*8.1*	*59*			*0.35*	*2.7*	*28*		*28*	*0.18*	*3.8*	*3.6*	*31*
	Max	*98*	*0.67*	*10*	*62*			*0.51*	*3.8*	*39*		*41*	*0.18*	*5.9*	*4.3*	*40*

(Continued)

Table 9. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
Minimum LOC [*]		87 [†]	NA	150	NA	NA	2.2	11 [†]	9	1000 [†]	2.5	388 [†]	0.77	52	1 [†]	120
LW3.1	3/21/2007	57	0.53	9.1	59	ND	ND	0.43	1.7	ND	ND	22	ND	4	**3.6**	34
	4/26/2007	58	0.65	11	60	ND	ND	0.53	3.5	ND	ND	20	ND	4.5	**3.7**	30
	5/23/2007	39	0.56	9.4	57	ND	ND	0.43	3.3	ND	ND	21	ND	4.4	**3.4**	26
	6/20/2007	41	0.51	8.3	55	ND	ND	0.36	3.5	23	ND	0.47	ND	3.9	**2.8**	22
	7/16/2007	49	0.55	8.7	56	ND	ND	0.39	2.7	ND	ND	14	ND	4.1	**3.2**	21
	8/22/2007	47	ND	9.1	52	ND	ND	0.36	3	ND	ND	3.7	0.16	3.6	**3.1**	23
	9/19/2007	42	0.54	10	56	ND	ND	0.35	3.5	ND	ND	2.8	ND	4.2	**3.5**	26
	10/17/2007	71	0.55	9.3	58	ND	ND	0.33	3.9	110	ND	22	ND	4.1	**3**	30
	11/19/2007	79	0.56	6.8	57	ND	ND	0.3	2.5	ND	ND	0.93	ND	4.6	**3.3**	25
	12/19/2007	86	0.53	0.53	53	ND	ND	0.46	3.3	26	ND	23	ND	5.6	**3.5**	35
	1/23/2008	**95**	0.55	7.1	61	ND	ND	0.34	2.5	22	ND	24	ND	4.5	**3.5**	33
	2/20/2008	85	0.57	7	59	ND	ND	0.37	3	ND	ND	25	ND	5.7	**4.1**	38
	3/18/2008	80	0.54	8.5	50	ND	ND	0.42	2.4	28	ND	23	ND	5.7	**3.7**	31
	Median	*58*	*0.55*	*8.7*	*57*			*0.37*	*3*	*26*		*21*	*0.16*	*4.4*	*3.5*	*30*
	Max	*95*	*0.65*	*11*	*61*			*0.53*	*3.9*	*110*		*25*	*0.16*	*5.7*	*4.1*	*38*

(Continued)

Table 9. Continued

Sampling Location	Date	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
Minimum LOC		87 [†]	NA	150	NA	NA	2.2	11 [†]	9	1000 [†]	2.5	388 [†]	0.77	52	1 [†]	120
LW0.8	3/21/2007	59	0.56	10	62	ND	ND	0.44	1.5	ND	ND	20	ND	4.2	**3.7**	35
	4/26/2007	56	0.64	11	59	ND	ND	0.49	3.4	20	ND	16	ND	4.4	**3.5**	29
	5/23/2007	39	0.56	9.4	57	ND	ND	0.43	3.3	ND	ND	21	ND	4.4	**3.4**	26
	6/20/2007	38	0.51	8.9	55	ND	ND	0.35	3.5	ND	ND	0.53	ND	3.8	**2.7**	22
	7/16/2007	44	0.52	8.3	53	ND	ND	0.36	2.5	ND	ND	13	ND	3.9	**2.9**	20
	8/22/2007	44	ND	9.4	52	ND	ND	0.36	3	ND	ND	1.7	0.14	3.7	**3.1**	22
	9/19/2007	38	0.5	10	56	ND	ND	0.28	3.4	ND	ND	1.2	ND	4.1	**3.2**	25
	10/17/2007	67	0.56	9.8	59	ND	ND	0.34	3.2	30	ND	31	ND	4.2	**3.2**	29
	11/19/2007	73	0.52	6.9	56	ND	ND	0.27	2.5	ND	ND	0.78	ND	4.4	**3.5**	24
	12/19/2007	83	0.51	10	53	ND	ND	0.45	3	26	ND	18	ND	5.4	**3.5**	32
	1/23/2008	**100**	0.53	7.1	61	ND	ND	0.33	2.5	20	ND	23	ND	4.7	**3.3**	33
	2/20/2008	82	0.68	7.5	57	ND	ND	0.36	2.9	ND	ND	20	ND	5.7	**3.8**	33
	3/18/2008	74	0.52	8.8	49	ND	ND	0.41	2.2	23	ND	20	ND	5.8	**3.8**	30
	Median	*59*	*0.53*	*9.4*	*56*			*0.36*	*3*	*23*		*18*	*0.14*	*4.4*	*3.4*	*29*
	Max	*100*	*0.68*	*11*	*62*			*0.49*	*3.5*	*30*		*31*	*0.14*	*5.8*	*3.8*	*35*

LOC, level of concern; NA, not available or not analyzed.

[*] No LOC based on dissolved concentration is available, so the minimum LOC based on total concentration is substituted.

[†] No LOC was identified for total dissolved chromium. The minimum LOC for dissolved chromium (III) would be the U.S. EPA chronic criterion of 74 µg/L. The minimum LOC for dissolved chromium (VI) would be the U.S. EPA chronic criterion of 11 µg/L. If total dissolved chromium is less than either of these criteria for specific oxidation states of chromium, the criteria for chromium (III) and chromium (VI) would not be exceeded.

Notes:

Sampling locations are described in Table 2.

Data points in normal font represent individual water sample data provided by SNWA to ACT I. Summary statistics calculated by ACT I are shown in italics.

Values in bold and shaded equaled or exceeded the minimum LOC.

ND indicates that the detection limit was not sufficiently low to determine whether the LOC was exceeded.

Table 10. Concentrations of Inorganic Contaminants of Potential Concern in Composite[*] Sediment Samples Collected From the Las Vegas Wash and a Tributary (Units: mg/kg)

	Location†																
	LW10.75		NP		DC_1		BSC		PB		LW0.8		LVB		LVB		LOC ‡
Chemical	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	
Aluminum	3500	5200	4700	6700	3900	5000	5800	11000	6300	9100	8000	11000	7400	10000	8600	11000	58,000
Antimony	ND		ND		ND		ND		ND		ND		ND		ND		25
Arsenic	ND		ND		ND		ND		ND		8.7	**12**	8.4	**11**	9.7	**13**	5.9
Barium	47	70	53	76	35	45	96	180	62	90	130	178	110	147	120	160	NA
Beryllium	ND		ND		ND		ND		ND		ND		ND		ND		NA
Boron	ND		ND		ND		ND		ND		ND		ND		ND		NA
Cadmium	ND		ND		ND		ND		ND		ND		ND		ND		0.58
Chromium	5.9	8.7	5.7	8.1	6	7.7	11	21	9.5	14	12	16	11	15	12	16	26
Copper	9.4	14	5.1	7.2	5.9	7.5	8.7	**17**	9.1	13	10	14	8.1	11	9.3	12	16
Iron	3100	4600	4100	5800	4400	5600	6400	12000	5500	7900	8600	12000	7900	11000	8900	12000	20000
Lead	ND		ND		ND		5.2	9.9	ND		18	25	26	**35**	32	**43**	31
Magnesium	14000	21000	13000	18000	10000	13000	65000	120000	15000	22000	17000	23000	11000	15000	12000	16000	NA
Manganese	74	110	81	120	84	110	100	190	170	240	300	410	330	440	380	**510**	460
Mercury	ND		ND		ND		ND		ND		ND		ND		ND		0.15
Molybdenum	ND		ND		ND		ND		ND		ND		ND		ND		NA
Nickel	ND		ND		ND		5.7	11	5.2	7.5	8.3	11	7.6	10	8.8	12	16
Selenium	ND		ND		ND		ND		ND		ND		ND		ND		1
Strontium	350	520	170	240	140	180	310	590	140	200	790	1100	310	410	360	480	NA
Titanium	120	180	160	230	240	310	380	720	240	350	380	520	440	590	470	630	NA
Vanadium	7.7	11	8.2	12	11	14	21	40	12	17	20	27	18	24	20	27	NA
Zinc	37	54	30	43	19	24	34	65	59	85	55	75	35	47	39	52	90
Perchlorate	ND		ND		ND		ND		ND		ND		ND		ND		NA

dw, dry weight residue; LOC, level of concern; NA, not available; ND, not detected; ww, wet weight residue

[*] Each data point represents a concentration in a single composite sample.

[†] Sampling locations are described in Table 2.

[‡] Minimum LOC from the previous bioassessment report (Intertox 2008) or from the U.S. DOE RAIS database (U.S. DOE 2007), whichever is lower. LOCs are listed in units of mg/kg dw.

Notes:

Chemical concentrations in bold and shaded exceed the minimum level of concern (LOC) for that chemical.

Table 11. Concentrations of Organic Contaminants of Potential Concern in Individual* Whole Fish Collected From the Las Vegas Wash and Its Tributaries (Units: mg/kg)

Location	Sample ID	Common Name	Aldrin			Dieldrin			Endrin			Heptachlor			Heptachlor Epoxide		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	NPGS01	Green sunfish		ND		0.00714	0.00135	0.189		ND			ND		0.00064	0.00012	0.0169
NP	NPGS02	Green sunfish		ND		0.0288	0.00727	0.164		ND			ND		0.00242	0.00061	0.0138
NP	NPGS03	Green sunfish		ND		0.0208	0.00492	0.189		ND			ND		0.00233	0.00055	0.0211
NP	NPGS04	Green sunfish		ND		0.0253	0.00653	0.196		ND			ND		0.00306	0.00079	0.0237
NP	NPGS05	Green sunfish		ND		0.0224	0.00543	0.165		ND			ND		0.00303	0.00073	0.0223
NP	NPGS06	Green sunfish		ND		0.0223	0.00538	0.182		ND			ND		0.00304	0.00073	0.0248
NP	NPBB01	Black bullhead		ND		0.0262	0.00548	0.694		ND			ND		0.00075	0.00016	0.0198
NP	NPBB02	Black bullhead		ND		0.0256	0.00492	0.834		ND			ND		0.00101	0.00019	0.0330
NP	NPBB03	Black bullhead		ND		0.0222	0.00477	0.641		ND			ND		0.00206	0.00044	0.0593
DC	DCGS01	Green sunfish		ND		0.0197	0.00500	0.115		ND			ND		0.00594	0.00151	0.0349
DC	DCGS02	Green sunfish		ND		0.00897	0.00213	0.111		ND			ND		0.00281	0.00067	0.0346
DC	DCGS04	Green sunfish		ND		0.00993	0.00243	0.110		ND			ND		0.00395	0.00097	0.0436
DC	DCGS05	Green sunfish		ND		0.00660	0.00161	0.0517		ND			ND		0.00568	0.00139	0.0445
DC	DCGS06	Green sunfish		ND		0.0206	0.00522	0.125		ND			ND		0.00473	0.00120	0.0288
DC	DCGS03	Green sunfish		ND		0.0115	0.00271	0.0696		ND			ND		0.00430	0.00102	0.0261
PB	LVWCC01	Common carp		ND		0.0435	0.0111	0.316		ND			ND		0.0364	0.00930	0.264
PB	LVWCC02	Common carp		ND		0.0369	0.00940	0.195		ND			ND		0.0613	0.0156	0.324
PB	LVWCC03	Common carp		ND		0.0595	0.0168	0.251		ND			ND		0.0848	0.0240	0.357
PB	LVWGS01	Green sunfish		ND		0.0158	0.00395	0.116		ND			ND		0.00340	0.00085	0.0249
PB	LVWGS02	Green sunfish		ND		0.0410	0.0122	0.144		ND			ND		0.0100	0.00299	0.0353
PB	LVWGS03	Green sunfish		ND		0.0370	0.00907	0.136		ND			ND		0.00825	0.00202	0.0303
PB	LVWGS04	Green sunfish		ND		0.0119	0.00292	0.101		ND			ND		0.00475	0.00117	0.0403
LVB	LVBCC01	Common carp		ND		0.00164	0.00053	0.00413		ND			ND		0.00719	0.00233	0.0181
LVB	LVBCC02	Common carp		ND		0.00082	0.00016	0.00828		ND			ND		0.00199	0.00039	0.0200
LVB	LVBCC03	Common carp		ND		0.00061	0.00020	0.00645		ND			ND		0.00169	0.00055	0.0179
LVB	LVBCC04	Common carp		ND		0.00453	0.00113	0.00968		ND			ND		0.0227	0.00568	0.0485
LVB	LVBCC05	Common carp		ND		0.0390	0.00908	0.216		ND			ND		0.0452	0.0105	0.250
LVB	LVBCC06	Common carp		ND		0.02023	0.00473	0.0785		ND			ND		0.0355	0.00830	0.138
PNWR	PNWRCC01	Common carp		ND			ND			ND			ND			ND	
PNWR	PNWRCC02	Common carp		ND		0.00005	0.00001	0.00058		ND			ND			ND	
PNWR	PNWRCC03	Common carp		ND			ND			ND			ND			ND	
PNWR	PNWRCC04	Common carp		ND			ND			ND			ND			ND	
PNWR	PNWRCC05	Common carp		ND		0.00009	0.00002	0.00095		ND			ND			ND	
PNWR	PNWRLM01	Largemouth bass		ND			ND			ND			ND			ND	
Minimum LOC				**na**			**na**			**na**			**na**			**na**	

(Continued)

Table 11. Continued

Location	Sample ID	Common Name	Oxychlordane			Alpha-Chlordane			Gamma-Chlordane			Trans-Nonachlor			Cis-Nonachlor		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	NPGS01	Green sunfish	0.00157	0.00030	0.0415	0.00145	0.00027	0.0384	0.00118	0.00022	0.0314	0.0186	0.00352	0.494	0.00321	0.00061	0.0851
NP	NPGS02	Green sunfish	0.00782	0.00197	0.0444	0.00647	0.00163	0.0367	0.00373	0.00094	0.0212	0.0378	0.00952	0.214	0.00556	0.00140	0.0316
NP	NPGS03	Green sunfish	0.00535	0.00126	0.0485	0.00569	0.00134	0.0516	0.00300	0.00071	0.0272	0.0344	0.00812	0.312	0.00631	0.00149	0.0573
NP	NPGS04	Green sunfish	0.00742	0.00192	0.0574	0.0141	0.00364	0.109	0.00608	0.00157	0.0471	0.0505	0.0131	0.391	0.00955	0.00247	0.0740
NP	NPGS05	Green sunfish	0.00542	0.00131	0.0399	0.00465	0.00112	0.0342	0.00335	0.00081	0.0247	0.0381	0.00923	0.281	0.00496	0.00120	0.0365
NP	NPGS06	Green sunfish	0.00457	0.00110	0.0372	0.00810	0.00195	0.0660	0.00509	0.00123	0.0414	0.0409	0.00985	0.333	0.00576	0.00139	0.0469
NP	NPBB01	Black bullhead	0.00077	0.00016	0.0204	0.00153	0.00032	0.0406	0.00122	0.00026	0.0324	0.00418	0.00087	0.111	0.00082	0.00017	0.0216
NP	NPBB02	Black bullhead	0.00071	0.00014	0.0233	0.00340	0.00065	0.111	0.00317	0.00061	0.104	0.00663	0.00128	0.216	0.00131	0.00025	0.0426
NP	NPBB03	Black bullhead	0.00131	0.00028	0.0377	0.00451	0.00097	0.130	0.00397	0.00085	0.114	0.0170	0.00365	0.490	0.00356	0.00076	0.1026
DC	DCGS01	Green sunfish	0.00832	0.00212	0.0489	0.0127	0.00324	0.0749	0.00297	0.00076	0.0174	0.0341	0.00869	0.201	0.00813	0.00207	0.0478
DC	DCGS02	Green sunfish	0.00275	0.00066	0.0340	0.00332	0.00079	0.0409		ND		0.0194	0.00461	0.239	0.00606	0.00144	0.0747
DC	DCGS04	Green sunfish	0.00383	0.00094	0.0423	0.00357	0.00088	0.0394		ND		0.0249	0.00610	0.275	0.0135	0.00331	0.149
DC	DCGS05	Green sunfish	0.00314	0.00077	0.0246	0.00301	0.00074	0.0236	0.00183	0.00045	0.0144	0.0365	0.00892	0.286	0.0136	0.00331	0.106
DC	DCGS06	Green sunfish	0.00381	0.00097	0.0232	0.00784	0.00199	0.0478	0.00203	0.00052	0.0124	0.0365	0.00925	0.222	0.0184	0.00466	0.112
DC	DCGS03	Green sunfish	0.00296	0.00070	0.0180	0.00614	0.00145	0.0373	0.00165	0.00039	0.0100	0.0195	0.00461	0.118	0.00725	0.00172	0.0440
PB	LVWCC01	Common carp	0.00236	0.00060	0.0171	0.0171	0.00438	0.124	0.0169	0.00433	0.123	0.0233	0.00595	0.169	0.00927	0.00237	0.0674
PB	LVWCC02	Common carp	0.00431	0.00110	0.0228	0.0239	0.00609	0.126	0.0259	0.00661	0.137	0.0392	0.00998	0.207	0.0125	0.00319	0.0660
PB	LVWCC03	Common carp	0.00440	0.00124	0.0185	0.0277	0.00785	0.117	0.0274	0.00775	0.115	0.0398	0.0113	0.167	0.0155	0.00438	0.0652
PB	LVWGS01	Green sunfish	0.00270	0.00067	0.0198	0.00760	0.00190	0.0556	0.00318	0.00079	0.0233	0.0169	0.00422	0.124	0.00453	0.00113	0.0332
PB	LVWGS02	Green sunfish	0.0114	0.00341	0.0403	0.0227	0.00678	0.0801	0.00852	0.00254	0.0300	0.0577	0.0172	0.203	0.0153	0.00455	0.0537
PB	LVWGS03	Green sunfish	0.0121	0.00296	0.0445	0.0163	0.00398	0.0598	0.00651	0.00159	0.0239	0.0643	0.0158	0.237	0.0162	0.00396	0.0595
PB	LVWGS04	Green sunfish	0.00497	0.00122	0.0422	0.00401	0.00098	0.0340	0.00153	0.00037	0.0130	0.0271	0.00663	0.230	0.00773	0.00189	0.0656
LVB	LVBCC01	Common carp	0.00026	0.00009	0.00067	0.00378	0.00123	0.00954	0.00267	0.00087	0.00674	0.00490	0.00159	0.0124	0.00499	0.00162	0.0126
LVB	LVBCC02	Common carp		ND		0.00102	0.00020	0.0103	0.00068	0.00013	0.00681	0.00126	0.00025	0.0127	0.00219	0.00043	0.0220
LVB	LVBCC03	Common carp	0.00010	0.00003	0.00106	0.00114	0.00037	0.0121		ND		0.00151	0.00049	0.0161	0.00110	0.00036	0.0117
LVB	LVBCC04	Common carp	0.00112	0.00028	0.00239	0.00919	0.00230	0.0196	0.00803	0.00201	0.0172	0.0144	0.00360	0.0308		ND	
LVB	LVBCC05	Common carp	0.00149	0.00035	0.00827	0.00882	0.00205	0.0489	0.0107	0.00249	0.0592	0.00872	0.00203	0.0483		ND	
LVB	LVBCC06	Common carp		ND		0.00689	0.00161	0.0267	0.00691	0.00162	0.0268	0.0121	0.00282	0.0468		ND	
PNWR	PNWRCC01	Common carp		ND		0.00028	0.00006	0.00174	0.00019	0.00004	0.00121	0.00038	0.00008	0.0023	0.00009	0.00002	0.00053
PNWR	PNWRCC02	Common carp		ND		0.00010	0.00003	0.00117		ND		0.00011	0.00003	0.00131		ND	
PNWR	PNWRCC03	Common carp		ND		0.00023	0.00005	0.00261	0.00016	0.00004	0.00178	0.00022	0.00005	0.00247		ND	
PNWR	PNWRCC04	Common carp		ND		0.00036	0.00007	0.00517	0.00029	0.00006	0.00414	0.00028	0.00006	0.00397	0.00008	0.00002	0.00121
PNWR	PNWRCC05	Common carp	0.00019	0.00005	0.00203	0.00014	0.00003	0.00149	0.00011	0.00003	0.00122	0.00013	0.00003	0.00136	0.00004	0.00001	0.00041
PNWR	PNWRLM01	Largemouth bass	0.00004	0.00001	0.00045	0.00006	0.00001	0.00075		ND		0.00021	0.00005	0.00270		ND	
Minimum LOC				**na**			**na**			**na**			**na**			**na**	

(Continued)

Table 11. Continued

Location	Sample ID	Common Name	Alpha-HCH			Beta-HCH			Delta-HCH			Gamma-HCH			DDMU		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	NPGS01	Green sunfish		ND			ND			ND		0.00005	0.00001	0.00145		N/A	
NP	NPGS02	Green sunfish		ND		0.00071	0.00018	0.00404		ND		0.00033	0.00008	0.00187	0.00163	0.00041	0.00925
NP	NPGS03	Green sunfish		ND		0.00037	0.00009	0.00333		ND		0.00030	0.00007	0.00273	0.00145	0.00034	0.0131
NP	NPGS04	Green sunfish		ND		0.00061	0.00016	0.00474		ND		0.00031	0.00008	0.00241	0.00241	0.00062	0.0186
NP	NPGS05	Green sunfish		ND		0.00031	0.00007	0.00226		ND		0.00034	0.00008	0.00250		N/A	
NP	NPGS06	Green sunfish		ND		0.00050	0.00012	0.00405	0.00069	0.00017	0.00560	0.00024	0.00006	0.00198	0.00130	0.00031	0.0106
NP	NPBB01	Black bullhead		ND		0.00021	0.00004	0.00555		ND		0.00015	0.00003	0.00409	0.00078	0.00016	0.0207
NP	NPBB02	Black bullhead		ND		0.00020	0.00004	0.00659		ND			ND		0.00124	0.00024	0.0403
NP	NPBB03	Black bullhead		ND			ND		0.00018	0.00004	0.00524	0.00010	0.00002	0.00295	0.00143	0.00031	0.0413
DC	DCGS01	Green sunfish		ND		0.00038	0.00010	0.00223		ND		0.00014	0.00004	0.00082		N/A	
DC	DCGS02	Green sunfish		ND		0.00031	0.00007	0.00377		ND		0.00014	0.00003	0.00173		N/A	
DC	DCGS04	Green sunfish		ND		0.00044	0.00011	0.00491		ND		0.00010	0.00003	0.00116		N/A	
DC	DCGS05	Green sunfish		ND		0.00036	0.00009	0.00283		ND		0.00013	0.00003	0.00098		N/A	
DC	DCGS06	Green sunfish		ND		0.00162	0.00041	0.00990	0.00038	0.00010	0.00234	0.00024	0.00006	0.00148	0.00370	0.00094	0.0226
DC	DCGS03	Green sunfish		ND		0.0104	0.00247	0.0634	0.00107	0.00025	0.00651	0.00048	0.00011	0.00292	0.00349	0.00083	0.0212
PB	LVWCC01	Common carp	0.00129	0.00033	0.00941	0.0151	0.00385	0.1094	0.00213	0.00055	0.0155	0.00036	0.00009	0.00263	0.00000	0.00000	0.00000
PB	LVWCC02	Common carp		ND		0.0206	0.00526	0.1089	0.00304	0.00077	0.0161	0.00040	0.00010	0.00211	0.00809	0.00206	0.0427
PB	LVWCC03	Common carp	0.00112	0.00032	0.00473	0.0332	0.00939	0.140	0.00478	0.00135	0.0201	0.00049	0.00014	0.00208	0.0109	0.00309	0.0460
PB	LVWGS01	Green sunfish		ND		0.0103	0.00256	0.0751	0.00058	0.00014	0.00425	0.00028	0.00007	0.00204	0.00000	0.00000	0.00000
PB	LVWGS02	Green sunfish	0.00213	0.00063	0.00750	0.0414	0.0123	0.146	0.00487	0.00145	0.0171	0.00086	0.00026	0.00303	0.00374	0.00111	0.0132
PB	LVWGS03	Green sunfish	0.00221	0.00054	0.00813	0.0460	0.0113	0.169	0.00554	0.00136	0.0204	0.00121	0.00030	0.00444	0.00311	0.00076	0.0115
PB	LVWGS04	Green sunfish	0.00141	0.00035	0.0119	0.0117	0.00287	0.0993	0.00112	0.00027	0.00950	0.00019	0.00005	0.00163	0.00231	0.00057	0.0196
LVB	LVBCC01	Common carp	0.0547	0.0177	0.138	0.00231	0.00075	0.00583	0.00026	0.00009	0.00067		ND		0.0118	0.00384	0.0299
LVB	LVBCC02	Common carp		ND		0.00089	0.00017	0.00895	0.00015	0.00003	0.00147	0.00049	0.00010	0.00494	0.00249	0.00049	0.0251
LVB	LVBCC03	Common carp		ND		0.00050	0.00016	0.00528		ND			ND		0.00261	0.00085	0.0278
LVB	LVBCC04	Common carp		ND		0.00404	0.00101	0.00864	0.00036	0.00009	0.00076	0.00100	0.00025	0.00214	0.0358	0.00895	0.0764
LVB	LVBCC05	Common carp		ND		0.0259	0.00603	0.143	0.00249	0.00058	0.0138	0.00081	0.00019	0.00450	0.0680	0.0158	0.377
LVB	LVBCC06	Common carp	0.00210	0.00049	0.00814	0.0954	0.0223	0.3703	0.00572	0.00134	0.0222	0.00350	0.00082	0.0136	0.0297	0.00695	0.115
PNWR	PNWRCC01	Common carp		ND		0.00029	0.00007	0.00182		ND		0.00041	0.00009	0.00257	0.00047	0.00011	0.00295
PNWR	PNWRCC02	Common carp		ND		0.00029	0.00008	0.00336		ND		0.00015	0.00004	0.00175	0.00022	0.00006	0.00263
PNWR	PNWRCC03	Common carp		ND			ND			ND		0.00031	0.00007	0.00357	0.00050	0.00012	0.00576
PNWR	PNWRCC04	Common carp		ND			ND			ND		0.00011	0.00002	0.00155	0.00017	0.00003	0.00241
PNWR	PNWRCC05	Common carp		ND		0.00019	0.00005	0.00203		ND		0.00071	0.00017	0.00759	0.00024	0.00006	0.00257
PNWR	PNWRLM01	Largemouth bass		ND		0.00019	0.00005	0.00240		ND		0.00011	0.00003	0.00135	0.00029	0.00007	0.00375
Minimum LOC				**na**			**na**			**na**			**na**			**na**	

(Continued)

Table 11. Continued

Location	Sample ID	Common Name	o,p'-DDD			p,p'-DDD			o,p'-DDE			p,p'-DDE			o,p'-DDT		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	NPGS01	Green sunfish		ND		0.00073	0.00014	0.0195	0.00007	0.00001	0.00174	0.0444	0.00841	1.18		ND	
NP	NPGS02	Green sunfish		ND		0.00322	0.00081	0.0183	0.00103	0.00026	0.00585	0.0378	0.00954	0.215		ND	
NP	NPGS03	Green sunfish		ND		0.00350	0.00083	0.0317	0.00070	0.00017	0.00637	0.0490	0.0116	0.445		ND	
NP	NPGS04	Green sunfish		ND		0.00402	0.00104	0.0311	0.00200	0.00052	0.0155	0.0510	0.0132	0.395		ND	
NP	NPGS05	Green sunfish		ND		0.00222	0.00054	0.0164	0.00112	0.00027	0.00823	0.0420	0.0102	0.309		ND	
NP	NPGS06	Green sunfish		ND		0.00230	0.00056	0.0188	0.00119	0.00029	0.00973	0.0300	0.00722	0.244		ND	
NP	NPBB01	Black bullhead		ND		0.00052	0.00011	0.0137	0.00011	0.00002	0.00292	0.00784	0.00164	0.208		ND	
NP	NPBB02	Black bullhead		ND		0.00038	0.00007	0.0124	0.00006	0.00001	0.00194	0.0113	0.00217	0.368		ND	
NP	NPBB03	Black bullhead		ND		0.00167	0.00036	0.0482	0.00018	0.00004	0.00524	0.0363	0.00779	1.05		ND	
DC	DCGS01	Green sunfish		ND		0.00231	0.00059	0.0136	0.00100	0.00025	0.00586	0.0529	0.0135	0.311		ND	
DC	DCGS02	Green sunfish		ND		0.00218	0.00052	0.0269	0.00071	0.00017	0.00880	0.0458	0.0109	0.565		ND	
DC	DCGS04	Green sunfish		ND		0.00137	0.00034	0.0152	0.00101	0.00025	0.0111	0.102	0.0251	1.13		ND	
DC	DCGS05	Green sunfish		ND		0.00131	0.00032	0.0102	0.00069	0.00017	0.00544	0.130	0.0317	1.02		ND	
DC	DCGS06	Green sunfish		ND		0.00240	0.00061	0.0146	0.00289	0.00073	0.0176	0.157	0.0397	0.955		ND	
DC	DCGS03	Green sunfish	0.00255	0.00060	0.0155	0.00549	0.00130	0.0333	0.00529	0.00125	0.0321	0.0534	0.0126	0.324		ND	
PB	LVWCC01	Common carp	0.00887	0.00227	0.0645	0.0137	0.00349	0.0992	0.0120	0.00306	0.0870	0.165	0.0421	1.20		ND	
PB	LVWCC02	Common carp	0.0133	0.00340	0.0704	0.0129	0.00329	0.0682	0.0169	0.00432	0.0895	0.138	0.0352	0.729		ND	
PB	LVWCC03	Common carp	0.0141	0.00398	0.0593	0.0206	0.00584	0.0869	0.0192	0.00543	0.0808	0.420	0.119	1.77		ND	
PB	LVWGS01	Green sunfish		ND		0.00121	0.00030	0.00882	0.00090	0.00023	0.00662	0.0328	0.00819	0.240		ND	
PB	LVWGS02	Green sunfish		ND		0.0157	0.00469	0.0554	0.00854	0.00254	0.0301	0.133	0.0396	0.468		ND	
PB	LVWGS03	Green sunfish		ND		0.0176	0.00430	0.0646	0.00928	0.00227	0.0341	0.176	0.0431	0.647		ND	
PB	LVWGS04	Green sunfish		ND		0.00646	0.00158	0.0548	0.00199	0.00049	0.0168	0.0620	0.0152	0.526		ND	
LVB	LVBCC01	Common carp	0.00665	0.00215	0.0168	0.0272	0.00882	0.0687	0.0161	0.00520	0.0405	0.207	0.0670	0.521		ND	
LVB	LVBCC02	Common carp	0.00227	0.00044	0.0228	0.00879	0.00172	0.0886	0.00476	0.00093	0.0480	0.112	0.0219	1.13		ND	
LVB	LVBCC03	Common carp	0.00193	0.00063	0.0205	0.00889	0.00288	0.0946	0.00358	0.00116	0.0381	0.111	0.0360	1.18		ND	
LVB	LVBCC04	Common carp	0.0277	0.00693	0.0592	0.106	0.0264	0.226	0.0855	0.0214	0.183	0.605	0.151	1.29		ND	
LVB	LVBCC05	Common carp	0.0418	0.00973	0.231	0.135	0.0314	0.748	0.193	0.0449	1.07	0.924	0.215	5.12		ND	
LVB	LVBCC06	Common carp	0.0255	0.00595	0.0988	0.0894	0.02089	0.347	0.113	0.0265	0.439	1.06	0.248	4.12		ND	
PNWR	PNWRCC01	Common carp		ND		0.00061	0.00014	0.00378		ND		0.00940	0.00209	0.0585		ND	
PNWR	PNWRCC02	Common carp	0.00014	0.00004	0.00161	0.00021	0.00006	0.00248		ND		0.00444	0.00117	0.0521		ND	
PNWR	PNWRCC03	Common carp	0.00011	0.00003	0.00123	0.00023	0.00005	0.00261	0.00006	0.00001	0.00069	0.00355	0.00085	0.0406		ND	
PNWR	PNWRCC04	Common carp		ND			ND			ND		0.00413	0.00084	0.0588		ND	
PNWR	PNWRCC05	Common carp	0.00013	0.00003	0.00136	0.00016	0.00004	0.00176	0.00010	0.00002	0.00108	0.00295	0.00070	0.0316		ND	
PNWR	PNWRLM01	Largemouth bass		ND		0.00016	0.00004	0.00210	0.00005	0.00001	0.00060	0.00367	0.00088	0.0470		ND	
Minimum LOC				**na**			**na**			**na**			**na**			**na**	

(Continued)

