

SACRAMENTO



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QUALITY
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Delta Science Program

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February 21, 2020

Sent via email to: Yumiko.Henneberry@deltacouncil.ca.gov

Subject: Sacramento Stormwater Quality Partnership's Clarifications and Additional Context to Comments on the *Delta Mercury Control Program Phase 1 Methylmercury Control Studies Independent Scientific Review Report*

Dear Ms. Henneberry:

The Sacramento Stormwater Quality Partnership (SSQP) appreciates this opportunity to provide clarifications and contextual background on the August 2019 *Delta Mercury Control Program Phase 1 Methylmercury Control Studies Independent Scientific Review* report prepared by the Independent Scientific Review Panel and facilitated by the Delta Science Program for the Central Valley Regional Water Quality Control Board (Regional Water Board). The SSQP is the municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) permittee group for the cities and unincorporated urban areas within Sacramento County. Each SSQP member agency is regulated under the Regional Water Board's MS4 General Permit (NPDES No. CAS0085324, Order No. R5-2016-0040) which regulates stormwater discharge for municipal and county agencies within the Central Valley.¹

The purpose of this letter is to provide additional information that may support the completion of Phase 1 and inform the Regional Water Board and Advisory Panel regarding program considerations for implementation of Phase 2 (that support pragmatic and effective solutions to protect beneficial uses impaired by mercury and methylmercury).

We appreciate the Independent Scientific Review Panel's review of the SSQP's Delta Methylmercury Control Study Final Report (Final Report). We agree with many of the key Independent Scientific Review Panel's points made to the Advisory Panel for moving forward

¹ The MS4 General Permit was adopted on June 23, 2016, became effective on October 1, 2016, and will expire on September 30, 2021. The Sacramento Area individual permittees were assigned the following General Order Nos.: City of Citrus Heights MS4 (R5-2016-0040-004), City of Elk Grove MS4 (R5-2016-0040-005), City of Folsom MS4 (R5-2016-0040-006), City of Galt MS4 (R5-2016-0040-007), City of Rancho Cordova MS4 (R5-2016-0040-008), City of Sacramento MS4 (R5-2016-0040-009), and County of Sacramento MS4 (R5-2016-0040-010).

into Phase 2. We have included **Attachment A** to respond to specific statements or interpretations that are incorrect or do not provide adequate context regarding the history of the SSQP's Phase 1 Control Studies. Based on the comments and clarifications provided in this letter and attachment, we consider the SSQP's Phase 1 report to be complete according to the approved Work Plan and look forward to implementation of the Phase 2 implementation program.

INDEPENDENT SCIENTIFIC REVIEW PANEL POINTS OF AGREEMENT

The Independent Scientific Review Panel review identified a number of conclusions for consideration of the broader group of permitted discharges and their relative contribution to downstream fish tissue concentrations. The Independent Scientific Review Panel also provided a number of technical assessment and monitoring comments that we agree would be helpful for future consideration as the SSQP considers revisions to its monitoring and assessment program.

MS4 Load Contribution is Small and Future Changes Are Not Measurable Downstream

The Independent Scientific Review Panel stated that "Given the small proportion of methylmercury loads to the Delta from the sources considered here, the Review Panel is quite definitive in its conclusion that the expected methylmercury load reductions will probably not have *measurable* effects" when evaluating the cumulative study results. In addition, "[t]he Control Study results suggest that the TMDL allocations to these sources may not be in alignment with the size of their contributions". We consider these definitive conclusions to support our recommendation that continued effort to refine mass loadings and implement wasteload allocations as discrete loads is not necessary. TMDL compliance can be based on completion of programmatic elements such as those included in the Statewide Mercury Objectives in conjunction with continued monitoring and implementation of the SSQP's Stormwater Quality Design Manual requirements. Moreover, it is not useful to further refine the Phase 1 reports, but instead apply the technical comments on monitoring and assessment to future Phase 2 activities.

As has been stated throughout Phase 1, the relatively small contribution from the SSQP (0.03%) and absolute estimated load in the TMDL (1.8 grams/year) "are not a significant source of methylmercury relative to other sources documented as part of the TMDL inventory", and, therefore, will have no measurable impact on the overall Delta methylmercury budget. Further revisions to the SSQP's Final Report will have very limited value and is not necessary.

Assessment Framework for Climate Change Future Projections is Not Responsibility of Individual Stakeholders

The Regional Water Board did not require consideration of climate change, as the 2012 control study guidelines only posed this question for consideration and not as part of the minimum requirements. As noted by the Independent Scientific Review Panel, climate change could reasonably affect both methylmercury geochemistry and the watershed hydrology. While the Independent Scientific Review Panel suggests on page 10 that dischargers consider climate change, "the Panel also believes that it is not the responsibility of individual studies to conduct these analyses; an updated TMDL framework will ensure consistency among reports and a common set of conditions within which to provide data." The SSQP agrees that individual permittees should not be required to develop individual climate change assessment approaches.

