# APPENDIX A

Contra Costa Clean Water Program Reasonable Assurance Analysis Report

# CONTRA COSTA CLEAN WATER PROGRAM REASONABLE ASSURANCE ANALYSIS

## Submitted in Compliance with Provision C.11.c.iii.(3), C.11.d.iii, C.12.b.iii.(2), and C.12.d.iii

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August 2020

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| BASMAA | Bay Area Stormwater Management Agencies Association |
| CCCWP | Contra Costa Clean Water Program |
| g | gram |
| GI | Green Infrastructure |
| GSI | Green Stormwater Infrastructure |
| HRU | Hydrologic Response Unit |
| MRP | Municipal Regional Permit |
| MS4 | Municipal Separate Storm Sewer System |
| NPDES | National Pollutant Discharge Elimination System |
| O&M | Operations and Maintenance |
| PCBs | Polychlorinated Biphenyls |
| PG&E | Pacific Gas and Electric |
| RAA | Reasonable Assurance Analysis |
| RWSM | Regional Watershed Spreadsheet Model |
| SFBRWQCB | San Francisco Bay Regional Water Quality Control Board |
| SFEI | San Francisco Estuary Institute |
| SWMM | Stormwater Management Model |
| TMDL | Total Maximum Daily Load |
| WLA | Wasteload Allocation |
| WY | Water Year |

# 1. INTRODUCTION

This report presents the results of the reasonable assurance analysis (RAA) for Contra Costa County required by the Municipal Regional Permit (MRP) for urban stormwater issued by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB; Order No. R2-2015-0049). MRP Provisions C.11.c, C.11.d, C.12.c, and C.12.d require an RAA for the PCBs and mercury control measures that are described in the PCBs Control Measure Plan and the Mercury Control Measure Plan. The methodologies for estimating load reductions are introduced herein; additional details on the RAA methodology are provided in the Reasonable Assurance Analysis Peer Review Package (Appendix H of the *Contra Costa PCBs and Mercury TMDL Control Measure Plan and Reasonable Assurance Analysis* report).

The following MRP reporting requirements are addressed within this report:

- A reasonable assurance analysis to demonstrate quantitatively that Contra Costa's population-based portion of PCBs reductions of at least 3 kg/yr and mercury reductions of at least 10 kg/yr will be realized by 2040 through implementation of GSI projects; all data used; a full description of models and model inputs relied on to make the demonstration; and documentation of peer review of the reasonable assurance analysis.
- A PCBs and mercury control measure implementation plan RAA that demonstrates quantitatively that the plan will result in mercury load reductions sufficient to attain the mercury TMDL wasteload allocations by 2028 and PCBs load reductions sufficient to attain the PCBs TMDL wasteload allocations by 2030.

# 2. METHODOLOGY

## 2.1 Overview

The approach used to estimate the load reductions resulting from implementation of the PCBs Control Measure Plan and the Mercury Control Measure Plan includes a number of different model components. The methodology is consistent with the *Bay Area RAA Guidance Document* (BASMAA, 2017)

The model components include:

- Baseline Pollutant Loading Model – the baseline pollutant loading model is a continuous simulation[1] hydrology model combined with pollutant loading inputs to obtain the average annual loading of PCBs and mercury across Contra Costa County

[1] Continuous simulation models calculate outputs (e.g., runoff) "continuously", i.e., for many time steps over a long-term period of record (e.g., every 10 minutes for 10 years). Long-term "continuous" input data (e.g., hourly rainfall) is required. This is contrasted with design-event simulations which model a single rainfall event, e.g., a 24-hour storm with a 10-year recurrence frequency.

during the TMDL baseline period (i.e., 2003 – 2005, see BASMAA, 2017). See Section 3 for the baseline model results.

  - Hydrology – this model component produces average annual runoff across Contra Costa County for the period of record using a hydrologic response unit (HRU) approach. The HRU approach involves modeling various combinations of land surface features (i.e., imperviousness, underlying soil characteristics, slope, etc.) present within Contra Costa County for a unit area drainage catchment.
  - Water Quality – the hydrology output is combined with average annual concentrations estimated by the Regional Monitoring Program's Regional Watershed Spreadsheet Model (RWSM; SFEI, 2018) developed by SFEI to produce average annual PCBs and mercury loading for the period of record.

- GSI Performance Models – GSI performance models were developed to represent load reductions resulting from implementation of GSI.
- Source Control Measure Calculations – Calculation methods for estimating load reduction associated with implementation of the source control measures identified in the PCBs Control Measure Plan and the Mercury Control Measure Plan, as established in the *Source Control Load Reduction Accounting for Reasonable Assurance Analysis* report (BASMAA, 2020, provided in Appendix B of the *Contra Costa PCBs and Mercury TMDL Control Measure Plan and Reasonable Assurance Analysis* report).
- Future Condition Models – the RAA future condition models represent future land use changes and control measure implementation that would result in pollutant load reduction. These include the following:
  - Future Land Use – changes to land use as a result of new development and redevelopment and the associated reduction in pollutant loading (i.e., with newer building materials and practices) is represented.
  - Future GSI Performance – the GSI performance model output is applied to areas to be treated by GSI in the future based on the Permittees' Green Infrastructure Plans.
  - Source Control Measure Performance – Performance of the source control measures that have been or will be implemented is modeled based on the incidence and location of these control measures.