Table 11. Continued

Location	Sample ID	Common Name	p,p'-DDT			1,2,3,4-Tetrachlorobenzene			1,2,4,5-Tetrachlorobenzene			Hexachlorobenzene			Pentachloroanisole		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	NPGS01	Green sunfish	0.00056	0.00011	0.0148		ND		0.00076	0.00014	0.0200	0.0426	0.00806	1.13	0.00049	0.00009	0.0131
NP	NPGS02	Green sunfish	0.00250	0.00063	0.0142		ND		0.00382	0.00096	0.0217	0.0530	0.0134	0.301	0.00063	0.00016	0.00357
NP	NPGS03	Green sunfish	0.00174	0.00041	0.0158		ND		0.00415	0.00098	0.0377	0.0818	0.0193	0.742	0.00089	0.00021	0.00808
NP	NPGS04	Green sunfish	0.00287	0.00074	0.0222		ND		0.00694	0.00179	0.0537	0.0504	0.0130	0.390	0.00117	0.00030	0.00905
NP	NPGS05	Green sunfish	0.00194	0.00047	0.0143		ND		0.00710	0.00172	0.0523	0.0539	0.0130	0.397	0.00087	0.00021	0.00637
NP	NPGS06	Green sunfish	0.00151	0.00036	0.0123		ND		0.00398	0.00096	0.0324	0.0447	0.0108	0.364	0.00073	0.00018	0.00594
NP	NPBB01	Black bullhead	0.00020	0.00004	0.00525		ND		0.00253	0.00053	0.0668	0.0626	0.0131	1.6556	0.00030	0.00006	0.00788
NP	NPBB02	Black bullhead		ND			ND		0.00144	0.00028	0.0469	0.0300	0.00577	0.979	0.00025	0.00005	0.00814
NP	NPBB03	Black bullhead	0.00040	0.00009	0.0115		ND		0.00224	0.00048	0.0646	0.0337	0.00724	0.972	0.00030	0.00006	0.00852
DC	DCGS01	Green sunfish	0.00195	0.00050	0.0114		ND		0.00344	0.00087	0.0202	0.0550	0.0140	0.323	0.00210	0.00053	0.0123
DC	DCGS02	Green sunfish	0.00099	0.00024	0.0123		ND			ND		0.0754	0.0179	0.929	0.00130	0.00031	0.0160
DC	DCGS04	Green sunfish	0.00156	0.00038	0.0172		ND			ND		0.0594	0.0146	0.656	0.00111	0.00027	0.0123
DC	DCGS05	Green sunfish		ND			ND		0.00192	0.00047	0.0150	0.0501	0.0122	0.392	0.00110	0.00027	0.00860
DC	DCGS06	Green sunfish	0.00230	0.00058	0.0140		ND			ND		0.00411	0.00104	0.0251	0.00083	0.00021	0.00506
DC	DCGS03	Green sunfish	0.00193	0.00046	0.0117	0.00116	0.00027	0.00702		ND		0.00269	0.00064	0.0163	0.00051	0.00012	0.00307
PB	LVWCC01	Common carp		ND		0.00917	0.00234	0.0666	0.0155	0.00396	0.113	0.0573	0.0146	0.416	0.00344	0.00088	0.0250
PB	LVWCC02	Common carp	0.00289	0.00074	0.0153		ND		0.00555	0.00141	0.0293	0.1697	0.0432	0.896	0.00421	0.00107	0.0222
PB	LVWCC03	Common carp		ND			ND		0.0100	0.00283	0.0422	0.2064	0.0584	0.869	0.00756	0.00214	0.0318
PB	LVWGS01	Green sunfish	0.00097	0.00024	0.00711		ND		0.00702	0.00175	0.0514	0.0691	0.0173	0.506	0.00135	0.00034	0.00989
PB	LVWGS02	Green sunfish	0.00447	0.00133	0.0157		ND		0.0151	0.00451	0.0532	0.1069	0.0318	0.376	0.00237	0.00071	0.00834
PB	LVWGS03	Green sunfish	0.00508	0.00124	0.0187		ND		0.0182	0.00445	0.0669	0.1085	0.0266	0.399	0.00248	0.00061	0.00912
PB	LVWGS04	Green sunfish	0.00201	0.00049	0.0171		ND		0.00785	0.00192	0.0666	0.0813	0.0199	0.690	0.00091	0.00022	0.00776
LVB	LVBCC01	Common carp		ND			ND			ND		0.0150	0.00487	0.0379		ND	
LVB	LVBCC02	Common carp		ND			ND			ND		0.135	0.0264	1.36	0.00113	0.00022	0.0114
LVB	LVBCC03	Common carp		ND			ND			ND		0.0225	0.00728	0.239	0.00022	0.00007	0.00234
LVB	LVBCC04	Common carp		ND			ND			ND		0.195	0.0488	0.417	0.00190	0.00047	0.00405
LVB	LVBCC05	Common carp		ND			ND			ND		0.194	0.0452	1.07	0.00236	0.00055	0.0131
LVB	LVBCC06	Common carp		ND			ND			ND		0.241	0.0564	0.936	0.00433	0.00101	0.0168
PNWR	PNWRCC01	Common carp		ND			ND			ND		0.0197	0.00439	0.122	0.00438	0.00098	0.0272
PNWR	PNWRCC02	Common carp		ND			ND			ND		0.0648	0.0171	0.760	0.00233	0.00061	0.0273
PNWR	PNWRCC03	Common carp		ND		0.00148	0.00035	0.0169		ND		0.0749	0.0179	0.855	0.00279	0.00067	0.0318
PNWR	PNWRCC04	Common carp		ND			ND			ND		0.0570	0.0116	0.812	0.00154	0.00031	0.0219
PNWR	PNWRCC05	Common carp		ND		0.00097	0.00023	0.0104		ND		0.0905	0.0216	0.969	0.00253	0.00060	0.0271
PNWR	PNWRLM01	Largemouth bass		ND			ND			ND		0.0458	0.0110	0.587	0.00067	0.00016	0.00856
Minimum LOC				na			na			na			na			na	

(Continued)

Table 11. Continued

Location	Sample ID	Common Name	Pentachlorobenzene			Endosulfan II			Endosulfan I			Endosulfan Sulfate			Mirex		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	NPGS01	Green sunfish	0.0105	0.00199	0.279		ND			ND			ND		0.00097	0.00018	0.0259
NP	NPGS02	Green sunfish	0.0417	0.0105	0.237		ND		0.00949	0.00239	0.0539		ND		0.00125	0.00031	0.00708
NP	NPGS03	Green sunfish	0.0384	0.00906	0.348		ND		0.00476	0.00112	0.0432		ND		0.00174	0.00041	0.0158
NP	NPGS04	Green sunfish	0.0341	0.00882	0.264		ND		0.00952	0.00246	0.0737		ND		0.00131	0.00034	0.0102
NP	NPGS05	Green sunfish	0.0356	0.00862	0.262		ND		0.00392	0.00095	0.0288		ND		0.00126	0.00031	0.00928
NP	NPGS06	Green sunfish	0.0299	0.00721	0.244		ND		0.00364	0.00088	0.0297		ND		0.00184	0.00044	0.0150
NP	NPBB01	Black bullhead	0.0303	0.00632	0.801		ND			ND			ND		0.00034	0.00007	0.00905
NP	NPBB02	Black bullhead	0.0193	0.00371	0.629		ND			ND			ND		0.00029	0.00005	0.00930
NP	NPBB03	Black bullhead	0.0191	0.00410	0.551		ND			ND			ND		0.00049	0.00010	0.0141
DC	DCGS01	Green sunfish	0.0355	0.00904	0.209		ND		0.00840	0.00214	0.0494		ND		0.00256	0.00065	0.0151
DC	DCGS02	Green sunfish	0.0467	0.0111	0.576		ND		0.00575	0.00137	0.0709		ND		0.00087	0.00021	0.0107
DC	DCGS04	Green sunfish	0.0443	0.0108	0.489		ND		0.00821	0.00201	0.0906	0.00832	0.00204	0.0919	0.00069	0.00017	0.00766
DC	DCGS05	Green sunfish	0.0397	0.00970	0.311		ND		0.00502	0.00123	0.0393	0.01891	0.00462	0.148	0.00100	0.00024	0.00783
DC	DCGS06	Green sunfish		ND			ND		0.0223	0.00567	0.136		ND		0.00087	0.00022	0.0053
DC	DCGS03	Green sunfish	0.00118	0.00028	0.00716		ND		0.00226	0.00053	0.0137		ND		0.00193	0.00046	0.0117
PB	LVWCC01	Common carp	0.0239	0.00610	0.173		ND		0.00096	0.00025	0.00700		ND		0.00097	0.00025	0.00703
PB	LVWCC02	Common carp	0.0465	0.0118	0.245		ND			ND			ND		0.00074	0.00019	0.00388
PB	LVWCC03	Common carp	0.0568	0.0161	0.239		ND			ND			ND		0.00116	0.00033	0.00489
PB	LVWGS01	Green sunfish	0.0430	0.0107	0.315		ND		0.00224	0.00056	0.0164		ND		0.00110	0.00028	0.00809
PB	LVWGS02	Green sunfish	0.0473	0.0141	0.166		ND		0.0133	0.00396	0.0468		ND		0.00394	0.00117	0.0139
PB	LVWGS03	Green sunfish	0.0471	0.0115	0.173		ND		0.0164	0.00402	0.0604		ND		0.00474	0.00116	0.0174
PB	LVWGS04	Green sunfish	0.0480	0.0118	0.407		ND		0.00572	0.00140	0.0485		ND		0.00205	0.00050	0.0174
LVB	LVBCC01	Common carp	0.0193	0.00627	0.049		ND		0.00405	0.00131	0.0102	0.00518	0.00168	0.0131	0.00069	0.00022	0.00173
LVB	LVBCC02	Common carp	0.0249	0.00487	0.251		ND			ND			ND		0.00049	0.00010	0.00494
LVB	LVBCC03	Common carp	0.0131	0.00425	0.139		ND		0.00049	0.00016	0.00524		ND		0.00076	0.00025	0.00809
LVB	LVBCC04	Common carp	0.0672	0.0168	0.144		ND		0.00523	0.00131	0.0112		ND		0.00174	0.00043	0.00371
LVB	LVBCC05	Common carp	0.0476	0.0111	0.264		ND		0.00626	0.00146	0.0347		ND		0.00061	0.00014	0.00340
LVB	LVBCC06	Common carp	0.0735	0.0172	0.285		ND		0.00333	0.00078	0.0129		ND		0.00360	0.00084	0.0140
PNWR	PNWRCC01	Common carp	0.0168	0.00374	0.105		ND		0.00001	0.00000	0.00007	0.00016	0.00004	0.00098		ND	
PNWR	PNWRCC02	Common carp	0.0364	0.00958	0.427		ND			ND			ND			ND	
PNWR	PNWRCC03	Common carp	0.0155	0.00372	0.177		ND			ND			ND			ND	
PNWR	PNWRCC04	Common carp	0.0244	0.00496	0.348		ND			ND			ND			ND	
PNWR	PNWRCC05	Common carp	0.0172	0.00409	0.184		ND		0.00002	0.00001	0.00023		ND			ND	
PNWR	PNWRLM01	Largemouth bass	0.0340	0.00819	0.435		ND			ND			ND			ND	
Minimum LOC				**na**			**na**			**na**			**na**			**6.3**	

(Continued)

Table 11. Continued

Location	Sample ID	Common Name	Chlorpyrifos			Total HCH			Total Chlordane			Total DDT			Total PCB		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	NPGS01	Green sunfish	0.00015	0.00003	0.00407	0.00005	0.00001	0.00145	0.0267	0.00505	0.707	0.0458	0.00867	1.21	0.59995	**0.114**	15.9
NP	NPGS02	Green sunfish	0.00062	0.00016	0.00351	0.00104	0.00026	0.00591	0.0638	0.0161	0.362	0.0462	0.0116	0.262	0.29533	0.0745	1.68
NP	NPGS03	Green sunfish	0.00032	0.00008	0.00293	0.00067	0.00016	0.00606	0.0571	0.0135	0.518	0.0564	0.0133	0.512	0.41636	0.0983	3.78
NP	NPGS04	Green sunfish	0.00131	0.00034	0.0102	0.00092	0.00024	0.00716	0.0907	0.0234	0.702	0.0623	0.0161	0.483	0.34859	0.0901	2.70
NP	NPGS05	Green sunfish	0.00047	0.00011	0.00347	0.00065	0.00016	0.00476	0.0595	0.0144	0.438	0.0472	0.0114	0.348	0.33755	0.0817	2.49
NP	NPGS06	Green sunfish	0.00051	0.00012	0.00413	0.00143	0.00034	0.0116	0.0674	0.0163	0.549	0.0363	0.00874	0.296	0.42468	**0.102**	3.46
NP	NPBB01	Black bullhead	0.00012	0.00003	0.00321	0.00036	0.00008	0.00963	0.00928	0.00194	0.245	0.00945	0.00197	0.250	0.10666	0.0223	2.82
NP	NPBB02	Black bullhead		ND		0.00020	0.00004	0.00659	0.0162	0.00313	0.530	0.0130	0.00249	0.423	0.14844	0.0286	4.84
NP	NPBB03	Black bullhead	0.00015	0.00003	0.00426	0.00028	0.00006	0.00820	0.0324	0.00696	0.935	0.0400	0.00858	1.15	0.20770	0.0446	5.99
DC	DCGS01	Green sunfish	0.00111	0.00028	0.00653	0.00052	0.00013	0.00304	0.0722	0.0184	0.424	0.0581	0.0148	0.341	0.54080	**0.138**	3.18
DC	DCGS02	Green sunfish	0.00032	0.00008	0.00393	0.00045	0.00011	0.00550	0.0343	0.00817	0.423	0.0497	0.0118	0.613	0.39647	0.0944	4.89
DC	DCGS04	Green sunfish		ND		0.00055	0.00013	0.00607	0.0497	0.0122	0.549	0.106	0.0261	1.17	0.39909	0.0978	4.41
DC	DCGS05	Green sunfish		ND		0.00049	0.00012	0.00381	0.0638	0.0156	0.499	0.132	0.0322	1.03	0.78010	**0.190**	6.11
DC	DCGS06	Green sunfish	0.00103	0.00026	0.00631	0.00225	0.00057	0.0137	0.0732	0.0186	0.447	0.168	0.0426	1.02	0.54170	**0.137**	3.30
DC	DCGS03	Green sunfish	0.00047	0.00011	0.00285	0.01199	0.00284	0.0728	0.0418	0.00988	0.253	0.0722	0.0171	0.438	0.34053	0.0806	2.07
PB	LVWCC01	Common carp		ND		0.0188	0.00482	0.137	0.105	0.0269	0.766	0.199	0.0509	1.45	1.13299	**0.290**	8.23
PB	LVWCC02	Common carp		ND		0.0241	0.00613	0.127	0.167	0.0426	0.882	0.192	0.0490	1.02	1.37628	**0.351**	7.26
PB	LVWCC03	Common carp		ND		0.0396	0.0112	0.167	0.200	0.0565	0.840	0.485	0.137	2.04	1.81169	**0.513**	7.63
PB	LVWGS01	Green sunfish		ND		0.0111	0.00278	0.0814	0.0383	0.00958	0.281	0.0358	0.00896	0.262	0.40137	**0.100**	2.94
PB	LVWGS02	Green sunfish		ND		0.0493	0.0147	0.173	0.126	0.0375	0.443	0.165	0.0493	0.582	0.85416	**0.255**	3.01
PB	LVWGS03	Green sunfish		ND		0.0549	0.0134	0.202	0.124	0.0303	0.455	0.211	0.0516	0.776	1.17925	**0.289**	4.34
PB	LVWGS04	Green sunfish		ND		0.0144	0.00353	0.122	0.0500	0.0123	0.425	0.0747	0.0183	0.634	0.49019	**0.120**	4.16
LVB	LVBCC01	Common carp		ND		0.0573	0.0186	0.144	0.0238	0.00771	0.0600	0.268	0.0870	0.677	0.33651	**0.109**	0.849
LVB	LVBCC02	Common carp		ND		0.00152	0.00030	0.0154	0.00713	0.00139	0.0719	0.130	0.0255	1.31	0.27269	0.0533	2.75
LVB	LVBCC03	Common carp		ND		0.00050	0.00016	0.00528	0.00553	0.00179	0.0589	0.128	0.0415	1.36	0.20506	0.0665	2.18
LVB	LVBCC04	Common carp	0.00025	0.00006	0.00053	0.00540	0.00135	0.0115	0.0554	0.0139	0.118	0.859	0.215	1.84	0.85532	**0.214**	1.83
LVB	LVBCC05	Common carp		ND		0.0292	0.00680	0.162	0.0749	0.0174	0.415	1.36	0.317	7.55	0.87996	**0.205**	4.88
LVB	LVBCC06	Common carp		ND		0.107	0.0249	0.414	0.0614	0.0143	0.238	1.32	0.309	5.12	1.76768	**0.413**	6.86
PNWR	PNWRCC01	Common carp		ND		0.00071	0.00016	0.00439	0.00094	0.00021	0.00583	0.0105	0.00234	0.0652	0.01906	0.00425	0.119
PNWR	PNWRCC02	Common carp		ND		0.00044	0.00011	0.00511	0.00021	0.00006	0.00248	0.00501	0.00132	0.0588	0.01915	0.00504	0.225
PNWR	PNWRCC03	Common carp		ND		0.00031	0.00007	0.00357	0.00060	0.00014	0.00686	0.00446	0.00107	0.0509	0.06086	0.0146	0.695
PNWR	PNWRCC04	Common carp		ND		0.00011	0.00002	0.00155	0.00102	0.00021	0.0145	0.00430	0.00087	0.0612	0.01595	0.00324	0.227
PNWR	PNWRCC05	Common carp	0.00023	0.00005	0.00244	0.00090	0.00021	0.00962	0.00061	0.00014	0.00651	0.00358	0.00085	0.0384	0.06792	0.0162	0.727
PNWR	PNWRLM01	Largemouth bass		ND		0.00029	0.00007	0.00375	0.00030	0.00007	0.00390	0.00417	0.00101	0.0535	0.01547	0.00373	0.198
Minimum LOC				**0.0004**			**na**			**0.1**			**na**			**0.1**	

(Continued)

Table 11. Continued

Location	Sample ID	Common Name	Toxaphene		
			dw	ww	ln
NP	NPGS01	Green sunfish		ND	
NP	NPGS02	Green sunfish		ND	
NP	NPGS03	Green sunfish		ND	
NP	NPGS04	Green sunfish		ND	
NP	NPGS05	Green sunfish		ND	
NP	NPGS06	Green sunfish		ND	
NP	NPBB01	Black bullhead		ND	
NP	NPBB02	Black bullhead		ND	
NP	NPBB03	Black bullhead		ND	
DC	DCGS01	Green sunfish		ND	
DC	DCGS02	Green sunfish		ND	
DC	DCGS04	Green sunfish		ND	
DC	DCGS05	Green sunfish		ND	
DC	DCGS06	Green sunfish		ND	
DC	DCGS03	Green sunfish		ND	
PB	LVWCC01	Common carp		ND	
PB	LVWCC02	Common carp		ND	
PB	LVWCC03	Common carp		ND	
PB	LVWGS01	Green sunfish		ND	
PB	LVWGS02	Green sunfish		ND	
PB	LVWGS03	Green sunfish		ND	
PB	LVWGS04	Green sunfish		ND	
LVB	LVBCC01	Common carp		ND	
LVB	LVBCC02	Common carp		ND	
LVB	LVBCC03	Common carp		ND	
LVB	LVBCC04	Common carp		ND	
LVB	LVBCC05	Common carp		ND	
LVB	LVBCC06	Common carp		ND	
PNWR	PNWRCC01	Common carp		ND	
PNWR	PNWRCC02	Common carp		ND	
PNWR	PNWRCC03	Common carp		ND	
PNWR	PNWRCC04	Common carp		ND	
PNWR	PNWRCC05	Common carp		ND	
PNWR	PNWRLM01	Largemouth bass		ND	
Minimum LOC				**0.4**	

ND, not detected; NA, not analyzed or not available; dw, dry weight residue; ww, wet weight residue; ln, lipid-normalized residue; LOC, level of concern.

[*] Each data point represents a concentration in an individual fish.

Notes:

Non-detect values for the concentrations of individual constituents were ignored. Detection limits were not determined for chlordane.

LOCs were taken from Table 18.

Table 12. Concentrations of Inorganic Contaminants of Potential Concern in Individual [*] Whole Fish Collected From the Las Vegas Wash and Its Tributaries (Units: mg/kg)

Location	Sample ID	Common Name	Al		As		Ba		Be		B		Cd	
			dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww
NP	NPGS01	Green sunfish	22	4.3	0.30	0.07	1.5	0.3	ND		ND		ND	
NP	NPGS02	Green sunfish	220	57	0.66	0.17	4.5	1.2	ND		4	0.9	ND	
NP	NPGS03	Green sunfish	67	17	0.30	0.09	3.3	0.85	ND		3	0.7	ND	
NP	NPGS04	Green sunfish	32	8.3	0.30	0.08	4.1	1.1	ND		ND		ND	
NP	NPGS05	Green sunfish	ND		0.30	0.07	2.4	0.61	ND		ND		ND	
NP	NPGS06	Green sunfish	ND		ND		2.5	0.63	ND		4	0.9	ND	
NP	NPBB01	Black bullhead	380	78.2	0.30	0.07	16	3.2	ND		6	1	ND	
NP	NPBB02	Black bullhead	44	9.1	ND		6.4	1.3	ND		3	0.5	ND	
NP	NPBB03	Black bullhead	19	4.3	ND		9.7	2.2	ND		ND		ND	
DC	DCGS01	Green sunfish	18	4.9	0.30	0.07	1.6	0.45	ND		3	0.7	ND	
DC	DCGS02	Green sunfish	89	22	0.40	0.09	2.0	0.48	ND		3	0.9	ND	
DC	DCGS03	Green sunfish	69	17	0.40	0.10	1.8	0.45	ND		3	0.8	ND	
DC	DCGS04	Green sunfish	25	6.0	0.30	0.07	0.97	0.24	ND		3	0.7	ND	
DC	DCGS05	Green sunfish	58	15	0.30	0.09	1.3	0.34	ND		5	1	ND	
DC	DCGS06	Green sunfish	40	11	0.40	0.10	0.86	0.24	ND		ND		ND	
PB	LVWCC01	Common carp	ND		ND		5.6	1.5	ND		ND		ND	
PB	LVWCC02	Common carp	15	3.9	0.50	0.1	2.8	0.75	ND		ND		ND	
PB	LVWCC03	Common carp	5.0	1.0	0.88	**0.25**	2.2	0.64	ND		ND		ND	
PB	LVWGS01	Green sunfish	12	3.1	ND		1.1	0.28	ND		ND		ND	
PB	LVWGS02	Green sunfish	ND		0.50	0.10	0.6	0.2	ND		ND		ND	
PB	LVWGS03	Green sunfish	7.6	2.2	0.50	0.20	1.3	0.38	ND		ND		ND	
PB	LVWGS04	Green sunfish	68	18	0.30	0.08	2.9	0.74	ND		ND		ND	
LVB	LVBCC01	Common carp	300	100	0.60	0.20	11	3.8	ND		ND		ND	
LVB	LVBCC02	Common carp	480	114	**1.1**	**0.27**	30	7.1	ND		ND		0.3	**0.07**
LVB	LVBCC03	Common carp	680	143	**1.4**	**0.30**	26	5.5	ND		ND		0.61	**0.13**
LVB	LVBCC04	Common carp	150	49	0.60	0.19	9.5	3.1	ND		ND		ND	
LVB	LVBCC05	Common carp	9.6	2.5	0.30	0.09	3.7	0.95	ND		ND		ND	
LVB	LVBCC06	Common carp	5.0	1.0	0.40	0.10	6.5	1.6	ND		ND		0.2	0.04
PNWR	PNWRCC01	Common carp	ND		ND		3.6	0.99	ND		ND		ND	
PNWR	PNWRCC02	Common carp	ND		ND		6.2	1.3	ND		ND		ND	
PNWR	PNWRCC03	Common carp	ND		ND		4.7	1.2	ND		ND		ND	
PNWR	PNWRCC04	Common carp	20	4.5	ND		14	3.1	ND		ND		ND	
PNWR	PNWRCC05	Common carp	4.0	0.9	0.40	0.09	5	1.2	ND		ND		ND	
PNWR	PNWRLM01	Largemouth bass	11	2.4	0.30	0.06	2.9	0.67	ND		ND		ND	
Minimum LOC				**na**	**1**	**0.22**		**na**		**na**		**na**		**0.05**

(Continued)

Table 12. Continued

Location	Sample ID	Common Name	Cr		Cu		Fe		Hg		Mg		Mn	
			dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww
NP	NPGS01	Green sunfish	0.7	0.1	1.3	0.26	66	13	ND		2900	570	9	1.8
NP	NPGS02	Green sunfish	1.0	0.33	2.9	0.73	180	46	ND		2500	650	9	2.3
NP	NPGS03	Green sunfish	1.0	0.3	1.8	0.48	89	23	ND		2500	640	11	2.8
NP	NPGS04	Green sunfish	42	**11**	10	**2.7**	260	68	ND		2100	540	16	4.2
NP	NPGS05	Green sunfish	ND		1.3	0.32	34	8.5	0.2	0.04	2100	540	6.9	1.8
NP	NPGS06	Green sunfish	2.4	0.6	1.1	0.27	53	13	ND		2000	510	7.4	1.8
NP	NPBB01	Black bullhead	1.9	0.39	5.3	**1.1**	370	76	ND		2900	600	40	8.3
NP	NPBB02	Black bullhead	3.2	0.67	4.3	**0.91**	200	41	ND		2600	540	37	7.8
NP	NPBB03	Black bullhead	24	**5.4**	3.4	0.78	250	57	ND		2700	620	50	11
DC	DCGS01	Green sunfish	6	1.6	1.7	0.45	85	23	ND		1700	460	21	5.6
DC	DCGS02	Green sunfish	2.1	0.52	1.7	0.43	110	26	ND		2000	500	21	5.1
DC	DCGS03	Green sunfish	ND		1.6	0.41	83	21	ND		2100	530	17	4.4
DC	DCGS04	Green sunfish	0.6	0.1	1.3	0.31	56	14	ND		1700	420	22	5.3
DC	DCGS05	Green sunfish	1.0	0.34	1.3	0.34	84	22	ND		2000	510	19	4.9
DC	DCGS06	Green sunfish	0.7	0.2	1.4	0.38	69	19	ND		1700	460	20	5.4
PB	LVWCC01	Common carp	1.0	0.34	5.1	**1.4**	120	34	ND		1900	530	9.1	2.5
PB	LVWCC02	Common carp	ND		3.4	**0.90**	150	39	ND		1700	450	10	2.7
PB	LVWCC03	Common carp	ND		8.4	**2.4**	230	65	ND		1400	400	9.8	2.8
PB	LVWGS01	Green sunfish	0.8	0.2	2	0.50	50	13	ND		1700	430	12	3.1
PB	LVWGS02	Green sunfish	1.0	0.3	1.1	0.36	34	11	ND		1700	530	13	4.1
PB	LVWGS03	Green sunfish	0.9	0.3	1.2	0.34	40	12	ND		1400	420	7.4	2.2
PB	LVWGS04	Green sunfish	0.6	0.2	2	0.51	96	25	ND		1700	430	11	2.8
LVB	LVBCC01	Common carp	1.0	0.5	2.4	0.80	590	200	ND		1500	520	20	6.6
LVB	LVBCC02	Common carp	6.6	1.6	4.2	**1.0**	880	210	0.2	0.05	2500	600	32	7.6
LVB	LVBCC03	Common carp	2.9	0.61	5	**1.1**	1100	230	0.2	0.04	2700	580	30	6.4
LVB	LVBCC04	Common carp	3.4	1.1	2.6	0.84	394	130	ND		1400	470	14	4.4
LVB	LVBCC05	Common carp	0.7	0.2	6.1	**1.6**	120	31	ND		1600	400	6.9	1.8
LVB	LVBCC06	Common carp	4.5	1.1	3.8	**0.94**	205	51	0.42	0.1	1400	350	6.4	1.6
PNWR	PNWRCC01	Common carp	ND		4.8	**1.3**	100	28	ND		1300	370	6.7	1.8
PNWR	PNWRCC02	Common carp	ND		4.9	**1.0**	160	34	ND		1600	340	6.4	1.4
PNWR	PNWRCC03	Common carp	ND		1.8	0.45	120	30	ND		1600	400	5.4	1.3
PNWR	PNWRCC04	Common carp	ND		3.3	0.73	150	33	ND		1800	410	7.4	1.6
PNWR	PNWRCC05	Common carp	6	1.4	3.1	0.71	140	33	ND		1500	340	6	1.4
PNWR	PNWRLM01	Largemouth bass	11	2.5	1.8	0.40	100	23	0.2	0.04	1700	380	5	1.1
Minimum LOC				**4**		**0.9**		**na**	**0.62**	**0.17**		**na**		**na**

(Continued)

Table 12. Continued

Location	Sample ID	Common Name	Mo		Ni		Pb		Se		Sr		V	
			dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww
NP	NPGS01	Green sunfish	ND		ND		ND		**5.3**	1.1	550	110	ND	
NP	NPGS02	Green sunfish	ND		ND		0.3	0.07	**5.5**	1.4	290	74	0.6	0.1
NP	NPGS03	Green sunfish	ND		ND		ND		**4.3**	1.1	400	100	ND	
NP	NPGS04	Green sunfish	ND		18	4.8	ND		**5.2**	1.3	340	88	ND	
NP	NPGS05	Green sunfish	ND		ND		0.3	0.06	**4.7**	1.2	400	100	ND	
NP	NPGS06	Green sunfish	ND		ND		ND		**4.6**	1.2	420	110	ND	
NP	NPBB01	Black bullhead	ND		ND		0.72	0.15	2.7	0.55	360	74	1	0.2
NP	NPBB02	Black bullhead	ND		ND		0.85	0.18	1.4	0.3	450	93	0.9	0.2
NP	NPBB03	Black bullhead	ND		7.9	1.8	0.93	0.21	1.7	0.38	500	110	1	0.2
DC	DCGS01	Green sunfish	ND		2.7	0.72	ND		**6.5**	1.8	320	88	ND	
DC	DCGS02	Green sunfish	ND		0.8	0.2	ND		**7.7**	1.9	420	100	ND	
DC	DCGS03	Green sunfish	ND		ND		ND		**6.7**	1.7	270	69	ND	
DC	DCGS04	Green sunfish	ND		ND		ND		**11**	2.7	340	83	ND	
DC	DCGS05	Green sunfish	ND		ND		ND		**7.4**	1.9	370	94	ND	
DC	DCGS06	Green sunfish	ND		ND		ND		**10**	2.9	320	87	ND	
PB	LVWCC01	Common carp	ND		1	0.3	ND		**4.1**	1.1	420	120	ND	
PB	LVWCC02	Common carp	ND		1	0.32	0.6	0.1	**7.2**	1.9	300	80	ND	
PB	LVWCC03	Common carp	ND		0.9	0.2	ND		**5.3**	1.5	240	67	ND	
PB	LVWGS01	Green sunfish	ND		ND		ND		**6.1**	1.5	240	60	ND	
PB	LVWGS02	Green sunfish	ND		ND		ND		**3.5**	1.1	250	77	ND	
PB	LVWGS03	Green sunfish	ND		ND		ND		**3.5**	1	190	57	ND	
PB	LVWGS04	Green sunfish	ND		ND		ND		**4.8**	1.3	210	54	ND	
LVB	LVBCC01	Common carp	ND		1	0.3	1.7	**0.57**	**4.3**	1.4	170	58	1.6	0.5
LVB	LVBCC02	Common carp	ND		3.9	0.94	3.3	**0.8**	**5.6**	1.4	310	75	2.9	0.69
LVB	LVBCC03	Common carp	ND		1.8	0.39	2.4	**0.51**	**6.4**	1.3	190	40	3.1	0.65
LVB	LVBCC04	Common carp	ND		2.7	0.88	1.1	**0.36**	**4.6**	1.5	190	62	1	0.4
LVB	LVBCC05	Common carp	ND		0.6	0.1	1.9	**0.49**	**4.1**	1	310	80	ND	
LVB	LVBCC06	Common carp	ND		2.5	0.61	0.86	0.21	**5.3**	1.3	210	51	0.6	0.2
PNWR	PNWRCC01	Common carp	ND		ND		ND		0.9	0.25	230	62	ND	
PNWR	PNWRCC02	Common carp	ND		ND		ND		0.85	0.18	390	81	ND	
PNWR	PNWRCC03	Common carp	ND		1	0.33	ND		0.97	0.24	310	77	ND	
PNWR	PNWRCC04	Common carp	ND		ND		ND		1	0.23	380	85	ND	
PNWR	PNWRCC05	Common carp	ND		4.1	0.94	ND		1.1	0.25	270	61	ND	
PNWR	PNWRLM01	Largemouth bass	ND		5.6	1.3	ND		1.5	0.34	190	42	ND	
Minimum LOC				**na**		**na**		**0.22**	**3**			**na**		**na**

(Continued)

Table 12. Continued

Location	Sample ID	Common Name	Zn dw	Zn ww
NP	NPGS01	Green sunfish	120	**24**
NP	NPGS02	Green sunfish	94	**24**
NP	NPGS03	Green sunfish	100	**27**
NP	NPGS04	Green sunfish	100	**27**
NP	NPGS05	Green sunfish	97	**25**
NP	NPGS06	Green sunfish	79	**20**
NP	NPBB01	Black bullhead	170	**35**
NP	NPBB02	Black bullhead	150	**30**
NP	NPBB03	Black bullhead	130	**30**
DC	DCGS01	Green sunfish	82	**22**
DC	DCGS02	Green sunfish	98	**24**
DC	DCGS03	Green sunfish	100	**26**
DC	DCGS04	Green sunfish	90	**22**
DC	DCGS05	Green sunfish	83	**21**
DC	DCGS06	Green sunfish	86	**24**
PB	LVWCC01	Common carp	320	**89**
PB	LVWCC02	Common carp	290	**77**
PB	LVWCC03	Common carp	510	**140**
PB	LVWGS01	Green sunfish	88	**22**
PB	LVWGS02	Green sunfish	78.6	**25**
PB	LVWGS03	Green sunfish	65	19
PB	LVWGS04	Green sunfish	72	19
LVB	LVBCC01	Common carp	210	**71**
LVB	LVBCC02	Common carp	230	**54**
LVB	LVBCC03	Common carp	220	**46**
LVB	LVBCC04	Common carp	150	**49**
LVB	LVBCC05	Common carp	330	**85**
LVB	LVBCC06	Common carp	270	**65**
PNWR	PNWRCC01	Common carp	250	**68**
PNWR	PNWRCC02	Common carp	270	**57**
PNWR	PNWRCC03	Common carp	250	**61**
PNWR	PNWRCC04	Common carp	190	**42**
PNWR	PNWRCC05	Common carp	190	**44**
PNWR	PNWRLM01	Largemouth bass	57	13
Minimum LOC				**20**

ND, not detected; NA, not analyzed or not available; dw, dry weight residue; ww, wet weight residue; LOC, level of concern

[*] Each data point represents a concentration in an individual fish.

Notes:

Element symbols are presented in Table 1.

Wet weight based concentrations were calculated using moisture content of individual samples.

Chemical concentrations highlighted and in bold text exceed the minimum level of concern (LOC) for that chemical.

LOCs were taken from Table 19.

Some values are rounded.

