CDM Smith

Memorandum

To: *Alice Yeh, EPA Region 2*
Elizabeth Franklin, USACE

Cc: *Jennifer LaPoma, EPA Region 2*
AmyMarie AccardiDey, Louis Berger Group

From: *David A. Marabello and Scott Kirchner, CDM Smith*

Date: *May 6, 2016*

Subject: *CDM Smith Review of Tierra's revised: CSO/SWO Phase I Data Quality Usability Assessment Report, Evaluation/Recommendation Report, and Total TCDD Verification Memorandum*
Lower Passaic River Study Area

At the request of the United States Environmental Protection Agency (EPA) and the United States Army Corps of Engineers (USACE), CDM Federal Programs Corporation (CDM Smith) reviewed the following revised Combined Sewer Overflow (CSO)/Stormwater Outfall (SWO) Phase I reports:

- Phase 1 Data Quality Usability Assessment Report, dated March 2016, Revision 1 and prepared by Environmental Data Services, Ltd. for Tierra Solutions, Inc. (Tierra) on behalf of Occidental Chemical Corporation for the Lower Passaic River Restoration Project.
- Phase 1Evaluation/Recommendation Report, dated April 2016, Revision 1, and prepared by Tierra on behalf of Occidental Chemical Corporation for the Lower Passaic River Restoration Project.
- Total Tetrachlorinated Dibenzo-*p*-dioxin (TCDD) Verification Memorandum, Revision 1, dated March 30, 2016 and prepared by Environmental Data Services, Ltd. for Tierra on behalf of Occidental Chemical Corporation for the Lower Passaic River Restoration Project.

The revisions made to the documents listed above are generally acceptable. However, there are approximately eight revisions that need editing or clarification. These are listed in red text on the attached comment review matrix under the column heading "Revised Report Review (5/6/2016)".

August 2014 – Phase I Data Quality Usability Assessment Report for CSO/SWO Investigation

No.	PDF Page	Section	Comment	Tierra Response	CDM Smith Response	Revised Report Review (5/6/2016)	Tierra Response (06/23/2016)
Comments pertaining to Phase I Data Quality Usability Assessment Report for CSO/SWO Investigation							
1		3.4	**1a.** The second to the last statement at the bottom of the page that indicated the use of "x" designation for the table that follows appears to be referenced in error. The tables that follow the paragraph did not use any "x" designation to identify issues concerning sensitivity. Please revise sentence. **1b.** The tables also show that there are few analytical groups that have a high percentage of results that did not meet the data quality objectives of meeting the PQLs outlined in the QAPP. It is not clear if this affected the usability of the data for decision-making. Please clarify.	**1a.** Tierra will revise Section 3.4 of the Phase I Data Quality Usability Assessment Report for the CSO/SWO Investigation (DQUAR) to remove the last three sentences from the last paragraph on page 6 of the report. **1b.** The tables located in Section 3.4 provide a summary of those data that fell short of meeting the project quantitation limits (PQLs) outlined in the QAPP as a data quality objective. The tables are organized by sample type (whole water, particulate, and dissolved), sample collection method (whole water, low solids mass, and high solids mass), and analytical group. The commenter's observation is correct in that there are a few instances where a particular sample type and/or sample collection method exhibited a relatively high percentage of results that did not meet the established PQLs for specific analytical groups. These exceptions did not influence the usability of the affected results. Since the sample results were not rejected during data validation on the basis of these exceptions, the anomaly did not prevent those results from being considered in the data evaluation process. Therefore, the impacted results were used for decision-making. However, the fact that data obtained for a particular sample type/collection technique failed to meet established PQLs for specific analytical groups may have had an impact on the number of positive results identified in those same categories.	**1a.** It is not necessary to remove the last three sentences on page 6, only the sentence regarding the "x" designation. **1b.** Since failure to meet the established PQLs may have impacted the number of positive results for a given sample collection method and analytical group, this could have affected the selection of a recommended sample collection method for each analytical group during Steps 3 and 4 of the Phase I evaluation process, as outlined in the Phase I Evaluation/Recommendation Report. Please revise this section to include discussion of the analytical groups for which failure to meet the PQLs might have impacted this evaluation. This discussion should be carried over to the relevant sections of the Phase I Evaluation/Recommendation Report as well.	**1a.** Revisions are acceptable. **1b.** Revisions were incorporated, but "percent of results" should be rounded to two significant figures.	"Percent of Results" column in all tables in section 3.4 were rounded to two significant figures.
2		3.7	(Completeness) needs an accounting of samples and analyses planned in the QAPP versus actual samples collected and analyses performed.	Tierra will revise Section 3.7 of the DQUAR to include a table detailing the samples and analyses planned in the QAPP versus actual samples collected and analyses performed.	The response is acceptable.	Revisions are acceptable. The table added to page 19 addresses the comment on "field completeness by analysis and number of number of samples." The table on the bottom of page 19 (original table) should be deleted because the added tables on page 20-22 show completeness by "analysis and sample type."	Agreed. The original table was deleted.

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3		4.1.2	For section 4.1.2 and even numbered sections that follow, it would be helpful if the major issues also include identifying what results/analytes are affected.	Tierra will revise the DQUAR to include itemized details identifying specific samples and results impacted by major data quality issues.	The response is acceptable.	Revisions are acceptable. However, Tierra should review text for accuracy. For example, TSS text says that "four minor data quality issues were identified" but the table only has one row. Please check text and tables for consistency.	Tierra reviewed tables, and text for accuracy, and made revisions accordingly. The tables, and text are now consistent throughout section.

No.	PDF Page	Section	Comment	Tierra Response	CDM Smith Response	Revised Report Review (5/6/2016)	Tierra Response (06/23/2016)
Comments Pertaining to Combined Sewer Overflow/Stormwater Outfall Investigation Phase I Evaluation/Recommendation Report Revision 0, October 2014 (report)							
1	General	General	**1a.** For the LSM particulates, did the smaller than anticipated sample size resulted in more of the COCs being reported as non-detected when compared to the HSM particulates samples? **1b.** Can some adjustments be made on the sample collection methods to account for low TSS in order to be able to generate a larger sample size for the LSM particulate samples?	**1a.** Since sample size has a direct impact on the achievable analytical sensitivity for a given analyte, Tierra Solutions, Inc. (Tierra) agrees that it is logical to link the smaller than anticipated sample size obtained for low-solids mass (LSM) particulates to the larger number of non-detected results observed for many of the chemicals of concern (COCs) as a direct cause and effect. This is especially true for the hydrophobic constituents, which are associated in large part with the particulate, rather than the dissolved-phase of the combined sewer overflow (CSO) overflow. This is a limitation of the LSM sample collection method. Even if the anticipated LSM particulate sample size had been collected, the mass of particulates obtained would have been approximately 10 to 100 times less than the high-solids mass (HSM) particulate sample mass. Therefore, it is unclear whether the targeted LSM particulate sample size would have produced a greater number of positive results for COCs when compared to the HSM particulate samples. **1b.** One possible adjustment to the LSM sample collection protocol would be to increase the volume of bulk whole water CSO effluent processed to obtain the LSM particulate and dissolved-phase samples, thereby creating a larger LSM particulate sample size when total suspended solids (TSS) are low. There are two negative aspects to this adjustment however: • First, the TSS concentration in the whole water CSO effluent is not known *a priori*. Rather, it is determined at the laboratory following sample collection. Therefore, additional bulk liquid sample would need to be collected during each overflow as contingency volume. The need for processing the contingency volume would be determined later once TSS results became available. This would result in the need for increased bulk sample collection time, increased sample shipping capacity, and longer filtration time during LSM sample separation. • Second, TSS is a variable physical characteristic of the CSO effluent at the time of discharge. Therefore, as experienced during Phase I of the CSO/stormwater outfall (SWO) program, estimates of the bulk CSO effluent and contingency volumes needed to achieve a given LSM particulate sample size based on expected CSO effluent TSS concentrations are imprecise. This was demonstrated repeatedly during implementation of Phase I of the CSO/SWO program, during which, based upon historical data, TSS was expected to be 150 milligrams per liter (mg/L), on average, at the Clay Street location. Targeted LSM bulk effluent sample volumes were calculated based on historical TSS data. Actual TSS measurements during Phase I implementation at Clay Street were significantly lower and variable, ranging from 71.7 mg/L to 6.8 mg/L. Therefore, modification to the LSM sample collection method to increase the bulk liquid sample volume processed as TSS concentrations decline, does not guarantee that the LSM particulate sample size collected will be sufficient to achieve targeted project quantitation limits. Another approach, but requiring additional consideration and investigation, is to monitor TSS in real time using a turbidimeter to inform the volume of water that needs to be processed.	**1a.** Similar discussion should be added to the text of the report for clarity. **1b.** The response is acceptable. The possibility of implementing real-time TSS monitoring using a turbidimeter should be further evaluated and can be discussed at the upcoming meeting.	**1a.** Revisions are acceptable. **1b.** Revisions are acceptable.	

