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July 27, 2021

Ms. Paula Scott
Town Manager
106 Western Ave
Hampden ME 04444

Subject: Pine Tree Landfill
Drumlin Environmental Review of Annual 2020 Water Quality Data

Dear Ms. Scott:

Drumlin Environmental, LLC (Drumlin), the Town of Hampden's (Town) environmental consultants, submitted a memorandum (memo) to you and the Hampden Environmental Trust on July 12, 2021 to update the Town on the conditions at the New England Waste Services of Maine (NEWSME) Pine Tree Landfill (PTL). Drumlin's memo summarized both the 2020 Annual Report and the April 2021 Water Quality Data results that were prepared by Sevee & Maher Engineers, Inc. (SME) on NEWSME's behalf.

Matt Reynolds of Drumlin presented the memo to the Hampden Town Council on July 19, 2021. PTL abutters were notified of the meeting and Drumlin's memo and presentation were posted on the Town's website one week prior. NEWSME and SME were notified of the meeting on July 17th and representatives from each organization were in attendance. In general, NEWSME and SME agreed with Drumlin's assessment of the site with regards to several specific conductivity trends and the need to continue using the gas and groundwater extraction wells, two corrective actions currently in place at PTL. There were a few statements and recommendations in Drumlin's memo with which NEWSME and SME did not agree that are discussed herein.

Below is a summary of the PTL post-closure water quality threshold criteria for reference followed by responses to a few key topics discussed in Drumlin's memo.

PINE TREE LANDFILL ENVIRONMENTAL MONITORING PLAN WATER QUALITY THRESHOLD CRITERIA

The PTL Post-Closure Environmental Monitoring Plan (EMP) was submitted to the Maine Department of Environmental Protection (MEDEP) for review in May 2011. MEDEP indicated acceptance of the EMP as part of their 2010 Water Quality Report review memo dated August 16, 2011. The EMP established threshold criteria to evaluate the site groundwater over the post-closure period in order to demonstrate successful corrective action, as defined during the Department's review of the site-wide closure plan and included in the Department Closure Order. The water quality threshold criteria are:

- Off-site groundwater quality:

  - Tested water quality parameters below applicable groundwater United States Environmental Protection Agency (U.S.EPA) Maximum Contaminant Levels (MCLs) and Maine Maximum Exposure Guidelines (MEGs),
  - The 95 percent upper confidence level for specific conductance at off-site private water supply wells below 400 micromhos per centimeter (µmhos/cm), and
  - Dissolved methane at off-site private water supply wells less than 700 micrograms per liter (µg/L).
- On-site groundwater quality:
  - Specific conductance at on-site monitoring locations less than 500 µmhos/cm.
- Off-site surface water quality:

  Meet surface water quality classifications established in 38 MRSA Sections 465 through 465-B.

Off-site surface water quality meets existing water quality classification standard.

GROUNDWATER QUALITY MONITORING FREQUENCY FOR POST-CLOSURE MONITORING YEARS 2021-2040

As initially proposed in the original PTL post-closure EMP[1], the PTL 2020 Water Quality Report[2] Conclusions and Recommendations section proposes reducing the groundwater quality monitoring frequency from twice per year to once per year for post-closure monitoring years 2021 through 2040. Similarly, and also included in the original post-closure EMP, a groundwater quality monitoring frequency reduction from three times per year to two times per year for post-closure monitoring years 2016 through 2020 was proposed in the PTL 2015 Water Quality Report[3] and was approved by MEDEP. This practice is consistent with state practices and with Chapter 405, Section 2 (Water Quality Monitoring) which notes that the sampling frequency and parameters for closed landfills are expected to decrease throughout the post-closure period.

On behalf of NEWSME, SME reached out to MEDEP on March 19, 2021 regarding the proposed reduction in monitoring frequency since, if established, it would eliminate the April 2021 groundwater quality monitoring event. MEDEP responded on April 1, 2021, stating they wanted to first review the PTL 2020 Water Quality Report and the April 2021 groundwater quality monitoring results. The 2020 PTL Water Quality Report was submitted to MEDEP in April 2020 and the results of the April 2021 groundwater monitoring quality were submitted to the MEDEP on June 23, 2021. As of now, SME has not received a response from MEDEP regarding the proposed reduction in groundwater quality monitoring frequency from two times per year to one time per year.

In their July 12, 2021 memo, Drumlin recommends "reducing the monitoring frequency to once-per-year in some wells (e.g., 906B, where the target criteria are consistently achieved), but maintaining a twice per year frequency in other wells (e.g., wells with rising trends)".

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[1] SME, 2011. Post-Closure Environmental Monitoring Plan, Pine Tree Landfill, Hampden, Maine. January 2011.
[2] SME, 2021. 2020 Water Quality Report, Pine Tree Landfill, Hampden, Maine. April 2021.
[3] SME, 2016. 2015 Water Quality Report, Pine Tree Landfill, Hampden, Maine. April 2016.

It is SME's understanding that Drumlin's recommendations regarding proposed groundwater quality monitoring frequency changes at the PTL will be presented by the Town of Hampden to the MEDEP for consideration. The fall 2021 groundwater quality monitoring event will occur regardless of a one time or two time per year monitoring frequency. This allows time (i.e., prior to spring 2022) for MEDEP to review both SME's recent water quality data submissions and Drumlin's memorandum prior to further discussion on the PTL groundwater quality monitoring frequency moving forward. SME and NEWSME continue to endorse reducing the monitoring frequency to once per year. Given the significant volume of data obtained to date, sampling once per year will allow plenty of opportunity to assess trends in water quality and progress toward water quality threshold criteria.

DISCUSSION OF DATA TRENDS

Drumlin provided an assessment of trends for specific conductance or total dissolved solids (TDS) through April 2021 in their July 12, 2021 memo. In their assessment, Drumlin designated six monitoring locations as having a 5-year upward trend for specific conductance or TDS. Five of these six monitoring locations (MW03-802A, MW03-803A, MW03-803B, P-914A, and P-914B) are associated with the previously discussed condition in the landfill cover on the southwest side of the landfill that lead to leachate impact to soils and groundwater.[4] The sixth monitoring location that Drumlin designated as having a five-year upward trend for specific conductance or TDS is residential well DW-103.

We are not certain whether Drumlin is using a qualitative (i.e., visual) approach or statistical approach to designating trends. Below, we present SME's statistical assessment of trends for comparison to Drumlin's assessment for sitewide monitoring locations, and also our visual/qualitative assessment of trends for monitoring locations associated with leachate impacts since NEWSME repaired conditions in the landfill cover on the southwest side of the PTL. Our discussion here is limited to trends for specific conductance given its significance with regard to post-closure threshold criteria and since TDS is not measured at every monitoring location.

The Mann-Kendall analyses for statistically significant trends for the past three years and five years through April 2021 (i.e., including the April 2021 monitoring event) is included as Attachment 1. The Mann-Kendall trend analysis indicates that only one of the groundwater and surface water monitoring locations at the PTL, P-914B, currently has a five-year statistically significant increasing trend for specific conductance, and that no monitoring locations currently have three-year statistically significant increasing trends for specific conductance. There are six groundwater monitoring locations and three surface water monitoring locations that currently have three-year and/or five-year statistically significant decreasing trends for specific conductance.

Table 1 summarizes the comparison of Drumlin's designated predominant specific conductance or TDS five-year trends compared to the Mann-Kendall statistically significant five-year trend analyses for specific conductance. As a reminder, SME's assessment is confined to specific conductance since it is the only

[4] NEWSME identified a condition in the landfill cover on the southwest side of the landfill on June 21, 2016. Leachate was noted to be draining from several defects in the cover onto the soils surrounding the landfill. The length of time that this condition existed is unknown. The condition was reported to the MEDEP on the same day; NEWSME then removed the visually impacted soils and repaired the cover during the week of July 10, 2016.

threshold criterion for on-site groundwater, and since TDS is not measured at every monitoring location. We understand that this is not a direct comparison, but useful for discussion. There are five monitoring locations designated by Drumlin as having a five-year specific conductance or TDS increasing trend where no trend is shown by the Mann-Kendall analysis for specific conductance. There are three monitoring locations designated by Drumlin as having no trends for specific conductance or TDS over the past five years where decreasing trends are shown by the Mann-Kendall analysis for specific conductance.