Table 13. Concentrations of Organic Contaminants of Potential Concern in Individual[*] Bird Eggs Collected From the Las Vegas Wash and Its Tributaries (Units: mg/kg)

Location	Sample ID	Common Name	Aldrin			Dieldrin			Endrin			Heptachlor			Heptachlor Epoxide		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	07AC-6	American coot		ND		0.0256	0.00665	0.0458		ND		0.00177	0.00046	0.00317	0.0211	0.00548	0.0378
NP	07AC-7	American coot		ND		0.0174	0.00444	0.0305		ND		0.00045	0.00012	0.00080	0.00887	0.00226	0.0156
NP	07AC-8	American coot		ND		0.0287	0.00810	0.0519		ND			ND		0.0303	0.00853	0.0547
DC	07KD-3	Killdeer	0.00010	0.00003	0.00015	3.95	**1.17**	5.78		ND		0.00112	0.00033	0.00164	0.124	0.0368	0.182
DC	07KD-7	Killdeer		ND		0.0244	0.00750	0.0409	0.00064	0.00020	0.00108		ND		0.0395	0.0121	0.0662
DC	07KD-8	Killdeer		ND		0.0307	0.00894	0.0632	0.00048	0.00014	0.00099		ND		0.0461	0.0134	0.0949
DC	07KD-9	Killdeer		ND		0.499	**0.169**	0.707		ND		0.00157	0.00053	0.00222	0.0316	0.0107	0.0448
BSC	07KD-1	Killdeer		ND		0.0235	0.00673	0.0410		ND		0.00085	0.00024	0.00148	0.0288	0.00824	0.0502
BSC	07KD-2	Killdeer		ND		0.0174	0.00464	0.0258		ND		0.00165	0.00044	0.00245	0.0210	0.00561	0.0312
BSC	07KD-5	Killdeer		ND		0.0220	0.00615	0.0414	0.0415	0.0116	0.0782	0.00062	0.00017	0.00117	0.0137	0.00384	0.0259
BSC	07KD-6	Killdeer	0.00185	0.00055	0.00320	0.0228	0.00680	0.0393	0.00362	0.00108	0.00625		ND		0.299	**0.0894**	0.517
BVP	07AC-1	American coot		ND		0.0238	0.00605	0.0482		ND		0.00181	0.00046	0.00365	0.0231	0.00588	0.0468
BVP	07AC-2	American coot		ND		0.0123	0.00311	0.0251		ND		0.00134	0.00034	0.00275	0.0211	0.00537	0.0433
BVP	07AC-9	American coot		ND		0.0197	0.00517	0.0406	0.00053	0.00014	0.00109		ND		0.0574	0.0151	0.118
BVP	07KD-4	Killdeer	0.00009	0.00002	0.00016	0.0352	0.00940	0.0615		ND		0.00267	0.00071	0.00467	0.0486	0.0130	0.0849
BVP	07KD-10	Killdeer		ND		0.0217	0.00609	0.0348		ND			ND		0.817	**0.2287**	1.31
BVP	07KD-12	Killdeer	0.00547	0.00167	0.0124	0.135	0.0413	0.307	0.0106	0.00324	0.02403		ND		1.02	**0.313**	2.32
PB	07KD-11	Killdeer		ND		0.0900	0.0264	0.132	0.00035	0.00010	0.00051		ND		0.0466	0.0136	0.0685
PB	07RWB-1	Red-winged blackbird		ND		0.147	0.0383	0.468		ND			ND		0.0952	0.0249	0.304
PB	07RWB-2	Red-winged blackbird		ND		0.0422	0.0103	0.107		ND			ND		0.0443	0.0109	0.112
PB	07RWB-3	Red-winged blackbird		ND		0.0371	0.00738	0.0804		ND			ND		0.126	0.0251	0.273
PB	07-MW-1	Marsh wren		ND		0.0156	0.00372	0.0524	0.00021	0.00005	0.00070		ND		0.0725	0.0173	0.244
PB	07-MW-2	Marsh wren		ND		0.0493	0.0105	0.125	0.00071	0.00015	0.00181		ND		0.0600	0.0128	0.152
PNWR	07AC-3	American coot		ND		0.0154	0.00422	0.0263	0.00128	0.00035	0.00220	0.00090	0.00025	0.00154	0.0141	0.00387	0.0241
PNWR	07AC-4	American coot		ND		0.00293	0.00068	0.00786		ND		0.00041	0.00010	0.00111	0.00285	0.00066	0.00765
PNWR	07AC-5	American coot		ND		0.0201	0.00511	0.0328		ND		0.00126	0.00032	0.00205	0.0174	0.00441	0.0283
Minimum LOC				**na**			**0.15**			**0.27**			**na**			**0.04**	

(Continued)

Table 13. Continued

Location	Sample ID	Common Name	Oxychlordane			Alpha-Chlordane			Gamma-Chlordane			Trans-Nonachlor			Cis-Nonachlor		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	07AC-6	American coot	0.0135	0.00352	0.0243	0.00070	0.00018	0.00125	0.00048	0.00012	0.00086	0.00297	0.00077	0.00532	0.00098	0.00026	0.00176
NP	07AC-7	American coot	0.0137	0.00349	0.0240	0.00023	0.00006	0.00040	0.00031	0.00008	0.00055	0.00174	0.00044	0.00305		ND	
NP	07AC-8	American coot	0.0217	0.00611	0.0392	0.00056	0.00016	0.00101		ND		0.00351	0.00099	0.00634	0.00439	0.00124	0.00793
DC	07KD-3	Killdeer	0.0977	0.0289	0.143	0.00278	0.00082	0.00407		ND		0.385	0.114	0.563	0.0352	0.0104	0.0515
DC	07KD-7	Killdeer	0.00895	0.00275	0.0150	0.00030	0.00009	0.00051		ND		0.0101	0.00311	0.0170		ND	
DC	07KD-8	Killdeer	0.0153	0.00447	0.0316	0.00040	0.00012	0.00081		ND		0.0197	0.00572	0.0405	0.00340	0.00099	0.00699
DC	07KD-9	Killdeer	0.0542	0.0183	0.0768	0.00177	0.00060	0.00251		ND		0.102	0.0345	0.145	0.00033	0.00011	0.00046
BSC	07KD-1	Killdeer	0.0103	0.00294	0.0179	0.00070	0.00020	0.00122	0.00091	0.00026	0.00159	0.0134	0.00384	0.0234		ND	
BSC	07KD-2	Killdeer	0.0112	0.00298	0.0166	0.00052	0.00014	0.00077	0.00030	0.00008	0.00045	0.0136	0.00363	0.0202		ND	
BSC	07KD-5	Killdeer	0.00969	0.00271	0.0183	0.00099	0.00028	0.00187	0.00074	0.00021	0.00139	0.0160	0.00447	0.0301		ND	
BSC	07KD-6	Killdeer	0.0134	0.00400	0.0231	0.00134	0.00040	0.00232		ND		0.0122	0.00366	0.0212	0.405	0.121	0.701
BVP	07AC-1	American coot	0.00750	0.00191	0.0152	0.00043	0.00011	0.00087		ND		0.00214	0.00054	0.00432		ND	
BVP	07AC-2	American coot	0.00543	0.00138	0.0111	0.00030	0.00008	0.00061		ND		0.00133	0.00034	0.00272		ND	
BVP	07AC-9	American coot	0.00352	0.00093	0.00727	0.00025	0.00006	0.00051		ND		0.00250	0.00066	0.00517		ND	
BVP	07KD-4	Killdeer	0.0183	0.00490	0.0321		ND		0.00061	0.00016	0.00107	0.0321	0.00858	0.0561	0.00032	0.00009	0.00056
BVP	07KD-10	Killdeer		ND		0.00044	0.00012	0.00070	0.00144	0.00040	0.00230	0.0109	0.00306	0.0175		ND	
BVP	07KD-12	Killdeer	0.0380	0.0116	0.0863		ND			ND		0.164	0.05032	0.374	1.55	0.475	3.53
PB	07KD-11	Killdeer	0.0133	0.00391	0.0196	0.00058	0.00017	0.00086		ND		0.0264	0.00774	0.0389	0.00311	0.00091	0.00457
PB	07RWB-1	Red-winged blackbird	0.0705	0.0184	0.225	0.00028	0.00007	0.00090		ND		0.153	0.03990	0.488	0.0571	0.0149	0.182
PB	07RWB-2	Red-winged blackbird	0.00656	0.00161	0.0166	0.00068	0.00017	0.00173		ND		0.0143	0.00351	0.0363	0.00749	0.00184	0.0190
PB	07RWB-3	Red-winged blackbird	0.0104	0.00208	0.0226	0.00084	0.00017	0.00182		ND		0.0450	0.00895	0.0975	0.0264	0.00525	0.0571
PB	07-MW-1	Marsh wren	0.00735	0.00176	0.0247	0.00064	0.00015	0.00215	0.00136	0.00033	0.00459	0.00369	0.00088	0.0124	0.00294	0.00070	0.00991
PB	07-MW-2	Marsh wren	0.00562	0.00120	0.0142	0.00054	0.00012	0.00138		ND		0.0122	0.00262	0.0310		ND	
PNWR	07AC-3	American coot	0.00276	0.00076	0.00473	0.00027	0.00007	0.00046	0.00041	0.00011	0.00070	0.00208	0.00057	0.00355		ND	
PNWR	07AC-4	American coot	0.00384	0.00089	0.0103	0.00008	0.00002	0.00022	0.00006	0.00001	0.00016	0.00052	0.00012	0.00141		ND	
PNWR	07AC-5	American coot	0.00412	0.00105	0.00672	0.00038	0.00010	0.00063	0.00052	0.00013	0.00084	0.00303	0.00077	0.00495		ND	
Minimum LOC				**na**			**na**			**na**			**na**			**na**	

(Continued)

Table 13. Continued

Location	Sample ID	Common Name	Alpha-HCH			Beta-HCH			Delta-HCH			Gamma-HCH			DDMU		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	07AC-6	American coot		ND		0.0125	0.00324	0.0223		ND			ND		0.0265	0.00688	0.0474
NP	07AC-7	American coot		ND		0.00725	0.00185	0.0127		ND			ND		0.00894	0.00228	0.0157
NP	07AC-8	American coot		ND		0.0108	0.00305	0.0195		ND		0.00043	0.00012	0.00078	0.00831	0.00234	0.0150
DC	07KD-3	Killdeer		ND		0.0159	0.00470	0.0232		ND			ND		0.0148	0.00437	0.0216
DC	07KD-7	Killdeer		ND		0.0187	0.00574	0.0313		ND			ND		0.0208	0.00638	0.0348
DC	07KD-8	Killdeer		ND		0.0194	0.00566	0.0400		ND			ND		0.0189	0.00550	0.0389
DC	07KD-9	Killdeer		ND		0.0233	0.00789	0.0331		ND			ND		0.0143	0.00483	0.0202
BSC	07KD-1	Killdeer		ND		0.482	0.138	0.840	0.482	0.138	0.840		ND			N/A	
BSC	07KD-2	Killdeer	0.00175	0.00047	0.00260	1.88	0.503	2.80	0.00042	0.00011	0.00063		ND		0.0666	0.0178	0.0989
BSC	07KD-5	Killdeer		ND		0.656	0.184	1.24		ND			ND		0.244	0.0684	0.460
BSC	07KD-6	Killdeer		ND		0.751	0.225	1.30		ND			ND		0.759	0.227	1.31
BVP	07AC-1	American coot		ND		0.0711	0.0181	0.144	0.00046	0.00012	0.00093		ND		0.0405	0.0103	0.0819
BVP	07AC-2	American coot		ND		0.0496	0.0126	0.102	0.00010	0.00003	0.00020		ND		0.0307	0.00779	0.0629
BVP	07AC-9	American coot		ND		0.0371	0.00977	0.0766	0.00084	0.00022	0.00173	0.00042	0.00011	0.00086	0.0156	0.00411	0.0323
BVP	07KD-4	Killdeer		ND		0.0747	0.0199	0.131		ND			ND		0.0197	0.00525	0.0344
BVP	07KD-10	Killdeer		ND		0.176	0.0493	0.282	0.00073	0.00020	0.00116		ND		0.0597	0.0167	0.0955
BVP	07KD-12	Killdeer		ND		0.350	0.107	0.796		ND			ND		1.45	0.442	3.28
PB	07KD-11	Killdeer		ND		0.275	0.0805	0.404		ND		0.00101	0.00030	0.00149	0.00826	0.00242	0.0121
PB	07RWB-1	Red-winged blackbird		ND		0.121	0.0316	0.386		ND			ND		0.0560	0.0146	0.179
PB	07RWB-2	Red-winged blackbird		ND		0.136	0.0334	0.345		ND			ND		0.0191	0.00469	0.0485
PB	07RWB-3	Red-winged blackbird		ND		0.255	0.0507	0.552		ND			ND		0.0239	0.00476	0.0518
PB	07-MW-1	Marsh wren		ND		0.228	0.0545	0.768		ND			ND		0.0142	0.00341	0.0480
PB	07-MW-2	Marsh wren		ND		0.205	0.0438	0.518		ND			ND		0.0471	0.0101	0.119
PNWR	07AC-3	American coot		ND		0.00716	0.00197	0.0123		ND			ND		0.0166	0.00456	0.0284
PNWR	07AC-4	American coot		ND		0.00126	0.00029	0.00339		ND			ND		0.00242	0.00056	0.00651
PNWR	07AC-5	American coot		ND		0.0121	0.00308	0.0198		ND			ND		0.0166	0.00422	0.0271
Minimum LOC				**na**			**na**			**na**			**10**			**na**	

(Continued)

Table 13. Continued

Location	Sample ID	Common Name	o,p'-DDD			p,p'-DDD			o,p'-DDE			p,p'-DDE			o,p'-DDT		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	07AC-6	American coot		ND			ND		0.0125	0.00324	0.0223	0.522	**0.136**	0.935	0.00228	0.00059	0.00409
NP	07AC-7	American coot		ND			ND		0.00351	0.00089	0.00615	0.271	0.0692	0.476	0.00097	0.00025	0.00170
NP	07AC-8	American coot		ND		0.00033	0.00009	0.00060	0.00641	0.00181	0.0116	0.290	0.0818	0.524		ND	
DC	07KD-3	Killdeer		ND			ND		0.0128	0.00378	0.0187	0.670	**0.198**	0.980	0.00529	0.00157	0.00774
DC	07KD-7	Killdeer		ND			ND		0.0109	0.00336	0.0183	0.649	**0.199**	1.09		ND	
DC	07KD-8	Killdeer		ND			ND		0.0108	0.00315	0.0223	0.495	**0.144**	1.02		ND	
DC	07KD-9	Killdeer		ND			ND		0.00720	0.00243	0.0102	0.749	**0.253**	1.06	0.00348	0.00118	0.00493
BSC	07KD-1	Killdeer	0.103	0.029	0.179	0.00604	0.00173	0.0105	0.00184	0.00053	0.00321	0.0916	0.0262	0.160	11.9	3.41	20.8
BSC	07KD-2	Killdeer	0.00166	0.00044	0.00246		ND		0.0191	0.00509	0.0283	3.47	**0.926**	5.15	0.00510	0.00136	0.00758
BSC	07KD-5	Killdeer	0.00488	0.00137	0.00919		ND		0.0666	0.0187	0.126	12.6	**3.54**	23.8	0.016	0.00444	0.0299
BSC	07KD-6	Killdeer	0.0232	0.00694	0.0401	0.647	**0.193**	1.12	0.381	0.114	0.659	17.6	**5.27**	30.5		ND	
BVP	07AC-1	American coot		ND		0.0263	0.00668	0.0532	0.00724	0.00184	0.0146	1.84	**0.466**	3.71	0.00242	0.00062	0.00490
BVP	07AC-2	American coot		ND			ND		0.00520	0.00132	0.0107	1.46	**0.370**	2.99	0.00140	0.00036	0.00287
BVP	07AC-9	American coot		ND		0.00456	0.00120	0.00942	0.00607	0.00160	0.0125	1.20	**0.317**	2.48		ND	
BVP	07KD-4	Killdeer		ND			ND		0.00938	0.00251	0.0164	0.861	**0.230**	1.51	0.00528	0.00141	0.00922
BVP	07KD-10	Killdeer	0.00639	0.00179	0.0102	0.0105	0.00293	0.0167	0.0187	0.00523	0.0299	3.00	**0.840**	4.80		ND	
BVP	07KD-12	Killdeer		ND			ND		2.00	0.613	4.55	51.7	**15.8**	118		ND	
PB	07KD-11	Killdeer		ND		0.00079	0.00023	0.00116	0.00479	0.00140	0.00704	3.29	**0.965**	4.84		ND	
PB	07RWB-1	Red-winged blackbird		ND		0.00769	0.00201	0.0245	0.0436	0.0114	0.139	4.55	**1.19**	14.5		ND	
PB	07RWB-2	Red-winged blackbird		ND		0.00143	0.00035	0.00362	0.00798	0.00195	0.0202	0.574	**0.141**	1.45		ND	
PB	07RWB-3	Red-winged blackbird		ND			ND		0.0105	0.00209	0.0227	0.828	**0.165**	1.79		ND	
PB	07-MW-1	Marsh wren		ND		0.00364	0.00087	0.0122	0.00448	0.00107	0.0151	0.547	**0.131**	1.84		ND	
PB	07-MW-2	Marsh wren		ND		0.00814	0.00174	0.0206	0.0177	0.00378	0.0448	0.915	**0.196**	2.32		ND	
PNWR	07AC-3	American coot		ND			ND		0.00620	0.00171	0.0106	0.308	0.0847	0.528		ND	
PNWR	07AC-4	American coot		ND			ND		0.00098	0.00023	0.00263	0.319	0.0743	0.857		ND	
PNWR	07AC-5	American coot		ND			ND		0.00668	0.00170	0.0109	0.663	**0.169**	1.08	0.00045	0.00011	0.00073
Minimum LOC				**na**			**0.1**			**na**			**0.1**			**na**	

(Continued)

Table 13. Continued

Location	Sample ID	Common Name	p,p'-DDT			1,2,3,4-Tetrachlorobenzene			1,2,4,5-Tetrachlorobenzene			Hexachlorobenzene			Pentachloroanisole		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	07AC-6	American coot		ND		0.0382	0.00993	0.0685	0.0242	0.00629	0.0433	0.0553	0.0144	0.0991	0.00027	0.00007	0.00049
NP	07AC-7	American coot	0.00098	0.00025	0.00172	0.0358	0.00914	0.0629	0.0159	0.00406	0.0279	0.0383	0.00977	0.0672	0.00036	0.00009	0.00062
NP	07AC-8	American coot	0.00135	0.00038	0.00244		ND			ND		0.0454	0.0128	0.0820	0.00027	0.00008	0.00050
DC	07KD-3	Killdeer	0.00383	0.00113	0.00560	0.0406	0.0120	0.0594		ND		0.0562	0.0166	0.0823	0.00035	0.00010	0.00052
DC	07KD-7	Killdeer	0.00066	0.00020	0.00110		ND			ND		0.0522	0.0160	0.0875	0.00029	0.00009	0.00049
DC	07KD-8	Killdeer	0.00047	0.00014	0.00096		ND			ND		0.0610	0.0177	0.125	0.00034	0.00010	0.00069
DC	07KD-9	Killdeer		ND		0.0554	0.0187	0.0785	0.0156	0.00529	0.0222	0.0602	0.0203	0.0853	0.00034	0.00011	0.00048
BSC	07KD-1	Killdeer	0.0188	0.00537	0.0327	0.0197	0.00562	0.0343	0.0303	0.00868	0.0529	0.00889	0.00254	0.0155	0.0463	0.0133	0.0808
BSC	07KD-2	Killdeer	0.0208	0.00556	0.0309	0.0346	0.00923	0.0514	0.0142	0.00379	0.0211	0.0625	0.0167	0.0928	0.00022	0.00006	0.00032
BSC	07KD-5	Killdeer	0.0312	0.00872	0.0587	0.0334	0.00934	0.0628	0.0118	0.00329	0.0222	0.0448	0.0125	0.0844	0.00048	0.00013	0.00090
BSC	07KD-6	Killdeer		ND		0.0113	0.00338	0.0195	0.0134	0.00400	0.0231	0.212	0.0633	0.366	0.00016	0.00005	0.00028
BVP	07AC-1	American coot	0.00820	0.00208	0.0166	0.0631	0.0160	0.128	0.0269	0.00684	0.0544	0.0636	0.0162	0.129	0.00032	0.00008	0.00064
BVP	07AC-2	American coot		ND		0.0366	0.00929	0.0750	0.0134	0.00340	0.0275	0.0583	0.0148	0.120	0.00021	0.00005	0.00043
BVP	07AC-9	American coot		ND			ND			ND		0.0302	0.00794	0.0623	0.00075	0.00020	0.00154
BVP	07KD-4	Killdeer		ND		0.0489	0.0131	0.0855	0.0210	0.00560	0.0367	0.0546	0.0146	0.0954	0.00031	0.00008	0.00054
BVP	07KD-10	Killdeer		ND		0.00071	0.00020	0.00114		ND		0.137	0.0383	0.219	0.00019	0.00005	0.00031
BVP	07KD-12	Killdeer	0.112	0.0343	0.254	0.0295	0.00902	0.0670	0.0285	0.00872	0.0647	0.434	0.133	0.987	0.00039	0.00012	0.00089
PB	07KD-11	Killdeer		ND		0.00462	0.00135	0.00680	0.00503	0.00147	0.00739	0.0637	0.0187	0.0936	0.00032	0.00009	0.00047
PB	07RWB-1	Red-winged blackbird		ND		0.00155	0.00041	0.00495		ND		0.0600	0.0156	0.191	0.00044	0.00012	0.00141
PB	07RWB-2	Red-winged blackbird		ND		0.00146	0.00036	0.00371		ND		0.0252	0.00617	0.0639	0.00039	0.00010	0.00099
PB	07RWB-3	Red-winged blackbird		ND		0.00231	0.00046	0.00500	0.00527	0.00105	0.0114	0.0428	0.00852	0.0928	0.00025	0.00005	0.00053
PB	07-MW-1	Marsh wren		ND		0.00202	0.00048	0.00681	0.00431	0.00103	0.0145	0.0217	0.00519	0.0731	0.00016	0.00004	0.00055
PB	07-MW-2	Marsh wren		ND		0.00178	0.00038	0.00450	0.00458	0.00098	0.0116	0.0341	0.00731	0.0865	0.00018	0.00004	0.00046
PNWR	07AC-3	American coot		ND		0.0439	0.0121	0.0751	0.0155	0.00426	0.0265	0.0486	0.0134	0.0832	0.00039	0.00011	0.00066
PNWR	07AC-4	American coot		ND		0.0220	0.00513	0.0592	0.00949	0.00221	0.0255	0.0127	0.00296	0.0342	0.00012	0.00003	0.00033
PNWR	07AC-5	American coot		ND		0.0439	0.0111	0.0716	0.0177	0.00449	0.0288	0.0451	0.0114	0.0735	0.00045	0.00011	0.00073
Minimum LOC				0.2			na			na			6.2			na	

(Continued)

Table 13. Continued

Location	Sample ID	Common Name	Pentachlorobenzene			Endosulfan II			Endosulfan I			Endosulfan Sulfate			Mirex		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	07AC-6	American coot	0.00097	0.00025	0.00174		ND			ND			ND			ND	
NP	07AC-7	American coot	0.00091	0.00023	0.00159		ND			ND			ND		0.00022	0.00006	0.00038
NP	07AC-8	American coot		ND			ND			ND			ND		0.00111	0.00031	0.00200
DC	07KD-3	Killdeer	0.00103	0.00030	0.00150		ND			ND			ND		0.00386	0.00114	0.00565
DC	07KD-7	Killdeer		ND			ND		0.00272	0.00084	0.00456		ND		0.00050	0.00016	0.00085
DC	07KD-8	Killdeer		ND			ND		0.00715	0.00208	0.0147		ND		0.00116	0.00034	0.00238
DC	07KD-9	Killdeer	0.00174	0.00059	0.00246		ND		0.139	0.0470	0.197		ND		0.00627	0.00212	0.00888
BSC	07KD-1	Killdeer	0.00044	0.00013	0.00076	0.00214	0.00061	0.00373		ND		0.00605	0.00173	0.0105		ND	
BSC	07KD-2	Killdeer	0.00231	0.00062	0.00343		ND		0.00698	0.00186	0.0104		ND			ND	
BSC	07KD-5	Killdeer	0.00121	0.00034	0.00229		ND		0.00775	0.00217	0.0146		ND		0.00012	0.00003	0.00022
BSC	07KD-6	Killdeer	0.0875	0.0262	0.151		ND			ND			ND		0.0105	0.00313	0.0181
BVP	07AC-1	American coot	0.00396	0.00101	0.00801		ND			ND			ND			ND	
BVP	07AC-2	American coot	0.00316	0.00080	0.00647		ND			ND			ND			ND	
BVP	07AC-9	American coot		ND			ND			ND			ND		0.00517	0.00136	0.0107
BVP	07KD-4	Killdeer	0.00106	0.00028	0.00185		ND		0.0149	0.00397	0.02596		ND		0.00195	0.00052	0.00340
BVP	07KD-10	Killdeer	0.0167	0.00466	0.0266		ND			ND			ND			ND	
BVP	07KD-12	Killdeer	0.176	0.0538	0.400		ND		0.0310	0.00950	0.0706		ND			ND	
PB	07KD-11	Killdeer	0.0133	0.00389	0.0195		ND		0.0212	0.00620	0.0311		ND		0.00452	0.00132	0.00664
PB	07RWB-1	Red-winged blackbird		ND			ND		0.108	0.02820	0.345		ND		0.0106	0.00278	0.03396
PB	07RWB-2	Red-winged blackbird	0.00869	0.00213	0.0220		ND		0.00515	0.00126	0.0131		ND		0.00214	0.00052	0.00541
PB	07RWB-3	Red-winged blackbird	0.0148	0.00295	0.0322		ND		0.0219	0.00435	0.0474		ND		0.00564	0.00112	0.0122
PB	07-MW-1	Marsh wren	0.0176	0.00420	0.0591		ND		0.00627	0.00150	0.0211		ND		0.00615	0.00147	0.0207
PB	07-MW-2	Marsh wren	0.0105	0.00225	0.0266		ND		0.00796	0.00170	0.0202		ND		0.00637	0.00136	0.0161
PNWR	07AC-3	American coot	0.00143	0.00039	0.00245		ND			ND			ND			ND	
PNWR	07AC-4	American coot	0.00065	0.00015	0.00174		ND			ND			ND		0.00012	0.00003	0.00033
PNWR	07AC-5	American coot	0.00169	0.00043	0.00276		ND			ND			ND			ND	
Minimum LOC				**na**			**na**			**na**			**na**			**20**	

(Continued)

Table 13. Continued

Location	Sample ID	Common Name	Chlorpyrifos			Total HCH			Total Chlordane			Total DDT		
			dw	ww	ln	dw	ww	ln	dw	ww	ln	dw	ww	ln
NP	07AC-6	American coot		ND		0.0125	0.00324	0.0223	0.0415	0.0108	0.0744	0.563	0.146	1.01
NP	07AC-7	American coot		ND		0.00725	0.00185	0.0127	0.0253	0.00644	0.0443	0.286	0.0729	0.501
NP	07AC-8	American coot	0.00410	0.00116	0.00741	0.0112	0.00317	0.0203	0.0604	0.0170	0.109	0.307	0.0865	0.554
DC	07KD-3	Killdeer		ND		0.0159	0.00470	0.0232	0.646	0.191	0.945	0.707	0.209	1.03
DC	07KD-7	Killdeer	0.00168	0.00052	0.00281	0.0187	0.00574	0.0313	0.0589	0.0181	0.0987	0.681	0.209	1.14
DC	07KD-8	Killdeer	0.00250	0.00073	0.00515	0.0194	0.00566	0.0400	0.0849	0.0247	0.175	0.525	0.153	1.08
DC	07KD-9	Killdeer		ND		0.0233	0.00789	0.0331	0.192	0.0647	0.271	0.774	0.262	1.10
BSC	07KD-1	Killdeer		ND			ND		0.482	0.138	0.840	0.0550	0.0157	0.0958
BSC	07KD-2	Killdeer		ND		1.88	0.503	2.80	0.0483	0.0129	0.0717	3.58	0.956	5.32
BSC	07KD-5	Killdeer		ND		0.656	0.184	1.24	0.0417	0.0117	0.0786	13.0	3.64	24.5
BSC	07KD-6	Killdeer	0.00080	0.00024	0.00137	0.751	0.225	1.30	0.731	0.219	1.26	19.4	5.81	33.6
BVP	07AC-1	American coot		ND		0.0715	0.0182	0.145	0.0350	0.00889	0.0708	1.92	0.488	3.88
BVP	07AC-2	American coot		ND		0.0497	0.0126	0.102	0.0295	0.00750	0.0605	1.49	0.379	3.06
BVP	07AC-9	American coot	0.00066	0.00017	0.00137	0.0384	0.0101	0.0792	0.0637	0.0167	0.131	1.23	0.324	2.54
BVP	07KD-4	Killdeer		ND		0.0747	0.0199	0.131	0.103	0.0274	0.179	0.896	0.239	1.57
BVP	07KD-10	Killdeer	0.00108	0.00030	0.00172	0.177	0.0495	0.283	0.830	0.232	1.33	3.10	0.867	4.95
BVP	07KD-12	Killdeer		ND		0.350	0.107	0.796	2.78	0.849	6.31	55.3	16.9	126
PB	07KD-11	Killdeer	0.00155	0.00045	0.00228	0.276	0.0808	0.405	0.0900	0.0264	0.132	3.31	0.969	4.86
PB	07RWB-1	Red-winged blackbird	0.00223	0.00058	0.00711	0.121	0.0316	0.386	0.376	0.0981	1.20	4.66	1.22	14.9
PB	07RWB-2	Red-winged blackbird	0.00160	0.00039	0.00405	0.136	0.0334	0.345	0.0734	0.0180	0.186	0.603	0.148	1.53
PB	07RWB-3	Red-winged blackbird	0.00108	0.00022	0.00235	0.255	0.0507	0.552	0.209	0.0415	0.452	0.862	0.172	1.87
PB	07-MW-1	Marsh wren	0.00093	0.00022	0.00314	0.228	0.0545	0.768	0.0885	0.0211	0.298	0.570	0.136	1.92
PB	07-MW-2	Marsh wren	0.00174	0.00037	0.00441	0.205	0.0438	0.518	0.0784	0.0168	0.199	0.988	0.211	2.50
PNWR	07AC-3	American coot		ND		0.00716	0.00197	0.0123	0.0205	0.00563	0.0351	0.331	0.0910	0.567
PNWR	07AC-4	American coot		ND		0.00126	0.00029	0.00339	0.00776	0.00181	0.0209	0.322	0.0751	0.866
PNWR	07AC-5	American coot		ND		0.0121	0.00308	0.0198	0.0267	0.00677	0.0435	0.687	0.175	1.12
Minimum LOC				na			na			na			na	

(Continued)

Table 13. Continued

Location	Sample ID	Common Name	Total PCB			Toxaphene		
			dw	ww	ln	dw	ww	ln
NP	07AC-6	American coot	0.488	0.127	0.875		ND	
NP	07AC-7	American coot	0.308	0.0785	0.540		ND	
NP	07AC-8	American coot	0.531	0.150	0.959		ND	
DC	07KD-3	Killdeer	1.96	0.580	2.87		ND	
DC	07KD-7	Killdeer	1.31	0.402	2.19		ND	
DC	07KD-8	Killdeer	0.638	0.186	1.31		ND	
DC	07KD-9	Killdeer	1.77	0.599	2.51		ND	
BSC	07KD-1	Killdeer	12.2	3.48	21.2	1.5	0.43	2.6
BSC	07KD-2	Killdeer	1.08	0.287	1.60		ND	
BSC	07KD-5	Killdeer	1.40	0.392	2.64		ND	
BSC	07KD-6	Killdeer	4.98	1.49	8.60		ND	
BVP	07AC-1	American coot	0.620	0.157	1.25		ND	
BVP	07AC-2	American coot	0.514	0.131	1.05		ND	
BVP	07AC-9	American coot	0.435	0.114	0.898		ND	
BVP	07KD-4	Killdeer	1.69	0.450	2.95		ND	
BVP	07KD-10	Killdeer	1.80	0.504	2.88		ND	
BVP	07KD-12	Killdeer	16.2	4.95	36.8		ND	
PB	07KD-11	Killdeer	1.01	0.296	1.49		ND	
PB	07RWB-1	Red-winged blackbird	6.20	1.62	19.8		ND	
PB	07RWB-2	Red-winged blackbird	1.10	0.27	2.79		ND	
PB	07RWB-3	Red-winged blackbird	3.01	0.599	6.52		ND	
PB	07-MW-1	Marsh wren	3.20	0.764	10.77		ND	
PB	07-MW-2	Marsh wren	2.84	0.607	7.19		ND	
PNWR	07AC-3	American coot	0.105	0.0289	0.180		ND	
PNWR	07AC-4	American coot	0.129	0.0301	0.347		ND	
PNWR	07AC-5	American coot	0.298	0.0757	0.486		ND	
Minimum LOC				**16**			**50**	

dw, dry weight residue; HCB, hexachlorobenzene; ln, lipid-normalized residue; LOC, level of concern; NA, not analyzed or not available; ND, not detected; ww, wet weight residue.

[*] Each data point represents a concentration in a single bird egg.

<u>Notes:</u>

Chemical concentrations highlighted and in bold text exceed the minimum level of concern (LOC) for that chemical.

LOCs were taken from Table 20.