2	General	General	**2a.** There were hits reported for the field blanks. What was the effect of the field blank results in reducing the number of analytes being reported after validation process? **2b.** Did this in turn affect the evaluation process that was used? **2c.** Did the field and/or decontamination operations contribute to the field blank results?	**2a.** During the data validation process, positive sample results associated with contaminants identified in a field blank were assessed per U.S. Environmental Protection Agency (USEPA) Region 2 validation guidance. Positive sample results that fell within the affected concentration range as defined in the CSO/SWO Investigation Quality Assurance Project Plan, Revision 3 (QAPP; Tierra 2013) and applicable USEPA Region 2 validation guidance were qualified "U" (not detected). The number of positive sample results qualified as "U" based on field blank contamination is shown in the attached chart. **2b.** In some cases, identified field blank contamination did lead to the qualification of otherwise positive sample results (as indicated in the attached chart), as "U" (not detected). Therefore, this anomaly did have an impact on the data evaluation process because the positive results affected by field blank contamination were considered to be "not detected" during the data evaluation process. **2c.** The decontamination and/or sample collection equipment handling and storage operations may have contributed to the positive field blank results, however, it is not possible to precisely identify the source of contamination.	**2a.** Discussion of the field blank results and affected sample results, including the attached table, should be added to the report. In the table, please clarify whether "Percent of Results Affected" refers to the percent of the total results or the percent of results for the affected samples. In addition, please specify which Region 2 validation guidance was used and add a reference to this guidance in the report. **2b.** This information should be added to the report with the discussion of the field blank results. **2c.** Please clarify whether all applicable decontamination procedures were followed at all times, or if there were any noted exceptions to the decontamination procedures.	**2a.** Revisions are acceptable. **2b.** Revisions are acceptable. **2c.** Revisions are acceptable.	
3	General	General	From the detailed evaluation sheets provided in the appendices, the LSM particulate results appear to be reporting higher contaminant concentrations when compared to the HSM particulate results for hydrophobic contaminants such as PCDD/PCDF, PCB congener and organochlorine pesticides. Although sample heterogeneity could account for part of the results, it is not clear if different particle sizes from the two sample collection methods contributed to the results. Comparing the HSM dissolved to the LSM dissolved, it appears to be that the LSM dissolved samples reported lower concentrations versus the HSM dissolved samples.	The comparison of particulate and dissolved-phase sample concentrations for LSM versus HSM was not part of the data evaluation specified in the QAPP and, therefore, was not performed as part of the Phase I reporting. However, based on this comment, Tierra reviewed the results from the LSM and HSM side-by-side datasets in terms of concentration for the hydrophobic analyte groups mentioned, and noted, in some instances, trends similar to those observed by the commenter. Based on this preliminary review of the side-by-side concentration datasets, Tierra believes there is merit in taking a closer look at this aspect of the results as we prepare for Phase II of the CSO/SWO program. Tierra will further evaluate the Phase I concentration data and will be prepared to discuss the findings and observations with USEPA when we meet.	In addition to presenting this information at the upcoming meeting, a detailed comparison of the LSM and HSM results should be added to the text of the report or compiled as an addendum to the report.	Revisions are acceptable.	

4	General	General	Page numbers in Sections 2, 3, and 5 are wrong. They begin as page 1-1 in Sections 2 and 3 and as 4-1 in Section 5. These erroneous page numbers are also reflected in the table of contents. Please correct the page numbers in the text and table of contents. The correct page numbers are used for identification of the specific comments below.	The page numbers will be corrected in the Table of Contents and report text.	The response is acceptable.	Revisions are acceptable.	
5	General	General	To better facilitate sample identification and cross-checking to event/attempt, please add the sample identification suffix for each event/attempt (e.g. for Event 1, Attempt 1: PRICSOCLY**-01A) to the tables in Appendices A through J and Table 2-1, *Summary of Samples Collected and Analyzed*. In Table 2-1, a "Sample Identification" column can be added, and in the tables in the appendices, a sample identification line can be added under the event description in the header.	Edits to the table and appendices will be made to include the sample identification suffix for each event/attempt as suggested.	The response is acceptable.	Revisions are acceptable. Table 2-1 Select appendices updated with Sample ID where appropriate	
6		Page ii, Table of Contents	Please include page numbers for the tables in the table of contents since they are incorporated into the body of the document.	Page numbers for the tables will be included in the Table of Contents.	The response is acceptable.	Revisions are acceptable.	
7		Pages iv through v, Acronyms and Abbreviations	Please correct the following errors: • COPC and COPEC are defined differently in the text than in the list of acronyms and abbreviations ("contaminant" rather than "constituent"). • PVSC is not defined in the text, and the last word should be "Commission", not "Commissioners". • "Phase I Report" and "POTW" are not in alphabetical order in the list of acronyms and abbreviations. • "Publicly" is spelled incorrectly ("publically") in the definition of POTW in the text.	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	