TABLE 1

PTL SPECIFIC CONDUCTANCE TRENDS

Monitoring Location	Drumlin's Designated Predominant Specific Conductance or TDS 5-Year Trend[1,2]	Mann-Kendall 5-Year Trend Analysis 95% Confidence (alpha=0.05) for Specific Conductance[3]
200	None	None
641	None	None
MW-906B	None[4]	Down
MW02-801A	Down	Down
MW02-801B	None	None
MW03-802A	Up	None
MW03-802B	None	Down
MW03-803A	Up	None
MW03-803B	Up	None
MW03-804A	None	None
P-914A	Up	None
P-914B	Up	Up
516B-B	None	Down
MW98-601A	Down	Down
MW98-601B	None	None
MW01-602B	None	None
MW97-123	None	None
509A	None	None
509B	None	None
P-911B	None	None
916	None	None
917	None	None
DW04-109	None	None
DW-103	Up	None
SW-A	None	None
SW-C	None	None
SW-D	None	None
SW-E	None	None

Notes:
1. For data through April 2021.
2. Drumlin Environmental, LLC (Drumlin) July 12, 2021 memorandum to Paula Scott and the Hampden Environmental Trust with subject *Pine Tree Landfill – Post Closure Monitoring Review & Update*
3. 5/1/2016 to 5/1/2021.
4. Highlighted text indicated a discrepancy between Drumlin's designated predominant specific conductance or TDS trends and the Mann-Kendall analysis results for specific conductance.

In general, monitoring locations south and southwest of the landfill have been affected by the leachate formerly leaking from the southwest PTL cover defect. Drumlin states in their memo that the "cover repair does not appear to have been sufficient to reverse the upward trend;" however, the current Mann-Kendall statistically significant trend analysis for specific conductance indicates that the cover repair does appear to have stabilized or reversed trends. Table 2 shows the Mann-Kendall statistically significant trend analyses results for specific conductance through 2017 compared to through April 2021 at southwest and west monitoring locations that appear to have been influenced by the PTL's former southwest cover defects. Box and whisker plots of specific conductance data with fast-Fourier transform smoothing of yearly mean values are included as Attachment 2 to aid in visualizing the improvements to groundwater quality following the cover repairs in 2016. One example (from monitoring location MW03-802B is provided in Figure 1 and shows a response in water quality following completion of repairs to the liner conducted by NEWSME in 2016.

TABLE 2

**PTL SPECIFIC CONDUCTANCE MANN-KENDALL RESULTS THROUGH 2017
COMPARED TO THROUGH APRIL 2021 AT SOUTHWEST AND WEST MONITORING LOCATIONS**

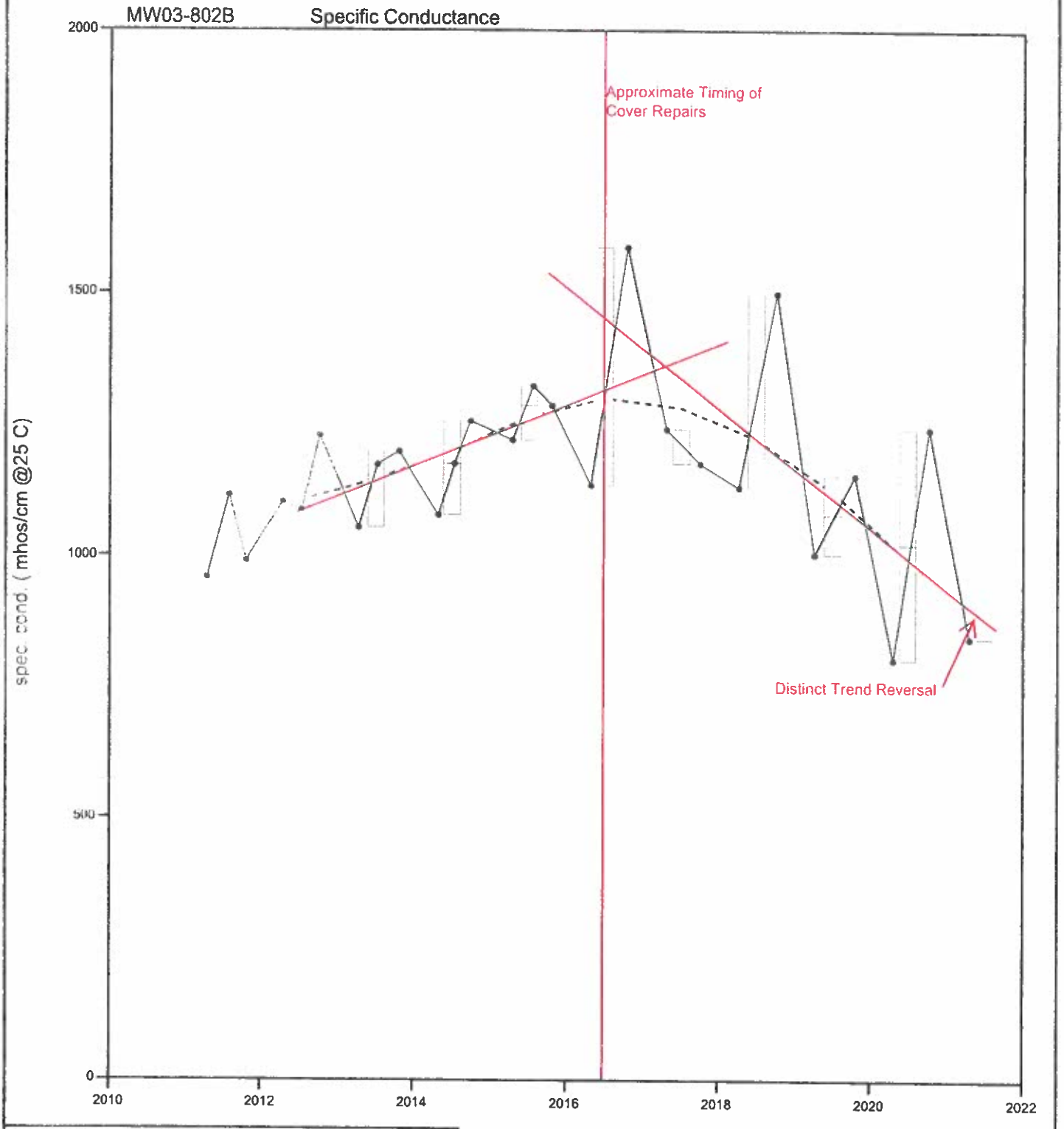
Monitoring Location	Mann-Kendall Trend Analysis 95% Confidence (alpha=0.05) for Specific Conductance through 2017	Mann-Kendall Trend Analysis 95% Confidence (alpha=0.05) for Specific Conductance through April 2021	Comments (View Box and Whisker Plots in Attachment 2)
MW03-802A	None (3-year) Decreasing (5-year)	None (3-year) None (5-year)	MW03-802A is the deeper bedrock well that is a companion to shallower bedrock well MW03-802B. Impact from cover defect appears to be delayed at MW03-802A.
MW03-802B	None (3-year) Increasing (5-year)	None (3-year) Decreasing (5-year)	Distinct reversal in trend following cover repair starting in approximately 2017.
MW03-803A	Increasing (3-year) Increasing (5-year)	None (3-year) None (5-year)	Distinct stabilization following cover repair starting in approximately 2018.
MW03-803B	Increasing (3-year) Increasing (5-year)	None (3-year) None (5-year)	Subtle recent stabilization.
MW03-804A	None (3-year) Increasing (5-year)	None (3-year) None (5-year)	Distinct reversal in trend following cover repair starting in approximately 2018.
P-914A	Increasing (3-year) Increasing (5-year)	None (3-year) None (5-year)	Distinct stabilization following cover repair starting in approximately 2018.
P-914B	Increasing (3-year) Increasing (5-year)	None (3-year) Increasing (5-year)	Subtle recent stabilization.

