ATTACHMENT 1 – SUMMARY OF PROPOSED ACTION: DRAFT BASIN PLAN AMENDMENT

ATTACHMENT X TO RESOLUTION NO. R8- 2009-00xx

CHANGES TO CHAPTER 4 – WATER QUALITY OBJECTIVES

(NOTE: Additional language regarding site-specific objectives for selenium in Newport Bay and the freshwater streams of the Newport Bay watershed is proposed to be added to Chapter 4, Water Quality Objectives. If the Basin Plan Amendment is approved, corresponding changes will be made as necessary to the Table of Contents, the List of Tables, page numbers, and page headers in the plan. Due to the two-column layout of the Basin Plan, the location of tables in relation to text may change during final formatting of the amendment. Formatting changes, including page numbers, page headers and table and figure identifiers may be modified for the purposes of re-publication of the Basin Plan. However, no substantive changes to the text, tables or figures would occur absent a Basin Plan amendment.)

Amend the language in CHAPTER 4 – WATER QUALITY OBJECTIVES, ENCLOSED BAYS AND ESTUARIES, as follows (added language is underlined):

Toxic Substances
Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels, which are harmful to human health.

The concentrations of toxic substances in the water column, sediments or biota shall not adversely affect beneficial uses.

Site-specific objectives for selenium that apply to Newport Bay and the inland surface waters in the Newport Bay watershed have been established. See "Selenium Site-Specific Objectives for Newport Bay Watershed", below.

Amend CHAPTER 4 – WATER QUALITY OBJECTIVES, INLAND SURFACE WATERS, as follows (added language is underlined):

Radioactivity
*Radioactivity materials shall not be present in the waters of the region in concentrations which are deleterious to human, plant or animal life. Waters designated **MUN** shall meet the limits specified in the California Code of Regulations, Title 22, and listed here:*

Combined Radium-226 and Radium-228	*5*	*pCi/L*
Gross Alpha particle activity	*15*	*pCi/L*
Tritium	*20,000*	*pCi/L*
Strontium-90	*8*	*pCi/L*
Gross Beta particle activity	*50*	*pCi/L*
Uranium	*20*	*pCi/L*

Selenium

Site-specific objectives for selenium that apply to Newport Bay and the inland surface waters in the Newport Bay watershed have been established. See "Selenium Site-Specific Objectives for Newport Bay Watershed", below.

Sodium

The presence of sodium in drinking water may be harmful to persons suffering from cardiac, renal, and circulatory diseases. It can contribute to taste effects, with the taste threshold depending on the specific sodium salt. Excess concentrations of sodium in irrigation water reduce soil permeability to water and air. The deterioration of soil quality because of the presence of sodium in irrigation water is cumulative and is accelerated by poor drainage.

The sodium objectives listed in Table 4-1 shall not be exceeded as a result of controllable water quality factors.

Amend CHAPTER 4 – WATER QUALITY OBJECTIVES, INLAND SURFACE WATERS, as follows (added language is underlined):

Toxic Substances

Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels, which are harmful to human health.

The concentrations of contaminants in waters which are existing or potential sources of drinking water shall not occur at levels that are harmful to human health.

The concentrations of toxic pollutants in the water column, sediments or biota shall not adversely affect beneficial uses.

Site-specific objectives for selenium that apply to Newport Bay and the inland surface waters in the Newport Bay watershed have been established. See "Selenium Site-Specific Objectives for Newport Bay Watershed", below.

Amend CHAPTER 4 – WATER QUALITY OBJECTIVES, INLAND SURFACE WATERS, by adding the following between the section "MAXIMUM BENEFIT WATER QUALITY OBJECTIVES" and the section "COMPLIANCE WITH OBJECTIVES" (added language is underlined):

SELENIUM SITE-SPECIFIC OBJECTIVES: NEWPORT BAY WATERSHED[1]

Selenium (Se) is a naturally occurring, metalloid element that readily bioaccumulates through the food chain at levels that can cause adverse effects on humans and aquatic life and wildlife, including fish and birds that prey on fish and invertebrates. Toxicological effects of selenium on wildlife include lowered reproduction rates (e.g., impaired hatching), shortened life spans, and stunted growth. The California Toxics Rule (CTR)(40 CFR 131.38) specifies water column criteria for selenium for fresh and marine waters. However, review of these criteria is in progress by the U.S. Environmental Protection Agency (USEPA) and U.S. Fish and Wildlife Service (USFWS) due to the concern that the criteria will not assure the protection of aquatic life and aquatic dependent wildlife, including certain endangered or sensitive species.

Selenium toxicity is highly site-specific due to the complex set of factors that affect the chemical nature, transport, fate and bioavailability of the element. Through State contract and grant funds as well as other sources, extensive studies of selenium in the Newport Bay watershed have been conducted during the last 12 years. Building on these earlier studies, the Nitrogen and Selenium Management Program (NSMP) Working Group and NSMP consultants initiated additional investigations to fill in data gaps and refine our knowledge concerning the sources and adverse effects of selenium in the aquatic food webs in the Newport Bay watershed [http://www.ocnsmp.com/library.asp] (See Chapter 5, Implementation, Newport Bay Watershed, 4.c. for discussion of the NSMP). Based on those investigations, it was determined that the development of a site-specific selenium objective(s) for the Newport Bay watershed would be appropriate. Staff specialists in selenium from USEPA, USGS, and USFWS, recommended site-specific objectives for selenium based on fish and bird egg

[1] The Newport Bay watershed encompasses both upper and lower Newport Bay and its tributaries, San Diego Creek, Santa Ana Delhi, and Big Canyon Wash subwatersheds, and the Costa Mesa and Santa Isabel channels. With the exception of selenium, TMDLs established to address water quality standards impairment of these waters (see Chapter 5, section 4.c.) have referred to the watershed as the "San Diego Creek/Newport Bay" watershed. However, the County of Orange recently performed a comprehensive evaluation of all the watersheds located within their boundaries with the intent of verifying watershed divisions and nomenclature. The County decided that the San Diego Creek/Newport Bay watershed would simply be referred to as the Newport Bay watershed. All of the County programs, including the NPDES program, and all County documents now refer to the Newport Bay watershed. For consistency, this new nomenclature is applied to the selenium site-specific objectives (and to the selenium TMDLs established in Chapter 5).

tissue concentrations. Because selenium bioaccumulates primarily through diet, not water, measurement of selenium concentrations in fish and bird egg tissue provides a direct link to assessment of impairment effects due to selenium.

The following site-specific objectives for selenium apply to the Newport Bay watershed, which includes both the Bay and its inland surface water tributaries:
Fish tissue (whole body): 5 µg Se/g dry weight (dw)
Bird egg tissue: 8 µg Se/g dry weight (dw)

These site-specific objectives supersede those specified in the CTR (reference(s) to SSO approval by USEPA/revision of CTR).

Total Maximum Daily Loads (TMDLs) designed to achieve compliance with water quality standards, including these site-specific objectives (and compliance with applicable CTR criteria, if not superseded by the site-specific objectives) are identified in Chapter 5 Implementation, Newport Bay Watershed, section 4.c. The selenium site-specific objectives and TMDLs were developed and considered jointly in collaboration with the NSMP Working Group. Technical reports prepared as part of this process provide detailed description and justification for the site-specific objectives [http://www.ocnsmp.com/library.asp or [RB web link to be inserted]]. The methodology to be employed to determine compliance with the site-specific objectives was identified as part of this process. This methodology is identified in section 4.c.3.

CHANGES TO CHAPTER 5 - IMPLEMENTATION

(NOTE: The language identified below is proposed to be inserted into Chapter 5 of the Basin Plan. If the amendment is approved, corresponding changes will be made as necessary to the Table of Contents, the List of Tables, page numbers, and page headers in the plan. Due to the two-column layout of the Basin Plan, the location of tables in relation to text may change during final formatting of the amendment. In order to accommodate other new TMDLs adopted as Basin Plan amendments and to maintain their order by watershed, section numbers and the table and figure identifiers may be modified in future formatting of the Basin Plan for re-publication purposes.)

Amend CHAPTER 5 – IMPLEMENTATION, Newport Bay Watershed, 4. Toxic Substances Contamination to add the following (NOTE: all the language below is to be added to the Basin Plan; as a matter of clarity for public review, the language is not underlined):

4.c. Selenium TMDLs

Selenium (Se) is a naturally occurring element that persists in soils and aquatic sediments and readily bioaccumulates through the food chain at levels that can cause adverse effects on higher-level aquatic life and wildlife, including fish and birds. The behavior of selenium in the environment is largely influenced by its oxidation state, as well as physical factors such as geology, climate, and hydrology. Selenium occurs in several forms, including multiple oxidation states, which vary depending on ambient conditions (such as pH, Eh [oxidation/reduction potential], and microbial activity), as well as the environmental medium (such as water, sediment, or biological tissue). Biologically significant oxidation states include selenide (Se^{2-}), elemental selenium (Se^{0}), selenite (Se^{4+}), and selenate (Se^{6+}). Selenium is transported via rivers, streams, creeks, groundwater, and irrigation drainage water. Terminal waterbodies may become contaminated due to evaporative enrichment and sequestering over several seasons of runoff. These physical factors influence the fate and transport of selenium in various environmental media.

Dissolved selenium entering an aquatic system can 1) be absorbed or ingested by organisms, 2) bind or complex with particulate matter, or 3) remain free in solution. Although most selenium is either taken up by organisms or bound to particulate matter over time, selenium does not remain constant in the system. Instead, biological, chemical and physical processes move selenium through the system such that selenium stored in sediments can be cycled back into the biota and remain at elevated concentrations even when inputs of dissolved selenium in the water column are reduced or stopped.

Though selenium is an essential nutrient for fish, birds, animals, and humans, there is a very narrow margin between nutritionally optimal and potentially toxic dietary exposures for vertebrate animals (Wilber 1980). Excessive amounts of selenium are found to cause toxicity in wildlife. Toxicological effects of selenium on wildlife include deformities (teratogenesis), lowered reproduction rates (e.g., impaired hatching), shortened life spans, stunted growth, and impaired immune response. Many of these effects are not readily observable and detailed biological studies are required to determine whether or not selenium is negatively impacting biota in a watershed (USEPA 2002).

Hydraulic linkages also play an important role in selenium cycling. Connections between riverine systems and wetlands, lakes, impoundments, and estuaries can result in accelerated selenium accumulation in these hydrologically connected waterbodies even though the riverine system itself may not appear to be effected (Luoma et al., 1992; Skorupa, 1998; Lemly, 1998). The aquatic systems that are most efficient at accumulating selenium are shallow, slow-moving waters with low flushing rates, such as most lentic systems (Lemly, 1998). Lotic systems, such as fast-moving streams and rivers, do not tend to accumulate particulate matter, and plants and animals that accumulate selenium may be scarce. However,

even lotic systems may have lentic areas, such as pools or standing backwaters. Therefore, it is important to evaluate, and accurately classify, all aspects of an aquatic system, especially downstream of a site, to determine how selenium may be cycling through these different, but connected, hydrologic areas.

The primary source of selenium in surface waters in the Newport Bay watershed is diffuse rising groundwater that has resulted from the extensive hydromodification that has occurred in the watershed since the early 1900s. In the case of the San Diego Creek subwatershed, in the late 1800s and early 1900s, sheep and cattle grazing dominated the watershed. The central portion of the watershed (Tustin plain) was covered in marshlands (Camp Dresser & McKee, Inc., 1985) supported by springs and groundwater seeps (Trimble, 1998). This large marshland, locally known as the Swamp of the Frogs, was drained in the early 1900s to make way for row crop cultivation. A network of agricultural channels was formed to transport the swamp waters and agricultural wastewater (irrigation return flows) away from the cultivated areas. The network of channels was expanded as the area developed and by the early 1960s, this network of channels was extended to conduct floodwaters directly to Upper Newport Bay.

Selenium and other trace metals accumulated in the marsh soils, likely from runoff from source rocks in the local foothills, and possibly from springs and groundwater seeps. Runoff from drainages in the foothills ultimately collected in the Swamp of the Frogs. Selenium likely accumulated in the swamp soils over a period of several hundreds to thousands of years until the swamp was drained in the early 1900s. The result of the hydromodification of the surface water drainages in this area of the San Diego Creek subwatershed has been to lower the groundwater table, and as a result, introduce oxygen into previously hydric soils, resulting in the mobilization of some redox-sensitive elements, such as selenium. The presence of nitrates in the shallow groundwater from past agricultural activities in the watershed appear also to be helping to mobilize selenium and other trace metals from the old swamp deposits (Meixner et al., 2004).

Local precipitation appears to be flushing selenium and nitrate out of the vadose zone soils into shallow groundwater, which then enters surface waters. Urbanization and the resultant increases in irrigation and runoff have also contributed to increased inputs into the shallow perched groundwater aquifer, which now supports perennial flows in many of the surface drainages in the watershed. While approximately 76% of the nitrate and 96% of the selenium in San Diego Creek and its tributaries is believed to be from this shallow rising groundwater (Meixner et al., 2004), the existing beneficial uses in many of these drainages would not be possible without these groundwater-supported perennial flows.

For Big Canyon Wash, hydromodification also appears to be playing an important role in selenium mobilization and accumulation. Big Canyon Wash is a small tributary drainage to Upper Newport Bay that is separate from the San Diego Creek subwatershed and drains a watershed of approximately 2 square miles. The majority of the watershed (approximately 96%) is highly developed with homes, commercial areas, a golf course, cemetery, and other urban features. The downstream, undeveloped portion of the canyon flows into the Upper Newport Bay Ecological Reserve. The 60-acre Big Canyon Creek Nature Park is located in this part of the watershed.

High selenium concentrations in surface waters in Big Canyon Nature Park were measured during water quality monitoring conducted by the City of Newport Beach as part of their planning efforts to restore the nature park. Water column concentrations throughout the nature park exceeded the CTR freshwater chronic criterion for selenium of 5 µg/L (Weston Solutions, Inc. 2007). Soil samples collected at the mouth of Big Canyon as part of a study of urban wetlands by the Southern California Coastal Water Research Project (SCCWRP; Sutula et al., 2008), exceeded the substantial ecological risk screening value for selenium in sediment of 4 milligrams per kilogram (mg/kg) dry weight (Presser et al. 2004). In 2008, samples of water, sediment and biota from different areas within the nature park were collected to evaluate selenium concentrations and potential impacts in the food webs in the area. The analytical data indicated that selenium concentrations in water, sediment, and biota were elevated throughout the park, even in the middle and upper sections of the canyon.

The sources of selenium that enters the watershed have not been positively identified. The steep cliffs that rim Big Canyon Wash are formed primarily of the Miocene Monterey Formation (Morton and Miller, 1981), a known source of selenium in California (USGS, 2002; http://geomaps.wr.usgs.gov/env/monterey.html) and are a likely source of selenium in Big Canyon. The changes in canyon hydrology and the areas tributary to Big Canyon Wash as the watershed has developed have likely contributed to the mobilization of selenium. Shallow groundwater is found throughout much of the upper portion of the watershed. Urban landscape irrigation, the construction of an 18-hole golf course in the up-gradient part of the canyon east of Jamboree Road, Big Canyon Reservoir, and storm drain systems that discharge to the canyon, have changed the canyon's flow regime from ephemeral to perennial. This has resulted in significant changes in habitat and has likely contributed to the high selenium concentrations that have been found in the soils and water in the canyon.

Selenium concentrations in the water column samples collected from the San Diego Creek subwatershed, consistently exceed the chronic (4-day average) California Toxics Rule (CTR) criterion for freshwater (5 µg/L). This has been observed in numerous studies, which also cite occasional exceedances of the

National Toxics Rule acute (1 hour maximum) criterion of 20 µg/L (Hibbs and Lee 1999, IRWD 1999, Lee and Taylor 2001). There is no acute freshwater selenium criterion in the CTR. Selenium concentrations measured in water column samples collected from the Big Canyon Wash subwatershed also exceed the CTR chronic freshwater criterion of 5 µg/L. While dissolved selenium concentrations in Newport Bay do not exceed the CTR saltwater chronic criterion of 71 µg/L, fish tissue (Allen et al. 2004, 2008) and bird egg tissue (CH2MHill, 2006) data indicate that selenium loadings that enter the Bay from the freshwater drainages may be causing toxicity, or contributing to conditions threatening wildlife, in Upper Newport Bay.

In 2002, as part of a number of TMDLs for toxic pollutants, USEPA promulgated TMDLs for selenium for the San Diego Creek subwatershed and both Upper and Lower Newport Bay (including the Rhine Channel)[2], based primarily on exceedance of the California Toxics Rule (CTR) selenium criteria in freshwater, trends in selenium concentrations in freshwater fish tissue, and the proximity of Newport Bay to the San Diego Creek subwatershed, which is the primary source of selenium to the Bay. USEPA's TMDLs contain the requisite TMDL elements but do not include an implementation plan, which is within the purview of the State.

The selenium TMDLs established below address selenium impairment in the Newport Bay watershed[3]. These TMDLs revise and refine the USEPA TMDLs based on new data and information and based on site-specific objectives (SSOs) for selenium (see Chapter 4, Site-Specific Objectives, Newport Bay Watershed) that were developed concurrently with the TMDLs. An implementation plan for the TMDLs and SSOs is specified (see subsection 4.c.4). These TMDLs and SSOs are the result of a remarkable collaborative effort by a consortium of watershed stakeholders (the Nitrogen and Selenium Management Program (NSMP) Working Group), the Regional Water Board, and selenium experts from the USEPA, United States Fish and Wildlife Service (USFWS), United States Geological Survey (USGS) and NSMP consultants. Substantive guidance for the

[2] At the time USEPA was developing its TMDLs, the selenium problem in Big Canyon Wash had not been identified; therefore USEPA's selenium TMDLs do not include load estimates or allocations for selenium in Big Canyon Wash.

[3] The Newport Bay watershed encompasses both upper and lower Newport Bay and its tributaries, San Diego Creek, Santa Ana Delhi, and Big Canyon Wash subwatersheds, and the Costa Mesa and Santa Isabel channels. Other TMDLs adopted to address impairment of one or more of these waters have referred to the watershed as the "San Diego Creek/Newport Bay" watershed. However, the County of Orange recently performed a comprehensive evaluation of all the watersheds located within their boundaries with the intent of verifying watershed divisions and nomenclature. The County decided that the San Diego Creek/Newport Bay watershed would simply be referred to as the Newport Bay watershed. All of the County programs, including the NPDES program, and all County documents now refer to the Newport Bay watershed. For consistency with the new nomenclature, these selenium TMDLs also refer to these waters as the Newport Bay watershed.

consideration of the selenium SSOs, and for the NSMP effort as a whole, was provided by an Independent Advisory Panel convened by the NSMP, as well as an expert Selenium Technical Review Committee convened by Regional Water Board staff.