Table 14. Concentrations of Inorganic Contaminants of Potential Concern in Individual[*] Bird Eggs Collected From the Las Vegas Wash and Its Tributaries (Units: mg/kg)

Location	Sample ID	Common Name	Al		As		Ba		Be		B		Cd	
			dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww
NP	07AC-6	American coot	ND		0.74	0.19	5	1.3	ND		ND		ND	
NP	07AC-7	American coot	ND		0.64	0.16	4.1	1	ND		ND		ND	
NP	07AC-8	American coot	ND		ND		2.9	0.81	ND		3	1	ND	
DC	07KD-3	Killdeer	ND		ND		1.1	0.33	ND		ND		ND	
DC	07KD-7	Killdeer	ND		ND		1.8	0.56	ND		ND		ND	
DC	07KD-8	Killdeer	ND		ND		0.84	0.24	ND		ND		ND	
DC	07KD-9	Killdeer	ND		ND		0.3	0.1	ND		ND		ND	
BSC	07KD-1	Killdeer	ND		ND		1.2	0.34	ND		ND		ND	
BSC	07KD-2	Killdeer	ND		ND		1.5	0.4	ND		ND		ND	
BSC	07KD-5	Killdeer	ND		ND		0.82	0.23	ND		ND		ND	
BSC	07KD-6	Killdeer	ND		ND		2.1	0.64	ND		ND		ND	
BVP	07AC-1	American coot	ND		ND		5.2	1.3	ND		ND		ND	
BVP	07AC-2	American coot	ND		ND		2.8	0.72	ND		ND		ND	
BVP	07AC-9	American coot	ND		ND		6.1	1.6	ND		ND		ND	
BVP	07KD-4	Killdeer	ND		ND		2.3	0.6	ND		3	0.7	ND	
BVP	07KD-10	Killdeer	ND		ND		0.83	0.23	ND		ND		ND	
BVP	07KD-12	Killdeer	ND		ND		2	0.62	ND		3	0.8	ND	
PB	07KD-11	Killdeer	ND		ND		0.4	0.1	ND		ND		ND	
PB	07RWB-1	Red-winged blackbird	ND		0.6	0.2	3.1	0.82	ND		3	0.9	ND	
PB	07RWB-2	Red-winged blackbird	ND		0.4	0.1	2.7	0.66	ND		ND		ND	
PB	07RWB-3	Red-winged blackbird	ND		0.4	0.08	3	0.59	ND		ND		ND	
PB	07MW-1	Marsh wren	ND		0.5	0.1	2.1	0.5	ND		ND		ND	
PB	07MW-2	Marsh wren	ND		0.3	0.06	3	0.65	ND		ND		ND	
PNWR	07AC-3	American coot	ND		0.4	0.1	4.8	1.3	ND		ND		ND	
PNWR	07AC-4	American coot	ND		0.4	0.1	8.1	1.9	ND		3	0.6	ND	
PNWR	07AC-5	American coot	ND		0.3	0.09	3.2	0.81	ND		ND		ND	
Minimum LOC				**na**		**1.3**		**na**		**na**		**3.2**		**na**

(Continued)

Table 14. Continued

Location	Sample ID	Common Name	Cr		Cu		Fe		Hg		Mg		Mn	
			dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww
NP	07AC-6	American coot	ND		2.8	0.74	100	26	ND		490	130	1	0.3
NP	07AC-7	American coot	ND		2.4	0.61	130	32	ND		560	140	2.2	0.57
NP	07AC-8	American coot	ND		2.2	0.61	98	28	ND		460	130	1.5	0.43
DC	07KD-3	Killdeer	ND		3	0.88	92	27	0.2	**0.06**	380	110	0.6	0.2
DC	07KD-7	Killdeer	ND		3	0.94	100	31	0.2	**0.05**	430	130	2.7	0.82
DC	07KD-8	Killdeer	ND		3.7	1.1	100	30	0.36	**0.11**	400	120	1	0.44
DC	07KD-9	Killdeer	ND		3.1	1.0	98	33	0.2	**0.06**	370	130	1	0.3
BSC	07KD-1	Killdeer	ND		3.2	0.9	74	21	0.3	**0.07**	420	120	1.9	0.53
BSC	07KD-2	Killdeer	ND		3.3	0.89	110	29	0.46	**0.12**	340	92	1	0.35
BSC	07KD-5	Killdeer	ND		3.5	0.97	91	25	ND		490	140	1.5	0.43
BSC	07KD-6	Killdeer	ND		2.6	0.78	130	38	ND		370	110	1	0.32
BVP	07AC-1	American coot	ND		3.8	0.97	110	27	ND		630	160	2.4	0.62
BVP	07AC-2	American coot	ND		5.4	1.4	110	28	ND		680	170	2.5	0.63
BVP	07AC-9	American coot	ND		3.7	0.98	100	26	ND		560	150	1.7	0.44
BVP	07KD-4	Killdeer	ND		3.1	0.83	120	32	0.82	**0.22**	410	110	0.9	0.2
BVP	07KD-10	Killdeer	ND		2.8	0.79	93	26	ND		390	110	1.6	0.44
BVP	07KD-12	Killdeer	ND		3.5	1.1	120	36	ND		460	140	ND	
PB	07KD-11	Killdeer	ND		3.3	0.96	110	32	ND		360	110	1	0.44
PB	07RWB-1	Red-winged blackbird	ND		3.2	0.83	170	44	ND		540	140	6	1.6
PB	07RWB-2	Red-winged blackbird	ND		2.3	0.56	170	43	ND		310	77	4.1	1
PB	07RWB-3	Red-winged blackbird	ND		2.1	0.43	140	28	ND		410	82	3.3	0.66
PB	07MW-1	Marsh wren	ND		4	0.96	140	34	ND		680	160	4.7	1.1
PB	07MW-2	Marsh wren	ND		2.9	0.61	120	27	ND		380	80	2.9	0.63
PNWR	07AC-3	American coot	1	0.3	3	0.82	98	27	ND		520	140	3.9	1.1
PNWR	07AC-4	American coot	ND		3.9	0.91	130	31	0.32	**0.08**	780	180	4	0.94
PNWR	07AC-5	American coot	ND		2.5	0.64	110	29	0.44	**0.11**	460	120	2.8	0.72
Minimum LOC				**na**		**na**		**na**	**1**	**0.05**		**na**		**na**

(Continued)

Table 14. Continued

Location	Sample ID	Common Name	Mo		Ni		Pb		Se		Sr		V	
			dw	ww	dw	ww	dw	ww	dw	ww	dw	ww	dw	ww
NP	07AC-6	American coot	ND		ND		ND		3.4	0.9	17	4.4	ND	
NP	07AC-7	American coot	ND		ND		ND		3.4	0.87	26	6.6	ND	
NP	07AC-8	American coot	ND		ND		ND		2.4	0.67	23	6.4	ND	
DC	07KD-3	Killdeer	ND		ND		ND		2.8	0.83	15	4.5	ND	
DC	07KD-7	Killdeer	ND		ND		ND		4.5	1.4	24	7.3	ND	
DC	07KD-8	Killdeer	ND		ND		ND		3.3	0.96	21	6	ND	
DC	07KD-9	Killdeer	ND		ND		ND		5	1.7	14	4.8	ND	
BSC	07KD-1	Killdeer	ND		ND		ND		2.2	0.64	22	6.3	ND	
BSC	07KD-2	Killdeer	ND		ND		ND		2.6	0.69	13	3.5	ND	
BSC	07KD-5	Killdeer	ND		ND		ND		3	0.83	35	9.7	ND	
BSC	07KD-6	Killdeer	ND		ND		ND		3.3	0.99	23	6.8	ND	
BVP	07AC-1	American coot	ND		ND		ND		4.4	1.1	29	7.5	ND	
BVP	07AC-2	American coot	ND		ND		ND		4.1	1	21	5.2	ND	
BVP	07AC-9	American coot	ND		ND		ND		2.7	0.71	49	13	ND	
BVP	07KD-4	Killdeer	ND		ND		ND		3.3	0.88	16	4.3	ND	
BVP	07KD-10	Killdeer	ND		ND		ND		6.2	1.7	14	3.8	ND	
BVP	07KD-12	Killdeer	ND		ND		ND		5.4	1.6	18	5.4	ND	
PB	07KD-11	Killdeer	ND		ND		ND		4	1.2	11	3.3	ND	
PB	07RWB-1	Red-winged blackbird	ND		ND		ND		8.9	2.3	96	25	ND	
PB	07RWB-2	Red-winged blackbird	ND		ND		ND		9	2.2	26	6.4	ND	
PB	07RWB-3	Red-winged blackbird	ND		ND		ND		6.9	1.4	22	4.4	ND	
PB	07MW-1	Marsh wren	ND		ND		ND		8.8	2.1	130	30	ND	
PB	07MW-2	Marsh wren	ND		ND		ND		8.9	1.9	23	5.0	ND	
PNWR	07AC-3	American coot	ND		ND		ND		2.4	0.66	12	3.3	ND	
PNWR	07AC-4	American coot	ND		ND		ND		2.7	0.63	36	8.4	ND	
PNWR	07AC-5	American coot	ND		ND		ND		3.2	0.81	7.6	1.9	ND	
Minimum LOC				**16**		**na**		**na**		**3**		**na**		**na**

(Continued)

Table 14. Continued

Location	Sample ID	Common Name	Zn	
			dw	ww
NP	07AC-6	American coot	71	19
NP	07AC-7	American coot	80	20
NP	07AC-8	American coot	71	20
DC	07KD-3	Killdeer	47	14
DC	07KD-7	Killdeer	55	17
DC	07KD-8	Killdeer	56	16
DC	07KD-9	Killdeer	48	16
BSC	07KD-1	Killdeer	47	14
BSC	07KD-2	Killdeer	50	13
BSC	07KD-5	Killdeer	55	15
BSC	07KD-6	Killdeer	55	16
BVP	07AC-1	American coot	56	14
BVP	07AC-2	American coot	59	15
BVP	07AC-9	American coot	57	15
BVP	07KD-4	Killdeer	62	17
BVP	07KD-10	Killdeer	49	14
BVP	07KD-12	Killdeer	44	14
PB	07KD-11	Killdeer	45	13
PB	07RWB-1	Red-winged blackbird	63	16
PB	07RWB-2	Red-winged blackbird	51	13
PB	07RWB-3	Red-winged blackbird	61	12
PB	07MW-1	Marsh wren	63	15
PB	07MW-2	Marsh wren	58	12
PNWR	07AC-3	American coot	64	18
PNWR	07AC-4	American coot	71	17
PNWR	07AC-5	American coot	52	13
Minimum LOC				**50**

ND, not detected; na, not analyzed or not available; dw, dry weight residue; ww, wet weight residue; ln, lipid-normalized residue; LOC, level of concern.

[*] Each data point represents a concentration in a single egg sample.

Notes:

Chemical concentrations highlighted and in bold text exceed the minimum level of concern (LOC) for that chemical. LOCs were taken from Table 21.

Table 15a. Organic Contaminants of Potential Concern That Exceeded Levels of Concern in Water, Sediment, Whole Fish, and Bird Eggs at Sampling Locations in the Las Vegas Wash and Its Tributaries

Sampling Location [*]	Water [†]	Sediment	Fish	Bird Egg
LVC_2 Meadows Detention Basin		NA	NA	NA
LW12.1 Las Vegas Creek		NA	NA	NA
FW Flamingo Wash	gamma-HCH	NA	NA	NA
SC Sloan Channel		NA	NA	NA
LW10.75 Wash upstream of all municipal wastewater treatment plants	NA		NA	NA
LW8.85	NA	NA	NA	NA
MC Monson Channel		NA	NA	NA
NP Nature Preserve	NA		Total PCBs	p,p’-DDE
LW6.85	NA	NA	NA	NA

(Continued)

Table 15a. Continued

Sampling Location [*]	Water [†]	Sediment	Fish	Bird Egg
DC/PW Duck Creek/ Pittman Wash			Total PCBs	p,p’-DDE Dieldrin
WM Whitney Mesa Channel	NA	NA	NA	NA
BSC Burns Street Channel			NA	p,p’-DDD p,p’-DDE Heptachlor epoxide
BVP Bird Viewing Preserve	NA	NA	NA	p,p’-DDE Heptachlor epoxide
LWC6.3 Kerr-McGee seep		NA	NA	NA
PB LW6.05 upstream of Pabco Rd ERC	NA		Total PCBs	p,p’-DDE Heptachlor epoxide
PB/PC	NA	NA	NA	NA
LW5.9	NA	NA	NA	NA
LW5.5	NA	NA	NA	NA
LW5.3	NA	NA	NA	NA
LW4.95	NA	NA	NA	NA

(Continued)

Table 15a. Continued

Sampling Location [*]	Water [†]	Sediment	Fish	Bird Egg
LW3.85	NA	NA	NA	NA
LW3.75	NA	NA	NA	NA
LWC3.7	NA	NA	NA	NA
LW3.1	NA	NA	NA	NA
LW0.8 End of Wash	NA		NA	NA
LVB Las Vegas Bay Delta	NA		Total PCBs	NA
PNWR Reference location	NA	NA		p,p’-DDE

ERC, erosion control structure; NA, not available; PNWR, Pahranagat National Wildlife Refuge

[*] Sampling locations are described in Table 1.

[†] Organic contaminants of potential concern (COPCs) were analyzed only in tributaries and seeps along the Wash and not in the mainstream Wash.

Notes:

Shaded rows indicate locations where multiple environmental media (i.e., water, sediment, whole fish, or bird egg) were sampled.

Table 15b. Inorganic Contaminants of Potential Concern That Exceeded Levels of Concern in Water, Sediment, Whole Fish, and Bird Eggs at Sampling Locations in the Las Vegas Wash and Its Tributaries

Sampling Location [*]	Water	Water (Dissolved) (Mainstream Wash) [†]	Sediment	Fish	Bird Egg
LVC_2 Meadows Detention Basin	Copper Selenium Zinc	NA	NA	Na	NA
LW12.1 Las Vegas Creek	Aluminum Copper Selenium Zinc	NA	NA	NA	NA
FW Flamingo Wash	Copper Selenium Zinc	NA	NA	NA	NA
SC Sloan Channel	Copper Selenium Zinc	NA	NA	NA	NA
LW10.75 Wash upstream of all municipal wastewater treatment plants	Aluminum Copper Molybdenum Selenium Vanadium Zinc	Selenium		NA	NA
LW8.85	Aluminum Copper Selenium Zinc	Selenium	NA	NA	NA

(Continued)

Table 15b. Continued

Sampling Location [*]	Water	Water (Dissolved) (Mainstream Wash) [†]	Sediment	Fish	Bird Egg
MC Monson Channel	Copper Iron Selenium Zinc	NA	NA	NA	NA
NP Nature Preserve	NA	NA		Chromium Copper Selenium Zinc	
LW6.85	Aluminum Copper Mercury Selenium Zinc	Aluminum Selenium	NA	NA	NA
DC/PW Duck Creek/ Pittman Wash	Arsenic Copper Selenium	NA		Selenium Zinc	Mercury
WM Whitney Mesa Channel	NA	NA	NA	NA	NA
BSC Burns Street Channel	Aluminum Arsenic Chromium Copper Perchlorate Selenium	NA	Copper	NA	Mercury

(Continued)

Table 15b. Continued

Sampling Location [*]	Water	Water (Dissolved) (Mainstream Wash) [†]	Sediment	Fish	Bird Egg
BVP Bird Viewing Preserve	NA	NA	NA	NA	Mercury
LWC6.3 Kerr-McGee seep	NA	NA	NA	NA	NA
PB LW6.05 upstream of Pabco Rd ERC	NA	NA		Arsenic Copper Selenium Zinc	
PB/PC	NA	NA	NA	NA	NA
LW5.9	Aluminum Copper Mercury Molybdenum Selenium Zinc	Aluminum Selenium	NA	NA	NA
LW5.5	Aluminum Copper Lead Mercury Molybdenum Selenium Zinc	Aluminum Selenium	NA	NA	NA
LW5.3	NA	NA	NA	NA	NA

(Continued)

Table 15b. Continued

Sampling Location [*]	Water	Water (Dissolved) (Mainstream Wash) [†]	Sediment	Fish	Bird Egg
LW4.95	Aluminum Copper Mercury Molybdenum Selenium Zinc	Aluminum Selenium	NA	NA	NA
LW3.85	NA	NA	NA	NA	NA
LW3.75	NA	NA	NA	NA	NA
LWC3.7	NA	NA	NA	NA	NA
LW3.1	Aluminum Copper Mercury Molybdenum Selenium Zinc	Aluminum Selenium	NA	NA	NA
LW0.8 End of Wash	Aluminum Copper Mercury Molybdenum Selenium Zinc	Aluminum Selenium	Arsenic	NA	NA

(Continued)

Table 15b. Continued

Sampling Location [*]	Water	Water (Dissolved) (Mainstream Wash) [†]	Sediment	Fish	Bird Egg
LVB Las Vegas Bay Delta	NA	NA	Arsenic Lead Manganese	Arsenic Cadmium Copper Lead Selenium Zinc	NA
PNWR Reference location	NA	NA	NA	Copper Zinc	Mercury

ERC, erosion control structure; NA, not available; PNWR, Pahranagat National Wildlife Refuge

[*] Sampling locations are described in Table 1.

[†] Dissolved inorganic COPCs were analyzed only at mainstream Wash location and not in the tributaries and seeps.

Notes:

Shaded rows indicate locations where multiple environmental media (i.e., water, sediment, whole fish, or bird egg) were sampled.

Table 16. Levels of Concern Not Yet Identified for Contaminants of Potential Concern in Water, Sediment, Whole Fish, and Bird Eggs

ORGANICS			
Water	**Sediment**	**Whole Fish**	**Bird Egg**
Chlordane, alpha-	Chlordane, alpha-	Aldrin	Aldrin
Chlordane, gamma-	Chlordane, gamma-	Dieldrin	Chlordane
Oxychlordane	Chlorpyrifos	Endrin	Chlordane, alpha-
Nonachlor-cis	DDMU	Chlordane, alpha-	Chlordane, gamma-
Nonachlor-trans	HCH, delta-	Chlordane, gamma-	Chlorpyrifos
Endosulfan sulfate	Nonachlor, cis-	DDT and related chemicals	o,p’-DDT
Hexachlorobenzene	Nonachlor, trans-	Endosulfan I	o,p’-DDE
HCH-alpha	Oxychlordane	Endosulfan II	o,p’-DDD
HCH-beta	Pentachloroanisole	Endosulfan sulfate	DDMU
HCH-delta	Tetrachlorobenzene, 1,2,3,4-	Heptachlor	Endosulfan I
Pentachloroanisole	Tetrachlorobenzene, 1,2,3,5-	Heptachlor epoxide	Endosulfan II
Pentachlorobenzene		Hexachlorobenzene	Endosulfan sulfate
Tetrachlorobenzene, 1,2,3,4-		Hexachlorocyclohexane and isomers	Heptachlor
Tetrachlorobenzene, 1,2,3,5-		Oxychlordane	Hexachlorocyclohexane
		Nonachlor, cis-	HCH, alpha-
		Nonachlor, trans-	HCH, beta-
		Pentachloroanisole	HCH, delta-
		Pentachlorobenzene	Nonachlor, cis-
		Tetrachlorobenzene, 1,2,3,4-	Nonachlor, trans-
		Tetrachlorobenzene, 1,2,3,5-	Oxychlordane
			Pentachloroanisole
			Pentachlorobenzene
			Tetrachlorobenzene, 1,2,3,4-
			Tetrachlorobenzene, 1,2,3,5-

(Continued)

Table 16. Continued

INORGANICS			
Water	**Sediment**	**Whole Fish**	**Bird Egg**
Antimony Barium [*] Beryllium Magnesium [†] Strontium Titanium [*]	Barium [*] Beryllium Boron Magnesium [†] Molybdenum Perchlorate Strontium [*] Titanium Vanadium [*]	Aluminum Antimony Barium Beryllium Boron Iron Magnesium [†] Manganese Molybdenum Nickel Perchlorate Strontium Titanium Vanadium	Aluminum Antimony Barium Beryllium Cadmium [‡] Chromium Copper Iron Lead Magnesium [†] Manganese Nickel Perchlorate Strontium Titanium Vanadium

[*] Although no LOC has been identified yet, typical background levels have been found in the literature.

[†] Magnesium is typically not considered to be an environmental concern.

[‡] Cadmium levels accumulated into bird eggs are negligible and are not expected to cause embryotoxic effects (Beyer et al. 1996).

References:

Beyer WN, GH Heinz, and AW Redmon-Norwood (Editors). (**1996**). *Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations*, *SETAC special publications series*. Boca Raton, FL: CRC Press.

Table 17. Summary of Detections and LOC Exceedences of Inorganic Contaminants of Potential Concern in Sediment Collected From the Las Vegas Wash and Its Tributaries Across Study Years

Location	Al			Sb			As			B			Ba			Be			Cd			Cr			Cu			Fe			Hg		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
LW10.75	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Exceeds LOC	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected
NP	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Exceeds LOC	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected
DC	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Exceeds LOC	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
BSC	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Exceeds LOC	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected
PB	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Exceeds LOC	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
LW0.8	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Exceeds LOC	Not Detected	Exceeds LOC	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
LVB	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Exceeds LOC	Not Detected	Exceeds LOC	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
LOC		*58,000*			*25*			*5.9*			*na*			*na*			*na*			*0.58*			*26*			*16.0*			*20,000*			*0.15*	

Location	Mg			Mn			Mo			Ni			Pb			Se			Sr			Ti			V			Zn			Perchlorate		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
LW10.75	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Not Detected	Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
NP	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Detected	Detected	Not Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
DC	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Detected	Exceeds LOC	Not Detected	Detected	Not Detected	Not Detected	Not Detected	Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
BSC	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected
PB	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Detected	Exceeds LOC	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
LW0.8	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Detected	Exceeds LOC	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
LVB	Detected	Detected	Detected	Detected	Detected	Exceeds LOC	Detected	Not Detected	Not Detected	Detected	Exceeds LOC	Detected	Exceeds LOC	Detected	Exceeds LOC	Exceeds LOC	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
LOC		*na*			*460*			*na*			*16*			*31*			*1*			*na*			*na*			*na*			*90*			*na*	

LOC, level of concern; na, not analyzed

KEY:
- Not Analyzed
- Not Detected
- Detected
- Exceeds LOC

<u>Notes:</u> LOCs - mg/kg (dry wt)
Element symbols are presented in Table 1.
Locations are described in Table 2.

Table 18. Summary of Detections and LOC Exceedences of Organic Contaminants of Potential Concern in Whole Fish Collected From the Las Vegas Wash and Its Tributaries Across Study Years

Location	Aldrin			Dieldrin			Endrin			Chlordane			Heptachlor			Oxychlordane			alpha-Chlordane			gamma-Chlordane			trans-Nonachlor			cis-Nonachlor		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
NP																														
DC																														
PB/PC																														
LVB																														
PNWR																														
LOC	na			na			na			0.1			na			na			na			na			na			na		

Location	Heptachlor Epoxide			alpha-HCH			beta-HCH			delta-HCH			gamma-HCH			DDMU			o,p'-DDD			p,p'-DDD			o,p'-DDE			p,p'-DDE		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
NP																														
DC																														
PB/PC																														
LVB																														
PNWR																														
LOC	na			na			na			na			na			na			na			na			na			na		

(Continued)

Table 18. Continued

Location	o,p'-DDT			p,p'-DDT			1,2,3,4-Tetrachloro-benzene			1,2,4,5-Tetrachloro-benzene			Hexachloro-benzene		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
NP	Detected	Not Detected	Not Detected	Detected	Not Detected	Detected	Not Detected	Not Analyzed	Not Detected	Not Detected	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected
DC	Not Detected	Not Detected	Not Detected	Detected	Not Detected	Detected	Not Detected	Not Analyzed	Detected	Detected	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected
PB/PC	Not Detected	Not Detected	Not Detected	Detected	Not Detected	Detected	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected
LVB	Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Not Analyzed	Not Detected	Detected	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected
PNWR	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected
LOC	na			na			na			na			na		

Location	Pentachloro-anisole			Pentachloro-benzene			Endosulfan II			Endosulfan I			Endosulfan Sulfate		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
NP	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Detected	Detected	Not Analyzed	Not Detected	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Not Detected
DC	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Not Detected	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Detected
PB/PC	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Not Detected	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Not Detected
LVB	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Not Detected	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Detected
PNWR	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Not Detected	Not Detected	Not Analyzed	Not Detected	Not Detected	Not Analyzed	Not Detected
LOC	na			na			na			na			na		

Location	Total HCH			Mirex			Chlorpyrifos			Total DDT			Total PCB			Toxaphene		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
NP	Not Analyzed	Not Analyzed	Not Detected	Detected	Not Detected	Detected	Not Detected	Not Analyzed	Detected	Detected	Detected	Detected	Exceeds LOC	Not Detected	Exceeds LOC	Not Detected	Not Detected	Not Detected
DC	Not Detected	Not Analyzed	Detected	Detected	Not Detected	Detected	Detected	Not Analyzed	Not Detected	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Not Detected	Not Detected	Not Detected
PB/PC	Not Detected	Not Analyzed	Detected	Detected	Not Detected	Detected	Detected	Not Analyzed	Not Detected	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Not Detected	Not Detected	Not Detected
LVB	Not Detected	Not Analyzed	Detected	Detected	Not Detected	Detected	Detected	Not Analyzed	Not Detected	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Not Detected	Not Detected	Not Detected
PNWR	Not Analyzed	Not Analyzed	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Analyzed	Not Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected	Not Detected	Not Detected
LOC	na			6.3			0.0004			na			0.1			0.4		

LOC, level of concern; na, not available

KEY:
- Not Analyzed
- Not Detected
- Detected
- Exceeds LOC

<u>Notes:</u>
LOCs - mg/kg (wet/wt)
2005 - Combined MC and NP
Locations are described in Table 2.

Table 19. Summary of Detections and LOC Exceedences of Inorganic Contaminants of Potential Concern in Whole Fish Collected From the Las Vegas Wash and Its Tributaries Across Study Years

	Sb			Al			As			B			Ba			Be			Cd			Cr			Cu			Fe			Hg		
Location	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
NP	Not Detected	Detected	Not Analyzed	Not Analyzed	Not Analyzed	Detected	Exceeds LOC	Detected	Detected	Not Analyzed	Not Analyzed	Detected	Detected	Detected	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Detected	Exceeds LOC	Not Detected	Detected	Detected	Exceeds LOC	Detected	Not Detected	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Detected
DC	Not Detected	Detected	Not Analyzed	Not Analyzed	Not Analyzed	Detected	Exceeds LOC	Detected	Detected	Not Analyzed	Not Analyzed	Detected	Detected	Detected	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Detected	Exceeds LOC	Not Detected	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected
PB	Not Detected	Detected	Not Analyzed	Not Analyzed	Not Analyzed	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Not Analyzed	Not Analyzed	Not Detected	Detected	Detected	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Detected	Exceeds LOC	Not Detected	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Not Detected
LVB	Not Detected	Detected	Not Analyzed	Not Analyzed	Not Analyzed	Detected	Not Detected	Exceeds LOC	Exceeds LOC	Not Analyzed	Not Analyzed	Not Detected	Detected	Detected	Detected	Not Analyzed	Not Analyzed	Not Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Detected
PNWR	Not Detected	Detected	Not Analyzed	Not Analyzed	Not Analyzed	Detected	Exceeds LOC	Exceeds LOC	Detected	Not Analyzed	Not Analyzed	Not Detected	Detected	Detected	Detected	Not Analyzed	Not Analyzed	Not Detected	Detected	Exceeds LOC	Not Detected	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Detected
LOC	na			na			0.22			na			na			na			0.05			4			0.9			na			0.17		

	Mg			Mn			Mo			Ni			Pb			Se			Sr			Ti			V			Zn		
Location	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
NP	Not Analyzed	Not Analyzed	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Not Analyzed	Detected	Detected	Detected	Exceeds LOC	Detected	Exceeds LOC
DC	Not Analyzed	Not Analyzed	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Exceeds LOC	Not Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Not Analyzed	Detected	Detected	Not Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC
PB	Not Analyzed	Not Analyzed	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Not Analyzed	Detected	Detected	Not Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC
LVB	Not Analyzed	Not Analyzed	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC	Exceeds LOC	Exceeds LOC	Exceeds LOC	Detected	Detected	Detected	Detected	Detected	Not Analyzed	Detected	Detected	Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC
PNWR	Not Analyzed	Not Analyzed	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Analyzed	Detected	Detected	Not Detected	Exceeds LOC	Exceeds LOC	Exceeds LOC
LOC	na			na			na			na			0.22			3*			na			na			na			20		

LOC, level of concern; na, not analyzed

KEY:
- Not Analyzed
- Not Detected
- Detected
- Exceeds LOC

<u>Notes:</u> Most LOCs - mg/kg (wet wt)
* LOC based on dry wt (mg/kg)
Element symbols presented in Table 1.
Locations described in Table 2.

Table 20. Summary of Detections and LOC Exceedences of Organic Contaminants of Potential Concern in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries Across Study Years

Sample Site	Aldrin			Dieldrin			Endrin			Chlordane†			Heptachlor			Oxychlordane			Alpha-Chlordane			Gamma-Chlordane			Trans-Nonachlor			Cis-Nonachlor		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
10.75																														
NP																														
DC																														
BSC																														
BVP																														
PB/PC																														
LVB																														
PNWR																														
LOC	na			0.15			0.27			na			na			na			na			na			na			na		

Sample Site	Heptachlor-Epoxide			Alpha-HCH(BHC)			Beta-HCH(BHC)			Delta-HCH(BHC)			Gamma-HCH(BHC)			DDMU			2,4'-DDD			4,4'-DDD			2,4'-DDE			4,4'-DDE		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
10.75																														
NP																														
DC																														
BSC																														
BVP																														
PB/PC																														
LVB																														
PNWR																														
LOC	0.04			na			na			na			10			na			na			0.1			na			0.1		

(Continued)

Table 20. Continued

Location	o,p'-DDT			p,p'-DDT			1,2,3,4-Tetrachloro-benzene			1,2,4,5-Tetrachloro-benzene			Hexachloro-benzene		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
10.75	Detected	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed
NP	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Detected	Detected	Not Detected	Detected	Not Analyzed	Not Analyzed	Detected
DC	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Not Analyzed	Not Analyzed	Detected
BSC	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Analyzed	Not Analyzed	Detected
BVP	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected
PB/PC	Detected	Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Analyzed	Not Analyzed	Detected
LVB	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed
PNWR	Detected	Detected	Not Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Detected	Detected	Not Detected	Detected	Not Analyzed	Not Analyzed	Detected
LOC	na			0.2			na			na			6.2		

Location	Pentachloro-anisole			Pentachloro-benzene			Endosulfan II			Endosulfan I			Endosulfan Sulfate		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
10.75	Not Detected	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Not Detected	Detected	Not Analyzed	Detected	Not Detected	Not Analyzed	Not Detected	Detected	Not Analyzed
NP	Not Detected	Detected	Not Detected	Detected	Not Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected
DC	Not Detected	Detected	Not Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Not Detected	Detected	Not Detected	Detected	Detected	Not Detected	Not Detected
BSC	Detected	Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected	Detected	Detected	Detected	Not Detected
BVP	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected
PB/PC	Not Detected	Detected	Not Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected	Detected	Not Detected	Detected	Detected	Not Detected	Not Detected
LVB	Not Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed
PNWR	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected	Detected	Not Detected	Not Detected
LOC	na			na			na			na			na		

Location	Total HCH			Mirex			Chlorpyrifos			Total DDT			Total PCB			Toxaphene		
	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
10.75	Detected	Detected	Not Analyzed	Not Detected	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Detected	Detected	Not Analyzed	Not Detected	Not Detected	Not Analyzed
NP	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
DC	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
BSC	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
BVP	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected
PB/PC	Detected	Detected	Detected	Detected	Not Detected	Detected	Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
LVB	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Detected	Not Analyzed	Not Analyzed	Not Detected	Not Analyzed	Not Analyzed
PNWR	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected	Not Detected	Not Detected
LOC	na			20			na			na			16			50		

LOC, level of concern; na, not analyzed

KEY:
- Not Analyzed
- Not Detected
- Detected
- Exceeds LOC

Notes:
LOCs - mg/kg (wet wt)
2005 - Combined MC and NP
Locations are described in Table 2.

Table 21. Summary of Detections and LOC Exceedences of Inorganic Contaminants of Potential Concern in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries Across Study Years

	Sb			Al			As			B			Ba			Be			Cd			Cr			Cu			Fe			Hg		
Location	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
10.75																																	
NP																																	
DC																																	
BSC																																	
BVP																																	
PB																																	
LVB																																	
PNWR																																	
LOC	**na**			**na**			**1.3**			**3.2**			**na**			**na**			**na**			**na**			**na**			**na**			**0.05**		

	Mg			Mn			Mo			Ni			Pb			Se			Sr			Ti			V			Zn		
Location	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007	2003	2005	2007
10.75																														
NP																														
DC																														
BSC																														
BVP																														
PB																														
LVB																														
PNWR																														
LOC	**na**			**na**			**16**			**na**			**na**			**3**			**na**			**na**			**na**			**50**		

LOC, level of concern; na, not analyzed

KEY:
- Not Analyzed
- Not Detected
- Detected
- Exceeds LOC

Notes: LOCs - mg/kg (wet wt)
2005 - Combined MC and NP
Element symbols are presented in Table 1.
Locations are described in Table 2.

Table 22. Number and Percentage of Water, Whole Fish, and Bird Eggs Samples Collected from 2000-2008 Containing Detectable Levels of Selected Organic Contaminants of Potential Concern

Chemical	Number of Detections [1] 2000 - 2008	% Detections [2]
p,p'-DDD	1	0.4%
Aldrin	1	0.4%
Dieldrin	3	1.1%
Endrin	2	0.7%
alpha-HCH	7	2.6%
beta-HCH	32	12%
delta-HCH	18	6.7%
gamma-HCH (lindane)	9	3.4%

[1] Number of water samples collected from January 1, 2000 through January 28, 2009 containing detectable levels of selected organic contaminants of potential concern (COPCs)

[2] Percent of water samples (n=267 for all three media) collected from January 1, 2000 through January 28, 2009 containing detectable levels of selected organic COPCs

APPENDIX A

CASRN AND COMMON SYNONYMS FOR ORGANIC CONTAMINANTS OF POTENTIAL CONCERN

Table A.1. CASRN and Common Synonyms for Organic Contaminants of Potential Concern for the 2007-2008 Las Vegas Wash Monitoring and Characterization Study

Chemical	CASRN	Common Synonyms
Aldrin	309-00-2	
Dieldrin	60-57-1	Aldrin epoxide
Chlorpyrifos	2921-88-2	Dursban (trade name)
Endrin	72-20-8	
Total DDT		DDT and degradates
DDD, o,p’-	53-19-0	2,4'-DDD o,p'-Dichlorodiphenyldichloroethane 2,4'-Dichlorodiphenyldichloroethane 2,4'-Dichlorophenyldichlorethane
DDE, o,p’-	3424-82-6	2,4'-DDE o,p’-Dichlorodiphenyl dichloroethene o,p’-Dichlorodiphenyldichloroethylene
DDT, o,p’-	789-02-6	2,4'-DDT o,p’-Dichlorodiphenyltrichloroethane
DDD, p,p’-	72-54-8	4,4'-DDD Dichlorodiphenyldichloroethane
DDE, p,p’-	72-55-9	4,4'-DDE DDT dehydrochloride Dichlorodiphenyl dichloroethene Dichlorodiphenyldichloroethylene
DDT, p,p’-	50-29-3	4,4'-DDT dichlorodiphenyltrichloroethane 4,4'-dichlorodiphenyltrichloroethane p,p'-dichlorodiphenyltrichloroethane

(Continued)

Table A.1. Continued

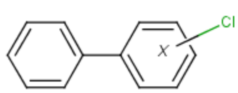
Chemical	CASRN	Common Synonyms
Chlordane (technical grade)	12789-03-6	Tradenames: Chlordan, Velsicol 1068, Octachlor
Chlordane, alpha-	5103-71-9	cis-Chlordane c-Chlordane
Chlordane, gamma-	5103-74-2	trans-Chlordane
Nonachlor, cis-	5103-73-1	
Nonachlor, trans-	39765-80-5	
Oxychlordane	27304-13-8	Octachlor epoxide
Heptachlor	76-44-8	
Heptachlor epoxide	1024-57-3	
Endosulfan	115-29-7	Endosulphan Thiodan
Endosulfan I	959-98-8	alpha-Endosulfan
Endosulfan II	33213-65-9	beta-Endosulfan
Endosulfan sulfate	1031-07-8	Endosulfate
Hexachlorobenzene	118-74-1	HCB
Mirex	2385-85-5	Dodecaclor Perchlordecone
Pentachloroanisole	1825-21-4	
Pentachlorobenzene	608-93-5	
Polychlorinated biphenyls	1336-36-3*	PCBs Total PCBs
1,2,3,4-Tetrachlorobenzene	634-66-2	
1,2,4,5-Tetrachlorobenzene	634-90-2	
Toxaphene	8001-35-2	Camphechlor

Table A.1. Continued

Chemical	CASRN	Common Synonyms
Hexachlorocyclohexane (technical mixture)	608-73-1	Lindane (technical mixture) Benzene hexachloride
HCH, alpha-	319-84-6	alpha-Benzene hexachloride alpha-BHC alpha-Hexachlorocyclohexane alpha-Lindane Benzene hexachloride-alpha-isomer
HCH, beta-	319-85-7	beta-Benzene hexachloride beta-BHC beta-Hexachlorocyclohexane beta-Lindane beta-Hexachlorobenzene trans-alpha-Benzenehexachloride
HCH, delta-	319-86-8	delta-Benzene hexachloride delta-BHC delta-Hexachlorocyclohexane delta-Lindane
HCH, gamma-	58-89-9	Lindane gamma-Benzene hexachloride gamma-BHC gamma-Hexachlorocyclohexane Benzene hexachloride Benzene hexachloride-gamma isomer Hexachlorocyclohexane Hexachlorocyclohexane, gamma-isomer gamma-Hexachlorobenzene

CASRN, Chemical Abstract Services registry number.

