Appendix G

Groundwater Concentration Trend Analysis Results by Area at fYNOP

Constituent of concern (COC) concentration trends in groundwater at fYNOP were evaluated using Mann-Kendall statistical analysis with United States Environmental Protection Agency (USEPA) ProUCL version 5.2 statistical software package (USEPA, 2022). The Mann-Kendall test used the Confidence Coefficient (CC) of 90% and 80% to determine if a statistically significant upward or downward trend was indicated by the data.

If a trend could not be determined using the 90% CC, then an 80% CC was used. If a statistically significant trend was not indicated at an 80% CC, a least squares linear regression analysis was performed using ProUCL. However, no statistical test of significance was used to evaluate the trends identified using linear regression.

Tables 4.2-7 and **4.2-8** present the results of trend analyses conducted on the groundwater attainment data from 48 wells. Trends were determined for COCs in groundwater samples collected from each area at fYNOP that include the Northern Property Boundary (NPBA), Eastern Site Perimeter (ESP), South-Central Site Area (SCSA), Southern Property Boundary Area (SPBA), South Plume Area (SPA), Codorus Creek Levee Area, West Side of Codorus Creek, and Northern Site Perimeter (NSP). **Table 4.2-7** presents the trend results for trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene (cis12DCE), and vinyl chloride (VC). **Table 4.2-8** presents the trend results for 1,1-dichloroethane (11DCA), 1,1-dichloroethene (11DCE), 1,2-dichloroethane (12DCA), 1,1,1-trichloroethane (TCA), benzene, and methyl tertiary-butyl ether (MTBE) for the SCSA and SPA, only. Trend analyses outputs and plots are included in **Appendix F**.

A trend summary for COCs in 157 NPBA groundwater attainment samples from 16 wells since 2013, is as follows:

- Statistically significant decreasing TCE concentration trends were determined in groundwater from eight wells. Statistically significant increasing trends for TCE were determined in groundwater in two wells (MW-16S and MW-20M) at concentrations above the MSC. No statistically significant trend for TCE was determined for groundwater in one well; however, the linear regression test suggests a declining trend in TCE concentrations in groundwater from that well.

GROUNDWATER SCIENCES CORPORATION

- Statistically significant decreasing PCE concentration trends were determined in groundwater from five wells. A statistically significant increasing PCE trend was determined in samples from one well (MW-20M) at concentrations below the MSC. No statistically significant PCE trend was determined in groundwater from three wells; however, the linear regression tests suggest a declining trend in PCE concentration in groundwater from two wells and an increasing PCE trend for groundwater in one well (MW-20S) at concentrations above the MSC.

- Statistically significant decreasing cis12DCE concentration trends were determined in groundwater from six wells. Statistically significant increasing trends for cis12DCE were determined in samples from three wells (MW-12, MW-142S, and MW-143D) at concentrations below the MSC. No statistically significant cis12DCE trend was determined in groundwater from two wells; however, the linear regression tests suggest a declining trend in cis12DCE concentrations in samples from these wells.

- Statistically significant decreasing VC concentration trends in groundwater were determined from groundwater in three wells.

A trend summary for COCs in 12 ESP groundwater attainment samples from three wells since 2019, is as follows:

- A statistically significant decreasing TCE concentration trend was determined in groundwater from one well. No statistically significant TCE trends were determined in groundwater from two wells; however, the linear regression tests suggest declining trends in TCE concentrations in groundwater from these wells.

- No statistically significant concentration trends for PCE were determined in groundwater from three wells. The linear regression tests suggest a declining trend for PCE in samples from one well and increasing trends in samples from two wells (MW-14 and MW-65S at concentrations above and below the MSC, respectively).

- A statistically significant trend for cis12DCE was not determined for groundwater from one well; however, the linear regression tests suggest a declining trend in cis12DCE concentrations in groundwater from this well.

A trend summary for COCs in 34 SCSA groundwater attainment samples from eight wells since 2019, is as follows:

- Statistically significant decreasing TCE concentration trends were determined in groundwater from three wells. No statistically significant TCE trends were determined in groundwater from five wells. The linear regression tests for TCE suggest declining trends in groundwater from three wells and increasing trends in groundwater from two wells (MW-111 and MW-112) at concentrations below the MSC.

Final Report – Appendix G   *November 3, 2023 / Revised January 30, 2024*

GROUNDWATER SCIENCES CORPORATION

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- A statistically significant decreasing PCE trend was determined in groundwater from one well. No statistically significant PCE trend was determined in samples from two wells; however, the linear regression tests suggest a declining trend in PCE concentrations in groundwater from those wells.

- Statistically significant decreasing cis12DCE concentration trends were determined in samples from four wells. No statistically significant cis12DCE trends were determined in groundwater from three wells. Linear regression tests for cis12DCE suggest a declining trend in groundwater from one well and increasing trends in groundwater from two wells (MW-88 and MW-111) at concentrations below the MSC.

- A statistically significant VC trend in groundwater was not determined; however, the linear regression test suggests an increasing VC trend in groundwater from MW-115 at concentrations above the MSC.