In formation concerning the purpose and formation of the NSMP, and the NSMP work products are posted on the NSMP web site: http://www.ocnsmp.com/. A staff report ("TMDLs and SSOs for Selenium in the Newport Bay Watershed, Orange County, California", State of California, Santa Ana Regional Water Quality Control Board, 2009, or 2009 Selenium Staff Report) prepared by Regional Water Board staff in collaboration with the NSMP Working Group describes the technical and scientific basis for the TMDLs and SSOs[4].

A key first step in the reconsideration of USEPA's TMDLs was the review/revision of the impairment assessment conducted by USEPA using new data, guidance and policy not available to USEPA in 2002. USEPA's findings of selenium impairment, and the USEPA TMDLs, were based largely on the numeric selenium criteria established by USEPA in the CTR (40 CFR 131. 38). These criteria, which are based on water column concentrations, are 5 micrograms per liter (µg/L) (chronic, 4-day average total recoverable selenium) for freshwater and 71 µg/L (chronic, 4-day average total dissolved selenium) for saltwater.

In their biological opinion issued on the then-proposed 2000 CTR criteria, staff of the USFWS stated that the proposed CTR criteria were "not sufficiently protective" of certain endangered or sensitive species (Spear and McInnis, 2000). For selenium, this is due, in part, to the fact that the critical pathway for selenium transfer within food webs is dietary and therefore, water column concentrations do not always accurately reflect the risk to fish and wildlife from selenium. Further, the CTR chronic freshwater criterion for selenium was developed for the protection of aquatic life and did not adequately consider the protection of aquatic-dependent wildlife, such as birds. The USEPA and the USFWS have agreed to revise the CTR selenium criteria to protect both aquatic life and aquatic-dependent wildlife (as well as to review and revise the criteria for several other pollutants). That process is still underway. (As described in Chapter 4, site-specific objectives for the Newport Bay watershed that are based on concentrations of selenium in bird eggs and fish tissue were developed in collaboration with the NSMP Working Group, based on recommendations from selenium experts from USEPA, USGS, and USFWS. These site-specific objectives were derived using methods comparable to those being employed by these agencies to develop revised selenium criteria on a statewidebasis.)

[4] This report also includes the analyses required for consideration of adoption of the SSOs and TMDLs, including the consideration of Water Code Section 13241 factors, economics and CEQA.

Regional Water Board staff's assessment of impairment due to selenium in the Newport Bay watershed was conducted in accordance with the methods specified in the State Water Board's "Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List" (State Listing Policy) (2004). In assessing impairment due to selenium, Regional Water Board staff relied in part on comparison of ambient water column concentrations in the Newport Bay watershed with the CTR criteria. However, because selenium is accumulated primarily through diet, Regional Water Board staff also compared selenium concentrations in the tissue of fish and bird eggs collected from both the saltwater (Upper Newport Bay) and freshwater habitats (San Diego Creek and Big Canyon Wash subwatersheds) in the watershed to ecological risk guidelines developed by the US Department of the Interior (USDOI, 1998) and Presser et al (2004). In addition, Regional Water Board staffs' assessment of impairment due to selenium was based on a much larger data set than that available to USEPA in 2002.

In all, twelve (12) freshwater drainages, three (3) freshwater wetlands, and Upper Newport Bay were found to be impaired due to selenium, thereby requiring the development of TMDLs (Table NB-Selenium-1). For fish, none of the fish fillets collected in San Diego Creek or Newport Bay were found to exceed the human health screening value[5]; however, whole body fish tissue selenium concentrations did exceed the marginal ecological risk guideline for fish[6]. All of the freshwater drainages and the Irvine Ranch Water District (IRWD) wetlands were found to be impaired due to selenium concentrations exceeding the CTR freshwater chronic criterion of 5 µg/L. Selenium concentrations in Upper and Lower Newport Bay did not exceed the CTR saltwater chronic criterion of 71 µg/L. Lower Peters Canyon Wash, Big Canyon Wash and the Santa Ana – Santa Fe Channel were also found to be impaired due to selenium accumulation in fish tissue; San Diego Creek Reach 1 and the IRWD wetlands were found to be impaired due to selenium in water, fish and bird egg tissue; the San Joaquin Freshwater Marsh Reserve (University of California at Irvine (UCI) wetlands) was found to be impaired due to selenium accumulations in fish and bird egg tissue; Upper Newport Bay was found to be impaired due to selenium accumulations in fish only.

[5] Office of Environmental Health Hazard Assessment (OEHHA) fish contaminant goal (FCG) for selenium of 7.4 µg Se/g wet weight at a consumption rate of 32 grams per day (g/day) converted to dry weight (30 µg Se/g dry weight; Klasing and Brodberg, 2008).
[6] 5 ug Se/g dry weight (Presser et al., 2004)

Table NB-Selenium-1. Summary of Waterbodies in the Newport Bay Watershed Requiring TMDLs for Selenium

Freshwater Drainages	Freshwater Wetlands	Saltwater-Estuarine
Lower Peters Canyon Wash* Central Irvine Channel* El Modena-Irvine Channel* Como Storm Channel* Santa Ana-Santa Fe Channel* Warner Channel* Barranca Channel* San Diego Creek Reach 1* Lane Channel* Santa Isabel Channel Santa Ana Delhi Channel Big Canyon Wash	IRWD Treatment Wetlands* San Joaquin Freshwater Marsh Reserve* Big Canyon Nature Park Freshwater Wetlands	Upper Newport Bay

* Surface waters in the San Diego Creek subwatershed

A comparison of the water body-pollutant combinations identified by USEPA (2002) and Regional Water Board staff (2009) for selenium TMDLs is provided in Table NB-Selenium-2, below.

Table NB-Selenium-2. Waterbodies for which Selenium TMDLs were Established by USEPA (2002) and the Regional Water Board (2009)

	Freshwater	Estuarine/Marine
Regional Water Board	San Diego Creek, Santa Ana Delhi Channel, Big Canyon Wash subwatersheds; Santa Isabel Channel*	Upper Newport Bay
USEPA	San Diego Creek subwatershed	Upper Newport Bay, Lower Newport Bay, Rhine Channel

* Santa Isabel Channel is a very small drainage that is tributary to Upper Newport Bay.

As described in Chapter 4 and noted above, SSOs for selenium in fish tissue of 5 micrograms selenium (Se) per gram dry weight (5 µg Se/g dw) and in bird egg tissue of 8 µg Se/g dw were adopted by the Regional Water Board for the Newport Bay watershed (Chapter 4, Selenium Site-Specific Objectives, Newport Bay Watershed). Because selenium bioaccumulates primarily through diet, not water, measurement of selenium concentrations in fish and bird egg tissue provides a direct link to assessment of impairment effects due to selenium.

Reaching these tissue objectives will require reductions in selenium in groundwater (the largest source of selenium to surface waters in the Newport Bay watershed) and surface water. In order to determine the level of reductions in water that are necessary to achieve compliance with the tissue SSOs, and to provide water column selenium concentrations that can be used to develop effluent limits for permits, the NSMP Working Group contracted with USGS and USFWS staff to adapt the Luoma-Presser biodynamic model, developed by the USGS to address bioaccumulation of selenium in San Francisco Bay (Presser and Luoma, 2000 and Luoma and Presser, 2006), to the freshwater and saltwater habitats in the Newport Bay watershed. The biodynamic model links waterborne concentrations of selenium to the fractions taken up as particulates and then follows selenium through the food web, taking into account species-specific transfer factors between trophic levels. The model provides a quantitative link between waterborne selenium concentrations and the selenium concentrations in the tissues of selected biota. The model is an algorithm in which values for the input variables are selected based on field data, studies in the literature and knowledge of the specific food webs of interest and concern.

The selenium SSOs for fish and bird egg tissue are the basis for the primary numeric targets in these selenium TMDLs. The Luoma- Presser biodynamic model, as adapted for the Newport Bay watershed (Newport Bay watershed biodynamic model) by Presser and Luoma (2009), was used to translate these target selenium tissue concentrations into selenium water column guidelines (WCGs). The WCGs were then used, with certain exceptions, to determine loading capacities and TMDLs for the affected waters, as well as wasteload and load allocations (see sections 10.0, Loading Capacity and 11.0, Allocations, in the 2009 Selenium Staff Report). This water column based approach facilitates the determination of appropriate effluent limitations, monitoring, and compliance assessments such that progress toward meeting the selenium numeric tissue targets and SSOs and protecting fish and wildlife in the watershed can be more easily determined. The need to revise or enhance implementation actions to achieve the requisite selenium reductions can also be more readily identified.

Translation of the SSO-based, selenium tissue concentration numeric targets to selenium in the water column via the Newport Bay watershed biodynamic model results in a range of potential WCGs, depending on the characteristics of the waterbody and the types of food webs present (i.e., the values assumed and employed in the biodynamic model). A range of loading capacities, TMDLs and wasteload/load allocations can be calculated based on these WCGs. Implementation actions will first focus on meeting the upper end of the WCGs (and thus loading capacities, TMDLs and allocations). Tissue and water column monitoring will be used to assess whether the fish and bird egg tissue numeric targets are being met at that concentration. If the initial WCG has been attained, but the fish and bird egg tissue numeric targets are still being exceeded, then more stringent WCGs, loading capacities, TMDLs and allocations will apply.

Additional actions will be implemented in a step-wise, iterative fashion to continue to reduce water column selenium concentrations in the water bodies in the Newport Bay watershed until the fish and bird egg tissue numeric targets (and, thereby, the SSOs) are being met.

As there are currently no off-the-shelf treatment or Best Available technologies (BAT) for reducing selenium in water and biota to the concentrations needed to protect the beneficial uses in the Newport Bay watershed, these selenium TMDLs are designed as phased TMDLs, with a maximum 15-year compliance time frame (with compliance to be achieved as soon as possible, but no later than 15 years from the date the TMDLs become effective). This phased approach is necessary to provide sufficient time to test and build potential treatment technologies and Best Management Practices (BMPs) for selenium and to provide for review and revision of the TMDLs as necessary. The NSMP Working Group has developed a draft BMP Strategic Plan, based on demonstration testing of selected technologies. The need to propose and implement a Regional Water Board approved BMP Strategic Plan is reflected in the TMDL implementation plan (see subsection 4.c.4, Task 5 and Table NB-Selenium-9). The phased TMDL approach also allows sufficient time for the collection and assessment of field data to determine if the necessary reductions in selenium concentrations in water, fish and bird egg tissue are occurring and compliance with the selenium TMDLs/SSOs is being achieved. The TMDLs also include specific commitments for review so that they can be revised, if necessary, based on additional data and investigation. The revisions may include changes to the compliance schedules.

4. c.1. Numeric Targets used in Selenium TMDLs

The range of beneficial uses identified in the Basin Plan for these waters makes it clear that the TMDL numeric targets must address the protection of aquatic organisms, wildlife (including federally listed threatened and endangered species) and human consumers of recreationally and commercially caught fish. While selenium concentrations measured in fish collected in the Newport Bay watershed do not pose a risk to human consumers of fish, the available data indicate ecological risk to fish and birds. The numeric targets are intended to address this risk. Numeric targets/TMDLs intended to address beneficial uses related to aquatic life and aquatic-dependent wildlife will assure protection of other, potentially affected but less sensitive uses.

Numeric targets used in the selenium TMDLs are shown in Table NB-Selenium-3. As shown, the primary targets are based on selenium concentrations in fish and bird egg tissue and apply to both freshwater and saltwater species. The primary targets are based on the site-specific objectives (SSOs) for selenium identified as part of the joint selenium SSOs/TMDLs development process. Since the tissue SSOs are based on no effect concentrations (in birds) and no to low effects (in fish), the SSOs, and the TMDLs designed to achieve them, assure

the reasonable protection of beneficial uses in both fresh and salt waters throughout the Newport Bay watershed. The selenium site-specific objectives are shown in Chapter 4.

The secondary numeric target is based on the California Toxics Rule freshwater chronic criterion for selenium and applies only to freshwater. Once the selenium site-specific objectives are approved and the CTR criteria are de-promulgated for the Newport Bay watershed, this secondary target will no longer apply.

For saltwater, the applicable CTR chronic and acute criteria are substantially higher than the current median ambient water quality concentrations of selenium that have been measured in Newport Bay. Using the CTR saltwater criteria as the basis for setting secondary numeric targets for saltwater would not comport with antidegradation provisions, which preclude the lowering of water quality unless it can be demonstrated that beneficial uses would be protected and that the change in water quality is consistent with maximum benefit to the people of the state and necessary to accommodate important social or economic development. Accordingly, no secondary numeric target for selenium in saltwater is identified.

Table NB-Selenium-3. Numeric Targets for Selenium in the Newport Bay Watershed

Primary Tissue Targets[1] (µg Se/g dry weight)		Secondary Water Column Target[2] (µg Se/L)
Fish Tissue	**Bird Egg Tissue**	**Freshwater**
5	8	5

[1] Targets are based on the tissue SSOs for the Newport Bay watershed and are applicable to both fresh and saltwater species.

[2] Target is based on the CTR criterion for freshwater of 5 µg Se/L total recoverable selenium; this target will no longer be in effect once the CTR freshwater criterion has been replaced by approved tissue-based selenium SSOs for the Newport Bay watershed.

In order to facilitate the development of permit limitations to achieve the numeric targets and the assessment of compliance with the targets (and site-specific objectives) in the watershed, the numeric targets based on fish and bird egg tissue concentrations were translated into corresponding water column concentrations, or water column guidelines, using the Newport Bay watershed biodynamic model. This model was developed by the USGS (see the reference, Presser and Luoma, 2009, and the extensive discussion of the model and the derivation of water column guidelines in Section 9, Linkage Analysis, in the 2009 Selenium Staff Report). The model provides a quantitative link between waterborne selenium concentrations and the selenium concentrations in the tissues of selected biota. Compliance with the water column guidelines is

expected to achieve the tissue-based numeric targets and thus assure the attainment of water quality standards.

Using different assumptions for the variables in the model, ranges of water column guidelines were identified for a number of these areas, including the San Diego Creek subwatershed and Upper Newport Bay. These ranges in water column guidelines are shown in Table NB-Selenium-4.

Table NB-Selenium - 4 Range in Water Column Guidelines Predicted by the Newport Bay Watershed Biodynamic Model Using Fish (5 µg/g dw) and Bird Egg Tissue (8 µg/g dw) Numeric Targets/SSOs

Freshwater* (µg/L)					
Lower Peters Cyn Wash	**Lower San Diego Creek[1]**	**IRWD Wetlands[2]**	**UCI Wetlands[3]**	**Santa Ana Delhi Channel**	**Big Canyon Wash**
5.0 – 11.5	**5.0 – 13**	**6.0 – 9.0**	**2.0 – 2.6**	**12 - 28**	**0.9 – 1.4**

Saltwater (µg/L)	
Upper Newport Bay (water column)	**Upper Newport Bay (benthos)**
11 – 20	**0.109 – 0.184**

[1] Includes lower San Diego Creek (Reach 1) and the IRWD and UCI offline wetlands.
[2] Includes the IRWD offline wetlands (including the treatment ponds, riparian areas, and the Carlson Marsh).
[3] The San Joaquin Freshwater Marsh Reserve
* Insufficient data are available to calculate WCGs for the following tributary channels to which the selenium TMDLs apply: Central Irvine, El Modena-Irvine, Como, Santa Ana-Santa Fe, Warner, Barranca, Lane, and Santa Isabel channels.

With the exception of certain waters, the water column guidelines back-calculated from the tissue-based numeric targets using the Newport Bay biodynamic model (Section 4.c.1) are set as equivalent to the loading capacities, TMDLs and allocations (Section 4.c.2) for the waterbodies in the watershed. Loading capacities, TMDLs and allocations based on the CTR freshwater criterion are also established (see section 4.c.2); these CTR-based loading capacities, TMDLs and allocations will no longer be in effect upon approval of the selenium site-specific objectives and de-promulgation of the CTR selenium criteria for the Newport Bay watershed by USEPA.

4.c.2 Selenium Loading Capacities, TMDLs, Wasteload Allocations, Load Allocations and Compliance Dates

4.c.2.i. Selenium Loading Capacities and TMDLs

The water column guidelines back-calculated from the tissue-based numeric targets (which are based on the selenium SSOs; see 4.c.1.) using the Newport

Bay biodynamic model (Section 4.c.1) are set as equivalent to the loading capacities for the freshwater drainages (SSO-based loading capacities) in the watershed, with the exception of certain water bodies (Table NB-Selenium-5). Selenium loading capacities for the freshwater areas of the Newport Bay watershed are also based on the CTR chronic freshwater criterion (CTR-based loading capacities), since this criterion applies until superseded by the selenium site-specific objectives. Once the site-specific objectives are approved and the CTR selenium criteria are de-promulgated for the Newport Bay watershed by USEPA, the CTR-based loading capacity will no longer be effective. The SSO-based loading capacities may change as new data and information become available during implementation.

Table NB=Selenium-5. Range in Loading Capacities for Selenium in the Newport Bay Watershed

Water Body		SSO-Based Loading Capacity		CTR-Based Loading Capacity[2]
		Tissue concentrations	WCG-based[1]	
Salt Water	Upper Newport Bay[3]	5-8 µg Se/g dw		NA
Freshwater Streams	San Diego Creek		5-13 µg Se/L	5 µg Se/L
	Santa Ana/Delhi		5-13 µg Se/L	5 µg Se/L
	Santa Isabel	5-8 µg Se/g dw		5 µg Se/L
	Big Canyon Wash		0.9-1.4 µg Se/L	5 µg Se/L
Freshwater Marshes and Wetlands	UCI Wetlands (San Joaquin FW Marsh Reserve)		2-3 µg Se/L	5 µg Se/L
	IRWD Wetlands (incl. treatment ponds and Carlson Marsh)		6-9 µg Se/L	5 µg Se/L

[1] Numbers are rounded to the nearest one except for Big Canyon Wash, which are rounded to the nearest tenth.

[2] If the SSOs are approved, the CTR will no longer be in effect and the final loading capacity for selenium will be set at the water column selenium concentration that results in compliance with the fish and bird egg tissue numeric targets/SSOs in all hydrologic units in the watershed, as demonstrated by tissue monitoring (Section 12.5, Task 8). Adjustments to the calculated range in loading capacities will be made if and as necessary using data collected during implementation of these TMDLs/SSOs and the Newport Bay watershed biodynamic model. Such adjustments will be considered through a Regional Water Board public participation process.

