Pennsylvania
Department of
Environmental Protection

December 20, 2024

VIA EMAIL

Kimberly Kaal, Environmental Manager
Shell Chemical Appalachia LLC
Shell Polymers Monaca Site
300 Frankfort Road
Monaca, PA 15061

Re: DEP Technical Review Comments
PSD Air Quality Analyses and Inhalation Risk Assessment
Shell Chemical Appalachia LLC
Application for Plan Approval 04-00740D
WWTP Permanent Controls Project, EMACT Project, and Plan Approval Reconciliations
Shell Polymers Monaca Site, Center and Potter Townships, Beaver County

Dear Kimberly Kaal:

The Pennsylvania Department of Environmental Protection (DEP) has conducted a technical review of Shell Chemical Appalachia LLC's (Shell) Prevention of Significant Deterioration (PSD) air quality analyses and inhalation risk assessment. The PSD air quality analyses and inhalation risk assessment were included in Shell's application for Plan Approval 04-00740D to support its Wastewater Treatment Plant (WWTP) Permanent Controls Project, Ethylene Maximum Achievable Control Technology (EMACT) Project, and Plan Approval Reconciliations at its Shell Polymers Monaca Site. The DEP's comments on Shell's PSD air quality analyses and inhalation risk assessment are enclosed with this letter.

At Shell's earliest convenience, the DEP suggests that a meeting be held to discuss the comments, answer questions, and provide clarifications. Subsequently, the DEP requests that Shell provide written responses to the comments as well as appropriate revisions to the PSD air quality analyses and inhalation risk assessment documentation and data, and the plan approval application, as needed. Please note that the DEP's Southwest Regional Office may have additional comments and/or deficiencies, related to its technical review of Shell's plan approval application, that may affect the PSD air quality analyses and/or inhalation risk assessment.

For questions regarding the DEP's technical review of Shell's PSD air quality analyses or inhalation risk assessment modeling (exposure assessment), please contact Henry Bonifacio (hbonifacio@pa.gov, 717.772.5968). For questions regarding the DEP's technical review of

Shell's inhalation risk assessment (risk characterization), please contact Stephen Steirer (ssteirer@pa.gov, 717.772.5620). For general, non-technical questions, please contact Andrew Fleck (afleck@pa.gov, 717.783.9243), manager of the Air Quality Modeling and Risk Assessment Section.

Sincerely,

Henry F. Bonifacio
Henry F. Bonifacio
Air Quality Program Specialist
AQ Modeling and Risk Assessment Section
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Stephen Steirer
Stephen J. Steirer
Air Quality Engineer
AQ Modeling and Risk Assessment Section
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Enclosures (2)

1. DEP Technical Review Comments on PSD Air Quality Analyses
2. DEP Technical Review Comments on Inhalation Risk Assessment

cc: Laura Sabolyk, Shell
Aubrey Jones, Landau Associates
Michael Carbon, Landau Associates
Mark Gorog, DEP/SWRO/Air Quality
Sheri Guerrieri, DEP/SWRO/Air Quality/New Source Review
Alexander Sandy, DEP/SWRO/Air Quality/New Source Review
Lauren Camarda, DEP/SWRO/Communications
Emily Green, DEP/SWRO/Environmental Justice
Michelle Homan, DEP/Environmental Toxicology
Nicholas Lazor, DEP/BAQ/Director
Viren Trivedi, DEP/BAQ/Permits
Sean Wenrich, DEP/BAQ/Permits/New Source Review
Andrew Fleck, DEP/BAQ/Permits/Air Quality Modeling and Risk Assessment

ENCLOSURE 1
DEP Technical Review Comments on PSD Air Quality Analyses
Shell Chemical Appalachia LLC
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WWTP Permanent Controls Project, EMACT Project, and Plan Approval Reconciliations
Shell Polymers Monaca Site, Center and Potter Townships, Beaver County
December 20, 2024

Appendix D-1
Air Dispersion Modeling and Class II Visibility Analysis for Shell Polymers Monaca in Beaver County Pennsylvania

1.0 Introduction and Summary of Results

1. On Page 1-2, there is a statement that reads "[t]he analyses were conducted to ensure that the EMACT Project and Plan Approval Reconciliations and WWTP Permanent Controls Project do not cause or contribute to air pollution in excess of a NAAQS or PSD Increment." Shell should clarify that the set of emissions evaluated for the EMACT Project differed from that of the Plan Approval Reconciliations and WWTP Project and a different set of air quality standards (i.e., NAAQS and PSD Increments) applies to each evaluation/air quality analysis. Therefore, the DEP suggests rephrasing the statement referenced above as follows: "The analyses were conducted to ensure that the EMACT Project does not cause or contribute to air pollution in excess of a NAAQS or PSD Increment and to ensure that the Plan Approval Reconciliations and WWTP Permanent Controls Project, in conjunction with the EMACT Project, do not change the overall results of the previous air quality analyses, which demonstrate compliance with the applicable NAAQS and PSD Increment standards."

2. On Page 1-3, Shell stated that the analysis in the modeling report "conforms with the modeling protocol submitted on June 5, 2024, and approved by the PADEP on June 6, 2024." However, the scope of the said modeling protocol was for the EMACT Project only and did not include the Plan Approval Reconciliations and WWTP Project. This clarification should be included in the affected paragraph.

1.1 Modeling Revisions

3. The U.S. Environmental Protection Agency (EPA) released v24142 of AERMOD, AERMAP, AERMET, and AERSURFACE on November 20. 2024. Subsequently, EPA released a recompiled 64-bit AERMOD executable on December 4, 2024. If re-execution of AERMOD is warranted in responding to these comments, the latest versions of AERMOD and its associated programs should be used. See Comments #9 and #13.

4.0 Model Selection and Model Input

4. This section has two pages of 4-1 and two pages of 4-2.

4.3 Source and Monitoring Data

Good Engineering Practice Stack Height Analysis

5. There were three (3) two-tiered structures that were modeled as six (6) single-tiered structures, with each tier defined as a separate single-tiered building. BPIPPRM calculates building downwash parameters for each tier, i.e., "first half" of BPIPPRM calculations, and, if there are more than one building/structure, for combined tiers of sufficiently close structures, i.e., "second half" of BPIPPRM calculations. The final building downwash parameters would be from the "half" with the highest wake effect heights (see Page 74 of the EPA's "User's Guide to the Building Profile Input Program"). Defining each tier of a multi-tiered structure as a separate structure instead of as a tier of the multi-tiered structure would influence the calculation of building downwash parameters during the "second half" of BPIPPRM. Therefore, pursuant to the EPA's "User's Guide to the Building Profile Input Program", the DEP recommends that each tier of a given building be defined as a tier of that building. The pair of single-tiered structures that should have been defined as part of two-tiered structures are the following:

a. PE12 & PE121 – PE12 is higher than but within PE121.

b. PERAIL & PESILOR – PESILOR is higher than but in the middle of PERAIL.

c. PE3TNK & PE3 Tier 1 – i.e., PE3TNK is higher than but within PE3 Tier 1. Please take note of the comment that PE3 Tier 1 (i.e., building PE3) be defined as a multi-tiered structure. See Comment #30 for details.

