



FUSS & O'NEILL

April 18, 2012

Ms. Kelly Owens
Supervising Engineer
Office of Waste Management
Rhode Island Department of Environmental Management
235 Promenade Street
Providence, RI 02908

RE: Response to Comments on the Draft Five-Year Review Report
Anthony Carnevale Elementary School and Del Sesto Middle School
50-152 Springfield Street
Providence, Rhode Island 02909

Dear Ms. Owens:

Fuss & O'Neill, Inc. (Fuss & O'Neill) is pleased to present the attached document which provides responses to comments generated during the stakeholder review process for the Anthony Carnevale Elementary School and Del Sesto Middle School complex Draft Five-Year Review report. The responses compiled in the attached document were prepared on behalf of the Rhode Island Department of Environmental Management (RIDEM) in accordance with the requirements of the *Second Assented to Supplemental Order* in the matter of the Rhode Island Superior Court case of *Hartford Park Tenants Association, et al. vs. RIDEM, et al.*

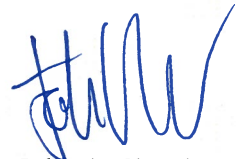
The comments addressed in the attached package were presented in the following documents:

1. Technical Assistance to Communities Summary and Review report, dated February 3, 2012
2. Transcript of the Public Hearing held on February 27, 2012
3. Letter from RI Legal Services, prepared on behalf of the plaintiffs in the *Hartford Park Residents Association et al. vs. RI DEM et al.* case, dated March 2, 2012
4. Letter from Arcadis, prepared on behalf of the City of Providence, dated March 2, 2012

If you have any questions or require additional information, please do not hesitate to contact the undersigned.

Sincerely,


Patrick J. Dowling, CPG
Project Manager


John A. Chambers, PG, LSP
Vice President

Attachment: Response to Comments on the Draft 5-Year Review Report
Revised Table 2 from the Draft 5-Year Review Report

Response to Comments on the Draft 5-Year Review Report
Anthony Carnevale Elementary School and Del Sesto Middle
School, 50-152 Springfield Street, Providence, RI

Comment Package No 1: Skeo Solutions - TAC Summary and Review, Feb. 3, 2012

1. Page 4 – Statement of Protectiveness

“The protectiveness statement appears to answer these questions [Section 3d of Order], although not explicitly. It would be helpful to the FYR reader if the questions were listed in the FYR and specifically addressed.”

As presented in the *Draft Five Year Report*, monitoring data reviewed and information gathered during the Five Year Review did not reveal evidence that the remedial controls implemented at the site are not adequately mitigating long-term risk posed to site users by environmental concerns at the site. However, the effectiveness and protectiveness of the sub-slab ventilation systems could be more definitively confirmed through measurement of vacuum conditions in the sub-slab environment, as discussed further below. Steps should also be taken to promptly identify and address instances when one or more of the sub-slab ventilation systems are shut down due to accumulation of water or ice in the knockout tank, or for any other reason. Additionally, the continuous protectiveness of soil cap could be more effectively ensured through more frequent inspections of the cap and timely notification and repair of cap deficiencies.

Explicit responses to the three questions listed in Section 3d of the *Second Assented to Supplemental Order* are provided below in response to Comment No. 12.

2. Page 5 – Comparison to EPA Superfund Guidance for FYR Reports

“... the draft FYR is lacking in three areas:

- *There is no discussion of the terms and current status of the Environmental Land Usage Restriction. This is listed in Section 2.2 as a component of the overall remedy and therefore its effectiveness is expected to be discussed in Section 4.”*

Though the Environmental Land Usage Restriction (ELUR) was not specifically discussed in the *Draft Five Year Review Report*, the Five Year Review did include review and discussion of the *Site Investigation Report*, *Remedial Action Work Plan*, and June 4, 1999 *Order of Approval*, which are appended to the ELUR and collectively document the environmental conditions, remedial actions, and post-remediation site use and monitoring requirements that necessitated implementation of the ELUR and formed the basis of the requirements documented therein. Fuss & O'Neill reviewed a copy of the ELUR, which included book and page numbers that indicated that the ELUR had

been recorded in the City of Providence (the City) land evidence records. The restrictions detailed in the ELUR include the following:

- o "No residential use of the Property shall be permitted"*
- o "No groundwater at the Property shall be used as potable water"*
- o "Soil at the Site shall not be disturbed in any manner without written permission of the Department's Office of Waste Management, except as permitted in the RAWP approved by and filed with the Department in a written approval letter dated June 4, 1999"*