Inorganic Mercury and Sediment Controls Are the Most Effective Means for MS4 Control Opportunities

The SSQP agrees with the Independent Scientific Review Panel that states that “Reduction in Hg loads would be one of the best ways to reduce MeHg production” (pg 26). In addition, the SSQP agrees with the Independent Scientific Review Panel that “[a]s long as LID controls are moving forward under other regulations, there is probably no reason to implement additional specific structural controls for MeHg.” Therefore, the SSQP recommends a BMP-based compliance such as is in the [Statewide Mercury Provisions](#). While the Delta Mercury Control Program includes wasteload allocations for a smaller urban area within the Delta, the SSQP “Jurisdictional Runoff Area” is a much larger area more appropriately covered by the Statewide Mercury Provisions at the discretion of the Regional Water Board.

Phase 2 Monitoring and Assessment Approach

We appreciate the technical recommendations to improve future monitoring and assessment of the contributions of methylmercury from urban runoff. The SSQP will use these recommendations for future monitoring and assessment planning. The SSQP acknowledges the importance of adequate and accurate assessments of total mercury and methylmercury discharge impacts as demonstrated by the extensive long-term discharge and receiving water dataset. It is important to then use these extensive data to evaluate the SSQP management programs and effectiveness through ongoing characterization and control strategy assessment. However, more extensive modeling to refine load model estimates would provide limited benefit.

The Independent Scientific Review Panel stated that it would be “worthwhile to revisit the monitoring strategy.”

The SSQP will evaluate the monitoring approach as part of the Monitoring Study Design permit requirement to determine the most effective monitoring approach for methylmercury and mercury load and control strategy assessments for the SSQP. The Monitoring Study Design will consider the relevant mercury constituents, flow, and all SSQP Priority Water Quality Constituents.

While the detailed Independent Scientific Review Panel comments on modeling and the regression-based Discharge Characterization Program (DCP) were helpful, load modeling was not specifically required by the Regional Water Board nor performed by other MS4s. In fact, the Technical Advisory Committee (TAC) specifically rejected consideration of watershed modeling as part of the Phase 1 control study work plan.

Because methylmercury should be considered a non-conservative constituent for modeling in a stormwater system with detention and large drainage areas and because of the inherent variability in stormwater discharge concentrations, the uncertainty of a methylmercury model cannot be reasonably reduced for these small load (1 g/year for TMDL area). Therefore, the SSQP would like to focus resources on reduction of load rather than the limited improvements of model characterization that can be made.

CLARIFICATION ON INDEPENDENT SCIENTIFIC REVIEW PANEL POINTS OF CONCERN

Because information was not provided to the Independent Scientific Review Panel or due to confusion over MS4 assessment concepts, the SSQP does not believe the following three

Independent Scientific Review Panel's points of concern were adequately or accurately considered: 1) the completeness of the Sylvan Center Work Plan, 2) the characterization of areas developed between 1996 and 2018, and 3) the use of low impact development (LID) methylmercury reductions in hypothetical assessments of future conditions.

Incomplete Work Plan Due to Limited Sampling at Sylvan Center

The Independent Scientific Review Panel's comments suggest that the SSQP did not complete all study elements of the approved Work Plan, however, the specific approved language of the Work Plan is not accurately stated by the reviewers. The SSQP did complete the Work Plan scope of work as described further below. Specifically, the Independent Scientific Review Panel identified the Sylvan Center study area:

The workplan calls for evaluation of runoff from and an existing LID redevelopment site (Sylvan Center) and a new retrofit project (The City Hall Green Parking lot study), both in the city of Citrus Heights. Only the City Hall study was carried out. [page 17]

Since the original LID pilot study was not fully implemented, one could argue that completing it with additional data collection would not be outside the scope of the Phase I TMDL. [page 23]

The SSQP Work Plan (page 13) states that "Sample collection will be limited to five events annually for the two year Study and will be limited to cases where there is outflow from the locations." The Independent Scientific Review Panel's comments (page 19) state that no discharge measurements were made at the Sylvan Center. In fact, a continuous sensor was installed to detect outflow for the two-year study which confirmed that only negligible outflow occurred for the entire study period during one brief period.

The SSQP Work Plan (page 14) specifies three sample collection locations for each year, which suggests fifteen total data points per year or thirty total data points from all locations for both years. The Progress Report and other communications previously delivered to the Regional Water Board noted the discontinuation of the Sylvan Center site off-site drainage (August 2015 Grant Report, page 14 also included in the Progress Report) so that resources could be used at the City Hall monitoring location to increase the useful sample number. A total of forty unique methylmercury samples were taken, even when considering the lack of runoff and discharge observed at the Sylvan Center which would require the removal of at least nine samples due to lack of flow (i.e., nine of ten events with no outflow observed). The SSQP collected nearly double the required number of samples within the allowed adaptive management of the Work Plan as documented in communications with the Regional Water Board.

Although discharge samples could not be collected at the Sylvan Center, stormwater runoff volume reduction essentially removed all methylmercury load. The study results were reported, but not used to characterize LID as the conditions were unique and would bias the overall benefit more than expected for a typical LID installation (e.g., 100% removal). Without the paired inflow-outflow samples, the off-site drainage concentrations were not relevant even without considering the difficulty collecting the intermittent off-site seepage from the adjacent private residences.