6. Based on the BPIPPRM input file provided, two circular structures (PEREACT1, PEREACT2) were inside and lower than PE121. If this were the case, i.e., inside a much larger and higher structure, there would have been no need to define these circular structures in the BPIPPRM input file. Please confirm the parameters/information for the two circular tiers – e.g., wrong locations (not inside PE121), wrong height (to represent tanks or stacks on top of PE121), etc. In addition, as discussed in Comment #5, PE121 should have been defined as part of a two-tiered structure.

Monitor Data Usage

7. For Table 1 on Page 4-9:

a. As indicated in the footnote of the equivalent table in the modeling protocol approved on June 6, 2024, the values for PM2.5 in Table 1 are design values and not maximum monitored values.

b. For the EMACT Project, SIL analyses were conducted for CO, NO_2, and PM2.5. Therefore, in the footnote, rephrase "less than the PM2.5 SILs" to "less than the CO, NO_2, and PM2.5 SILs.

8. For Beaver Falls 1-hour NO_2 concentration measurements, Hour 01 has no data because of scheduled daily calibration implemented by the DEP on all its monitors. For documentation purposes, please describe the data substitution applied for Hour 01.

4.4 Receptor Data

9. If re-execution of AERMOD is warranted in responding to these comments (see Comment #3), the receptor elevations and hill height scales should be calculated using the latest version of AERMAP.

4.5 Meteorological Data

Data Selection and Representativeness

10. Aside from the runs that used ZORAD (Default Method for Determining Roughness Length), AERSURFACE modeling files provided also included a run that used the option ZOEFF (Experimental Method for Determining Roughness Length). Figures 10 and 11 of the PSD modeling report were based on runs that used ZORAD only. If the run that used ZOEFF was used in the analysis, the modeling report should document the details and the results. If it was not used, the associated modeling files in the submission should be removed.

Data Processing

11. The first paragraph on Page 4-18 should indicate that the Beaver Valley meteorological data were processed under the ONSITE pathway in AERMET Stage 1.

12. Page 4-18 should state that AERMET Stage 2 was executed using the adjust u* option for documentation purposes. See language in the modeling protocol approved on June 6, 2024.

13. If re-execution of AERMOD is warranted in responding to these comments (see Comment #3), the latest version of AERMET should be used. The DEP has reprocessed the meteorological dataset using the latest versions of AERMET and AERSURFACE and, if appropriate, will share the meteorological files with Shell.

5.2 Turbine Load/Operating Conditions

14. On Page 5-2, it stated that the "emissions and flows for the other loads and operating modes were scaled from the 100% load condition." In the table for Turbine Load Analysis on Page A-6, the footnote stated that "Emissions are approximately linear with load. Flow and Velocity are not." Without any other details, it is not clear how the flow/velocity values for the other load conditions (45%, 75%) were scaled from the 100% load condition. Note that preliminary evaluations on turbine load and operating conditions were not discussed in the modeling protocol for the EMACT Project approved on June 6, 2024. For documentation purposes, please describe the scaling done for the flow/velocity values used in modeling the lower turbine load conditions.

15. The three combustion turbines are equipped with CEMS to measure CO and NOx. Using CEMS data and other required/available monitoring (e.g., load operating level), please confirm and/or demonstrate that the assumption that emissions are "approximately linear with load" is true. Note that under Plan Approval 04-00740A, the combustion turbines are subject to a different CO emission limit during startup and shutdown periods, which are both defined in the plan approval in terms of baseload operating level – i.e., startup begins when the combustion turbine reaches 55% of its baseload operating level while shutdown begins when the combustion turbine drops below 55% of its base load operating level. Thus, it is assumed that for compliance purposes, operating levels of the combustion turbines are being monitored and recorded.

16. In Shell's quarterly CEMS report (e.g., Year 2022, Quarter 3), CO and NOx emissions are reported in terms of 'ppm' and 'lbs/hr'. Having emissions being reported in terms of 'lbs/hr' would indicate that stack volumetric flow rate is being monitored. If the flow/velocity values for the other load conditions (45%, 75%) in the turbine load analysis were not based on measured values, please confirm and/or demonstrate that the scaling applied for flow/velocity at the other load conditions would agree with the trend/relationship based on measurements. As stated in Comment #15, it is assumed that operating levels of the combustion turbines are being monitored and recorded.

5.4 Significant Impact Analysis

17. For Table 4 on Page 5-5:

a. Please include/define the PSD Class II significant impact levels for PM10.

b. For footnote 'a', please change 'Table 4' (which is for PSD Class II SILs) to 'Table 6' (which is for NAAQS). The affected statements should reference the Beaver Falls background values (Table 1) and the NAAQS (Table 6). Please see equivalent table in the modeling protocol approved on June 6, 2024.

18. Please incorporate a table summarizing the emission rates, i.e., emission rates due to the EMACT Project, for NOx, CO, and PM2.5 used in the EMACT Project SIL analysis and provide details on their calculations, i.e., emission factor, heat input, etc.

Also, please address the difference in heat input settings used in calculating NOx and CO emissions rates for TEGF A and TEGF B in the SIL analyses. Based on the review of emission rates in the modeling input files, maximum short-term heat inputs estimated from the hourly NOx and CO emission rates, i.e., emission rate increases for NOx and CO, respectively, due to the EMACT Project, used in the SIL analyses differed from each other. Utilizing the emission factors on PDF Page 739 of the Plan Approval Application, the hourly NOx emission rate used in the 1-hr NO_2 SIL analysis has an equivalent heat input of 1,715 MMBtu/hr per flare whereas the hourly CO emission rate used in the 1-hr/8-hr CO SIL analysis has a lower equivalent heat input at 528 MMBtu/hr per flare. In contrast, the hourly NOx and CO emission rates for TEGF A and TEGF B in the NAAQS analyses were both calculated using the same maximum short-term heat input setting, i.e., 3,900 MMBtu/hr per flare.