No evidence that any of the restrictions summarized above had been violated was noted by Fuss & O'Neill as a result of this review. However, the ELUR requires that an environmental professional evaluate and document that the site is in compliance with the terms of the ELUR on an annual basis. While the quarterly monitoring events and corresponding reports regularly document the condition of remedial controls implemented at the site, no specific discussion of ELUR reviews or statements regarding compliance with the specific terms of the ELUR were noted in the quarterly reports. Therefore, Fuss & O'Neill recommends that, moving forward, the City adhere to the specific annual certification documentation requirement stipulated in Section I of the ELUR.

- *"Monitoring data is not presented quantitatively in the report. Monitoring data is discussed qualitatively in Section 3.2.1 as exceedances and summarized in Table 2. It would be useful for the reader of the FYR to have information about the quantitative extent of exceedances."*

Table 2 of the Draft Five Year Review Report has been revised to include quantitative data associated with the threshold exceedances identified during the quarterly monitoring events included in the Five Year Review. A revised version of Table 2 is attached.

- *"There is no discussion of the validity of 1999 RAWP action levels for indoor air and soil gas screening identified in the O&M Plan. The report discusses data based on exceedances of the O&M thresholds, but a discussion of current standards or screening levels is needed to confirm that the O&M thresholds remain protective."*

Fuss & O'Neill researched published background concentrations and health-effects levels for the various compounds included in the monitoring program. Based on the compiled information, Fuss & O'Neill believes that the thresholds for indoor air and soil gas documented in the April 1999 *Long-Term Operation and Maintenance Plan (O&M Plan)* are valid and appropriately protective of site users, with one exception. Fuss & O'Neill agrees with SKEO Solutions' (SKEO) recommendation to lower the threshold for hydrogen sulfide in indoor air from 5 parts per million (ppm) to 2 ppm to ensure better protection of asthmatic site users.

3. Page 6 – TASC Review and Summary of 1999 Site Investigation [SI] and Quarterly Monitoring Reports

“Section 9 of the SI report states that, “Based on the results of this study, it is not likely that abutting properties have been impacted by the release at this site.” The basis for this determination is not clear. TASC recommends an updated evaluation of the potential for releases of landfill gas into nearby residences.”

While the potential impact of solid waste in the subsurface on abutting properties may warrant further evaluation, the intent of the *Second Assented to Supplemental Order* and corresponding requirements of the Five Year Review are focused on the effectiveness of the remedial systems to be protective of users of the site. Additionally, the RIDEM-approved remedial actions implemented at the site and subjected to the Five Year Review were designed to be protective of site users only. For these reasons, evaluation of the presence of solid waste on abutting properties or the potential intrusion of landfill gases into nearby residences is not included within the scope or intent of the Five Year Review.

4. Page 9 – TASC Comments on the 1999 SI Report

“TASC recommends that RI DEM review whether quarterly soil gas sample analyses should also include analyzing for carbon disulfide, methyl mercaptans, and hydrogen sulfide.”

In general, Fuss & O’Neill recommends modifying the quarterly monitoring program by replacing laboratory analysis of samples collected from the perimeter soil gas vents in favor of laboratory analysis of influent soil gas samples collected from the sub-slab ventilation systems, prior to discharge through the carbon filter units. Though quarterly in-situ monitoring of soil gas sampled from the perimeter vents should continue, Fuss & O’Neill believes that laboratory analysis should be reserved for soil gas samples collected from the sub-slab ventilation systems, as these samples are representative of the soil gas directly beneath the buildings, which would have the potential to migrate into indoor air. As such, laboratory analysis of system influent samples would allow better evaluation of risk posed to building occupants by soil gas under the building, in comparison to laboratory analysis of soil gas samples collected from monitoring vents relatively far from the buildings.

In response to the above and other similar comments, RIDEM and Fuss & O’Neill reviewed whether the soil gas samples submitted for laboratory analysis should be analyzed for the additional compounds identified by SKEO (i.e. additional volatile organic compounds (VOC) and sulfur-containing compounds) and concluded that expansion of the analyte list is not warranted. The additional VOC identified by SKEO (i.e. acetone, acrylonitrile, bromodichloromethane, carbon disulfide, hexane, methyl ethyl ketone, methyl isobutyl ketone, methyl mercaptan) are not typically required by RIDEM in monitoring programs for other solid waste landfill sites regulated by RIDEM, unless they are identified as contaminants of concern identified during the investigation.

