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MEMORANDUM

TO:	Christopher Ketchen, Town Manager, Lenox, MA
FROM:	Weston & Sampson
DATE:	October 9, 2023
SUBJECT:	Review of Final Pre-Design Investigation Summary Report for Upland Disposal Facility

Weston and Sampson Engineers, Inc. (Weston & Sampson) has reviewed the relevant technical documents and reports pertaining to the pre-design investigation and conceptual design of the proposed Upland Disposal Facility (UDF) for the GE-Pittsfield/Housatonic Rest of River Project. In this memorandum we provide our review comments on the site hydrogeology, environmental assessment, geotechnical, and landfill engineering aspects of the Project. The documents which were the primary focus of our review and comment efforts were as follows:

- *Final Pre-Design Investigation Summary Report for Upland Disposal Facility Area*, GE-Pittsfield/Housatonic River Site; Arcadis, August 2023.
- *Upland Disposal Facility Conceptual Design Plan*, GE-Pittsfield/Housatonic River Site; Arcadis, December 2022.

To support this technical review, we also referred to the following documents for supporting information:

- *Pre-Design Investigation Work Plan for Upland Disposal Facility*, Arcadis and AECOM, November 2021.
- USEPA Conditional Approval of General Electric's November 24, 2021, submittal titled Rest of River, Pre-Design Investigation Work Plan for Upland Disposal Facility, GE-Pittsfield/Housatonic River Site, February 25, 2022.
- *DRAFT Comments on Upland Disposal Facility (UDF) Pre-Design Investigation (PDI) Summary Report*, GE-Pittsfield/Housatonic River Site Technical Assistance Services for Communities, September 13, 2023.

The format for this memorandum generally presents a brief bulleted synopsis of relevant information in the reports as a summary of our project understanding followed by our comments, where applicable. The memorandum has three main sections focusing on Site Hydrogeology and Environmental Assessment, Geotechnical Engineering, and Landfill Engineering.

SITE HYDROGEOLOGY AND ENVIRONMENTAL ASSESSMENT

<u>Report Reviewed:</u> *Final Pre-Design Investigation Summary Report for Upland Disposal Facility Area*

Introduction

- A former sand and gravel quarry; GE acquired April 2021.
- Support area may include sediment dewatering.
- Lee municipal landfill (LML) to south.

2.1 Site Description

- East central portion site has wetland conditions, vernal pool.

2.2.4 Soils

- Loamy fine sand to very coarse gravel.
- Overburden glacial sediments, outwash deposits, fine-medium sand, varying amounts silt and gravel. Stratified and heterogeneous.
- Bedrock Stockbridge Group, carbonate limestone, dolomite, marble.

2.2.5 Groundwater Elevations

- September 2019 – preliminary investigation Geoprobe 5 locations.
- GW Elev 947-949' NGVD 29. Pond stage 947'. Conclude surface-water stage in ponds reflects nearby groundwater levels.
- Nearest USGS groundwater-monitor well 1.2 miles northwest. Conclude not representative of site due to distance and topo variability.
- 12 other USGS wells reported to be on southern edge of Wood Pond; could not locate.
- MADEP files include *Evaluation Opinion Transmittal Report* for LML, contains summary of groundwater-elevation data from monitoring wells nearby Schweitzer-Mauduit and LML.
- Report indicates GW in MW-84-1, east side LML, 10/84-12/88 = 955.4-959.91'
- MW-84-2 west side LML 948.85-952.59'. Data indicate east to west flow direction/gradient.

3.3.3 Soil Testing Results

- 22 borings. Glacial outwash deposits, over marble. Two main soil units:
    - Fine sand and silt. Alternating layers silty sand and sandy silt. Medium dense to dense.
    - Mixed sand, gravel, and silt. Heterogeneous silty fine to coarse sand and fine to medium gravel. Layers of gravel and cobbles. Loose to dense.
- Bedrock marble, slight weather zone. Top bedrock 909.5-957.5', sloping down to northwest.

3.3.4 Soil Infiltration Testing Results

- 8 test holes drilled where stormwater basins proposed, June 2023.
- Constant head test method used to measure rate of infiltration, inside 3-inch diameter drill casing.
- Infiltration rates ranged from 0.74-0.98 in/hr, north to south. Very consistent. Two locations 35-78 in/hr; gravel.