The SSQP Final Report and Phase 1 Control Study should be considered complete and additional sample collection can be considered as part of Phase 2.

1996-2018 New Development Characterization

The Independent Scientific Review Panel's comments suggest that the SSQP did not demonstrate that discharges from areas developed under the 1996-2018 requirements can be generally characterized as improved compared to discharges from the pre-1996 developed areas. The SSQP disagrees and has demonstrated that design standards (i.e. Stormwater Quality Design Manual) have effectively improved water quality. The discharge concentration distribution comparisons are compelling demonstrations of the benefit of 1996-2018 new development standards (represented as regional treatment basins).

Our review of the Independent Scientific Review Panel's comments suggests that there may be some confusion regarding the point of measurement (compliance) and upstream runoff conditions. The Independent Scientific Review Panel made the following comments:

The Control Study from the Sacramento Storm Water Quality Partnership concluded that the actual characteristics of the land-use change (in an urban context) was less impactful on methylmercury loads than WHEN the land-use change occurred. [page 10]

*The Strong Ranch site is apparently in a channel. Could the North Natomas collection on the outflow of a detention pond be the cause of lower particulate Hg and MeHg at that site, rather than the LID features of newer development in the drainage? **Therefore, the data and analysis presented are not sufficient to support the conclusion that stormwater MeHg concentrations are lower in areas of post-1996 development.** The conclusion that MeHg concentrations are lower in North Natomas than the other two urban runoff sites is supported by the data presented, but the conclusion that this is due to differences in development age is not. Perhaps the supporting data are in other documents, but this report should provide enough information for the reader to assess the finding. [page 25]*

Therefore, the data and analysis presented are not sufficient to support the conclusion that stormwater MeHg concentrations are lower in areas of post-1996 development.
[page 25]

The 1996-2018 development standards included "regional" wet detention basin treatment that was extensively adopted for new development. Detention basins, such as the North Natomas detention pond, are an example of the post-1996 development stormwater quality feature that were implemented, and therefore the basin's effectiveness is being evaluated by assessing when the land-use change occurred. The timeframe of when development occurred is a proxy for the characteristics of the land use change (i.e. whether the land use change occurred at the time when implementation of regional water quality features and/or on-site LID were required (post-1996) or not required (pre-1996). The point of regulation and measurement is at the wet detention basin outflow to a receiving water, not the upstream urban runoff. The Strong Ranch Slough example cited by the Independent Scientific Review Panel reinforces the differences in water quality. As a pre-1996 developed area, Strong Ranch Slough urban runoff water quality does not have the benefit of the regional basin treatment. Strong Ranch Slough discharges to the American River just downstream from the measurement point.

The water quality development standards were implemented at a point in time. Practically, 1996 is used as the point after standard adoption when most projects were covered by the requirements, though this is an estimate to consider grandfathered projects into older

requirements. The important concept is that the land development design standards are a significant factor in statistically comparing discharge datasets between different development age areas (Final Report, Appendix D, Figure 4 regression results). Additionally, the SSQP previously evaluated two other basins that demonstrated methylmercury removal efficiencies consistent with the North Natomas Detention Basin.²

The comparison in point-of-discharge between the 1996-2018 basins and pre-1996 discharge is demonstrated in the Final Report with the multi-variate factor regression and comparisons of the datasets through distributional plots and summary statistics. The Independent Scientific Review Panel does not provide a technical assessment of these quantitative comparisons and suggests that the sites should be compared at points in the drainage that are prior to the stormwater quality feature, not points of compliance (i.e., runoff prior to treatment and discharge). The SSQP strongly asserts that the 1996-2018 development standards were demonstrated as beneficial for solids removal and methylmercury reductions over annual assessment periods. While the reductions might be modest, they provide a clear benefit over older development without regional basins.

The July 2018 Stormwater Quality Manual further adopts new LID standards. The characteristics of the land development stormwater features (including redevelopment of existing urban areas) are the primary management “control” legally available to the SSQP agencies for improving stormwater quality in privately owned land areas.

Additionally, as clarification, the SSQP assessment does not evaluate differences between land uses (i.e., residential, industrial, commercial, etc.) but evaluates larger drainages with mixed land uses of specific development ages. Characterization of sources within land uses has been performed by others and is well known. Characterization of the larger drainage mixed land uses provides less variable and broader characterization of the urban areas to evaluate changes over time.

Use of One Low Impact Development Study to Demonstrate 85% Reduction

The Independent Scientific Review Panel’s review suggested that the estimated SSQP discharged loads relied on the assumption of carrying the 85% removal from the Citrus Heights City Hall study to the entire drainage:

Results of the City Hall study were used to project future MeHg loads, based on the assumption that areas where LID is fully implemented would see 85% load reductions. There are no data to support the idea that results of the City Hall study – which covered just a few acres – are scalable to larger basins; or how the load reductions might change under different hydrologic conditions. So, while it is reasonable to predict that implementation of stormwater runoff controls will probably reduce MeHg loads over time, the quantitative estimates provided need to be tempered with some estimate of uncertainty. [page 18]

The 85% removal was not assumed for the assessment of compliance with the current wasteload allocation or a projection to 2030. Because the SSQP determined that compliance with the 1 g/year wasteload allocation is already likely attained, future LID implementation through the

² Sacramento Stormwater Quality Partnership. 2010-2011 Addendum to the Wet Detention Basin Effectiveness Study. Prepared by Larry Walker Associates. September 2011.