* CASRN refers to PCBs in general, as indicated by the structure:



APPENDIX B
GENERAL WATER QUALITY PARAMETERS FOR SAMPLING LOCATIONS

Table B.1. General Water Quality Parameters for Sampling Locations in the Mainstream Las Vegas Wash

Location*	Date	Cond. [†] µs/cm	DO mg/L	pH units	Temp °C	Ca mg/L	Mg mg/L	Hardness [‡] mg/L	Sulfate mg/L	TSS mg/L	TDS mg/L
LW10.75 Upstream City of Las Vegas	3/21/2007	3750	7.64	8.14	12.92	290	230	1670	1800	10	3200
	4/25/2007	3670	9.38	8.31	17.38	280	220	1610	1700	<5	2400
	5/23/2007	3747	11.09	8.24	16.36	250	230	1570	1700	9	3300
	6/20/2007	3709	9.07	8.07	21.31	290	210	1590	1700	<5	3000
	7/16/2007	3469	11.68	8.14	26.42	210	220	1430	1500	10	2600
	8/22/2007	3723	11.66	8.13	23.38	290	200	1550	1700	NA	2400
	9/19/2007	3705	10.57	8.23	19.01	270	200	1500	1700	6	2900
	10/17/2007	3494	9.83	7.35	14.20	290	210	1590	1700	7	3100
	11/19/2007	3629	11.86	7.99	14.74	180	270	1560	1700	<5	720
	12/19/2007	3629	17.73	7.75	10.27	280	210	1560	1600	8	2800
	1/23/2008	3600	16.06	8.19	7.91	270	230	1620	1700	<5	3000
	2/20/2008	3753	13.02	8.32	13.31	270	210	1540	1700	<5	2700
	3/18/2008	probe error	11.84	8.34	11.81	230	200	1400	1500	<5	2300
LW8.85 Upstream Pabco Weir	4/25/2007	2063	9.94	7.14	24.05	110	55	530	510	<5	1300
	5/23/2007	2044	7.85	7.31	24.55	120	60	500	530	7	1500
	6/20/2007	1984	7.02	7.28	27.53	120	59	550	500	<5	1300
	7/16/2007	1998	15.09	7.10	29.40	130	62	540	500	<5	1600
	8/22/2007	2007	6.51	7.26	28.94	110	53	580	490	NA	1300
	9/19/2007	1943	6.77	7.41	28.18	110	53	490	470	5	1400
	10/17/2007	2079	6.36	7.25	25.41	120	59	490	510	<5	1300
	11/19/2007	1982	7.23	7.34	24.99	110	57	540	470	<5	2700
	12/19/2007	2102	10.70	7.21	21.71	120	58	510	530	<5	1400
	1/23/2008	2073	9.13	7.16	20.24	110	59	540	510	<5	1500
	2/20/2008	2032	7.61	7.15	21.29	110	54	520	500	6	1400
	3/18/2008	2059	7.32	7.24	20.98	110	57	500	530	<5	1200

(Continued)

Table B.1. Continued

Location*	Date	Cond. [†] µs/cm	DO mg/L	pH units	Temp °C	Ca mg/L	Mg mg/L	Hardness [‡] mg/L	Sulfate mg/L	TSS mg/L	TDS mg/L
LW6.85 Downstream Pabco Weir	3/21/2007	2510	6.34	7.87	21.06	150	81	710	730	11	1700
	4/25/2007	2471	6.68	7.89	22.87	140	78	670	690	<5	1700
	5/23/2007	2443	9.37	7.90	23.22	150	80	700	700	5	1800
	6/20/2007	2327	8.41	7.89	26.64	140	72	650	660	<5	1600
	7/16/2007	2322	14.25	7.79	28.71	150	77	690	640	<5	2100
	8/22/2007	2292	7.94	7.87	28.15	130	65	590	630	NA	1400
	9/19/2007	2278	7.91	7.99	26.66	140	72	650	630	13	1500
	10/17/2007	2437	7.83	7.77	23.97	140	75	660	660	<5	1600
	11/19/2007	2279	8.02	7.83	23.77	130	70	610	590	15	1300
	12/19/2007	2465	12.58	7.84	20.26	150	77	690	690	19	1700
	1/23/2008	2473	11.06	7.80	18.49	140	81	680	690	<5	1800
	2/20/2008	2402	8.61	7.87	20.28	140	76	660	660	<5	1600
	3/18/2008	2483	9.25	7.81	19.51	140	82	690	720	<5	1400
LW5.9 Upstream Historic Lateral Weir	3/21/2007	2689	6.23	7.79	21.24	160	80	730	750	10	1800
	4/25/2007	2620	6.75	7.83	23.06	150	80	700	730	<5	1700
	5/23/2007	2740	9.17	7.61	23.44	150	80	700	750	7	2000
	6/20/2007	2650	8.20	7.66	26.60	150	79	700	700	5	1800
	7/16/2007	2521	6.76	7.75	28.79	160	79	720	680	<5	2200
	8/22/2007	2447	7.82	7.77	28.26	140	69	630	630	NA	1500
	9/19/2007	2497	7.44	7.64	26.92	140	67	630	610	5	1700
	10/17/2007	2546	7.03	7.39	24.60	140	70	640	670	<5	1600
	11/19/2007	2352	7.47	7.54	24.40	130	64	590	530	<5	1600
	12/19/2007	2708	11.09	7.32	21.68	130	59	570	570	5	1900
	1/23/2008	2485	10.49	7.62	19.17	110	56	510	530	5	1700
	2/20/2008	2484	8.05	7.55	20.56	140	69	630	640	<5	1700
	3/18/2008	2622	8.47	7.42	20.52	140	69	630	660	<5	1500

(Continued)

Table B.1. Continued

Location*	Date	Cond. [†] µs/cm	DO mg/L	pH units	Temp °C	Ca mg/L	Mg mg/L	Hardness [‡] mg/L	Sulfate mg/L	TSS mg/L	TDS mg/L
LW5.5 Downstream Historic Lateral Weir	3/21/2007	2605	6.71	8.02	21.20	160	84	750	780	8	1800
	4/25/2007	2568	7.10	7.98	23.24	150	81	710	730	6	1700
	5/23/2007	2462	9.78	7.86	24.18	150	78	700	690	10	1800
	6/20/2007	2563	8.49	7.80	26.74	150	80	700	700	<5	1800
	7/16/2007	2488	6.85	7.82	28.94	150	78	700	670	7	2300
	8/22/2007	2405	8.02	7.87	28.37	140	69	630	640	NA	1500
	9/19/2007	2386	7.67	7.91	26.63	140	70	640	640	<5	1600
	10/17/2007	2467	7.49	7.77	23.84	150	73	680	660	<5	1700
	11/19/2007	2323	7.95	7.84	23.80	140	71	640	600	<5	1700
	12/19/2007	2579	12.08	7.74	20.42	140	73	650	670	7	1900
	1/23/2008	2391	11.35	7.64	19.18	130	73	630	640	5	1800
	2/20/2008	2456	8.60	7.88	20.26	140	74	650	680	<5	1700
	3/18/2008	2576	9.38	7.80	19.76	150	80	700	690	<5	1500
LW4.95 Upstream Demonstration Weir	3/21/2007	2724	6.45	8.10	21.03	170	85	770	810	9	1900
	4/25/2007	2682	6.73	8.06	23.24	160	84	750	750	7	1900
	5/23/2007	2623	9.76	8.09	23.86	160	82	740	740	9	1900
	6/20/2007	2535	8.34	7.92	26.81	150	73	680	670	<5	1800
	7/16/2007	2510	6.86	7.83	28.95	160	81	730	670	<5	1700
	8/22/2007	2478	7.67	7.92	28.15	150	72	670	660	NA	1500
	9/19/2007	2489	7.40	7.93	26.07	150	72	670	670	9	1600
	10/17/2007	2507	6.81	7.49	23.62	150	74	680	680	5	1600
	11/19/2007	2431	7.63	7.88	23.27	140	73	650	640	6	1700
	12/19/2007	2585	11.77	7.88	20.04	140	71	640	660	7	1800
	1/23/2008	2447	10.65	7.97	18.71	140	77	670	660	9	1800
	2/20/2008	2524	8.27	7.95	19.98	150	76	690	730	<5	1700
	3/18/2008	2545	8.89	7.80	19.38	140	76	660	700	<5	1500

(Continued)

Table B.1. Continued

Location*	Date	Cond. [†] µs/cm	DO mg/L	pH units	Temp °C	Ca mg/L	Mg mg/L	Hardness [‡] mg/L	Sulfate mg/L	TSS mg/L	TDS mg/L
LW3.1 Downstream Demonstration Weir	3/21/2007	2665	6.74	8.35	20.82	160	78	720	770	9	1800
	4/25/2007	2601	7.10	8.30	23.13	150	74	680	680	5	1800
	5/23/2007	2524	10.58	8.38	23.48	150	73	680	690	9	1800
	6/20/2007	2449	9.22	8.21	26.17	140	67	630	620	8	1700
	7/16/2007	2405	6.67	8.10	28.69	140	68	630	620	8	2300
	8/22/2007	2471	8.65	8.16	27.85	150	69	660	640	NA	1500
	9/19/2007	2447	8.09	8.08	25.60	140	67	630	650	9	2000
	10/17/2007	2455	7.82	7.99	23.08	140	68	630	650	<5	1600
	11/19/2007	2505	8.17	8.17	22.74	140	72	650	630	<5	1800
	12/19/2007	2530	12.78	8.11	19.66	140	66	620	630	12	1800
	1/23/2008	2533	11.24	8.19	18.40	140	75	660	670	5	1900
	2/20/2008	2582	8.65	7.98	19.91	150	75	680	710	<5	1800
	3/18/2008	2504	9.94	8.20	18.96	140	73	650	660	5	1400
LW0.8 Downstream Lake Las Vegas	3/21/2007	2694	6.26	8.33	20.90	170	80	750	790	21	1800
	4/25/2007	2613	6.61	8.32	23.22	150	74	680	690	8	1800
	5/23/2007	2541	9.87	8.46	23.59	150	73	680	690	9	1800
	6/20/2007	2479	8.85	8.31	26.05	150	70	660	660	12	1700
	7/16/2007	2424	6.74	8.20	28.71	150	71	670	630	7	2000
	8/22/2007	2489	8.26	8.25	27.93	150	70	660	640	NA	1600
	9/19/2007	2459	8.23	8.26	25.61	150	70	660	610	13	1600
	10/17/2007	2535	7.51	8.05	22.67	150	68	650	640	<5	1600
	11/19/2007	2526	8.29	8.18	22.72	150	72	670	640	<5	1800
	12/19/2007	2574	12.65	8.16	19.53	140	67	630	650	5	1900
	1/23/2008	2564	10.97	8.22	18.40	150	77	690	680	6	1900
	2/20/2008	2595	8.73	8.34	19.93	150	77	690	710	<5	1800
	3/18/2008	2517	9.72	8.36	19.19	140	73	650	660	5	1400

Ca, calcium; Cond., conductivity; DO, dissolved oxygen; Mg, magnesium; ND, not detected; Temp., temperature; TSS, total suspended solids; TDS, total dissolved solids.

[*] Sampling locations are described in detail in Table 2.

[†] Specific electrical conductivity.

[‡] Hardness was determined by calculation as described by APHA (1995), using the following equation:

Hardness (mg/L equivalent as $CaCO_3$) = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L].

Hardness estimates were based on averages of monthly (or quarterly) concentrations of calcium and magnesium.

<u>Note:</u>

Each data point represents a single sample.

Table B.2. General Water Quality Parameters for Sampling Locations in Major Tributaries to the Las Vegas Wash

Location *	Date	Cond. [†] µS/cm	DO mg/L	pH units	Temp. °C	Ca mg/L	Mg mg/L	Hardness [‡] mg/L	Sulfate mg/L	TOC mg/L
LVC_2 Meadows Detention Basin	1/23/2007	2608	13.26	8.3	0.4	170	160	1080	870	3.5
	4/18/2007	2357	12.08	8.21	8.4	140	110	800	690	8.0
	7/18/2007	1803	8.53	8.67	23.1	93	80	560	510	5.8
	10/24/2007	1242	11.54	8.25	14.7	86	43	390	330	3.1
	1/22/2008	2585	14.66	8.22	4.0	150	150	990	830	3.3
	4/23/2008	2338	10.61	7.48	11.4	140	130	880	790	6.8
LW12.1 Las Vegas Creek	1/23/2007	3951	12.65	8.38	8.0	260	310	1930	1900	3.8
	4/18/2007	3493	10.51	8.04	15.6	210	230	1470	1600	10.0
	7/18/2007	3558	7.04	8.11	26.5	210	220	1430	1700	5.4
	10/24/2007	3917	13.41	8.43	16.5	230	280	1730	1900	5.2
	1/22/2008	4093	12.62	8.29	10.0	240	320	1920	2000	2.6
	4/23/2008	4131	9.53	8.13	17.6	240	340	2000	1600	3.7
FW_1 Flamingo Wash	1/23/2007	3347	10.14	8.26	9.4	330	200	1650	1500	2.1
	4/18/2007	3467	11.89	8.23	14.0	290	180	1470	1600	4.3
	7/18/2007	3569	7.67	8.14	25.1	310	180	1520	1600	3.6
	10/24/2007	3434	12.57	8.19	16.1	310	180	1520	1500	3.8
	1/22/2008	3413	11.74	8.24	10.4	310	200	1600	1500	2.3
	4/23/2008	3445	9.66	8.1	15.8	310	210	1640	2000	13

(Continued)

Table B.2. Continued

Location *	Date	Cond. [†] µS/cm	DO mg/L	pH units	Temp. ºC	Ca mg/L	Mg mg/L	Hardness [‡] mg/L	Sulfate mg/L	TOC mg/L
SC_1 Sloan Channel	1/23/2007	2990	13	8.51	6.4	150	210	1240	1100	1.8
	4/18/2007	3057	12.68	8.36	9.1	130	200	1150	1100	2.7
	7/18/2007	3271	8.96	8.65	25.5	150	210	1240	1300	4.5
	10/24/2007	4072	13.23	8.57	13.6	190	290	1670	1700	12.0
	1/22/2008	2987	13.74	8.8	12.6	130	210	1190	1100	1.7
	4/23/2008	3069	10.57	8.49	15.7	140	220	1260	1200	2.5
MC_1 Monson Channel	1/24/2007	4932	11.25	8.17	9.8	400	300	2230	2500	2.7
	4/18/2007	4975	18.95	8.31	15.9	400	320	2320	2600	2.5
	7/18/2007	4750	9.67	8.07	29.6	400	280	2150	2500	2.9
	10/24/2007	4758	19.99	8.52	21.3	390	290	2170	2400	2.0
	1/22/2008	4774	18.75	8.62	16.1	410	340	2420	2400	2.7
	4/23/2008	4828	17.99	7.92	18.4	430	360	2560	2600	2.7
DC_1 Duck Creek	1/24/2007	5975	9.87	7.82	16.6	440	270	2210	2400	2.3
	4/18/2007	3840	10.82	7.85	20.3	460	270	2260	2500	2.5
	7/18/2007	5681	8.21	8.13	32.4	440	250	2130	2500	3.5
	10/24/2007	6237	13.35	7.53	25.0	480	310	2480	2600	2.2
	1/22/2008	5663	11.20	8.15	17.4	430	270	2190	2300	1.9
	4/23/2008	5984	10.12	7.79	22.5	530	390	2930	3000	1.6

(Continued)

Table B.2. Continued

Location *	Date	Cond. [†] µS/cm	DO mg/L	pH units	Temp. ºC	Ca mg/L	Mg mg/L	Hardness [‡] mg/L	Sulfate mg/L	TOC mg/L
LWC6.3 Kerr-McGee Seep	1/23/2007	NS	NS	NS	NS	NS	NS	NA	NS	NS
	4/18/2007	NS	NS	NS	NS	NS	NS	NA	NS	NS
LWC3.7 GCS5 Seep	1/23/2007	NS	NS	NS	NS	NS	NS	NA	NS	NS
	4/18/2007	NS	NS	NS	NS	NS	NS	NA	NS	NS
BS_1 Burns Street	1/24/2007	5182	8.94	8.37	18.2	390	180	1720	1800	1.6
	4/18/2007	4984	10.31	8.17	21.7	390	190	1760	1700	0.77
	7/18/2007	5140	8.63	8.21	28.5	420	190	1830	1900	1.5
	10/24/2007	4973	10.39	8.31	25.9	410	190	1810	1900	1.9
	1/22/2008	3148	11.9	8.44	20.4	410	210	1890	1900	1.4
	4/23/2008	5363	10.63	8.24	23.2	450	240	2110	2000	1.7

Ca, calcium; Cond., Conductivity; DO, dissolved oxygen; Mg, magnesium; NA, not available; Temp., temperature; TOC, total organic carbon.

[*] Sampling locations are described in detail in Table 2.

[†] Specific electrical conductivity.

[‡] Hardness was determined by calculation as described by APHA (1995), using the following equation:

Hardness (mg/L equivalent as $CaCO_3$) = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L].

Hardness estimates were based on averages of monthly (or quarterly) concentrations of calcium and magnesium.

Notes:

Each data point represents a single sample.

LWC3.5 (GCS-5 Seep) was not sampled.

APPENDIX C

COPCS ANALYZED IN WATER, SEDIMENT, WHOLE FISH, AND BIRD EGGS IN THE LAS VEGAS WASH AND ITS TRIBUTARIES

Table C.1. Inorganic Contaminants of Potential Concern Analyzed in Sediment, Fish, Bird Eggs, and Water for the 2007-2008 Bioassessment

Chemical	Sediment	Fish	Bird Egg	Water: Mainstream Wash (Total & Dissolved)	Water: Tributaries (Total)
Aluminum	√	√	√	√	√
Antimony	√	NA	NA	√	NA
Arsenic	√	√	√	√	√
Barium	√	√	√	√	√
Beryllium	√	√	√	√	NA
Boron	√	√	√	NA	NA
Cadmium	√	√	√	√	NA
Chromium	√	√	√	√	√
Copper	√	√	√	√	√
Iron	√	√	√	√	√
Lead	√	√	√	√	√
Magnesium	√	√	√	√ [*]	NA
Manganese	√	√	√	√	√
Mercury	√	√	√	√	NA
Molybdenum	√	√	√	√	NA
Nickel	√	√	√	√	√
Perchlorate	√	NA	NA	√ [*]	√
Selenium	√	√	√	√	√
Strontium	√	√	√	NA	NA
Titanium	√	NA	NA	NA	NA
Vanadium	√	√	√	√	NA
Zinc	√	√	√	√	√

DL, detection limit; dw, dry weight; MRL, method reporting limit; NA, not available; ww, wet weight.

[*] Total only; no measurements of dissolved fraction were made.

Table C.2. Organic Contaminants of Potential Concern Analyzed in Sediment, Whole Fish, Bird Eggs, and Water (Mainstream Las Vegas Wash and Its Tributaries)

Chemical	Water: Tributaries [*]	Sediment	Fish	Bird Egg
Aldrin	√	√	√	√
Dieldrin	√	√	√	√
Endrin	√	√	√	√
DDT, Total	NA	NA	√	√
o,p’-DDT	NA	NA	√	√
o,p’-DDE	NA	NA	√	√
o,p’-DDD	NA	NA	√	√
p,p’-DDT	NA	√	√	√
p,p’-DDE	NA	√	√	√
p,p’-DDD	√	√	√	√
DDMU	NA	NA	√	√
HCH, Total (or technical lindane)	√ [†]	√ [‡]	√	√
HCH, alpha-	√	√	√	√
HCH, beta-	√	√	√	√
HCH, delta-	√	√	√	√
HCH, gamma-	√	√	√	√
Chlordane, alpha-	NA	√	√	√
Chlordane, gamma-	NA	√	√	√
Chlordane (technical mixture)	NA	√	√	√
Nonachlor, cis-	NA	NA	√	√
Nonachlor, trans-	NA	NA	√	√
Oxychlordane	NA	NA	√	√
Heptachlor	NA	√	√	√
Heptachlor epoxide	NA	√	√	√
Hexachlorobenzene	NA	NA	√	√
Mirex	NA	NA	√	√
Aroclor 1016	NA	√	NA	NA
Aroclor 1221	NA	√	NA	NA
Aroclor 1232	NA	√	NA	NA
Aroclor 1242	NA	√	NA	NA

(Continued)

Table C.2. Continued

Chemical	Water: Tributaries [*]	Sediment	Fish	Bird Eggs
Aroclor 1248	NA	√	NA	NA
Aroclor 1254	NA	√	NA	NA
Aroclor 1260	NA	√	NA	NA
Total PCBs	NA	NA [§]	√	√
Chlorpyrifos	NA	NA	√	√
Endosulfan I	NA	√	√	√
Endosulfan II	NA	√	√	√
Endosulfan sulfate	NA	√	√	√
Pentachloroanisole	NA	NA	√	√
Pentachlorobenzene	NA	NA	√	√
1,2,3,4-Tetrachlorobenzene	NA	NA	√	√
1,2,3,5-Tetrachlorobenzene	NA	NA	√	√
Toxaphene	NA	√	√	√

NA, not analyzed.

[*] Organic COPCs were analyzed only in tributaries and seeps contributing to the Wash and not in the mainstream Wash.

[†] The analytical laboratory reported the concentration of lindane in water as a technical mixture which is considered in this report to approximate total HCH.

[‡] Total HCH in sediment was not reported by analytical laboratory. Concentrations of individual HCH isomers reported by the laboratory were summed to obtain total HCH concentrations for sediment.

[§] Although total PCBs were not analyzed in sediment, several Aroclor mixtures were analyzed and none were detected.

Appendix D

SUMMARY OF COPCS WITH LOC EXCEEDENCES FOR WHOLE FISH AND BIRD EGGS COLLECTED FROM THE LAS VEGAS WASH AND ITS TRIBUTARIES AROSS STUDIES

Notes:

Horizontal red lines indicate LOCs.

Green open circles indicate non-detects.

Vertical arrows indicate concentrations exceeding the range of the x-axis. The number in parentheses accompanying an arrow indicates the associated value.

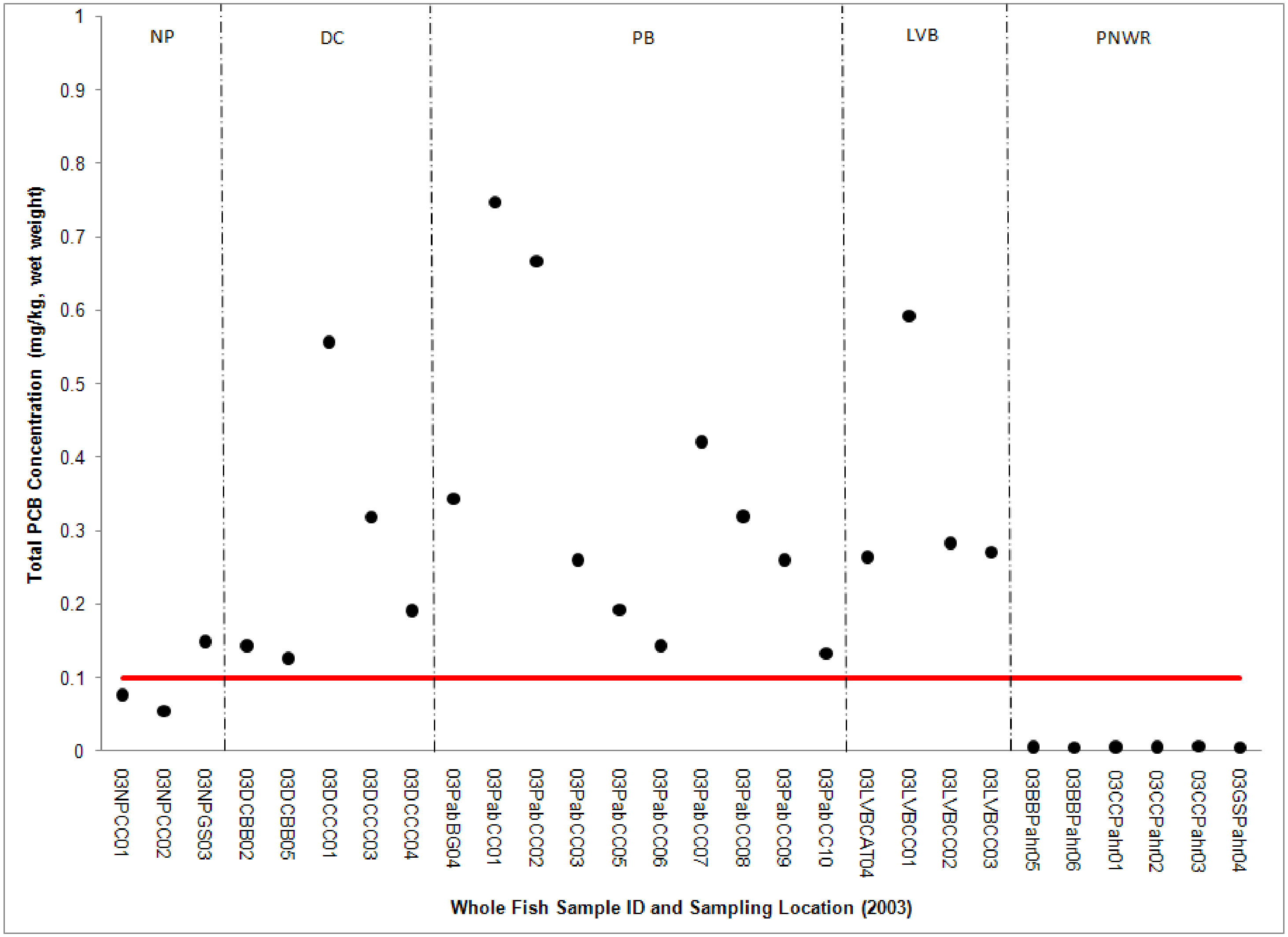


Figure D.1. Summary of Total PCB Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2003(— = LOC).

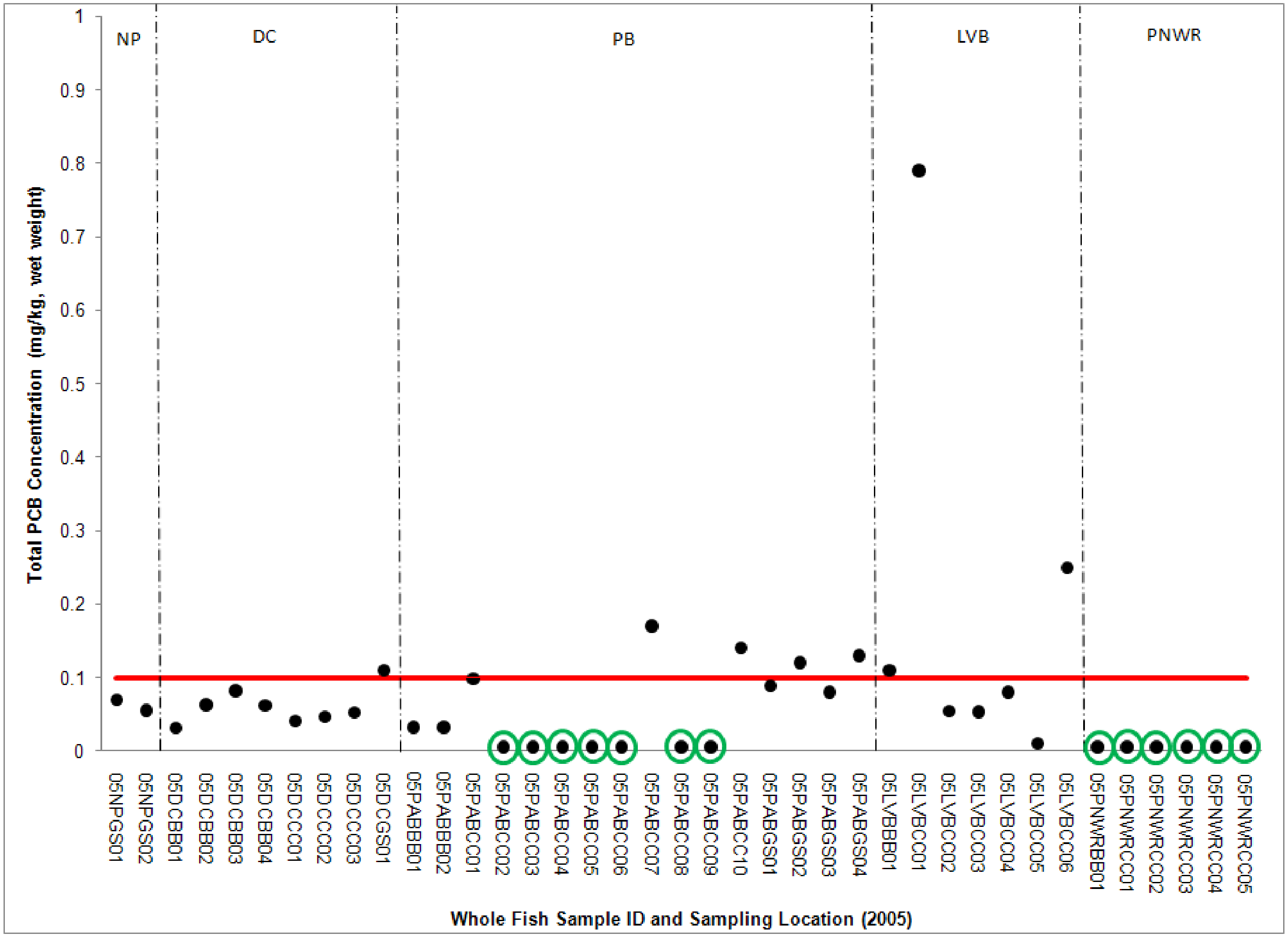


Figure D.2. Summary of Total PCB Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2005 (O = ND; — = LOC).

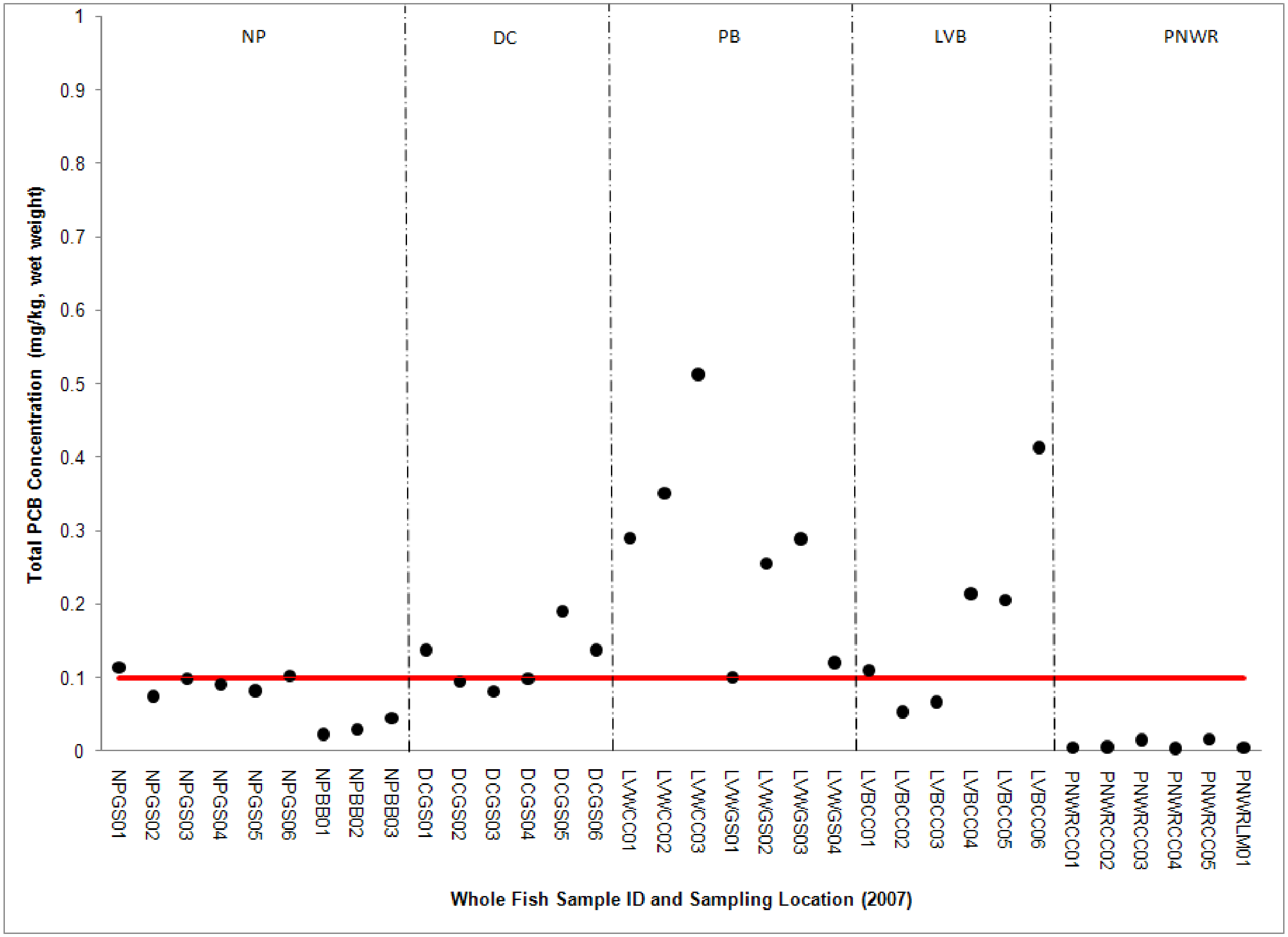


Figure D.3. Summary of Total PCB Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2007 (— = LOC).

