UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1 – NEW ENGLAND
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BOSTON, MASSACHUSETTS 02109-3912

Via Electronic Mail

November 22, 2019

Mr. Peter Britz, Environmental Planner
City of Portsmouth Planning Department
1 Junkins Avenue
Portsmouth, NH 03801

RE: Coakley Landfill Superfund Site
September 2019 *Stormwater Investigation Report, Coakley Landfill Superfund Site, North Hampton, New Hampshire*

Dear Mr. Britz:

The United States Environmental Protection Agency (USEPA) is in receipt of the September 2019 *Stormwater Investigation Report* (the "Stormwater Report") prepared by CES, Inc., on behalf of the Coakley Landfill Group (CLG), that details the results from the fall 2018 and spring 2019 collection and analysis of samples from stormwater management structures at the Coakley Landfill Superfund Site (Site). The stormwater investigation detailed in the Stormwater Report was completed in accordance with the *Stormwater Investigation Work Plan* submitted by CLG on October 24, 2018, based on USEPA's September 26, 2018, conditional approval.

Following consultation with the New Hampshire Department of Environmental Services (NHDES), USEPA provides the following comments:

1. Water infiltrating within Areas 1 and 2 is collected by the underdrain piping system while water infiltrating in Area 3 enters a gravel-filled toe drain system, but the ultimate discharge location for the toe drain system is not identified.

2. The Introduction briefly describes the stormwater sampling that was proactively conducted in spring 2018. The data from that sampling event should be provided in either its own table or included in Table 3 to allow for comparison of results over time.

3. Section 2 describes the perimeter drainage ditches and "rip-rap let-down structures" and cites Figure 1, but the figure does not have the let-down structures labeled. Given that the Stormwater Report references several rip-rap structures, it would be useful to specifically label the let-down structures and toe-drains in Figure 1.

4. First paragraph of Section 2 describes the "stormwater retained in the basins" as subsequently discharging to "adjacent wetland areas through infiltration and via an outlet structure in each basin…". This description is a bit simplistic compared to the more accurate description provided throughout the rest of the Stormwater Report. Consider expanding the description here to explain the infiltration from the basins to shallow groundwater, and subsequently to adjacent wetland areas.

5. Section 3.1 describes the landfill cap construction, including the "plastic drainage netting (geonet) with bonded geotextile fabric on top and textured flexible membrane liner (FML) located below the geonet." Figure 2 describes the geonet as being bonded with geotextile on both sides, and as-built drawing 5-5 also describes the geonet as being bonded on top for the slopes up to 5% and bonded on both sides for side slopes.

6. Figure 2 presents a cross-section of the landfill cap based on the Type 4 model but does not provide cross-sections for the other cap types. It would be helpful to include cross-sections for landfill cap Types 1, 2 and 3 as figures, or to reference the cross-sections included in Landfill Cover System Design Report Drawing 5-5 in Appendix A in the text descriptions.

7. In the description of the sources of the cover soil provided in Section 3.1.1, the term "top soil" is used to describe the cover soil in that section.

8. Section 3.2, second paragraph should clarify that piezometers PZ-1 and PZ-2 were constructed of stainless steel and that PZ-3 was constructed of PVC.

9. Section 3.3 and Table 1 describe the surface and groundwater elevation and provide the data from fall 2018 and spring 2019 monitoring. Table 1 is confusing as both surface water and groundwater elevations are provided in the columns labeled as "GW. EL. FT." A map should be provided that includes all locations used for water elevation measurements (see Table 1). Not all the monitoring wells listed in Section 3.3 are shown on Figure 1; nor are all the surface water locations listed in Table 1.

10. Section 3.4.1 does not identify or describe the analytical methods used for the analysis of the various cap components. It is presumed that the varying sample types (soil, pipe, membrane) would require different analytical testing procedures. The laboratory methods and procedures should be described. Section 3.4.1 should also describe the methods for sampling the cap materials (hand auger, test pit, shovel, etc.) and the depths of the various samples and how those depths compared to the design drawings. The last paragraph of Section 3.4.1 states that the soil matrix samples were a 4-point composite, but only a single sampling location is shown on Figure 1, and that a 2-point composite was used for sampling the construction materials. The Stormwater Report should describe the sample collection methods and analytical preparation procedures for the cap soils and materials, and detail the analytical methods used.

