

**Norfolk Southern Railway Company**

# **Sediment Mitigation Measures Work Plan - Modified**

**East Palestine Train Derailment  
Columbiana County, Ohio**

**Prepared in response to USEPA's Administrative Order pursuant to  
Section 311 of the Clean Water Act – Docket No. CWA-1321-5-24-001**

March 1, 2024  
(modified by USEPA)

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**Prepared By:**

Arcadis U.S., Inc.  
7575 Huntington Park Drive, Suite 130  
Columbus  
Ohio 43235  
Phone: 614 985 9100  
Fax: 614 985 9170

**Prepared For:**

Norfolk Southern Railway Company

**Our Ref:**

30169714

**Modified By:**

U.S. Environmental Protection Agency  
Region 5  
77 West Jackson Boulevard  
Chicago, Illinois 60604

## Version Control

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0	January 5, 2024	---	Initial Plan
1	February 5, 2024	All	Revisions based on January 26, 2024 (written) and February 5, 2024 (verbal) comments from USEPA
2	March 1, 2024	All	Revisions by USEPA

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# 1 Introduction

This Sediment Mitigation Measures Work Plan (Plan) was developed on behalf of Norfolk Southern Railway Company (NSRC) by Arcadis U.S., Inc. (Arcadis) in response to the February 3, 2023, derailment in East Palestine, Ohio. This Plan was prepared in accordance with the United States Environmental Protection Agency (EPA) Administrative Order (Docket No. CWA-1321-5-24-001) which was issued pursuant to Section 311 of the Clean Water Act (CWA), and which became effective on October 18, 2023 (CWA Order). This Plan identifies sediment mitigation measures to be implemented as required by Paragraph 57 of the CWA Order. The waterbodies targeted for action are those described in subparagraphs 51 (a) and (b) of the CWA Order (see Figure 1):

- Sulphur Run from its confluence with Leslie Run to 1,000 feet upstream beyond the confluence with the Unnamed Tributary of Sulphur Run (located just north of the railroad tracks), which is commonly called the North Ditch (referred to in this Plan as the Sulphur Run area)
- Leslie Run from its confluence with Bull Run to 1,000 feet upstream past the confluence with Sulphur Run (referred to in this Plan as the Leslie Run area)

The purpose of this Plan is to describe mitigation measures to address impacts attributed to the derailment in the waterbody areas. Section 2 provides a summary of relevant investigation and cleaning events completed to date. Section 3 describes mitigation measures including iterative procedures and end points. Section 4 provides a schedule for implementation of mitigation actions. Section 5 lists references cited throughout this Plan.

## 2 Summary of Work in the Sulphur Run and Leslie Run Areas

### 2.1 Investigation Efforts

Several investigation efforts have been performed since the derailment to assess the presence of chemicals of potential concern (COPCs) in environmental media over time. The COPC list (see Table 1) was provided by the EPA and represents what was on the train, what was subsequently detected in surface water and sediment after the derailment, and what is potentially toxic to human health. Associated degradation products and combustion products were also considered. In addition, EPA provided ecological screening levels (ESLs) and human health screening levels (HHSLs) to allow evaluation of the potential for contaminated media to serve as ongoing sources and threats to the environment and human health. EPA is using HHSLs to establish whether the discharged oil and any CWA hazardous substances discharged continue to pose a substantial threat to public health or welfare. Table 1 presents the identified COPCs, ESLs, and HHSLs. The COPCs are presented in four categories to aid in the understanding of the sources of impacts to the waterbodies: the analytes identified in the EPA-approved *Appendix D – Main Line Interim Soil Removal Plan (Arcadis 2023a)*, polycyclic aromatic hydrocarbons<sup>1</sup> (PAHs), semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs).