3.4 Soil Testing for Environmental Quality

- Soil-quality samples collected from each boring for monitoring wells and piezometers, and six additional borings.

- Samples collected from 0-2 ft bg (feet below grade), the 2-ft-intervals spaced 15 feet apart to 60 ft bg or groundwater level. One sample collected at groundwater interface.
- All samples analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs dioxins/furans and metals.
- Results:
  - No PCBs. Detection limits relatively high but below MCP Method 1 S-1/GW-1 standard of 1 ppm
  - VOCs, SVOCs, pesticides and herbicides at relatively low concentrations
  - Detections of dioxins/furans at low concentrations
  - Metals at background levels
- Results compared to EPA Region 9 Preliminary Remediation Goals (PRGs) and MCP standards to evaluate potential reuse.
  - Arsenic above applicable PRG but below MCP standard
  - Nickel in 2 samples above MCP standard but below PRG

<u>Weston & Sampson Comments:</u>

1. *Sampling network appears representative and includes worst-case sampling locations near grade and at groundwater interface.*
2. *No conclusion offered about reuse. Appears adequate quality for reuse but should be confirmed.*

3.5 Piezometers and Monitoring Well Installations

- 6 piezometers installed for water-level measurements only, constructed with 1-inch diameter PVC well materials, by hollow-stem auger and sonic drill methods.
- 11 groundwater-monitoring wells, including two shallow/deep well clusters, constructed with 2-inch diameter PVC well materials.

3.6.1 GW Elevation Monitoring

- Manual measurements made monthly.
- Pressure transducer/dataloggers (PTDLs) installed in PZs and MWs set to measure and record water levels hourly.
- Monitoring period June 6, 2022, to June 2023.
- Water-level data shows seasonal fluctuation of 2.5 to 9.8 feet.
- Within consolidation area footprint, groundwater elevations ranged from 949-973' April- May 2023; 946-967' November 2022.
- Groundwater-flow direction/gradient east-west, east-northwest, east-southwest.
- Cluster wells measured upward vertical hydraulic gradient (VHG) from bedrock to deeper sediments.
- LML data also shows upward VHG from bedrock to deeper sediments.

<u>Weston & Sampson Comments:</u>

3. *Geologic cross sections indicate thickness of overburden sediments range from 68 to 117 feet (east to west) and 47 to 105 feet (north to south). Depth-to groundwater ranges from 57 to 79 ft bg (east to west) and 21 to 80 ft bg (north to south). Variability east to west principally due to sloping bedrock surface, north to south due to topography.*
4. *Geologic cross sections indicate phreatic water table, with no confining conditions or significant restrictive layers/stratification.*

5. *Consider providing an extended section view from east to west, e.g., from the till boundary to other side of the Housatonic River valley.*
6. *Data suggests the till boundary is nearby to east and affects groundwater levels and gradient.*
7. *Table 1, below, presents a summary of the water-level data relative to seasonal high groundwater levels.*

Table 1: Summary of water-Level Data Referenced for Hydrogeologic Review

ID	Low GW EL	High GW EL	Flux	Max Frimpter GW EL	Diff	High Date	High – Baseliner EL 975'	Max Frimpter – 975'
MW-2022-1S	966.50	973.87	7.37	975.85	1.98	5/23	-1.13	0.85
1D	966.50	973.29	6.79	975.66	2.37	5/23	-1.71	0.66
2	950.00	962.61	12.61	965.20	2.59	3/23	-12.39	-9.8
3	947.00	949.74	2.74	953.53	3.79	6/22	-25.26	-21.47
4S	947.00	950.50	3.50	953.90	3.40	6/22	-24.50	-21.1
4D	947.50	952.31	4.81	954.43	2.12	4/23	-22.69	-20.57
5	951.00	955.90	4.90	959.12	3.22	4/23	-19.10	-15.88
6	947.10	952.00	4.90	954.28	2.28	4/23	-23.00	-20.72
7	949.00	955.63	6.63	957.50	1.87	4/23	-19.37	-17.5
8	949.50	953.94	4.44	958.35	4.41	6/22	-21.06	-16.65
9	948.20	954.41	6.21	956.24	1.83	4/23	-20.59	-18.76
PZ-1	949.30	951.77	2.47	956.44	4.67	4/23	-23.23	-18.56
2	948.80	952.54	3.74	955.73	3.19	6/22	-22.46	-19.27
3	957.80	963.80	6.00	966.61	2.81	6/22	-11.20	-8.39
5	951.40	955.28	3.88	958.45	3.17	4/23	-19.72	-16.55
7	952.20	961.26	9.06	963.09	1.83	4/23	-13.74	-11.91
8	952.10	960.69	8.59	962.52	1.83	4/23	-14.31	-12.48
MW-84-1	953.00	965.32	12.32	967.15	1.83	4/23	-9.68	-7.85
2	948.30	954.46	6.16	957.15	2.69	6/22	-20.54	-17.85
MAX	966.50	973.87	12.61	975.85	4.67		-1.13	0.85
MIN	947.00	949.74	2.47	953.53	1.83		-25.26	-21.47
AVG	951.69	957.86	6.16	960.59	2.73		-17.14	-14.411
POND	947.00	949.60	2.60					