[3] The loading capacities for selenium in Upper Newport Bay and Santa Isabel Channel are currently set at the fish and bird egg tissue numeric targets, or in the future at the water column selenium concentration that results in compliance with the tissue targets, if future data collection efforts improve the predictive ability of the Newport Bay watershed biodynamic model for these areas. Such adjustments to the biodynamic model will be considered through a Regional Water Board public participation process.

NA Not applicable: The CTR saltwater chronic and acute criteria for selenium are substantially higher than current ambient water column concentrations measured in Upper Newport Bay and are not appropriate for use in these TMDLs.

WCG Water column guideline; selenium water column concentration predicted from the tissue numeric targets/ SSOs by the Newport Bay biodynamic model (see Section 9.0).

Because there is insufficient information to determine WCGs for each impaired freshwater channel in the Newport Bay watershed, and the objective of these TMDLs is to restore the beneficial uses in the watershed through meeting the fish and bird egg tissue selenium numeric targets, the loading capacity for the entire

San Diego Creek subwatershed, including Peters Canyon Wash, is set to the range in WCGs (5 – 13 µg Se/L) for lower San Diego Creek (San Diego Creek Reach 1) that were back-calculated from the fish and bird egg tissue SSOs/numeric targets. Lower San Diego Creek has the most robust data set of the sites and food webs modeled. For this reason, the biodynamic model is considered to generate the most reliable results when back-calculating from tissue concentrations to water column concentrations for this area. This range is similar to the range in WCGs calculated for Peters Canyon Wash (see Table NB-Selenium-4) and it is expected to be applicable to the tributary channels as well since rising groundwater is also the primary source of selenium in these waters. San Diego Creek is the primary source of freshwater and selenium to the IRWD and UCI off-channel wetlands and to Upper Newport Bay. Implementation actions based on the model predictions for this location should also result in selenium reductions in these other hydrologically connected areas.

There is also insufficient information to set WCG-based loading capacities for the Santa Ana Delhi Channel (Delhi Channel) and the Santa Isabel Channel. In the case of the Delhi Channel, the Newport Bay watershed biodynamic model over-predicts the range in WCGs. This is likely due to the limited data available for this channel (no fish or bird egg tissue data and very few matched sediment or algae and water column data). The median ambient water column concentration in the lower portion of the Delhi Channel is 10 µg Se/L. Since the Delhi channel subwatershed is similar in geology, hydrology, and selenium sources and concentrations to the San Diego Creek subwatershed, the range in loading capacities for the Delhi is set to the same range in loading capacities for the San Diego Creek subwatershed of 5 – 13 µg Se/L. The loading capacity based on the CTR freshwater chronic criterion of 5 µg Se/L also applies until the selenium SSOs are approved and the CTR is de-promulgated for the Newport Bay watershed.

There are only limited water column data for selenium (only 24 samples collected in a 3 year period) for the Santa Isabel Channel; no sediment, algae, fish or bird egg tissue selenium data are available. The channel drains a very small area (less than 2 square miles) and is tributary to Upper Newport Bay. The median ambient water column selenium concentration is 2 µg Se/L, below either the CTR freshwater criterion or the SSO-based water column guidelines for the San Diego Creek subwatershed. A finding of impairment for this channel was made based on the minimum dataset required to determine impairment (2 of 24 samples equaled or exceeded the CTR freshwater chronic criterion of 5 µg Se/L). Given the small drainage area of this channel, its generally low selenium concentrations, and lack of suitable habitat for birds, it likely poses little ecological risk to fish or birds and it is not a significant source of selenium to Upper Newport Bay. Because only limited data are available for the Santa Isabel Channel (water column data only), WCGs for this channel cannot be calculated at this time. For that reason, the SSO-based fish and bird egg tissue numeric

targets will be used as the SSO-based loading capacities for this channel. In addition, though the CTR selenium freshwater criterion is higher than the median ambient selenium water column concentrations measured in this channel, given the limited dataset available, the criterion will be applied to the Santa Isabel Channel as the CTR-based loading capacity. Again, this CTR-based loading capacity will no longer be effective once the selenium SSOs are approved.

For Upper Newport Bay, the selenium loading capacity is set equal to the tissue-based numeric targets for selenium concentrations in fish tissue and bird eggs. As noted in section 4.c.1, inadequate data are available for the Bay to provide robust estimates, using the Newport Bay watershed biodynamic model, of the water column concentrations needed to meet the tissue-based numeric targets in the Upper Bay. Establishing a loading capacity for Upper Newport Bay based on water column concentrations may be considered in the future when suitable data are collected and any necessary adjustments to the Newport Bay watershed biodynamic model are completed. The CTR saltwater chronic and acute criteria for selenium are substantially higher than current ambient water column concentrations measured in Upper Newport Bay. Using the CTR saltwater criteria as the basis for setting numeric targets for saltwater would not comport with antidegradation provisions; therefore, the CTR saltwater criteria cannot be applied to Newport Bay.

The TMDLs are set at the loading capacities, but given consideration of critical conditions and seasonal variations (see 2009 Selenium Staff Report, TMDLs and Allocations, 11.1), apply only during dry-weather flows year round (that is, when the flows measured in San Diego Creek at Campus Drive are less than or equal to 23 cfs). Given the limited variability of dry weather flow concentrations of selenium, TMDLs based on water column concentrations are expressed as semi-annual arithmetic means. The semi-annual periods are defined as April 1 through September 30 and October 1 through March 31. Selenium tissue concentrations are expected to vary widely. Accordingly, these tissue-based TMDLs are expressed as annual geometric means. The TMDLs are shown in Table NB-Selenium-6. In response to a decision by the D.C. Circuit Court of Appeals (*Friends of the Earth, Inc. v. EPA, et al.,* No. 05-5015 [D.C. Cir. 2006]), the water column concentration-based TMDLs are also expressed as daily maximum values (Table NB-Selenium-6). Identifying daily maximum tissue-based TMDLs is neither meaningful nor practicable.

This water column concentration-based approach (except for the Santa Isabel Channel and Upper Newport Bay; see preceding discussion) to determining the loading capacities and TMDLs (and allocations; see 4.c.2.ii) was utilized in lieu of the more typical mass-based approach for several reasons. In particular, the water column guidelines generated using the Newport Bay watershed biodynamic model provide a direct link to meeting the tissue-based selenium site-specific objectives and, thus, the protection of beneficial uses. The water column

guidelines incorporate differences in selenium speciation and recycling that may occur in a water body through the use of particulate to water column partitioning coefficients (K_ds) and trophic transfer factors (TTFs) that represent how efficiently selenium transfers from primary producers to predators, the most important route for selenium bioaccumulation in tissue. Loading capacity/TMDLs based on the more typical mass-based approach do not provide this direct link to the protection of beneficial uses. For the Santa Isabel Channel and Upper Newport Bay, the TMDLs are also set at the loading capacities, based on tissue concentrations. This approach likewise provides a direct link to the protection of wildlife-related beneficial uses.

Table NB-Selenium-6 shows the concentration-based TMDLs for the Newport Bay watershed. The TMDLs are to be achieved as soon as possible, but no later than 15 years from the effective date of the TMDLs, i.e., no later than [*insert date certain once TMDLs are approved*].

Table NB-Selenium-6. Total Maximum Daily Loads for Selenium in the Newport Bay Watershed [0,1]

Water Body		SSO-Based TMDLs[2]		CTR-Based TMDLs[2]	
		TMDLs as Semi-annual Arithmetic or Annual Geometric Mean[3]	TMDLs as Daily Maximum[4]	TMDLs as Semi-annual Arithmetic[3] Mean (µg Se/L)	TMDLs as Daily Maximum (µg Se/L)[4]
Salt Water	Upper Newport Bay[5]	5-8 µg Se/g dw (tissue)	5-8 µg Se/g dw (tissue)[6]	NA	NA
Freshwater Streams	San Diego Creek	5-13 µg Se/L	10-27 µg Se/L	5	10
	Santa Ana/Delhi	5-13 µg/L	10-27 µg Se/L	5	10
	Santa Isabel[5]	5-8 µg Se/g dw (tissue)	5-8 µg Se/g dw (tissue)[6]	5	10
	Big Canyon Wash	0.9-1.4 µg Se/L	1.9-2.9 µg Se/L	5	10
Freshwater Marshes and Wetlands	UCI Wetlands (San Joaquin FW Marsh Reserve)	2-3 µg Se/L	4-6 µg Se/L	5	10
	IRWD Wetlands (incl. treatment ponds and Carlson Marsh)	6-9 µg Se/L	12-19 µg Se/L	5	10

[0] TMDLs apply year-round during dry weather flows (i.e., when flow at San Diego Creek at Campus is ≤ 23 cfs).
[1] Numbers are rounded to the nearest one except for Big Canyon Wash, which are rounded to the nearest tenth.
[2] If the SSOs are approved, the CTR will no longer be in effect and the final TMDLs for selenium will be set at the water column selenium concentration that results in compliance with the fish and bird egg tissue numeric targets/SSOs in all hydrologic units in the watershed, as demonstrated by tissue monitoring (see subsection 4.c.4, Task 8 [and Section 12.5, Task 8, of the 2009 Selenium Staff Report]). Adjustments to the calculated range in TMDLs will be made if and as necessary using data collected during implementation of these TMDLs/SSOs and the Newport Bay watershed biodynamic model. Such adjustments will be considered through a Regional Water Board public participation process. If the SSOs are approved, the CTR-based TMDLs will no

longer be in effect.

[3] A semi-annual (April 1 through September 30; October 1 through March 31) arithmetic mean is applied to water column concentrations; an annual geometric mean is applied to fish and bird egg tissue concentrations.

[4] For water column concentration-based TMDLs, daily maximum TMDLs are based on the scheme described in the Draft EPA Document "Options for Expressing Daily Loads in TMDLs" (USEPA, 2007). A factor of 2.064 is applied to the semi-annual arithmetic mean to calculate the daily maximum concentration.

[5] The TMDLs for selenium in Upper Newport Bay and Santa Isabel Channel are currently set at the fish and bird egg tissue numeric targets, or in the future at the water column selenium concentration that results in compliance with the tissue targets, if future data collection efforts improve the predictive ability of the Newport Bay watershed biodynamic model for these areas. Such adjustments to the biodynamic model will be considered through a Regional Water Board public participation process.

[6] Tissue-based daily maximum TMDLs are set as the same as the annual geometric mean TMDLs; it is not practicable or protective of beneficial uses to attempt to apply a daily concentration to fish or bird egg tissue selenium concentrations..

NA Not applicable: The CTR saltwater chronic and acute criteria for selenium are substantially higher than current ambient water column concentrations measured in Upper Newport Bay and are not appropriate for use in these TMDLs.

In a recent D.C. Circuit Court of Appeals decision (*Friends of the Earth, Inc. v. EPA, et al.,* No. 05-5015 [D.C. Cir. 2006]), the court held that two TMDLs for the Anacostia River did not comply with the Clean Water Act because they were not expressed as "daily" loads. In light of this decision, these TMDLs (except for those based on tissue concentrations) are also being expressed in average daily time increments (Table NB-Selenium-6). Once the selenium site-specific objectives are approved and the CTR freshwater criterion is de-promulgated by USEPA for the Newport Bay watershed, the CTR-based TMDLs will no longer be in effect.

The ranges in TMDLs shown in Table NB-Selenium-6 for the inland surface waters in the Newport Bay watershed reflect the range in water column guidelines calculated for these waters with the Newport Bay watershed biodynamic model, using different assumptions for the model variables. The range of TMDLs for the Santa Isabel Channel and Upper Newport Bay is based on tissue-concentrations equivalent to the tissue-based numeric targets.

Adjustments to the calculated range in TMDLs will be made if and as necessary using data collected during implementation of these TMDLs/SSOs and the Newport Bay watershed biodynamic model. Such adjustments will be considered through a Regional Water Board public participation process. The final TMDLs for these areas will be determined based on monitoring of fish and bird egg tissue. The TMDLs for each of these waters will ultimately be set at either the numeric tissue targets or the water column concentration (WCG) that results in compliance with the tissue-based numeric targets.

4.c.2.ii. Wasteload and Load Allocations

TMDLs are the sum of the wasteload allocations (WLAs), load allocations (LAs), and a margin of safety (MOS).

TMDL = WLA + LA + MOS

An implicit margin of safety is included in the determination of the selenium TMDLs (see Section 11. 2.1, 2009 Selenium Staff Report). Water column concentration-based wasteload and load allocations are established; in each case, the allocations are equivalent to the water column concentration-based TMDLs. (Concentration-based wasteload and load allocations are not additive.) Wasteload and load allocations are established to meet both the tissue-based numeric targets/TMDLs (which implement the selenium site-specific objectives) and those based on the CTR selenium freshwater criterion. (TMDLs and allocations based on the CTR criterion will no longer be in effect once the selenium SSOs are approved and the CTR criteria are de-promulgated for the Newport Bay watershed.) Compliance with the allocations is to be achieved as soon as possible but no later than 15 years from the effective date of the TMDLs, i.e., no later than (*insert date certain, once BPA is approved).*

As described above, ranges of water column concentrations (water column guidelines or WCGs) necessary to achieve the tissue-based numeric targets were calculated for the freshwater areas of the watershed using the Newport Bay watershed biodynamic model. These water column guidelines are the basis of the water column concentration-based loading capacities and TMDLs, and, in turn the water column concentration-based wasteload and load allocations. For the purposes of establishing the wasteload and load allocations, the upper end of the range of TMDLs, i.e., 13 µg Se/L for the San Diego Creek subwatershed (including the IRWD and UCI wetlands and the Santa Ana Delhi Channel subwatershed) and 1 µg Se/L for Big Canyon Wash, are set initially as the final allocations. Compliance with the wasteload allocations and load allocations (section 4.c.2.iii) for the freshwater areas in the Newport Bay watershed (which are the largest sources of selenium to the bay) is expected to result in compliance with the TMDLs established for Upper Newport Bay; no separate allocations for the Upper Bay are established. Likewise, reductions in selenium concentrations in San Diego Creek are also expected to result in reductions in

both the UCI and IRWD off-channel wetlands such that the tissue SSOs will be met; again, no separate allocations for these wetlands are established. As discussed previously, the Santa Ana Delhi Channel is treated as part of the San Diego Creek subwatershed; therefore, with the exception of Big Canyon Wash and the Santa Isabel Channel, the allocations identified for the San Diego Creek watershed are considered to be applicable to the Newport Bay watershed as a whole. At this time, there are insufficient data to determine allocations to meet the tissue-based TMDLs for the Santa Isabel Channel. Selenium limitations on discharges to this channel will take into consideration ambient water quality conditions and applicable standards, including antidegradation provisions.

During implementation of these TMDLs/SSOs, data will continue to be collected from Newport Bay, San Diego Creek, the off-channel wetlands and other areas in the watershed in order to assess whether implementation actions are resulting in sufficient reductions in selenium concentrations in sediment, water, and biota in these hydrologically connected areas of the watershed.

As the selenium TMDLs are implemented, monitoring of fish and bird egg tissue may demonstrate that these allocations need to be revised in order to achieve the tissue-based numeric targets and the TMDLs, as well as the selenium SSOs. In addition, the collection of additional data may lead to adjustments in the variables employed in the biodynamic model, resulting in revised calculations of appropriate water column guidelines. The allocations may be revised as necessary to address these circumstances. Specifically, these TMDLs require that the model inputs and water column guidelines be reevaluated and updated as necessary, but in no case no later than 8 years from the effective date of the TMDLs (i.e., no later than [*insert date certain, once BPA is approved*]. Subject to review and comment via a Regional Board public participation process, updated values may then replace the initial values in the equations, resulting in revised TMDLs and allocations.

In the event of any such change in allocations, compliance with the allocations, TMDLs, and with the selenium site-specific objectives or CTR freshwater criterion (if it remains applicable) would continue to be required as soon as possible but no later than 15 years from the effective date of the TMDLs, i.e., (*insert date certain, once BPA is approved).* To assure timely compliance with the allocations, whether or not adjustments are made as the TMDLs are implemented, the TMDL implementation plan (section 4.c.4), including the BMP Strategic Plan, considered the full range of allocations and identified the actions necessary to meet the full range of water column concentration-based TMDLs, including those necessary to achieve the CTR selenium freshwater criterion.

All point sources (permitted discharges) are assigned waste load allocations (WLAs) for and non-point sources are assigned load allocations (LAs) for these TMDLs. The point sources include both temporary and long-term groundwater

dewatering and remediation discharges. The non-point sources include agricultural discharges, atmospheric deposition, open space, and rising groundwater. Atmospheric deposition has not been assigned a separate load allocation since most of the atmospheric deposition is accounted for in allocations for runoff from the various land uses. Direct atmospheric deposition to the water bodies accounts for less than one percent of the total non-point source load.

These concentration-based allocations are assigned to implement the CTR-based TMDLs in freshwater areas of the Newport Bay watershed, and to implement the TMDLs based on the water column guidelines (which are based on the selenium tissue numeric targets/SSOs). Upon approval of the selenium SSOs and de-promulgation of the CTR criteria for the Newport Bay watershed, the CTR-based allocations will no longer be effective.

Waste load and load allocations are applicable year-round during dry weather flows, that is, when flow measurements at San Diego Creek at Campus are $\leq$ 23 cfs. The allocations will be calculated as semi-annual arithmetic means (April 1st through September 30th and October 1st through March 31st).

Compliance with the WLAs and LAs will be determined per the approach discussed in Section 4.c.3, below. The WLAs and LAs are presented in Tables NB-Selenium-7 and 8, respectively. Consistent with the Friends of the Earth, Inc. decision regarding daily expression of Total Maximum Daily Loads (see 4.c.2.i.) the waste load allocations for these TMDLs are also being expressed in average daily time increments (Table NB-Selenium-9).

Table NB-Selenium-7 Final Waste Load Allocations as a Semi-Annual Arithmetic Mean (for implementation purposes)[a]

Point Sources	CTR-Based Allocation (µg/L) [b, i, j]	SSO-Based Allocation (µg/L) [b, c, d, e, f, g, h, i, j]	
		Newport Bay Watershed	Big Canyon Wash
Urban Runoff [k] GW Long-term Dewatering GW Short-term Dewatering GW Clean-up (Long Term) GW Clean-up (Short Term/ Mobile Systems) Nursery Operations	5	13	1

(a) For semi-annual arithmetic mean: April 1 through September 30; October 1 through March 31 each year.

(b) Allocations apply during dry weather flows (as determined when flow at San Diego Creek at Campus is ≤ 23 cfs).