19. The same hourly NOx, CO, and PM10 emission rate values for TEGF A and TEGF B were used by Shell in the Plan Approval Reconciliation and WWTP Project SIL analysis and cumulative analyses (NAAQS and/or Increment). However, according to Page 5-1 of Appendix D-1 of the Plan Approval Application, SIL analysis for the Plan Approval Reconciliation and WWTP Project were based on "*proposed facility-wide potential emissions minus the emissions increases associated with the EMACT Project*" while the corresponding cumulative analysis "*also includes the emissions increases associated with the EMACT Project.*"

a. Please explain why the hourly NOx and CO emission rates for TEGF A and TEGF B for the SIL analysis were based on the maximum short-term heat input of 3,900 MMBtu/hr per flare, which is the setting used in calculating the flares' hourly NOx and CO emission rates for the NAAQS analysis. Based on the discussion included in Comment #18, the maximum short-term heat input increase due to the EMACT Project is the 1,715 MMBtu/hr per flare value as estimated from the NOx emission rate (or 528 MMBtu/hr if estimated from the CO emission rate). This would imply that the maximum short-term heat input prior to the EMACT Project is not 3,900 MMBtu/hr per flare and estimated to be approximately 2,185 and 3,372 MMBtu/hr per flare if based on NOx and CO emission rates, respectively. It should be noted that in the 2020 revised PSD modeling, the maximum short-term heat input of 1,363 MMBtu/hr per flare was documented and used.

b. Similarly, please explain why the same PM10 emission rate was used for the SIL analysis and cumulative analyses (NAAQS, Increment) for 24-hr PM10. According to Note [A] on PDF Page 739 of the Plan Approval Application, the PM10 maximum emission rate was based on a maximum 24-hr average from actual process data. The DEP assumes that the actual process data does not yet reflect emissions from the combustion of supplemental gas.

5.7 NO2 Analyses

20. According to the modeling report (Page 5-8) and the modeling protocol approved on June 6, 2024, 100% NOx to NO_2 conversion was conservatively assumed in assessing compliance with the annual NO_2 NAAQS (and increment). However, based on AERMOD input files provided, the Tier 3 PVMRM (Plume Volume Molar Ratio Method) was applied instead for the annual NO_2 NAAQS analysis.

5.8 NAAQS Analysis and Increment Analysis

21. The hourly NOx emission rate used for TEGF A, TEGF B, and HP Elevated flare in the cumulative analysis was based on a maximum short-term heat input rating of 3,900 lb/MMBtu per flare (i.e., anticipated rate from various SU/SD events) and was then scaled based on the assumption that turnaround SU/SD events are expected to occur less than once every five years (see Comment 23). The resulting hourly NOx emission rate (6.6829 g/s) has an equivalent maximum short-term heat input of 780 MMBtu/hr per flare. Please confirm from process data that the actual individual short-term/hourly heat inputs, except during the 'various SU/SD

events', for the three flares *plus* the equivalent heat inputs for the estimated individual amount/s of supplemental gas needed would not exceed the 780 MMBtu/hr value.

If the equivalent heat input in calculating the NOx emission rate increase due to the EMACT Project would be 528 MMBtu/hr instead of 1,715 MMBtu/hr (see Comments #18 and #19), the 780 MMBtu/hr value should be lowered to 542 MMBtu/hr.

22. For Note [A] of the Flare Emission Calculation Notes on PDF Page 739 of the Plan Approval Application, please include the date of the 'approved modeling protocol' associated with 1-hr maximum NOx emission rate being divided by 5, i.e., because turnaround SU/SD events are expected to occur less than once every five years. This is to clarify that this calculation approach was not discussed in the modeling protocol for the EMACT Project recently approved by DEP on June 6, 2024. If the discussion in the March 1, 2011, EPA guidance ("Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard"), which was cited in the June 6, 2024, modeling protocol, would be the basis, dividing the 1-hour maximum NOx rate by 5 would be equivalent to having SU/SD events 1,752 hours per year (8,760 hours). The DEP notes that this is a conservative assumption.

23. For the PTE calculations for PE Units 1 and 2 Process Vent PM10 emissions, the table on PDF Page 724 of the Plan Approval Application used the terminology "Total per Line". This could be interpreted such that the two lines would have the same PM10 emission rates in the AERMOD runs. Based on the review of AERMOD input files, each of this line was modeled as having two emissions components, one modeled as a point source and the other modeled as a volume source. For their emissions components modeled as point sources, PEU1 and PEU2 have the same 24-hr emission rate and annual emission rate. However, for their emissions components modeled as volume sources, PEU1 has a higher 24-hr emission rate and a lower annual emission rate than those for PEU2.

6.2 Furnace Mode and Worst-Case Operating Condition Results

24. On Pages 6-1 and 6-5, the results of the worst-case furnace analysis, which were conducted on 1-hour, 8-hour, and 24-hour basis, were applied only to CO and NO_2 – i.e., for PM10, all seven furnaces have the same PM10 emission rates in the cumulative analyses. CO and NO_2 both do not have 24-hour standards. Please consider removing reference for "24-hour" in the discussion on Page 6-1 and in Table 10 on Page 6-5.

6.3 Secondary $PM_{2.5}$ Analysis Results

25. In Table 11 on Page 6-5:

a. Please revise to include the values for '24-hour and Annual Modeled Impact from Hypothetical Source' for Class I areas, as was done for Class II areas. Shell may consider having separate tables for Class II and Class I data (e.g., Table 11a, Table 11b).

b. Please correct footnote 'b', which states that the hypothetical source used is in Allegheny County, PA. As mentioned in Section 6.3 of the modeling report, and as checked by the DEP using data downloaded from the EPA's MERPs View Qlik, "[t]he results were calculated from the highest modeled concentrations from the 500 tpy sources in the Northeast and Ohio Valley climate zones."

6.4 EMACT Project Significant Impact Analysis Results

26. For Table 12 on Page 6-6, revise the 'Maximum Modeled Impact' for PM2.5, 24-hr Avg Period. Based on SUM files provided, the highest value should be 0.021 $\mu g/m^3$, and not 0.020 $\mu g/m^3$.

7.0 Class II Visibility Analysis

27. On Page 7-3, it stated that the dispersion condition of F stability and 2-m/s wind speed were used for Level-2 VISCREEN screening. However, based on the Iowa DNR Screening Tool provided (i.e., with screenshot on Page 7-6), the worst-case dispersion condition, which was identified using the 1% cumulative frequency criterion, using the 1987 – 1991 KPIT ISC meteorological dataset had F stability and 1-m/s wind speed. This is the dispersion condition highlighted in the resulting run using the Iowa DNR Screening Tool.