July 2018 Stormwater Quality Design Manual was only used in Section 7.2 to provide a “bookend” on the estimated load if complete redevelopment of all urban areas occurred to develop a cost for LID implementation relative to the hypothetical upper end removal. The stated hypothetical condition was then used to estimate a unit mass cost estimate to address the optional cost information requested by the Regional Water Board. The section notes that completed redevelopment is likely not possible because of physical constraints (e.g., soil and groundwater conditions).

The SSQP agrees that additional LID studies that consider methylmercury will be important to better characterize the methylmercury load reduction benefit, and that implementation of stormwater runoff controls will reduce methylmercury loads over time but the overall load reduction can be demonstrated going forward through BMP monitoring rather than reliance on reducing model uncertainty at a watershed scale. In this way the load removed can be characterized directly through representative monitoring.

RECOMMENDED NEXT STEPS

The Independent Scientific Review Panel’s review of the SSQP’s Final Report and other control studies provides a valuable technical resource which future monitoring and assessment planning can consider and implement as necessary and feasible. The Independent Scientific Review Panel importantly concluded

As long as LID controls are moving forward under other regulations, there is probably no reason to implement additional specific BMP controls for MeHg. [page 18]

The SSQP recommends that the Regional Water Board and Delta Science Program take the following actions:

1. The Regional Water Board should find that the SSQP Phase 1 control study is complete and identify any key monitoring or assessment guidance for MS4s to consider in developing future monitoring plans. Further refinement and accuracy of the small loads and load reductions will not provide further benefit to the Phase 1 program.
2. In light of small loads from MS4s and the expected inability to measure changes in downstream fish tissue concentrations due to MS4 load reductions, the Regional Water Board should charge the Advisory Panel to consider the efficacy of BMP-based compliance to meet the TMDL requirement.

The SSQP appreciates the Independent Scientific Review Panel’s technical advice and recommendations. Specific responses and clarifications to the Independent Scientific Review Panel’s comments on the SSQP’s Final Report are provided in **Attachment A**. This input is not comprehensive and only intended to identify key issues and clarifications. We would be glad to meet with the Regional Water Board and Delta Science Program to discuss how we can support the next steps for Phase 2 of the Delta Mercury Control Program.

Thank you for considering our comments. Please contact Dave Tamayo (916-874-8024), County of Sacramento, or Lisa Moretti (916-808-5390), City of Sacramento, with any questions on these comments.

Sincerely,

A handwritten signature in black ink that reads "David Tamayo". The signature is written in a cursive, flowing style.

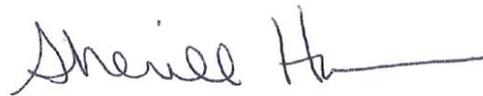
Dave Tamayo signing for:

Dana Booth, P.G

Program Manager – Storm Water Quality

Sacramento County

Department of Water Resources

A handwritten signature in black ink that reads "Sherill Huun". The signature is written in a cursive, flowing style.

Sherill Huun, P.E.

Supervising Engineer

City of Sacramento

Department of Utilities

cc:

Meredith Howard, Central Valley Regional Water Quality Control Board

Jennifer Fuller, Central Valley Regional Water Quality Control Board

Dirk Medema, City of Citrus Heights

Amittoj Thandi, City of Elk Grove

Ryan Neves, City of Folsom

Bill Forrest, City of Galt

Dalia Fadl, City of Rancho Cordova

ATTACHMENT A. SPECIFIC CONTEXTUAL RESPONSE TO INDEPENDENT SCIENTIFIC REVIEW PANEL'S COMMENTS

The following are specific responses to comments from the Independent Scientific Review Panel on the SSQP's report where clarification or more information was appropriate. These responses are intended to support the Advisory Panel and Regional Water Board to demonstrate that no further modifications to the SSQP report are necessary and to support development of Phase 2.

Table 1: Specific responses to Review Panel Comments

Page Number and Comment from Independent Scientific Review Panel	Response from Sacramento Stormwater Quality Partnership
<p>General</p> <p>On several occasions the reviewers suggested the load calculations could be improved and that findings of compliance should be “tempered”.</p>	<p>The SSQP’s methods were improvements to those used in the TMDL staff reports and referenced in Attachment G of the MS4 General Permit. The Regional Water Board’s estimates for the SSQP’s load were based on limited and simple static models of methylmercury concentrations and rational method runoff volumes. Another methodology for load calculations was not provided, however, the SSQP previously submitted to the Regional Water Board an evaluation of methodologies, including the long-standing approach used by the SSQP. Certainly the methods can be improved to reduce error, however, the assessment performed is an improvement over that used by the Regional Water Board as it better accounts for sources of variability. The reviewer also does not consider the difference between point error for a storm load and the wasteload allocation that is based on an annual load.</p> <p>The TMDL also includes a “margin of safety” that is not addressed in the comments relative to compliance assessments and acceptable measurement error.</p>
<p>Page 9</p> <p><i>Given that high quality water flux measurements are as critical as a precise and accurate measurement of mercury concentrations in water samples when calculating loads, Permit Holders should be required to undertake both with equal rigor in order to contribute scientifically-defensible load estimates to guide the TMDL process.</i></p>	<p>The Regional Water Board should provide guidance, data quality objectives, and measurement quality objectives for measuring discharge flow from the hundreds of discharge points in the SSQP’s MS4s that are highly variable based on operation of flood control facilities and the hydraulics of gravity discharge based on downstream river stage. The TMDL wasteload allocation is based on an annual load, and while highly accurate discharge flow measurements are generally more useful, there would be a significant level of effort to maintain measurement equipment and compile high resolution data.</p>