(c) Concentration-based final allocations are based on the back calculated water column guidelines derived from the bird egg and fish tissue targets through the use of the biodynamic model represented by this equation: [[((((fish tissue target)/TTFff)/TTFf)/TFFi)/Kd)*1000]+[((((bird egg target)/TTFe)/TTFf)/TFFi)/Kd)*1000]]/2.

(d) TTFe = trophic transfer factor from predatory fish to egg, TTFff = trophic transfer factor from small fish to predatory fish, TTFf = trophic transfer factor from invertebrates to fish, TTFi = trophic transfer factor from particulates to invertebrates, Kd = uptake coefficient from dissolved Se in water to particulates.

(e) Initial values: TTFe = 1.4, TTFff = 1.1, TTFf = 1.1, TTFi = 2.8, K_d SDC = 159, K_d BCW = 1469. Additional K_d values may be incorporated for additional specific water bodies. TTF values may vary by specific water body. In water bodies where predatory fish are not present, the TTFf value in both equations should equal 1 to represent that one less step is occurring in the food chain. Such applications of the equation will be considered through a public participation process.

(f) During the development of the TMDLs, the derivation of the water column guidelines from the targets produced a range of possible water column guideline values based on the values assumed for the variables in the equation. The initial values selected included a rounded WCG of 1 ug/L for Big Canyon Wash and 13 ug/L for the rest of the Newport Bay watershed.

(g) Following the completion of studies to evaluate appropriate K_d and other variables (see subsection 4.c.4, Task 10 [and Section 12.0, Task 10 in the 2009 Selenium Staff Report) and based on the implementation of the BMP Strategic Plan (subsection 4.c.4, Task 5 [and Section 12.0, Task 5 in the 2009 Selenium Staff Report), the model inputs and WCGs will be reevaluated and updated as necessary no later than 8 years from the effective date of the TMDLs. Subject to review and comment via a public participation process, updated values may then replace the initial values in the equations, resulting in revised allocations. The implementation plan, including the BMP Strategic Plan, and all the analyses required and completed for consideration of these Basin Plan amendments, including economics and CEQA, considered the full range of allocations.

(h) The allocations based on the back-calculated water column guidelines are to be achieved as soon as possible, but no later than 15 years from the effective date of the TMDLs.

(i) Assessed in the receiving water for members of the Cooperative Watershed Program(subsection 4.c.4, Task 2 [and Section 12.0, Task 2 in the 2009 Selenium Staff Report)). Compliance with allocations will be determined pursuant to the Compliance Approach outlined in subsection 4.c.3

(j) Assessed at 'end of pipe' for Individual Action Plan point sources (subsection 4.c.4, Task 3 [and Section 12.0, Task 3 in the 2009 Selenium Staff Report). Compliance with allocations will be determined pursuant to the Compliance Approach outlined in subsection 4.c.3.

(k) Assessment location for Urban Runoff is the Costa Mesa Channel. This location was selected as a surrogate urban runoff site because the sub-watershed is approximately 1 square mile in area, it has predominately urban land uses, and it is outside of the areas impacted by groundwater seepage.

Table NB-Selenium-8. Final Load Allocations as a Semi-Annual Arithmetic Mean (for implementation purposes) [a]

Nonpoint Source	CTR-based Allocation (ug/L) [b, g, i]	SSO-based Allocation (ug/L) [b, c, d, e, f, g, h, i]	
		Newport Bay Watershed	Big Canyon Wash
Agricultural Discharges Open Space Rising Groundwater	5	13	1

(a) For semi-annual arithmetic mean: April 1 through September 30; October 1 through March 31 each year.

(b) Allocations apply during dry weather flows (as determined when flow at San Diego Creek at Campus is ≤ 23 cfs).

(c) Concentration-based final allocations are based on the back calculated water column guidelines derived from the bird egg and fish tissue targets through the use of the biodynamic model represented by this equation: [[((((fish tissue target)/TTF_{ff})/TTF_f)/TFF_i)/K_d)*1000]+[((((bird egg target)/TTF_e)/TTF_f)/TFF_i)/K_d)*1000]]/2.

(d) TTF_e = trophic transfer factor from predatory fish to egg, TTF_{ff} = trophic transfer factor from small fish to predatory fish, TTF_f = trophic transfer factor from invertebrates to fish, TTF_i = trophic transfer factor from particulates to invertebrates, Kd = uptake coefficient from dissolved Se in water to particulates.

(e) Initial values: TTF_e = 1.4, TTF_{ff} = 1.1, TTF_f = 1.1, TTF_i = 2.8, $K_{d\ SDC}$ = 159, $K_{d\ BCW}$ = 1469. Additional K_d values may be incorporated for additional specific water bodies. TTF values may vary by specific water body. In water bodies where predatory fish are not present, the TTF_f value in both equations should equal 1 to represent that one less step is occurring in the food chain. Such applications of the equation will be considered through a public participation process.

(f) During the development of the TMDLs, the derivation of the water column guidelines from the targets produced a range of possible water column guideline values based on the values assumed for the variables in the equation. The initial values selected included a rounded WCG of 1 ug/L for Big Canyon Wash and 13 ug/L for the rest of the Newport Bay watershed.

(g) Following the completion of studies to evaluate appropriate K_d and other variables (subsection 4.c.4, Task 10 [and Section 12.0, Task 10 in the 2009 Selenium Staff Report) and based on the implementation of the BMP Strategic Plan (subsection 4.c.4, Task 5 [and Section 12.0, Task 5 in the 2009 Selenium Staff Report), the model inputs and WCGs will be reevaluated and updated as necessary no later than 8 years from the effective date of the TMDLs. Subject to review and comment via a public participation process, updated values may then replace the initial values in the equations, resulting in revised allocations. The implementation plan, including the BMP Strategic Plan, and all the analyses required and completed for consideration of these Basin Plan amendments, including economics and CEQA, considered the full range of allocations.

(h) The allocations based on the back-calculated water column guidelines are to be achieved as soon as possible, but no later than 15 years from the effective date of the TMDLs.

(i) Assessed in the receiving water

Table NB-Selenium-9. Final Waste Load Allocations expressed as a Daily Maximum (expressed on a "daily" basis to be consistent with the recent D.C. Circuit Court of Appeals decision in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015 [D.C. Cir.2006]) [a]

Point Sources	CTR-Based Allocation (ug/L) [b, i, j]	SSO-Based Allocation (ug/L) [b, c, d, e, f, g, h, i, j]	
		Newport Bay Watershed	Big Canyon Wash
Urban Runoff [k] GW Long-term Dewatering GW Short-term Dewatering GW Clean-up (Long Term) GW Clean-up (Short Term/ Mobile Systems) Nursery Operations	10	27	2

(a) Daily expression of the allocations was calculated based on the Draft EPA Document "Options for Expressing Daily Loads in TMDLs" (USEPA, 2007). Daily allocations were calculated using the following equation: Daily allocation=Semi-annual allocation * $e^{(Z\sigma-0.5\sigma^2)}$,where Z = z-score associated with target recurrence interval of 90 days (2.291), $\sigma^2 = \ln((CV)^2 + 1)$ and CV = Coefficient of variation. The CV was calculated using dry weather data from San Diego Creek at Campus Drive and set equal to 0.352.

(b) Allocations apply during dry weather flows (as determined when flow at San Diego Creek at Campus is ≤ 23 cfs).

(c) Concentration-based final allocations are based on the back calculated water column guidelines derived from the bird egg and fish tissue targets through the use of the biodynamic model represented by this equation: [[((((fish tissue target)/TTF_{ff})/TTF_f)/TFF_i)/K_d)*1000]+[((((bird egg target)/TTF_e)/TTF_f)/TFF_i)/K_d)*1000]]/2.

(d) TTF_e = trophic transfer factor from predatory fish to egg, TTF_{ff} = trophic transfer factor from small fish to predatory fish, TTF_f = trophic transfer factor from invertebrates to fish, TTF_i = trophic transfer factor from particulates to invertebrates, Kd = uptake coefficient from dissolved Se in water to particulates.

(e) Initial values: TTF_e = 1.4, TTF_{ff} = 1.1, TTF_f = 1.1, TTF_i = 2.8, $K_{d\ SDC}$ = 159, $K_{d\ BCW}$ = 1469. Additional K_d values may be incorporated for additional specific water bodies. TTF values may vary by specific water body. In water bodies where predatory fish are not present, the TTF_f value in both equations should equal 1 to represent that one less step is occurring in the food chain. Such applications of the equation will be considered through a public participation process.

(f) During the development of the TMDLs, the derivation of the water column guidelines from the targets produced a range of possible water column guideline values based on the values assumed for the variables in the equation. The initial values selected included a rounded WCG of 1 ug/L for Big Canyon Wash and 13 ug/L for the rest of the Newport Bay watershed.

(g) Following the completion of studies to evaluate appropriate K_d and other variables (see Implementation Section) and based on the implementation of the BMP Strategic Plan, the model inputs and WCGs will be reevaluated and updated as necessary no later than 10 years from the effective date of the TMDLs. Subject to review and comment via a public participation process, updated values may then replace the initial values in the equations, resulting in revised allocations. The implementation plan, including the BMP Strategic Plan, and all the analyses required and completed for consideration of these Basin Plan amendments, including economics and CEQA, considered the full range of allocations.

(h) The allocations based on the back-calculated water column guidelines are to be achieved as soon as possible, but no later than 15 years from the effective date of the TMDLs, as discussed in Section 12.

(i) Assessed in the receiving water for members of the Cooperative Watershed Program. Compliance with allocations will be determined pursuant to the Compliance Approach outlined in the implementation plan.

(j) Assessed at 'end of pipe' for Individual Action Plan point sources. Compliance with allocations will be determined pursuant to the Compliance Approach outlined in the implementation plan.

(k) Assessment location for Urban Runoff is the Costa Mesa Channel. This location was selected as a surrogate urban runoff site because the sub-watershed is approximately 1 square mile in area, it has predominately urban land uses, and it is outside of the areas impacted by groundwater seepage.

Comment [JES1]: The change from "were" to "was" should be made also in Sec. 11, Tables 11-4 and 11-6.

Comment [JES2]: Raises the question of whether the calculated values would differ based on semi-annual - I don't think so…

Table NB-Selenium- 10. Final Load Allocations expressed as a Daily Maximum (expressed on a "daily" basis to be consistent with the recent D.C. Circuit Court of Appeals decision in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015 [D.C. Cir.2006])[a]

Nonpoint Source	CTR-based Allocation (ug/L) [b, g, i]	SSO-based Allocation (ug/L) [b, c, d, e, f, g, h, i]	
		Newport Bay Watershed	Big Canyon Wash
Agricultural Discharges Open Space Rising Groundwater	10	27	2

(a) Daily expression of the allocations was calculated based on the Draft EPA Document "Options for Expressing Daily Loads in TMDLs" (USEPA, 2007). Daily allocations were calculated using the following equation: Daily allocation=Semi-annual allocation * $e^{(Z\sigma-0.5\sigma^2)}$, where Z = z-score associated with target recurrence interval of 90 days (2.291); $\sigma^2 = \ln((CV)^2 + 1)$ and CV = Coefficient of variation. The CV was calculated using dry weather data from San Diego Creek at Campus Drive and set equal to 0.352.

(b) Allocations apply during dry weather flows (as determined when flow at San Diego Creek at Campus is ≤ 23 cfs).

(c) Concentration-based final allocations are based on the back calculated water column guidelines derived from the bird egg and fish tissue targets through the use of the biodynamic model represented by this equation: [[((((((fish tissue target)/TTF_{ff})/TTF_f)/TTF_i)/K_d)*1000]+[((((((bird egg target)/TTF_e)/TTF_f)/TTF_i)/K_d)*1000]]/2.

(d) TTF_e = trophic transfer factor from predatory fish to egg, TTF_{ff} = trophic transfer factor from small fish to predatory fish, TTF_f = trophic transfer factor from invertebrates to fish, TTF_i = trophic transfer factor from particulates to invertebrates, Kd = uptake coefficient from dissolved Se in water to particulates.

(e) Initial values: TTF_e = 1.4, TTF_{ff} = 1.1, TTF_f = 1.1, TTF_i = 2.8, $K_{d\ SDC}$ = 159, $K_{d\ BCW}$ = 1469. Additional K_d values may be incorporated for additional specific water bodies. TTF values may vary by specific water body. In water bodies where predatory fish are not present, the TTF_f value in both equations should equal 1 to represent that one less step is occurring in the food chain. Such applications of the equation will be considered through a public participation process.

(f) During the development of the TMDLs, the derivation of the water column guidelines from the targets produced a range of possible water column guideline values based on the values assumed for the variables in the equation. The initial values selected included a rounded WCG of 1 ug/L in Big Canyon Wash and 13 ug/L in the rest of the Newport Bay watershed.

(g) Following the completion of studies to evaluate appropriate K_d and other variables (see Implementation Section) and based on the implementation of the BMP Strategic Plan, the model inputs and WCGs will be reevaluated and updated as necessary no later than 10 years from the effective date of the TMDLs. Subject to review and comment via a public participation process, updated values may then replace the initial values in the equations, resulting in revised allocations. The implementation plan, including the BMP Strategic Plan, and all the analyses required and completed for consideration of these Basin Plan amendments, including economics and CEQA, considered the full range of allocations.

(h) The allocations based on the back-calculated water column guidelines are to be achieved as soon as possible, but no later than 15 years from the effective date of the TMDLs, as discussed in Section 12.

(i) Assessed in the receiving water

4.c. 3. Assessing Compliance with Selenium TMDLs

The assessment of impairment of water quality standards due to selenium in the Newport Bay watershed relied on the 303(d) listing methodology and criteria identified in the 2004 State Listing Policy. Where water quality standards are attained in impaired waters as the result of the implementation of TMDLs or other actions, those waters can be removed from the 303(d) list, i.e., they can be de-listed. The State Listing Policy also identifies delisting criteria. Meeting the numeric targets for selenium, including those based on the selenium site-specific objectives, and TMDLs is expected to result in the attainment of water quality standards. Thus, the delisting methods/criteria identified in the State Listing

Policy are also applied to the determination of compliance with the selenium numeric targets, TMDLs and SSOs and, thereby, the attainment of water quality standards.

Pursuant to the State Listing Policy, water segments or toxic pollutants can be removed from California's section 303(d) list if the numeric water quality objectives, criteria, or standards for toxic pollutants are not exceeded as follows:

- Using the binomial distribution, waters shall be removed from the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 4.1 of the Policy.
- The binomial distribution cannot be used to support a delisting with sample sizes less than 28.

The State Listing Policy requires that for toxic pollutants, a minimum of 28 samples be used to determine if a water body can be removed from the 303(d) list (it may be noted that this is almost twice the number of samples required to place a water body on the 303(d) list). The ability to delist is actually determined by the number of exceedances per a range in sample numbers, with roughly 6-8% of the samples not to exceed the delisting criteria when compared to the total number of samples used in the delisting assessment. Though the listing/delisting policy does not specifically address bird egg tissue, it is not excluded either; therefore, the delisting criteria will also be used to determine compliance with the bird egg tissue numeric target/SSO.

Assessing compliance with both the fish and bird egg tissue numeric targets/SSOs at all locations in the watershed will be difficult. It may not be possible in a given year (or even, in some locations, over multiple years) to collect sufficient numbers of samples, particularly bird eggs, to meet the Listing Policy criteria. Recommendations regarding the regional monitoring program to be proposed and implemented for these TMDLs (see 4.c.4, Task 8, below) address these constraints. It is recommended that specific monitoring sites be grouped by drainages to provide a better probability of attaining adequate tissue samples that could be considered representative of a defined portion of the watershed. Tissue chemistry results from any given year of monitoring may be grouped by these "compliance assessment areas" for assessing compliance with the TMDL tissue targets. In addition to this spatial aggregation, it may be necessary, particularly for bird eggs, to collect data over more than one year to achieve the requisite number of samples per the State Listing Policy. In such cases, compliance assessments will take place once the minimum number of samples is collected. In those areas where bird egg (and/or fish tissue) collection is particularly problematic, it may be necessary to identify an invertebrate surrogate. The use of surrogate tissue data will need to be justified by site-specific demonstration of a reliable relationship between selenium tissue concentrations in the surrogate organism and that of bird target species.

For each compliance assessment area, results from individual bird egg or whole-body composite fish samples will be compared separately against the criteria in NB-Selenium-11 to identify appropriate follow-up actions. Table NB-Selenium-11 presents a list of three tiers that increase in severity of exceedance of the tissue targets. For any given tier, exceedance of the tissue target concentrations by a certain percentage of either bird eggs or fish samples qualifies for that tier. As the degree of exceedance increases, the number and intensity of proposed actions increases in response. The actions identified focus on the review of the regional monitoring program, its results, and the design and implementation of BMPs. The actions must remain flexible to address non-compliance conditions on a site/area-specific basis. Exceedances in different areas of the freshwater habitats or of the bay in different types of biota may require different responses. The degree of exceedance (if any) is expected to vary among these assessment area groupings and the proposed actions would focus on the specific areas showing tissue exceedances.

Because the State Listing Policy allows an exceedance rate of the tissue targets of 6-8%, it is appropriate to ensure that compliance determined based on the delisting criteria in the State Listing Policy is not simultaneously allowing extreme exceedances of the tissue targets/SSOs. A ceiling for these types of low frequency exceedances will be used only to trigger additional investigation to determine why a limited number of tissue samples may be well above the criteria yet still fall within the State Listing Policy's requirements to delist. Exceedance of a ceiling concentration, even though the majority of samples meet the tissue criterion, would automatically indicate that there may be a problem that could potentially result in non-compliance and that would then set in motion further investigations before a final determination of compliance could be made (e.g., instead of remaining in Tier 1 in Table NB-Selenium-11, below, exceedance of the ceiling concentration for bird egg or fish tissue would automatically trigger Tier 2).

The selenium site-specific objectives established for the Newport Bay watershed are 5 µg Se/g dry weight (dw) for fish tissue and 8 µg Se/g dw for bird egg tissue. As previously described, these SSOs are incorporated into the selenium TMDLs as primary numeric tissue targets. The low-frequency exceedance ceiling concentrations for selenium in fish and bird egg tissue, respectively, are 10 µg Se/g dw and 16 µg Se/g dw. Exceedance of these ceiling concentrations will trigger additional investigations with the intent to confirm compliance with the tissue targets and SSOs in accordance with the State Listing Policy.

Table NB-Selenium-11. Tiered Compliance Assessment and Actions Approach; Selenium TMDLs Monitoring Program, Newport Bay Watershed. Whole-body Fish Tissue and Bird Egg Tissue Considered Separately for Exceedance of Targets for each Compliance Assessment Site/Area.