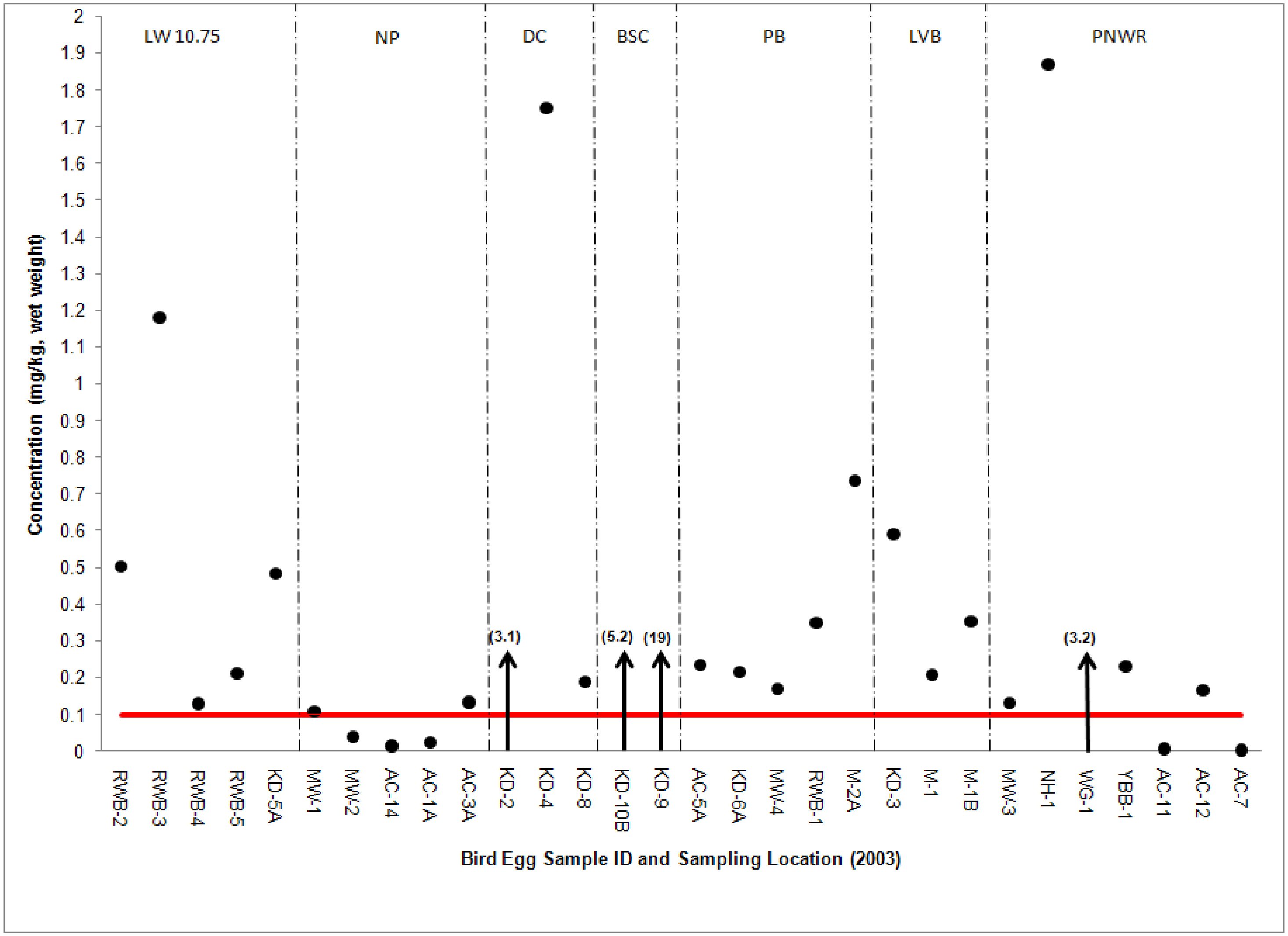


Figure D.4. Summary of 4,4'-DDE Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2003 (↑= >LOC; — = LOC).

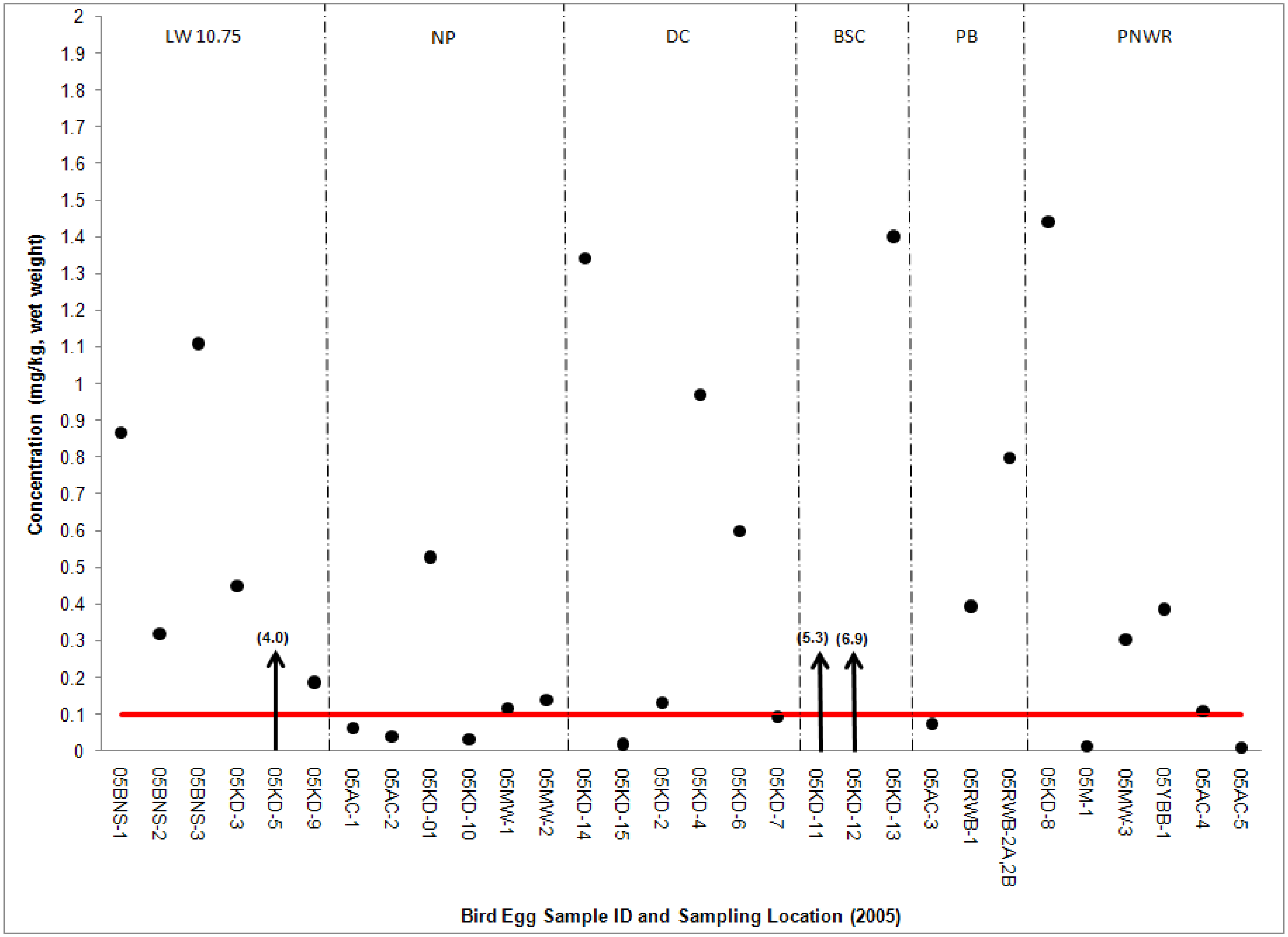


Figure D.5. Summary of 4,4'-DDE Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2005 (↑= >LOC; — = LOC).

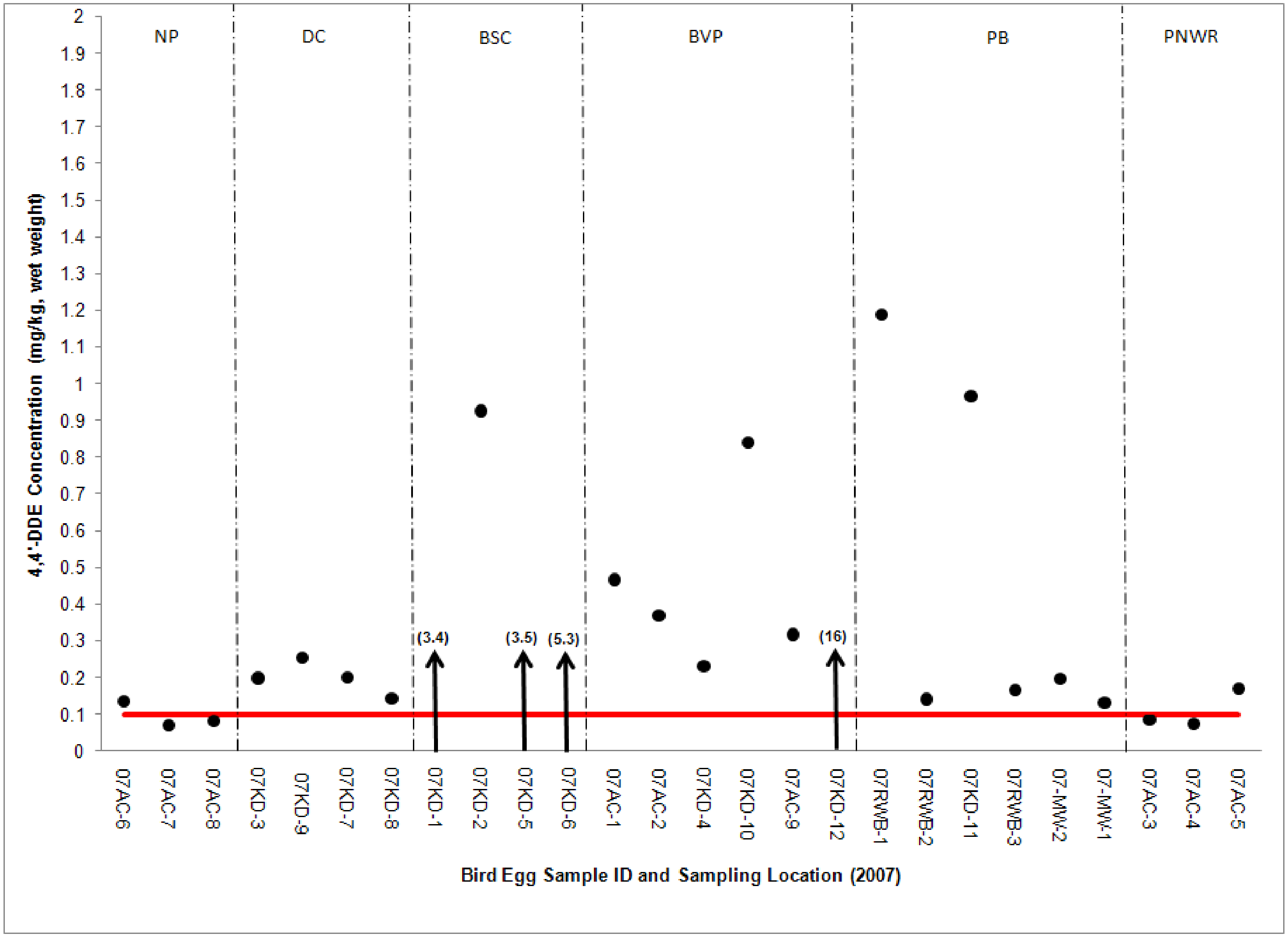


Figure D.6. Summary of 4,4'-DDE Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2007 (↑= >LOC; — = LOC).

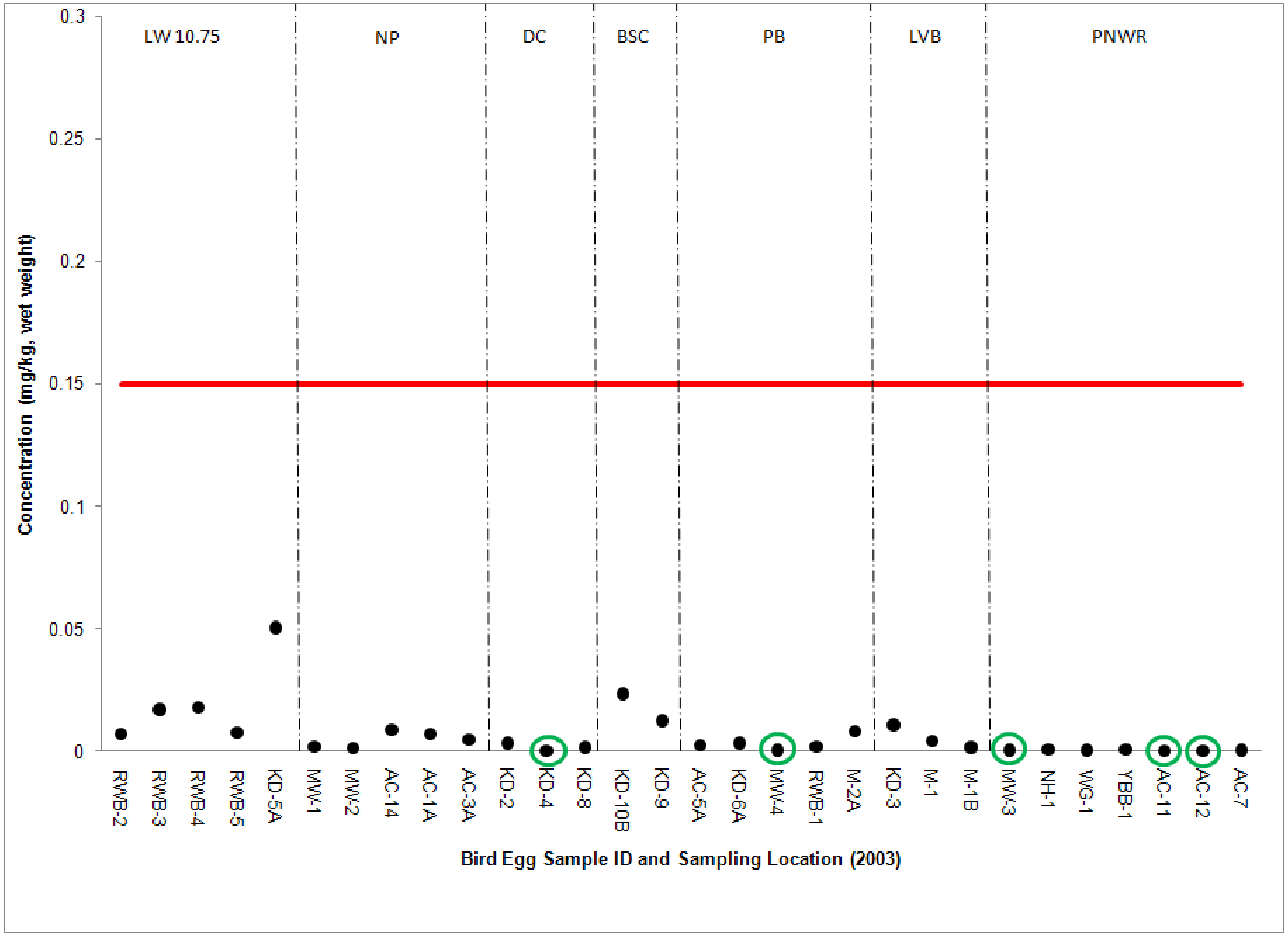


Figure D.7. Summary of Dieldrin Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2003 (↑= >LOC; O = ND; — = LOC).

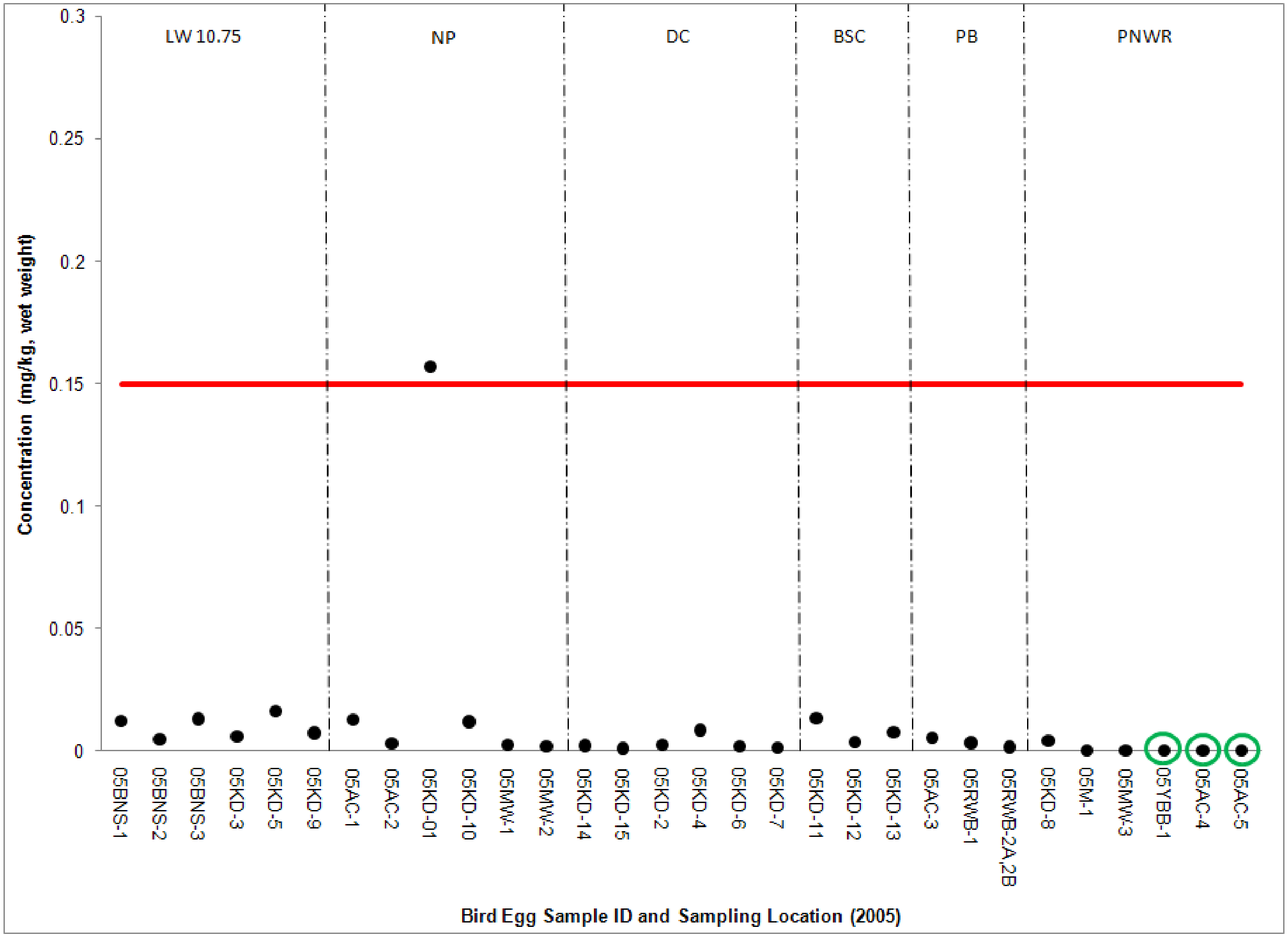


Figure D.8. Summary of Dieldrin Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2005 (↑= >LOC; O = ND; — = LOC).

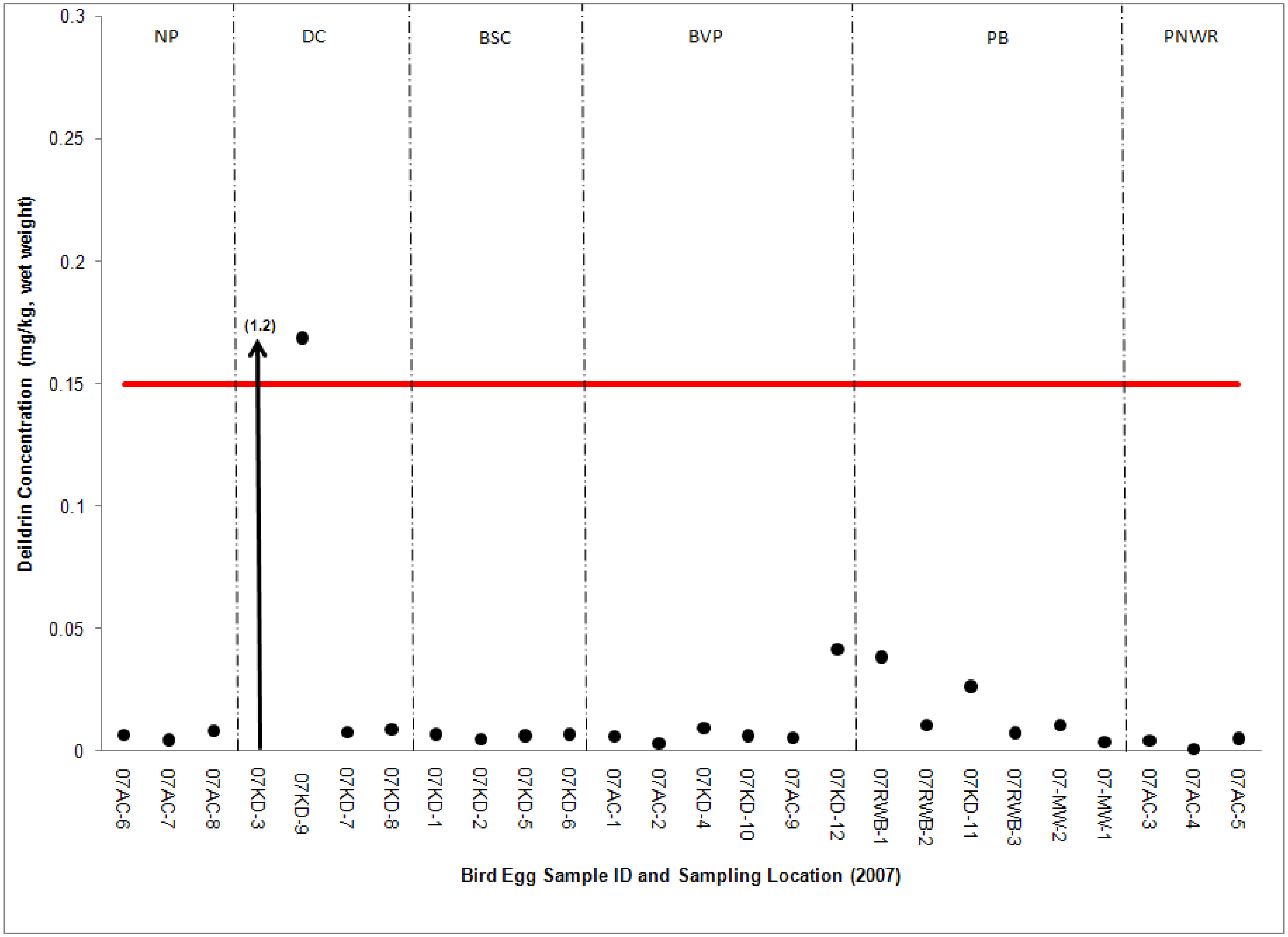


Figure D.9. Summary of Dieldrin Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2007 (↑= >LOC; O = ND; — = LOC).

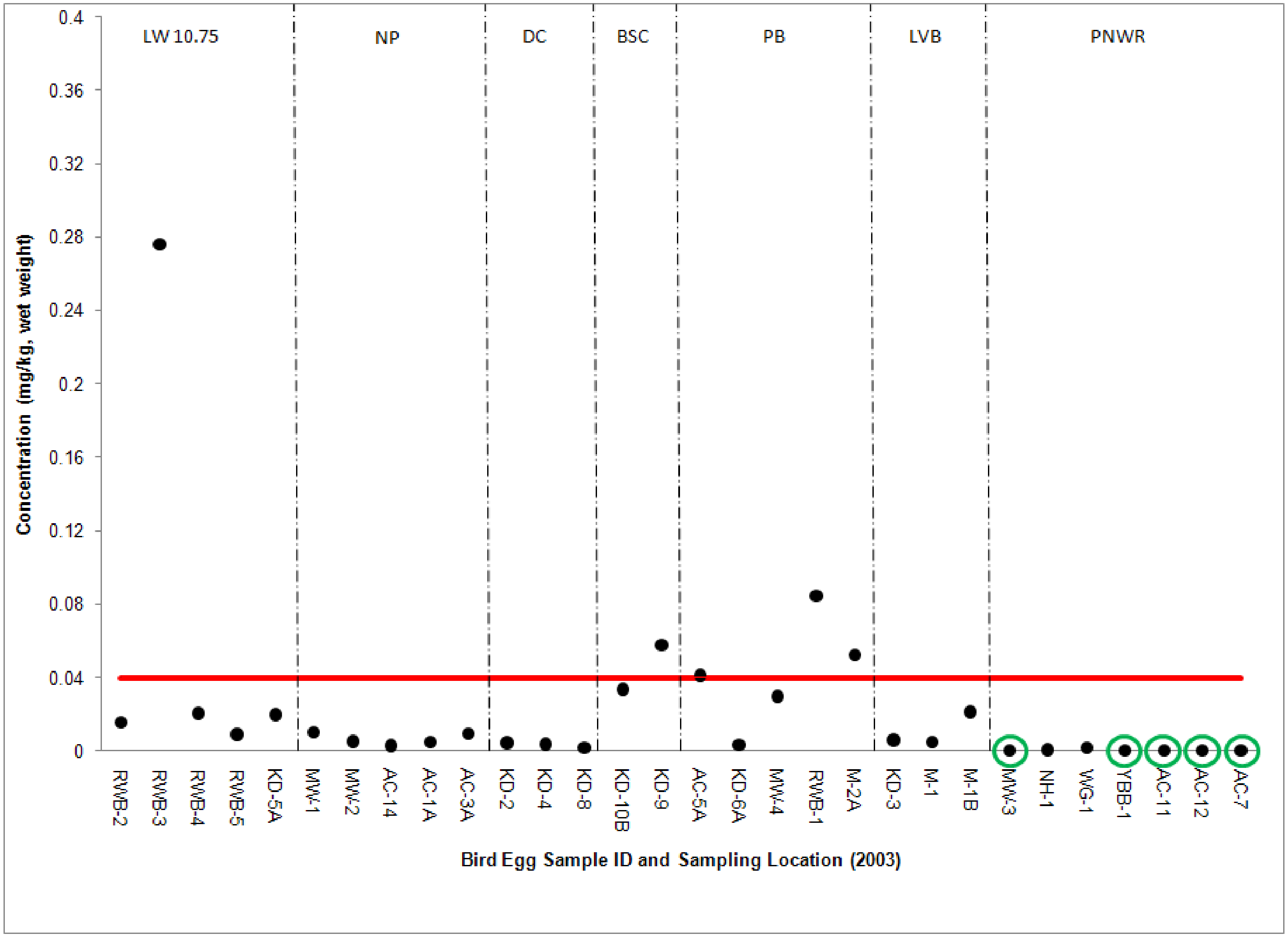


Figure D.10. Summary of Heptachlor Epoxide Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2003 (O = ND; — = LOC).

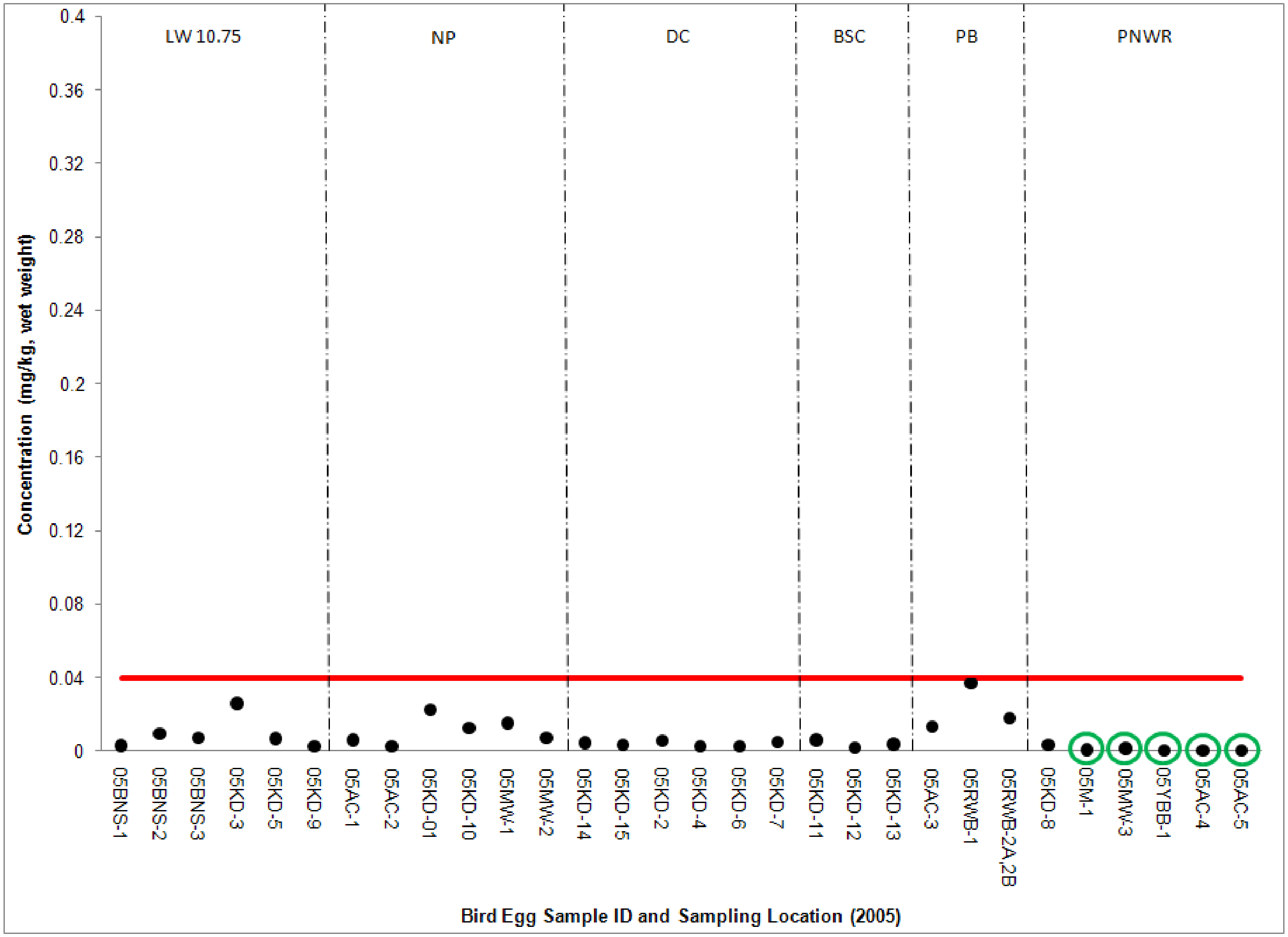


Figure D.11. Summary of Heptachlor Epoxide Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2005 (O = ND; — = LOC).

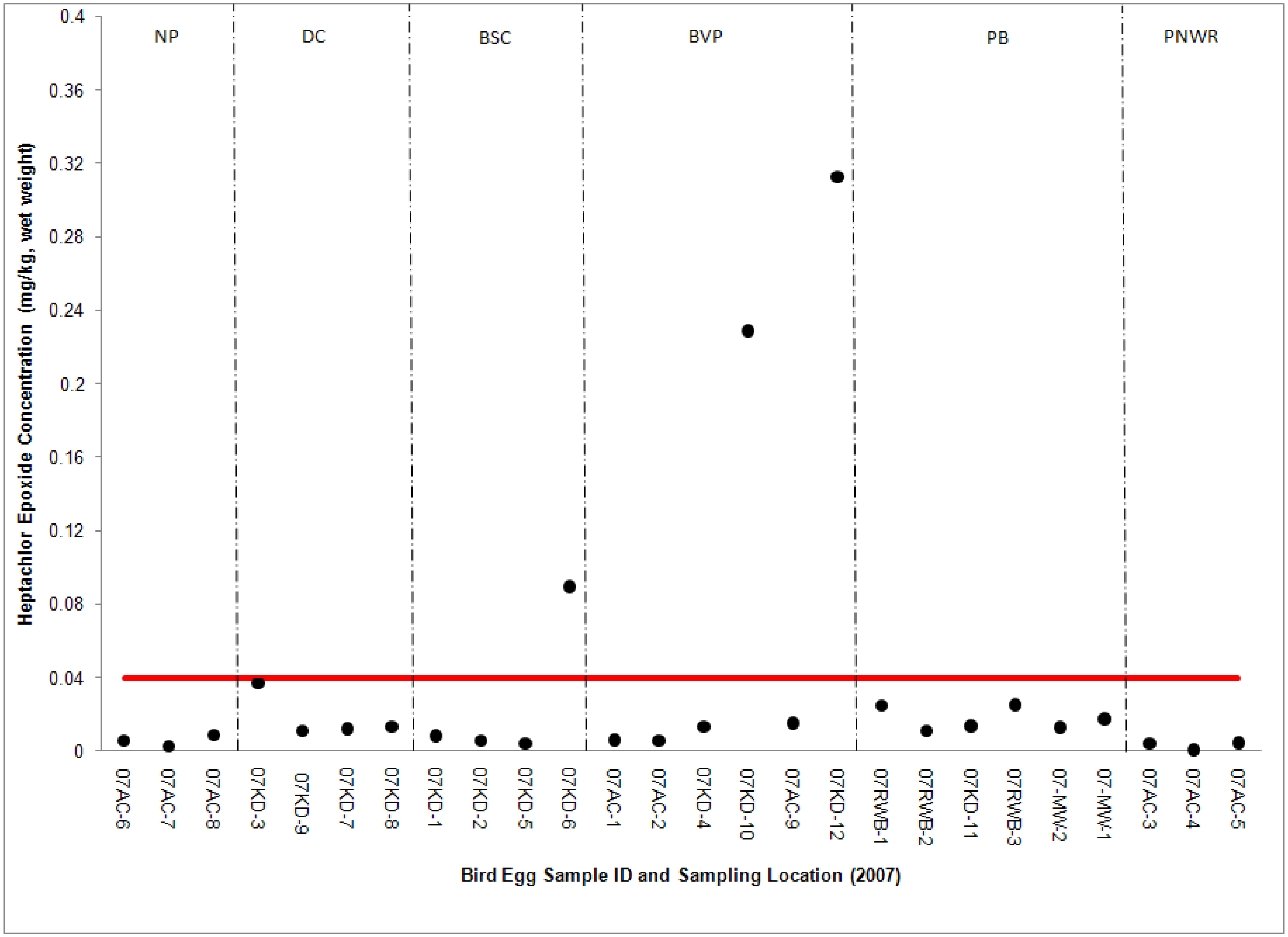


Figure D.12. Summary of Heptachlor Epoxide Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2007 (O = ND; — = LOC).