The DEP understands that the combination of F stability and 1-m/s wind speed is the default setting in the Level-1 VISCREEN screening. Given that the identified worst-case dispersion condition from actual measurements also had F stability and 1-m/s wind speed, Level-1 and Level-2 VISCREEN screening were basically the same in this case. Please provide documentation and/or guidance to support not using the combination of F stability and 1-m/s wind speed for Level-2 VISCREEN screening even if meteorological data analysis indicates it is the actual worst-case dispersion condition. Otherwise, the DEP recommends that Shell follow the steps below to determine if there will be potential visibility impairments (at Raccoon Creek State Park).

a. Step #1: Level-2 VISCREEN screening with refined settings instead of using default values. For details, see the EPA's "Workbook for Plume Visual Impact Screening and Analysis" (EPA-454/R-92-023) – e.g., Page 41. If potential visibility impairments are indicated, or if skipping this step, proceed to either Step #2 or Step #3.

b. Step #2: Level-2 VISCREEN screening using a most recent meteorological data. The challenge with this is the processing of the current meteorological data format into the ISC format – i.e., different parameters for atmospheric stability. If potential visibility impairments are indicated, proceed to Step #3.

c. Step #3: Level-3 analysis (i.e., estimate frequency distributions of dispersion conditions and plume visual impacts, etc.). Please see Chapter 5 of the EPA's "Workbook for Plume Visual Impact Screening and Analysis." Recommended model for Level-3 analysis is PLUVUE II (a more sophisticated plume visibility model). There is also an optional use of VISCREEN for Level-3 analysis.

Attachment A
Modeled Source Input Data

28. Attachment A is not mentioned in the modeling report. Please cite Attachment A under the appropriate section/s of the modeling report.

29. Unless each cooling tower exhausts through one of its two cells at a time only, the 16 cooling towers (13 Process Cooling Towers, 3 Cogeneration Plant Cooling Towers) should be modeled as 32 emission points, i.e., two emission points per cooling tower, instead of 16 emission points. If each cooling tower exhausts through one of its two cells at a time only, please state this fact in the document.

30. Based on their modeled stack heights (ranging from 17.53 to 42.67 m) and locations, most of the emission points for PE Unit 3 Process Vent are within and lower than a building named PE3, which has a building height of 45.72 m. This indicates that either the emission points and/or the building were not properly defined in the model.

a. Confirm the stack heights and locations of the affected emission points, i.e., Model IDs AFEEDA, AFEEDB, AFEEDC, AFEEDD, AUSA, AUSB, AUSC, AUSD, EXTRUD, FIBC, and PELTDRY.

b. Define building PE3 in BPIPPRM as a multi-tiered structure (i.e., several tier heights) instead of a single-tiered structure (i.e., one building height only). Also, please take note that PE3TNK should be part of or combined with building PE3. See Comment #5 for details.

31. On Page A-2, for the table with heading 'Effective Release Heights and Diameters for Flares', the equations for flare's effective diameter and effective height in the footnotes are from SCREEN3. However, the equations used should be from AERSCREEN as documented in Section 4.3 of the modeling report and of the approved June 6, 2024, modeling protocol.

32. On Page A-5, for table (Non-Road Volume Source Parameter Calculations):

a. Please confirm the release height and initial dispersion coefficients for PEU2. Values for these parameters in this table and table 'Modeled Volume Source Parameters' (Page A-3) differ. The values used in the modeling input files agree with those in table 'Modeled Volume Source Parameters' where PEU2 has the same values as PEU1.

b. PEU3 should be removed from this table for non-road volume sources. Based on the review of AERMOD modeling input files and tables in Appendix B (Potential to Emit Calculations), all emission points of PEU3 were modeled as point sources.

c. For footnotes #2 and #3 of this table, change 'Table 3-1' to 'Table 3-3'.

33. On Page A-5, for the table with heading 'Truck Roadway Volume Source Parameter Calculation', 5 steps were shown for calculation of volume source parameters used in modeling

emissions from truck roadway. However, as described in the modeling report, under *4.3 Source and Monitoring Data, Volume Sources* (and also in the approved June 6, 2024, modeling protocol for the EMACT Project), there are 6 steps in the calculation. Missing in the table on Page A-5 was the calculation of the number of volume sources to be modeled. Please provide the calculation of the number of volume sources representing the truck roadway.

In addition, please confirm and/or clarify the deviation from the documented procedure in calculating the number of volume sources. The September 22, 2020, review memo for Plan Approval 04-00740C documented that the road length was updated from 0.967 mile to 0.49 mile (2,587 feet). Following the steps described under *4.3 Source and Monitoring Data, Volume Sources*, there should be 57 or 58 volume sources representing the roadways. However, based on the table on Pages A-3 to A-4, there were 39 volume sources modeled representing the roadways, i.e., 26 for 'Plant Roadways (Transport Trucks)', 13 for 'Plant Roadways (Talc Transport via Trucks)'. These were also the number of volume sources representing the roadways in the 2020 revised PSD modeling.

Appendix D-2
Additional Impacts Analysis: Potential Growth Impacts and Potential Impairment to Soils and Vegetation from the Proposed EMACT Project and Plan Approval Reconciliations and WWTP Permanent Controls Project at Shell Polymers Monaca in Beaver County, Pennsylvania

2.0 Potential Impacts to Soils and Vegetation

34. Beryllium, which is one of the HAPs emitted from Shell, is one of the direct acting pollutants listed in the EPA's "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals." Shell should add a short discussion regarding beryllium based on their modeled results, e.g., modeled maximum annual concentration of 6.014E-7 $\mu g/m^3$, which is lower than the screening concentration of 0.01 $\mu g/m^3$ from Table 1 of the EPA document.

ENCLOSURE 2
DEP Technical Review Comments on Inhalation Risk Assessment
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December 20, 2024

Appendix D-3A
Emission Estimates for the Inhalation Risk Assessment for Shell Polymers Monaca Shell Chemical Appalachia LLC Beaver County, Pennsylvania

Notes:

Page numbers listed in the Comments 1 through 18 below for Appendix D-3A are the page numbers of the Plan Approval Application's PDF document, which contains 1,032 pages.

The "Chronic IHRA Emissions" spreadsheet within the "Step 2 Cancer Risk and Chronic HQ 2024-0913.xlsx" Excel workbook is referred to as the C-Spreadsheet in the comments below.

The "Acute IHRA Emissions" spreadsheet in the "Step 2 Acute HQ 2024-0913.xlsx" Excel workbook is referred to as the A-Spreadsheet in the comments below.