Page Number and Comment from Independent Scientific Review Panel	Response from Sacramento Stormwater Quality Partnership
<p>Page 9</p> <p>This uncertainty could be reduced with continued <i>systematic monitoring of both dissolved and particulate mercury species (see next point).</i></p> <p>Page 9</p> <p>B) <i>The Review Panel is aware that the current TMDL sets target concentrations for methylmercury in unfiltered samples.</i></p>	<p>The SSQP will address these comments in the Monitoring Study Design document. The Control Study monitoring was completed in accordance with the Work Plan.</p>
<p>Page 10</p> <p>The Control Study from the Sacramento Storm Water Quality Partnership concluded that the actual characteristics of the land-use change (in an urban context) was less impactful on methylmercury loads than WHEN the land-use change occurred. This is in contrast with other Control Studies where neither the land- cover characteristics, nor the timing of land-use change, were considered. Given that the land-use of the Delta will not be static over the coming decades, the Review Penal is of the opinion that it is imperative that the land-cover characteristics and development history be considered when ‘case-specific’ Control Studies are being extrapolated to much broader geographic areas with diverse land-uses.</p>	<p>The SSQP stated that in mixed land use monitoring, differences in the type of development (regional basin vs. no treatment or control requirements) is statistically significant. The SSQP did not evaluate specific land use types. The drainages that were monitored were not insignificant in size as all were greater than 400 acres.</p>

Page Number and Comment from Independent Scientific Review Panel	Response from Sacramento Stormwater Quality Partnership
<p>Page 17</p> <p>Only the City Hall study was carried out.</p>	<p>The Control Study was complete according to the Work Plan, which specified that sample collection would not occur if flow was not present. The SSQP monitored Sylvan Center water elevation over a control structure before outflow to the MS4. Only negligible flow was recorded in the two year study and a sample was collected just prior to this outflow. Additional samples were then collected at the primary study site (City Hall - Police Station) such that the samples collected were nearly double those specified in the Work Plan.</p>
<p>Page 18</p> <p>Results of the City Hall study were used to project future MeHg loads, based on the assumption that areas where LID is fully implemented would see 85% load reductions. There are no data to support the idea that results of the City Hall study – which covered just a few acres – are scalable to larger basins; or how the load reductions might change under different hydrologic conditions.</p>	<p>The analysis of compliance does not consider the City Hall Control Study. A hypothetical exercise was performed as a “bookend” assessment of full LID implementation to evaluate the cost and benefit of complete conversion to LID within the urban area. This was not a required part of the Work Plan, but can be useful in evaluating the potential costs and benefits of management actions. This evaluation can be refined when LID studies of methylmercury over time and for a range of conditions provide sufficient data to make more accurate projections.</p>
<p>Page 18</p> <p>As long as LID controls are moving forward under other regulations, there is probably no reason to implement additional specific BMP controls for MeHg. However, continued monitoring of both total Hg and MeHg in SSQP outfalls and receiving waters is critical to evaluating loads to the Delta over time, assuring compliance, and providing information on how LID implementation in the area over time affects MeHg load. Modifications to the current monitoring program could improve the usefulness of the data.</p>	<p>The SSQP agrees that additional controls are not necessary and will consider methylmercury monitoring and assessment strategies as part of the Monitoring Study Design document to improve data usefulness. However, the reviewer’s conclusion does not consider what the “compliance” condition should be. It suggests both BMP compliance and quantitative wasteload allocation compliance but does not demonstrate why a numeric objective that is difficult to measure will benefit downstream water quality.</p>