These components are summarized in the following sections and described in further detail in the Peer Review Package (Appendix H).

## 2.2 Baseline

The baseline pollutant loading model is a representation of the loading of PCBs and mercury across the County during the TMDL baseline period (i.e., 2003 – 2005, see BASMAA, 2017). The baseline model utilizes an HRU approach to estimate runoff across the County. Generic HRUs, characterized by varying the values of specific identified parameters within a defined representative range, were modeled using USEPA's Stormwater Management Model (SWMM). HRU parameters varied included precipitation and evaporation, slope, underlying soil type (i.e., subsurface infiltration rate) and compaction (i.e., developed versus undeveloped areas), and imperviousness. Continuous simulation HRU models were run on an hourly timestep for the identified baseline period of record (water years [WYs] 2000 – 2009).

An average annual runoff volume per acre was obtained for each HRU through the continuous simulation runs. The average annual runoff volume per acre associated with each specific HRU was multiplied by the area represented by that HRU within the entire area for analysis (i.e., across the county, estimated using geospatial data). Watershed-based drainage routing was accounted for through calibration efforts. Calibration of the generic HRU models was conducted on the average annual discharge volume for WYs 2000-2009, utilizing available stream flow records. The objective of the calibration was to reasonably match the average annual runoff volume for this 10-year period (i.e., within the bounds included in BASMAA (2017).

To obtain pollutant loading, average annual concentrations estimated by the RWSM (SFEI, 2018), for each land use category (i.e., Old Industrial, Old Urban Commercial/Transportation, Old Urban Residential, New Urban, and Open Space) are multiplied by the calibrated average annual runoff volume estimated using the HRU approach. The average annual PCBs and mercury loading for the baseline period of record was validated using available in-stream concentration data.

A flow chart representing the baseline loading model is provided in Figure 2-1 below.

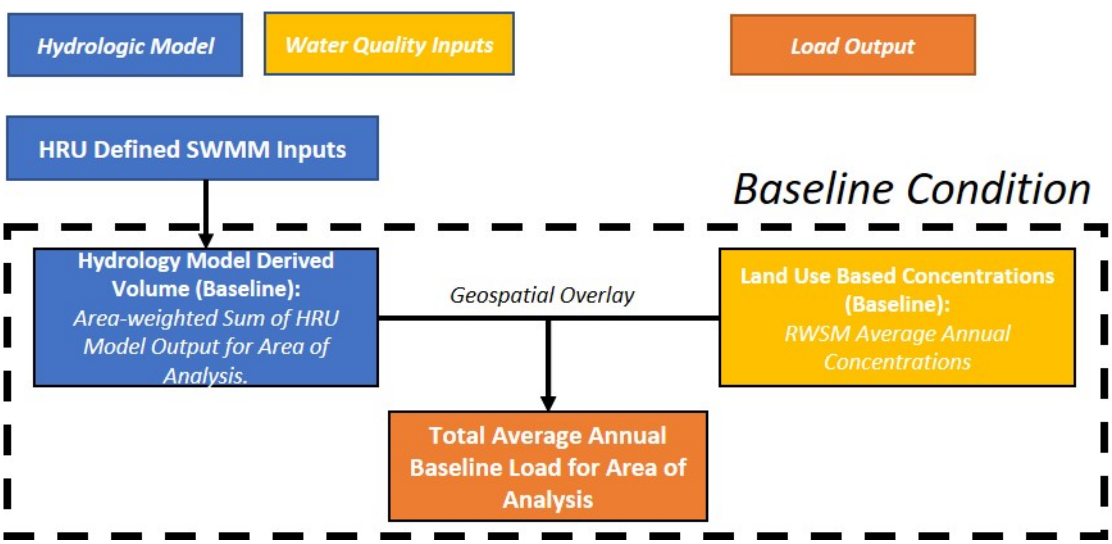


**Figure 2-1: Baseline Condition Model Flow Chart**

## 2.3 Loads Reduced

Loads reduced from baseline are estimated based on projected land use changes and control measure implementation. To calculate pollutant load reductions associated with land use changes and GSI and source control implementation for future scenarios, the difference between the pollutant loading in the baseline scenario and the total pollutant loading associated with each future implementation scenario were calculated. Future scenarios included implementation in years 2030, 2040, and beyond 2040. Loads reduced resulting from implementation of control measures are estimated through different methods depending on control measure type. Details relating to load reductions resulting from land use changes versus those from control measures are provided in the following sections.