1. Table 1 lists a total of 58 emitted chemicals of potential concern (COPC) identified by Shell (from EPA's AP-42 Compilation of Air Pollutant Emission Factors and other references) based on the current air emission sources. The DEP reviewed the AP-42 Emission Factors (Sections 1.4, 3.1, 3.2, and 3.3) that were used in the Plan Approval and determined a total of 83 COPCs (ammonia is not in the AP-42 Sections but is included in the 83). The difference in the number of COPCs could be that a different version of AP-42 Section 3.2 was used by Shell. The difference in the number of COPCs is addressed in Comment #8 below. The additional COPC should be added to Appendix B (Potential to Emit Calculations) of the plan approval application, C-Spreadsheet, A-Spreadsheet, and Appendices D-3A and D3-C.

2. There appears to be an estimated 67 air emission sources on the C-Spreadsheet and A-spreadsheet. There appears to be an estimated 50 air emission sources on Table 2 and Table 3. The number of sources in Table 2 should equal the number of sources on the C-Spreadsheet and the plan approval application (Appendix B). If some of the fugitive sources from the C-spreadsheet were combined into one source on Table 2, then please provide an itemized list of sources, to include lb/hr emissions, for each combined source in Table 2. The source numbers should also be added to each source name on the C-Spreadsheet. Likewise, the number of sources in Table 3 should equal the number of sources on the A-Spreadsheet and the plan approval application (Appendix B). If some of the fugitive sources from the A-spreadsheet were combined into one source on Table 3, then please provide an itemized list of sources, including the lb/hr emissions, for each combined source in Table 3. The source numbers should also be added to each source name on the A-Spreadsheet.

ENCLOSURE 2

Related to Ethane Cracking Furnaces / Source IDs 031 – 037 on Page 711:

3. The following annual PTE T/yr emission rates appear to not be equivalent to the annual lb/hr emission rates in Table 2 and the C-spreadsheet: barium, benzene, cadmium, chromium, copper, dichlorobenzene, formaldehyde, hexane, lead, manganese. molybdenum, naphthalene, nickel, toluene, vanadium, and zinc. Likewise, the following hourly PTE lb/hr emission rates appear to not be equivalent to the hourly lb/hr emission rates in Table 3 and the A-spreadsheet: barium, benzo(a)anthracene, benzene, butane, ethane, formaldehyde, hexane, nickel, naphthalene pentane, propane, toluene, vanadium, and zinc. These emission rates should be presented in a consistent manner.

4. EPA AP-42, Chapter 1.4 (Natural Gas Combustion) was used to identify the COPCs and emission factors. The following COPCs are listed in Table 1.4-3 of AP-42: acenaphthylene, butane, and ethane. However, acenaphthylene, which is a COPC, is not included in Page 711 but is listed in Table 2, Table 3, the C-Spreadsheet, and the A-spreadsheet, but with no associated emission rate. Butane and ethane are included in Page 711 but not listed in Table 2, the C-Spreadsheet, Table 3, and the A-spreadsheet.

5. The annual PTE emission rate for ammonia is listed as 10.45 T/yr. The DEP calculated: (3.80E-03 lb/MMBtu)*(336.2 MMBtu/hr)*(8,760 hr/2,000 hr) = 5.60 T/yr, which is equivalent to an annual emission rate of 1.28E+00 lb/hr. Table 2 and the C-Spreadsheet list the annual emission rate as 2.39E+00 lb/hr. Likewise, the hourly PTE emission rate for ammonia is listed as 2.39 lb/hr. The DEP calculated: (3.80E-03 lb/MMBtu)*(336.2 MMBtu/hr) = 1.28E+00 lb/hr. Table 3 and the A-Spreadsheet list the annual emission rate as 2.39E+00 lb/hr.

Related to Turbine Duct Burners / Source IDs 101-103 on Pages 712-713:

6. Annual PTE emission rate calculations for lead are listed in Page 712; however, lead emission rates are not included in Table 2 and the C-Spreadsheet. Likewise, hourly PTE emission rate calculations for lead are listed in Page 712; however, lead emission rates are not included in Table 3 and the A-Spreadsheet.

7. The annual PTE T/yr emission rates for most COPCs appear to not be equivalent to the annual lb/hr emission rates in Table 2 and the C-spreadsheet. Likewise, the hourly PTE lb/hr emission rates for most COPCs appear to not be equivalent to the hourly lb/hr emission rates in Table 3 and the A-spreadsheet. These emission rates should be presented in a consistent manner.

Related to Natural Gas Emergency Generator Engines / Source ID 107 on Page 723:

8. EPA AP-42, Chapter 3.2 (Natural Gas-fired Reciprocating Engines) was used to identify the COPCs and emission factors. The following COPCs are listed in Table 3.2-2 of AP-42; however, the following COPCs were not listed in Table 2, the C-Spreadsheet, Table 3, and the A-spreadsheet.

- Acenaphthene
- Acenaphthylene
- Benzo(b)fluoranthene
- Benzo(e)pyrene
- Benzo(g,h,i)perylene
- Butane
- Butyr/Isobutyraldehyde
- Carbon Tetrachloride
- Chlorobenzene
- Chloroethane
- Chrysene
- Cyclopentane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,2-Dichloropropane
- 1,3-Dichloropropene
- Ethane
- Ethylene Dibromide
- Fluoranthene
- Fluorene
- Methylcyclohexane
- Methylene Chloride
- n-Nonane
- n-Octane
- Phenanthrene
- Perchloroethylene
- 1,1,2,2-Tetrachloroethane
- 1,1,2-Trichloroethane
- 1,2,3-Trimethylbenzene
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- 2,2,4-Trimethylpentane
- Vinyl Chloride

Related to Continuous Vent Thermal Oxidizer / Source ID C204A on Page 731:

9. EPA AP-42, Chapter 1.4 (Natural Gas Combustion) was used to identify the COPCs and emission factors. The following COPCs are listed in Table 1.4-3 of AP-42: acenaphthylene, butane, and ethane. However, these COPCs are not included in Page 731, Table 2, the C-Spreadsheet, Table 3, and the A-spreadsheet.

Related to MPGFs (CVTO, Ethylene Tank, PE Units) / Source ID C204B on Pages 733-738:

10. EPA AP-42, Chapter 1.4 (Natural Gas Combustion) was used to identify the COPCs and emission factors. The following COPCs are listed in Table 1.4-3 of AP-42: acenaphthylene, butane, and ethane. However, these COPCs are not included in Pages 733-738, Table 2, the C-Spreadsheet, Table 3, and the A-spreadsheet.

Related to TEGF A, TEGF B, & HP EF / Source IDs C205A, C205B, and C205C on Page 740:

11. These three flares are summed together in the annual average T/yr emissions rate column, however, Table 2 and the C-Spreadsheet list separate emission rates for each flare. Please explain how the three values on Table 2 and the C-Spreadsheet were derived from the combined annual average T/yr emission rate on Page 740. Each flare's calculated annual average emission should be added to Page 740 to demonstrate that the calculated emissions are equivalent to the Table 2 and C-Spreadsheet lb/hr emissions.