Notes: Yellow highlighted text indicates monthly precipitation amount below normal.
Light blue highlighted text indicated monthly precipitation amount above normal.
Red indicates water level within 15 feet of proposed baseliner elevation.

8. *Appears to be significant Variability of high groundwater levels between wells, which suggests variable hydrogeology relative to sediment composition, vertical permeability, and infiltration rates.*

9. *It appears that the high groundwater level often occurs in months with below normal precipitation (see attached table showing monthly precipitation amounts for 2000 through 2023, normalized mean values and relative wet/dry months for monitoring period). This should be explained.*
10. *The fluctuation of groundwater levels is generally highest along the eastern perimeter, reflecting thinning of aquifer to east and effects of till boundary.*
11. *For PZ-2022-3 located within the UDF footprint, the high groundwater elevation and Max Frimpter elevation is less than 15 feet below the proposed baseliner elevation of 975'.*
12. *Water levels at MW-2022-1S/D well cluster, located east of the UDF, are significantly higher than 975'. Using the gradient from 1S/D to PZ-2022-5, groundwater beneath the eastern edge of the UDF may be higher than 975'.*
13. *The monitoring network appears to be representative of hydrogeologic conditions. May need more monitoring wells along eastern edge of UDF and a longer period of record for comparison to the baseliner elevation.*
14. *Confirm the location of MW-2022-5. It appears to be shown at different locations on figures and cross section. This well is critical to the groundwater configuration beneath the central and western UDF areas.*
15. *The groundwater configuration appears relatively consistent throughout the monitoring period. The steep gradient beneath the east side of the UDF likely reflects the upland till/bedrock boundary. The hydraulic gradient shallows beneath the central and western portions of the UDF, with a centrally located east to west divide; flow north and south toward groundwater discharge areas at the northern pond and MW-2022-6. The divide is principally established by water levels in MW-2022-5, which appear to be several feet higher than would be expected. Water levels at MW-2022-5 and screen/aquifer connection should be confirmed. Redevelop well if needed.*
16. *Table 2 below, shows a water-level fluctuation of 3 to 6 feet beneath areas of the UDF, with the east area within 9 feet of the baseliner elevation, and 6 feet when seasonal high Frimpter elevations are considered.*

Table 2: Summary of Groundwater Elevations from Contour Maps

Month	Groundwater Elevation Taken from Contour Maps				
	East	Central	NW	SW	West
6/22	966	955	951	953	955
7/22	965	953	950	952	953
8/22	963	951	949	950	951
9/22	962	951	949	949	950
10/22	961	950	948	948	950
11/22	960	950	948	948	951
12/22	960	950	948	949	950
1/23	961	951	949	951	951
2/23	962	953	950	953	953
3/23	964	952	950	952	952
4/23	965	954	951	954	954
5/23	966	954	950	954	954
6/23	965	953	949	952	953

Month	Groundwater Elevation Taken from Contour Maps				
	East	Central	NW	SW	West
Max	966	955	951	954	955
Min	960	950	948	948	950
Avg	963	952	949	951	952
Flux max-min	6	5	3	6	5
Max Rel 975	9	20	24	21	20
Frimpter Add	3	3	5	2	3
Frimpter High	969	958	956	956	958
Frimpter High Rel 975	6	17	19	19	17
Notes: Yellow highlighted data indicates highest groundwater level. Red highlighted data indicates the highest groundwater level is within 15 feet of the proposed baseliner elevation.					