NSRC carried out investigation events in the waterbodies in February, March, May, July/August, and November/December 2023 in accordance with the following Work Plans:

- *Sediment Sampling Work Plan (Arcadis 2023d)*
- *Qualitative Stream Sediment Assessment Sampling and Analysis Plan and Quality Assurance Project Plan (EnviroScience 2023a)*
- *Sediment Quality Assurance Project Plan (QAPP, Arcadis 2023e) and Appendix H1 Sulphur Run Characterization Work Plan (Arcadis 2023f)*
- *Sediment Quality Assurance Project Plan (Arcadis 2023g) and Appendix H2 Leslie Run and Downstream Creeks Characterization Work Plan (Arcadis 2023h)<sup>2</sup>*

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<sup>1</sup> PAHs are a subset of SVOCs and include 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene. The SVOC category in Table 1 includes only non-PAH SVOCs.

<sup>2</sup> The *Appendix H1 Sulphur Run Characterization Work Plan* and associated QAPP (Arcadis 2023f and Arcadis 2023) and the *Appendix H2 Leslie Run and Downstream Creeks Sediment Characterization Work Plan* and associated QAPP (Arcadis 2023f and Arcadis 2023g) replaced the Sediment Sampling Work Plan included as Appendix H to the March 2023 Removal Work Plan (Arcadis 2023d).

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- *Comprehensive Sheen and Sediment Investigation Work Plan – Sulphur Run and Leslie Run (Arcadis and EnviroScience 2023)* and the associated QAPP (Arcadis 2023i)

The May-August 2023 investigations were performed under EPA's Unilateral Administrative Order for Removal Actions CERCLA Docket No. V-W-23-C-004. Investigation efforts included qualitative stream (sheen) assessments, sediment probing, and sampling with analytical testing for COPCs in sediment, sheen, and pore water. The field efforts, field and analytical data, and resulting data evaluation and conclusions are provided in the *Sediment Investigation Summary Report (Arcadis 2023j)*.

The November/December 2023 investigation work conducted under the CWA Order included a qualitative stream (sheen) assessment along the entire length of the waterbodies, as well as the collection of sediment and sheen samples for analytical testing for the COPCs listed in Table 1. Figures 2 through 19 illustrate the November/December 2023 sampling locations in the Sulphur Run and Leslie Run areas. The results from the qualitative sheen assessment were provided in the *Qualitative Sheen Assessment Summary Report (EnviroScience 2023b)*. The full report of all final and validated data required under Paragraph 56 of the CWA Order – the *Comprehensive Sheen and Sediment Investigation Report – Sulphur Run and Leslie Run* – was submitted on January 19, 2024 (Arcadis 2024).

In July/August 2023, NSRC also completed an aquatic biocriteria and stream assessment as well as a native freshwater mussel assessment.

- *Aquatic Biocriteria Plan of East Palestine Streams: Sulphur Run, Leslie Run, Bull Creek, North Fork Little Beaver Creek, and Little Beaver Creek 2023 (EnviroScience 2023c)* – this work was approved by and completed under the direction of the Ohio Environmental Protection Agency (Ohio EPA).
- *Native Mussel Resources Assessment Workplan for the Little Beaver Creek Watershed of Ohio and Pennsylvania (EnviroScience 2023d)* – this work was approved by and completed under the direction of the Ohio Department of Natural Resources and the US Fish and Wildlife Service.

In addition, actions to characterize and address sediment within five culverts along Sulphur Run – as required in Paragraphs 59, 60, and 61 of the CWA Order – are documented under separate work plans and summary reports and are not described herein (Arcadis 2023k and 2023l).

## 2.2 Stream Washing Efforts

Past stream washing efforts to remediate impacts to the sediments included the entire stretch of Sulphur Run from the derailment site to the confluence of Leslie Run, and within Leslie Run from the confluence to approximately 1,800 feet downstream, ending just south of the East Palestine Wastewater Treatment Plant.

Stream washing was completed in segments of approximately 200 to 500 feet in length, and sheen and sediment capture devices were established downstream of the wash area.