Tier	Frequency of Exceedance of Tissue Targets*	Action
1: Compliance	Less than 8%* (no egg to exceed 16 ug Se/g dw; no fish tissue composite to exceed 10 ug Se/g dw)†	Continued monitoring Continue BMP Strategic Plan
2: Non-compliance	8-18%**	All actions in Tier 1, plus one or more of the following (as appropriate): • Identify sites for increased sampling • Identify potential sources/causes for outlier results • Reassess the Newport Bay biodynamic model parameters and results (partitioning coefficients, trophic transfer factors, water quality guidelines, etc.) • Identify options for focused BMP enhancements, need for and nature of additional BMPs or other implementation actions; implement appropriate measures in a timely manner
3: Non-compliance	Over 18%***	All actions in Tier 2, plus one or more of the following (as appropriate): • Resample biota • Increase sampling (include selenium speciation in water column samples) • Institute special studies as needed • Assess need for additional source controls • Early/timely implementation of additional BMPs

* This is based on the State Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List, September 2004 (State Listing Policy). The State Listing Policy determination for findings of impairment is based on a binomial distribution and varies depending on the total number of samples from 6-8%. However, the number of tissue samples per year is expected to be highly variable. If the data meet the State Listing Policy delisting criteria and fall into the Tier 1 category, the compliance assessment area is considered to be in compliance with the TMDLs.

† These not-to-exceed concentrations will ensure protection of the beneficial uses in the Newport Bay watershed.

** Tier 2 represents progress towards achieving compliance, but recognizes that additional actions are necessary to ensure that compliance is achieved by the end of the implementation period. The upper end of the frequency of exceedance range is based on the unacceptable exceedance proportion identified in Table 4.1 within the State Listing Policy. The lower end of the frequency of exceedance range is just above the upper end of the allowable frequency of exceedance range.

*** Tier 3 represents an assessment area for which meeting the tissue targets requires more significant actions than Tier 2. The frequency of exceedance range is based on the unacceptable exceedance proportion identified in Table 4.1 within the State Listing Policy.

4.c.4. Selenium TMDL Implementation

The implementation plan detailed below identifies the actions necessary to assure that the selenium TMDLs and applicable water quality standards, including both the selenium site-specific objectives and the CTR selenium criteria (if not supplanted by the selenium SSOs), will be achieved.

Controlling selenium discharges in the Newport Bay watershed poses extraordinary challenges since there is no readily available, conventional selenium treatment technology that can be implemented in a reasonably practicable manner, given the watershed-scale of the selenium problem, its diffuse origin (largely rising groundwater) and the limited land available for facility placement given the high degree of urbanization in the watershed. In view of these challenges, and in light of uncertainty and the need to collect and consider additional data that are expected to lead to refinement of the TMDLs, implementation of the TMDLs will proceed in a phased manner, utilizing an adaptive management approach.

Phased TMDLs are used when, for scheduling reasons, the TMDLs need to be established despite significant data uncertainty and where, as in the case of these selenium TMDLs, it is expected that the loading capacity and allocation scheme may be revised in the near future as additional data are collected to refine the TMDLs. As described in a preceding subsection (4.c.2), the Newport Bay watershed biodynamic model produced ranges of water column guidelines that implement the tissue-based numeric targets (and thus, the tissue-based selenium site-specific objectives) in different waterbodies within the watershed. These ranges resulted from different assumptions regarding the appropriate values used for the model variables. As additional data are collected to refine these assumptions, and as monitoring demonstrates whether or not the attainment of specific water column guidelines will achieve the tissue-based numeric targets (and SSOs), adjustments to the water column guidelines and the loading capacities, TMDLs and allocations derived from them may be made. The phased approach employed in these TMDLs also provides time, in part, to conduct additional monitoring to fill existing data gaps and to refine the parameters used in the biodynamic model, as well as to conduct field demonstration testing of potential selenium BMPs/treatment technologies and to implement full-scale BMPs/treatment technologies that appear to have promise.

To accommodate this phased approach, compliance schedules to attain the TMDLs, and to implement the tasks identified below, are identified. The TMDLs are to be achieved as soon as possible but no later than 15 years from the effective date of the TMDLs, i.e., no later than [*insert date certain, once BPA is approved*]. While it is recognized that time is needed to identify, evaluate the efficacy of and implement suitable selenium control measures, the Regional Water Board expects aggressive efforts to comply with the TMDLs as soon as possible.

The NSMP Working Group has already made significant strides toward selenium reductions, including pilot testing and operation of promising BMPs/treatment technologies. In anticipation of one of the tasks of this implementation plan (Task 5), the Working Group has drafted a detailed BMP Strategic Plan that identifies the steps that will be taken to investigate and implement selenium reduction BMPs/treatment technologies and to achieve the TMDLs. The draft Strategic Plan includes "early action items", projects and activities that will be undertaken in the relatively near future to achieve selenium reductions. The Strategic Plan is required to be implemented upon Regional Water Board approval, and will be subject to annual review and update. Revisions to the Strategic Plan will be considered for approval by the Regional Board using a public participation process; any revisions to the Strategic Plan will be implemented upon Regional Water Board approval.

This implementation plan, and the BMP Strategic Plan, addresses attainment of the numeric target based on the CTR chronic criterion for selenium in freshwater, and thus the CTR criterion itself[7], if that criterion is not supplanted by the selenium SSOs. These plans also address attainment of the full ranges of water column guidelines calculated by the biodynamic model to meet the tissue-based numeric targets (and SSOs) in specific waterbodies, and, therefore, the ranges of loading capacities, TMDLs and allocations derived from these guidelines (see preceding subsections) [8].

Implementation actions will be focused initially on meeting the upper end of the identified water column guideline (WCG) ranges. Where monitoring data demonstrate that attainment of these upper end water column guidelines does not result in attainment of the tissue-based numeric targets (and tissue-based SSOs), then the applicable TMDLs and allocations will be based on more stringent WCGs within the ranges identified. Additional implementation actions will be necessary. Further, refinement of the biodynamic model may result in refined calculations of the water column guidelines that are expected to result in attainment of the tissue-based numeric targets (and selenium SSOs). The model inputs and water column guidelines will be reevaluated and updated as

[7] As discussed in 4.c.1, the CTR saltwater criteria for selenium are not relevant to these selenium TMDLs since ambient selenium concentrations in the saltwater areas of the Newport Bay watershed are well below these criteria.

[8] The requisite economic and environmental analysis of this implementation plan, including reasonably foreseeable methods of compliance with the TMDLs and selenium site-specific objectives, and reasonably foreseeable alternatives, encompassed the actions necessary to attain the numeric targets and TMDLs based on the CTR selenium chronic criterion for freshwater and the numeric targets and TMDLs based on the tissue-based selenium site-specific objectives. In particular, it is important to note that the economic and environmental analyses addressed the full range of water column guidelines that may be found necessary to achieve the tissue-based numeric targets (and the tissue-based SSOs).

necessary no later than 8 years from the effective date of the TMDLs, i.e., no later than [*insert date certain, once BPA is approved*]. Subject to review and comment via a public participation process, updated values may then replace the initial values in the model equations, resulting in revised TMDLs and allocations.

Implementation of these TMDLs will be an adaptive, iterative, and dynamic process whereby data and information collected from ongoing monitoring and implementation activities will be fed back into TMDL implementation and review processes on a continuous basis, so that the need for changes can be identified and appropriate modifications can be implemented in a timely manner.

To guide the implementation of the TMDLs and gauge progress in attaining water quality standards, the Regional Water Board will rely extensively on stakeholder input and interaction, likely through the NSMP, and with funding likely provided through the Cooperative Watershed Program (CWP) funding agreement (see Task 2, below). Further, implementation of these TMDLs will be integrated with actions that are being or will be taken to implement other TMDLs in the Newport Bay watershed. For example, it is expected that significant reductions in nitrogen inputs to the surface waters of the watershed will occur as BMPs/treatment technologies to achieve selenium reductions are implemented. For many of these selenium BMPs/treatment technologies, nitrogen reductions are a prerequisite to selenium removal. Thus, actions taken to implement the selenium TMDLs should to help to achieve the nitrogen reductions called for by the established nutrient TMDLs (see section 4.b ?).

The NSMP Working Group has made significant commitments to the development and implementation of these TMDLs. This level of commitment is expected to continue through the implementation and evaluation of the selenium TMDLs. The NSMP will make recommendations for the revision and improvement of the TMDL tasks, as appropriate. Regional Water Board staff will continue to be active participants in the NSMP. This approach allows for the ongoing participation of the stakeholders for the duration of the TMDL implementation plan and greater transparency for the overall process. The NSMP stakeholders, including representatives from local environmental groups and Regional Water Board staff, will evaluate progress toward achieving the TMDLs, integrate the selenium TMDLs implementation tasks with other tasks already being conducted in response to other programs (e.g., permits, other TMDLs), and make recommendations for revisions to the TMDLs, including the implementation plan.

Based on consultation with stakeholders and review of the best available science, the most timely and effective course of action to assure appropriate implementation of the TMDLs as soon as possible is for all existing and potential dischargers in the Newport Bay watershed to participate in the NSMP through the CWP Funding Agreement (Task 2, below). Non-point source rising

groundwater is the largest source of selenium in the watershed and the attainment of the SSOs and final TMDL numeric targets is contingent on the management of this significant source. A coordinated, regional watershed approach is necessary to achieve the selenium TMDLs efficiently. Absent a comprehensive, coordinated approach, it is less likely that this source could be managed in a timely and effective manner.

While participation in the NSMP and CWP Funding Agreement is strongly encouraged, it is also appropriate to recognize that individual dischargers may find it more appropriate and cost-effective to implement compliance strategies on an individual basis, including implementation of site-specific BMPs, such as sewering the discharge. However, it is recognized that the implementation of these strategies, including sewering, may require some time to implement and/or may have inherent limitations that render them a temporary rather than permanent option. Further, in consideration of fairness, any discharger who elects not to participate in the NSMP and CWP Funding Agreement should not necessarily be permitted to avail themselves of the significant effort and investment by NSMP stakeholders to identify and implement selenium controls on an individual and/or regional basis.

In light of the above, three compliance options have been identified:

Option 1. NSMP funded through the CWP Funding Agreement. Dischargers who elect to participate in the NSMP and CWP Funding Agreement will be required to fulfill specific requirements outlined below (Table NB- Selenium-9) pursuant to an executed CWP Funding Agreement and to comply with the TMDLs and waste discharge requirements/waiver conditions necessary to implement the related provisions in accordance with the compliance schedules identified in the TMDLs. Implementation of the selenium TMDLs is to occur in two phases: the first phase is to take no more than seven (7) years to complete and the second phase is to take no more than eight (8) years to complete. Compliance is to be achieved as soon as possible, but no later than fifteen (15) years from the effective date of the TMDLs (i.e., [*insert date certain, once BPA is approved*].

Option 2. Individual Action Plan. Existing dischargers may elect to identify and implement an alternative, acceptable means to comply with the final TMDLs WLAs, LAs, numeric targets, and/or with the waste discharge requirements or waiver conditions necessary to implement these TMDL components. Individual Action Plan dischargers will be required to achieve compliance *as soon as possible* but no later than three (3) years from the effective date of the selenium TMDLs (i.e., no later than [*insert date certain once BPA is approved*] in accordance with an Individual Action Plan and schedule approved by the Regional Water Board's Executive Officer**.** *Further, these dischargers will be required to implement an acceptable offset for their*

selenium discharges in excess of their selenium limitations until final compliance is achieved. The NSMP CWP Funding Agreement is expected to include offset provisions to address such dischargers; however, other offset proposals may be considered. For new dischargers who elect not to participate in the NSMP and CWP Funding Agreement, the discharges will not be allowed to commence until an action plan and schedule, including a proposed offset and monitoring and reporting program, is approved by the Regional Water Board's Executive Officer.

Option 3. No Discharge. Absent participation in the NSMP and CWP Funding Agreement or implementation of an Individual Action Plan, existing dischargers will be required to immediately cease discharging and no new discharges will be authorized.

Table NB- Selenium-12 identifies the tasks needed to implement the selenium TMDLs.

Table NB-Selenium-12. TMDL Tasks and Compliance Schedule

Task	Description	Responsible Party	Compliance Date – As Soon As Possible But No Later Than[1]
PHASE I IMPLEMENTATION			***Completion no later than 7 years from the date of OAL approval of BPA***
1.	Permit Revisions and Issuance a. Revise existing WDRs and NPDES permits: includes *Groundwater Dewatering and Remediation Permit, MS4 Permit, Other NPDES Permits*	Regional Water Board	a. Upon OAL approval of BPA and permit renewal
	b. Consider issuance of permits (NPDES, WDRs or conditional waivers of WDRs) for Individual Action Plan dischargers	Regional Water Board	b. As soon as possible upon OAL approval of BPA *(date)*
2.	NSMP and CWP Funding Agreement a. Submit NSMP Cooperative Watershed Program Funding Agreement and List of Dischargers to Regional Water Board	NSMP Dischargers	a. (*1 month after OAL approval of BPA*)
	b. Execute Cooperative Watershed Program Funding Agreement	NSMP Dischargers	b. Upon approval of the agreement by program participants

3.	Individual Action Plan a. Submit Individual Action Plan (identifying the offset plan/alternative means of compliance).	Individual Action Plan Dischargers	a. Upon *OAL approval of BPA* and permit renewal
	b. Implement Individual Action Plan	Individual Action Plan Dischargers	b. Upon EO approval with final compliance within 3 years of effective date of BPA
4.	Volume Reduction BMPs a. Implement Volume Reduction BMPs	All Dischargers	a. Ongoing
5.	BMP Strategic Plan a. Submit BMP Strategic Plan, including Early Action Items, and BMP Effectiveness Monitoring Program to Regional Water Board for review and approval	NSMP Dischargers	a. (*1 month after OAL approval of BPA*)
	b. Implement plans	NSMP Dischargers	b. Upon Regional Water Board approval.
	c. Submit annual progress/status reports to Regional Water Board for review and approval. Annual reports shall include assessment of the efficacy of the actions taken pursuant to the BMP Strategic Plan and recommendations for any modifications to the BMP Strategic Plan.	NSMP Dischargers	c. Annually
	d. Implement modified BMP Strategic Plan.	NSMP Dischargers	d. Upon approval by the Regional Water Board
6.	Groundwater-Surface Water Model a. Analyze existing data to determine if development of a groundwater-surface water model is reasonably feasible and submit results to the Regional Water Board	NSMP Dischargers	a. (*3 months after OAL approval of BPA*)
	b. If the Regional Water Board has determined that development of the model is reasonably feasible, develop groundwater-surface water model	NSMP Dischargers	b. *18 months after OAL approval of BPA*), submit completed groundwater surface water model to Regional Board
	c. Use groundwater-surface water model to identify	NSMP Dischargers	c. 6 months after groundwater-surface water model

	locations of groundwater dependent demonstration scale projects as part of the BMP Strategic Plan		development completed
	d. Use model to identify data gaps, recommend additional implementation actions and/or special studies	NSMP Dischargers	d. 6 months after groundwater model development completed
	e. Submit any additional recommended implementation actions, schedules and special studies to Regional Water Board for approval	NSMP Dischargers	e. 12 months after groundwater model development completed; implement upon Regional Water Board approval
	f. Complete special studies to develop data needed to complete groundwater-surface water model	NSMP Dischargers	f. 24 months after approval of Regional Water Board of additional special studies.
	g. If necessary, as determined by the Regional Water Board, revise groundwater-surface water model based on special studies data	NSMP Dischargers	g. 12 months after completion of special studies.
	h. Use groundwater-surface water model and results of the BMP Strategic Plan demonstration scale projects to re-evaluate the BMP Strategic Plan including the BMP Effectiveness Monitoring Plan, and the RMP	NSMP Dischargers	h. 12 months after any necessary revisions to the groundwater-surface water model have been completed.
	i. Submit any recommended revisions to the BMP Strategic Plan (and the BMP Effectiveness Monitoring Plan) and the RMP, other implementation actions, and special studies to the Regional Water Board for approval	NSMP Dischargers	i. 18 months after completion of revisions, if necessary, to the groundwater-surface water model.
	j. Implement revisions to the BMP Strategic Plan and RMP	NSMP Dischargers	j. Upon Regional Water Board approval
7.	Irrigation Reduction and Control Program		
	a. Per A.B. 1881, adopt updated Model Water Efficient	a. Local jurisdictions and/or NSMP Dischargers[9]	a. By January 1, 2010 or as required by A.B 1881.

[9] If the local jurisdiction participates in the NSMP then the NSMP will be the responsible party for this task

	Landscape Ordinance or one that is "at least as effective as" that Ordinance.		
	b. Assess whether additional irrigation reduction and control actions are necessary for areas with high selenium concentrations in soils, shallow groundwater, or surface waters.	b. Local jurisdictions and/or NSMP Dischargers.	b. Within 2 years of the adoption of a water efficient landscape ordinance, submit assessment of program and recommendations for any additional irrigation reduction/controls for high selenium areas to the Regional Water Board.
	c. Implement additional identified actions for areas with high selenium as described in b above.	c. Local jurisdictions and/or NSMP Dischargers	c. Upon Regional Water Board approval.
	d. Develop site specific program to reduce irrigation and control surface runoff for Big Canyon Wash subwatershed	d. City of Newport Beach and/or NSMP Dischargers	d. Within *1 month of OAL approval of the BPA*
	e. Implement Big Canyon Wash irrigation reduction and control program	e. City of Newport Beach and/or NSMP Dischargers	e. Upon Regional Water Board approval.
	f. Assess efficacy of Big Canyon Wash program and make adjustments as needed.	f. City of Newport Beach and/or NSMP Dischargers	f. Annually.
8.	Regional Monitoring Program a. Submit regional monitoring program (RMP) for selenium to Regional Water Board for approval	a. NSMP Dischargers	a. (*3 months after OAL approval of BPA*)
	b. Implement monitoring program	b. NSMP Dischargers	b. Upon Regional Water Board approval
9.	Selenium Management Programs 1. Big Canyon Wash	1. City of Newport Beach and/or NSMP Dischargers[10]	
	2. San Joaquin Marsh Freshwater Preserve (UCI Wetlands)	2. UCI and/or UCNRS and/or NSMP Dischargers[11]	
.	3. IRWD Carlson Marsh and	3. IRWD and/or NSMP	

[10] If the City of Newport Beach participates in the NSMP then the NSMP will be the responsible party for this task.
[11] If the University of California, Irvine, or the Natural Reserve System participates in the NSMP then the NSMP will be the responsible party for this task.