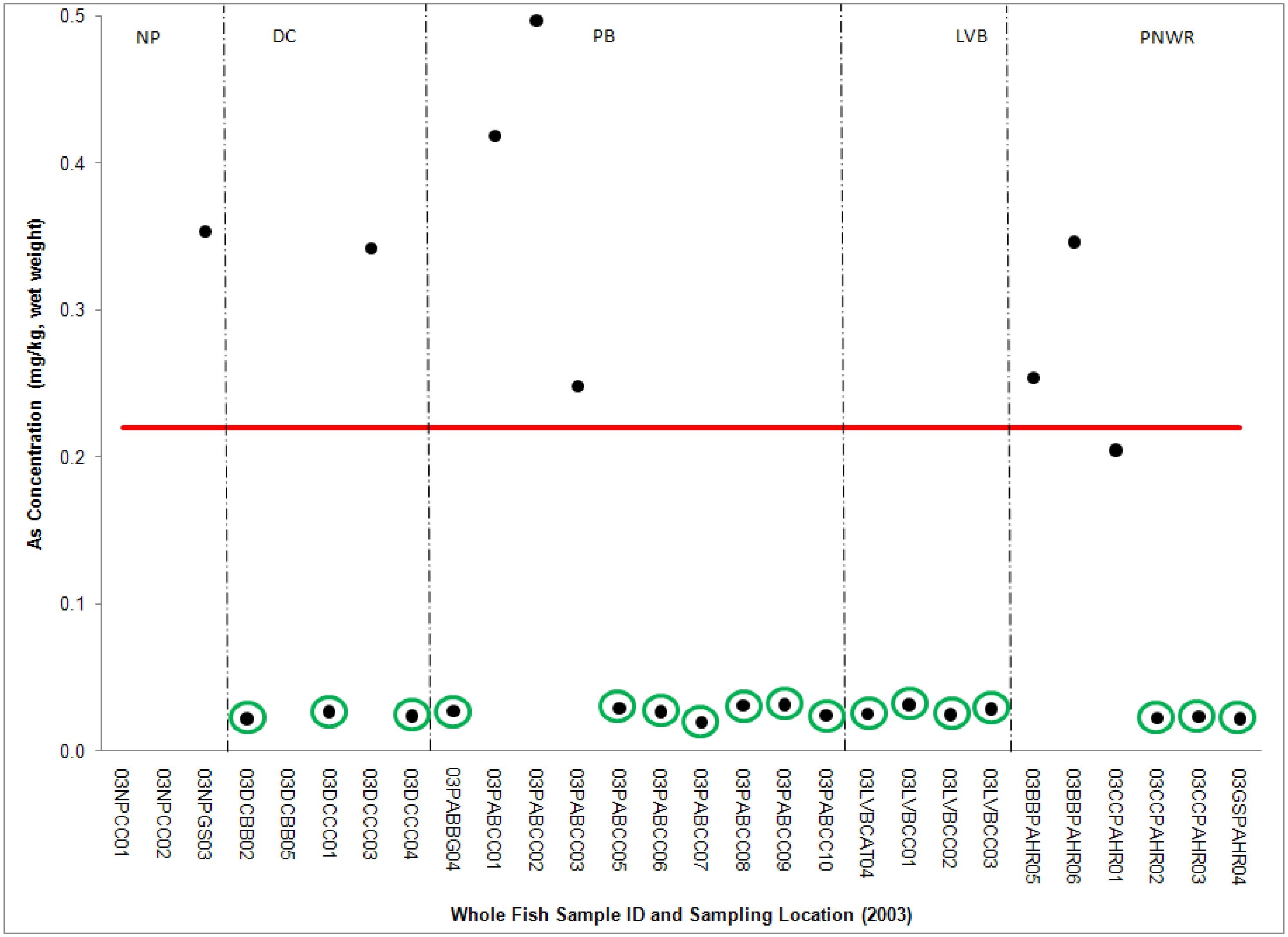


Figure D.13. Summary of As Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2003 (O = ND; — = LOC).

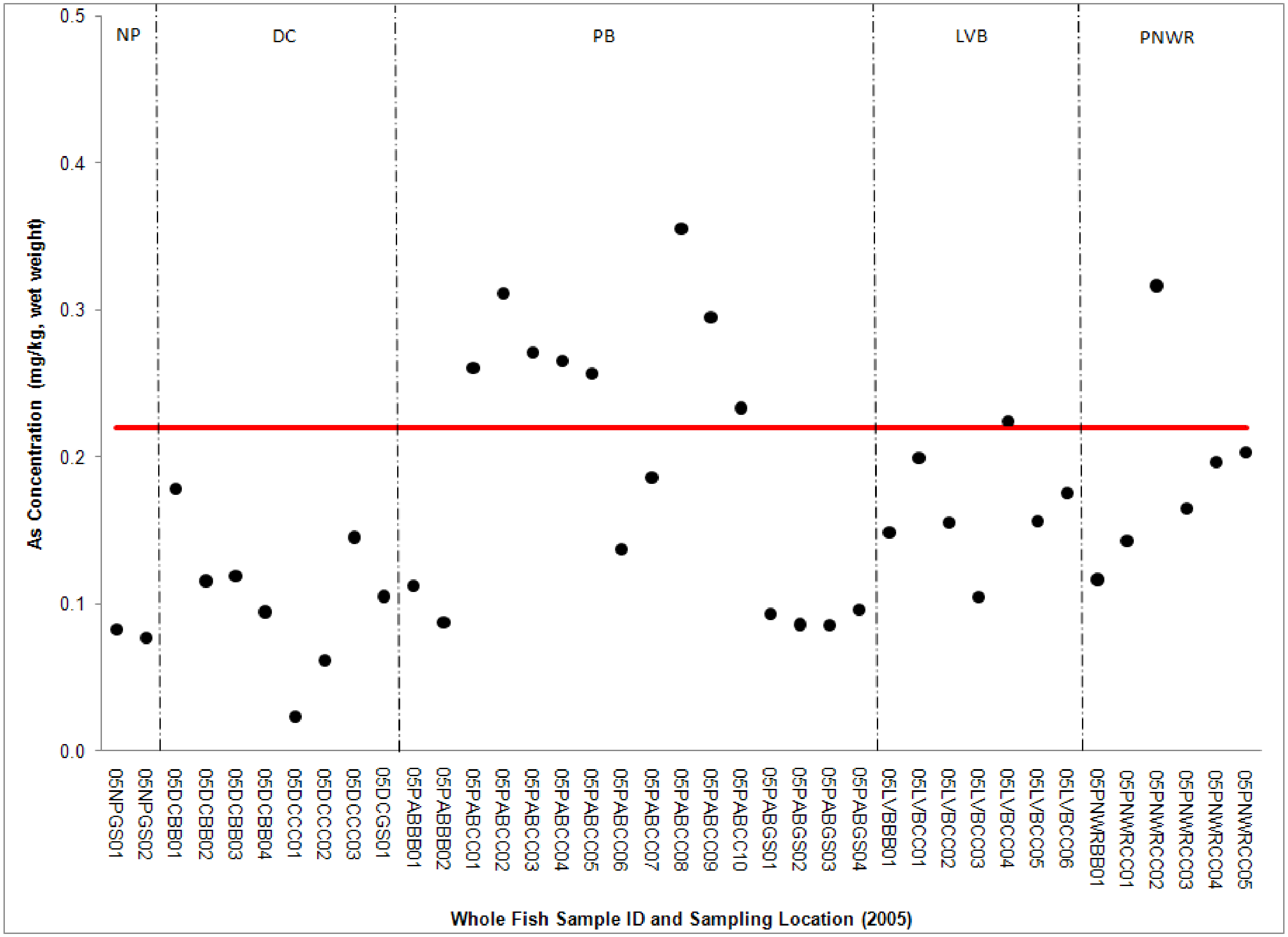


Figure D.14. Summary of As Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2005 (O = ND; — = LOC).

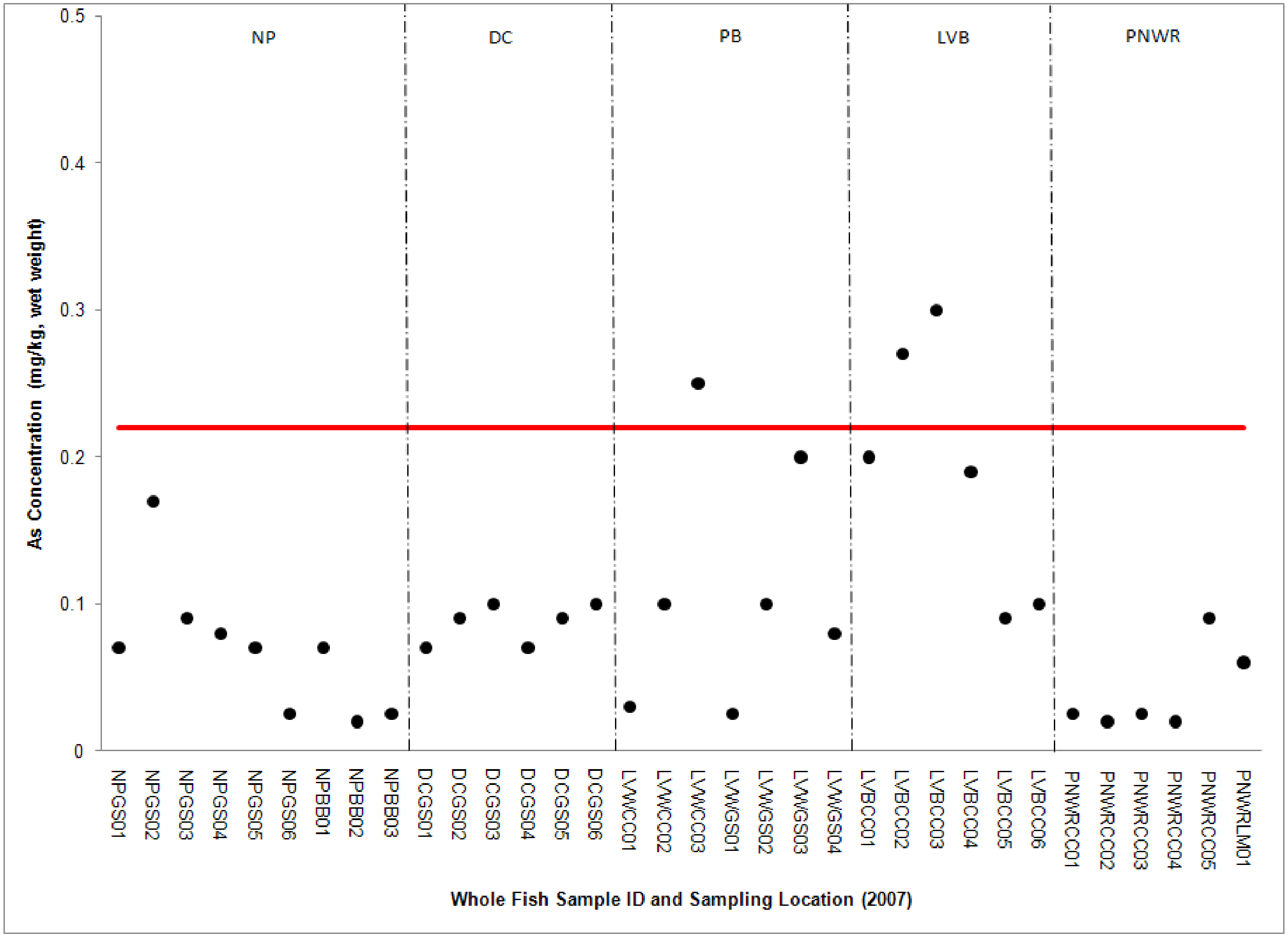


Figure D.15 Summary of As Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2007 (O = ND; — = LOC).

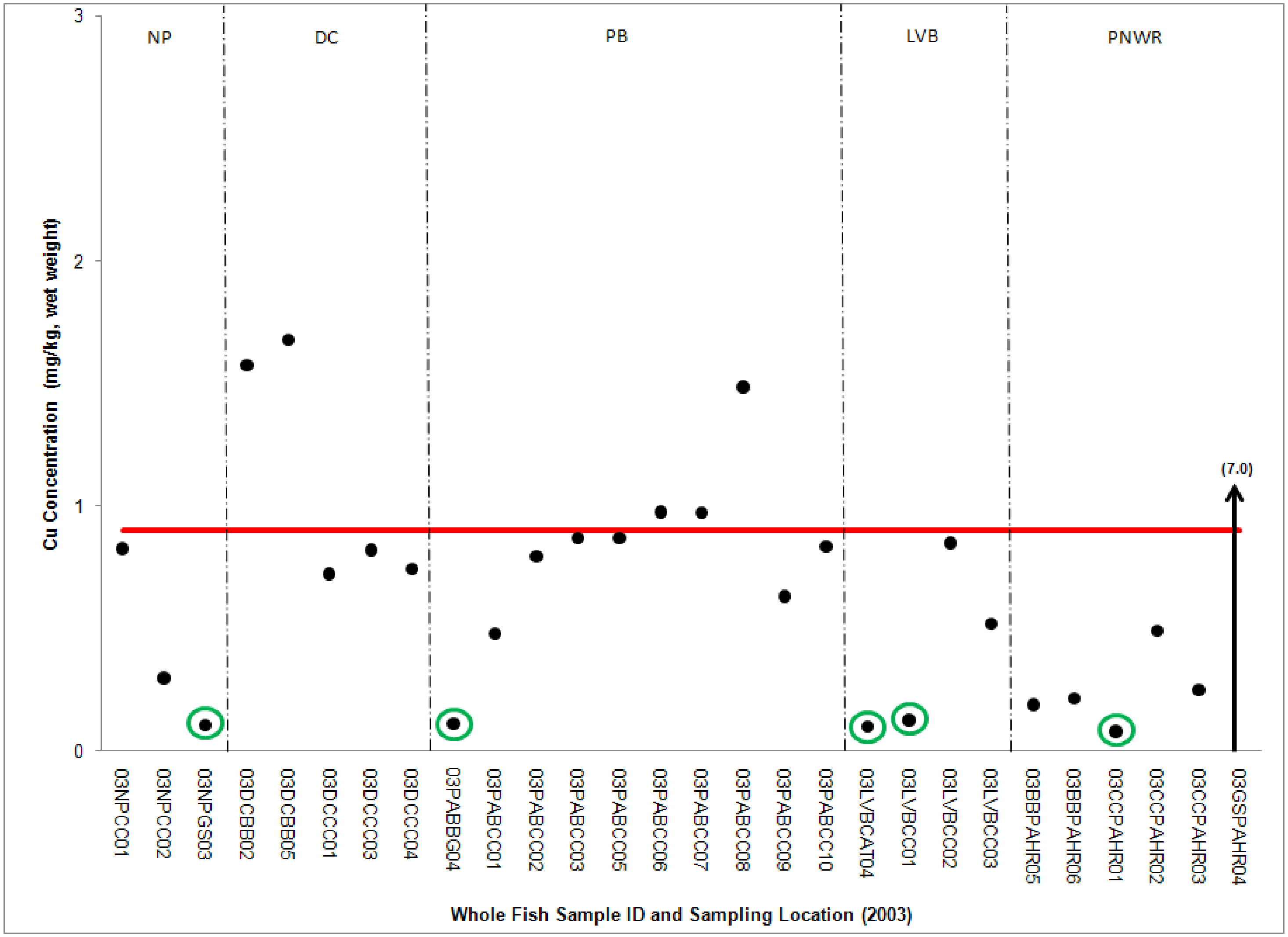


Figure D.16. Summary of Cu Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2003 (↑= >LOC; O = ND; — = LOC).

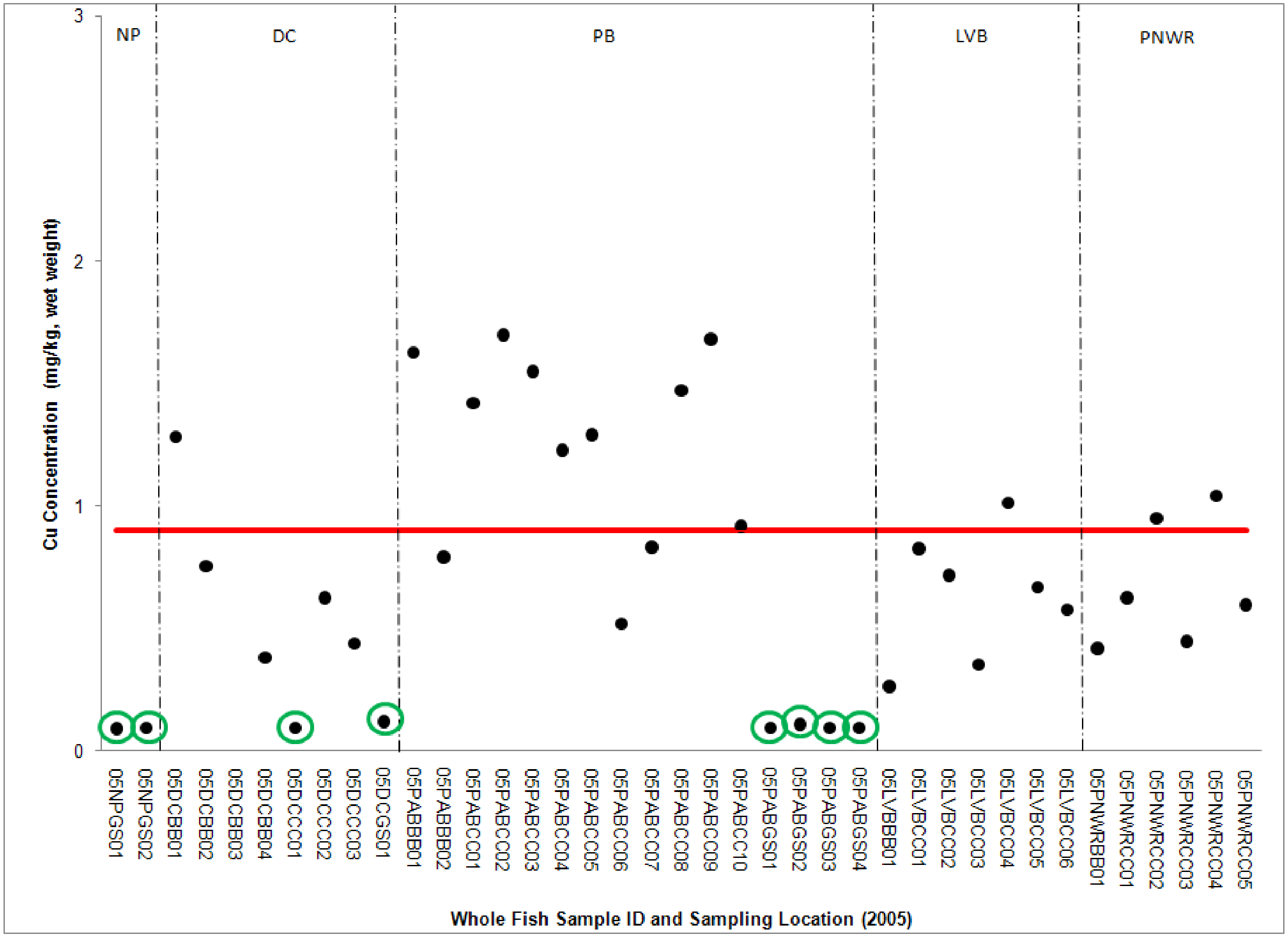


Figure D.17. Summary of Cu Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2005 (↑= >LOC; O = ND; — = LOC).

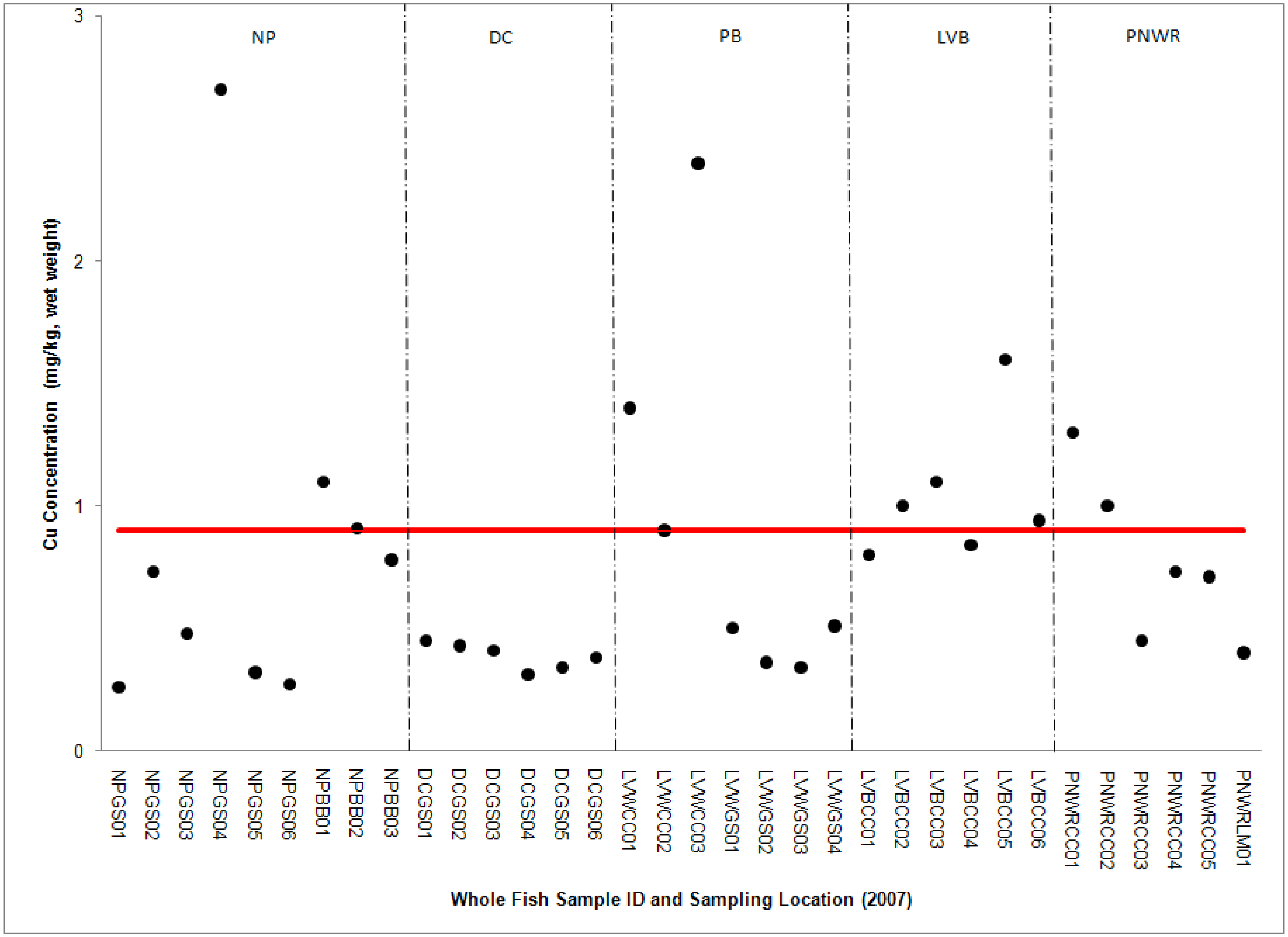


Figure D.18. Summary of Cu Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2007 (↑= >LOC; O = ND; — = LOC).

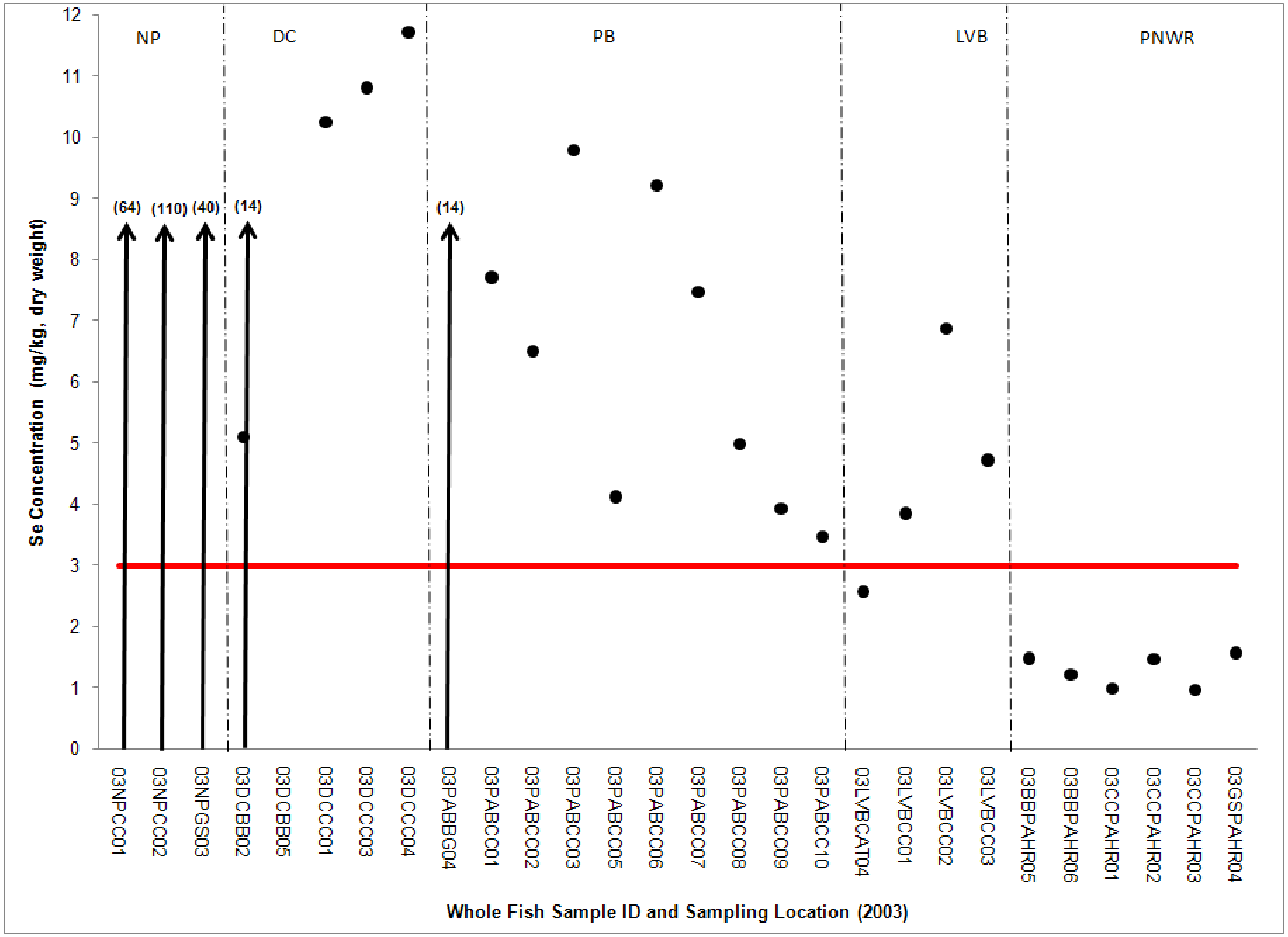


Figure D.19. Summary of Se Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2003 (↑= >LOC; — = LOC).

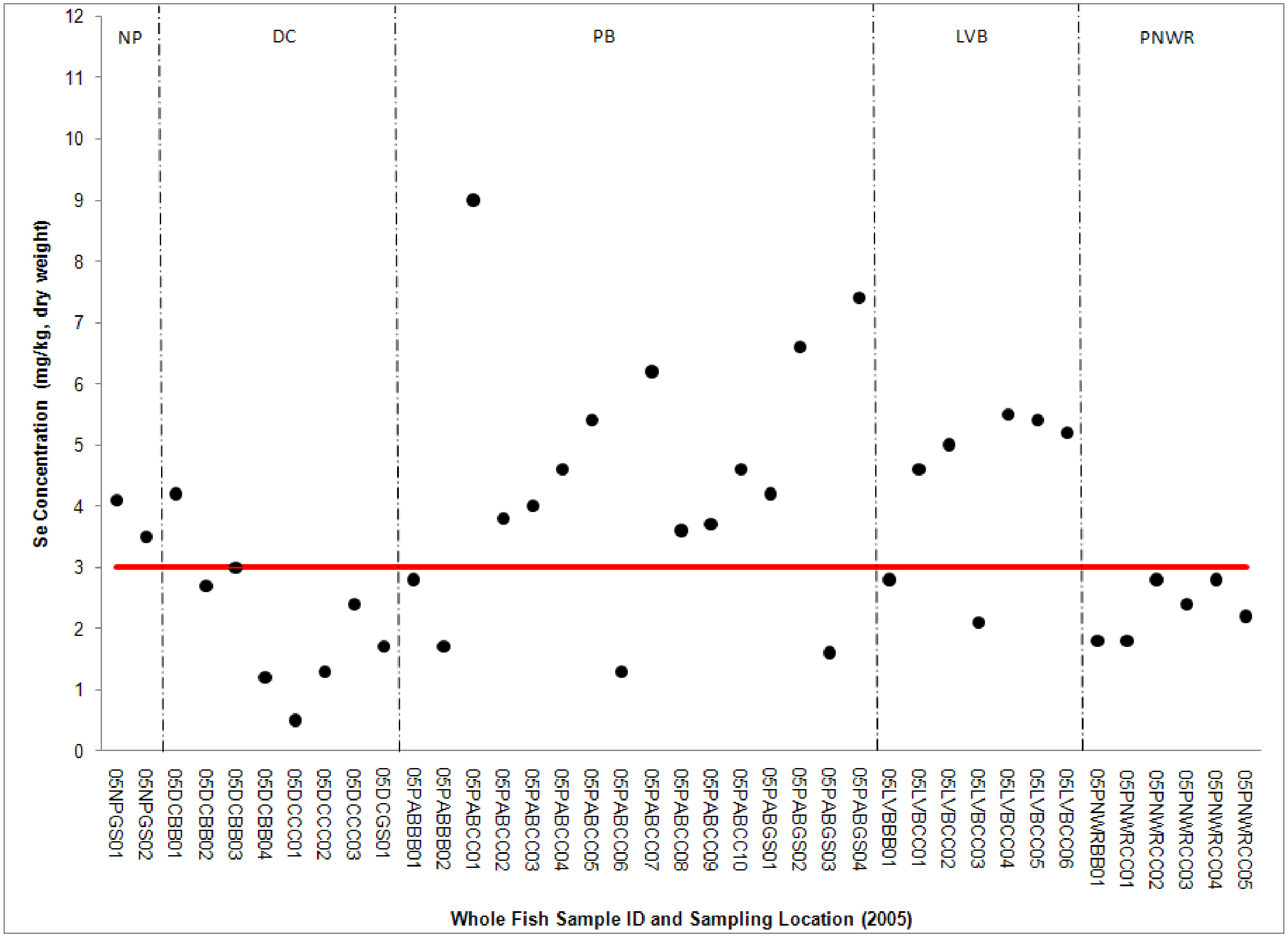


Figure D.20. Summary of Selenium Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2005 (↑= >LOC; — = LOC).

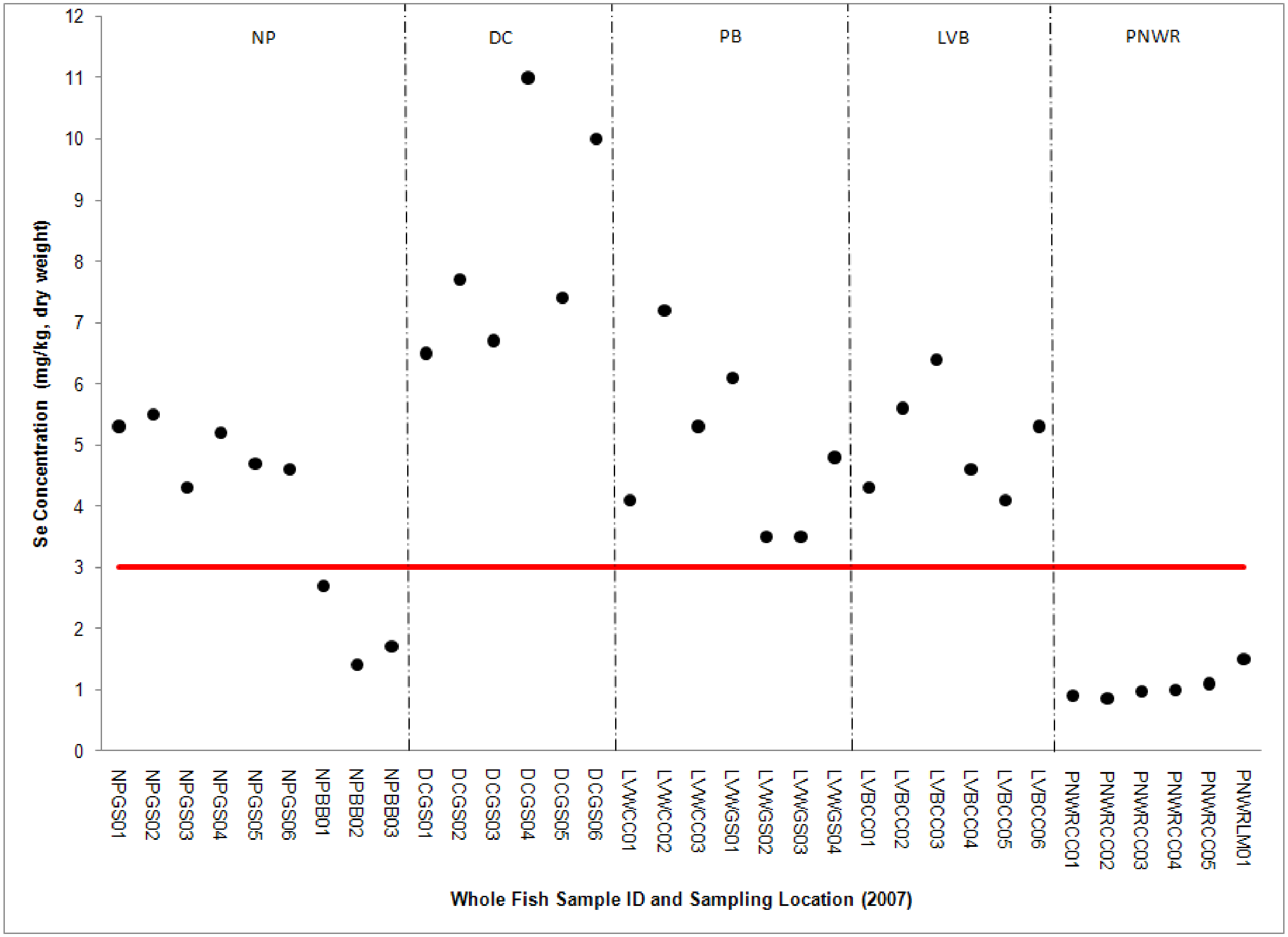


Figure D.21. Summary of Se Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2007 (↑= >LOC; — = LOC).