### 2.3.1 Load Reduction Resulting from Land Use Changes

Land use-based pollutant loading was based on changes to the land use through new development and redevelopment that has occurred or is projected to occur since the 2003-2005 baseline. To forecast future private development area, CCCWP used the output of UrbanSim,[2] a model developed by the Urban Analytics Lab at the University of California under contract to the Bay Area Metropolitan Transportation Commission (MTC). The UrbanSim modeling system was developed to support the need for analyzing the potential effects of land use policies and infrastructure investments on the development and character of cities and regions. The Bay Area's application of UrbanSim was developed specifically to support the development of Plan Bay Area, the Bay Area's Sustainable Communities planning effort.

MTC forecasts growth in households and jobs and uses the UrbanSim model to identify development and redevelopment sites to satisfy future demand. Model inputs include parcel-specific zoning and real estate data; model outputs show increases in households or jobs attributable to specific parcels. The methods and results of the Bay Area UrbanSim model have been approved by both MTC and Association of Bay Area Governments Committees for use in transportation projections and the regional Plan Bay Area development process.

The CCCWP process used outputs from the Bay Area UrbanSim model to map parcels predicted to undergo development or redevelopment in each Contra Costa jurisdiction at the time increments specified in the MRP (i.e., 2020, 2030, and 2040). The resulting maps were reviewed by Permittee staff for consistency with local knowledge and local planning and economic development initiatives and revised as needed.

If projected new development and redevelopment is assumed to alter the imperviousness of parcels identified for development, the HRU assigned at the parcel scale was revised from the baseline condition to represent the new imperviousness (no other HRU variables would be anticipated to change) in the future condition. Similarly, the overlying RWSM land use category designation was updated from the baseline condition to reflect new land uses from new development and redevelopment. Updated land use-based pollutant loading was then calculated for the future conditions, using the applicable updated HRU and RWSM land use category assignments.

### 2.3.2 Load Reductions Resulting from GSI Implementation

Load reduction through implementation of GSI facilities was estimated through the methods described as part of the *Quantitative Relationship between GSI Implementation and*

[2] http://www.urbansim.com/

*PCBs/Mercury Load Reductions Report* (CCCWP, 2018; provided in Appendix H). The POC load reductions through GSI were developed through a combination of hydraulic modeling of GSI facilities combined with empirically derived effluent concentration estimates. The annual estimate of pollutant load reduction from the modeled drainage area is equivalent to the difference between the influent load and the sum of the pollutant load that bypasses the GSI facility and the effluent load. The effluent load is calculated as the proportion of runoff that is treated by the GSI facility multiplied by an effluent concentration. Water quality performance data from selected, representative studies were used to determine a method to predict effluent concentrations in stormwater following treatment through a bioretention GSI facility. A flow chart representing the GSI load reduction modeling is provided in Appendix H.

GSI implementation levels corresponding to each future implementation scenario were estimated based on GI Plan projections. The pollutant loading resulting from each of the GSI implementation scenarios was calculated by first applying the updated land use loading. Then, pollutant load reductions resulting from implementation of GSI were applied to identified GSI drainage areas (i.e., both development areas, where land uses are assumed to change, and GSI retrofit areas, where land uses are not assumed to change) to obtain a revised total pollutant loading for those land surfaces. Resulting pollutant loading for areas identified as draining to GSI and areas not draining to GSI were combined geospatially to obtain the pollutant loading associated with each GSI implementation scenario.

#### 2.3.3 Load Reductions Resulting from Implementation of Source Controls

Pollutant load reductions from the source controls described in the implementation plans are incorporated into the RAA scenarios for the TMDL attainment date (i.e., 2030) along with future scenarios for 2040 and beyond 2040. The calculation methods used to estimate load reduction are those described in the *Source Control Load Reduction Accounting for Reasonable Assurance Analysis* (BASMAA, 2020, provided in Appendix B). The resulting load reductions from source controls implemented are combined with the land use and GSI load reduction estimations to get the total estimated load reduction for each future implementation scenario.

# 3. ADJUSTED BASELINE LOADS AND LOAD REDUCTION GOALS

## 3.1 PCBs

#### 3.1.1 Adjusted PCBs Baseline Load

The results of the RAA baseline modeling for PCBs are presented for Contra Costa County in Table 3-1 below.

