STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF REMEDIATION AND WASTE MANAGEMENT
DIVISION OF TECHNIAL SERVICES
MEMORANDUM

TO: Sherwood McKenny, WMDSM Project Manager

FROM: Linda Butler, MDEP Project Manager; and Gail Lipfert, PhD, C.G. # GE506 Hydrogeologist

DATE: September 9, 2020

RE: Phase 14 Solid Waste Permit Application, Supplemental Geologic and Hydrogeologic Report, Crossroads Landfill, Waste Management Disposal Services of Maine (WMDSM), Norridgewock, Maine

CC: Chris Evans, C.G., Hydrogeology Unit supervisor; Kathy Tarbuck, P.E., Project Engineer; Molly King, Division Director Technical Services

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1. The above-mentioned document was prepared in response to our comments on the Geologic and Hydrogeologic Assessment. They completed a pumping test and re-evaluated the clay hydrogeology. The Department has concluded that, based upon the pumping test results as presented by Golder, rule requirement ch. 401.2C(2) has been satisfied and the minimum time of travel to the proposed sensitive receptors of greater than 6 years has been proven, as required in ch. 401.1C(c).

THE FOLLOWING REQUIRE A RESPONSE FROM WMDSM:

2. 2.0 Presumpscot Clay. WMDSM is correct that during previous investigations of the other phases at Crossroads landfill fractures/fissures/joints were observed primarily in the stiff upper clay and not in the soft lower clay. We note, however, that there are areas of Phase 14 that are underlain only by the stiff clay and not the soft clay. Please propose a method or methods to address the areas of limited extent of the soft clay throughout the footprint of the proposed expansion, in accordance with ch. 401.1C(3)(b). WMDSM must request a variance to this rule requirement. Please reference the April 30, 2020 meeting notes of discussion with MDEP. Please submit the variance request together with supporting documentation as an addendum to the application for MEDEP review.

3. The uncertainty regarding fracturing in the clay, particularly in the stiff clay, would be alleviated by scarification of clays, expansion of the area of proposed fill and the addition of compacted clay in the northwestern part of Phase 14, as WMDSM proposed in the above referenced April meeting to satisfy rule requirement ch. 401.2(D)(3).

4. 6.1 Proposed groundwater water quality monitoring program. Based on the till equipotential contour lines (Figure 13a of volume III), the well MW14-04D is not

downgradient of the likely discharge point, Ph14C, so MEDEP has indicated a new location for MW14-4D in the figure below. MEDEP considers that it is not necessary to install new upgradient wells for monitoring. WMDSM should be able to use the PZ-7 or PZ8 well clusters instead of installing new upgradient wells.

5. Follow-on response to Comment 16 of MEDEP memorandum dated June 22, 2020. MEDEP concurs that with weak vertical gradients, the transport of groundwater from the landfill to the bedrock would probably take a long time, but it would also mean that the water from the landfill would extend out from the landfill for a long distance before entering the bedrock and not intersect the existing bedrock wells. Some indication of this can be seen in the cross-section in Figure 15 of Volume III. There is no flow path from the landfill that intersects the screen of the downgradient bedrock well, MW14-04B. We concur that there appears to be a good hydraulic connection between the bedrock wells, but this does not tell us where the flow lines from the bottom of the landfill to the bedrock are.

   Two bedrock monitoring wells are required downgradient of Phase 14 so that groundwater released from the landfill is likely to be intercepted by the wells. MEDEP has indicated the locations of these wells in the figure below. Also, MW14-4D is not located downgradient of Ph 14C, the likely release point, and, like the bedrock well, MW14-4B, is not located far enough away for water from a release at Ph14C to intercept its screen, so we have indicated a new location. WMDSM must include two bedrock monitoring wells in its proposed water quality monitoring program that satisfy MEDEP concerns.

6. Follow-on response to Comment 29 of MEDEP memorandum dated June 22, 2020. MEDEP concurs that with weak vertical gradients, the transport of groundwater from the landfill to the bedrock would probably take a long time, but it would also mean that the water from the landfill would extend out from the landfill for a long distance before entering the bedrock and not intersect the existing bedrock wells. Some indication of this can be seen in the cross-section in Figure 15 of Volume III. There is no flow path from the landfill that intersects the screen of the downgradient bedrock well, MW14-04B. We concur that there appears to be a good hydraulic connection between the bedrock wells, but this does not tell us where the flow lines from the bottom of the landfill to the bedrock are. Two bedrock monitoring wells are required downgradient of Phase 14 so that groundwater released from the landfill is likely to be intercepted by the wells. MEDEP has indicated the locations of these wells in the figure below (end of document). Also, MW14-4D is not located downgradient of Ph 14C, the likely release point, and, like the bedrock well, MW14-4B, is not located far enough away for water from a release at Ph14C to intercept its screen, so we have indicated a new location.

7. Given that a single geomembrane liner is proposed, the Department strongly recommends that WMDSM proposes to conduct an Electrical Leak Location Survey at the completion of each cell's construction to verify the integrity of the geomembrane liner following installation and prior to waste disposal, providing added post-construction quality control. The survey utilizes electrical conductivity techniques to detect leaks in the geomembrane. The survey will address the performance standards of ch. 401.1C(a) to ensure that the proposed landfill expansion does not contaminate groundwater outside the solid waste boundary.