12. EPA AP-42, Chapter 1.4 (Natural Gas Combustion) was used to identify the COPCs and emission factors. The following COPCs are listed in Table 1.4-3 of AP-42: acenaphthylene,

butane, and ethane. However, these COPCs are not included in Page 740, Table 2, the C-Spreadsheet, Table 3, and the A-spreadsheet.

Related to Spent Caustic Thermal Oxidizer / Source ID C206 on Page 742:

13. EPA AP-42, Chapter 1.4 (Natural Gas Combustion) was used to identify the COPCs and emission factors. The following COPCs are listed in Tables 1.4-2 and 1.4-3 of AP-42: butane, ethane, and lead. However, these COPCs are not included in Page 742, Table 2, the C-Spreadsheet, Table 3, and the A-Spreadsheet. Acenaphthylene is listed in Table 1.4-3 of AP-42 and on Page 742 without the AP-42 emission factor. The AP-42 lb/h emission should be included in the total lb/hr emission for acenaphthylene on Page 742, Table 2, C-Spreadsheet, Table 3, and the A-Spreadsheet.

Related to Liquid Loadout (Recovered Oil) / Source ID 302 on Page 746:

14. A total annual PTE HAPs emission rate of 0.10 T/yr is listed (as 100% of the total VOC emissions); however, there are no emission calculations for each HAP and it is unclear how these emissions relate to Table 2 and the C-spreadsheet. Additionally, there is no hourly PTE HAPs emission rate and no emission calculations for each HAP and it is unclear how these emissions relate to Table 3 and the A-spreadsheet. There are HAPs listed on the C-Spreadsheet and A-Spreadsheet under "Recovered Oil & Truck Loadout". Are these two sources the same?

Related to C3+ Railcar Loading and C3 Railcar Unloading / Source ID 304 on Page 748:

15. Annual PTE emission rates of 1,3-butadiene, benzene, and toluene are not listed in Page 748. It is unclear how this emission source relates to Table 2 and the "Rail for C3+" emission source on the C-Spreadsheet, assuming this is the same emission source. Additionally, hourly PTE emission rates of 1,3-butadiene, benzene, and toluene are listed in Page 748. However, it is unclear how this emission source relates to Table 3 and the "Rail for C3+" emission source on the A-Spreadsheet, assuming this is the same emission source.

Related to Storage Tanks Diesel Fuel / Source ID 406 on Page 749:

16. A total annual PTE HAPs emission rate of 4.25E-04 T/yr is listed (as 100% of the total VOC emissions); however, there are no emission calculations for each HAP and it is unclear how these emissions relate to Table 2 and the C-spreadsheet. Additionally, there is no hourly PTE HAPs emission rate and no emission calculations for each HAP and it is unclear how these emissions relate to Table 3 and the A-spreadsheet.

Related to Equipment Components (OSBL) / Source ID 501 on Pages 750-760:

17. It is unclear how these emission sources and annual PTE HAPs emission rates relate to Table 2 and the C-Spreadsheet. Additionally, there are no hourly PTE HAPs emission rates included in Pages 750-760 and it is unclear how these emission sources relate to Table 3 and the A-Spreadsheet.

Related to the remaining emission sources:

18. The following emission sources and associated emission rates are listed in the C-Spreadsheet and A-spreadsheet; however, it is unclear how these emission sources relate to the emission sources listed in Appendix B (Potential to Emit Calculations) of the plan approval application, Table 2, and Table 3.

- PE Blending Silos
- Ethane Cracking
- Fuel Gas and Regeneration System
- Wash Water System
- Cracked Gas Compression
- Caustic Wash
- Gas Redistillation
- C2/C3 Separation
- C2 Hydrogenation
- C1/C2 Separation
- Spent Caustic Treatment
- Flare Condensate
- 590
- 236LR
- 646
- 642
- Flare Header Segment 1
- Flare Header Segment 2
- Flare Header Segment 3
- Flare Header Segment 4
- Flare Header Segment 5
- Flare Header Segment 6
- Flare Header Segment 7
- C3+

Appendix D-3B
Dispersion Modeling Analysis for the Inhalation Risk Assessment for Shell Polymers Monaca Beaver County, Pennsylvania

4.2 Model Control Options and Land Use

19. The EPA released v24142 of AERMOD, AERMAP, AERMET, and AERSURFACE on November 20. 2024. Subsequently, EPA released a recompiled 64-bit AERMOD executable on December 4, 2024. If re-execution of AERMOD is warranted in responding to these comments, the latest versions of AERMOD and its associated programs should be used. See Comment #3 in Enclosure 1, above.

20. On Page 7, change ‘subsection 7.2.3(c)’ to ‘subsection 7.2.1.1’. See the PSD modeling report.

4.3 Source Data

Point Sources

21. The comment on the PSD modeling related to Process Cooling Towers also applies to the dispersion modeling for the inhalation risk assessment. For details, see Comment #29 in Enclosure 1, above.

ENCLOSURE 2

Fugitive Emissions from Tanks and Equipment Leaks

22. On Page 13, change 'Table 3-1' to 'Table 3-3' for the equations of volume sources' initial dispersion coefficients in the AERMOD user's guide.

23. For Table 2 (SPM Non-Road Volume Source Parameter Calculations) on Pages 14 and 15:

a. Model IDs PERC, PETK, PEU1, and PEU2 were not defined in the AERMOD modeling input files for both chronic and acute risk assessments. If HAPs are emitted from these sources or through these emission points modeled as volume sources, they should be modeled. If not, then they can be removed from Table 2.

b. Please remove PEU3 from this table. All emission points from PEU3 are modeled as point sources. For details, see Comment #32 in Enclosure 1.

c. Footnotes #2, #3, #5: Change 'Table 3-1' to 'Table 3-3'.

d. Footnote #4: This no longer applies. Based on the 2020 Risk Assessment Modeling Report, this footnote was for the multipoint ground flare (MPGF), which was modeled as a volume source at the time. The MPGF is now modeled as a point source as discussed in the modeling protocol approved by the DEP on June 6, 2024. Please remove the footnote and revise the table as appropriate (i.e., Footnote column).

Turbine Load/Operating Conditions

24. The three comments on the PSD modeling related to combustion turbine load analysis also apply to the dispersion modeling for the inhalation risk assessment. For details, see Comments #14 through #16 in Enclosure 1, above.