**Table 3-1: RAA Model Baseline Loading Estimates – PCBs**

| RWQCB Region | Above/Below Dam | Permit | Baseline Load Contra Costa County (kg/yr) |
|---|---|---|---|
| **Region 2** | **Below Dam** | **MRP[1]** | **1.73** |
| | | NPDES[2] | 0.62 |
| | | Phase II[3] | 0.01 |
| | ***TMDL Baseline*** | | ***2.36*** |
| | Above Dam | MRP[1] | 0.04 |
| | | NPDES[2] | <0.01 |
| | | Phase II[3] | 0 |
| Region 5 | Below Dam | MRP[1] | 0.13 |
| | | NPDES[2] | 0.01 |
| | | Phase II[3] | <0.01 |
| | Above Dam | MRP[1] | <0.01 |
| | | NPDES[2] | 0 |
| | | Phase II[3] | 0 |
| County-wide | | Total | 2.55 |

[1] Municipal Regional Permit permitted areas, along with IGP facilities and facilities with individual NPDES Stormwater Industrial permits.
[2] Major and Non-Major dischargers with individual NPDES permits. See Appendix A.
[3] Phase II General Permit permittees. See Appendix A.

The countywide baseline load below dams estimated using the RAA model is 2.36 kg/yr. The baseline load estimated for the Permittees after deducting the estimated baseline load for the NPDES dischargers within the County is 1.73 kg/yr. This baseline load is used to establish the PCBs TMDL load reduction goal described below.

### 3.1.2 TMDL Attainment Load Reduction Goal (2030)

Calculations were conducted to develop the PCBs load reduction goals as described in the *Bay Area RAA Guidance Document* (BASMAA, 2017). The calculation methodology is summarized below.

$$LR_{TMDLgoal} = \text{Baseline} - \text{WLA (kg/yr)}$$

Where:

$LR_{TMDLgoal}$ = The TMDL load reduction goal (kg/yr)

Baseline = The baseline pollutant loading as calculated through the RAA

WLA = The population-based wasteload allocation for Contra Costa County

The TMDL population-based wasteload allocation for Contra Costa County is 0.3 kg/yr. This wasteload allocation must be distributed between the MRP permittees and other permitted stormwater dischargers (i.e., individual NPDES permittees and Phase II permittees). The wasteload allocations calculated to reflect the relative percentage of the estimated baseline loads are provided in Table 3-2.

For example, as shown in Table 3-1, the MRP Permittees baseline load is estimated to be 1.73 kg/yr, which represents 73% of the total baseline load below dams (i.e., 1.73/2.36 x 100 = 73%). Thus, the PCBs wasteload allocation for the MRP Permittees is equal to 73% of 0.3 kg/yr (i.e., 0.73 x 0.3 kg/yr = 0.22 kg/yr)

**Table 3-2: TMDL Wasteload Allocations for Contra Costa County**

| Stormwater Discharger within TMDL Baseline Area[1] | Percentage of Baseline Load (%) | PCBs WLA (kg/yr) |
|---|---|---|
| MRP Permittees | 73% | 0.22 |
| NPDES Permittees | 26% | 0.08 |
| Phase 2 Permittees | 1% | 0.002 |
| Contra Costa County | 100% | 0.3 |

[1] All SFBRWQCB Region 2, above dams.
WLA – Wasteload Allocation

Using the calculated MRP Permittee proportion of the wasteload allocation and RAA-calculated baseline load, the load reduction goal is estimated to be 1.51 kg/yr (i.e., 1.73 kg/yr – 0.22 kg/yr = 1.51 kg/yr).

### 3.1.3 MRP Load Reduction Goal through GSI by 2040

The PCBs load reduction required to be achieved through GSI by 2040 per MRP Provision C.3.j (i.e., 3 kg/yr MRP area-wide or 0.56 kg/yr for Contra Costa County) must be adjusted to reflect the RAA-calculated load reduction goal (i.e., 1.51 kg/yr).

The MRP C.3.j load reduction requirement for GSI by 2040 (for all Permittees; 3 kg/yr) represents 20.8% of the overall load reduction required in the TMDL[3] (i.e., [3 kg/yr ÷ 14.4 kg/yr] x 100 = 20.8%). Therefore, the adjusted countywide load reduction through GSI can be calculated as:

$$LR_{MRP,\ GSI,\ 2040} = LR_{TMDLgoal} * 20.8\%$$

The adjusted countywide MRP PCBs load reduction goal through GSI by 2040 is 0.31 kg/yr (i.e., 1.51 kg/yr x 0.208 = 0.31 kg/yr).

[3] The PCBs TMDL estimates a total urban baseline stormwater load of 20 kg/yr and assigns a wasteload allocation to urban stormwater of 2 kg/yr; thereby resulting in a required load reduction of 18 kg/yr (i.e., a 90% reduction) by 2030. Note that the MRP area is a portion of the total TMDL area, as Marin, Napa, San Francisco, and Sonoma are not within the MRP boundary. The MRP portion of the estimated TMDL baseline load is 16 kg/yr and the MRP portion of the 2 kg/yr wasteload allocation is 1.6 kg/yr, thus the TMDL load reduction goal for the MRP area is 14.4 kg/yr.

## 3.2 Mercury

### 3.2.1 Adjusted Mercury Baseline Loads

The results of the RAA baseline modeling for mercury are presented for Contra Costa County in Table 3-4 below. The countywide baseline load estimated with the RAA model is 6.25 kg/yr. The baseline load estimated for the Permittees after deducting the estimated baseline load for the NPDES dischargers within the County is 6.02 kg/yr. This baseline load is used to establish the mercury TMDL load reduction goal described below.