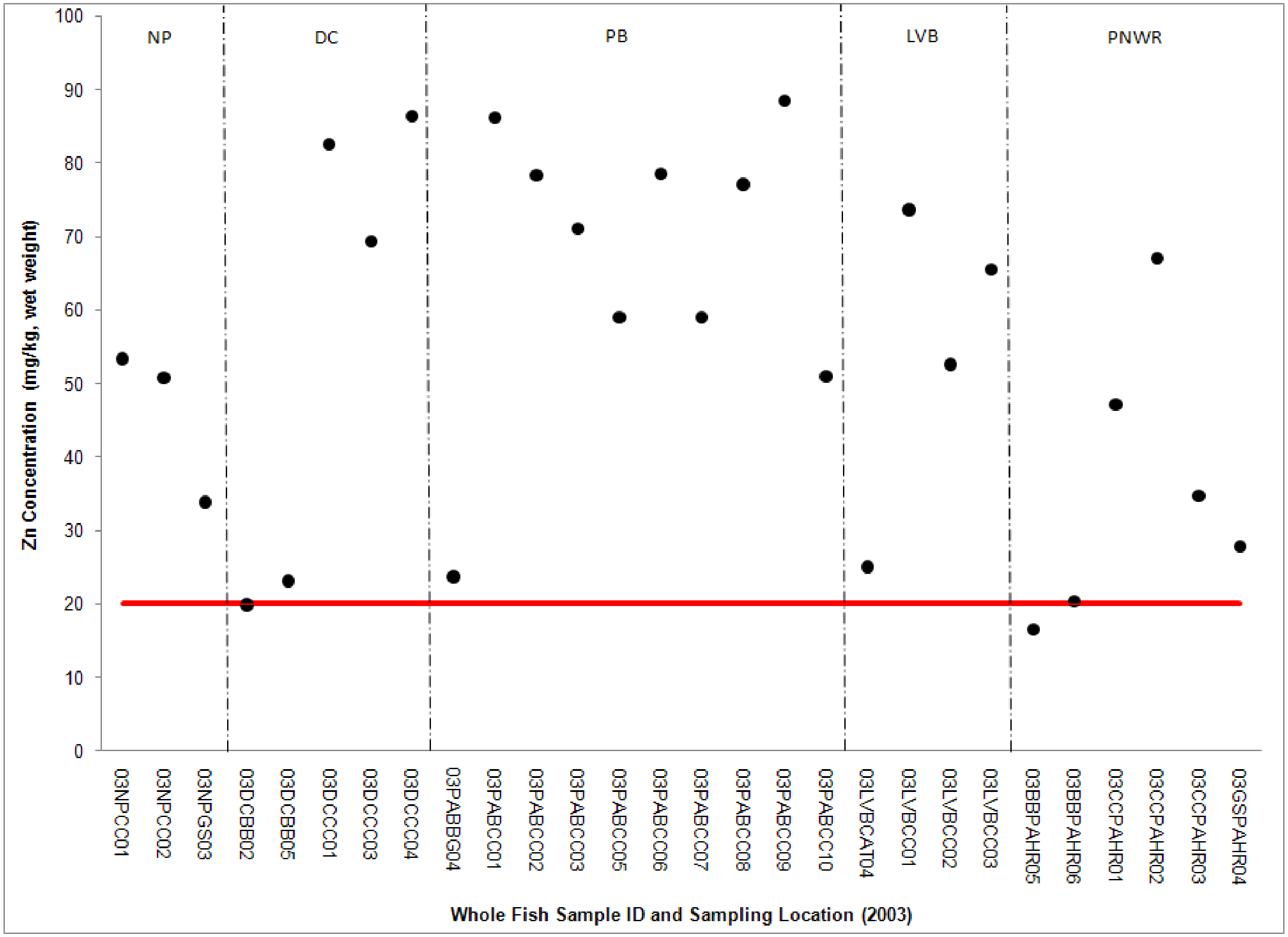


Figure D.22. Summary of Zn Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2003 (— = LOC).

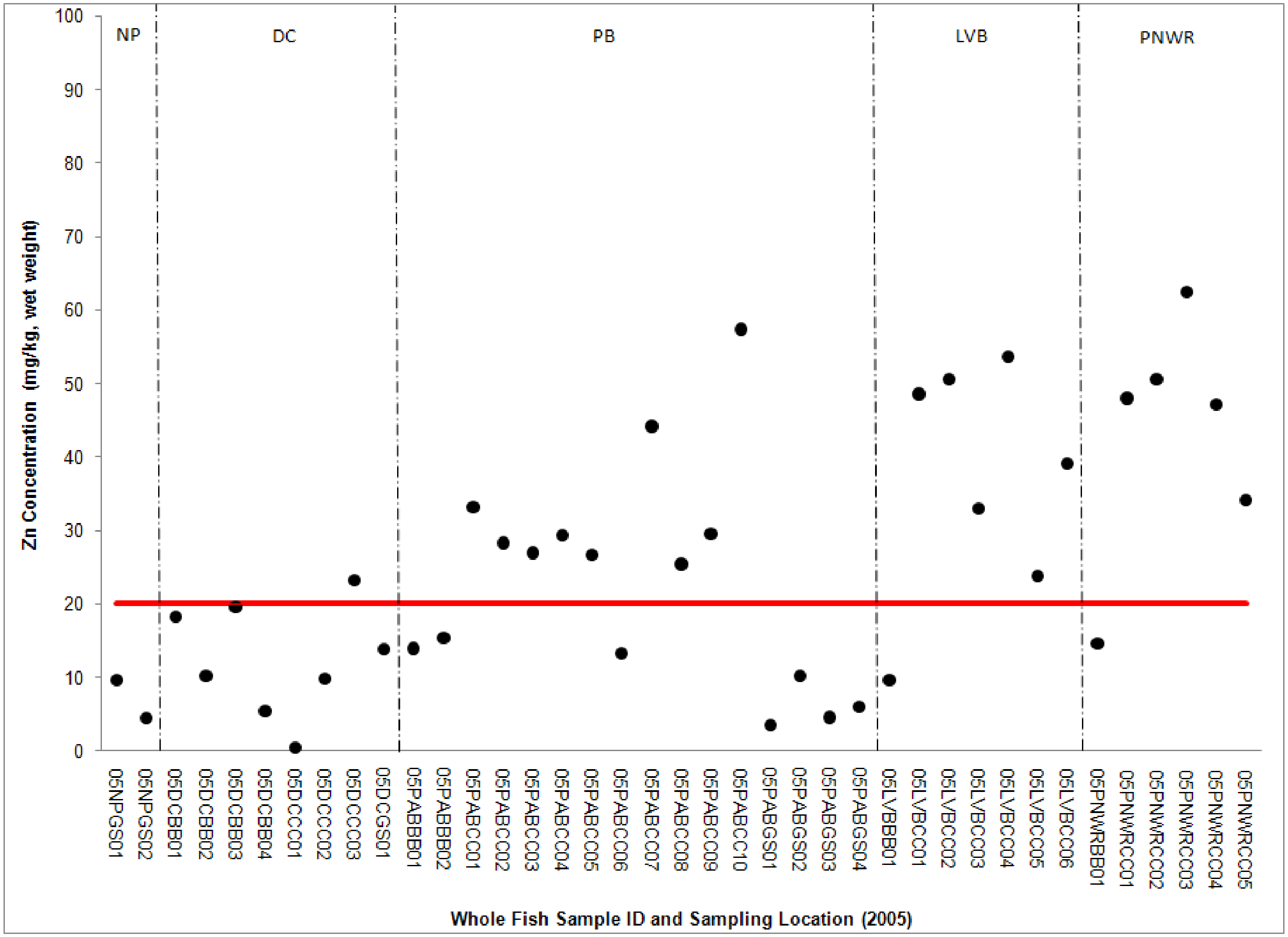


Figure D.23. Summary of Zn Detections and LOC Exceedences in Whole Fish Collected From the Las Vegas Wash and Its Tributaries in 2005 (— = LOC).

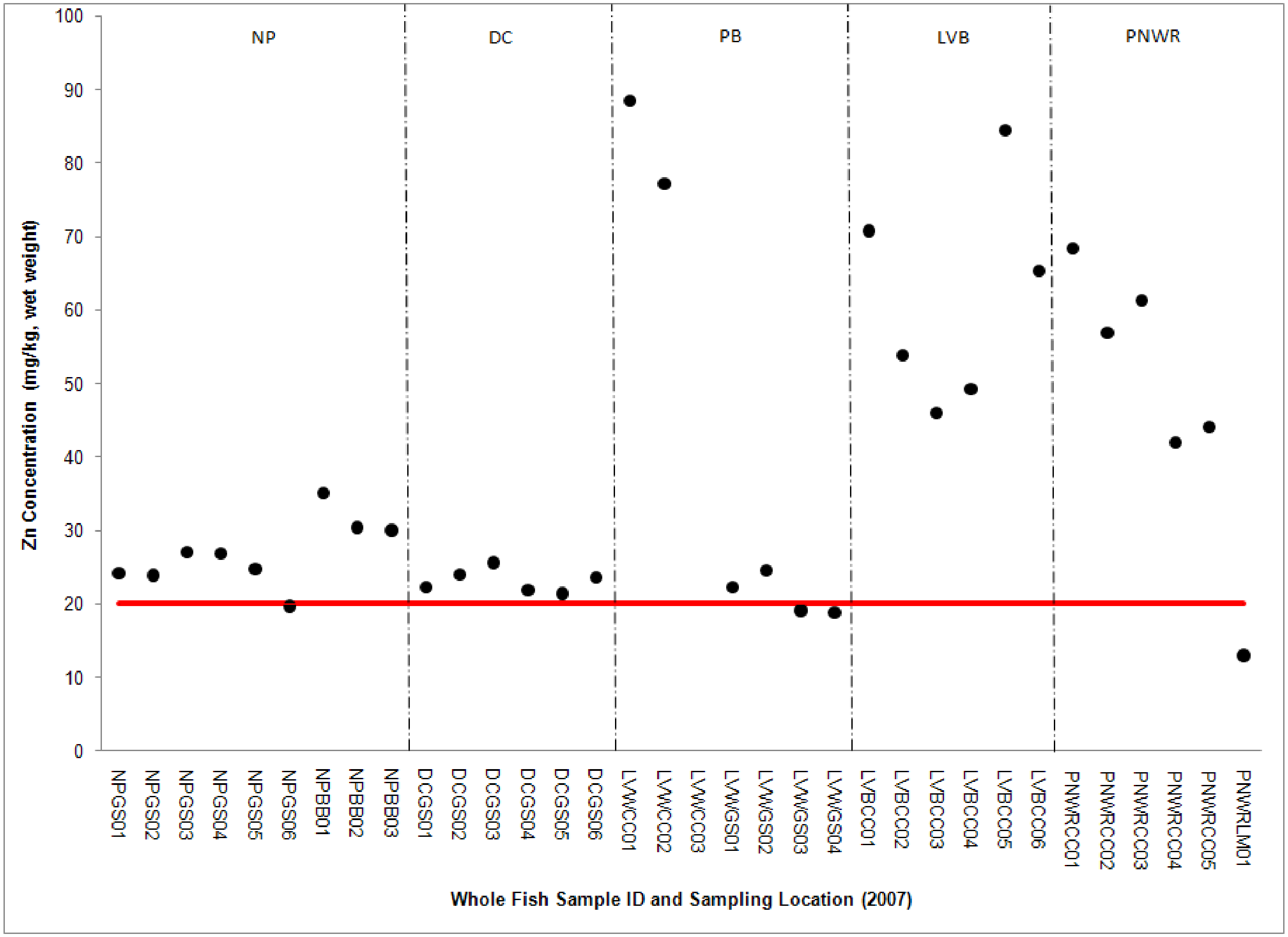


Figure D.24. Summary of Zn Detections and LOC Exceedences in Whle Fish Collected From the Las Vegas Wash and Its Tributaries in 2007 (— = LOC).

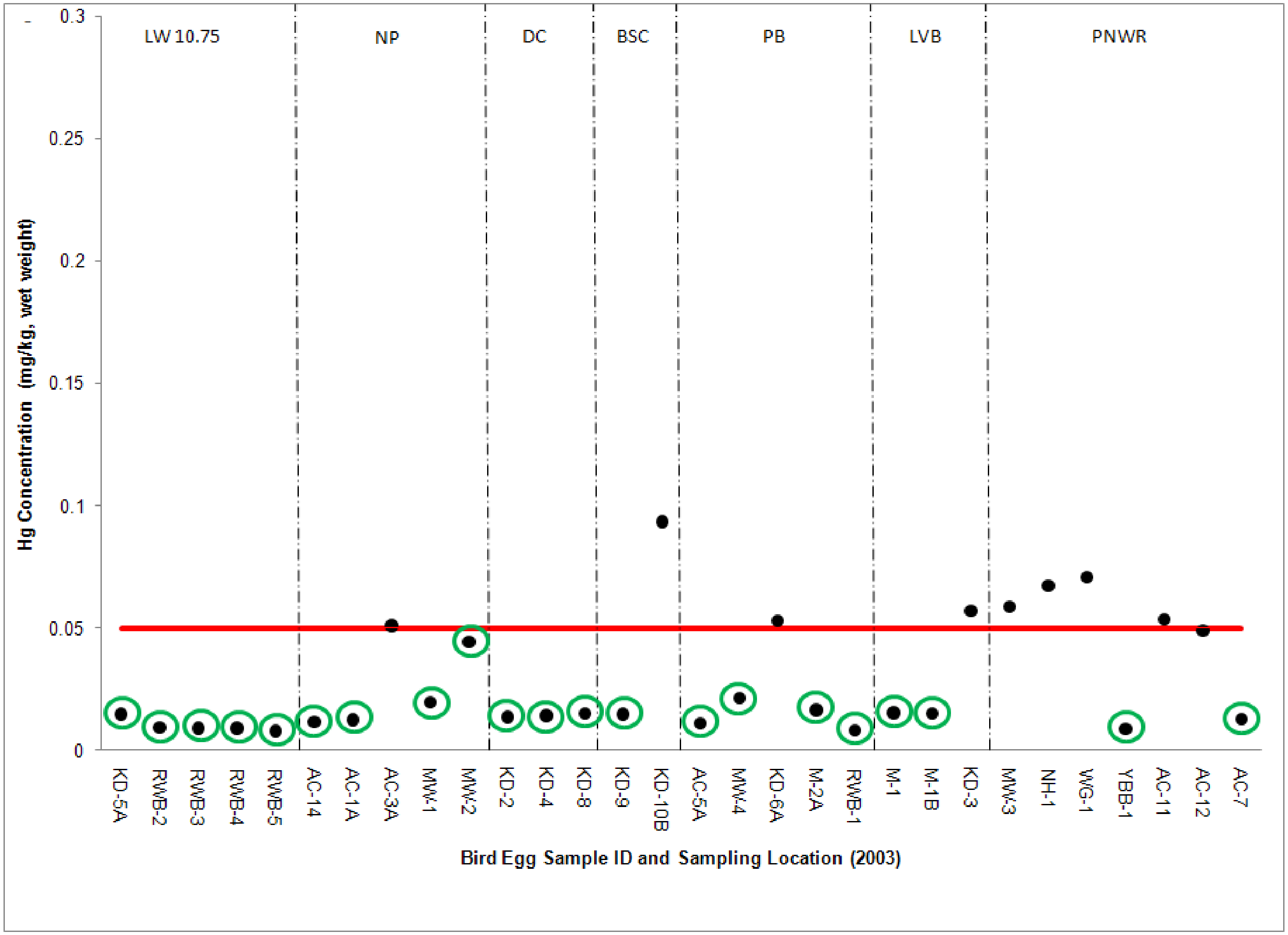


Figure D.25. ummary of Hg Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2003 (— = LOC; O = ND).

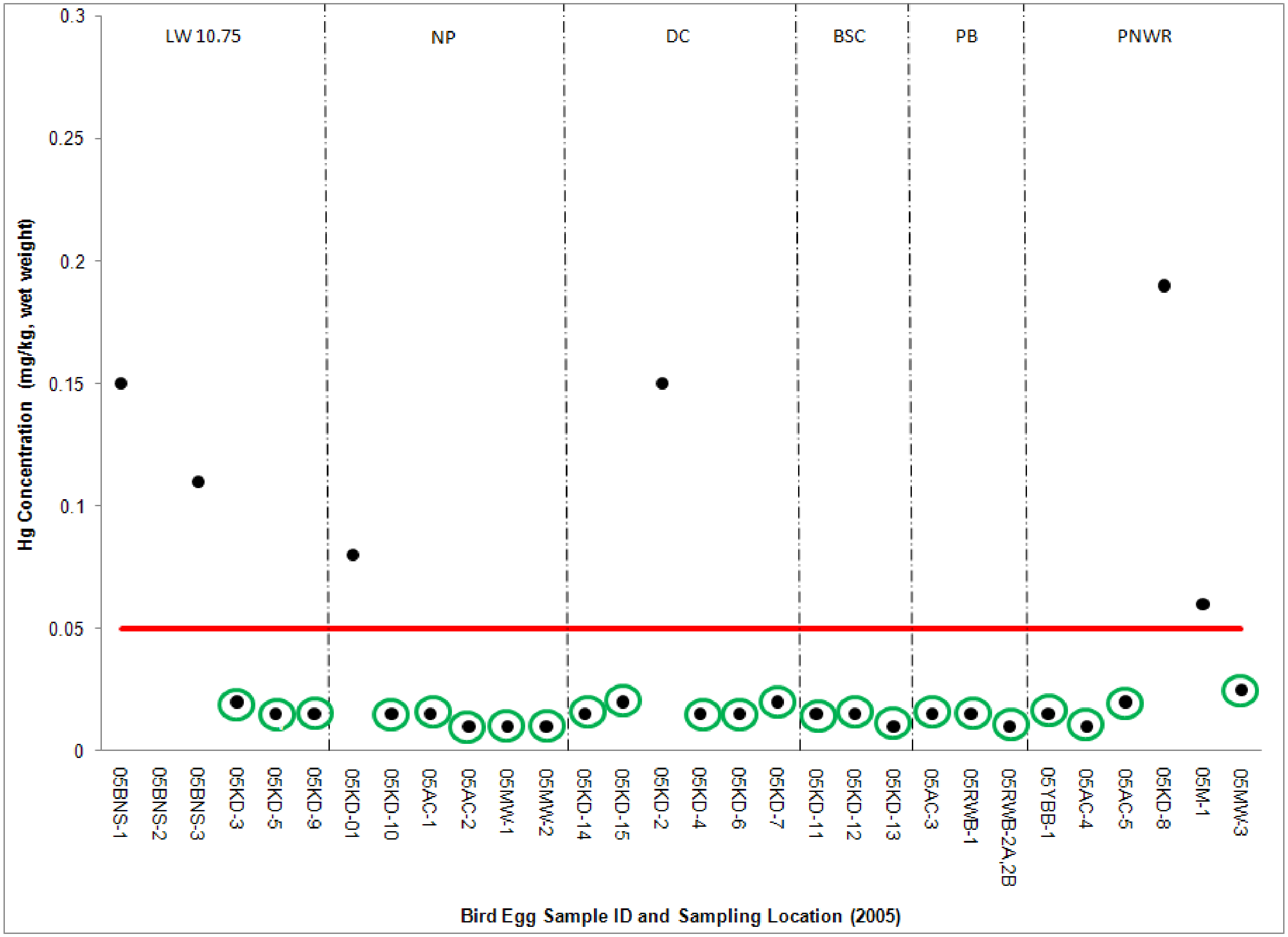


Figure D.26. Summary of Hg Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2005 (— = LOC; O = ND).

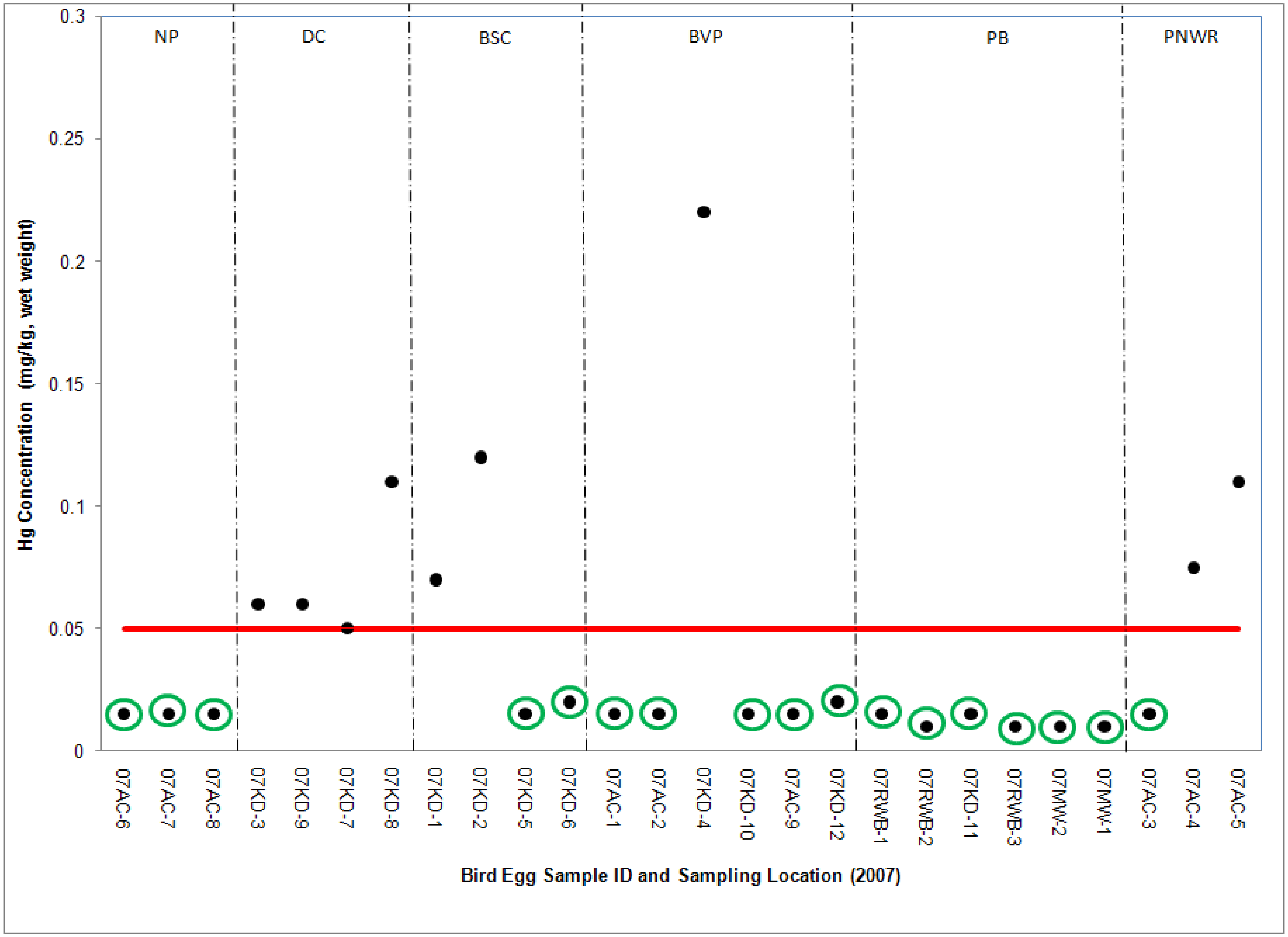


Figure D.27. Summary of Hg Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2007 (— = LOC; O = ND).

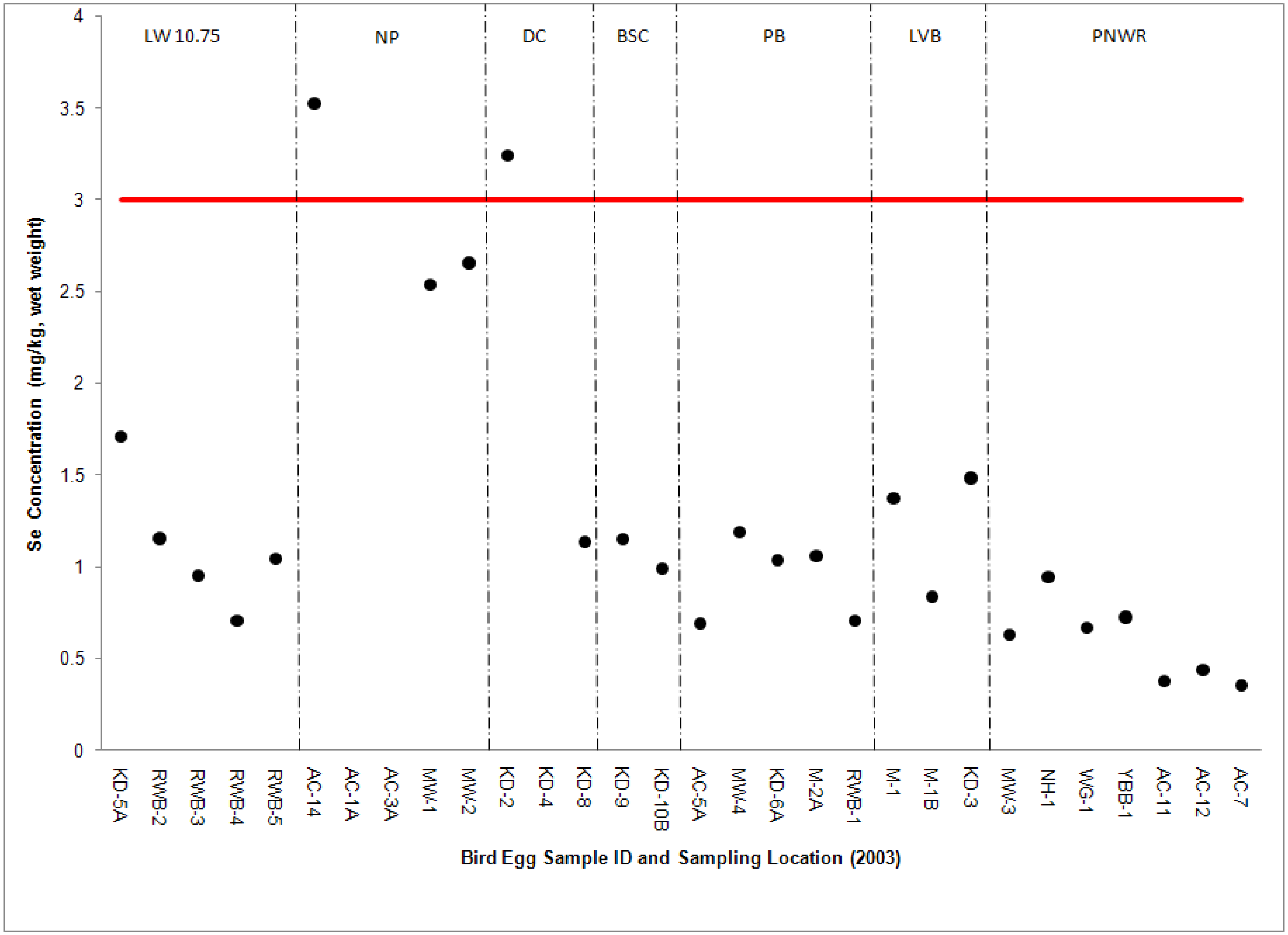


Figure D.28. Summary of Se Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2003 (— = LOC).

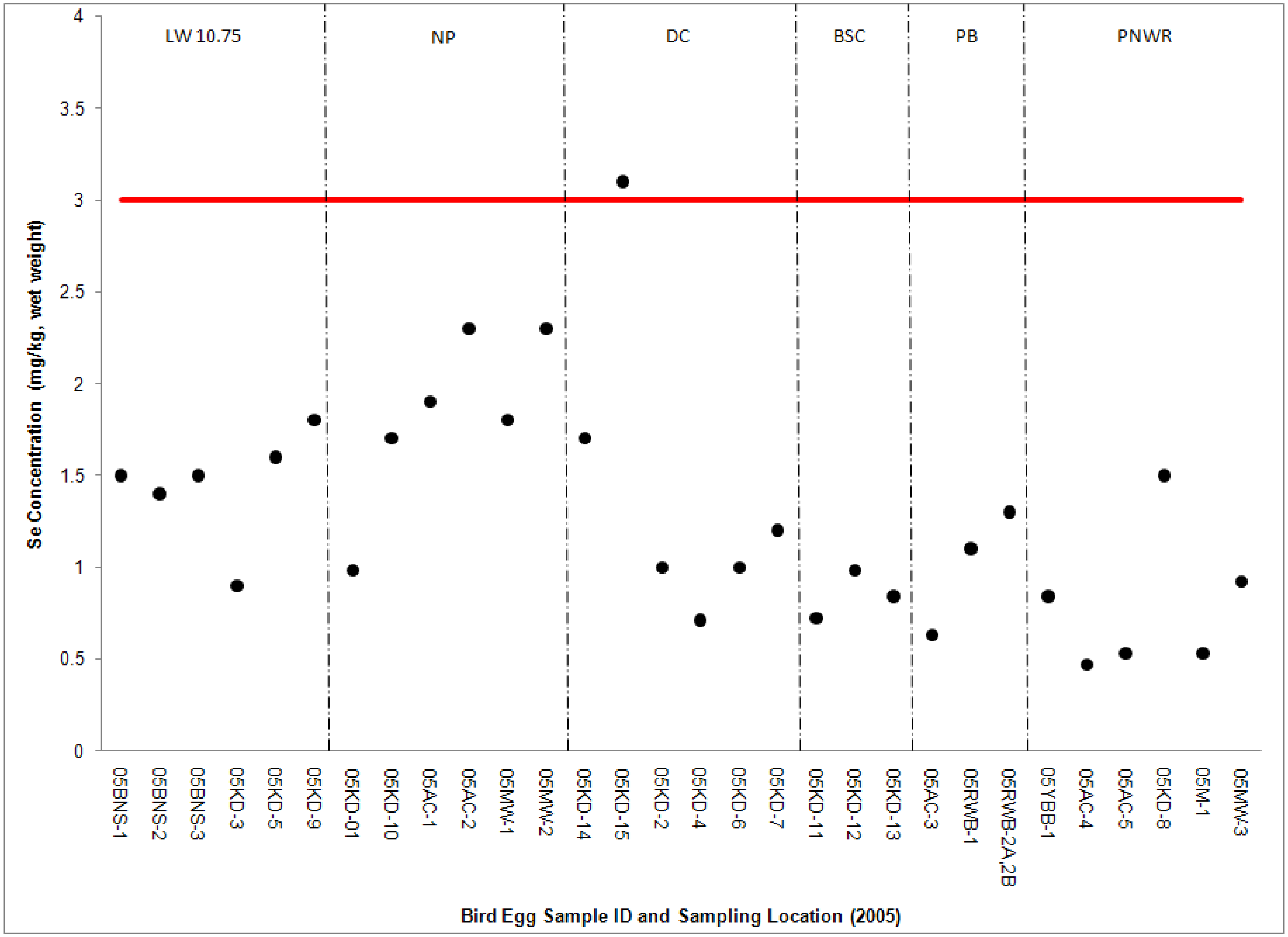


Figure D.29. Summary of Se Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2005 (— = LOC).

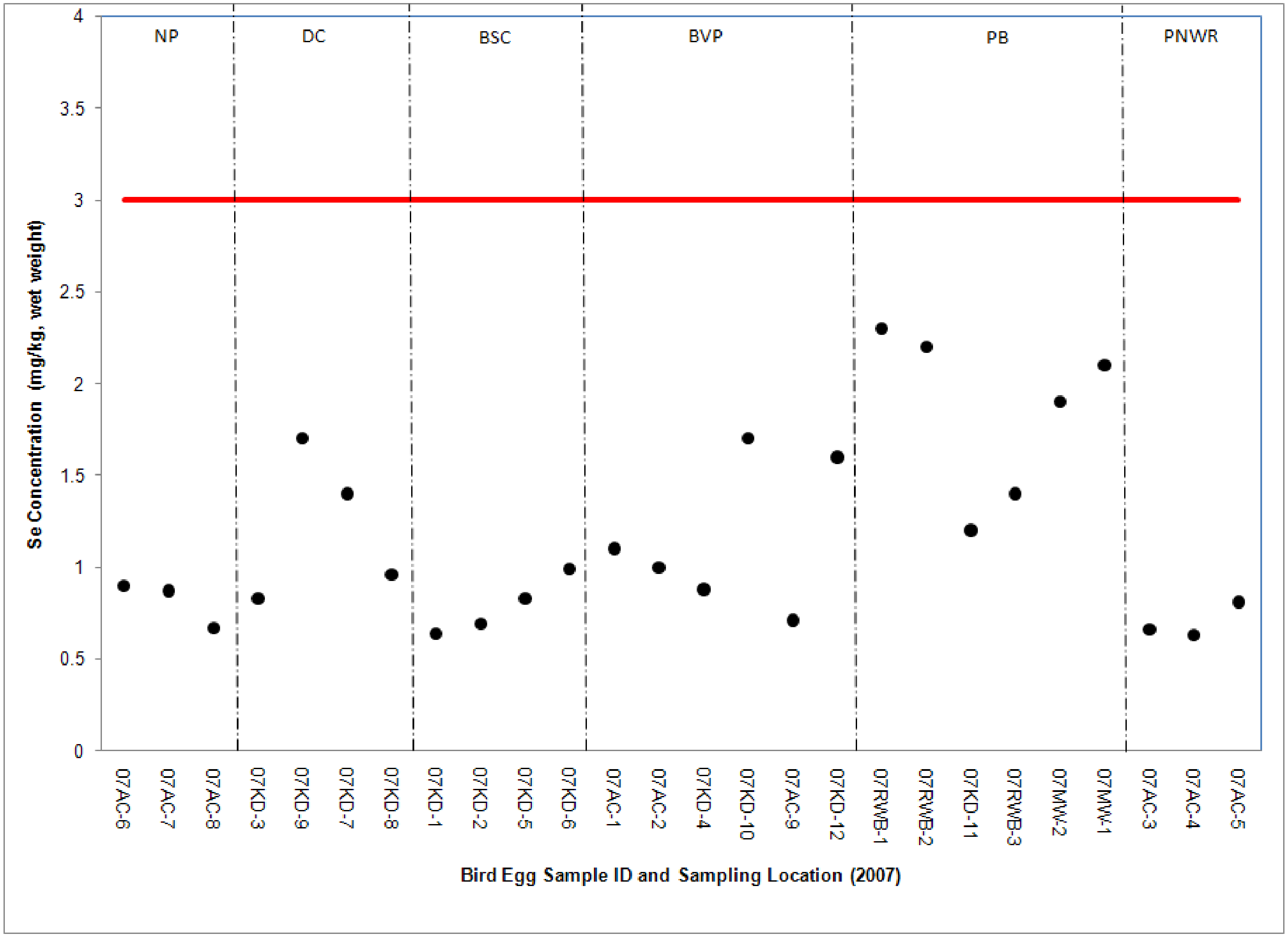


Figure D.30. Summary of Se Detections and LOC Exceedences in Bird Eggs Collected From the Las Vegas Wash and Its Tributaries in 2007 (— = LOC).