Table 2 demonstrates an overall improvement to groundwater quality with respect to specific conductance values at the southwest and west monitoring locations. Additional improvement to groundwater quality southwest and west of the PTL are expected with more time since the 2016 cover repairs.

DISCUSSION OF SOURCE OF WATER QUALITY IMPACTS SEEN DURING POST-CLOSURE SOUTHWEST AND SOUTH OF THE PTL

Drumlin states in their memo that "based on water quality, it is difficult to attribute the upward trend to the leachate leak that was identified and repaired in 2016 (i.e., 5 years ago). Lower rates of methane removal and other, as yet identified, factors are likely to contribute to this trend." SME does not agree with this statement. As presented in Table 2, improvements to specific conductance values are evident at southwest

Red trend lines indicate visual interpretation and are qualitative



LEGEND

- Maximum Value
- 75th Percentile
- Median
- 25th Percentile
- Minimum Value
- FFT smoothing of yearly mean values.
- Sample Event
- BDL

Pinetree Landfill

MW03-802B

Sevee & Maher Engineers, Inc.

and west monitoring locations. The timing of the improvements varies based on the monitoring locations and depth (i.e., dependent on distance from the source and direction of groundwater flow), as is expected, and improvements are evident starting within a year to up to five years after the cover repairs. These timeframes are generally consistent with SME's experience with groundwater quality monitoring in Maine glacial till and bedrock where travel times are measured in feet per year.

Post-closure water quality data also do not suggest that the subject impacts to groundwater quality southwest and west of the PTL result from landfill methane. As a contrast and as often discussed in past PTL annual water quality reports, the east side of the PTL is influence predominantly by methane and not by leachate. The primary lines of evidence for this conclusion are historical detections of elevated dissolved methane and bicarbonate and low concentrations of key leachate indicator parameter chloride. (Please note that dissolved methane concentrations at monitoring locations east of the PTL are currently low or non-detect, attributed to gas extraction; we offer this discussion only to provide contrast for observations at the southwest monitoring locations).

The subject impacts to groundwater quality southwest and west of the PTL are more consistent with influence from leachate rather than from landfill methane. Southwest monitoring location MW03-803B water quality data, as an example, demonstrates a substantial decrease in dissolved methane concentration after 2014. The 2020 dissolved methane concentration at MW03-803B of 360 µg/L has decreased from a historical maximum concentration of 7,160 µg/L in 2010. Additionally, bicarbonate, a key indicator of influence from landfill methane, has generally decreased during post-closure. The former increasing specific conductance trends at MW03-803B coincided with increasing concentrations for chloride, which indicates influence from leachate. Chloride was detected at a new historical maximum value of 260 mg/L in April 2020 but has since begun to decrease and was detected at a concentration of 52 mg/L in April 2021.

LEACHATE RECIRCULATION AND THE GAS TO ENERGY PLANT

Leachate recirculation was implemented at PTL in 2011 to enhance methane production during the post-closure period. The program was put into place to help stabilize PTL's diminishing gas curve, caused by a reduction of moisture, associated with the installation of the landfill's final cover system. In 2008, 3-Jenbacher JG320 engines were installed when the PTL Gas-to-Energy (GTE) facility was brought online. These engines were intended to run solely off of PTL's landfill gas.

After leachate recirculation began, evidence of enhanced methane production was noticed, but never enough to completely reverse the overall diminishing gas trend. As years went on PTL staff recirculated an average of 4 million gallons annually between 2011-2016. In 2016, a leachate leak was identified, which escaped through the final cover system. The cause was two of the four leachate recirculation trenches (LRT #1 and LRT #4). After this occurrence, the two problematic recirculation trenches were discontinued, and the leachate recirculation program reevaluated. Beginning in 2018, PTL staff thought it was best to reduce leachate recirculation flows to minimize risk of reoccurrence. Moving forward, only bleed water from PTL's Thiopaq Landfill Gas Treatment Facility and landfill gas condensate from two GTE pump stations would be recirculated through the remaining two recirculation trenches.

On January 29, 2021, the PTL GTE was closed due to decreasing methane generation and lower hydrogen sulfide concentrations within the gas. A review of the data and landfill conditions determined further recirculation would not generate the volume of methane needed to run the GTE facility.

NEWSME and SME do not expect additional odors or uncontrolled gas emissions due to the closure of the GTE facility. The three landfill gas engines have been discontinued and NEWSME will continue to monitor, collect, and combust the generated landfill gas to ensure emissions continue to be captured and combusted through a flare. Flare combustion efficiencies are assumed to be roughly 98 percent to 99 percent effective and this is higher than typical GTE engine efficiencies. Flaring of methane at PTL is in compliance with ambient air quality standards and with PTL's air license.

FUTURE CORRECTIVE ACTIONS

Based on trends observed in the 2020 annual water quality report and the results of the April 2021 monitoring event, SME anticipates continued improvement in water quality as the existing gas extraction wells, passive gas trench, perimeter drain pump station (PDPS), and recently repaired groundwater extraction wells continue to operate. SME will continue to monitor the water quality at the wells for statistically significant trends and threshold criteria parameters.

SME and NEWSME will continue to work with MEDEP to ensure that existing corrective actions are optimized and to determine whether post-closure monitoring results suggest the need to consider additional corrective actions.

CONCLUSION

The post-closure monitoring objective is to identify that the water quality threshold criteria identified in the post-closure EMP have been met by the end of 30 years. PTL is currently only one-third of the way through the post-closure monitoring period and post-closure water quality monitoring at PTL has generally shown an overall improvement since monitoring began. The improvement to groundwater quality with respect to specific conductance values at the southwest and west monitoring locations (see Table 2) following the 2016 southwest PTL cover repairs provides optimism that groundwater southwest and south of the PTL will begin to exhibit sustained decreasing trends (as are seen to the south/southeast and northeast).

The 2020 and April 2021 water quality monitoring data demonstrate that corrective actions implemented, such as the groundwater and gas extraction wells, the PDPS, and the passive gas trench, have had an overall effect of improving groundwater quality at the site during post-closure. SME anticipates continued improvement in water quality and will continue monitoring in accordance with the post-closure EMP. SME and NEWSME will continue to work with MEDEP to ensure that existing corrective actions are optimized and to determine whether post-closure monitoring results warrant additional corrective actions.

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It is SME's opinion that the monitoring frequency reduction initially proposed in the post-closure EMP is reasonable given the amount data that has been collected during post-closure thus far. SME and NEWSME continue to endorse the monitoring frequency proposed in the 2020 annual report. SME and NEWSME look forward to feedback from MEDEP on water quality and monitoring frequency.

Very truly yours,

SEVEE & MAHER ENGINEERS, INC.

Erik M. Clapp, PhD, L.G
President / Principal

Attachments

cc: Wayne Boyd, NEWSME
Toni King, NEWSME
Jeffrey Pelletier, NEWSME

ATTACHMENT 1

MANN-KENDALL TREND ANALYSES RESULTS

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Summary of Mann-Kendall Trend Analysis
95% Confidence (alpha=0.05)
Pinetree Landfill 2021

M-K 3-Year post-closure: 5/1/2018 to 5/1/2021 M-K 5-Year post-closure: 5/1/2016 to 5/1/2021