8		Page 1-1, Section 1, fourth paragraph, first sentence	Please include an in-text citation for the USEPA Combined Sewer Overflow/ Stormwater Overflow Sampling and Analytical Plan, i.e. "(USEPA 2008)".	The citation will be added to the text as suggested.	The response is acceptable.	Revisions are acceptable.	
9		Page 2-4, Table 2-1	Please make the following revisions to the table: • **9a.** Please link footnote 2 to both events/attempts during which the grab samples were collected. Currently, the footnote is only linked to Event 2, Attempt 2. • **9b.** Please add some explanation of how Events/Attempts were defined. For example, it is not intuitive that Event 1, Attempt 3 is part of Event 1 since it occurred after both Event 2 attempts.	**9a.** Edits to the footnotes in Table 2-1 will be made as suggested. **9b.** The following footnote will be added to provide the requested clarification: "Phase I sampling consisted of two sampling events, which consist of collecting sufficient sample volume (primary and contingency), using three sampling approaches, to conduct all required analyses. Multiple attempts or mobilizations were needed to collect sufficient sample to complete an event." Note, PCDD/PCDF and PCB congeners were collected during Event 1, Attempt 3 to replace the results obtained during Event 1, Attempt 1. During Attempt 1, the "fine" and "non-fine paper like" material from the HSM Particulate sampling was not combined and homogenized and only the "fine" material was analyzed. As a result of discussions with USEPA after Event 1, Attempt 1, it was determined that the two matrix types (fines/non-fines) would be combined, homogenized and analyzed moving forward in Event 1, Attempt 2. In order to be consistent with the rest of the sampling attempts, additional sample was collected for PCDD/PCDFs and PCB congeners analysis (Event 1, Attempt 3). The results of Event 1, Attempt 3 replaced those from Attempt 1 of Event 1. Therefore, Event 1 was completed in two attempts (Event 1, Attempt 2 and Event 1, Attempt 3). In addition. the following laboratory issues were identified during review of the Event 1 data for chlorinated herbicides collected during Event 1: • Extremely high surrogate standard recoveries • Laboratory method blank contamination • Unacceptable target analyte recovery in Laboratory Control Sample (LCS). Since Tierra was collecting PCDD/PCDFs in Attempt 3, Tierra obtained USEPA approval to collect an additional set of herbicide samples during Event 1, Attempt 3. Therefore chlorinated herbicides were added to the list of constituents being analyzed in Event 1, Attempt 3.	**9a.** The response is acceptable. **9b.** The footnote provided in the response does not address the potential confusion arising from the fact that Event 1, Attempt 3 occurred after both Event 2 attempts. The footnote should include the note that "PCDD/PCDF and PCB congeners were collected during Event 1, Attempt 3 to replace the results obtained during Event 1, Attempt 1" and should clarify why these results needed to be replaced.	**9a.** Revisions are acceptable. **9b.** Revisions are acceptable.	

10		Page 2-5, Section 2.4	Please correct the following errors in this paragraph: • In the third sentence, the "I" should be "in"; the word "and" before "…but dedicated…" should be deleted; and the "i.e." in the first set of parentheses should be "e.g." ("i.e." implies that the decontamination described was only performed between Attempts #1 and #2 of Event #1). • The last sentence needs to be clarified. The word "However" at the beginning of the sentence does not appear to serve any purpose. It is also unclear whether the "gross cleaning" described is in addition to the decontamination described in the preceding sentence, or if it is the same thing. If these two sentences describe the same decontamination process, please combine and simplify the sentences. If the "gross cleaning" is a different process than what is described in the preceding sentence, please state whether this process is defined in the QAPP.	Section 2.4 will be revised to address the errors. The text will be modified as follows to address the comments: "Between sampling events, full decontamination procedures were followed in accordance with Section 2.2.2 of Standard Operating Procedure (SOP) No. 6: Decontamination. Field sampling equipment designated for non- trace metals (i.e., CFC bowl, CFC bowl Teflon® liner, CFC components, stainless steel fittings, and stainless steel tools used for HSM particulate sample collection) was decontaminated prior to the first sampling attempt for each event. Dedicated sampling equipment (CFC bowl Teflon® liner, Teflon® tank liners and Teflon® tubing) was replaced with new dedicated sampling equipment between events. Between sampling attempts (e.g., between Attempts #1 and #2 of Event #1), non-dedicated sampling equipment used for HSM particulate sample collection (e.g., CFC bowl, CFC bowl Teflon® liner, CFC components, stainless steel bowls and spoons) was fully decontaminated in accordance with Section 2.2.3 of SOP No. 6. Note that the stainless steel fittings associated with the sampling system prior to entry into the CFC bowl were not fully decontaminated (due to access/removal limitation), but a "gross cleaning" procedure was followed as per SOP No. 6 by circulating deionized water through the system. Dedicated sampling equipment (Teflon® tank liners and Teflon® tubing) was not replaced between sampling attempts (unless damaged)."	The response is acceptable; however, references to the QAPP should be retained in the revised text.	Revisions are acceptable.	

11		Page 3-1, Table 3-1	Please clarify the following inconsistencies in the table: • **11a.** Table 3-1 indicates that samples were not collected for cyanide or TEPH analysis using LSM; however, Table 2-1 shows that such samples were collected during Event 1, Attempt 2 and Event 2, Attempt 2. • **11b.** Table 3-1 indicates that samples were not collected for VOC analysis using LSM; however, Table 2-1 shows that such samples were collected during Event 1, Attempt 2 and Event 2, Attempt 1. • **11c.** Table 3-1 indicates that samples were not collected for POC analysis using HSM; however, Table 2-1 shows that such samples were collected during Event 2, Attempt 2. • **11d.** Please list the sampling methods in the same order as Table 2-1 for consistency (i.e. HSM, then LSM, then whole water). • **11e.** Please add a footnote to clarify what the Xs and dashes mean and ensure that there are no blank cells in the table.	**11a.** Samples for cyanide and total extractable petroleum hydrocarbon (TEPH) analyses were not collected using the LSM method during Event 1, Attempt 2 or Event 2, Attempt 2. Tierra will revise Table 2-1 to reflect this. **11b.** Samples for volatile organic compound (VOC) analysis were not collected using the LSM method during Event 1, Attempt 2 or Event 2, Attempt 1. Tierra will revise Table 2-1 to reflect this. **11c.** Samples for particulate organic carbon analysis were not collected using the HSM method during Event 2, Attempt 2. Tierra will revise Table 2-1 to reflect this. **11d.** Tierra will revise Table 3-1 to be consistent with Table 2-1. Columns for whole water and HSM will be transposed to be consistent with the order presented in Table 2-1. **11e.** Tierra will add footnotes to Table 3-1 to define the Xs and dashes and correct any blank cells. "X" will denote the analytical sampling method that was preformed and "-"will denote the analytical sample method that was not preformed.	**11a.** The response is acceptable. **11b.** The response is acceptable. **11c.** The response is acceptable. **11d.** The response is acceptable. **11e.** The response is acceptable.	**11a.** Revisions are acceptable. **11b.** Revisions are acceptable. **11c.** Revisions are acceptable. **11d.** Revisions are acceptable. **11e.** Revisions are acceptable.	