3.6.2 Estimate of Seasonally High Groundwater Elevation

Description of Frimpter Method

- Terrain setting valley-flat and terrace; evaluated as terrace, which they consider to be more conservative (yields higher groundwater elevations).
- Geologic environment – stratified drift sand and gravel.
- Frimpter compares two ratios: 1) measured groundwater fluctuation at site and at an observation well (OW); and 2) standard Frimpter range of groundwater fluctuations and the recorded upper limit of the range of groundwater fluctuations at the OW. Seasonal high groundwater elevations for site are estimated based on recorded groundwater elevation fluctuations at OW.
- The OW selected for this evaluation was USGS MA-PTW 51 Pittsfield MA. Similar valley setting. Data 1985-2022. Range of groundwater elevation in OW approximately 5.2 feet, compared to 5.0 at GE site.
- Frimpter calculations show increases in PDI gauging points of 1.8 to 4.7 feet above PDI measured elevations.
- Comparative calculation using OW MA-DWF 44R in Deerfield MA; terrain very flat and stratified drift. Showed similar results to PTW-51.
- Determined PTW-51 data appropriate for use.
- Frimpter also run on 2 LML wells, with longer historical GW record. Highest water level in the LML wells occurred in spring 1984. The maximum Frimpter terrace elevation was 967.15; 1.4 feet higher than measured. Note, the MW-84-1 measurement on June 6, 1984, was determined to be anomalous due to surface-water leakage into well. For MW-84-2, the maximum Frimpter elevation was 957.15, about 0.8 ft lower than measured.

<u>Weston & Sampson Comments:</u>

17. *The average fluctuation of groundwater levels in all wells, including the LML, was 6.16 feet; and for site wells only 5.80 feet. This conflicts with determination of 5 feet for comparison to OW. The significance of this deviation should be explained/evaluated or corrected.*
18. *Weston & Sampson reviewed stream-gauge and precipitation records to evaluate the climatic conditions for the monitoring period. The stream gauge in the Housatonic River at Lenox dale,*

MA-01197145 (at Site) only has a period of record beginning September 2022. The gauge near Great Barrington, MA-01197500, is the closest downstream station to the parcel with a long period of record. This gauge shows variable flow conditions over the monitoring period but generally representative of historical flow variability, with the possible exception of highest flow period 2021.

19. *During the monitoring period the precipitation total was 63.16 inches, compared to the normalized mean precipitation total for this period of 56.76. so monitoring was conducted during a statistically wet period.*
20. *In 2022, total precipitation was 50.19 inches, compared to the normal annual precipitation amount of 47.57 inches, so relatively wet.*
21. *Since 2000, the highest annual precipitation was 66.53 inches recorded in 2021 prior to the monitoring period. This corresponds to a high stream gauge reading as noted above. The monitoring period was statistically wet, as noted above under #19, but not the wettest period according to recent records. The measured water levels during the monitoring period should reflect relatively high conditions, but not the highest.*

3.7 Groundwater Testing for Environmental Quality

- Samples collected from 11 groundwater-monitoring wells, including shallow/deep cluster wells at MW-1S/D and MW-4S/D.
- Sampling designed to establish baseline chemical conditions for comparative evaluations during UDF operations and post-closure monitoring.
- All samples analyzed for PCBs, VOCs, SVOCs, inorganics, dioxins/furans, pesticides, herbicides and PFAS.
- Three sampling events: spring 2022, fall 2022, and spring 2023.

<u>Results June 23-July 6, 2022:</u>

- No PCBs
- Only few detections of VOCs, SVOCs and herbicides at MW-2022-1S and 1D (east, upgradient)
- Few detections of pesticides in 4 MWs and inorganics in all 11 MWs at low concentrations
- PFAS in 8 of 11 MWs at low concentrations
- Dioxins/Furans in all 11 MWs at low concentrations

<u>Results November 9-December 19, 2022:</u>

- No PCBs
- Only few detections of VOCs, SVOCs and herbicides at MW-2022-1D and MW-2022-2 at low concentrations
- Few detections of pesticides in 8 of 10 MWs and inorganics in all 10 MWs sampled at low concentrations.
- PFAS in 7 of 10 MWs low concentrations
- Dioxins/Furans in all 10 MWs sampled at low concentrations.

<u>Results April 25-May 5, 2023:</u>

- No PCBs
- Only few detections of VOCs, SVOCs and herbicides at MW-2022-2, MW-2022-3 and MW-2022-5 at low concentrations
- Few detections of pesticides in 5 of 11 MWs and inorganics in all 11 MWs sampled at low concentrations.