	Increasing Trends		Decreasing Trends		NoTrends	
LOCATION	3 Year	5 Year	3 Year	5 Year	3 Year	5 Year
200		K	Spec Cond		OC, Cl, HCO3, SO4, TDS, Na, K, Mg, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, pH, Temp, Fe	HCO3, Spec Cond, OC, SO4, TDS, Na, Ni, Mn, Mg, Pb, Co, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, pH, Temp, Cl, Fe
509A		pH		DO	WLE NGVD29ft, DO, Spec Cond, Water Elev., Temp, pH, Eh	WLE NGVD29ft, Water Elev., Temp, Spec Cond, Eh
509B		Fe	Eh	Mn, HCO3, Eh, Na	Mg, Spec Cond, Cl, OC, HCO3, SO4, TDS, Na, K, pH, Ca, As, DO, Water Elev., WLE NGVD29ft, Fe, Temp	pH, Cl, OC, SO4, TDS, K, Ni, Spec Cond, Pb, Co, Ca, As, DO, Water Elev., Temp, Mg, WLE NGVD29ft
516B-B			TDS, DO	Ca, DO, Spec Cond	Na, SO4, HCO3, OC, Ca, K, Cl, Mg, Fe, Spec Cond, As, Eh, Temp, pH	Cl, OC, HCO3, Ni, SO4, TDS, Na, Mn, K, Mg, pH, Pb, Fe, Co, As, Eh, Temp
641					Mg, K, Na, TDS, SO4, Fe, Cl, OC, HCO3, As, DO, Eh, Water Elev., WLE NGVD29ft, Temp, pH, Spec Cond, Ca	Mg, Ni, K, Na, TDS, SO4, HCO3, Methane, Cl, Pb, OC, pH, Co, Spec Cond, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, Temp, Fe, Mn
DW04-109			Methane	Methane, Cl	Spec Cond, DO, Eh, WLE NGVD29ft, Temp, pH, Water Elev.	Mg, OC, HCO3, SO4, TDS, Na, K, Ni, Mn, Spec Cond, Fe, Co, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, Temp, Pb, pH
DW-103		TDS			Methane, pH, Temp, Eh, DO, Spec Cond	Methane, Cl, OC, HCO3, SO4, K, Ni, Mn, Mg, pH, Pb, Temp, Eh, DO, As, Ca, Spec Cond, Co, Fe, Na
LCS-3C			Na, TDS, SO4, As, OC, Cl, Spec Cond, K, Mg	Cl, Ca, Mg, Spec Cond, K, TDS, Na	HCO3, Ca, pH, DO, Eh, Temp, Fe	Ni, SO4, OC, HCO3, Mn, Pb, Fe, As, Methane, DO, Eh, Temp, pH, Co
MW01-602B					Water Elev., Eh, WLE NGVD29ft, Temp, pH, Spec Cond, DO	Water Elev., DO, Eh, Temp, WLE NGVD29ft, Spec Cond, pH
MW02-801A			Mg, Spec Cond, TDS, Na	HCO3, Ni, K, Na, TDS, Mg, Spec Cond, Methane	Fe, Cl, OC, HCO3, SO4, Ca, pH, As, DO, Eh, Water Elev., WLE NGVD29ft,	OC, Cl, Mn, SO4, Fe, Co, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, Temp, pH, Pb
MW02-801B					Temp, DO, Eh, WLE NGVD29ft, pH, Spec Cond, Water Elev.	WLE NGVD29ft, Eh, Water Elev., pH, Spec Cond, DO, Temp
MW03-802A	Na		Temp	Temp, SO4	Fe, Cl, OC, HCO3, SO4, TDS, Mg, Spec Cond, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, pH, K	K, Methane, Cl, OC, HCO3, Na, Ni, Mn, Mg, Water Elev., TDS, Pb, Spec Cond, WLE NGVD29ft, Eh, DO, As, Ca, Co, Fe, pH
MW03-802B				Mg, Spec Cond, Ca, Eh, DO	Eh, Water Elev., WLE NGVD29ft, Temp, Spec Cond, DO, pH	K, Na, Methane, TDS, SO4, HCO3, Cl, Ni, OC, Pb, Fe, As, Water Elev., WLE NGVD29ft, Temp, pH, Co, Mn
MW03-803A				DO, Temp	Water Elev., DO, Eh, WLE NGVD29ft, Temp, Spec Cond, pH	OC, Mg, Mn, Ni, K, Pb, TDS, Na, Fe, Co, Ca, As, Water Elev., WLE NGVD29ft, pH, Spec Cond, HCO3, Eh, Cl, Methane, SO4
MW03-803B		K, pH, TDS, Na, Mg		Temp	Mg, Cl, OC, Spec Cond, HCO3, SO4, TDS, Na, K, pH, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, Fe, Temp	Methane, Cl, OC, HCO3, SO4, Mn, Eh, Spec Cond, Ni, Water Elev., Pb, DO, As, Ca, Co, Fe, WLE NGVD29ft
MW03-804A					DO, Eh, Water Elev., WLE NGVD29ft, Temp, pH, Spec Cond	Spec Cond, pH, Temp, WLE NGVD29ft, Water Elev., Eh, DO
MW-906B				Na, Spec Cond	pH, TDS, Spec Cond, Cl, OC, SO4, Na, K, Mg, WLE NGVD29ft, HCO3, Temp, Fe, Water Elev., Eh, DO, As, Ca	Cl, OC, HCO3, pH, TDS, K, Ni, Mn, Mg, Temp, Fe, Co, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, Pb, SO4

MW-916		DO, pH			Mg, Water Elev., OC, HCO3, SO4, TDS, Na, K, Cl, pH, DO, Spec Cond, Fe, Temp, WLE NGVD29ft, Eh, As, Ca	Methane, Cl, OC, HCO3, Ni, SO4, TDS, Na, K, Pb, Temp, Mg, WLE NGVD29ft, Water Elev., Eh, As, Co, Fe, Mn, Spec Cond, Ca
MW-917			Fe, TDS, As	Cl, Fe, As	SO4, HCO3, Na, K, Mg, Cl, pH, Ca, OC, Temp, Spec Cond, WLE NGVD29ft, Water Elev., Eh, DO	OC, Ni, K, Na, TDS, Methane, HCO3, Mn, SO4, WLE NGVD29ft, Mg, Temp, Spec Cond, Water Elev., Eh, DO, Ca, Co, Pb, pH
MW97-123					Eh, Mg, OC, HCO3, SO4, TDS, Na, K, Cl, Fe, Ca, DO, Water Elev., WLE NGVD29ft, Temp, pH, Spec Cond, As	Na, Spec Cond, Mn, Ni, K, TDS, SO4, HCO3, Cl, Fe, OC, Co, Ca, As, DO, Eh, Water Elev., WLE NGVD29ft, Temp, pH, Pb, Mg
MW98-601A			Spec Cond	Spec Cond, Eh	Water Elev., Eh, DO, pH, Temp, WLE NGVD29ft	DO, Water Elev., WLE NGVD29ft, Temp, pH
MW98-601B					Spec Cond, pH, Temp, WLE NGVD29ft, Water Elev., Eh, DO	DO, Eh, Water Elev., Spec Cond, WLE NGVD29ft, pH, Temp
P-911B					Temp, DO, Eh, WLE NGVD29ft, pH, Spec Cond, Water Elev.	DO, Eh, Water Elev., WLE NGVD29ft, Temp, pH, Spec Cond
P-914A	TDS, K	Ca, Mg, TDS			Mg, Cl, OC, HCO3, SO4, Na, Eh, Ca, DO, As, Water Elev., WLE NGVD29ft, Temp, pH, Spec Cond, Fe	OC, HCO3, SO4, Na, K, Ni, Mn, Cl, Pb, Fe, As, DO, Eh, Water Elev., WLE NGVD29ft, Temp, pH, Spec Cond, Co
P-914B		Spec Cond, DO			Temp, DO, Eh, WLE NGVD29ft, pH, Spec Cond, Water Elev.	Eh, pH, Temp, WLE NGVD29ft, Water Elev.
PDPS		Ca	OC	As	Mg, Fe, Cl, HCO3, SO4, TDS, Na, Spec Cond, Ca, As, DO, Eh, Temp, pH, K	Ni, Methane, Cl, OC, HCO3, SO4, TDS, K, Mn, Spec Cond, Pb, Fe, Co, DO, Eh, Temp, pH, Mg, Na
SW-A	DO		Spec Cond		K, HCO3, SO4, TDS, Na, OC, Mg, Fe, Ca, Eh, Cl, Temp, pH, As	K, Na, Cl, TDS, Eh, SO4, HCO3, Mn, OC, As, Mg, Spec Cond, pH, Temp, DO, Ca, Fe
SW-C			Spec Cond		TDS, pH, Cl, OC, SO4, Na, K, Temp, Fe, Ca, As, DO, Eh, Mg, HCO3	Mg, Mn, OC, HCO3, SO4, TDS, Na, Cl, pH, Fe, Ca, As, DO, Eh, Temp, K, Spec Cond
SW-D					Mg, Cl, Na, TDS, SO4, OC, Fe, HCO3, As, DO, Eh, Temp, pH, Spec Cond, K, Ca	K, Na, Cl, TDS, SO4, OC, Eh, Mn, HCO3, Fe, Ca, DO, Temp, pH, Spec Cond, As, Mg
SW-E			Spec Cond, TDS		Na, SO4, K, OC, Eh, HCO3, Mg, Fe, Ca, DO, Temp, pH, Cl, As	OC, K, Na, TDS, Mn, HCO3, Eh, SO4, Mg, Fe, Ca, DO, Temp, pH, Spec Cond, Cl, As