- Capture devices included soft booms, hard booms, and turbidity curtains. A vacuum truck was staged at the capture devices to skim and recover sheen, product, and/or sediments produced from the washing activities.
- The length of each segment was determined based upon access points for personnel and equipment.
- The upstream extent of a segment was defined by the downstream extent of the previously completed segment, with the capture devices from the previously completed segment remaining in place during the washing of the next segment.

Washing within a segment was completed using a high-volume low-pressure pumping tactic that pulled stream water from the immediate upstream segment to wash the stream banks and bottom. During the washing, crews also agitated the sediments using hand tools and manual manipulation, and debris was removed for disposal.

Stream washing continued in this manner moving from the upstream start point in Sulphur Run to the downstream extent established in Leslie Run. Once crews reached the final targeted segment in Leslie Run, they began again from the first segment.

An additional tactic was used to achieve more agitation of stream sediments. While washing using the high-volume, low-pressure pumping tactic continued on the stream banks, air knifing using a high-pressure air wand was used to remediate the stream bottom.

## 3 Mitigation Measures

Under this Plan, NSRC will implement the mitigation tactics (such as those described in Section 3.1) followed by stream re-assessments (as described in Section 3.2) to mitigate impacts to sediments identified during the November/December 2023 stream assessment (EnviroScience 2023b, Arcadis 2024). The tactics will be applied in an iterative fashion and as such are expected to be flexible and adaptable. Refer to Attachment A for descriptions of procedures for removal tactics such as focused digging, excavation, etc.

### 3.1 Sediment Mitigation

Areas within both Sulphur Run and Leslie Run requiring mitigation are shown on Figure 1. Areas of the affected streams that have observed sheen scores of 2 and 3 from the Qualitative Sheen Assessment and chemical exceedances in sediment of human health screening levels will be targeted. Areas of confounding sources of contamination in Sulphur Run are depicted in Figures 5 & 7 by red hatches.

A stakeholder group consisting of NSRC, EPA, Ohio (OEPA), and as applicable their consultants, will assess each of the targeted areas in the field to select and determine mitigation tactics. Mitigation tactics will be specific for each targeted area and will include consideration of aggressive removal tactics such as focused digging, excavation, etc. Once a targeted area is assessed by the stakeholder group, NSRC will propose a mitigation tactic for each targeted area, which may vary from one target area to the next. The EPA Operations Chief will determine and document the tactic(s) to be employed following consideration of stakeholder input.

Following implementation of mitigation tactics and an equilibration period of at least 12 hours, each targeted area will undergo a focused qualitative sheen re-assessment to determine the effectiveness of the tactic employed. This process will be repeated until a sheen score of 0 or 1 is achieved in that area. When the stakeholder group has determined that only no sheen or light sheen (0 or 1 score) conditions remain, the initial tactical objective will be considered to have been met and the tactic is considered effective. Teams will employ an iterative approach to addressing sheen scores of 2s and 3s in Leslie and Sulphur Run which includes assessment of each area and re-assessment after tactics are employed. During this process, tactics may change and new tactics not previously employed may be developed.

#### **Sulphur Run:**

- Perform sediment mitigation using tactics in targeted areas with documented sheen scores of 2 and 3 (medium and heavy sheens) and target areas with exceedances of HHSLs in sediment (Figure 20, based on analytical results from the November/December 2023 field work). As shown on Figures 5-10, and 20 there are 13 targeted areas. Selection of tactics to be employed in each targeted area will follow the process discussed above.

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- See Figures 5 through 10 for visual detail of the areas for sediment mitigation. Figures 2-4 present data in the upstream portion of the Sulphur Run area (upstream of the railroad crossing) for reference.
- Mitigation in Sulphur Run shall also include sections within Culvert 1 where qualitative assessment sheen scores of 2 and 3 were identified (Arcadis 2023I). The mitigation tactics employed for Culvert 1 will be evaluated by the stakeholder group and determined by the EPA Operations Chief. Refer to Attachment E (subject to separate approval by EPA) for tactical options. Pre-mitigation briefs with the Agencies (EPA and OEPA) and OSHA will be conducted to discuss and resolve safety concerns relating to culvert work.
- Specific areas within the flow path of oil discharged during the derailment that are known to have confounding sources of contamination will be addressed. These areas include the portion of the creek adjacent to the former Leake Oil gas station (see Figure 5) and areas with an unknown black product/liquid unrelated to the derailment that surfaced during air knifing activities in March 2023 (see Figure 7).