11. Section 3.5 does not list the analytical methods used for the various samples, or even the laboratory used. Again, the Stormwater Report should specify the analytical methods used for all samples.

12. Table 2 indicates that bold text denotes concentrations above reporting limits (Note 10), but the results in Table 2 that appear to be above the reporting limits and are not flagged, do not appear in bold text.

13. Section 4.1 discusses results for PFOA and PFOS but does not mention the distribution and types of the other PFAS compounds analyzed and detected.

14. Section 4.2.1 details the results from location L-1 as part of the stormwater investigation, but these results are not included in Table 3. While Table 4 presents the historical results for L-1, the results from samples collected as part of the stormwater investigation should also be provided in Table 3 for comparison with the results from the other locations sampled as part of the investigation.

15. Section 5.1 concludes that "some infiltration of shallow groundwater may be entering the annular space between the corrugated steel piping of the outfall system and surrounding bedding material during periods when shallow groundwater levels are high." Shallow groundwater levels would be high during wet periods when surface water may be present in the stormwater basin. Another conclusion could be that during high groundwater level conditions, stormwater discharging from the basin is leaking down around the overflow pipe and flowing through the bedding material and out into the L-1 area. The head driver for that pathway would be substantially higher than for shallow groundwater.

16. Section 5.2 describes an "average annual precipitation" of 59.55 inches, based on NOAA precipitation data for 2018. The amount of water falling on the landfill in 2018 (39 million gallons) is described as calculated using the average annual precipitation value and the landfill area. If 59.55 inches of rainfall for 2018 is used in this calculation, wouldn't it be more accurately described as total rainfall for 2018 rather than average annual precipitation? And that the total amount of water falling on the landfill would be specifically for 2018 rather than an annual average?

17. If the average annual precipitation (46 inches) was used in the mass loading calculations rather than the 2018 precipitation (59 inches) as described in Section 5.2, then the model calculations for the average rainfall amount should be described in similar detail and the amounts for surface runoff, infiltration and evapotranspiration should be provided.

18. Section 5.2.2 - The area of impacted groundwater discharge to Berrys[a] Brook (estimated at 40 acres) should be clearly demarcated and labeled on Figure 3. A legend should be added to indicate the meaning of the various line types (3) used on that figure. In addition, no reference is provided for the watershed boundaries shown in Figure 3 and they do not correspond to the boundaries shown in NH GRANIT, a statewide geographic information system clearinghouse http://www.granit.unh.edu/. These maps show a considerably different southern boundary of the Berrys Brook watershed near the landfill and does not

[a] Multiple sources including New Hampshire Fish & Game, NH GRANIT and Google Maps, refer to Berrys Brook without the possessive apostrophe.

show a Bailey Brook watershed but suggest Bailey Brook is included in Berrys Brook watershed.

19. Section 5.2.2 – Why wasn't data from more wells (AE-3A, PZ-3) and L1 seep used in the representation of groundwater quality? How was the 40-acre groundwater discharge area defined, and why wasn't it defined using monitoring wells and groundwater contours?

20. Section 5.2.2 should more specifically describe the data set used to calculate the average concentration of PFAS.

21. Section 5.2.2 does not adequately explain how the PFAS mass discharge via groundwater from the landfill was calculated. It is not clear how the average value for recharge from precipitation (22.3") can be applied to a 'groundwater discharge area' in a wetland to estimate PFAS mass flux in groundwater from the landfill by applying an average PFAS concentration from monitoring wells.

    A more traditional method would be to calculate the PFAS mass flux in groundwater at a series of transects perpendicular to the groundwater flow across the mapped plume. The groundwater flux is calculated via Darcy's Law and analytical results from monitoring wells located along the transect(s) are used for the PFAS concentration. This provides a reliable estimate of the PFAS mass leaving the landfill via the groundwater pathway.

22. Section 5.2.3 does not adequately explain how the PFAS mass discharge into Berrys Brook was calculated. It is unclear how an average surface water PFAS concentration based on limited sample results from a single location can be applied to groundwater recharge over the entire watershed to estimate the mass. Further, the resulting recharge mass is then assumed to equate to the mass in Berrys Brook.