12		Page 3-2, third and fourth bullets and last paragraph	For steps 3 and 4, please clarify how the preferred sample collection method was determined if more than one method produced greater than 10% positive results for a given analytical group. In addition, please clarify what "greater than 10% positive results" means. For example, for step 3, would a sampling method need to demonstrate 10% detections for all COPCs/COPECs in that analyte group, or only some of them? How would two different sampling methods be compared if they both had 10% detections for some, but not all, COPCs in that analyte group? It would be helpful to include a table somewhere in this document listing the COPCs/COPECs in each analyte group. For step 4, please clarify that this step was only applicable if a preferred sample collection method could not be determined based on step 3. In addition, please remove the words "of the" before "positive results" since this gives the sentence a different meaning than "10% positive results". This correction also applies to the first sentence after the bullets.	Tierra recognizes that, as written, the referenced text does not clearly describe steps 3 and 4 of the data evaluation process. The third and fourth bullets will be revised as follows: • "Step 3 – Frequency of detections of COPCs/COPECs: If, for a given analytical group, one sample collection method produced greater than 10% more positive results (detections) than another method for analytes identified as COPCs, then that sample collection method was identified as the preferred sample collection method for that particular analytical group. • Step 4 – Frequency of detections of all analytes: If for a given analytical group, one sample collection method produced greater than 10% more positive results (detections) than another method, then that sample collection method was identified as the preferred sample collection method, for that particular analytical group. Note Step 4 of the evaluation process was completed only in cases where a preferred sample collection method could not be determined based on Step 3." The last paragraph on page 3-2 will be revised as follows: "If for a given analytical group, no sample collection method produced greater than 10% more positive results (detections) than another, the preferred sample collection method for that analytical group was identified as inconclusive."	The response is acceptable; however, the revised text should clarify that the preferred method would need to produce greater than 10% more positive results than "all other methods," not just "another method."	Revision not fully implemented. Tierra needs to add the words "all other methods".	Revisions incorporated to Section 3 of the Phase I Report (Rev 2). Revised steps 3 and 4 to include "all other methods" and delete "another method". Made similar edits to last paragraph on page 3-2.

13		Page 3-3, Phase I Evaluation Process flow chart	**13a.** As presented, the flow chart serves to muddy rather than clarify the evaluation process. Please clarify that the first two boxes were applied to each analyte group separately (e.g., by adding text such as "for this analyte group" at the end of the sentences; alternatively, add a subheading to the flow chart or a footnote below the flow chart specifying that this process was carried out for each analyte group using each sampling method). **13b.** Please delete the word "One" at the beginning of the text in the third and fourth boxes since this evaluation was only completed for one sample collection method at a time. The third and fourth boxes also suffer from the same ambiguity identified in the third and fourth bullets on the previous page. Please clarify what it means for a given sample collection method to attain "≥ 10% positive results". Please also note and correct the inconsistency that the flow chart specifies greater than or equal to 10%, whereas the description on the previous page reads "greater than 10%". **13c.** Finally, as noted on the previous page, please clarify what the process was if, based on this flow chart, more than one preferred sample collection method was ascertained for a given analyte group.	**13a.** Tierra will provide the following text as a footnote below the Phase I Evaluation Process flow chart: "Steps 1 and 2 were carried out individually for each analytical group, for each sampling method, and for each sampling event and attempt." **13b.** Tierra recognizes that the text in flowchart boxes 3 and 4 does not clearly or accurately describe steps 3 or 4 of the data evaluation process. Tierra will revise the text in flow chart box numbers 3 and 4 to reflect the modified text proposed in Tierra's response to USEPA comment #12, which is indeed the process as it was carried out. **13c.** Tierra will add a footnote to clarify under what circumstances the evaluation was inconclusive. The footnote will contain the revised text proposed in response to USEPA comment #12: "If for a given analytical group, no sample collection method produced greater than 10% more positive results (detects) than another, the preferred sample collection method for that analytical group was identified as inconclusive." **13d.** Tierra will remove the red underlines from boxes 3 and 4 of the flow chart and correct the spelling of the word "analytes" as requested.	**13a.** The response is acceptable. **13b.** The response is acceptable. **13c.** The response is acceptable. **13d.** The response is acceptable.	**13a.** Revisions are acceptable. **13b.** Revision not fully implemented. (1) Tierra needs to add the words "all other methods" (2) Comment reference Box 3 and Box 4 as well as Step 1 and Step 2. The figure is not labeled. (3) The flow chart specifies "…greater than or equal to 10%..." yet the description on the previous page reads "greater than 10%..." Please reconcile this inconsistency. **13c.** Revisions are acceptable. **13d.** Revisions are acceptable.	**13b.** Revisions incorporated as recommended **(1)** Added "all other methods" to steps 3 and 4 in the flowchart and Note # 2. **(2)** Added "Flow Chart" to identify the data evaluation process flowchart/figure. **(3)** Revised steps 3 and 4 in the flowchart to be consistent with steps 3 and 4 on page 3-2 and states "greater than 10% more positive results (detections) than all other methods."

14		Pages 4-3 through 4-9, Section 4.2	Throughout Section 4.2, for each sample collection method, the discussion of "Implementability" is separate from the discussion of "Ability to Generate Target Sample Mass/Volume". However, ability to generate sufficient sample is part of the definition of implementability as defined in this report. Please either combine the two discussions for each sample collection method into one discussion of implementability or change the "Implementability" header for each sample collection method to "Implementation Challenges" or something similar.	The "Implementability" header for each sample collection method in Section 4.2 will be changed to "Implementation Challenges and Logistics".	The response is acceptable.	Revisions are acceptable.	
15		Page 4-4	Data from the first sampling event, when the "fines" and "non-fine paper-like material" were not homogenized, should be included in this report for completeness and because they may provide limited comparative information on the individual components. They do not have to be factored into the Phase I evaluation.	Tierra will revise the report to include an appendix with tables presenting the data from Event 1, Attempt 1. However, it should be clarified that it was during this first event that the presence of two distinct particle types, "fines" and "non-fine paper-like material", were initially identified in the field. This situation was unanticipated and the "non-fine paper-like material" was disposed and not submitted for analysis. After discussions between USEPA/Tierra during sample processing, it was agreed that the "non-fine paper-like material" would not be submitted for analysis, and could be disposed as investigation-derived waste. It was not until after the first sampling event was completed, that it was decided, in consultation with USEPA, that moving forward Tierra would begin homogenizing the two materials together using a blender. Therefore, results obtained for the HSM particulate sample collected during Event 1, Attempt 1 represent only the "fines", which differs from simply a lack of homogenization as the commenter suggests. The standard operating procedure modification allowing the two HSM particulate sample types to be homogenized in the field prior to sub-sampling was developed as a result of this situation and implemented during each of the subsequent sampling events and attempts.	The response is acceptable. References to the new appendix should be added to the text as appropriate.	Revisions are acceptable.	
16		Page 4-4 to 4-5	How often was contingency sample mass actually used by the laboratory?	The use of contingency sample mass was not compiled as part of the sampling plan in the QAPP. The information is available and will need to be assembled to quantify and report exactly how often contingency mass was needed. Tierra will provide further details when we meet in the coming month(s).	In addition to presenting this information at the upcoming meeting, a brief summary should be added to the text of the report.	Revisions are acceptable.	