- PFAS in 7 of 11 MWs low concentrations
- Dioxins/Furans in all 11 MWs sampled at low concentrations.

Results were compared to MCP Method GW-1 (drinking water) and GW-3 (discharge to surface water) groundwater standards.

- Total PFAS at MW-2022-1S, MW-2022-1D and MW-2022-9 for all 3 events above GW-1 standard. Source not determined but apparently hydraulically upgradient.
- Spring 2022 sample from MW-2022-5 contained cyanide above the GW-3 standard.

No current or reasonably foreseeable future use of groundwater as drinking water at parcel, and no active drinking water wells within 500 feet of UDF consolidation area.

<u>Weston & Sampson Comments:</u>

22. *The analyte list appears to be adequate for assessment of background conditions. Confirm that the list includes all analytes used for assessment of remedial dredge samples to confirm the background water-quality results are useful for monitoring of potential releases from UDF.*
23. *Sample results from seasonal events appear to be reasonably consistent, validating use for background conditions.*
24. *Absence of PCBs good for operational and post-closure monitoring.*

3.8 Hydraulic Conductivity Testing

- Slug tests at MW-2022-1S, 2, 5, 7 and 9 to determine hydraulic conductivity (K) of parcel soils. Additional testing at MW-2022-1S and 4D in July 2023 as directed by EPA.
- Relative locations for test wells:
    - MW-2022-1S: east-central parcel boundary, upgradient of UDF
    - MW-2022-2: north-central parcel boundary, outside and side gradient of UDF, north of SW infiltration basin
    - MW-2022-5: west parcel boundary, west and downgradient of UDF
    - MW-2022-7: east-central parcel boundary, upgradient of UDF
    - MW-2022-9: south-central parcel, inside south limit of UDF
    - MW-2022-4D: west-central parcel boundary, outside and downgradient of UDF
- Water-level displacement using solid slug 1.5-inch diameter by 2-feet-long.
- Water-level recovery measured with PTDL.
- Test response with the lesser amount of <u>initial variability</u> used to analyze K.
- Recovery data processed and analyzed with AQTESOLV, following guidance from Butler (2019).
- MW 1S, 7 and 9 partially submerged screens, or screens/upper filter packs that became partially submerged during rising head test.
- Estimated K values ranging from 0.3 to 38 ft/day.

<u>Weston & Sampson Comments:</u>

25. *To understand the significance and distribution of results, the relevance and use of in-situ "K values for parcel soils" should be explained. The report only references it as being required by EPA.*
26. *The results are not relevant to reuse due to depth of saturated soils. They may be useful for development of a groundwater flow model, which is recommended to understand pre- and post UDF conditions.*

27. *K values reflect the heterogeneous nature of glacial deposits.*

28. *No slug tests were conducted within the proposed stormwater basin area for mounding analysis purposes. The closest test was conducted at MW-2022-2; K = 30 ft/d; 224 gpd/ft^2. This K value is characteristic of fine to coarse sand and glacial till (Groundwater and Wells, 1989). K values beneath the proposed stormwater basin would facilitate a mounding analysis for the design use of infiltration, and to assess the effects of infiltration on groundwater elevation and flow in the northern UDF area.*

29. *A mounding analysis should be conducted to confirm groundwater separation from baseliner in northern portion of UDF. Of note, the Frimpter estimate at PZ-1 is about 18.5 feet below the baseliner elevation 975'. Would mounding raise groundwater in this area 3.5 feet?*

3.11 Non-Community and Private Water Supply Wells

- Reviewed surrounding area within 500 feet of the UDF consolidation area to identify possible non-community and private water-supply wells.
- Reviewed aerial imagery to determine locations requiring investigation, conducted field reconnaissance of accessible areas within the area of investigation looking for visible evidence of private wells, and made an inquiry to MassDEP for records concerning wells in the investigation area.
- Review identified no active wells in 500-foot radius.
- Review identified 3 potential wells in vicinity, 2 were outside 500-foot radius and one that served a former residence and is no longer in use.

