

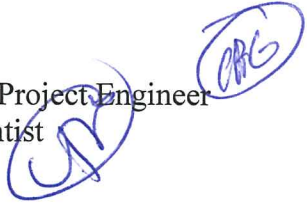
ROUX MEMORANDUM

TO: Michael Krasnik

FROM: Chase A. Gerbig, Ph.D., Project Engineer
Ian Reed, Principal Scientist

DATE: October 27, 2015

RE: Old Amherst Landfill
Belchertown Road
Amherst, Massachusetts



Roux Associates, Inc. (Roux Associates) was retained by Michael Krasnik of 23 Tanglewood Road to evaluate the condition of the Old Amherst Landfill (the “landfill”) located on the south side of Belchertown Road in Amherst, Massachusetts. It is Roux Associates’ understanding that Mr. Krasnik represents a group of Amherst residents that are concerned about the state of the landfill. Specifically, Roux Associates was asked to evaluate the initial construction of the cap, the maintenance and performance of the cap, and whether the cap is currently suitable for installation of a large capacity solar array.

Roux Associates reviewed files from the Massachusetts Department of Environmental Protection (MassDEP), the Town of Amherst (the “Town”), and the various consultants (i.e., Almer Huntley Jr. & Associates; Tighe & Bond; Camp, Dresser & McKee) who worked on behalf of the Town to close the landfill and investigate the landfill after closure. Roux Associates also conducted a site visit and inspection of the landfill and surrounding area on October 10, 2015.

Based on the document review and site inspection, Roux Associates reached the following conclusions regarding the landfill:

1. The final design thickness of the landfill cap (6 inches), while technically approved by MassDEP in December 1985, was substantially less than the thickness originally required by MassDEP at the time of closure approval (12 inches) in June 1985. Furthermore, the actual thickness of the cap has been observed to be as thin as 4 inches, which is 33% less than the final thickness MassDEP approved in 1985; and 67% less than MassDEP originally required in 1985. Note that current regulations require a minimum of 18 inches of impermeable cap material.¹ It is Roux Associates’ experience that the

¹ 310 CMR 19.112(6)(b)(1)(a)

thinner the cap, the more likely water will infiltrate the cap and ultimately leach landfill contaminants into the groundwater over time.

2. In 1985 MassDEP approved construction of a landfill cap consisting of a “compacted clay layer” with a hydraulic conductivity (i.e. the soils ability to transmit water) of 1×10^{-6} cm/s. However, according to the 2006 *Interim Comprehensive Site Assessment*, the cap consists of “yellow to brown silty sand” with a mean hydraulic conductivity of 1.5×10^{-4} cm/s.² This measured hydraulic conductivity is consistent with the “silty sand” soil classification, and represents a hydraulic conductivity that is 150 times more permeable than specified in the landfill closure plan. Note that current regulations require the cap to have a hydraulic conductivity of 1×10^{-7} cm/s³ – 10 times less permeable than the cap originally approved by MassDEP in 1985, and 1,500 times less permeable than the cap in its current condition.
3. Given that the landfill was not properly capped as demonstrated by the inadequate thickness and excessive permeability, it is not appropriate to characterize the cap as “impermeable.” Almost certainly water is readily infiltrating the cap and transporting contaminants from the landfill to the groundwater.
4. It has been known since at least the 1970’s that leachate from the landfill travels to nearby surface water bodies (Gull Pond and Hop Brook Wetlands) and monitoring wells located off-site from the landfill.
5. Recent investigations detected landfill-associated contaminants (primarily metals) above regulatory standards in wells adjacent to the wetlands to the west of the landfill. Surface water and sediment samples confirm that landfill-associated metals are impacting the wetlands, and may be causing adverse ecological effects. In addition, these wetland areas contain nature walking trails and the contaminants may be accessible to humans. The risk of human exposure has not been fully quantified because all impacted areas have not been adequately examined.
6. Some metals (arsenic, mercury) increased significantly in concentration in wetland sediments between 2006 (as reported in the *Interim Comprehensive Site Assessment*) and 2009 (as reported in the *Comprehensive Site Assessment*). These increasing concentrations indicate a potential trend and should be fully investigated before determining that the landfill poses no threat to the environment.
7. The current condition of the cap and associated monitoring infrastructure is poor. Examples of the current poor conditions include:

² The Town’s environmental consultant suggests that the hydraulic conductivity was “compromised by heavy rainfall that caused seepage of water into the test hole.” However, the observed hydraulic conductivity is consistent with the soil characterization of “silty sand.”

³ 310 CMR 19.112(6)(b)(1)(b)

- a. Ponding water on the surface of the cap;^{4,5}
 - b. Evidence of burrowing animals, indicating disturbance of the cap;
 - c. Damaged wells and landfill gas vents; and
 - d. Overgrown and potentially silting-in surface water drainage swales.
8. Maintenance and management of the landfills (including the New Landfill on the north side of Belchertown Road) was sub-standard throughout the landfills' history, and potentially continues to be sub-standard. For example:
- a. At least six Notices of Noncompliance for the two landfills were issued by MassDEP between 1985 and 2002. In 2002 MassDEP issued a Consent Order compelling the Town to take action with respect to the New Landfill because the Town allegedly made misrepresentations to MassDEP about the operation of the New Landfill and was operating outside of the permit.
 - b. The June 25, 1985 closure plan approved by MassDEP specifically states: "The Department believes that the practice of snow dumping on portions of the closed landfill may defeat the purpose of the final cover and, therefore, recommends against continuation of this activity when closure is completed." However, at least as late as 2006, as stated in the *Interim Comprehensive Site Assessment*, "The landfill site is currently maintained as open space and is unused by the Town with the exception of **snow storage during winter months** [emphasis added]." Anecdotal reports from nearby residents suggest snow storage during winter months continued beyond 2006.

Taken in aggregate, these facts suggest that the landfill is an uncontrolled source of pollution to the environment, potentially impacting groundwater, surface water, and wetland sediments over a wide area. The environmental conditions associated with the landfill are unlikely to attenuate over time. In fact, as the landfill cap degrades further, the conditions are likely to worsen as water infiltration accelerates. The current condition of the landfill cap, coupled with the Town's difficulty adequately managing the landfill to prevent further degradation of the cap, suggest that the landfill is reasonably likely to continue to present a threat to public health, safety, and the environment. Furthermore, delaying remediation of the landfill will substantially increase the cost of remediating impacted environmental resources in the future.

⁴ Ponding is so severe on the landfill that MassDEP's online global information systems (GIS) mapping tool, MassGIS, identifies portions of the landfill cap as wetlands.

⁵ Regrading operations are ongoing. However, regrading does not modify the contour of the cap or further increase the cap thickness. Instead, water that was once visible surface water will still be present, but will exist below the surface of the regraded areas. This water is still available to infiltrate the thin, permeable cap.

According to *The Guide to Developing Solar Photovoltaics at Massachusetts Landfills*, prepared by the Massachusetts Department of Energy Resources, one of the limitations to developing a photovoltaic solar array at a Massachusetts landfill is “an incomplete landfill assessment or capping.” Clearly, based on the facts above, the assessment and capping of the Old Amherst Landfill is incomplete. Adequately repairing the landfill and mitigating its ongoing discharges in order to eliminate its risk to public health, safety, and the environment may require a number of potentially costly investigations, updates, and modifications. The updates and modifications may potentially consist of recapping the landfill, installing an adequate leachate collection and treatment system, and remediating the on-going off-site impacts. These repairs and updates will likely cost millions of dollars.

Installation of a solar array on top of the landfill will preclude the implementation of a timely, thorough, and effective remedy. Furthermore, installation of the solar array will substantially increase the already high costs of appropriately remediating and closing the landfill.