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Re: Engineered Barrier Design
Former Gloucester Gas Light Company MGP Facility
Harbor Loop
Gloucester, Massachusetts
Release Tracking Number (RTN) 3-25126

Dear Iris:

As a follow-up to our meeting of October 10, 2013, GZA GeoEnvironmental, Inc. (GZA) has prepared this letter to address comments provided by the Massachusetts Department of Environmental Protection (MassDEP) regarding the proposed installation of an engineered barrier within Solomon Jacobs Park as part of remediation activities at the former Gloucester Gas Light Company (GGLC) Manufactured Gas Plant (MGP) Site. The following comments (shown in italics) were included in a MassDEP letter dated August 14, 2013 following the submittal of an Expanded Environmental Notification Form (EENF) for the remediation project (EEA# 15076):

The proposed engineered barrier design is described as three to four feet of soil over an orange snow fence, (Section 1, page 14), which does not meet the following regulatory standards: 310 CMR 40.996(5)(a): An Engineered Barrier shall, (among other requirements):

- *be comprised of materials that are resistant to degradation;*
- *be consistent with the technical standard of RCRA Subpart N. 40 CFR 264.300, 310 CMR 30.600 or equivalent standards;*
- *be appropriately monitored and maintained to ensure the long-term integrity and performance in accordance with a monitoring and maintenance plan that shall be submitted to the Department and shall document that one or more financial assurance mechanism(s), entailed in 310 CMR 30.906, have been established and adequately provided for ongoing future monitoring, maintenance and any necessary replacement of the barrier.*

It was anticipated that technical justification for the engineered barrier design would be included in the Phase IV RIP for the Site; however, in response to MassDEP's EENF review, the information is being provided in this letter. The letter addresses each of the specific comments included in the MassDEP letter, and further describes some changes to the original design, which are intended to address MassDEP concerns raised at last week's meeting.

Background



At the former Gloucester MGP site (the Site), an engineered barrier was selected as the remedial action alternative for a relatively small area (approximately 3,600 square feet) of Solomon Jacobs Park where residual soil concentrations were detected in excess of the Upper Concentration Limits (UCLs) established by the Massachusetts Contingency Plan (MCP). The engineered barrier was designed to meet the requirements of 310 CMR 40.0996, which defines the functions and key elements of an engineered barrier, requires that it be consistent with the technical standards of RCRA Subpart N, 40 CFR 264.300, 310 CMR 30.600 or equivalent standards, and provides mechanisms for its long term maintenance and monitoring. In support of this requirement, and recognizing that “because state and federal RCRA regulations and guidance documents are predicated on the assumption of a site-by-site regulatory approval mechanism, they lack definitive technical standards and specificity” (BWSC, November 2002), MassDEP issued a *Draft Guidance on the Use, Design, Construction, and Monitoring of Engineered Barriers*. The stated objective of the guidance is to provide clarification and guidance on achieving compliance with the regulatory requirements of 40.0996(4), and to help ensure protective and consistent applications of this remedial action alternative.

As part of the engineered barrier design, GZA conducted a Site-specific technical evaluation of the individual barrier elements relative to the recommended design and construction specifications outlined in 310 CMR 40.0996 and MassDEP’s guidance document. As described in the EENF, the engineered barrier at Solomon Jacobs Park would be constructed by excavating impacted soil within the park to between 4 and 6 feet below ground surface (bgs), i.e., to the water table. A defining layer (consisting of orange snow fence or similar material) would then be placed at a minimum of 4 feet bgs, overlain by an isolation layer consisting of at least 4 feet of clean fill material. To provide for cap longevity and reduce exposure risk, an Activity and Use Limitation (AUL) will subsequently be implemented in accordance with the MCP.

The following sections describe how this design meets MassDEP’s requirements for an engineered barrier, and outlines changes designed to address specific MassDEP concerns.

Recommended Design and Construction Specifications

The required components of an engineered barrier as specified by the MassDEP guidance document, in order of increasing depth, include:

Separation Layer – Clean soil, bituminous pavement, reinforced concrete and/or some combination thereof, designed to isolate contaminants from potential human interaction.