**Table 3-3: RAA Model Baseline Loading Estimates – Mercury**

| RWQCB Region | Above/Below Dam | Permit | Baseline Load Contra Costa County (kg/yr) |
|---|---|---|---|
| **Region 2** | **Below Dam** | **MRP[1]** | **6.02** |
| | | NPDES[2] | 0.20 |
| | | Phase 2[3] | 0.03 |
| | ***TMDL Baseline*** | | ***6.25*** |
| | Above Dam | MRP[1] | 1.59 |
| | | NPDES[2] | 0.002 |
| | | Phase 2[3] | 0.00 |
| Region 5 | Below Dam | MRP[1] | 1.02 |
| | | NPDES[2] | 0.004 |
| | | Phase 2[3] | 0.001 |
| | Above Dam | MRP[1] | 0.35 |
| | | NPDES[2] | 0.00 |
| | | Phase 2[3] | 0.00 |
| County-wide | | Total | 9.23 |

[1] Municipal Regional Permit permitted areas, along with IGP facilities and facilities with individual NPDES Stormwater Industrial permits.

[2] Major and Non-Major dischargers with individual NPDES permits. See Appendix A.

[3] Phase II General Permit permittees. See Appendix A.

### 3.2.2 TMDL Attainment Load Reduction Goal (2028)

The mercury WLA for Contra Costa County is 11 kg/yr, while the estimated baseline load for the entire county below dams is only 6.25 kg/yr. Thus, the results of the RAA indicate that the TMDL wasteload allocation has been achieved.

### 3.2.3 MRP Load Reduction Goal through GSI (2040)

The mercury load reduction required to be achieved through GSI by 2040 per MRP Provision C.3.j is 10 kg/yr MRP area-wide (19% or 1.9 kg/yr for Contra Costa County). This represents 8% of the estimated TMDL baseline load of 127.7 kg/yr for the MRP area. Applying this percentage to the adjusted baseline from the RAA model, an adjusted GSI goal would be 0.48 kg/yr for Contra Costa County (i.e., 6.02 kg/yr x 0.08 = 0.48 kg/yr).

# 4. ESTIMATE OF LOADS REDUCED

## 4.1 Loads Reduced – PCBs

The total estimated annual PCBs loads reduced through implementation of control measures by 2020, 2030, 2040, and 2050 is provided in Table 4-1.

**Table 4-1: Summary of PCBs Load Reductions Achieved through Control Measure Implementation**

| Control Measure | PCBs Load Reduction (kg/yr) by: | | | |
|---|---|---|---|---|
| | **2020** | **2030** | **2040** | **2050** |
| PCBs in Building Materials Management | 0.37 | 0.37 | 0.37 | 0.37 |
| Source Property Identification and Abatement | 0.21 | 0.54 | 0.54 | 0.54 |
| PCBs in Electrical Utilities Management | 0.07 | 0.12 | 0.17 | 0.21 |
| PCBs in Infrastructure | 0.00 | 0.01 | 0.02 | 0.02 |
| Green Stormwater Infrastructure | 0.14 | 0.18 | 0.26 | 0.32 |
| Full Trash Capture Treatment Control Measures | 0.05 | 0.05 | 0.05 | 0.05 |
| Enhanced Operations and Maintenance | 0.004 | 0.004 | 0.004 | 0.004 |
| **Total Load Reduced** | 0.84 | 1.27 | 1.41 | 1.51 |
| **Load Reduction Goal** | **1.51** | **1.51** | **1.51** | **1.51** |
| **Remaining Load to be Reduced** | 0.67 | 0.24 | 0.10 | 0 |

### 4.1.1 PCBs TMDL Attainment (2030)

As can be seen in Table 4-1, the required load reduction to achieve the TMDL wasteload allocation (1.51 kg/yr) is not met by the TMDL compliance date of 2030 but is achieved by 2050. The RAA estimate of achieving the PCBs TMDL wasteload allocation by 2050 is based on many assumptions, and while the RAA demonstrates that Contra Costa will not achieve the PCBs load reduction goal before 2050, this goal may not be achieved until well after 2050. An analysis of scenarios needed to achieve the TMDL wasteload allocation by 2030 is presented in Appendix G of the *Contra Costa PCBs and Mercury TMDL Control Measure Plan and Reasonable Assurance Analysis* report).

### 4.1.2 MRP GSI Load Reduction Goal (2040)

The estimated PCBs load reduced through implementation of GSI by 2040 is 0.26 kg/yr. As discussed in Section 3.1.3, the RAA-adjusted goal is 0.31 kg/yr, thus there is a predicted 0.05 kg/yr deficit.