17		Page 4-6, Section 4.2.2.1, fourth paragraph	In the discussion of the torn Teflon® liner, please provide the protocol for capturing sample water trapped between the torn liner and the secondary liner.	The tear/rip in the Teflon® tank liner during the December 9, 2013 sampling event was at the bottom of the tank liner and was identified after mixing and subsampling activities began. Mixing continued throughout the subsampling process, and the procedure used to collect the sample water was not changed. Water was collected from within the inner liner of the double-lined tank, and excess water remained in the tank at the end of sampling. It was not necessary to collect water from between the two Teflon® liners.	The response is acceptable. Please add a sentence or two to the text of the report to clarify.	Revisions are acceptable.	
18		Page 4-7, Table 4-1	**18a.** Please confirm whether the volumes listed in Table 4-1 were the volumes actually filtered to obtain the mass quantities listed for each sample/analytical group shown in Table 4-2. **18b.** Please add the actual volumes filtered into Table 4-1 alongside the minimum volumes required. **18c.** In addition, please clarify why some analyte groups collected using LSM per Table 2-1 (cyanide, VOCs, and TEPH) are not represented in Table 4-1. **18d.** Finally, please revise the title of Table 4-1 (here and in the table of contents) to clarify that it applies only to LSM bulk samples for laboratory filtration.	**18a.** The volumes listed in Table 4-1 represent the targeted LSM bulk liquid sample volumes to be collected. They are not the actual volumes filtered during collection of the LSM particulate samples shown in Table 4-2. **18b.** Tierra will revise the report to include actual LSM bulk liquid sample volumes filtered in each sampling event and attempt. **18c.** The noted analyte groups listed as being collected using LSM in the current version of Table 2-1 were placed there in error. Tierra will revise Table 2-1. See response to USEPA comment #11. However, Table 4-1 does not require revision as it is correct. **18d.** Tierra will revise the title of Table 4-1 in the text and in the Table of Contents, replacing the current title with "LSM Bulk Liquid Volume Requirements by Analytical Group".	**18a.** Please add a footnote to Table 4-1 to clarify that the listed volumes are the targeted volumes, not the actual volumes collected. **18b.** The response is acceptable. **18c.** The response is acceptable. **18d.** The response is acceptable.	**18a.** Revisions are acceptable. (Note: a footnote not added because Comment 18B supersedes footnote.) **18b.** Revisions are acceptable. **18c.** Revisions are acceptable. **18d.** Revisions are acceptable.	

19		Page 4-8, Table 4-2	**19a.** Please clarify why some analyte groups collected using LSM per Table 2-1 (cyanide, VOCs, TEPH, TSS, TDS, and DOC) are not represented in Table 4-2. **19b.** In addition, please clarify why Event 2, Attempt 1 is not included in the table. **19c.** Finally, please clarify in footnote c why PCDD/PCDF and PCB congener samples analyzed for Event 1, Attempt 1 are not part of the data evaluation (a reference to Section 4.2.1.1 would suffice), and add a link to this footnote in the table as was done with footnotes a and b.	**19a.** Table 2-1 will be revised to exclude VOC, TEPH, and cyanide collection for the LSM method (see USEPA comment #11). Therefore, these three analytical parameters would not appear in Table 4-2. TSS, dissolved organic carbon, and total dissolved solids (TDS) were collected for the LSM dissolved, not the LSM particulate. Table 4-2 is solely for the LSM particulate; therefore, no changes will be made to Table 4-2 with reference to the six analytical parameters mentioned above. **19b.** Event 2, Attempt 1 accomplished the collection of VOC and grab water TSS/TDS only, no LSM samples were collected during this event. **19c.** Tierra will revise footnote c to read the following: As a result of only the "fine" material being analyzed for Event 1, Attempt 1, Event 1, Attempt 1 samples were "replaced" by Event 1, Attempt 3. Therefore, Event 1, Attempt 1 results were not included as part of the data evaluation process.	**19a.** The response is acceptable. **19b.** Please add a footnote to Table 4-2 to clarify that no LSM samples were collected during Event 2, Attempt 1. In addition, TSS and TDS are not shown in Table 2-1 for Event 2, Attempt 1 whole water samples; please update the table as needed. **19c.** The response is acceptable. Please ensure that a link to footnote c is also added to the table as requested.	**19a.** Revisions are acceptable. **19b. part 1** Revisions are acceptable. **19b. part 2** Revision not implemented. Table 2-1 and its footnotes were not updated to capture collection of TSS/TDS samples. As the table reads now based on notes a & b, TSS/TDS were collected during event 2 attempt 2. Please clarify. **19c.** Revisions are acceptable. (Note: Tierra made slight edits to the proposed wording)	**19b. part 2.** Table 2-1 was revised to include a footnote ("*") to clarify that "Grab TSS/TDS samples were collected every 30 minutes during each sampling event/attempt. This is in addition to the TSS/TDS chemistry samples collected as part of HSM, LSM, and whole water sampling methods (including during Event 2/Attempt 2).
20		Page 4-9, Section 4.2.4, first and second paragraphs	The last sentence in the second paragraph of Section 4.2.4, which states that the ability to ship the grab samples on the day of collection was "contingent on the time of sample collection", is inconsistent with the first sentence in Section 4.2.4, which implies that all grab samples were shipped on the day of collection. Please revise for consistency.	All samples collected as "grab" samples for metals analysis, including mercury and methyl mercury, were shipped to the analytical laboratory on the same day to meet holding time requirements. The last sentence in the second paragraph of Section 4.2.4 will be revised to read: "To meet the analytical method holding time requirements, efforts were made to process and ship the metals samples via overnight courier on the same day of sample collection".	The phrase "efforts were made…" still implies that not all samples were shipped on the day of collection. Please revise the sentence to state that all samples were shipped on the same day as collection.	Revisions are acceptable. (Note: Tierra made slight edits to the proposed wording)	
21		Page 4-10, last sentence	Please delete the word "required" before "targeted mass". If the targeted mass for LSM particulate samples was a requirement, and this target was not met, it would follow that LSM did not meet the criteria for implementability.	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	

22		Pages 5-1 through 5-2, Table 5-1 and bullets	Please double-check the following inconsistencies and revise as appropriate: • **22a.** LSM Particulate – SVOCs: The second row in Table 5-1 indicates that 9 results were affected, but the second bullet after the table indicates that 11 results were affected. • **22b.** HSM Dissolved – SVOCs: The third and fourth rows in Table 5-1 indicate that 16 results were affected, but the first bullet on page 5-2 indicates that 18 results were affected.	Tierra will revise the text in the bullets below Table 5-1 to clarify the details of the results that were rejected. The text in the current bullets represents the total number of samples qualified rather than just those that were rejected as presented in the table above. **22a.** The second bullet will be revised to read: "LSM Particulate – SVOCs: 9 results were rejected in the Event 1, Attempt 2..." **22b.** The third bullet will be revised to read: "HSM Dissolved– SVOCs:16 results were rejected in the Event 1, Attempt 2…"	**22a.** The response is acceptable. **22b.** The response is acceptable.	**22a.** Revisions are acceptable. **22b.** Revisions are acceptable.	
23		Page 5-2, second bullet	Please revise the second "Event #1, Attempt #2" to read "Event #2, Attempt #1".	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	
24		Pages 5-2 through 5-9, Section 5.2	The language used throughout this section regarding the criteria for selecting preferred sample collection methods ("at least 10% more positive results") is inconsistent with the language used in Section 3 ("greater than 10% positive results" or "greater than 10% of the positive results"). Please revise for consistency.	Edits to the text will be made to include "greater than" to be consistent with the criterion used in the evaluation process and will be consistent with Section 3.	The response is acceptable.	Revisions are acceptable.	
25		Page 5-2, Section 5.2.1, second sentence	According to Table 2-1, samples were also collected for PCDD/PCDF analysis using the whole water method during Event 1, Attempt 2. Please revise for consistency.	Table 2-1 will be updated for Whole Water Event 1, Attempt 2 to state: "All, excluding PCDDs/PCDFs, PCB congeners, DOC, POC, metals, mercury, and methyl mercury"	The response is acceptable.	Revisions are acceptable.	
26		Page 5-3, Section 5.2.2, second sentence	According to Table 2-1, samples were also collected for PCB congener analysis using the whole water method during Event 1, Attempt 2. Please revise for consistency.	Table 2-1 will be updated for Whole Water Event 1, Attempt 2 to state: "All, excluding PCDDs/PCDFs, PCB congeners, DOC, POC, metals, mercury, and methyl mercury"	The response is acceptable.	Revisions are acceptable.	
27		Page 5-4, Section 5.2.3, last sentence	Please revise the phrase "…PCB congeners is summarized in Table 5-3 below" to read "…Aroclor PCBs is summarized in Table 5-4 below."	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	