Additionally, use of portable field instruments to measure the concentrations of landfill gases, including hydrogen sulfide, in soil gas is included in the ongoing monitoring program. The use of field monitoring equipment for these gasses is a commonly-used and widely-accepted industry practice. Therefore, the method for analyzing landfill gases currently employed at the site is consistent with the typical standard of care for monitoring the environmental conditions in Rhode Island and fixed-base laboratory analysis of these compounds in soil gas is thus not warranted.

We believe that monitoring the efficiency of the ventilation system in maintaining a suitable differential pressure between the sub slab and indoor air environments would be a much more effective use of funding and effort when compared to the addition of supplemental laboratory analyses of soil vapor samples.

In summary, Fuss & O'Neill recommends that the following modified soil gas sampling and monitoring program be implemented at the site going forward:

- Continue in-situ field measurements of soil gas samples collected from the perimeter vents and the sub-slab ventilation systems for methane, carbon monoxide, carbon dioxide, hydrogen sulfide, oxygen, and total VOC, using hand-held field instruments, as specified in the *O&M Plan*.
- In lieu of laboratory analysis of soil gas samples collected from the perimeter vents, begin collecting influent soil gas samples from the sub-slab ventilation systems (before the carbon vessels) and submit to a fixed-based laboratory for analysis of VOC by Method TO-14

Fuss & O'Neill further recommends that the monitoring program be expanded by coupling field-measurements and laboratory analytical data for the system influent samples with vacuum measurements taken from the sub-slab environment beneath both schools. The confirmation of a sub-slab vacuum beneath both schools would be extremely useful data in determining effectiveness of the remedial systems.

Response actions would be warranted under circumstances where applicable thresholds are exceeded and a measurable vacuum is not detected across the entire footprint of the buildings. As long as a measurable vacuum is present throughout the sub-slab environment, a vapor intrusion pathway would not exist and further response actions would not be necessary, regardless of the concentrations of VOC and landfill gases in influent soil gas.

5. Page 11 – TASC Comments on the Quarterly Monitoring Reports

“The following contaminants of potential concern were not included in the list of soil gas analytes for the Site:

1. Acetone
2. Acrylonitrile
3. Bromodichloromethane
4. Carbon disulfide
5. Hexane
6. Methyl ethyl ketone
7. Methyl isobutyl ketone
8. Methyl mercaptan

TASC recommends that RI DEM review whether quarterly soil gas sample analyses should also include analyzing for these common LFG contaminants.”

See previous response to Comment No. 4.

“The list of soil gas analytes in the November 11, 2011 quarterly monitoring report also does not include hydrogen sulfide. Because hydrogen sulfide has been detected above 2 parts per million (ppm) in indoor air of both schools at various times and hydrogen sulfide causes health effects at low concentrations (See World Health Organization Table 2 below), TASC recommends that soil gas samples be analyzed for hydrogen sulfide.”

See previous response to Comment No. 4.

6. Page 12 – TASC Comments on the Quarterly Monitoring Reports

“For future field monitoring activities, TASC recommends that the UV lamp of the PID be chosen so that the VOCs detected by laboratory analysis in previous soil gas samples are also detectable by the PID, if possible. Also, TASC recommends that the quarterly report list any VOCs previously detected in laboratory samples that the PID is not expected to detect.”

Fuss & O’Neill agrees that the photoionization detector (PID) lamp(s) utilized during future monitoring events should be selected so that the individual VOC previously-detected in soil gas via laboratory analysis are also detected via field screening, to the extent feasible. Furthermore, any VOC that were previously detected in soil gas samples subjected to laboratory analysis but cannot be detected by the PID(s) should be identified in the quarterly monitoring reports. An evaluation of the effectiveness of the selected PID lamp to detect VOC of concern should also be documented in future quarterly monitoring reports.

7. Page 13 – TASC Comments on the Quarterly Monitoring Reports

“TASC recommends that future quarterly monitoring reports be revised to reflect the actual indoor air RAWP action levels for methane (500 ppm) and hydrogen sulfide (5 ppm), and appropriate actions should be taken if the specified RAWP action level is exceeded.”