Defining Layer – A layer installed beneath the Separation Layer to visually demarcate and identify the area of concern.

An engineered barrier may also include a Containment Layer consisting of the following components:

Low Permeability Barrier – a Drainage Layer, underlain by a Flexible Membrane Liner (FML) in intimate contact with a Low Hydraulic Conductivity Layer, to limit the infiltration of surface water into underlying contaminated soils.

Gas Vent Layer – a layer of soil with supporting piping and venting network to control the migration of contaminant vapors and/or biogenic gases.

Only the Separation Layer and Defining Layer are required in all cases to provide an adequate degree of long-term isolation of site contaminants from unplanned and/or unregulated human interaction. As established by the guidance document, the need for additional barrier elements (i.e., the Low Permeability Barrier and Gas Vent Layer) is Site-specific, based on Site conditions and contaminant migration concerns.

It is our opinion that an engineered barrier consisting of a Separation Layer of clean fill and a Defining Layer will be sufficient to create a Condition of No Significant Risk (NSR) in the area of the park where conditions currently exceed UCLs. Additional description of the proposed engineered barrier, and technical justification for its design, are provided below.

Engineered Barrier at Solomon Jacobs Park – Required Components

Separation Layer

The recommended design for the Separation Layer at most sites is (a) 12 to 48 inches of suitable soils, depending on the presence and thickness of other engineered barrier components, (b) 8 inches of bituminous pavement, or (c) 5 inches of reinforced concrete. As described in the EENF, soil near the center of the park will be excavated to the water table, resulting in the removal of 4 to 6 feet of material. Fill will be placed as needed in the deeper portions of the excavation to a depth of 4 feet below grade, and will be overlain by a defining layer as described below. A minimum of 4 feet (48 inches – the maximum specified in the DEP guidance) of clean soil will then be placed above the defining layer to comprise the Separation Layer of the Engineered Barrier. Therefore, the Separation Layer proposed for the Site meets the criteria as described in the guidance document.

Defining Layer

The defining layer may consist of geofabric, horizontal plastic snow fencing, horizontal chain-link fencing, grids of Warning Tape, or another inert material or unit that visually demarcates and identifies the area of concern. The EENF described a defining layer consisting of orange snow fencing, placed at a minimum depth of 4 feet below grade to mark the base of the Separation Layer. To address MassDEP's concerns regarding the composition of this layer (Geogrid was suggested at the meeting), we propose revising the design so that the defining layer will consist of horizontal chain-link fencing at 4 feet bgs in lieu of the snow fencing that was originally proposed. The chain-link defining layer, in addition to providing the required visual demarcation, will also provide further separation attributes by physically resisting penetration. In this regard, the chain-link is even more



robust than Geogrid. In addition, as a further conservative measure, a second demarcating layer of snow fence will be placed at 3 feet bgs to provide an advance visual warning, thus further limiting the possibility of penetration through the Separation Layer by construction crews.



The combined layers of the Engineered Barrier will result in isolation of residual soils, and will limit the future possibility of inappropriate disturbance/excavation of underlying soils. Thus, in conjunction with the AUL that will be placed on the park to restrict unprotected subsurface excavations, the Engineered Barrier will result in a Condition of No Significant Risk in this area.

Engineered Barrier at Solomon Jacobs Park – Optional Components

Based on our evaluation of Site-specific conditions, it is our opinion that the following layers are not required for the Engineered Barrier at Solomon Jacobs Park.

Low Permeability Barrier

A Low Permeability Barrier is not required at this Site because it would not meet the effectiveness criterion outlined in the guidance document, which states that:

“A Low Permeability Barrier would generally not be considered effective or required by DEP if 90% or more of the mass of soil contaminants above UCL values are located below the mean water table elevation at the Site.”