<u>Weston & Sampson Comments:</u>

30. *Is 500-foot radius adequate for this assessment? This radius should consider well yields and radius of influence, which could be greater than 500 feet if used for more than residential supply.*

31. *Will construction of the UDF include a restriction from development of groundwater supplies within a certain radius of the UDF consolidation area?*

<u>Report Reviewed</u>: Upland Disposal Facility Conceptual Design Plan

2.1 Performance Standards UDF

- Baseliner minimum 15 feet above conservative estimate of seasonally high groundwater elevation; describes method for determining i.e., Frimpter.
- Cap is low permeability layer with hydraulic drainage layer. 1×10^{-7} cm/s with minimum 0.030-inch thickness and chemically compatible with PCBs.
- Description of stormwater management system and groundwater-monitoring plan.

2.3.5 Piezometer and Monitoring Well Installation

- Reference to 6 PZs and 11 MWs, including 2 deep/shallow MW pairs installed within parcel.

2.3.6 Groundwater Elevation Monitoring

- Groundwater monitoring at 6 PZs, 11 MWs on parcel, 2 MWs at LML, 2 surface-water points on artificial ponds on parcel and Housatonic River at Crystal Street Bridge.
- Seasonal high groundwater levels determined from monitoring data and Frimpter Method.

2.5 Perimeter Berm and Baseliner System

- Perimeter berm constructed with site soils excavated from UDF footprint. Designed to provide protection from stormwater run-on outside UDF

- Baseliner consists of upper primary and lower secondary liners. Primary HDPE geomembrane underlain by geosynthetic clay liner. Secondary HDPE and clay liner and 1-ft-thick compacted clay liner.
- Primary leachate collection above primary liner. Secondary leachate collection between primary and secondary liners, function as leak detection system.
- Two UDF cells separated by intercell berm constructed of compacted clay. Cells would be hydraulically separated. Each will have dedicated collection sump. Cells would be constructed together or in phases.

2.8 Surface Water Management

- Stormwater drainage system with open channels, culverts, and infiltration basins. Perimeter ditch would collect runoff and route to an infiltration basin north of UDF.
- Runoff from peripheral areas will be limited and managed by smaller infiltration areas.

3.3.2 Groundwater and Bedrock Offsets

- Revised Permit requires that baseliner must have a minimum separation distance of 15-feet-vertical from seasonal high groundwater.
- 310 CMR 19.110(6) requires baseliner to be a minimum of 4 feet above top of bedrock or maximum high GW table.
- The seasonal high groundwater level used for design must be approved by EPA.

<u>Weston & Sampson Comments:</u>

32. *The bedrock surface was confirmed at 3 borings. The highest bedrock-surface elevation was 957.5', at MW-2022-1. This is approximately 17.5 feet below the baseliner elevation of 975'.*

4.3.1 Drainage Layer Design

- A geocomposite drainage layer will collect/convey non-contact water that infiltrates cover soil layers. This will minimize hydraulic head on the geomembrane and geosynthetic layer, which should reduce the potential for leakage and generation of leachate and improve slope stability.

4.3.2 Collection and Conveyance Piping Design

- Perforated piping in connection with the geocomposite layer will collect and convey infiltrated stormwater to the stormwater management system.

4.4.4 Stormwater Basin Design

- Infiltration basins to be sized to attenuate peak runoff.

5.3 Management of Contact and Non-contact waters

- Non-contact stormwater runoff prior to placement of consolidated material, dewatering discharge, surface and geocomposite runoff.
- Contact/leachate: any water with potential to interact with consolidated material. Drawings show contact leachate routed to Treatment Facility then discharged to River.

<u>Weston & Sampson Comments:</u>

33. *Design drawings and sections show lowest bottom elevation of baseliner at 975'. Drawing of bottom elevation contours compared to seasonal high groundwater elevation contour should be provided.*

GEOTECHNICAL ENGINEERING

Report Reviewed: Final Pre-Design Investigation Summary Report for Upland Disposal Facility Area

Weston & Sampson Comments:

1. MW-2022-4S/D: profile on Figure 7 indicated that this boring extended into rock, but log indicates it terminated in sand.
2. A total of 22 borings for the site seems low. Provide justification that the number of borings adequately assesses site subsurface conditions.
3. Of the 22 borings completed, 5 encountered very loose to loose material. Based on the "upland disposal facility limits of Consolidated material" on Figure 6, these borings are outside the UDF. Please confirm.
4. Of the 22 borings completed, only 9 are located within the "Upland Disposal Facility Limits of Consolidated Material" on Figure 6. Rock cores were retrieved from 3 of the 22 borings, none of which are located within the UDF limits. Recommend additional borings within the UDF limits extending into rock to further define the soil conditions, soil thickness and rock elevation, and rock characteristics in particular degree of fracturing and corresponding permeability.
5. Additional borings may be necessary to assess slope stability depending on the proposed grading.