Fuss & O’Neill agrees that the correct thresholds listed in the *O&M Plan* should be utilized to evaluate the need for additional response actions and accurately documented in the quarterly reports. SKEO correctly noted that an incorrect threshold for methane in indoor air had been reported in the quarterly monitoring reports. Fuss & O’Neill reviewed the indoor air methane results reported for the quarterly events included in the Five Year Review and compared them to the correct indoor air threshold of 500 ppm (0.05% by volume). During the fourth quarter 2008 monitoring event, the reported concentration of methane in indoor air at 21 screening locations exceeded the applicable threshold. These exceedances had not been identified as such in the corresponding quarterly report because the incorrect threshold was used. The attached revised *Table 2* includes documentation of these exceedances. Methane was not detected at any indoor air screening location during any of the other monitoring events included in the Five Year Review at concentrations exceeding the detection limit of the field screening instrument.

“Because the World Health Organization has observed that asthmatic individuals may experience bronchial constriction with exposure to 2.8 mg/m³ (about 2 ppm) of hydrogen sulfide in air, it would be prudent to set the action level for hydrogen sulfide in indoor air at less than 2 ppm.”

See previous response to Comment No. 2.

8. Page 16 – TASC Comments on the Quarterly Monitoring Reports

“TASC notes that OSHA PELs may not be appropriate exposure limits [for comparison to soil gas VOC results] for children because PELs are primarily developed to protect adult worker health in the workplace. Also, not all substances have PELs. However, TASC does not have an alternative recommendation.”

Fuss & O’Neill agrees that the Permissible Exposure Limits (PEL) promulgated by the Occupational Safety and Health Administration (OSHA) are not appropriate for comparison to concentrations of VOC in soil gas samples because the PELs apply to the indoor air quality within a workplace for adult workers. Fuss & O’Neill recommends comparison of individual VOC concentrations in soil gas to Target Shallow Soil Gas Concentrations (Target Concentrations) listed in the USEPA Office of Solid Waste and Emergency Response (OSWER) *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*. This comparison would serve as a conservative screening-level evaluation to determine if compounds exist in soil gas at concentrations that may pose risk to site users, should a vapor intrusion pathway develop at the site. As documented in the

Subsurface Vapor Intrusion Guidance, the Target Concentrations use "...conservative generic attenuation factors that reflect generally reasonable worst-case conditions for a first-pass screening of... soil gas data."

The *Subsurface Vapor Intrusion Guidance* provides Target Concentrations which correspond to targeted indoor air concentrations (assumed attenuation factor of 0.1) set at 10^{-4} , 10^{-5} , and 10^{-6} incremental individual lifetime cancer risk values. For the purposes of evaluating whether current human exposures are under control with respect to vapor intrusion, USEPA recommends the use of 10^{-5} values.

"There are several years of soil gas laboratory analyses. TASC recommends that the City or DEM create a graphical display of laboratory results for each soil gas analyte over time to evaluate any decreasing or increasing trends."

Fuss & O'Neill agrees that preparation of graphs depicting the compounds detected in soil gas or indoor air at concentrations that exceeded applicable thresholds would be beneficial for evaluating temporal trends and should be included in future monitoring reports.

"In addition to making sure that future quarterly monitoring reports use the correct indoor air RAWP action level for hydrogen sulfide, TASC also recommends that the action level for hydrogen sulfide in indoor air be lowered to no more than 2 ppm – the concentration that the World Health Organization reports as causing bronchial constriction in asthmatic individuals."

See previous response to Comment No. 2.

9. Page 17 – TASC Comments on the Quarterly Monitoring Reports

"There are several years of soil gas field monitoring results. TASC recommends the City or RI DEM create a graphical display of laboratory results for each of the six gases measured over time at each location to evaluate any decreasing or increasing trends."

See previous response to Comment No. 8.

"Because the problem seems to be consistent over several years, TASC recommends that the subslab ventilation system be examined by a qualified engineer and appropriate equipment changes be made to solve the problem of frequent shutdown of the ventilation system blowers due to water accumulation in the knockout tanks (i.e., moisture separator tanks). Equipment changes could include adding a high water alarm in the knockout tanks or resizing the knockout tanks."

Fuss & O'Neill recommends that the City implement any necessary administrative programs (i.e. training on-site staff on the inspection and operation of the ventilation systems) and/or system design modifications (i.e. resizing knockout tanks) to eliminate the frequent shutdown of the middle school blower.