### **Leslie Run:**

- Based on a review of information collected during the November/December Qualitative Sheen Assessment, the locations in Leslie Run with heavy sheens appear to be directly related to creek features that may be trapping / retaining the sheens, such as large rocks, log jams, or downed trees. The sediment mitigation efforts are designed to address these obstructions to eliminate sheens, while keeping the actions focused to reduce impacts to the creek habitat and ecosystem, which have already shown signs of significant ecological recovery. Tactics to be employed in each targeted area will follow the stakeholder assessment process discussed above in Section 3.1.
- Target areas include those identified to contain sheen scores of 2 and 3 (medium and heavy sheens) and target areas with exceedances of HHSLs in sediment (Figure 20, based on analytical results from the November/December 2023 field work).
- See Figures 11-16 for visual detail of the 31 areas identified for stream mitigation in Leslie Run. Figures 17-19 present data for the remainder of the Leslie Run Area for reference.

## **Iterative Mitigation Cycle**

Mitigation will be an iterative process until the initial tactical objective is attained. After tactics are completed for a designated area, crews will wait at least 12 hours to allow the targeted area to recover to a normal state (reduction in turbidity, etc.), after which sediment agitation efforts (following qualitative re-assessment procedures) will be employed to determine the observed level of sheen score for the area and assess the effectiveness of the cleanup. If the stakeholder group determines that a sheen score of 0 (none) or 1 (light) is present, then the targeted area will be considered as having achieved the initial tactical objective. Assessment crews will agitate throughout the targeted area for assessment, including the specific location which scored as a 2 or 3 during the November 2023 Qualitative Assessment. The observations of sheen related to achieving initial tactical objectives for sediment mitigation will be documented on a field log form.

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Note that sediment mitigation crews may encounter conditions different from those observed during the November 2023 stream assessment. In Sulphur Run and Leslie Run, if crews are unable to generate medium or heavy sheens at the targeted areas, this condition will be documented. Crews will then step out up to 25 feet upstream and downstream to check for medium or heavy sheens. Conditions will be documented. If no medium or heavy sheens are observed, conditions will be documented, and the target area left at least 12 hours. When crews return, if they are still unable to generate medium or heavy sheens at the targeted areas, this condition will be documented and sediment mitigation in that particular area will not be performed. This decision (as relevant) on the second visit will be confirmed in the field with Agencies' representatives.

### **Containment**

During sediment mitigation activities at each targeted area, necessary containment and recovery controls will be employed. These containment and recovery controls shall be specified and implemented for each mitigation tactic in Attachment A which is employed. Refer to Attachment A for an array of containment and recovery controls.

### **Safety**

All work will be completed in accordance with the approved Health and Safety Plan for the site (Arcadis 2023m) and the existing Job Hazard Analysis (JHA) developed for stream washing (HEPACO 2023). This JHA will be reviewed and updated prior to the start of work, as specific measures will need to be included to address the hazards associated with working in cold conditions. If, during this review or when tactics are determined, new tasks requiring JHAs are identified, relevant JHAs will be developed for review after a safety assessment and prior to implementing those work activities.

Worker air sampling will be performed during stream washing using personal air sampling badges for butyl acrylate and vinyl chloride, as well as real-time monitoring for VOC. In the community, handheld air monitoring will be conducted for total VOCs during stream washing activities. Additionally, air sampling will be performed at four to six locations in the community immediately surrounding the work area using co-located evacuated canisters and badges, which provide data on a panel of 75 VOCs, including vinyl chloride and butyl acrylate. Air sampling methods that will be used for air sampling and their associated detection limits are listed in Table 3.5 of the Air Sampling and Analysis Plan (CTEH 2023). For consistency with the air monitoring work completed during the actions taken in the culverts on Sulphur Run, the team will follow the relevant elements of the Decision Tree for Ongoing Operations During Culvert Work (Attachment B).