Table 4-2 below provides an estimate of the PCBs loads reduced by the public and private land area that will be treated through GSI implementation by 2020, 2030, and 2040. The areas modeled were summarized from the Permittees' Green Infrastructure Plans, which were submitted to the SFBRWQCB in 2019.

**Table 4-2: Estimate of PCBs Load Reduced by Area Treated through GSI Implementation by 2020, 2030, and 2040 within Contra Costa County**

| Year | Estimated PCBs Load Reduced (kg/yr) | |
|---|---|---|
| | Private | Public |
| 2020 | 0.13 | 0.01 |
| 2030 | 0.16 | 0.02 |
| 2040 | 0.23 | 0.03 |

As can be seen in Table 4-2, public GSI area is a small portion of the total load reduced through GSI (ranging from 8% to 13%) and is also subject to a lot of uncertainty regarding when opportunities will emerge, and funding will be available.

Public GSI retrofit opportunities that have the highest potential to reduce PCBs loads are concentrated within a small subset of Contra Costa Permittee area due to the pattern of pre-1980 industrial development within the region. Conversely, many Contra Costa Permittees have no or very few opportunities to contribute significantly toward achievement of countywide PCBs loading reductions via implementation of GSI in their communities. Further, if load reductions are not achieved on a regional or countywide scale, and load reductions are allocated at a local level (by population), these Permittees would not be able to achieve those load reduction allocations due to a lack of opportunity.

Thus, given these findings, the Contra Costa Permittees, collectively, believe that a countywide strategy would be the best way to achieve the PCBs load reduction goals in a more efficient and effective manner. For the purposes of creating their local GI Plans, Contra Costa Permittees have prioritized their GSI projects based on achieving other multiple benefits. These other benefits include controlling other stormwater pollutants, preserving and enhancing local stream hydrology, reducing localized flooding, helping communities adapt to climate change by increasing the resiliency of water supply, ancillary benefits that derive from adding landscaped areas within the urbanized environment, and mitigating the urban heat island effect.

## 4.2 Loads Reduced – Mercury

The total estimated mercury loads reduced through implementation of the GSI and the other treatment control measures that are implemented for PCBs by 2020, 2030, 2040, and 2050 is provided in Table 4-3.

Note that these estimated load reductions do not account for loads reduced by the Mercury Load Avoidance and Reduction source control measure. CCCWP will continue to annually compile and report the number of mercury-containing products collected at household hazardous waste facilities. Translation of that collection information to loads reduced from urban stormwater discharges is challenging and may not be necessary to show attainment of the mercury TMDL.

**Table 4-3: Summary of Mercury Load Reductions Achieved through Control Measure Implementation**

| Control Measure | Hg Load Reduction (g/yr) by: | | | |
|---|---|---|---|---|
| | **2020** | **2030** | **2040** | **2050** |
| Green Stormwater Infrastructure | 0.17 | 0.22 | **0.28** | 0.33 |
| Full Trash Capture Treatment Control Measures | 0.10 | 0.12 | 0.12 | 0.12 |
| Enhanced Operations and Maintenance | 0.02 | 0.02 | 0.02 | 0.02 |
| **Total** | **0.29** | **0.36** | **0.42** | **0.47** |
| **Adjusted Load Reduction Goal via GSI in MRP 2** | **--** | **--** | **0.48** | **--** |
| **Remaining Load to be Reduced via GSI** | | | **0.20** | |

### 4.2.1 Mercury TMDL Attainment (2028)

As is stated in Section 3.2.2 above, the mercury WLA for Contra Costa County is 11 kg/yr, while the estimated baseline load for the entire county below dams is only 6.25 kg/yr. Thus, the results of the RAA indicate that the TMDL wasteload allocation has been achieved.

### 4.2.2 MRP Load Reduction Goal through GSI (2040)

The predicted mercury load reduction by 2040 through GSI (0.28 kg/yr) would not achieve the adjusted load reduction goal for GSI in the MRP (0.48 kg/yr). RAA results analyzing the potential for GSI to reduce mercury loads to achieve this goal are shown in Table 4-4 below. A significant portion of the Old Industrial, Old Commercial, Old Transportation, and/or Old Urban Residential land use area would need to be treated to meet this load reduction goal in Contra Costa County (shaded rows of Table 4-4). Assuming the mercury load reduction rate that is predicted by the RAA model to occur every decade through implementation of GSI on public and private land, this MRP load reduction goal would be achieved by 2077.

Given the RAA results for baseline load in comparison to the TMDL wasteload allocation, the load reduction goal set in the MRP appears to be unnecessary for TMDL compliance.