Key

As = Arsenic
Ca = Calcium
Cl = Chloride
Co = Cobalt
DO = Dissolved Oxygen
Eh = Eh
Fe = Iron
HCO3 = Bicarbonate Alkalinity (CaCO3)
K = Potassium
Methane = Methane
Mg = Magnesium
Mn = Manganese
Na = Sodium
Ni = Nickel
OC = Organic Carbon
Pb = Lead
pH = pH
SO4 = Sulfate
Spec Cond = Specific Conductance
TDS = Total Dissolved Solids
Temp = Temperature
Turb = Turbidity
Water Elev. = Water Level Elevation

- Values below the laboratory PQL (non-detects) are divided by 2. All other data qualifiers are ignored but any associated value is used.

- Samples collected for data quality control are not analyzed.

- Data sets with less than 5 data points are not analyzed.

- Data sets with a period shorter than the intended period of analysis (e.g. 3-yr analysis or 5-yr analysis) are not analyzed.

- Significant events in historical data can affect the distribution in a way that compromises the assumption of a monotonic data set. Events could include the cessation of filtering, a spill, changing sampling protocols or analytical method changes that alter the detection limit.

REFERENCES:

State of Wisconsin, Department of Natural Resources, Remediation and Redevelopment Program Mann-Kendall Statistical Test, Form 4400-215 (2/2001)

Gilbert, R.O., Statistical Methods for Environmental Pollution Monitoring, Van Nostrand Reinhold, 1987, pp. 204 – 240 and 272.

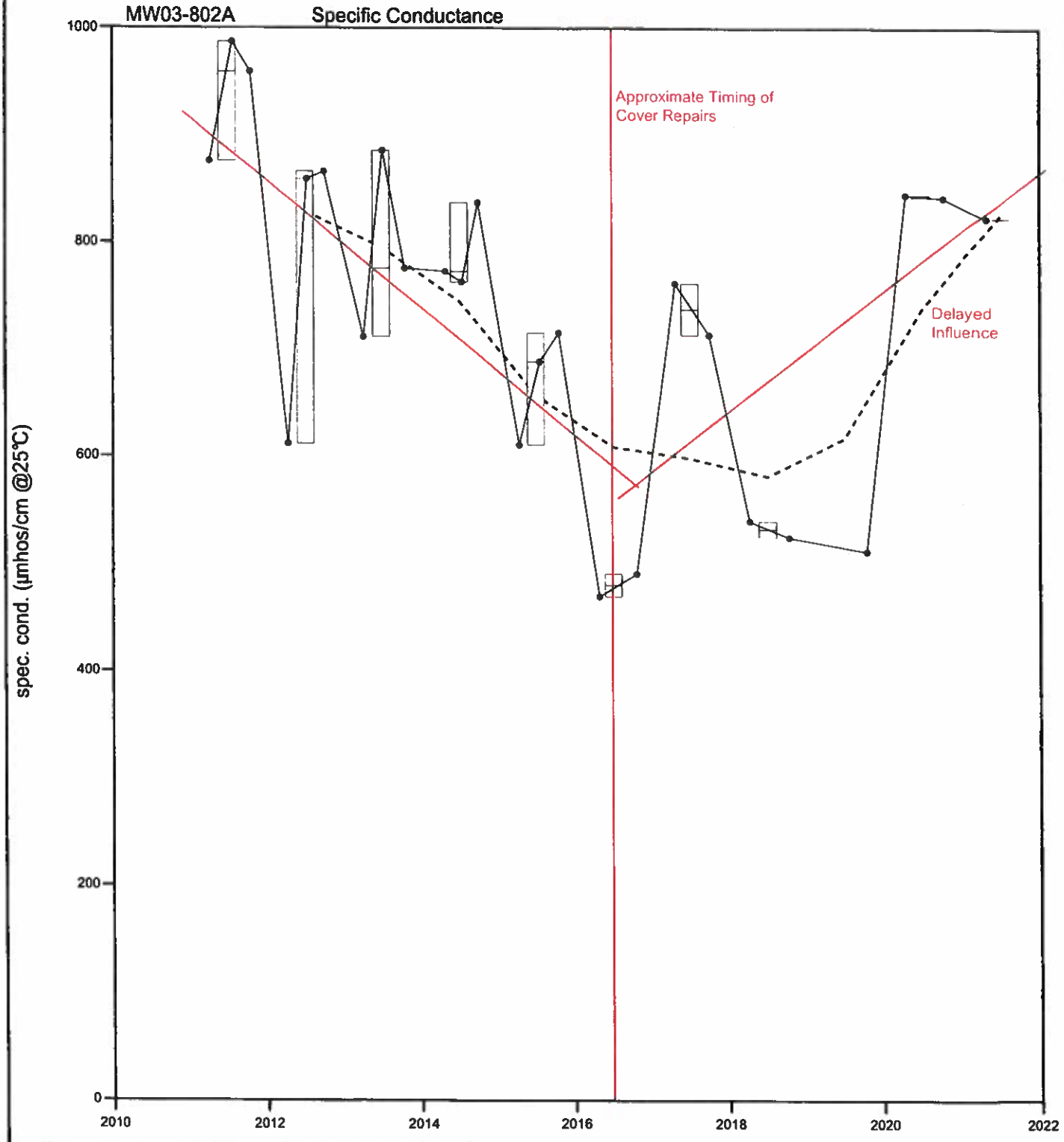
Hollander, M. and Wolfe, A.M Nonparameteric Statistical Methods, John Wiley Sons, 1999

ATTACHMENT 2

SPECIFIC CONDUCTANCE BOX AND WHISKER PLOTS

SME
SEVEE & MAHER
ENGINEERS

Red trend lines indicate visual interpretation and are qualitative



LEGEND

- Maximum Value
- 75th Percentile
- Median
- 25th Percentile
- Minimum Value
- FFT smoothing of yearly mean values.
- Sample Event
- BDL