28		Page 5-5, Section 5.2.4, second bullet, second sentence	Please replace "primary samples" with "duplicate samples" in this sentence.	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	
29		Page 5-6, first bullet	Please confirm the statement that "three samples were rejected due to data usability issues". The Appendix E tables do not reflect rejected SVOC results for the Event 1 original sample.	Tierra confirms that the first bullet on page 4-6 stating that there are "three samples" rejected due to data usability issues is correct. Appendix E does reflect the three rejections. The first two rejections appear in the table for Event 1 – Original Sample (page 1 of 4) – one sample for HSM dissolved and one sample in the HSM particulate. The third rejection is in the table for Event 1 – Field Duplicate (page 2 of 4) – one sample for HSM dissolved.	While the tables in Appendix E indicate the number of rejected results for each sample collection method, the number of rejected samples is not clear. Please revise the tables in Appendix E to indicate which sample collection methods had rejected samples, along with the number of rejected samples, their sample IDs, and the reason those samples were rejected. Similar revisions should be made for other appendices that include rejected samples; for example, the report text states that the Event 1, Attempt 2 HSM particulate sample for organochlorine pesticides (Appendix D) and all HSM samples for VOCs (Appendix I) were rejected.	Revisions are still confusing when compared to Tierra's response to comment. Using the example of Appendix J, SVOC Detail, Event 1 Original Samples (page 1 of 2). It appears that 2 samples are rejected due to "R" qualified data: 1. HSM dissolved 2. LSM particulate Resulting the subsequent rejection of their combined results for dissolved plus particulate. Thus resulting in 4 "samples" being rejected due to failing the analytical quality test. Is this the correct interpretation of the results presented on this work sheet?	The interpretation is not correct. As previously stated, for Appendix J of Rev 1 (previously Appendix E of Rev 0), there are "three samples" rejected due data usability issues. In Appendix J, for Event 1-original, 2 samples (HSM dissolved and LSM particulate) were rejected, and one sample (HSM dissolved) was rejected for the Field Duplicate sample (totaling 3 rejected samples). The combined dissolved plus particulate results should not be considered "samples" but instead are used for comparing for comparison of HSM and LSM total and whole water methods. In Rev 1, Tierra incorporated the edits as requested per EPA comment. Therefore, no additional changes from Revision 1 were made.

30		Page 5-6, first sentence after bullets	Please revise the phrase "…organochlorine pesticides is summarized in Table 5-6 below" to read "…SVOCs is summarized in Table 5-6 below."	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	
31		Page 5-6, Section 5.2.6, third sentence	Please revise the phrase "…for SVOC data" to read "…for SVOC SIM data".	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	
32		Page 5-7, Section 5.2.7, first paragraph	**32a.** In the seventh sentence, please include an in-text citation for the USEPA correspondence, i.e. "(USEPA 2014)", since it is cited in Section 7. **32b.** Please revise the eighth sentence, "Data from all three sampling events/attempts has have been used in this evaluation", to read "Data from all three sampling events/attempts have been used in this evaluation." **32c.** In addition, please clarify whether this includes the HSM particulate herbicide results from Event 2, Attempt 2, despite the noted failed laboratory control sample.	**32a.** Tierra will revise the seventh sentence in Section 5.2.7 to include the in- text citation for the USEPA correspondence "USEPA 2014". The sentence will read: "It was decided…the next sampling event (Event 1, Attempt 3) (USEPA 2014)". **32b.** Tierra will edit the eighth sentence to remove the typo "has". **32c.** Tierra confirms that the HSM particulate results from Event 2, Attempt 2 were used, as noted in Section 5.2.7, sentence 8.	**32a.** The citation should be added to the following sentence, beginning "This was approved by USEPA…" **32b.** The response is acceptable. **32c.** This is not "noted in Section 5.2.7, sentence 8" as stated in the response. Clarification is needed in the text as to whether the herbicide results affected by the failed laboratory control sample were used in the evaluation.	**32a.** Revisions are acceptable. **32b.** Revisions are acceptable. **32c.** Revisions are acceptable.	
33		Page 5-7, Section 5.2.7, second paragraph	Please state what effect the "larger than acceptable level of uncertainty" had on the evaluation of chlorinated herbicide data.`	The text regarding the larger than acceptable uncertainty draws attention to the data quality issue associated with the chlorinated herbicide dataset that may have confounded the data evaluation. Many results were qualified as "JN" (presumptive evidence of the presence of the analyte at an estimated concentration). This qualification indicates uncertainty in both the identification of the analyte, as well as the associated value reported. Part of the data evaluation process included comparing the number of positive results reported between sample collection methods (steps 3 and 4). The larger than acceptable uncertainty identified during data validation, especially in terms of analytes identification, could have affected the conclusions resulting from the data evaluation process.	Please clarify how the JN-qualified data "could have affected the conclusions resulting from the data evaluation process." If the qualified results might have impacted the selection of a recommended sample collection method, this should be clearly stated in the text.	Revisions are acceptable.	
34		Page 5-8, Section 5.2.8, second paragraph, second sentence	Please delete "Following are" before "A summary of the findings…"	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	

35		Page 5-8, Section 5.2.8, bullet	Please explain why the recommended sample collection method for cyanide is inconclusive if positive results were observed in both HSM and whole water samples.	As established in steps 3 and 4 of the data evaluation process, in order for a given sample collection method to be preferred over another for a given analytical group, one method must achieve greater than 10% more positive results (detects) than another. The failure of one sample collection technique to generate greater than 10% more positive results (detects) than another results in an inconclusive evaluation. Cyanide is a single-component analytical group and it was positively detected in both the whole water and HSM samples. With 100% detections for both methods, one sample collection method did not produce the required 10% larger number of positive results for cyanide than the other. Therefore, the evaluation is inconclusive as to the preferred sample collection method for cyanide. This aspect of the data evaluation process could be adjusted moving forward in the case of single component analyte groups such as cyanide. Perhaps in these cases, further evaluation of the relative concentrations of the analyte detected in each of the samples could be used to select a preferred sample collection method rather than defaulting to an inconclusive result.	A brief explanation should be added to the text of the report. Further evaluation of the procedure to identify a preferred sample collection method for single-component analytical groups can be discussed at the upcoming meeting.	Revisions are acceptable.	
36		Page 5-9, first paragraph	Please add a statement regarding whether the whole water sample collection method was selected as the recommended method for VOCs.	The whole water sample collection method was not selected as the recommended method for VOCs. Samples collected using the HSM sample collection method were rejected due to laboratory quality issues. Therefore, a limited dataset was available to complete the data comparison between sampling approaches, and only data for samples collected via the whole water method were considered usable. Additional investigation is recommended during Phase II to evaluate sampling approaches for VOCs.	A brief explanation should be added to the text of the report to clarify. Additional investigations to evaluate sampling approaches for VOCs during Phase II can be discussed at the upcoming meeting.	Revisions are acceptable.	
37		Page 5-9, Section 5.2.10, bullet	Please explain why the recommended sample collection method for TEPH is inconclusive if positive results were observed in both HSM and whole water samples.	As established in steps 3 and 4 of the data evaluation process, in order for a given sample collection method to be preferred over another for a given analytical group, one must achieve a significantly larger (greater than 10%) number of positive results than another. The failure of one sample collection technique to generate a significantly larger number of positive detects than another results in an inconclusive evaluation. As described in response to USEPA comment #35 for cyanide, TEPH is a single-component analytical group. TEPH was positively detected in both the whole water and HSM samples. With 100% detections for both methods, one sample collection method did not produce a significantly larger number of positive results for TEPH than the other. Therefore, the evaluation is inconclusive as to the preferred sample collection method for TEPH. This aspect of the data evaluation process could be adjusted moving forward in the case of single-component analyte groups such as TEPH. Perhaps in these cases, further evaluation of the relative concentration of the analyte detected in each of the samples could be used to select a preferred sample collection method rather than defaulting to an inconclusive result.	A brief explanation should be added to the text of the report. Further evaluation of the procedure to identify a preferred sample collection method for single-component analytical groups can be discussed at the upcoming meeting	Revisions are acceptable.	