Page Number and Comment from Independent Scientific Review Panel	Response from Sacramento Stormwater Quality Partnership
<p>Page 19</p> <p>Quantify differences in per acre loading from LID and non-LID sites.</p> <p>a. Significant reduction in MeHg loading after LID installation at City Hall were observed. No reduction data were obtained from the second site in the workplan.</p>	<p>The secondary site (Sylvan Center) had only negligible outflow and was documented with continuous outflow measurement to have 100% removal. However, this scenario was not considered typical for future implementation and was not used in the Final Report to characterize LID removal.</p>
<p>Page 20</p> <p>The high density of LID features meant that off-site stormwater flows almost never occurred. It was not clear why the adjacent non-LID watershed was not sampled to plan.</p>	<p>The off-site stormwater volume in the adjacent non-LID drainage area entering the study area (run-on) and was considered in the Work Plan as site “SV-0” to characterize background loads to the LID swale as a point input (see Work Plan Figure 3 schematic), but that discrete surface inflow to the LID feature rarely occurred.</p> <p>Sample collection within the adjacent non-LID drainage area was not intended in the Work Plan. Additionally, because outflow from the site to the MS4 was negligible any run-on flow could not be paired with corresponding site outflow to calculate removal efficiency. Off-site flow primarily occurred as seepage from the adjacent property over the length of the swale, and a point estimate could not be measured. The grant administer and Regional Water Board were notified of this approach through quarterly event reports.</p>
<p>Page 20</p> <p>Based on the observed drop in concentration, the SSQP estimated an 85% reduction in MeHg stormwater load. They did not provide any estimate of the error around that value, either based on this study, or through comparison with other studies.</p>	<p>The load decreased due to the concentration and flow volume decreases. Detailed summary statistics were provided including measures of variability. A confidence interval around the mean values could be provided if the value were to be used for estimates of loads besides the hypothetical condition.</p>

Page Number and Comment from Independent Scientific Review Panel	Response from Sacramento Stormwater Quality Partnership
<p>Page 20</p> <p>Data from the progress report were downloaded into a spreadsheet for analysis and evaluation as part of our evaluation. Overall, a decline in MeHg concentration between the years was evident, but there were a variety of issues that introduce significant error into the MeHg reduction estimate. For example, although roughly the same number of storm events was sampled each year, the number of total samples collected in year 1 was small overall (~10) and compared to year two (when several types of samplers were compared for certain storm events). Further, each of the three sampling sites was not sampled for each event (it was not clear if they did not flow or if they simply were not sampled). The sample timing (within the wet season) was different between years, with year 1 sampling starting later in the wet season. These sampling biases make the amount of MeHg reduction less certain.</p>	<p>The Control Study was limited in the pre-project period because of grant funding and contracting such that the available wet weather study period before construction was limited to a small number of storm events (Sacramento County rainfall primarily occurs between November and March). While not ideal, the lack of baseline data can be somewhat mitigated by introducing “control” data from other locations that is more extensively available (i.e., other SSQP characterization sites). While not ideal, this was a practical limitation of the approved Work Plan.</p> <p>At the PL-1 monitoring location, automated equipment was installed for sample collection at the constructed flow measurement weir. The other samples were primarily collected as grab samples and could not be collected in some cases because of lack of flow. The Work Plan specifies that samples cannot be collected when flow is not present. Furthermore, the grant-funded project had an upper limit of samples that could be collected and the USGS Menlo Park laboratory in some cases did not have capacity for sample analysis. The project was adaptively managed according to the Work Plan and in communication with the grant manager with notification to the Regional Water Board.</p>

Page Number and Comment from Independent Scientific Review Panel	Response from Sacramento Stormwater Quality Partnership
<p>Page 21</p> <p>Unfortunately, TSS was not collected at every sampling point; nor was turbidity measured routinely, or any correlation examined between TSS and turbidity.</p>	<p>TSS was collected at every City Hall Police Station location. Unfortunately, there was not sufficient sample volume for collection of the microsamples (aliquots taken over longer duration) using automated equipment to develop more representative event mean concentrations (EMCs). Microsampling was not part of the Work Plan, but included to support the grant goal of evaluating different sample collection techniques.</p> <p>TSS, turbidity, and SSC were collected for all site EMCs when there was sufficient sample volume, which occurred nineteen times. There were 26 turbidity measurements collected, not including more than 250,000 records (>8,000 with flow) of one-minute sensor data at PL-1 which includes a turbidity sensor.</p> <p>Turbidity and TSS relationship were not significant and were not presented. Figure 2 and Figure 3 of the Final Report evaluated SSC correlations with methylmercury at the SSQP urban runoff and urban tributary characterization sites that are not within the Work Plan study area, but are representative of typical SSQP development.</p> <p>Fluorescent Dissolved Organic Matter (FDOM) was also measured by a continuous sensor and evaluated as a surrogate for methylmercury (Final Report Attachment A. Figure 14).</p> <p>The Work Plan did not include assessments of TSS and turbidity relationships with methylmercury. However, this relationship will be evaluated further in the Monitoring Study Design.</p>