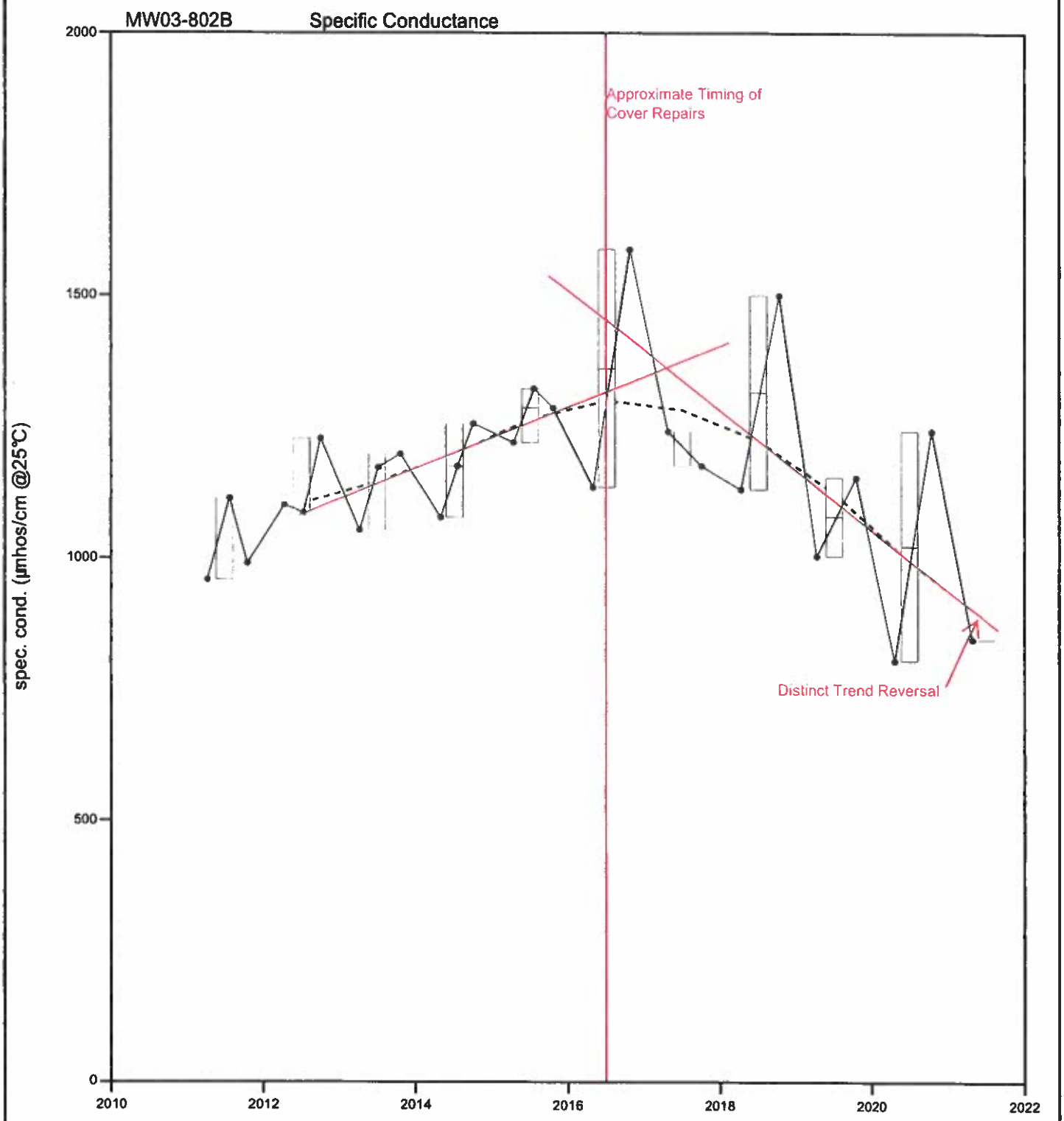
Pinetree Landfill

MW03-802A

Sevee & Maher Engineers, Inc.

(null) re004g030.g (1210719 14:48) BOX AND WHISKERS 2021 Specific Cond () 7/19/2021 10:17:05 AM

Red trend lines indicate visual interpretation and are qualitative



LEGEND

- Maximum Value
- 75th Percentile
- Median
- 25th Percentile
- Minimum Value
- FFT smoothing of yearly mean values.
- Sample Event
- BDL

Pinetree Landfill

MW03-802B

Sevee & Maher Engineers, Inc.

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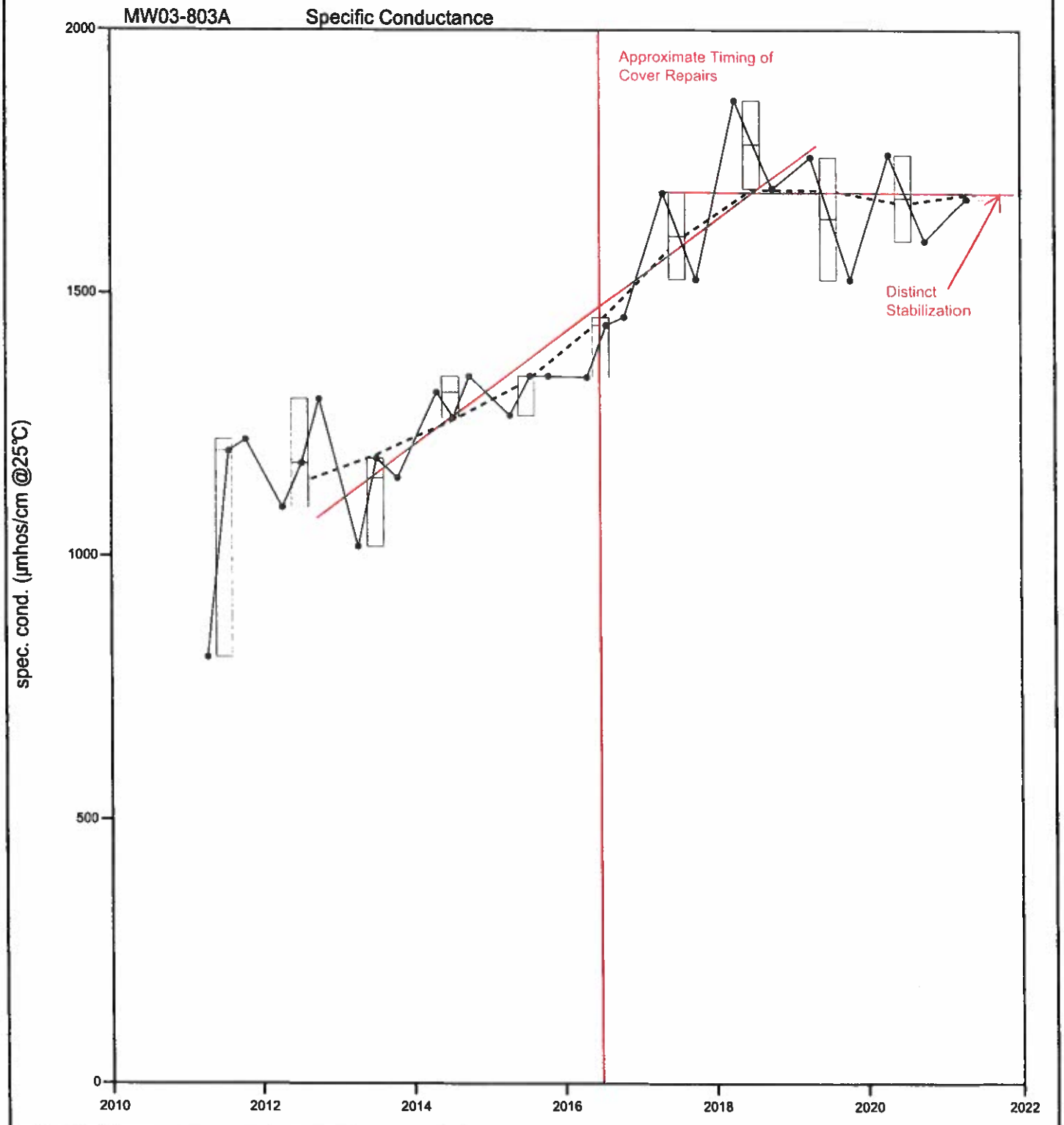
Red trend lines indicate visual interpretation and are qualitative



LEGEND

- Maximum Value
- 75th Percentile
- Median
- 25th Percentile
- Minimum Value
- FFT smoothing of yearly mean values.
- Sample Event
- BDL

Pinetree Landfill

MW03-803A

Sevee & Maher Engineers, Inc.