**Table 4-4: Application of GSI to All Land Use Area in Contra Costa County within Region 2 below Dams**

| Land Use Category | Maximum Potential Mercury Load Reduction through GSI (kg/yr) |
|---|---|
| Old Industrial | 0.40 |
| Old Commercial | 0.14 |
| Old Transportation | 0.22 |
| Old Urban Residential | 2.07 |
| New Urban | 0.02 |

## 4.3 RAA Modeling Uncertainty

There are two types of uncertainty in the RAA analysis: modeling uncertainty and planning uncertainty. This section discusses modeling uncertainty, whereas planning uncertainties are discussed in Section 6.2 of the *Contra Costa PCBs and Mercury TMDL Control Measure Plan and Reasonable Assurance Analysis* report.

As summarized in the RAA Guidance Document (BASMAA, 2017), according to USEPA's Guidance on the Development, Evaluation, and Application of Environmental Models (USEPA Model Guidance, 2009), model uncertainty describes the lack of knowledge about models, parameters, constants, data, and beliefs. The USEPA Model Guidance identifies two types of uncertainty related to models: model framework uncertainty, related to the scientific soundness of the model, and data uncertainty, arising from measurement errors, analytical imprecision, and limited data sample sizes. The methods and assumptions used for the analysis and described in detail in the appendices were developed with consideration of available data. The methods for developing baseline loading and GSI load reduction estimates went through a rigorous third-party peer review process. The source control load reduction calculations methods presented in Appendix B have been accepted by the SFBRWQCB. Therefore, the methods are considered to be reasonably rigorous given the data and resources available, and the primary source of uncertainty for these computational methods is expected to be data uncertainty.

The USEPA Model Guidance (USEPA, 2009) describes the three components that affect data uncertainty:

- Accuracy – the closeness of a measured or computed value to its "true" value.
- Variability – data differences arising from true heterogeneity or diversity in model parameters and their underlying input datasets.
- Precision – the quality of being reproducible in outcome or performance.

Due to natural variability, data limitations affect both accuracy and precision, resulting in higher data uncertainty. Because of this, data limitations will also inform the complexity of the model.

In addition, as indicated in the USEPA RAA Guide (USEPA, 2017), calibration and validation can be used to manage model uncertainty, though data limitations will still cause uncertainty in model output. Because of this, the USEPA RAA Guide suggests that it is important to update RAA modeling tools over time as additional data become available.

## 5. REFERENCES


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# APPENDIX A
List of NPDES Permittees Removed from Baseline

**Table A-1: List of Phase II Permittees, and Facilities with Major or Minor NPDES Permits, in Contra Costa County**

| Permit Category | Facility Name | Facility Owner | City |
|---|---|---|---|
| Phase II | Bay Area Rapid Transit (BART) | Bay Area Rapid Transit District | Various |
| Phase II | Cal State East Bay Concord Campus | State of California | Concord |
| Phase II | Federal Correctional Instituion, Dublin (Camp Parks) | United States of America | San Ramon / Unincorporated |
| NPDES Major | Tesoro Golden Eagle Refinery | Tesoro Refining & Marketing Co | Concord |
| NPDES Major | C&H Sugar Co Inc | Sugar Acquisition Corp | Crockett (Unincorporated) |
| NPDES Major | C&H Sugar Co Inc | Sugar Acquisition Inc | Crockett (Unincorporated) |
| NPDES Major | C&H Sugar Co Inc | C & H Sugar Company Inc | Crockett (Unincorporated) |
| NPDES Major | Phillips 66 - San Francisco Refinery | Shore Terminals LLC | Crockett (Unincorporated) |
| NPDES Major | Discovery Bay WWTP | Ccc Sanitation District #19 | Discovery Bay (Unincorporated) |
| NPDES Major | Discovery Bay WWTP | Discovery Bay Town Of | Discovery Bay (Unincorporated) |
| NPDES Major | Central Contra Costa WWTF | Central Cc Sanitary District | Martinez |
| NPDES Major | Eco Services Martinez Plant | Eco Services Operations LLC | Martinez |
| NPDES Major | Mt View Sanitary Dist WWTF | Mt View Sanitary District | Martinez |
| NPDES Major | Shell Oil Products, Martinez Refinery | Equilon Enterprises LLC | Martinez |
| NPDES Major | Tesoro Golden Eagle Refinery | Tesoro Refining & Marketing Co | Martinez |
| NPDES Major | Ironhouse Sd WWTP | Ironhouse Sanitary District | Oakley |
| NPDES Major | Pinole WWTF | Pinole City Of | Pinole |
| NPDES Major | Pittsburg Power Plant | Genon California North LLC | Pittsburg |
| NPDES Major | Pittsburg Power Plant | Pittsburg Power Company | Pittsburg |
| NPDES Major | Pittsburg Power Plant | Pacific Gas & Electric Co | Pittsburg |
| NPDES Major | Pittsburg Power Plant | Southern Energy Delta LLC | Pittsburg |
| NPDES Major | Uss-Posco Industries | Uss Posco Industries | Pittsburg |
| NPDES Major | Chevron Richmond Refinery | Chevron Usa Inc | Richmond |
| NPDES Major | Phillips 66 - San Francisco Refinery | Tosco Corporation | Rodeo (Unincorporated) |
| NPDES Major | Rodeo Sanitary District | Rodeo Sanitary District | Rodeo (Unincorporated) |
| NPDES Major | Chevron Richmond Refinery | Chevron Usa Inc | San Pablo |
| NPDES Minor | A1 Auto Dismantler Inc | Nguyen Theresa | Antioch |
| NPDES Minor | Bridgehead Marine Services | Devries Neil & Mary Tre | Antioch |
| NPDES Minor | Delta Diablo WWTP | Ccc Sanitation District #7 A | Antioch |
| NPDES Minor | Eastern Contra Costa Transit Authority | Eastern Contra Costa Transit | Antioch |
| NPDES Minor | Ftg Construction Materials Inc | Alegre Anthony J Tre | Antioch |
| NPDES Minor | Gateway Generating Station | Pacific Gas & Electric Co | Antioch |
| NPDES Minor | Georgia-Pacific Gypsum LLC | Georgia-Pacific Gypsum LLC | Antioch |
| NPDES Minor | Verco Decking, Inc | Verco Decking Inc | Antioch |
| NPDES Minor | Criterion Catalysts Company LP | LP Catalyst Holdings Inc | Bay Point (Unincorporated) |