	Treatment Wetlands	Dischargers[12]	
	a. Develop a Work Plan for the management of selenium, including identification of sources, selenium fate and transport, and reduction strategies including source controls, operational changes, or BMPs	Responsible Parties as identified above	a. By (*1 month after OAL approval of BPA*) for Regional Water Board approval
	b. Implement the Work Plan	Responsible Parties as identified above	b. Upon Regional Water Board approval
10.	Special Studies Plan a.Submit a plan to the Regional Water Board that describes the special studies that have been identified as needed to fill data gaps or provide additional data for implementation or revision of the TMDLs. The plan should also include a schedule for implementation of these studies. The plan should include the following recommended studies, or provide recommendations for alternative studies, including documentation of the justification of the selection of the alternative study(-ies) : 1. Water Translation/SSO Model Study - Conduct investigations to collect data from hydrologic units in watershed to refine water translation coefficient (Kd) in the Newport Bay watershed biodynamic model and corresponding water column guidelines. 2. Longitudinal Tracking Study Conduct study to confirm the fate, transport, and loss of selenium within the upper watershed. Determine Se	a. NSMP Dischargers	a. (*1 month after OAL approval of the BPA*) submit a proposed prioritized plan and schedule for the implementation of the identified special studies or alternative studies to the Regional Water Board for review and approval.

[12] If IRWD participates in the NSMP then the NSMP will be the responsible party for this task.

	mass balance. 3. Newport Bay Mixing Model study to determine the fate and transport of selenium once it enters the Bay. b. Implement Special Studies Plan c. Submit progress report, including any necessary revisions to the special studies plan to the Regional Water Board's Executive Officer for review and approval.	 b. NSMP Dischargers c. NSMP Dischargers	 b. Upon Regional Water Board approval. c. Annually.
PHASE II IMPLEMENTATION			***Completion no later than (15 years from the date of OAL approval of the BPA)***
11.	TMDL Reevaluation/Revision a. Review and recommend revisions (as necessary) to selenium TMDLs and schedules, including BMP Strategic Plan, RMP, Big Canyon Wash Work Plan, and special studies b. Submit proposed revisions to Regional Water Board for approval c. Implement proposed revisions		a. No later than eight (8) years thirteen (13) years from the date of OAL approval of BPA. b. Within 12 months of initiation of review period c. Upon Regional Water Board approval or upon approval by the Regional Water Board, State Water Board and OAL, as applicable

[1] The Regional Water Board may, after a public hearing, and without need for a Basin Plan amendment, revise the schedules in this table, except for extending the final compliance date of (*15 years from approval of the BPA*), if it determines good cause exists for such revisions.

Table NB- Selenium -13 outlines the primary TMDL milestones and their estimated completion dates.

Table NB- Selenium-13. TMDL Milestones and Estimated Implementation/Completion Dates

Milestone	**Estimated Implementation/Completion Date** (as soon as possible but no later than)
Submittal of Annual Regional Monitoring Program Reports to Regional Water Board assessing compliance with the TMDLs, applicable WLAs (applies to both IAP dischargers and NSMP dischargers), and BMP Strategic Plan Annual Progress Reports, including assessment of progress towards attainment of the water column guidelines and TMDL numeric targets/SSOs, successes and failures of the program, and the need and schedule for any proposed course changes.	Annually, to commence the first Oct after [*insert date certain, once BPA is approved]*. Reports will be submitted for review and approval by the Regional Board and to ensure public participation and input into the TMDL implementation process
Implement Cooperative Watershed Program Funding Agreement	Upon approval by participating dischargers
Implement BMP Strategic Plan, including Early Action Items, BMP Effectiveness Monitoring, and annual assessment and reporting requirements.	Upon approval by the Regional Water Board
Implement Groundwater-Surface Water Model Development	Upon approval by the Regional Water Board
Implement Irrigation Reduction and Control Program	Upon approval by the Regional Water Board
Implement Regional Monitoring Program	Upon approval by the Regional Water Board
Implement Selenium Management Programs for Big Canyon Wash, San Joaquin Freshwater Marsh Preserve, IRWD Wetlands (including Carlson Marsh).	Upon approval by the Regional Water Board
Assess Efficacy of the Irrigation Reduction and Control Program	Yearly, upon approval by the Regional Water Board
Complete Early Action Items identified in the BMP Strategic Plan	As soon as possible, but no later than 5 years after Regional Water Board approval of the BMP Strategic Plan
Complete Phase I of the TMDLs	As soon as possible but no later than 7 years from *[insert date certain, once BPA is approved]*
Complete Selenium Management Programs for Big Canyon	As soon as possible, but

Wash, San Joaquin Freshwater Marsh Preserve, and IRWD Wetlands	no later than 7 years from *[insert date certain, once BPA is approved]*
TMDL Reevaluation/Revision - Assess progress in attainment of the water column guideline(s) and the TMDL numeric targets. Determine if further load reductions are necessary. Review and revise (as necessary) the TMDLs (including implementation plan, BMP Strategic Plan, Regional Monitoring Program, Selenium management programs and special studies).	As soon as possible, but no later than 8 years from *[insert date certain, once BPA is approved]*
Begin Implementation of Phase II (Full Scale Implementation) of the BMP Strategic Plan	As soon as possible, but no later than 8 years from *[insert date certain, once BPA is approved]*
TMDL Reevaluation/Revision - Assess progress in attainment of the TMDL numeric targets and secondary water column guideline(s). Determine if further load reductions are necessary. Review and revise (as necessary) the TMDLs (including the TMDL implementation plan), BMP Strategic Plan, Regional Monitoring Program, selenium management plans, special studies status and needs, etc.	As soon as possible, but no later than 13 years from *[insert date certain, once BPA is approved]* or 5 years from the implementation of Phase II.
Completion of Phase II of the TMDLs: Final compliance with TMDL numeric tissue targets (SSOs) or 2000 CTR chronic freshwater chronic criterion, whichever is legally applicable at the end of the TMDL compliance period	As soon as possible but no later than 15 years from *[insert date certain, once BPA is approved]*

Each of the tasks described in Table NB- Se- 12 is described below.

Phase I Implementation

Task 1. Permit Revisions and Issuance

The Regional Water Board will review and revise, as necessary, the existing NPDES permits, including the area's MS4 permit, groundwater dewatering and groundwater remediation permits, and WDRs for commercial nurseries to incorporate the appropriate TMDL WLAs, LAs and monitoring program requirements. New permits (NPDES, WDRs or conditional waivers of WDRs) may also be issued to implement the approved TMDLs.

The TMDLs allow for the inclusion of a compliance schedule in new or existing permits for dischargers who participate in the NSMP Cooperative Watershed Funding Program. If a discharger elects not to participate in the NSMP Cooperative Watershed Funding Program, or is not fulfilling their obligations pursuant to the NSMP Cooperative Watershed Funding Program agreement in an effective or timely manner, then the discharger will be required to either (a)

cease or not initiate the discharge, or (b) develop and implement an Individual Action Plan that identifies an acceptable method for achieving compliance with the final WLAs/LAs specified in the approved TMDLs (subsection 4. c. 2). These different requirements are discussed in more detail below:

1. NSMP Cooperative Watershed Funding Program Dischargers: Provisions in NPDES permits/WDRs revised or issued to implement the TMDLs will specify the following for dischargers who are members of the NSMP Cooperative Watershed Funding Program:

   a) Allocations. Participation in the NSMP Cooperative Watershed Funding Program and timely and effective implementation of the related TMDL implementation plan tasks, including the BMP Strategic Plan and the Regional Monitoring Program, will constitute compliance with the requirement to achieve compliance with the TMDLs and associated WLAs "as soon as possible". The NPDES permits/WDRs will specify further that the status of compliance will be reviewed on an annual basis.

   b) Final allocations. Final WLAs will also be specified, with a schedule requiring compliance as soon as possible, but no later than 15 years after the effective date of the TMDL[13].

Dischargers who join the NSMP Cooperative Watershed Funding Program will be required to implement the following tasks as identified in Table NB-Selenium-12:

- Continue to implement the Nitrogen and Selenium Management Program (Task 2)
- Implement volume reduction BMPs (Task 4)
- Develop and implement a BMP Strategic Plan, which will include "early action items" and a BMP Effectiveness Monitoring Plan (Task 5)
- If feasible, as determined by the Regional Water Board, develop a groundwater-surface water model (Task 6)
- Develop and implement an irrigation reduction and control plan (Task 7)
- Develop and implement a Regional Monitoring Program (RMP) (Task 8)
- Develop and implement special studies as needed (Task 10)
- Provide periodic review and revision (as necessary) of the selenium TMDLs, BMP Strategic Plan, Regional Monitoring Program, and special studies status and needs (Task 11)

[13] It is recognized that this schedule will exceed the five year term of NPDES permits. This schedule will be reflected in subsequent renewals of these permits.

Other tasks identified in Table NB-Selenium-12 may also be implemented by NSMP dischargers. Some tasks may be implemented on an individual basis by responsible parties (e.g., Task 9, Selenium Management Programs) or through other regulatory vehicles (e.g., MS4 permits may incorporate irrigation reduction and control (Task 7)). Further, as implementation of the TMDLs proceeds, necessary adjustments to the implementation plan tasks will be reflected, as appropriate, in waste discharge requirements issued to the NSMP dischargers.

For NSMP dischargers, compliance with the TMDLs is expected to be achieved as the result of the iterative implementation of source controls and effective BMPS to manage the discharge of selenium, along with monitoring to measure BMP effectiveness. Compliance with the final TMDLs, WLAs, and LAs is to be achieved as soon as possible, but no later than (fifteen) 15 years from the effective date of the TMDLs, i.e., not later than *[insert date certain, once BPA is approved]*.

2. Individual Action Plan Dischargers: Dischargers not participating in the NSMP Cooperative Watershed Funding Program, or who are participating in the Program but fail to implement their Program-related responsibilities in a timely or effective manner, will be required to comply with the TMDLs, final WLAs and numeric targets within three years of the effective date of the TMDLs (i.e., no later than [*[insert date certain, once BPA is approved]* in accordance with an Individual Action Plan and schedule approved by the Regional Water Board's Executive Officer. Alternatively, these parties must cease any ongoing discharges and not initiate any proposed discharges.

Individual Action Plan dischargers will be required to implement, at a minimum, the following tasks as identified in Table NB- Se-12:

- Develop and implement an individual action plan (Task 3)
- Implement volume reduction BMPs (Task 4)
- Provide recommendations for and participate in periodic review and revision (as necessary) of the selenium TMDLs, BMP Strategic Plan, Regional Monitoring Program, and special studies status and needs (Task 11)

Individual Action Plan (IAP) dischargers will be required to submit and implement upon the Regional Water Board Executive Officer's approval, a selenium offset program for selenium discharges in excess of their selenium limitations until final compliance is achieved. As the NSMP CWP moves towards implementing regional controls for selenium reductions, it is expected to include offset opportunities for Individual Action Plan dischargers. IAP dischargers that choose to participate in an offset opportunity provided by the NSMP CWP will need only to offset the actual amount of selenium that exceeds their WLA(s) since they will be contributing to the regional, watershed-wide approach. However, any IAP

dischargers that do not offset their discharge through the NSMP CWP will be required to provide an additional increment of selenium removal that equals 2X greater than the amount of the exceedance of their selenium WLA(s) in their discharge. This is because they are not contributing the regional effort to reduce selenium concentrations in the watershed, including non-point source contributions, and discharges of selenium above their assigned WLA may result in long-term adverse effects on biota because due to the bioaccumulative nature of selenium. The Regional Water Board encourages a regional, watershed-wide approach to reducing selenium concentrations in water and biota, such as that being implemented through the NSMP CWP, since it is expected to provide the quickest and most cost-effective route to meaningful selenium reductions in the watershed.

As previously described, an adaptive approach to implementation of the TMDLs is identified. As the TMDL tasks are implemented, including BMP installation, monitoring and special investigations, and relevant data and information are compiled, revisions to the TMDLs, including implementation strategies, may be recommended and considered. Subsequent issuance/revisions of the NPDES permits/WDRs will implement any such changes.

Permit revision/issuance will be accomplished as soon as possible upon approval of these TMDLs. Given Regional Water Board constraints and the need to consider other program priorities, permits requiring revision will likely be revised during renewal.

Task 2. The Nitrogen and Selenium Management Program Cooperative Watershed Program

Non-point source rising groundwater is the largest source of selenium in many areas of the Newport Bay watershed. The final TMDL numeric targets cannot be achieved unless comprehensive measures are taken to reduce selenium loads to surface waters from groundwater. A regional watershed approach is necessary to achieve these load reductions in the groundwater and the groundwater-supported baseflows in the creeks. In order to provide reasonable assurance that these TMDLs will be implemented appropriately, effectively, and in a timely manner so that water quality standards will be attained as soon as possible, the selenium TMDLs strongly encourage all existing and potential dischargers in the Newport Bay watershed to participate in the NSMP Cooperative Watershed Program (NSMP CWP).

Dischargers who elect not to participate in the NSMP CWP must either not discharge (e.g., by sewering the discharge), or provide an Individual Action Plan that identifies an acceptable means to comply, within three years of the effective date of the TMDLs, with the TMDL WLAs, LAs, and numeric targets and with

waste discharge requirement limitations/waiver conditions necessary to implement these TMDL components (Task 1).

Those dischargers who elect to participate in the NSMP CWP must enter into a funding agreement with the NSMP CWP dischargers, and must provide an executed watershed agreement to the Regional Water Board within one month of the effective date of the TMDLs (i.e., by *[insert date certain, once BPA is approved]*).

The NSMP stakeholders will be expected to continue to hold regular meetings to oversee the implementation of the TMDL-related tasks and report the status and/or results to the Regional Water Board on an annual basis. The NSMP will continue to operate in accordance with its approved Memorandum of Procedures and Public Participation Program [http://www.ocnsmp.com/public.asp].

Task 3. Development and Implementation of an Individual Action Plan

As indicated in the discussion of Task 1, this implementation plan provides a compliance option for those dischargers who elect not to participate in the NSMP CWP but rather to implement an alternative, acceptable means to comply with the TMDLs WLAs, LAs, numeric targets, and with the waste discharge requirements or waiver conditions necessary to implement these TMDL components. The Individual Action Plan (IAP) dischargers will be required to comply with the TMDLs (WLAs, LAs, and numeric targets) no later than **three years** from the effective date of the TMDLs (i.e., no later than [*insert date certain, once BPA is approved]*, in accordance with an action plan and schedule approved by the Regional Water Board's Executive Officer. Alternatively, ongoing discharges must cease and no new discharges may commence.

Those dischargers who elect to develop and implement an individual action plan will be expected to submit the proposed plan to the Regional Water Board's Executive Officer for review and approval 3 months prior to the anticipated discharge (see Table NB-Selenium-9). IAP dischargers that choose to participate in an offset opportunity provided by the NSMP CWP will need only to offset the actual amount of selenium that exceeds their WLA(s) since they will be contributing to the regional, watershed-wide approach. However, any IAP dischargers that do not offset their discharge through the NSMP CWP will be required to provide an additional increment of selenium removal that equals 2X greater than the amount of the exceedance of their selenium WLA(s) in their discharge. Selenium is bioaccumulative; therefore discharges of selenium above the assigned WLA(s) can have long-term adverse effects on biota. A regional, watershed-wide approach to reducing selenium concentrations in water and biota, such as that being implemented through the NSMP CWP, is expected to provide the quickest and most cost-effective route to meaningful selenium reductions in the watershed.

The individual action plans must include, at a minimum, the following information:

- Project timeline, including duration of project, discharge locations, and schedule of discharge activities;
- Volume of water that is expected to be discharged (in gallons per day, and total for project) for the duration of the project and expected selenium concentrations;
- An estimate of the concentrations and loads of Se that are expected to be discharged during the life of the project (in µg/L and pounds per day/week/month, respectively);
- The monitoring plan, including locations, frequencies, constituents, and methodologies;
- If selenium concentrations are anticipated to exceed the applicable TMDL WLA(s), identify the means by which the portion of the discharge that exceeds the WLA(s) will be offset (which program and/or BMP, and confirmation that there is capacity with that program and/or BMP that will be utilized for the offset).

The IAP dischargers will be expected to implement their approved action plans and report the status and/or results to the Regional Water Board on a monthly and/or annual basis, depending upon the reporting requirements approved as a part of their IAP.

Task 4. Implementation of Volume Reduction BMPs

All dischargers are required to submit documentation with their notice of intent (NOI) or application to discharge that the feasibility of eliminating or reducing the volume of the discharge has been evaluated. Discharges to surface waters will be considered for permit authorization only provided that it is demonstrated that the reduction/elimination of the discharge is not reasonably feasible. Potential volume reduction measures were evaluated by the NSMP Working Group as part of the implementation of the approved NSMP Work Plan.

Three volume reduction BMPs were deemed feasible by the NSMP Working Group for the Newport Bay watershed. These are: (1) discharge to land; (2) discharge to sewer; and (3) offsite transport and disposal. Specifications and limitations of the three methods were listed in the NSMP report *Volume Reducing Best Management Practices for Short-Term Groundwater Related Discharges within Orange County – August 2005*[14]. A copy of this report is included as Attachment 12D in the 2009 Selenium Staff Report and can be downloaded from the NSMP library at http://www.ocnsmp.com/library.asp.

[14] "Short term Ground-water Discharges" are considered 1 year or less in duration.

Task 5. Develop and Implement a Selenium Best Management Practices (BMP) Strategic Plan with Early Action Plan and BMP Effectiveness Monitoring Program

NSMP CWP dischargers are required to develop a proposed BMP Strategic Plan and BMP Effectiveness Monitoring Program for submittal to the Regional Water Board no later than one month after the effective date of the TMDLs (i.e., no later than *[insert date certain, once BPA is approved]*) and to implement those Plans upon approval by the Regional Water Board at a public hearing.

The purpose of the BMP Strategic Plan is to identify a plan and schedule for the evaluation of potential selenium treatment/removal BMPs and for the implementation of selected BMPs that will assure compliance with the TMDLs as soon as possible but no later than 15 years from the effective date of the TMDLs, i.e., no later than [*insert date certain once BPA is approved].*

The NSMP Working Group has evaluated various source and treatment controls for their feasibility to address selenium discharges to surface waters in the Newport Bay Watershed. The key technical documents that have been developed can be found at: http://www.ocnsmp.com/library.asp. In anticipation of the requirement to do so, the NSMP Working Group also developed a draft BMP Strategic Plan (Appendix xx to Selenium Staff Report 2009) that employs the results of the Working Group investigations and findings. As reflected in the draft Plan, a phased, adaptive management approach to BMP investigation and implementation is anticipated. The phased, adaptive approach will allow the responsible parties to evaluate BMPs, proceed with those that have demonstrated ability to reduce or eliminate selenium discharges, and shift program priorities and schedules where tested BMPs fail to meet selenium removal expectations.