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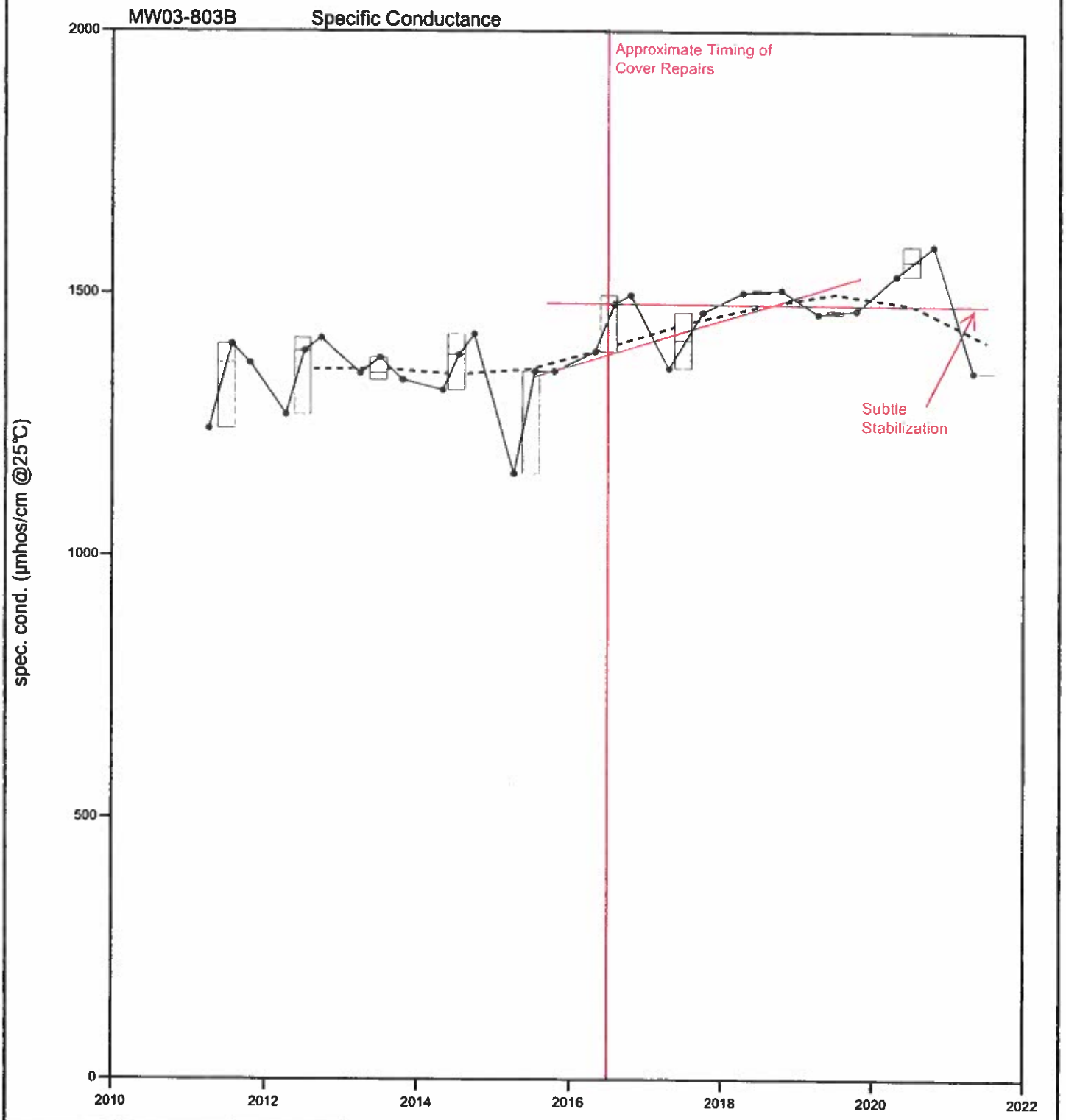
Red trend lines indicate visual interpretation and are qualitative



LEGEND

- Maximum Value
- 75th Percentile
- Median
- 25th Percentile
- Minimum Value
- FFT smoothing of yearly mean values.
- Sample Event
- BDL

Pinetree Landfill

MW03-803B

Sevee & Maher Engineers, Inc.

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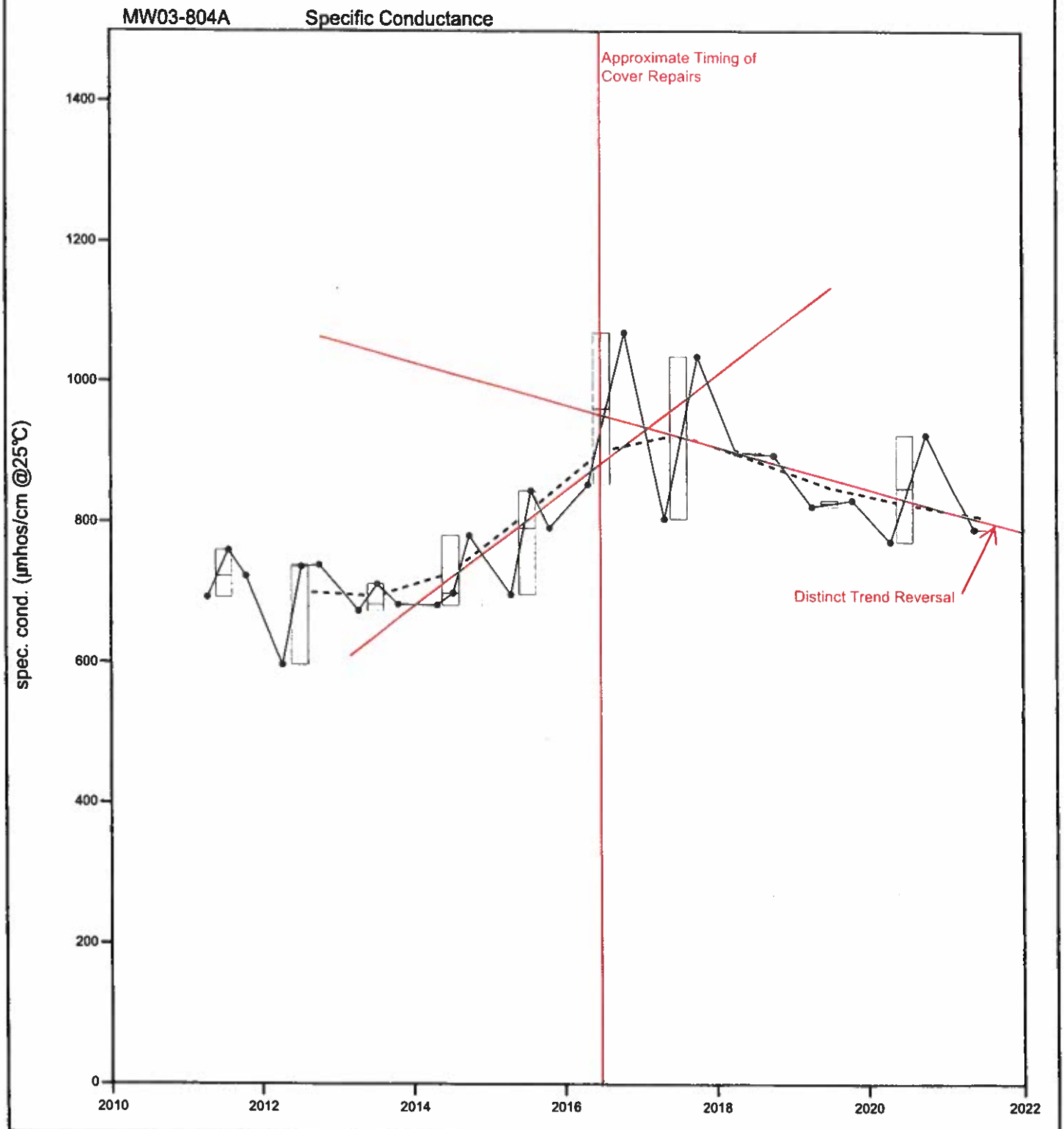
Red trend lines indicate visual interpretation and are qualitative



LEGEND

- Maximum Value
- 75th Percentile
- Median
- 25th Percentile
- Minimum Value
- FFT smoothing of yearly mean values.
- Sample Event
- BDL

Pinetree Landfill

MW03-804A

Sevee & Maher Engineers, Inc.