| Permit Category | Facility Name | Facility Owner | City |
|---|---|---|---|
| NPDES Minor | Insurance Auto Auctions Inc | Borba Scott L Tre | Bay Point (Unincorporated) |
| NPDES Minor | Diablo Boat Works | Weltin Dan | Bethel Island (Unincorporated) |
| NPDES Minor | Golden Gate Petroleum | Bay Area Diablo Petroleum | Brentwood |
| NPDES Minor | Right Away Redy Mix | Bay Cities Blding Mat Co Inc | Byron (Unincorporated) |
| NPDES Minor | Concord Auto Dismantlers | Countryside Investments LLC | Concord |
| NPDES Minor | John A Mchugh | Mchugh John A Tre | Concord |
| NPDES Minor | John A Mchugh | Mchugh Mary Karen | Concord |
| NPDES Minor | Royal Trucking Company | Buildings 1-4 LLC | Concord |
| NPDES Minor | Seg Trucking | Candy Properties | Concord |
| NPDES Minor | Systron Donner | Systron Donner Inertial Inc | Concord |
| NPDES Minor | Systron Donner | Systron Business Center LLC | Concord |
| NPDES Minor | Stege Sewer Collection System | Stege Sanitary District | El Cerrito |
| NPDES Minor | Bio-Rad Laboratories | Bio-Rad Laboratories Inc | Hercules |
| NPDES Minor | American Stage Tours | Lucas James V & Shari | Martinez |
| NPDES Minor | American Stage Tours | Lucas James & Shari | Martinez |
| NPDES Minor | American Stage Tours | Lucas James V & Shari S | Martinez |
| NPDES Minor | Eagle Marine | Martinez City Of | Martinez |
| NPDES Minor | Delta Scrap And Salvage | Graunstadt Kenneth P Tre | Oakley |
| NPDES Minor | Pena Dismantler | Hulsey Tim L Tre | Oakley |
| NPDES Minor | E B M U D Orinda Water Trtmnt Plant | East Bay Municipal Utility Dis | Orinda |
| NPDES Minor | Antioch Building Materials Company | Pittsburg Industrial Park LLC | Pittsburg |
| NPDES Minor | Delta Diablo WWTP | Ccc Sanitation District #7 A | Pittsburg |
| NPDES Minor | Delta Diablo WWTP | Delta Diablo Sanitation Dist | Pittsburg |
| NPDES Minor | Hasa Inc | CCIP LP | Pittsburg |
| NPDES Minor | Koch Carbon LLC | Isle Capital Corporation Tre | Pittsburg |
| NPDES Minor | Los Medanos Energy Center | Uss Posco Industries | Pittsburg |
| NPDES Minor | Praxair, Inc | Union Carbide Ind Gases Inc | Pittsburg |
| NPDES Minor | Bay Cities Refuse Service, Inc. | United Refuse Service Inc | Richmond |
| NPDES Minor | Bragg Crane Ser | Bragg Investment Company Inc | Richmond |
| NPDES Minor | Bragg Crane Ser | Bragg Invewtment Co Inc | Richmond |
| NPDES Minor | Ecology Control Industries | 255 Parr Blvd LLC | Richmond |
| NPDES Minor | First Student Inc 20306 | Laidlaw Transit Inc | Richmond |
| NPDES Minor | Qualawash Holdings LLC | Quality Carriers Inc | Richmond |
| NPDES Minor | West Co Water Pollutional Control Plant | West County Wastewater Dist | Richmond |
| NPDES Minor | West Co Water Pollutional Control Plant | West County Wastewater Dist | San Pablo |
| NPDES Minor | USPS Walnut Creek VMF | Marasco Joseph Tre | Walnut Creek |