Report Reviewed: Upland Disposal Facility Conceptual Design Plan

Weston & Sampson Comments:

6. Section 4.2.1 presents the final cover system components. Confirm that veneer stability has been assessed.
7. What will be the condition and degree of saturation of the dredged material at the time it is placed in the UDF cells? If sediment is to be dewatered on site how will this be achieved and how will effluent be managed? Is there sufficient space on site for a sediment dewatering operation?
8. Section 4.2.3 notes that settlement will be evaluated as part of the final design and it will include settlement of the proposed fill. Fill placement and compaction criteria for the dredged/waste materials has not been provided. Confirm that this will be included in the final report along with corresponding geotechnical strength parameters.
9. Section 4.2.4 indicates that slope stability analyses have been performed. However, the report does not provide the soil parameters or cross sections used in the analysis which are critical input in the analysis. Without that information, we cannot comment on the slope stability analysis.
10. Section 4.4.3 discusses culvert design with respect to flow conditions. Will the design also consider structural and geotechnical engineering?
11. Section 5.2 indicates that transport of the dredged or excavated material has not been determined but "trucking or conveyance via slurry within a temporary pipe to the UDF" are under consideration. These methods have very different impacts on the material handling, dewatering, and placement. It is unclear how geotechnical engineering parameters could have been assigned to perform a slope stability analysis without this having been determined.

LANDFILL ENGINEERING

Report Reviewed: Upland Disposal Facility Conceptual Design Plan

Our landfill engineering review of the conceptual design for the UDF primarily focused on the *Upland Disposal Facility Conceptual Design Plan*. The plan provides details on the preliminary design of the facility from the siting phase through construction and post-closure. Design items and data gaps were identified for which further information is required; however, none of these items or data gaps represent significant concerns about the general siting or design of the UDF from a solid waste/landfill engineering perspective.

Weston & Sampson Comments:

Capacity Calculations

Provide back-up calculations for UDF disposal capacity. Has the volume of the intercell berm and the general fill shown beneath the final cover on Figure 7 of the CDP been considered in the calculations of the maximum capacity?

Decomposition Gases

The disposal facility design does not include a system for managing gases produced from the decomposition of consolidated waste. The presence of a small amount of carbon, sulfur, and other elements in sediments could result in the production of decomposition gases beneath the final cover. This could threaten the integrity of the final cover.

Has the possible production of decomposition gases been considered in the design of the UDF?

Baseline to Final Cover Interface

Figure 7 depicts the geosynthetic layers of the baseliner and final cover terminating in separate anchor trenches. Has the approach of welding the geomembranes of the final cover system and primary baseliner been considered?

Shear Interface Testing

Section 4.2.4 discusses modelling of shear slope stability. Geosynthetic shear strength parameters are indicated as potentially the weakest interface shear strength in the UDF. It is noted that the baseliner was modelled as if it were a single layer. Are there intentions to further refine the shear strength modelling to determine if any particular interface within the baseliner or between the baseliners and an adjoining surface are weaker than is currently modelled? Are interface shear strength tests being considered as part of construction quality testing? Also, please see Geotechnical Engineering comment #8 above.

Temporary Stormwater Berms

Has the use of temporary stormwater berms within the cells been considered during early facility operations in order to reduce the size of the active cell and thus limit the amount of contact water generated during rain events?

Site Access Road

There does not appear to be an access road from the perimeter to the top of the disposal facility on Figure 4. Will an access road be included in a future design and how might it affect stormwater management and consolidation capacity?

Leachate Dewatering

The movement of leachate through the consolidation material could be rather slow, which could result in a lengthy settlement period. Have means of increasing the rate of leachate movement been considered, such as the use of vertical drainage risers that extend from the primary leachate collection system up through the consolidation material?

PFAS Concerns

There are indications that PFAS may present various concerns throughout the construction of the facility, such as the presence of PFAS in baseline groundwater monitoring. What considerations have been made about the potential presence of PFAS in various site materials, such as collected leachate? Given the evolving regulatory environment around PFAS, how will potential PFAS concerns be addressed if such compounds are detected during the project?

Financial Assurance Mechanism

It is assumed that a financial assurance will be established for the UDF. Given the high interest of local communities in the amount and type of financial assurance, discussion of this in the next report is recommended.