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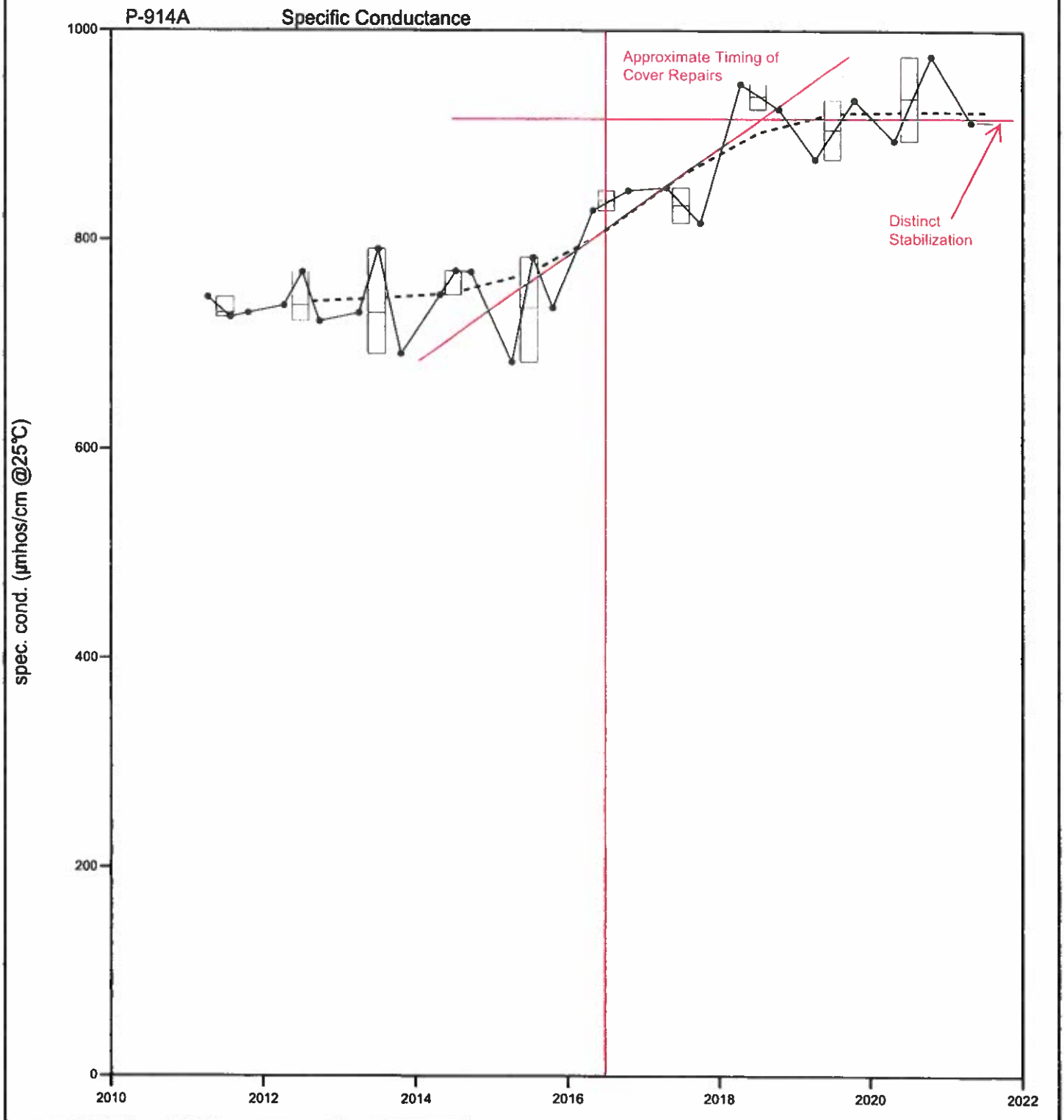
Red trend lines indicate visual interpretation and are qualitative



LEGEND

- Maximum Value
- 75th Percentile
- Median
- 25th Percentile
- Minimum Value
- FFT smoothing of yearly mean values.
- Sample Event
- BDL

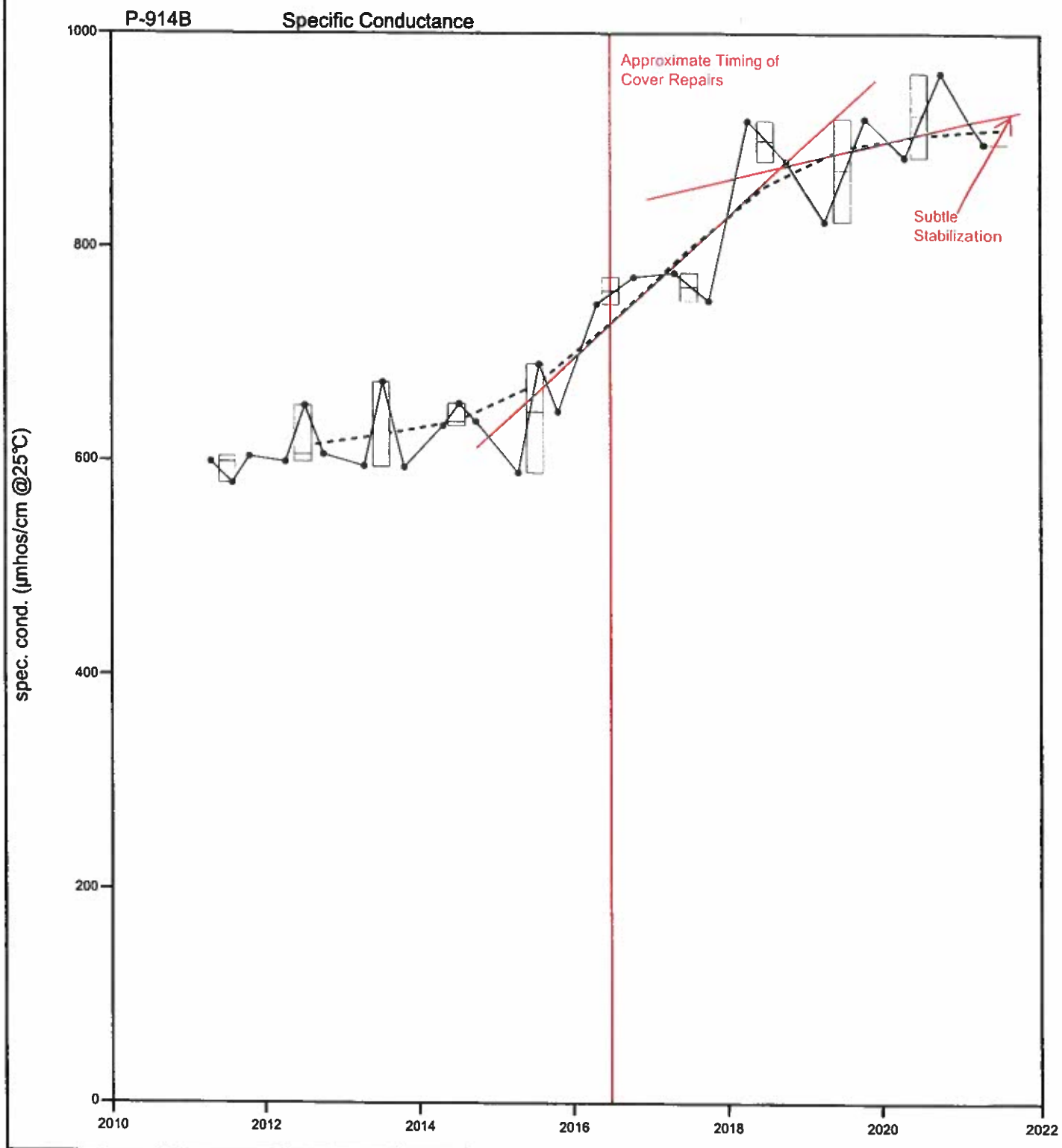
Pinetree Landfill

P-914A

Sevee & Maher Engineers, Inc.

(null) re004g039.g (1210719 14:48) BOX AND WHISKERS 2021 Specific Cond () 7/19/2021 10:17:05 AM

Red trend lines indicate visual interpretation and are qualitative



LEGEND

- Maximum Value
- 75th Percentile
- Median
- 25th Percentile
- Minimum Value
- FFT smoothing of yearly mean values.
- Sample Event
- BDL

Pinetree Landfill

P-914B

Sevee & Maher Engineers, Inc.

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