Page Number and Comment from Independent Scientific Review Panel	Response from Sacramento Stormwater Quality Partnership
<p>Page 21</p> <p>While these issues do not invalidate the finding of Hg and MeHg reduction through LID, it does mean that the finding of “85% reduction in MeHg concentration” should be viewed with appropriate associated error when extrapolated to the entire watershed.</p>	<p>Use of the 85% reduction in Section 7.2 is a hypothetical bookend condition to evaluate potential upper end costs and benefits. The Final Report specifies that this is not a feasible condition and is adequately tempered. Findings of compliance do not use this 85% reduction estimate.</p>
<p>Page 21</p> <p>In comparing all the samples taken at each site for each event, this yielded an average relative percent difference of roughly 40% for MeHg for each sampling event. This evaluation of the spread of the data is critical to constructing models for stormwater reduction and should be explicitly built into the reporting and models in this report.</p>	<p>At the low reporting limits used and concentrations observed, relative percent differences can be sensitive to small absolute changes. While we agree that stormwater runoff can be variable, the SSQP does construct a model (for the characterization sites) to identify significant factors that cause the observed variability. We agree that such a model would be useful in understanding LID systems, but such an evaluation was not part of the Work Plan.</p>
<p>Page 22.</p> <p><i>Potential environmental effects of control methods evaluated.</i></p> <p>The TAC requested that the report include this, but we did not see any discussion of this.</p>	<p>Page 40 of the Final Report includes the section titled “<i>Potential Environmental Effects of Methylmercury Control Methods</i>”.</p>
<p>Page 22</p> <p>The MeHg data for City Hall were not normally distributed but had apparently been evaluated in the report as if they were.</p>	<p>The Grant Study report states that the Year 1 and Year 2 data were compared using a Mann-Whitney test, which is a non-parametric evaluation (e.g., Table 7 of Progress Report). Moreover, Appendix D of the Final Report specifies the lognormal transformation used for the statistical modeling.</p>

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<p>Page 22</p> <p>The report states (p.17) that the City Hall LID study demonstrated a decrease in runoff coefficient from 0.71 (based on modeling) to 0.45 (measured). More data is necessary to support this for the LID study. We evaluated the discharge and precipitation data provided for PL2 (the only site with sufficient discharge data to do so) and found no significant difference in the discharge vs rain curve between years using ANCOVA.</p>	<p>It is not clear if the ANCOVA performed by the reviewer considered the change in area between the pre-project and post-project areas. While the change might not be statistically significant, the increase in impervious area appears to be mitigated by LID measures. As stated in the Final Report, the project removed pervious area and replaced it with <i>pervious</i> and impervious pavement. The PL-2 drainage increased impervious pavement area and a finding of no change is consistent with the Final Report for that drainage where only 25% of the area was treated by one rain garden. Because the project developed a significant area of undeveloped pervious area and did not remove a large section of existing impervious pavement (in PL-2), a statistically significant flow reduction was not necessarily anticipated at PL-2 and the reviewer’s finding is consistent with the Final Report where very modest flow volume reductions were observed for PL-2.</p>
<p>Page 25</p> <p>Figure 3 showed the relationship between MeHg and TSS, suggesting that a large fraction of MeHg in stormwater is particulate. Otherwise, I was not sure what these data were used for.</p>	<p>is the data was provided here to show the relationship as a possible control mechanism and to explain the benefit of regional basins that remove solids: “Data collected by the Partnership for urban runoff and urban tributary receiving waters is shown in Figure 3. The possible lower limits of methylmercury concentrations in urban runoff and urban tributaries based on suspended sediment concentrations are demonstrated in Figure 3.”</p>

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<p>Page 25</p> <p>The table captions for data tables in Appendix C should provide more information - period of collection, methods used, criteria for sample collection, etc.</p>	<p>The data tables follow the date ranges shown in the figures preceding figures (1996-2018), however, individual descriptions of each program are provided in other documents submitted to the Regional Water Board and would require more than table entries to describe the requested details. This information can be provided again upon request.</p>
<p>Page 25</p> <p>The Final Report concluded that stormwater MeHg concentrations are lower in more recently developed parts of the regulated area, but otherwise the same across mixed land use categories. This finding is based on differences in average MeHg concentration between just one urban stormwater monitoring station (North Natomas) in a more recently developed area (post 1996 development), compared to two monitoring sites draining older areas of the city (Fig. 4). The report did not present any analysis of other factors that might have influenced differences in MeHg among these three sites/drainages. Supporting information for this conclusion is apparently in the 2013 ROWD but we could not find the appendices with the detail of the analysis online. Section 6.2 of the Final Report refers to a stepwise ANOVA that was performed to separate effects of other factors, like rainfall amount and duration, and antecedent conditions, but this analysis did not include land use as far as we were able to ascertain.</p>	<p>All of the SSQP characterization sample collection is for “mixed land uses”. The SSQP conclusion is that features such as wet detention basins discharge statistically significantly lower concentrations than untreated discharge from areas where these treatments are not present because they were not required prior to 1996.</p>

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<p>Page 25</p> <p>Could the North Natomas collection on the outflow of a detention pond be the cause of lower particulate Hg and MeHg at that site, rather than the LID features of newer development in the drainage? <i>Therefore, the data and analysis presented are not sufficient to support the conclusion that stormwater MeHg concentrations are lower in areas of post-1996 development.</i> The conclusion that MeHg concentrations are lower in North Natomas than the other two urban runoff sites is supported by the data presented, but the conclusion that this is due to differences in development age is not. Perhaps the supporting data are in other documents, but this report should provide enough information for the reader to assess the finding.</p>	<p>The SSQP agrees that the North Natomas wet detention basin results in lower particulate mercury and methylmercury concentrations. This is one of the reasons such required features before discharge benefit receiving waters. Presence of these basins are a function of development age as a result of the 1996 era requirements.</p>