The proposed BMP Strategic Plan must include, at a minimum, the following elements:

1. A description of the phased, adaptive management approach to implement pollution prevention, source control and treatment control BMPs to meet TMDL targets for selenium and thereby achieve the selenium TMDLs as soon as possible;
2. Identification of BMP implementation priority areas considering the level of biological significance and selenium concerns;
3. Candidate source and/or treatment controls necessary to meet TMDL targets including:
    a. type(s) and approximate locations of controls;
    b. timing for implementation;
    c. treatment capacity;
    d. cost of implementation;

   e. constraints on implementation, such as permitting, brine disposal, diversion/removal of surface water flows that could impact instream beneficial uses; and
   f. anticipated removal rates and/or load reductions for both selenium and nitrogen
4. Early Action Tasks to be completed within the first 5 years[15] including:
   a. type and approximate locations of controls;
   b. timing for implementation;
   c. treatment capacity;
   d. anticipated removal rates and/or load reductions; and
   e. relation of Early Action Tasks to control of selenium in implementation priority areas (#2, above)
5. A BMP Effectiveness Monitoring Program;
6. A contingency plan for selection and implementation of alternative BMPs for evaluation/implementation should one or more of the control measures evaluated fail to achieve expectations;
7. A plan and schedule for Final Control Technology Implementation (Phase II of the TMDLs)

Due to the large contribution of non-point source rising groundwater to the total selenium load, effectively reducing selenium concentrations will likely require utilizing regional treatment BMPs and regional source control BMPs. Although several selenium treatment BMPs have been identified as potentially feasible, additional demonstration-scale testing is necessary before full-scale implementation can occur. The BMP Strategic Plan will include technology validation and demonstration-scale testing of candidate BMPs. Where these demonstration-scale BMPs prove successful in removing selenium, they are expected to remain in operation, achieving selenium reductions while full-scale implementation of BMPs are constructed/installed. Any treatment BMPs that are implemented to meet the selenium TMDLs must not discharge identified pollutants of concern in greater concentrations than are present in the inflows to the BMPs.

The BMP Strategic Plan that will be submitted to the Regional Water Board for approval will be considered a dynamic document, subject to review and revision based on the data and knowledge gained during the implementation process. Annual progress reports on the implementation of the BMP Strategic Plan are to be submitted within one year of Regional Water Board approval of the Plan and then yearly thereafter. These reports shall include, at a minimum, the status of implementation of the tasks identified in the Strategic Plan, the results of BMP effectiveness monitoring, and an assessment of the effectiveness of the actions implemented. Based on this assessment, recommendations for changes in the BMP Strategic Plan, including changes in the controls to be employed, placement of these controls and/or scheduling of implementation of these

[15] As soon as possible, but no later than 5 years from the effective date of the TMDLs.

controls, shall be identified. Changes to the BMP Strategic Plan will be considered by the Regional Water Board utilizing a public participation process and shall be implemented upon approval by the Regional Water Board.

Early Action Plan

It is recognized that many of the selenium reduction technologies/BMPs have not yet been tested at the field scale, and some implementation actions may take years to complete because of permitting issues, costs associated with land acquisition and/or construction, CEQA review, or other issues. However, it is appropriate and necessary to require that consideration be given to identifying and implementing actions that could be completed in the near term (within the first 5 years of TMDL implementation). Therefore, an Early Action Plan must be submitted as part of the BMP Strategic Plan to the Regional Water Board for review and approval as soon as possible, but no later than 1 month of the effective date of these TMDLs, i.e., [*insert date certain, once BPA is approved*].

The Early Action Plan must identify a plan and schedule for implementing BMPs, including source controls, that are suitable for early implementation, i.e., within the first five years of TMDL implementation, and that will result in measurable reductions in selenium concentrations in the watershed. The plan must also include a monitoring program that is structured so that the efficacy of the actions implemented and the amount of selenium (and nitrogen) reductions that are being achieved can be quantified. The monitoring program should provide data that will inform implementation and/or revision of the BMP Strategic Plan and assist efforts to evaluate progress toward meeting the TMDLs.

BMP Effectiveness Monitoring Program

The effectiveness of the different BMPs that may be implemented to reduce selenium (and nitrogen) concentrations in surface waters or groundwater must be understood in order to determine whether or not the BMP is performing as designed, and to ensure that the BMP is not causing or contributing to water quality impairment as a result of a change in surface water flows (e.g., surface flows diverted to the BMP might be reduced to the extent that the beneficial uses of the surface water are adversely affected) or the treatment process itself (e.g., the treatment process produces a contaminant, such as bacteria, that either exceeds or contributes to the exceedance of a water quality objective for that water body).

BMP effectiveness monitoring has two primary purposes:

1. To assess the performance of the BMP with regards to its engineering design (performance monitoring);
2. To assess the performance of the BMP with regards to potential impacts to water quality and beneficial uses (water quality monitoring).

Monitoring of the environment within and external to the BMP must be designed so that the inter-related goals of good engineering performance and water quality improvement can be tracked over the lifetime of the BMP. Engineering parameters such as inflow and outflow volumes, electrical/plumbing/mechanical performance, data transmission, energy use, etc., require monitoring to ensure that the BMP is operating efficiently and as designed. Monitoring of influent and effluent water quality, upstream and downstream ambient water quality, and pounds of selenium or nitrogen removed/volume of water diverted is required to ensure that the BMP is resulting in water quality improvement and that it is not potentially contributing to or causing water quality and/or beneficial use impairment.

A BMP effectiveness monitoring program must be submitted to the Regional Water Board for review and approval as part of the BMP Strategic Plan.

Task 6. Develop Groundwater-Surface Water Model

The principal source of selenium loading in the Newport Bay watershed is shallow groundwater discharge to surface channels. A groundwater-surface water interaction model may be needed to better understand the hydrogeologic and hydrologic transport of selenium through the watershed. Existing data will be analyzed to determine if development of a groundwater-surface water model is reasonably feasible and necessary for BMP development and TMDL implementation.

Within three months of the effective date of these TMDLs *[insert date certain, once BPA is approved]*, an assessment of the feasibility of developing a groundwater-surface water model shall be submitted to the Regional Water Board for review. If the Regional Water Board determines that the development of the model is both reasonable and appropriate, the completed model shall be submitted within 18 months of the effective date of the TMDLs, i.e., [*insert date certain once BPA is approved]*.

The primary purpose of the groundwater-surface water model would be assist in determining the location(s) and type of BMP(s) best suited to help minimize seepage of high concentration selenium groundwater into surface waters so that the volume of surface water requiring treatment can be reduced. However, the model could also be used to:

- Determine whether source control measures, such as reductions in irrigation, would result in measurable reductions in selenium loadings to groundwater and surface waters;
- Provide calculations of potential reductions in selenium loads based on the locations and expected performance of proposed selenium treatment BMPs;

- Identify data gaps;
- Recommend additional implementation actions and/or special studies; and
- Provide information that may be used to revise the BMP Strategic Plan, the Regional Monitoring Program (Task 8) and/or the selenium TMDLs, if necessary and appropriate.

Table NB-Selenium-12, Task 6 c through j identifies the tasks that are to be completed in the event that the decision is made to develop a groundwater-surface water model.

Task 7. Develop and Implement Irrigation Reduction and Control Program

To address the potential for surface irrigation to impact selenium groundwater discharges, irrigation reduction and control programs may be necessary. Statewide, this issue is being addressed through Assembly Bill 1881. To improve the efficiency of water use in new and existing urban irrigated landscapes in California, the Department of Water Resources (DWR) is updating the Model Local Water Efficient Landscape Ordinance. AB 1881 requires local agencies by no later than January 1, 2010, to adopt the updated model ordinance or equivalent. If the local agencies don't take action by that date, the ordinance will be adopted automatically by statute.

Adoption and implementation of the updated Model Local Water Efficient Landscape Ordinance (or equivalent) throughout the Newport Bay watershed will provide an efficient mechanism to reduce over-irrigation in the area. However, additional irrigation control reduction measures may be necessary in areas underlain by high selenium soils, shallow groundwater, or geologic formations. Monitoring and/or special studies in these areas are necessary to ensure that the ordinances, once they are in place, are sufficient to reduce the mobilization of selenium into groundwater and/or surface waters.

Within two years of the adoption of the Model Water Efficient Landscape Ordinance, or an ordinance that is at least as effective, the local jurisdictions or NSMP dischargers (if the local jurisdiction participates in the NSMP, then the NSMP will be the responsible party for this task) shall submit to the Regional Water Board for review and approval a program that assesses the efficacy of the ordinance in reducing irrigation inputs in areas underlain by soils or bedrock that are known sources of selenium, and that provides recommendations for additional reductions or other actions to further reduce inputs, if needed. Additional control actions shall be implemented upon Regional Water Board approval. The City of Newport Beach, or the NSMP if the City is an NSMP participant, shall develop a program specific to Big Canyon Wash to reduce irrigation and control surface water runoff. The program is to be implemented upon Regional Water Board approval and the efficacy of the program is to be

assessed annually. Changes needed to enhance the effectiveness of the program shall be implemented.

Task 8. Develop Regional Monitoring Program For Selenium

The TMDL implementation plan requires that the Cooperative Watershed Program participants submit a proposed watershed (regional) monitoring and reporting program within 3 months of the effective date of the TMDLs *[insert date certain, once BPA is approved]*, and that the program be implemented upon approval by the Regional Water Board. Appropriate monitoring and reporting requirements for discharges by the Individual Action Plan participants will be determined on a case-by-case basis, taking into consideration the objectives of the Regional Monitoring Program (in particular, the compliance monitoring requirements) and reasonable contributions by these dischargers to fulfill these objectives.

The regional monitoring program must satisfy several fundamental goals:

(1) Provide data needed to determine compliance with the selenium TMDLs, including the wasteload allocations, load allocations and numeric targets, and with the SSOs (upon approval);
(2) Provide data for the evaluation and future refinement of the TMDLs/SSOs; and
(3) Integrate the program with other ongoing or proposed monitoring in response to permit and other TMDL requirements (including the BMP effectiveness monitoring (Task 5), selenium management programs (Task 9), and special studies (Task 10)) required by the Implementation Plan for these selenium TMDLs.

The regional, integrated monitoring and reporting approach offers the most effective and efficient method for gathering and evaluating data that can be used to develop and revise these or other TMDLs. While it may not be possible to fully integrate all of the data collection that is occurring in the watershed, analyses of multiple contaminants can be performed on many of the samples that are being collected.

For the selenium TMDLs, the Regional Monitoring Program should also integrate pertinent aspects of the required TMDL compliance monitoring program (discussed below), BMP effectiveness monitoring (described in Task 5), the selenium management programs (see Task 9), and special studies (discussed in Task 10). The data collected from these programs will help to prioritize source controls, BMP implementation, refine the TMDLs, and assess progress towards compliance with the TMDLs/SSOs as implementation of the selenium TMDLs proceeds.

Compliance Monitoring Program
The principal goals of the Compliance Monitoring Program for the selenium TMDLs/SSOs are to:

- Measure progress toward attainment of the TMDL numeric targets and the selenium SSOs.
- Measure progress toward achievement of the waste load allocations (WLAs) and load allocations (LAs);
- Measure progress toward the protection of aquatic life and aquatic-dependent wildlife (e.g., aquatic birds) beneficial uses;

In addition to the above stated goals, the data collected from the Compliance Monitoring Program will help to identify priority areas in the watershed for BMP implementation and areas needing additional study or more focused monitoring.

Monitoring Parameters and Target Species
The nature and scope of the Regional Monitoring Program, including the Compliance Monitoring Program, for these TMDLs are complicated by the fact that the TMDLs include both tissue-based targets for selenium and water-column concentrations (water column guidelines) calculated by the Newport Bay watershed biodynamic model to meet the tissue targets. Further, water column concentration targets based on the CTR freshwater chronic criterion for selenium are specified in these TMDLs. (As described in 4.c.1, above, the CTR-based targets become ineffective upon approval of the selenium SSOs and de-promulgation of the CTR criteria for the Newport Bay watershed.)

Both tissue and water column monitoring will thus be integral to the selenium TMDLs monitoring effort. Water column monitoring will provide a direct mechanism for measuring progress towards achieving the TMDL allocations. Water column monitoring will also provide an indirect means, via the calculated water column guidelines, of measuring progress toward reaching the tissue targets and tissue-based SSOs. Monitoring of biota (whole-body fish and bird eggs) will provide a direct measure of progress toward achieving the tissue-based TMDL numeric targets and should help to refine the water column guidelines and TMDL allocations. In addition, monitoring of selenium concentrations in sediment will provide a measure of longer-term, integrated selenium concentrations in the environment and that data collected can be used to help track the sources and fate of selenium as well as other sediment-associated contaminants.

The compliance monitoring program must include, at a minimum, the sampling and analysis of water column, sediment, whole-body fish and bird eggs. Fish tissue sampling will serve three purposes: (1) to monitor selenium concentrations in fish to assess potential reproductive effects; (2) to assess the potential for effects on fish-eating birds; and (3) to monitor compliance with the fish tissue

numeric targets. Bird egg tissues need to be monitored to assess compliance with the bird egg numeric targets and to evaluate potential reproductive effects to local birds. Water column samples are necessary to determine compliance with the allocations in the selenium TMDLs and the TMDLs themselves, and to provide data needed to refine the Newport Bay watershed biodynamic model. Sediment sampling will provide additional information on selenium cycling and mass balance in the different compartments in the watershed. Particulate or bivalve monitoring (as future studies or regional monitoring program modifications) may also be necessary to track progress in meeting the selenium TMDLs.

Because of changing environmental conditions, the monitoring program must be adaptable and flexible. In particular, it is recognized that routine collection of bird eggs and, in some areas, fish tissue may be problematic. The program should include a discussion of alternatives that can be used if the target species/sampling locations are not present or conditions for sample collection are not optimal or actually preclude sample collection. A decision tree should be developed to identify the triggers for the selection of the alternatives.

While flexibility is necessary because of changing environmental circumstances, the program must be designed and implemented to assure that the monitoring program provides the data necessary to assess compliance with the TMDLs.

The monitoring locations should be selected based on the concentrations of selenium present, the sensitivity of the habitat, the type of hydrologic unit (e.g., lentic, lotic, wetlands) and hydrologic connections, and a reasonable assurance that the targeted samples will be present in sufficient numbers for the necessary analyses. The monitoring locations should be as representative as possible of the habitat and hydrologic units being monitored. The fish and bird species selected should include those that are likely to be either sensitive to selenium effects and/or the most exposed to selenium. Fish specimens will also need to be selected based on their importance in the diet of the targeted bird species. Bird species selected must include species that can act as surrogates for threatened and endangered species (e.g., Forster's tern as a surrogate for the endangered California least tern) and that are known to nest and feed in the watershed. Marine fish species selected for monitoring must be resident species, not migratory, to ensure that selenium concentrations in their tissues are representative of the conditions in the watershed.

The proposed monitoring program must address sampling and analytical constraints (see below) so that assessments of compliance can be made in accordance with the method identified in subsection 4.c.3. Compliance assessments must be based on a statistically significant population of samples that accurately reflect the uncertainty associated with the analysis. The monitoring and compliance methods must be designed so as to assure the long-

term protection of both the most sensitive and most exposed species of fish and birds in the watershed.

Recognizing that it is likely to be difficult to collect sufficient numbers of samples of fish and bird egg tissue in certain locations (or even in some locations over multiple years) to meet the listing policy criteria, it is recommended that the 8 sites identified above be grouped by drainages to provide a better probability of obtaining adequate tissue samples that could be considered representative of a defined portion of the watershed. These four Compliance Assessment Areas (CAAs) are grouped as follows:

- Swamp of the Frogs Drainage area: Peters Canyon Wash, San Diego Creek, and Santa Ana Delhi Channel sites (SOF-CAA).
- Off-channel wetlands: UCI and IRWD/Carlson marsh wetlands (WET-CAA)
- Big Canyon Wash (BCW-CAA)
- Upper and Lower Newport Bay (BAY-CAA)

Tissue chemistry results from any given year of monitoring may be grouped by these assessment areas for assessing compliance with the TMDL tissue targets. In addition to this spatial aggregation, it may be necessary, particularly for bird eggs, to collect data over more than one year to achieve the requisite number of samples per the Listing Policy. In such cases, compliance assessments would take place once the minimum number of samples is collected. In those areas where bird egg (and/or fish tissue) collection is particularly problematic, it may be necessary to identify an invertebrate surrogate. The use of surrogate tissue data will need to be justified by site-specific demonstration of a reliable relationship between selenium tissue concentrations in the surrogate organism and that of bird target species.

The inherent variability in the availability of fish and of bird eggs at specific locations and variations in the degree of selenium exposure must be considered in defining an appropriate collection and analytical program. Sampling sites for fish and for bird eggs must be selected based on their foraging range and their potential exposure to selenium.

Once fish or bird eggs have been sampled, water and sediment should be sampled at the nearest, precisely located monitoring station that lies within the foraging range of the target species[16]. If a precisely located monitoring station

[16] Birds and fish are mobile and may not be found in the same location from year to year. However, birds in particular tend to forage as close as possible to their nesting sites, if sufficient food items are present; some fish also have limited foraging ranges. Therefore, in order to correlate the selenium concentrations in the bird egg/ fish tissue, to water, sediment or food item selenium concentrations it is important that the media that are sampled are collected from within the foraging range of the species of bird or fish being targeted. Sediment, water, and food items

does not lie within the foraging range of the species being sampled, food items, water and sediment should be collected from within the foraging range of the targeted species, and the location of samples collected identified as accurately as possible. However, locations with limited habitat (e.g., Peters Canyon Wash, Santa Ana Delhi Channel) may not reliably provide any fish or bird eggs for collection, although water and sediment can always be sampled and food items or potential surrogates for fish, such as amphibians or upper trophic level macroinvertebrates may also be available for sampling.