Good Engineering Practice Stack Height Analysis

25. The two BPIPPRM-related comments on the PSD modeling also apply to the dispersion modeling for the inhalation risk assessment. For details, see Comments #5 and #6 in Enclosure 1, above.

4.4 Receptor Data

26. Based on the AERMAP and AERMOD input and output files provided, the modeling domain used for both chronic and acute exposure assessments extended up to ~5,000 meters from the facility fence. The information in Table 3 on Page 20, which stated that the modeling domain for the exposure assessments extended up to 10,000 meters from the facility, should be corrected.

4.5 Meteorological Data

Data Processing

27. See equivalent comments on the PSD modeling report (i.e., Comments #11 and #12 in Enclosure 1, above) regarding Beaver Valley meteorological data processing in AERMET Stage 1 and using the adjust u* option in AERMET Stage 2.

4.6 Output Options

28. There is no need to mention the excess lifetime cancer risk (ELCR) threshold (1:100,000 risk) in this subsection. Appendix D-3B is on the dispersion modeling for the inhalation risk assessment. Note that the cancer and noncancer risks thresholds are both documented in the separate appendix for risk characterization (Appendix D-3C, Inhalation Risk Assessment for Shell Polymers Monaca Shell Chemical Appalachia LLC Beaver County, Pennsylvania). This subsection could simply state that the ELCR was determined.

Appendix D-3C
Inhalation Risk Assessment for Shell Polymers Monaca Shell Chemical Appalachia LLC Beaver County, Pennsylvania

Notes:

The following acronyms are used below: Health Risk Value (HRV), which is synonymous with Inhalation Unit Risk (IUR) and Reference Concentrations (RfCs), Chronic Cancer (CC), Chronic Noncancer (CNC), Acute Noncancer (ANC), Excess Lifetime Cancer Risk (ELCR), Hazard Quotient (HQ), Hazard Index (HI), Integrated Risk Information System (IRIS), California Environmental Protection Agency (CalEPA), American Conference of Governmental Industrial Hygienists (ACGIH), Provisional Peer-Reviewed Toxicity Values (PPRTV), and Agency for Toxic Substances and Disease Registry (ATSDR).

Shell's January 2015 protocol lists a hierarchy of reference sources that is used to identify the specific HRV for each emitted COPC. The DEP will accept a HRV that does not follow the hierarchy as long as the HRV used is more protective. Inconsistencies with the hierarchy are indicated in Comments #29 through #31 below.

29. The following IUR values in the Chronic Cancer column in Table 1 should be replaced as shown below:

Table 1 IUR	Replace With
Arsenic 3.30E-03 $\mu g/m^3$ from CalEPA	IRIS value of 4.30E-03 $\mu g/m^3$
Chloroform 5.30E-06 $\mu g/m^3$ from CalEPA	IRIS value of 2.30E-05 $\mu g/m^3$
Formaldehyde 6.00E-06 $\mu g/m^3$ from CalEPA	IRIS value of 1.10E-05 $\mu g/m^3$

30. The following CNC RfC value in the Chronic Noncancer column in Table 1should be replaced as shown below:

Table 1 RfC	Replace With
Formaldehyde 9.00E-03 mg/m^3 from CalEPA	IRIS value of 7.00E-03mg/m^3

31. The following ANC RfC values in the Acute Noncancer column Table 1should be replaced as shown below:

Table 1 RfC	Replace With
Beryllium 2.50E-04 mg/m^3 PADEP	ACGIH TWA calculated value of 7.50E-06 mg/m^3
Chromium 1.00E-02 mg/m^3 PADEP	ACGIH STEL calculated value of 1.25E-05 mg/m^3
Manganese 7.50E-02 mg/m^3 PADEP	ACGIH TWA calculated value of 3.00E-03 mg/m^3

The replacement values for the ANC RfC were calculated by using the following formulas:

For Time Weighted Average (TWA) use: (3 * TWA / 20) = ANC RfC
For Short-Term Exposure Limit (STEL) use: (STEL / 40) = ANC RfC

32. The following COPCs are listed in Table 1 (Identified Compounds of Potential Concern) of Appendix D3-A; however, they were not included in Table 1 (Chronic and Acute Risk Factors for Inhalation Risk Assessment) in Appendix D-3C. These COPCs and the HRVs should be added to Table 1 of Appendix D3-C.

COPC	IUR	CNC RfC	ANC RfC
Benzo(g,h,l)perylene	NA	NA	NA
Heptane	NA	4.00E-01 mg/m^3 (PPRTV)	5.12E+01(ACGIH)
Propylene	NA	3.00E+00 mg/m^3 (CalEPA)	1.29E+02(ACGIH)
Zinc	NA	NA	NA

33. The chloroform CNC RfC listed in CalEPA is 3.00E-05 mg/m^3. Shell referenced CalEPA in Table 1 but listed the RfC as 2.00E-05 mg/m^3. The Chloroform CNC RfC value in Table 1 should be replaced with the CalEPA value of 3.00E-05 mg/m^3.

34. The chromium CNC RfC listed in IRIS is 3.00E-05 mg/m^3. Shell referenced IRIS but listed the RfC as 1.00E-04 mg/m3. The CNC value was updated in August 2024. The chromium CNC RfC value in Table 1 should be updated with the new value of is 3.00E-05 mg/m^3.

35. The chromium CC IUR listed in IRIS is 1.10E-02 $\mu g/m^3$. Shell used a CC IUR of 8.40E-02 $\mu g/m^3$. The chromium IUR in Table 1 should be replaced with the IRIS value of 1.10E-02 $\mu g/m^3$.

36. Ethylene oxide was listed as a COPC in Shell's January 2015 protocol and evaluated in Shell's January 2015 and March 2020 inhalation risk assessment submittals. There is no mention of ethylene oxide in this inhalation risk assessment. Please explain why ethylene oxide was excluded.

37. Table 1 lists the hexane ANC RfC at 27.00 mg/m^3. DEP calculated an ANC RfC of 26.4 mg/m^3: ACGIH TWA = 50 ppm = 176.23 mg/m^3, (3 * TWA / 20) = 26.4345 mg/m^3. The hexane ANC RfC in Table 1 should be replaced with the value of 2.64E+00 mg/m^3.

38. Table 1 lists the pentane ANC RfC at 180.00 mg/m^3. DEP calculated an RfC of 265.58 mg/m^3: CalEPA = 600 ppm = 1770.55 mg/m^3, (3 * TWA / 20) = 265.58 mg/m^3. The hexane ANC RfC in Table 1 should be replaced with the value of 2.66E+02 mg/m^3.