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<p>Page 26</p> <p>We agree with the sentiment that the number of sample sites and frequency of sampling for Hg/MeHg has not been sufficient to evaluate the impact of land use or specific BMPs. But stopping monitoring is not the answer.</p> <p>Page 26</p> <p>In DMCP TAC Progress Report Comments, they asked for an evaluation of multiple/alternative methods of monitoring for estimating loads, including ways to improve load calculations. We also think it would be worthwhile to revisit the monitoring strategy.</p>	<p>The SSQP suggests that monitoring and assessment programs be focused on the effectiveness of management actions to benefit downstream fish tissue concentration rather than ongoing characterization of small loads. The SSQP was not suggesting cessation of all methylmercury monitoring, but rather than based on magnitude of the loads, regional monitoring will not be able to demonstrate effectiveness of specific BMPs. Therefore, SSQP agree that multiple/alternative methods of monitoring will be necessary and agree with the commenters that “since the contribution of the SSQP to the entire Delta MeHg load is tiny, the cost-effectiveness of new studies directed specifically at MeHg load reduction”. Some of the reviewer’s recommendations will be helpful in this effort improve the usefulness of the data for evaluating loads to the Delta over time in a cost-effective approach.</p>
<p>Page 27</p> <p>This report updates that modeling to predict future loads, using the results of the LID study.</p>	<p>The Final Report does not predict future loads. Because compliance was determined under the existing conditions, the intent of Section 7.2 was to provide a hypothetical bookend estimate of the benefit of LID implementation to demonstrate ongoing benefit of the new requirements.</p>

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<p>The median MeHg concentrations at the urban runoff monitoring site with the highest concentration was 0.49 ng/L compared to 0.14 from Natomas. In the worst case scenario, if 0.49 ng/L was applied to new development areas, the MeHg load from those areas would be 3.5X higher; resulting in a 50% increase in load estimate for the entire regulated area.</p>	<p>It is not clear if the reviewer is using the new development area within the Delta or the new development area in the County as a whole. While we understand the broader point that extrapolating one study to a broader area also magnifies the error in load, this demonstrates why the SSQP used the pilot to demonstrate that LID would reduce methylmercury loads over time but did not use the concentration data of one site to extrapolate across the watershed. Rather, the larger dataset was used to show that the SSQP effectively meet the load requirements and LID will continue to reduce the load going forward.</p> <p>Regional basins, such as the Natomas Basin implemented as the post-1996 stormwater features treat a larger watershed. The 0.49 ng/L would not be representative for watersheds that have regional basins. The discharge from the regional basins are considered a compliance point.</p>

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<p>Page 28</p> <p>The City Hall parking lot study was used to predict concentrations in areas of future development/redevelopment to LID standards. Please see concerns above about the error associated with that estimate, and the ability to scale the MeHg reduction up from a very small test area. Page 28</p> <p>However, this approach did not consider the errors associated with MeHg concentration values based on current and future land use, which could be significant.</p> <p>Page 29</p> <p>We think that it is unlikely that applying the results of the City Hall study to larger drainage areas is appropriate, as MeHg yields may not scale with watershed size.</p> <p>Page 29</p> <p>It seems unreasonable to assume that LID implementation will have a significant effect on MeHg load by 2030. However, what implementation does occur should tend to decrease MeHg loads unless implementation includes construction of features that generate anaerobic soils.</p>	<p>We agree that scaling one small area LID study to a much larger area will amplify the error in mass load, which is further problematic because of the difficulty measuring small loads over large areas with hundreds of outfalls and intermittent flows. These were constraints that were based on guidance from the TAC to focus on a Control Study with specific testable hypothesis. The approved Work Plan did not require wider modeling or studies, as the TAC specifically rejected the SSQP's initial request to perform a broader study.</p> <p>Moreover, the LID results were only scaled to evaluate a hypothetical case to develop a cost for LID implementation relative to hypothetical upper end removal. The objective of the hypothetical exercise was to determine the upper limit of load removed with extensive LID implementation. Even with the upper limit reduction, the effect on fish tissue concentrations has not been shown to be measurable.</p> <p>The hypothetical exercise was also performed to estimate the potential benefit of a BMP-based compliance. In this way the SSQP could comply with TMDL requirements through implementation of LID development standards and track benefits with monitoring.</p>
<p>Page 28</p> <p>It does not appear that any sensitivity analysis was performed on model parameters.</p>	<p>Sensitivity analysis was not presented, but has been performed for the model factors.</p>

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<p>Page 29</p> <p>... the modified rational method is actually used for this, which is not a mechanistic hydrological model. In fact, this is the simplest of possible hydrological models.</p> <p>Page 29</p> <p>Though some caveats were given, model verification generally was quite poor and in the case of the somewhat smaller drainage areas, directionally biased.</p>	<p>While we agree that the hydrologic modeling can be improved, the performance of the model does consider event factors, including depression volumes and year-to-year rainfall variability. The TMDL is based on a much coarser assumption of annual rainfall for one year and land use coefficients based on pre-1996 land uses and, the approach should be sufficient for the Phase 1 averaging periods and areas.</p>