- A statistically significant decreasing 11DCA concentration trend was determined in groundwater from one well. No statistically significant 11DCA trend was determined in groundwater from one well; however, the linear regression test suggests a declining trend in 11DCA concentrations in groundwater from one well.

- A statistically significant decreasing 11DCE concentration trend was determined in groundwater from one well. A statistically significant increasing 11DCE trend was determined in groundwater from one well (MW-111) at concentrations below the MSC. No statistically significant trend was determined for 11DCE above the MSC; however, the linear regression test suggests a declining trend in 11DCE concentrations in groundwater from one well.

- A statistically significant decreasing 12DCA concentration trend was determined in groundwater from one well.

- A statistically significant decreasing TCA concentration trend was determined in groundwater from one well.

- A statistically significant decreasing benzene concentration trend was determined in groundwater from one well.

- A statistically significant trend for MTBE was not determined; however, the linear regression test suggests a declining trend in groundwater from one well.

A trend summary for COCs in 80 SPBA groundwater attainment samples from seven wells since 2018, is as follows:

- Statistically significant decreasing TCE concentration trends were determined in groundwater from four wells.

- Statistically significant decreasing PCE concentration trends were determined in groundwater from four wells. No statistically significant PCE trends were determined in groundwater from two wells; however, the linear regression tests suggest a declining PCE trend in groundwater

Final Report – Appendix G   *November 3, 2023 / Revised January 30, 2024*

GROUNDWATER SCIENCES CORPORATION
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Final Report Appendix G - Groundwater Concentration Trend Analysis Results 1.30.24.docx

from one well and an increasing trend in groundwater from one well (MW-166) at concentrations above the MSC.

A trend summary for COCs in 24 SPA groundwater attainment samples from six wells since 2019, is as follows:

- Statistically significant decreasing TCE concentration trends were determined in samples from two wells. No statistically significant TCE trends were determined in groundwater from four wells; however, the linear regression test suggests a declining trend in TCE concentration for samples from three wells and an increasing TCE trend in groundwater from one well (Cole Steel (MW-12)) at concentrations above the MSC.

- Statistically significant decreasing PCE concentration trends were determined in groundwater from two wells. A statistically significant increasing PCE trend was determined in groundwater from one well (Cole Steel (MW-12)) at concentrations below the MSC. No statistically significant PCE trend was determined in groundwater from two wells; however, the linear regression tests suggest a declining trend in PCE concentration for samples from one well and an increasing trend in groundwater from one well (GM-1D) at concentrations above the MSC.

- Statistically significant decreasing cis12DCE concentration trend was determined in groundwater from one well. A statistically significant increasing cis12DCE trend was determined in groundwater from one well (Cole Steel (MW-12)) at concentrations below the MSC. No statistically significant cis12DCE trend was determined in groundwater from one well; however, the linear regression test suggests a declining trend in cis12DCE concentration in groundwater from that well.

- A statistically significant decreasing 11DCE concentration trend was determined in groundwater from one well.

A trend summary for COCs in 12 Codorus Creek Levee Area groundwater attainment samples from two wells since 2021, is as follows:

- No statistically significant TCE trend was determined in samples from two wells; however, the linear regression test suggests a decreasing TCE trend in groundwater from one well and an increasing TCE trend in groundwater in one well (MW-101S) at concentrations below the MSC.

- No statistically significant PCE trend was determined in samples from two wells; however, the linear regression test suggests a decreasing PCE trend in groundwater from one well and an increasing trend in PCE concentration for groundwater from one well (MW-101S) at concentrations below the MSC.

Final Report – Appendix G   *November 3, 2023 / Revised January 30, 2024*

GROUNDWATER SCIENCES CORPORATION

H:\10000\10012\Final Report\Final to Regulators\Final Report (REVISED-ReSubmit)\G - Groundwater Concentration Trend Analysis Results by Area at fYNOP\fYNOP Final Report Appendix G - Groundwater Concentration Trend Analysis Results 1.30.24.docx

- A statistically significant decreasing cis12DCE concentration trend was determined in groundwater from one well. No statistically significant cis12DCE trend was determined in groundwater from one well; however, the linear regression test suggests an increasing trend in cis12DCE in groundwater from that well (MW-101S) at concentrations below the MSC.

Trend analyses were not performed on the analytical results for groundwater from two wells on the West Side of Codorus Creek (no COCs detected).

A trend summary for COCs in 19 NSP groundwater attainment samples from four wells since 2019, is as follows:

- A statistically significant decreasing TCE concentration trend was determined in groundwater from one well. No statistically significant TCE trend was determined in samples from one well; however, the linear regression test suggests a decreasing TCE trend in groundwater from that well.

- A statistically significant increasing PCE concentration trend was determined in groundwater from one well (MW-82) at concentrations below the MSC.

- A statistically significant decreasing cis12DCE concentration trend was determined in groundwater from two wells.

Final Report – Appendix G   *November 3, 2023 / Revised January 30, 2024*

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H:\10000\10012\Final Report\Final to Regulators\Final Report (REVISED-ReSubmit)\G - Groundwater Concentration Trend Analysis Results by Area at ƒYNOP\ƒYNOP Final Report Appendix G - Groundwater Concentration Trend Analysis Results 1.30.24.docx