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38		Page 7-1, Section 7	Please correct the following errors in the list of references: • There is no year given for the third reference. • The abbreviation for Tierra Solutions, Inc. (Tierra) should be included in the fourth reference since it is abbreviated in the next	Edits to the text will be made as suggested.	The response is acceptable.	Revisions are acceptable.	

39		Appendix D, page 1 of 8	The sample collection methods "HSM dissolved plus HSM particulate" and "HSM particulate" list "NA" under "Number of COPCs/COPECs listed in the FFS identified?" However, the table on page 2 of 8 has results for five of the COPCs/COPECs listed. Please confirm and revise the table and any corresponding information presented in the report or conclusions drawn as necessary.	The number (five) of COPCs/COPECs listed for Event 1, Attempt 2 for HSM particulate (page 2 of 8) is correct. However, during the analytical quality evaluation (third column labeled "analytical quality") (page 1 of 8), it was determined that there were greater than four results qualified "R", rejected, in that particular analysis. Therefore, per the requirements outlined in step 2 of the data evaluation process, data obtained from this particular HSM particulate sample analysis were excluded from further evaluation and "NA" was indicated in each of the remaining data evaluation categories.	While the table on page 1 of 8 indicates the number of rejected results for each sample collection method, no results are shown as rejected in the table on page 2 of 8, making the analytical quality evaluation difficult to follow using these tables. Please revise the tables in Appendix D to clearly identify the rejected results and their impact on the analytical quality evaluation. Similar revisions should be made for other appendices that include rejected results.	As with comment 29, this revision is difficult to follow. Please provide an explanation of the logic referencing the attachments and pagination from the revised document.	Tierra previously revised Appendix I in Revision 1 (Appendix D in Rev 0) to include the number of rejected samples their sample IDs, and reason for sample rejection (e.g., on page 2 of 2 for Event 1-Original Sample in Appendix I includes footnote "j" and sample results for the rejected sample PR1CSOCLYHP-01B). Other appendices were also revised, as appropriate. Note that footnote "j" in Appendix I, Rev 2 was revised to correct the sample ID that was rejected from PR1CSOCLYLP-01B (LSM particulate) to PR1CSOCLYHP-01B (HSM particulate) sample for Event 1-Original Sample. The pagination for Appendices F through O (Rev 1 and 2) were revised in an effort to separate the primary samples from the duplicate samples, as well as separate Event 1 evaluation results from those in Event 2 (e.g. Event 1-Primary is 2 pages, and Event 1 Duplicate is 2 pages.

CSO/SWO Phase I Field Blank Contamination Results Qualified			
Whole Water	Number of Samples Affected	Number of Results Affected	Percent of Results Affected
Semivolatile	4	4	2.0
Organochlorine Pesticide	4	29	25.9
Semivolatile SIM	3	23	19.2
Metals	4	6	6.5
Cyanide	2	2	50.0
PCDD/PCDFs	2	7	6.9
PCB Congeners	5	123	12.2
Chlorinated Herbicide	4	7	29.2
TOC	2	2	50.0
TDS	2	2	50.0
LSM Dissolved			
Semivolatile	3	4	2.0
Organochlorine Pesticides	4	30	26.8
Semivolatile SIM	4	26	21.7
PCDD/PCDFs	4	10	9.8
PCB Congeners	6	366	36.3
Chlorinated Herbicide	4	9	37.5
DOC	4	4	100.0
LSM Particulate			
Semivolatile	3	5	2.5
Organochlorine Pesticides	4	33	29.5
Semivolatiles SIM	4	28	23.3
PCDD/PCDFs	3	8	7.8
PCB Congeners	6	275	27.3
HSM Dissolved			
Semivolatiles	3	4	2.0
Organochlorine Pesticides	4	32	28.6
Semivolatiles SIM	4	35	29.2
PCDD/PCDFs	2	9	8.8
PCB Congeners	6	305	30.3
Chlorinated Herbicide	2	7	29.2
TOC	2	2	50.0
TEPH	2	2	50.0
TSS	2	2	25.0
TDS	2	2	25.0
HSM Particluate			
Semivolatiles	1	2	1.0
Organochlorine Pesticides	4	20	17.9
Semivolatiles SIM	2	8	6.7
Cyanide	3	3	75.0
PCDD/PCDFs	3	5	4.9
PCB Congeners	3	22	2.2
Chlorinated Herbicide	6	10	42.0
Grab Water Dissolved			
Metals	4	8	8.7