This criterion recognizes that a low permeability barrier can sometimes be used to limit impacts to the groundwater from contaminated unsaturated zone soils. Above the water table, leaching of OHM from the unsaturated zone is largely driven by the downward infiltration of precipitation from the surface. Therefore, where such residual contamination exists, a low permeability barrier can be used to limit this infiltration, thus rendering the unsaturated zone OHM largely immobile. However, when the impacted soils are largely or entirely located below the water table, the OHM partitions (leaches) directly into the horizontally flowing groundwater in which it is immersed. In this case, limiting downward infiltration is no longer effective because the OHM is already in the groundwater. Therefore, a low permeability layer would not be an effective component of the engineered barrier at this Site because the UCL exceedances located above the water table are being excavated with the remaining exceedances all located below the water table, as described below.

At Solomon Jacobs Park, soils with C₁₁-C₂₂ aromatic hydrocarbon concentrations exceeding UCLs are currently present within the top 6 feet at B-106 and B-306, and at 7-9 feet at B-404. The mean depth to groundwater, based on 25 gauging events at well MW-9A located within the engineered barrier area, is 6.15 feet. During construction of the engineered barrier, impacted soil will be removed to the water table, resulting in the elimination of the unsaturated zone UCL exceedances at B-106 and B-306. Thus the only remaining UCL in soil will be located at B-404, resulting in 100% of the mass of soil contaminants above UCLs being located below the mean water table elevation.

Gas Vent Layer

A Gas Vent Layer is not required at this Site per the following criterion in the guidance document.



The incorporation of a Gas Vent Layer into the engineered barrier may be waived in those cases where concern over the generation and buildup of toxic vapors and/or biogenic gases is eliminated through investigations and evaluations, which must be documented in the Remedial Action Plan.

As described in previous MCP and permitting documents, Solomon Jacobs Park is a waterfront day-use park with no occupied structures. Therefore, there is no concern over the buildup of toxic vapors and/or biogenic gases resulting in exposure of human receptors under current uses. Future uses at the park are also restricted by the deed to the park, which requires “continued maintenance, dedication, and lawful use as a public waterfront park area for the benefit of the City, its residents, and the general public”. Further, such ongoing use is protected by the 97th Amendment to the Massachusetts Constitution, which states that “lands or easements taken or acquired for such purposes shall not be used for other purposes or otherwise disposed of except by laws enacted by a two thirds vote, taken by yeas and nays, of each branch of the general court.” As such, there is no concern over the buildup of toxic vapors and/or biogenic gases, and the incorporation of a Gas Vent Layer is not required at this property.

Response to MassDEP Comments Regarding the Proposed Engineered Barrier

As described above, the Engineered Barrier proposed for the Site will:

- be comprised of the maximum required thickness of soil (Separation Layer) and horizontal chain-link fencing instead of orange snow fencing (Defining Layer), both of which are resistant to degradation and are permissible and adequate materials as described in the guidance document;
- be consistent with 310 CMR 40.0996 and the November 2002 guidance document established by MassDEP for the express purpose of “providing clarification and guidance on achieving compliance with the regulatory requirements of 40.0996(4), and to help ensure protective and consistent applications of this remedial action alternative”; and,
- be protected by an Activity and Use Limitation developed in accordance with the MCP and associated guidance documents. Mechanisms for the maintenance of the barrier have been negotiated with the property owner, and a maintenance and monitoring plan will be developed in accordance with the MCP and submitted to MassDEP prior to submittal of the RAO.

Conclusion

Based on our evaluation of Site conditions, 310 CMR 40.0996 and the MassDEP guidance, the proposed engineered barrier meets the regulatory requirements of the MCP and the associated MassDEP guidance document regarding the implementation of this remedial alternative at the Site. The material for the Defining Layer will be changed from orange snow fencing to horizontal chain-link fencing to address MassDEP's comments regarding this layer.

We trust that this letter addresses MassDEP's concerns regarding the proposed engineered barrier design, and look forward to discussing it further during our next meeting. If you have any questions about this letter, please contact any of the undersigned at 781-278-3700.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.



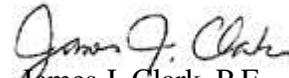
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