## **3.2 Re-Assessments**

### **Qualitative Sheen Re-Assessment**

An initial comprehensive qualitative sheen re-assessment will be performed following completion of the sediment mitigation efforts outlined in Section 3.1. Iterations of re-assessment at quarterly frequencies or other frequencies determined by the Agencies for final natural attenuation monitoring will continue until EPA has determined that all mitigation endpoints have been successfully achieved.

The qualitative re-assessment of sheens will be conducted in the following areas:

- In Sulphur Run from its confluence with Leslie Run to 1,000 feet upstream beyond the confluence with the Unnamed Tributary of Sulphur Run (located just north of the railroad tracks), which is commonly called the North Ditch (see Figure 5 for the upstream demarcation).

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- In Leslie Run from its confluence with Bull Run to 1,000 feet upstream beyond the confluence with Sulphur Run (see Figure 16 for the downstream demarcation / start of the qualitative re-assessment).

Work will be carried out using methods consistent with previous surveys conducted in these streams in March, May, and November 2023. The field team will walk the length of the stream channel identified for each waterbody and record observations at a frequency of every 25 feet. All work will be completed in accordance with the relevant EPA-approved work plan and quality assurance project plan (EnviroScience 2023a), and all observation logs and associated documentation will be provided to EPA consistent with Section 3.4.

### Surface Water, Sediment, and Biologic Sampling

Surface water sampling will be conducted at the locations listed in Attachment C, which also shows endpoint criteria. Surface water samples will be collected after the qualitative sheen re-assessments described above in Section 3.2. Sediment samples will be collected at all locations sampled in November/December 2023 (Arcadis 2024, Figures 2-19) for the parameters in Table 1 and after tactics are complete, concurrent with surface water samples. The need for additional biocriteria monitoring by NSRC in Leslie Run will be determined by the Agencies following review of post-derailment biomonitoring. Surface water, sediment, and biologic sampling will be conducted consistent with the existing and/or updated technical procedures and quality assurance project plan(s) for the site.

## 3.3 End Points

Removal work will be deemed complete when three field conditions are met: (1) no sheen is observed by NRSC field crews and Agencies' representatives in Sulphur Run and Leslie Run, (2) attainment of surface water quality criteria for the designated use as promulgated by OEPA; and (3) when exceedances of human health screening levels for oil and CWA hazardous substances discharged by NSRC have been mitigated such that the contamination no longer presents a substantial threat to public health and welfare.

Refer to Attachment C for surface water criteria. Results (scores) of the Qualitative Sheen Re-Assessment (Section 3.2) will determine if the criterion for sheen is met. Refer to Table 1 for human health screening levels.

Attachment D, which is under development and subject to separate approval by EPA, will include an evidence-based, literature-referenced discussion of natural breakdown processes of petroleum lube oil, petro oil NEC, and constituents in the environment. The discussion will be related to the conditions in Sulphur and Leslie Run and is necessary for any potential consideration of natural attenuation as a final mitigation tactic to meet sheen removal endpoints.

For areas with confounding sources of contamination, endpoints will be achieved when efforts have been made including consideration of aggressive tactics, implementation of engineering controls designed and installed to prevent recontamination to the extent practical, and the number of iterations performed (remove-assess-remove-reassess) to achieve the initial tactical objective equals the maximum performed in any other area of the creeks.

Following mitigation at any given targeted location, the stakeholder group will return no earlier than 12 hours later to assess the location and determine whether the initial tactical objective has been achieved (see Section 3.1). Mitigation will continue at that location until it is achieved. After mitigation tactics are complete in Sulphur Run and Leslie Run, the re-assessments described above in Section 3.2 will be conducted to determine if end points described in this section have been reached. If they have not, additional mitigation will be planned and conducted.