Monthly Total Precipitation for LENOX DALE, MA

Click column heading to sort ascending, click again to sort descending.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2000	3.05	2.92	3.69	4.67	5.5	8.53	M	M	5.38	2.61	M	4.63	M
2001	M	3.02	6.42	2.26	2.6	5.77	2.68	2.21	4.91	1.38	1.56	3.24	M
2002	1.62	1.73	3.69	3.74	4.95	4.73	M	3.89	3.74	3.11	5.67	4.38	M
2003	3.43	3.12	3.72	1.76	5.16	3.5	2.24	6.64	6.45	6	4.27	5.75	52.04
2004	2	1.58	3.07	4.28	4.88	2.24	M	M	8.38	2.11	2.96	3.42	M
2005	4.48	2.8	4.42	2.85	1.53	2.81	3.47	M	1.64	15.27	6.23	3.95	M
2006	6.51	1.82	0.59	4.18	5.18	5.93	3.76	M	4.13	4.65	3.66	2.29	M
2007	3.59	2.94	5.63	6.56	2.23	2.16	6.18	M	1.77	5.35	4.03	5.65	M
2008	1.85	9.93	6.57	2.75	3.1	M	9.5	3.48	5.82	4.14	2.24	8.86	M
2009	3.11	2.4	2.5	1.91	4.97	8.17	10.91	6.23	1.08	4.8	2.83	3.69	52.6
2010	3	4.68	5.7	1.36	2.19	4.22	4.35	1.68	1.06	9.73	2.61	4.51	45.09
2011	3.03	4.08	5.02	5.26	M	6.89	2.69	9.48	10.61	4.23	2.3	5.32	M
2012	3.71	1.19	1.55	2.05	6.98	2.86	2.6	2.82	6.06	4.75	0.88	5.2	40.65
2013	2.39	3.21	2.63	2.3	5.95	6.59	2.58	5.6	4.38	1.23	3.65	3.52	44.03
2014	3.18	3.9	2.84	3.1	3.36	9.07	10.32	2.42	1.14	5.4	3.58	6.58	54.89
2015	4.26	2.22	2.18	3.18	1.6	7.69	5.35	4.96	2.49	3.27	2.28	3.78	43.26
2016	1.76	4.93	2.5	3.35	6.36	2.74	2.81	2.88	3.11	4.25	3.34	5.46	44.9
2017	3.26	2.87	3.55	3.49	5.65	3.48	4.34	4.13	3.7	5.06	1.13	2.8	43.46
2018	5.05	4.94	4.67	3.78	1.83	4.05	4.6	8.83	7.45	4.67	7.66	4.26	61.79
2019	5.44	2.95	M	M	4.53	M	M	2.49	3.04	7.87	4.7	6.84	52.22
2020	1.65	3.29	3.7	4.4	2.91	3.51	3.56	3.93	0.68	3.82	2.62	4.61	M
2021	2.53	2.26	2.2	5.53	6.63	5.32	15.97	4.52	7.27	7.32	2.92	4.06	66.53
2022	1.99	4.33	3.24	5.84	3.12	2.92	5.03	2.32	7.87	5.29	2.95	5.29	50.19
2023	5.4	2.05	4.7	2.99	2.6	4.72	9.03	M	M	M	M	M	M
Mean	3.32	3.3	3.69	3.55	4.08	4.9	5.6	4.36	4.44	5.06	3.37	4.7	50.13
Max	6.51	9.93	6.57	6.56	6.98	9.07	15.97	9.48	10.61	15.27	7.66	8.86	66.53
	2006	2008	2008	2007	2012	2014	2021	2011	2011	2005	2018	2008	2021
Min	1.62	1.19	0.59	1.36	1.53	2.16	2.24	1.68	0.68	1.23	0.88	2.29	40.65
	2002	2012	2006	2010	2005	2007	2003	2010	2020	2013	2012	2006	2012

Normal	3.25	3.31	3.75	3.93	4.17	4.52	4.67	3.88	3.95	4.47	3.84	3.83	47.57		
													Total	Normal	Diff
2022						2.92	5.03	2.32	7.87	5.29	2.95	5.29	31.67	29.16	2.51
2023	5.4	2.05	4.7	2.99	2.6	4.72	9.03						31.49	27.6	3.89
													63.16	56.76	