THE FOLLOWING ARE COMMENTS AND QUESTIONS OF CLARIFICATION THAT MEDEP REQUESTS A RESPONSE TO FOR THE RECORD:

8. 2.0 Presumpscot Clay, fifth paragraph. Does this limitation in the extent of the fissures/fractures/jointing refer to a vertical extent? Please clarify.
9. 3.7 Recovery Period, summary of key events. This section states that pumping of MW14-3B ceased pumping July 13, 14:00, but the data show the recovery starting July 10, 14:00. Please clarify.
10. 3.7 Recovery Period, summary of key events. This section states that a precipitation event occurred on July 11 from 4 pm to 9 pm, but because the response in PZ-16M starts around 7 am and is mostly over by 4 pm of July 11, should this be July 11 from 4 am to 9 am?
11. 3.7 Recovery Period, review of recovery data to confirm a response to pumping. How did WMDSM distinguish between a response of the wells to the July 10, 14:00 cessation of the pumping well from a response to the July 11, 4:00 precipitation event?
12. 3.7 Recovery Period, bedrock wells. This paragraph states that MW14-2B recovered to within approximately 0.1 foot of the pre-pumping elevation, but then states that MW14-2B recovered to an elevation slightly higher than the pre-pumping level. Perhaps one of these statements refers to MW14-4B? Please clarify.
13. 3.9.2 Data adjustments. Please provide the actual calculations for the trends in the antecedent data that were removed from the drawdown period. Please provide the drawdown data that were used in the analysis.
14. 3.9.3 Hantush Data Analysis. This section states that the Hantush method would derive vertical hydraulic conductivity from the pumping test, but if the pumping well is in the same unit as the monitoring wells, shouldn't it be deriving horizontal hydraulic conductivity (with the possible exception of MW14-3D)?
15. 5.2.2 Presumpscot Clays, last paragraph. "…the Presumpscot clays impedes most meteoric recharge…" We noted that the response of the water levels in the background wells to the July 11 precipitation event indicated that the till responded quickly which might indicate rapid transmittal of the water across the clay. MW14-05D shows a very similar increase due to the precipitation that comes at virtually the same time as the clay

well MW14-05M, further supporting rapid transmittal of water across the clay to the till. Please provide your thoughts on the response of till water to the precipitation event.

16. 5.2.3 Glacial till, second paragraph. The till in the Phase 14 area may be primarily recharged from the north, northeast (outside of Phase 14 area, we presume), but please explain the rapid response of water elevations to the rain event in several till wells.
17. Follow-on response to Comment 27 of MEDEP memorandum dated June 22, 2020. WMDSM's response states that they provide (in Section 4.0) a comparison of the current Phase 14 time-of-travel parameters to the parameters used in Gerber's 1996 groundwater model, but other than some discussion on porosity values (which weren't used in the original Phase 14 time-of-travel estimates), we could not find any comparison or evaluation of the 1996 model. Section 6.4 of Volume III uses the Gerber modeling results to justify the Phase 14 time-of-travel estimations, so it is appropriate to ask for confirmation of the applicability of the model. Could they be more specific on the location of the validation of using the 1996 model results to support Phase 14?

THE FOLLOWING ARE ONLY COMMENTS OF NOTE:

18. 3.7 Recovery Period, response of clay wells to precipitation event. WMDSM concurs that a rapid response occurred in PZ-16M to the July 11 rain event and no other clay well responded this way. We concur that there may be a construction problem with this well. We note, however, that although the responses of the other clay wells are not as dramatic, many of them appeared to respond to the rain event (PZ-18M, MW14-4M, PZ-1M, MW14-2M, and MW14-5M) indicating the clay is recharged directly from precipitation. One can also see a response to the precipitation event in the till wells too, at PZ-10D, PZ-13D and possibly at MW14-04D and MW14-05D. This response in clay and till wells to precipitation events indicates that the till can be recharged directly from precipitation and the clay is not an impediment to recharge at all locations. Although not all the till and clay wells responded to the 7/11 precipitation event, there are locations were the till responded quickly, indicating that precipitation had to pass quickly through the clay to reach the till. The Conceptual Site Model should include possible recharge of the till through the clay.
19. 3.8 Evaluation of total drawdown, Till. Although the elevations in MW14-5D are similar in shape to MW14-4D and PZ-13D, the start of the decrease in water levels at MW14-05E and PZ-13D does not support a conclusion that the decrease is related to the pumping of MW14-3B. Likewise, the increase in water levels at MW14-05D and PZ-13D are closer to the 7/11 rain event (that can be seen in the background till well, PZ-10D) and is probably not related to the pumping well. We only have confidence that three till wells (MW14-3D, MW14-4D, and PZ-13D) responded to the pumping test, with MW14-04D being the furthest away, and conclude that the radius of pumping influence is closer to 600 feet, than 1,500 feet.

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20. 3.8 Evaluation of drawdown, Clay. We only have confidence that of the clay wells, MW14-3M, PZ-23M, and possibly PZ-22, responded to the pumping test, with PZ-23M being the furthest away, and conclude that the radius of pumping influence is closer to 30 feet, than 1,500 feet.