## 3.4 Data Submittal

The field teams will document qualitative findings, photographs, and agreements reached in the field. Relevant field data (e.g., qualitative sheen values, coordinates, field observations, sample descriptions, photographs, etc.) will be provided to EPA via the existing EPTD ArcGIS Online (AGO) shared account and NS SharePoint file sharing service, unless an alternate solution is approved by EPA.

### Qualitative Data

NS will collect data, review to assure accuracy and transmit data to EPA using AGO and SharePoint under the following timelines:

- Qualitative field data (Location IDs; dates/times; coordinates; other observation or information as relevant, like sheen scores) shall be provided via GIS Service to AGO no later than 48 hours following collection of the information.
- Summaries (e.g., tables) of qualitative data shall be uploaded to NS SharePoint and emailed no later than 48 hours following collection of the information.

For collection of any samples for laboratory analysis, those data will be transmitted as follows.

### Analytical Data

NS will collect field samples for laboratory analysis and transmit to EPA consistent with existing EPTD data transmission methods:

- Sample Location data
  - Via AGO shared Group - Sample Name, Location name, date, time, and coordinates shall be shared with EPA via existing EPTD AGO group no later than 48 hours from collection.
  - Via analytical data electronic data deliverables (EDD) - Sample coordinates shall be provided with all finalized analytical data EDDs.
- Preliminary analytical data
  - Shall be transmitted to EPA within 24 hours of receipt from the laboratory.
  - Data format shall be consistent with the EPTD electronic data deliverable format emailed to [R5\\_data@epa.gov](mailto:R5_data@epa.gov), [R5\\_ENVL@epa.gov](mailto:R5_ENVL@epa.gov), and others per the relevant directive.
- Final data to EPA EQUIS
  - Final data shall be uploaded to EPA's EPTD EQUIS project within 24 hours.
  - Data format shall be consistent with the EPTD EQUIS format already in-use.
- NS SCRIBE
  - Analytical data shall be uploaded to EPA SCRIBE.net within 24 hours, consistent with existing EPTD procedures.

### Reporting

NSRC will submit a report within 30 days from completion of the re-assessments discussed in Section 3.2. The report will at minimum summarize mitigation tactics employed for target areas including Culvert 1, validated analytical data, and qualitative data. Qualitative sheen assessment results collected over time will be overlain on a map of the creeks to graphically illustrate changes in sheen scores over time (i.e., March, May, and November events). All sediment data will be compared to HHSLs to determine if exceedances of these screening levels have been mitigated. If applicable, the report will also delineate areas where natural attenuation is proposed as a final mitigation tactic to meet sheen removal endpoints. Following the final re-assessments (Section 3.2), NSRC will submit a comprehensive report consistent with Paragraph 64 of the CWA 311 Order within 60 days after completing all mitigation and sampling required under this plan.

## 4 Schedule

Mitigation and qualitative stream re-assessments are expected to be completed by June 30, 2024. Work, beginning with the supporting activities described below, will start upon EPA approval of this Plan and EPA's explicit direction to proceed.

The timing and duration of supporting activities and mitigation work is as follows:

- **Tactics Selection for Target Areas and Safety Review by Stakeholders.** Refer to Section 3.1. This effort is anticipated to take 1-2 weeks.
- **Secure Access Agreements, Complete Health and Safety Reviews, Confirm Logistical Arrangements.** Access to adjacent properties will be required to complete the mitigation measures. Access agreements were in place with property owners for the November/December 2023 sampling, and these agreements will be reviewed and extended if needed. In addition, this time will be used to confirm locations for secondary containment and vacuum/suction collection equipment, and review/update the stream washing health and safety JHA. This effort is anticipated to take 1-2 weeks.
- **Conduct Sediment Mitigation in Sulphur Run.** It is anticipated that the sediment mitigation in Sulphur Run will take a total of 3-4 weeks to complete. The start date for sediment mitigation will be provided to EPA after required property access is confirmed, logistical details are finalized, and health and safety planning is complete and approved, but will not begin later than April 1, 2024.
- **Conduct Sediment Mitigation Work in Leslie Run.** After the stream mitigation efforts in Sulphur Run are complete, work in Leslie Run will begin. The targeted stream mitigation in Leslie Run is expected to take 2-3 weeks to complete. Mitigation completion is targeted for June 30, 2024.
- **Conduct Re-Assessment in Sulphur Run and Leslie Run.** After the sediment mitigation efforts in Sulphur Run and Leslie Run are complete, NSRC will coordinate with EPA to determine a start date for the qualitative stream assessment and sampling. The timing of the qualitative stream assessment is dependent on conditions in the field – specifically, the creeks must be at base flow levels. The re-assessment is estimated to take about 2 weeks to complete. Re-assessment will also include surface water sampling at locations listed in Attachment C and sediment sampling at locations sampled in November/December 2023, is expected to take 2-3 weeks to complete.
- **Review and Share Results.** Qualitative sheen re-assessment results will be collected on an ongoing basis and overlain on a map of the creeks to graphically illustrate changes in sheen scores over time (i.e., March 2023, May 2023, November 2023, and Spring 2024 events). Quantitative data will be shared as described in Section 3.4. Note that NSRC will communicate routinely with EPA regarding mitigation measures progress, data evaluation status and findings, and any potential additional measures that may be needed throughout implementation of this Plan.

## 5 References

- Arcadis. 2023a. *Appendix D – Main Line Interim Soil Removal Plan. Rev. 4.2, May 16.*
- Arcadis. 2023d. *Sediment Sampling Work Plan. February 21. Plan included in Appendix H of the March 2023 Removal Work Plan.*
- Arcadis. 2023e. *East Palestine Trail Derailment Site Sediment Quality Assurance Project Plan. Rev 4. July 21.*
- Arcadis. 2023f. *Appendix H1 – Sulphur Run Characterization Work Plan. Rev 2. July 11.*
- Arcadis. 2023g. *East Palestine Trail Derailment Site Sediment Quality Assurance Project Plan – Appendix H2. Rev 3. August 8.*
- Arcadis. 2023h. *Appendix H2 – Leslie Run and Downstream Creeks Characterization Work Plan. Rev 2. July 31.*
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- Arcadis. 2023k. *Sulphur Run Culvert Sediment Removal Plan. November 8.*
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- Arcadis. 2023m. *East Palestine Train Derailment Site Health and Safety Plan. Rev 3.2. July 23.*
- Arcadis. 2024. *Comprehensive Sheen and Sediment Investigation Report – Sulphur Run and Leslie Run. January 19.*
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- EnviroScience. 2023c. *Aquatic Biocriteria Plan of East Palestine Streams: Sulphur Run, Leslie Run, Bull Creek, North Fork Little Beaver Creek, and Little Beaver Creek 2023*
- EnviroScience. 2023d. *Native Mussel Resources Assessment Workplan for the Little Beaver Creek Watershed of Ohio and Pennsylvania*
- EnviroScience. 2023e. *East Palestine, Ohio – Leslie Run & Sulphur Run Operating Tactic. Version 2.0. July 6.*

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*Ohio EPA. 2023. Water Quality in Leslie Run and Sulphur Run. Ohio Environmental Protection Agency, Division of Surface Water, October 2023. Accessed online at <https://epa.ohio.gov/static/Portals/47/citizen/StreamUpdate.pdf>*

*EPA. 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Interim [Drhttps://www.epa.gov/sites/default/files/201803/documents/era\\_regional\\_supplemental\\_guidance\\_report\\_-\\_march-2018\\_update.pdf](https://www.epa.gov/sites/default/files/201803/documents/era_regional_supplemental_guidance_report_-_march-2018_update.pdf)ft. March.*