December 2014 - Phase I CSO/SWO Total TCDD Verification Memorandum

No.	PDF Page	Section	Comment	Tierra Response	CDM Smith Response	Revised Report Review (5/6/2016)	Tierra Response (06/23/2016)
Comments Pertaining to Phase I CSO/SWO Total TCDD Verification Memorandum							
1	General	General	The data validation narratives associated with these data do not contain any specific information or acknowledgement that the total tetrachlorinated dibenzo-*p*-dioxin (TCDD) verification procedure discussed in this memorandum was performed. There are no standard operating procedure (SOP) checklists or discussion of the review process outlined in the validation SOP titled *Total Tetra-Chlorinated Dibenzodioxin, Verification of Total Tetra-Chlorinated Dibenzodioxin Results, Rev. 1, 10/04/06* (provided as Attachment A) presented within the data validation narratives or provided under separate cover for the samples associated with the combined sewer overflow/stormwater outfall (CSO/SWO) Phase I sampling events. Please provide a narrative along with any supporting materials regarding the details of the total TCDD verification performed for the Phase I CSO/SWO samples.	Validation of isomer-specific 2,3,7,8 substituted dioxin and furan results for the CSO/SWO Phase I sampling events was conducted from January 2013 through July 2014 and resulted in 22 data validation reports (one for each sample delivery group) that were submitted to USEPA between November 22, 2013 and October 28, 2014. Verification of total tetra-chlorinated dibenzo-p-dioxin (TCDD) results for the CSO/SWO Phase I sampling events was completed later during the fall of 2014 as a separate task. This work was provided to USEPA in the form of a memorandum titled "Verification of Total TCDD Results Reported for Phase I of Tierra's Combined Sewer Overflow/Stormwater Outfall Investigation" dated November 2014. All 53 total TCDD results reported during implementation of the CSO/SWO Phase I Investigation were evaluated simultaneously and the findings are summarized together in the cited memorandum. Tierra will provide a narrative description of the process along with completed worksheets that contain supporting details of the total TCDD verification performed for the Phase I CSO/SWO samples. This submittal will be provided as a standalone document separate from the data validation reports.	The response is acceptable. Please provide a timeline for when this narrative will be provided.	Revisions are acceptable. Three new appendices have been added to the memorandum in order to provide the requested information. Opposed to issuing separate reports as indicated in the response to comments.	
2	General	General	The Form 1 sample result summaries edited based on data validation findings and included as part of the data validation reports do not contain the corrected result values identified in Table 1 of the memorandum. The Form 1 summary results for total TCDD were redlined with the notation "not validated". Please update the Form 1 sample result summaries with the corrected result values as indicated in Table 1 of the memorandum.	As indicated in the response above, data validation of isomer-specific 2,3,7,8 substituted dioxin and furan results was performed ahead of the TCDD verification task as a separate and unique evaluation. Appropriately, annotated Form 1s were included as appendices to the data validation reports for dioxins and furans, including the notation that total homologue results (which include TCDD) were "not validated". The annotated Form 1s submitted with the data validation reports should not include total homologue results since these data do not, by definition, conform with the data quality standards evaluated during data validation per USEPA guidance. Total TCDD results for Phase I of the CSO/SWO Investigation were verified later via the Region 2-approved Standard Operating Procedure (SOP) Verification of Total Tetra-chlorinated Dibenzo Dioxin Results, Rev.1, 10/04/06. As documented in the CSO/SWO Investigation Phase I Total TCDD Verification Memorandum, the procedure is limited to the assessment of the completeness and accuracy of the reported total TCDD results, and is not congruent with isomer specific 2,3,7,8- substituted data that have been validated per USEPA Region 2 protocols. Anomalies identified during the total TCDD verification process are summarized in the memorandum and, as indicated in the text, results have been corrected in both the original laboratory hardcopy data reports (Form 1s) and the USEPA Region 2 Main Electronic Data Deliverable (MEDD). Tierra will provide updated Form 1 sample result summaries for the four samples where result adjustments were necessary (samples identified in Table 1 of the	Updated Form 1 sample result summaries for all verified total TCDD results, not just those that required adjustment, should be submitted since the data were all redlined with the notation "not validated" in the original submittals.	Revisions are acceptable. Appendix B satisfies this comment.	

				memorandum), as part of the submission described in response to comment No. 1 above.			
No.	**PDF Page**	**Section**	**Comment**	**Tierra Response**	**CDM Smith Response**	**Revised Report Review (5/6/2016)**	**Tierra Response (06/23/2016)**
Comments Pertaining to Phase I CSO/SWO Total TCDD Verification Memorandum							
3	General	General	Total TCDD verification was not discussed in the *Combined Sewer Overflow/Stormwater Outfall Investigation Phase I Data Quality and Usability Assessment Report*, dated August 2014. Results related to the total TCDD verification should be included in the data quality and usability report associated with Phase I data.	Tierra will update the Combined Sewer Overflow/Stormwater Outfall Investigation Phase I Data Quality and Usability Assessment Report, August 2014, to include results from the total TCDD verification. Because the total TCDD verification is distinctly different from the data validation work, the total TCDD verification discussion will be added as a separate section in the report.	The response is acceptable.	Revisions are acceptable.	
4		Page 2, Table 1	Please address the following items regarding sample PR1CSOCLYHP-01C (the associated data validation report file is named "CSO_SWO_DV Reports_Event 1_Attempt 3.pdf"): **4a.** The original result value is listed in the table as 19.4 picograms per gram (pg/g), but the Form 1 result summary lists a result of 18.1 pg/g for total TCDD. Please verify the original result and update the information contained in Table 1 of the memorandum as necessary. **4b.** The corrected result value is listed in the table as 17.8 pg/g, but the value for total TCDD reported in the electronic data deliverable (EDD) is 0.501 pg/g. Please verify the corrected result value and update the information contained in Table 1 of the memorandum and/or the EDD as necessary.	**4a.** The original result value listed in Table 1 as 19.4 pg/g is correct. The Form 1 shows two results: a total TCDD concentration of 18.1 pg/g and a total TCDD Estimated Maximum Possible Concentration (EMPC) value of 19.4 pg/g. The 18.1 pg/g is not the final total TCDD result because it does not include the individual component contributions that were identified as EMPCs. The total TCDD EMPC result of 19.4 pg/g is the correct original total TCDD result for this sample. No update/changes to Table 1 are necessary. **4b.** The corrected result value for the total TCDD listed in Table 1 as 17.8 pg/g is correct. The 0.501 pg/g, does not appear on the MEDD as the total TCDD "result value." The value of 0.501 pg/g is the "Reporting Detection Limit" for 2,3,7,8-TCDD found in column "AN" of the MEDD. However, upon further review, it appears that the MEDD contains the original uncorrected result value of 19.4 pg/g in the total TCDD "result_value" field. Tierra will revise the MEDD to the corrected result value (17.8 pg/g) for this sample.	**4a.** The response is acceptable; however, note that discussion is ongoing regarding the overall approach for calculating totals to ensure consistency with other datasets. **4b.** The response is acceptable.	**4a.** Revisions are acceptable. **4b.** Revisions are acceptable. The changes will be confirmed upon receipt of the revised EDD.	The revised MEDD was previously sent to USEPA on 4/1/2016. In the MEDD for SDG PR146, the "result_value" field (column AD in excel) was revised according to EPA comment.
5		Attachment A, Section 2, fifth check item	A detailed logic for the calculation of the total TCDD value needs to be added to this check item. The logic must include how non-detect results are used in the summation if any or all of the TCDD isomer results are reported as non-detect. It must also contain the logic for evaluating data qualifiers that may be associated with any or all of the TCDD isomer results. Please revise the procedure accordingly.	The fifth check item included in Section 2 of the SOP, Verification of Total Tetra-chlorinated Dibenzo Dioxin Results, Rev.1, 10/04/06 (Attachment A), involves the summation of the individual component non-2,3,7,8-substituted, and 2,3,7,8-TCDD isomers meeting identification criteria to reproduce the total TCDD concentration reported by the laboratory. In response to the commenter's specific questions, the following logic was used during the verification and summation of individual non-2,3,7,8-substituted estimates and 2,3,7,8-TCDD results: • Non-detect results for individual components are not included in the total TCDD value. In these cases "zero" concentration is contributed to the summed total TCDD result. • Results flagged as Estimated Maximum Possible Concentration (EMPC), when present for any one or multiple individual component isomers, were included	The response is acceptable; however, note that discussion is ongoing regarding the overall approach for calculating totals to ensure consistency with other datasets. In addition, the third bullet point in the response appears to ignore R-qualified data, which presumably were not included in the totals. Please clarify.	Revisions are acceptable. The revised review text was added to the *Procedure for Verification of Total Tetra Chlorinated Dibenzo Dioxin Results, Rev.2* review worksheet	

				numerically in the summed total TCDD result. However, the final total TCDD result in these cases was also qualified as an EMPC. • No other data qualifiers were included or considered in the summation of individual component concentrations or the resulting total TCDD value. Tierra agrees that updating the procedure to include the text described in the bullets above will clarify the process used to verify the total TCDD results. Terra will revise the procedure accordingly.			