Suggested Routine Monitoring Parameters

- Water: flow volume, selenium (total and dissolved; general water quality parameters – TDS, DOC, TOC, TSS, general anions and cations, total nitrogen, etc.).
- Sediment: upper 2 cm, target fine, organic-rich sediment where possible (total selenium as dry weight, percent solids, total organic carbon, grain size).
- Tissues: Fish (whole-body analyses) and bird eggs (egg contents only); total selenium, percent solids, percent lipids.
  Suggested Targeted Biota by Habitat:
  - Fish:
    - Freshwater = Juvenile and adult fish in the Centrarchidae (sunfish) family (e.g., bluegill, largemouth bass) for compliance with the fish tissue target; juveniles of bluegill or largemouth bass, or smaller fish such as red shiners or fathead minnows for assessment of risk to fish-eating birds and for contaminant trend monitoring.
    - Saltwater = Topsmelt or anchovies (water column feeding species) and various goby species (benthic species) for assessment of selenium concentrations in bird food items. Both juvenile and adult specimens of larger, water column species such as jacksmelt or kelp bass and bottom-dwelling species such as halibut, turbot, or various surfperch species for determining compliance with the fish tissue target.
  - Bird Eggs:
    - Freshwater = Shorebirds (avocet, stilt; invertivorous birds), grebes (omnivorous or insectivorous birds), coots (omnivorous or herbivorous birds)
    - Marine = Terns or skimmers (piscivorous birds), shorebirds

must be collected from within this range even if the next, precisely-located monitoring station is outside of this range.

Fish Collection
As there are no native fish species in the freshwater areas of the watershed, introduced species of fish from the Centrarchidae (sunfish) family are suggested for monitoring to determine compliance with the TMDL fish tissue target. Of the non-native warm water fish species found in the freshwater creeks, fish of this family are the most sensitive to selenium effects. Bluegills are more sensitive to selenium than other sunfish; therefore, both adult and juvenile bluegill should be collected in preference to other sunfish species (e.g., pumpkinseed, green sunfish, black crappie, largemouth bass) that may be present. However, if bluegills are not present, then other sunfish species should be targeted for collection, including largemouth bass. Juveniles of these species or other smaller fish such as red shiners or fathead minnows should be sampled to monitor selenium tissue concentrations in fish that are most likely to be preyed on by aquatic-dependent bird species.

For saltwater (marine) areas, targeted fish should include resident small water column feeding fish such as topsmelt or anchovies (prey for piscivorous birds such as terns and skimmers) or small benthic dwelling fish such as gobies (prey for wading herons). Larger juvenile and adult fish (both water column and benthic feeding species) such as jacksmelt, kelp bass, halibut, turbot, or surfperch should also be collected and analyzed for selenium for comparison to the TMDL numeric fish tissue target, but care should be taken to ensure that the fish collected are resident to in the Bay. Some fish species, such as halibut, spend their larval and juvenile stages in the Bay, but may migrate in and out of the Bay as adults.

The monitoring program must be flexible with regard to the species targeted; ideally, the alternative fish species should still be in the same general taxonomic group as the targeted fish species (e.g., centrarchids/sunfish) or at a minimum, within the same feeding guild and trophic level (e.g., fish of similar size, trophic level, and habitat niche that have a similar diet).

Bird Egg Collection
The frequency of bird egg sampling should be coordinated with flood control channel maintenance activities in order to collect bird eggs in years when there is optimal nesting habitat. It is suggested that egg sampling be conducted annually but that sampling should take advantage of years with maximal nesting habitat. The nesting habitat on the islands and shoreline in Upper Newport Bay is expected to be more consistent on a yearly basis than the freshwater areas, despite current and future dredging activities.

<u>Suggested Monitoring Locations</u>
While specific, recommended sampling sites for monitoring selenium in water and sediment can be established, sampling sites for monitoring selenium in some biota (such as fish and birds) may vary depending on flow conditions in the

creeks (for fish), and nesting site availability (for birds). Compliance monitoring sites must provide sufficient target biota biomass for tissue sample analysis and confirmatory waterborne selenium concentrations for comparison to the water column guidelines.

Selected monitoring locations should include:

1. Peters Canyon Wash (PCW) upstream of its confluence with San Diego Creek

   This area lies within the historic Swamp of the Frogs, the primary source of selenium in the watershed, and will be representative of selenium concentrations in upstream tributary creeks and storm channels. Some invertebrates and small fish are usually available year-round in this area though habitat conditions are moderate to poor. Suitable bird nesting habitat is both sparse and sporadic in this area due to the highly channelized nature of the wash and lack of adjacent wetlands or habitat areas.

2. San Diego Creek (SDC) Reach 1 just upstream of Newport Bay

   This area has moderate to good quality habitat and includes a riparian strip along the east bank of the creek. Water is pumped from this portion of the creek to the IRWD off-channel treatment wetlands. Some of this pumped water is passed through to the UCI wetlands (San Joaquin Freshwater Marsh Reserve). Therefore, monitoring this area of the creek provides data on the selenium concentrations in water, sediment and biota in the creek and also provides a baseline selenium concentration for water entering the IRWD and UCI wetlands. The basins and riparian habitat in the downstream portion of Reach 1 are also likely to provide the most readily available freshwater tissue samples for TMDL compliance monitoring.

3. IRWD Treatment Wetlands and Carlson Marsh

   While the IRWD treatment wetlands have been shown to be effective in removing both nitrate and selenium from the water column, the impairment assessment performed for these TMDLs found impairment in the wetlands from selenium in water, fish tissue, and bird eggs. At the time, a distinction between samples collected from the treatment pond and the Carlson Marsh area could not be accurately determined. Water is pumped from San Diego Creek and sent through IRWD's treatment ponds. Approximately 30% of the selenium, and up to 60% of the nitrate, is removed from the water before flows are returned to the creek or passed through the Carlson Marsh to the UCI wetlands. High selenium concentrations have been found in sediment and biota collected from the Carlson Marsh (Sutula et al., 2008; Horne et al., 2006). Actions taken to reduce selenium concentrations in San Diego Creek are expected to result also in reductions in selenium in the treatment wetlands. Monitoring is needed to confirm that this is in fact occurring.

4. UCI San Joaquin Freshwater Marsh Reserve

   The San Joaquin Freshwater Marsh Reserve supports a variety of wetland habitats, including freshwater marshlands, shallow ponds, and channels confined by earthen dikes. Dry upland habitats with a remnant coastal sage scrub community rise on the margins of the reserve. The marsh is a critical stopping place for 100 migratory bird species using the Pacific Flyway. The wetlands receive seasonal flows, primarily from storm water runoff from adjacent urban areas, and from overflows from the IRWD treatment wetlands via Carlson Marsh. A finding of impairment due to selenium was made for fish and bird egg tissue collected from the reserve. A routine monitoring program will be required to be developed and implemented in the marsh to measure selenium in the various media on a regular basis. Actions taken to reduce selenium concentrations in San Diego Creek are expected to result also in reductions in selenium in the UCI wetlands. Monitoring is also needed to confirm that this is in fact occurring.

5. Big Canyon Wash (BCW) and Freshwater Wetlands

   Big Canyon Wash is a small (about 2 mi^2), highly urbanized watershed. However, the 60-acre Big Canyon Creek Nature Reserve lies in the most downstream portion of the watershed, adjacent to Upper Newport Bay. Recent monitoring (June 2008) found very high concentrations of selenium in water, algae, sediment, and fish collected from both the riparian and freshwater marsh areas. No bird eggs were found during the June 2008 sampling event, but it is expected that birds nesting and feeding in the canyon may also be at risk due to selenium. Monitoring in Big Canyon should include collection and analysis of water column samples for selenium speciation as well as the collection of sediment, fish, and bird eggs for selenium analysis. At least three or four monitoring stations are needed in the canyon to collect water column samples and to record flows. These samples should be collected on at least a quarterly basis at the following locations: at the downstream end of the canyon where freshwater flows enter Upper Newport Bay; at the upstream end of the nature park where water first flows into the park, west of Jamboree Road; and upstream of the Big Canyon Golf Course, adjacent to MacArthur Boulevard (the canyon splits into two main, and one minor, tributary at this location).

6. Santa Ana Delhi Channel (SADC)

   The Santa Ana Delhi Channel traverses a highly urbanized area. The lower, downstream portion of the channel that flows into Upper Newport Bay is tidally influenced and sample collection must occur when the flows in the channel are composed primarily of fresh water, since the freshwater flows are the primary source of selenium in the channel. Generally, only limited invertebrates, sediment, and water are available for sampling in this part of the channel. Fish are generally present in sufficient numbers

for sampling only when the tidal surge enters the creek, so they are marine fish and not representative of the fresh water conditions in the channel. There may be areas located further upstream in the watershed, but that are still within the high selenium areas, that contain fish and/or nesting habitat for birds. If this is the case, an additional monitoring location should be established in the upstream reaches of the Delhi Channel.

7. Upper Newport Bay

   The impairment assessment performed for these TMDLs found impairment due to selenium in fish collected from Upper Newport Bay. Water column, whole-body fish, and bird eggs should be sampled and analyzed for selenium. The upper bay nesting islands offer the best opportunities for egg sampling, and such samples should be collected from as many species as practicable. Both water column and benthic feeding resident fish should be targeted for collection.

8. Lower Newport Bay

   While a finding of impairment due to selenium was not found for Lower Newport Bay, it is hydrologically connected to Upper Newport Bay and baseline monitoring should be continued to ensure that selenium concentrations in biota in this waterbody do not increase. Water column, sediment and fish tissue monitoring are recommended. Both water column and benthic feeding resident fish should be targeted for collection.

Numbers of Samples and Reporting Frequency

Fish and sediment should be collected annually in the late spring/early summer at all sites. Bird eggs and bird food items (such as invertebrates) should also be collected annually in late spring; however, the number of eggs in any given year may vary significantly depending on the availability of nesting sites, and the number of eggs produced. Water samples should be collected concurrently with biota and sediment samples. Monitoring reports shall be submitted to the Regional Board's Executive Officer on an annual basis.

The targeted numbers of samples for analysis should be as follows:

- Bird eggs - Up to eight bird eggs per site for up to three species, to be analyzed individually (up to 24 bird eggs per site). Very few sites will yield that many eggs, but if they are available they should be collected.
- Fish - Up to three samples of composited, whole-body fish, consisting of five similar-sized, same-species fish per sample for up to three fish species, should be collected per site (nine or more composited fish samples per site).
- Surrogate Tissue Sampling – If no fish or bird eggs are present at a site, amphibians, such as frogs, and/or upper trophic level macroinvertebrates, such as crayfish, may need to be collected from a site as a surrogate for

the fish and birds. Tissue samples (amphibian or invertebrate) should be composited with a minimum of 3-5 individual, similar-sized organisms per composite per site.

- Sediment - Quarterly sampling; one sample from each of the 8 sites identified above. Samples should be taken from the upper 2 cm of the bed sediment and sampling should target areas with abundant detrital materials/organics.

Field Methods and Data Management

Water, sediment, and biota collection and handling methods and data management should be conducted in accordance with the applicable Surface Water Ambient Monitoring Program (SWAMP) protocols and as provided in the NSMP sampling and analysis plan (CH2MHILL, 2006). A Quality Assurance Project Plan (QAPP) must be submitted with the compliance monitoring program.

Phase I TMDL Monitoring

For each of the projects listed under Phase I in Table NB-Selenium-12, monitoring will be required to measure effectiveness and assist in management decisions by the Cooperative Watershed Program (CWP). These projects include volume reduction (both short- and long-term discharges) projects, all BMP effectiveness demonstration projects, compliance monitoring, and identified special studies associated with Phase I. The specific monitoring requirements for each project will be outlined as projects are developed and implemented, and incorporated into or coordinated with the Regional Monitoring Program.

Phase II TMDL Monitoring

For the Phase II tasks, monitoring will be required (or continued) to measure effectiveness and assist in management decisions made by the CWP. These projects include all BMP effectiveness demonstration projects and full scale implementation projects, and any newly identified special studies or studies continued from Phase I, and compliance monitoring. The specific monitoring requirements for each project will be outlined as projects are developed and implemented, and incorporated into or coordinated with the Regional Monitoring Program.

Task 9. Develop and Implement Selenium Management Programs

Selenium management programs are needed for Big Canyon Wash, the San Joaquin Freshwater Marsh Preserve, and the IRWD treatment wetlands, in particular, the Carlson Marsh, to determine the fate and transport of selenium in these hydrologic units, and in the case of the UCI and IRWD wetlands, to also assess how flows are managed. Within 1 month of the effective date of the selenium TMDLs, either the local jurisdiction or property owner, or the NSMP CWP stakeholders, shall develop and submit a detailed Work Plan to the

Regional Water Board for review and approval. The Work Plan must identify a plan and schedule for investigations needed to develop a comprehensive understanding of and management plan for selenium discharges and cycling within these water bodies. Upon approval of the Work Plans by the Regional Water Board, the responsible party or NSMP CWP shall implement the Work Plan. Completion of the Work Plan is expected to assist in the reevaluation/revision of theses TMDL and/or the BMP Strategic Plan (Task 5). Coordination of the sampling and monitoring tasks in the selenium management programs with the Regional Monitoring Program is highly recommended to avoid duplication of effort.

The Work Plans must include time lines and a scope of work needed to develop selenium management programs for these areas. Sampling plans must include all necessary media (water, sediment, algae/particulates, invertebrates, fish, bird eggs) and data (including selenium species in water) and appropriate and up to date analytical methods. Water, sediment, and biota collection and handling methods and data management should be conducted in accordance with the applicable SWAMP protocols and as provided in the NSMP sampling and analysis plan (CH2MHILL, 2006). Co-located water column, particulate, algae, sediment, invertebrates, fish tissue, and bird egg tissue (as available) samples should be collected in order to determine selenium bioaccumulation and transfer in differing food webs. A Quality Assurance Project Plan (QAPP) must be submitted with the selenium management program monitoring plans. Detailed information concerning specific suggested monitoring parameters, locations, and other detailed information for each of the areas requiring selenium management programs, is provided in the implementation plan discussion in the Selenium Staff Report (2009).

TASK 10. CONDUCT SPECIAL STUDIES

Special studies may be needed to assist with program implementation and for the refinement of the TMDLs. Three special studies are suggested below. Theses studies are based, in part, on input from the Resource Agencies (USGS, USFWS, USEPA), the Selenium Technical Review Committee (STRC), and consultants for the NSMP. Data and information collected during TMDL implementation may negate the need for these studies, or alternative/additional studies may be identified.

- Water Translation/SSO Model Study
  More information is needed on the particulate fractions of selenium in the water column for both fresh and saltwater areas of the watershed and bay. The data are needed for field estimates of uptake factors (K_d) in the translation models (see Section 9.0, Linkage Analysis, in the 2009 Selenium Staff Report).

- Longitudinal Tracking Study

This study is needed to confirm the concept of the 40% loss of upper watershed selenium in the selenium mass balance as measured in the water column. For the freshwater areas, a study is needed to refine the loading estimates from surfacing groundwater, which currently incorporate a generic and imprecise 40% load-loss term (per Meixner and Hibbs, 2004; Section 12.0, Task 10 of the 2009 Selenium Staff Report) so that a selenium mass balance for the watershed can be estimated. The study would entail quarterly, detailed measurements of waterborne selenium concentrations and flow longitudinally down Peters Canyon Wash and San Diego Creek, to assess areas where waterborne selenium loads decrease, likely due to a mix of biological and chemical sequestration and loss processes.

- Newport Bay Selenium Mixing Model
  The fate and transport of selenium once it enters the marine waters of Newport Bay are not well understood. If fish and bird egg tissue concentrations indicate impairment in the Bay after selenium reductions have been achieved in the freshwater areas of the watershed, additional modeling of selenium processes within the Bay may be necessary. The Newport Bay watershed biodynamic model did not perform as well for the bay as it did for the freshwater bodies in the watershed. However, the model did better at predicting selenium concentrations in the bay for the benthic food webs than it did for the water column food webs. The model used bed sediment data for the benthic food web; only one set of water column particulate data was available to model the water column food webs. Additional particulate data, information on flocculation of particulates, selenium bioavailability in bed sediments, and selenium transfer from particulates and sediment to biota may be needed.

It is recognized that as the TMDLs are implemented, the need for or type of special studies may change and that alternative studies may be more appropriate. A special studies plan that prioritizes and outlines the initial special studies that will be conducted must be submitted to the Regional Water Board for approval within 6 months of the effective date of the selenium TMDLs *[insert date certain, once BPA is approved]*. The plan must also include a task to develop a QAPP that meets SWAMP requirements. The plan must be implemented upon Regional Water Board approval.

Reporting Requirements

Annually, in conjunction with other reporting requirements established by these TMDLs, an assessment of the progress made, results of, or any recommended revisions to, the special studies plan are to be submitted to the Regional Water Board for review. Changes to the special studies plan are to be implemented upon Regional Water Board approval. These provisions are necessary and

appropriate to provide flexibility to adapt to changing conditions or requirements as implementation of these TMDLs proceeds.

Phase II Implementation

Task 13. TMDL Reevaluation/ Revision

Upon completion of Phase I of implementation (no later than eight years from the effective date of the TMDLs, i.e., *[insert date certain, once BPA is approved]*) these TMDLs must be reevaluated and revised as necessary, and then at least once every 5 years[17] after that (the second review would occur no later than thirteen years after the effective date of the TMDLs, i.e., *[insert date certain, once BPA is approved]*). Earlier review and revision may also occur if conditions warrant it.

All new data and information collected during Phase I must be evaluated to determine whether modifications to the TMDLs, including the implementation tasks, are necessary. Specifically, it is expected that Phase I will provide data and information necessary to evaluate the following:

a) Impairment findings: A revised impairment assessment may result in recommendations for modifications to the TMDLs and implementation priorities and schedules;
b) Wasteload/load allocations, targets and/or water column guidelines;
c) The effectiveness and placement of BMPs. It is also possible that, over time, new BMPs will be developed to address selenium discharges in an effective/efficient manner. Any such new BMPs should be incorporated in the BMP Strategic Plan;
d) The efficacy of the environmental and BMP effectiveness monitoring programs;
e) Potential data gaps;
f) The need for and nature of additional special studies;
g) Other implementation tasks, priorities, and schedule;
h) Revision of the responsible parties identified in the TMDLs.

A number of TMDLs are being, or are expected to be implemented, in the Newport Bay watershed. As implementation and review of the selenium TMDLs and these other TMDLs occurs, additional opportunities to integrate BMP, monitoring and other TMDL-related efforts will be identified and implemented. It

[17] A five year time frame is considered necessary to allow for the collection of sufficient data and information, and for the analysis of that data and information. This includes collection and evaluation of bird egg and fish tissue data and the results of the monitoring program and special studies.

is possible that changes to these (or other) TMDLs will be necessary to accommodate this integrated approach.

----------end of added text (section 4.c.)----------