    A more traditional method would be to calculate the PFAS mass flux in Berrys Brook using measured PFAS concentrations in the brook at the Breakfast Hill Road crossing and stream discharge rates from the USGS gauging station. The gauging station data can be adjusted to reflect the drainage area upstream from Breakfast Hill Road by applying the ratio method. This method is straightforward and accurate.

    This will facilitate a comparison between the three pathways: 1) groundwater PFAS flux in the plume, 2) PFAS mass flux in the stormwater, and 3) PFAS mass flux in the brook. The relative impact of the stormwater on Berrys Brook can then be quantitatively assessed. However, it should be noted that there are other components of the PFAS mass flux that are not considered by this method; refer to Comment 24.

23. In Section 5.2.3, what is meant by "above Breakfast Hill Road"? The description of the watershed area seems to identify the area north of Breakfast Hill Road and SW-110, but it appears that the calculation is for the area providing water volume that is discharged across Breakfast Hill Road?

24. The analysis in Section 5.2.3 assumes that all groundwater impacted by the landfill discharges to Berrys Brook upstream of Breakfast Hill Road. This assumption is not

accurate. Some overburden and bedrock groundwater containing PFAS migrates under Breakfast Hill Road and continues to flow downgradient. The analysis also ignores any migration of PFAS into the underlying bedrock, which we know takes place due to the detections noted in that unit. The PFAS mass flux for those pathways should be estimated to assess whether they are significant enough to be considered in the evaluation.

25. A sensitivity analysis should be conducted for all calculations detailed in Sections 5.2.1, 5.2.2, and 5.2.3 by modifying the inputs and assumptions (volume of discharge, average concentration, discharge area, etc.) to allow for an evaluation of the inputs relative to outputs; which will allow the accuracy of the various components of the assessment to be estimated.

26. One of the findings is that, based on 1,4-dioxane results from PZ-2 in fall 2018 (ND) and a detection in spring 2019, along with iron results from OFP-1, PZ-1, PZ-2 and PZ-3, shallow groundwater beyond the landfill boundary interacts with discharges from the northwest outfall pipe (OFP-2) during periods of high overburden groundwater levels. How are the iron results from OFP-1 and PZ-1 in the northeast basin related to the interaction between groundwater and the discharge from OFP-2? And how does the detection of 1,4-dioxane in PZ-2 relate to the discharge from OFP-2 when it is measuring shallow groundwater just beneath the basin?

27. Conclusions state that "stormwater and groundwater contribute significant percentages of PFAS to the wetland complex" while the annual contributions of PFAS from stormwater and groundwater discharge to surface water is described as exceeding the mass estimate of PFAS calculated in Berrys Brook by a factor of 2.5. The conclusions should more clearly represent this calculated relationship and summarize the potential causes of this discrepancy.

28. The Stormwater Report makes no mention of the underdrain system cleanouts. Were these inspected? Are these routinely checked? Is there any reason to believe that the system may not be functioning as designed due to the discharge piping being fouled?

29. The PFAS compositional plots included in Appendix D are not referenced or discussed anywhere in the document. They are only mentioned briefly in Section 6.1. A discussion of how the plots were prepared and what they represent should be included.

Given that the investigation of stormwater runoff has identified the landfill cap components as a source that may be contributing contaminant mass to Berrys Brook and the wetland complex located northwest of the Site, the CLG shall provide a scope of work for further investigating the extent of contaminant loading to Berrys Brook and groundwater from the landfill cap materials and stormwater runoff. This scope of work shall be developed with the intent to collect and evaluate data in the context of contaminant loading from the cap relative to contaminant loading from groundwater, and to evaluate the interaction between surface water and groundwater in Berrys Brook and the wetland complex adjacent to the northwest corner of the landfill. The scope of work shall also detail an assessment of options for limiting the contaminant loading to Berrys Brook, including the assessment of collection and treatment options through pilot or treatability studies.

The CLG shall provide a response to these comments, along with the scope of work described above, within 60 days of receipt of this letter.

If you have any questions or comments regarding this letter, you can contact me at (617) 918-1882 or Hull.Richard@epa.gov.

Sincerely,

Richard W. Hull

Richard W. Hull, Remedial Project Manager
New Hampshire & Rhode Island Superfund Program

cc: Andrew Hoffman, NHDES
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