39. The HRVs for Polycyclic Aromatic Hydrocarbons (PAH) are listed as an IUR of 7.10E-02 µg /m^3 and an ANC RfC as 1.90E-02 mg/m^3, however there is no reference listed for each COPC. The reference as to where the HRVs were obtained should be included in Table 1.

40. The COPCs and their Chronic Cancer IURs listed in the table below were not included in Table 1. The COPCs and the IURs should be added to Table 1 and the COPCs and ELCR calculations should be added to Table 2.

COPC	IUR (µg/m^3)	Reference
Carbon Tetrachloride	6.00E-06	IRIS
1,1-Dichloroethane	1.60E-06	CalEPA
1,2-Dichloroethane	2.60E-05	IRIS
1,2-Dichloropropane	3.70E-06	PPRTV
1,3-Dichloropropene	4.00E-06	IRIS
Ethylene Dibromide (1,2-Dibromethane)	6.00E-04	IRIS
Methylene Chloride (Dichloromethane)	1.00E-08	IRIS
1,1,2,2-Tetrachloroethane	5.80E-05	CalEPA
Tetrachloroethylene (Perchloroethylene)	2.60E-07	IRIS
1,1,2-Trichloroethane	1.60E-05	IRIS
Vinyl Chloride	4.40E-06	IRIS

41. The COPCs and their CNC RfCs listed in the table below were not included in Table 1. The COPCs and the CNC RfCs should be added to Table 1 and the COPCs and CNC HQ and HI calculations should be added to Table 2.

ENCLOSURE 2

COPC	CNC RfC (mg /m^3)	Reference
Benzo(e)pyrene	2.00E-06	PPRTV
Carbon Tetrachloride	1.00E-01	IRIS
Chlorobenzene	5.00E-02	PPRTV
1,2-Dichloroethane	7.00E-03	PPRTV
1,2-Dichloropropane	4.00E-03	IRIS
1,3-Dichloropropene	2.00E-02	IRIS
Ethylene Dibromide (1,2-Dibromethane)	9.00E-03	IRIS
Methylene Chloride (Dichloromethane)	6.00E-01	IRIS
Methylcyclohexane	9.50E-02	PPRTV
n-Nonane	2.00E-02	PPRTV
Tetrachloroethylene (Perchloroethylene)	4.00E-02	IRIS
1,2,3-Trimethylbenzene	6.00E-02	IRIS
1,2,4-Trimethylbenzene	6.00E-02	IRIS
1,3,5-Trimethylbenzene	6.00E-02	IRIS

42. The COPCs and their ANC RfCs listed in the table below were not included in Table 1. The COPCs and their RfC should be included in Table 1 and the COPCs and ANC HQ calculations should be added to Table 3.

COPC	ANC RfC (mg/m^3)	Reference
Butane	3.57E+02	ACGIH TWA (calculated)
Carbon Tetrachloride	1.90E+00	CalEPA
Chlorobenzene	6.91E+00	ACGIH TWA (Calculated)
Cyclopentane	4.30E+02	ACGIH TWA (Calculated)
Dibutyl phthalate	7.50E-01	ACGIH TWA (Calculated)
1,1-Dichloroethane	6.07E+01	ACGIH TWA (Calculated)
1,3-Dichloropropene	6.81E-01	ACGIH TWA (Calculated)
Heptane	5.12E+01	ACGIH STEL (Calculated)
Methylene Chloride	1.40E+01	CalEPA
Methylcyclohexane	6.02E+01	ACGIH TWA (Calculated)
2-Methylnapthalene	4.37E-01	ACGIH TWA (Calculated)
n-Nonane	1.57E+02	ACGIH TWA (Calculated)
n-Octane	2.10E+02	ACGIH TWA (Calculated)
Phenanthrene	3.00E-02	ACGIH TWA (Calculated)
Tetrachloroethylene	1.70E+01	ACGIH TWA (Calculated)
Propane	2.71E+02	OSHA TWA (Calculated)
Propylene	1.29E+02	ACGIH TWA (Calculated)
1,1,2,2-Tetrachloroethane	1.03E+00	ACGIH TWA (Calculated)
1,1,2-Trichloroethane	8.18E+00	ACGIH TWA (Calculated)
Vinyl Chloride	1.80E+02	CalEPA

43. Table 3 lists an ANC HQ for Zinc, however there is no ANC RfC for Zinc listed in Table 1. The ANC RfC for Zinc and its reference should be listed in Table 1.

44. In addressing the comments within this enclosure, the ELCR and CNC HQs and HI presented in Table 2 and the ANC HQs presented in Table 3 should be recalculated.

45. There is no mention of Table 2 (Estimated Health Effects from COPCs at Receptors with the Highest Aggregate ELCR and Chronic HQ) in subsection 1.1 (Chronic Cancer and Non-cancer Risks) of this subsection.

46. There should be a discussion of exposed populations (receptors) in Appendix D-3C. The risk assessment does not address to whom and what time frame the exposure and risk calculations were evaluated. The risk assessment should also include a discussion of distance from source emissions to community and sensitive populations such as schools, day care, or nursing homes in the area.

47. Based on the exposed populations, there should be a discussion of the exposure assumptions that are being used to estimate exposure and risk in Appendix D-3C. For example, are the risks calculated for an adult or child resident and is the exposure period over a lifetime?

48. The COPCs listed below are considered to be carcinogens by a mutagenic mode of action by the EPA. The complete list of chemicals that are mutagens can be found in the Regional Screening Levels (RSLs) User's Guide, section 5.17 Mutagens, URL: www.epa.gov/risk/regional-screening-levels-rsls-users-guide#mutagens. Children are more susceptible to cancer and tumor development if exposed to carcinogens with a mutagenic mode of action. To account for this increased susceptibility, EPA applies age-dependent adjustment factors (ADAFs) to the cancer risk equation for these contaminants. The ADAF-adjusted cancer risk equation can be found in EPA's guidance document *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (March 2005) at the following URL: www.epa.gov/sites/default/files/2013-09/documents/childrens_supplement_final.pdf. Examples of how to estimate cancer risks for mutagens are provided on pages 36 through 41 of this document. The DEP recommends including the COPCs listed below in a separate evaluation of the cancer risks to children from a mutagenic mode of action using the ADAF-adjusted equations provided by the EPA.

- benzo[a]anthracene
- benzo[a]pyrene
- benzo[b]fluoranthene
- benzo[k]fluoranthene
- indeno[1,2,3-cd]pyrene
- chromium VI
- chrysene
- dibenzo[a,h]anthracene
- 7,12-dimethylbenz[a]anthracene
- ethylene oxide
- formaldehyde
- methylcholanthrene
- methylene chloride
- vinyl chloride