10. Page 18 – TASC Comments on the Quarterly Monitoring Reports

“Quarterly reports indicate that the orange snow fencing indicator barrier is usually not visible during cap inspections, but holes frequently are found and filled to maintain the cap. TASC recommends a more frequent cap inspection/repair program.”

This recommendation is consistent with the recommendation provided by Fuss & O’Neill in *Section 4.2.1* of the *Draft Five-Year Review Report*.

11. Page 19 – TASC Comments from the Site Visit

“If not already occurring, TASC recommends that custodial staff and other appropriate school employees receive annual hazard recognition training with respect to Site conditions and subslab ventilation system operation from a qualified instructor.”

Fuss & O’Neill agrees that custodial staff and/or appropriate on-site school personnel should be trained to inspect and appropriately respond to issues regarding the engineered remedial controls in place at the site, including the sub-slab ventilation systems, methane sensors, and soil cap. The training and subsequent staff requirements should, at a minimum, be sufficient to ensure that issues with the operation and maintenance of the remedial controls are identified and the appropriate notifications are made, so that the issue can be documented and resolved in a timely fashion.

12. Page 24 and 25 – TASC Summary and Recommendations

“TASC agrees with the recommendations in the FYR report. These recommendations include:

- Inspection of the soil cap every two weeks and repair of observed cavities by filling and thorough compaction of fill soil immediately.
- Regular inspections and maintenance of the HVAC systems for the schools to ensure optimum indoor air quality, including carbon dioxide levels.
- Confirmation of a measurable vacuum in the subsurface environment throughout the Site to support a definitive conclusion that the systems are effectively preventing migration of subsurface vapors into indoor air.
- Actions to reduce the recurrence of sub-slab ventilation system shutdowns. These actions could include more frequent inspections, adjustments to the ventilation system, resized equipment, mechanical controls or alarms.”

Fuss & O’Neill notes that SKEO agreed with the above-listed recommendations documented in the *Draft Five Year Review Report*. In addition to the previously-identified recommendations, SKEO also provided the following additional recommendations:

- “That an updated evaluation of the potential for releases of LFG into nearby residences be conducted.”

See previous response to Comment No. 3.

- “Review of whether sulfur-containing substances (carbon disulfide and methyl mercaptans) should be added to quarterly laboratory analyses, as these are common LFGs. There is no record that these gases have ever been included in laboratory analyses of soil gases from the Site. Also, review if laboratory analyses should include the other 6 common LFGs listed and discussed on page 11.”

See previous response to Comment No. 4.

- “That quarterly laboratory analyses of soil gas samples include hydrogen sulfide.”

See previous response to Comment No. 4.

- “That future quarterly monitoring reports state whether or not the specific VOCs detected by laboratory analysis in previous soil gas samples are also detectable by the PID used for field screening of soil gas and indoor air.”

See previous response to Comment No. 6.

- “That future quarterly monitoring reports be revised to reflect the actual indoor air RAWP action levels for methane (500 ppm) and hydrogen sulfide (currently 5 ppm), and appropriate actions to be taken if the specified RAWP action level is exceeded.”

See previous response to Comment No. 7.

- “That the City or DEM create a graphical display of laboratory results for each soil gas analyte over time to evaluate any decreasing or increasing trends.”

See previous response to Comment No. 8.

- “That the RAWP action level for hydrogen sulfide in indoor air be lowered to no more than 2 ppm – the concentration that the World Health Organization reports as causing bronchial constriction in asthmatic individuals.”

See previous response to Comment No. 2.

- “That the City or DEM create a graphical display of laboratory results for each of the six gases measured over time at each location to evaluate any decreasing or increasing trends.”

See previous response to Comment No. 8.

- “Because the problem seems to be consistent over several years, TASC recommends that the sub-slab ventilation system be examined by a qualified engineer and appropriate equipment changes be made to solve the problem of frequent shutdown of the ventilation system blowers due to water accumulation in the knockout tanks (i.e., moisture separator tanks). Equipment changes could include adding a high water alarm in the knockout tanks or resizing the knockout tanks.”

See previous response to Comment No. 9.

- “If not already occurring, that custodial staff and other appropriate school employees receive annual hazard recognition training with respect to Site conditions and sub-slab ventilation system operation from a qualified instructor.”

See previous responses to Comments No. 9 and 11.

- “That a review of RI DEM reporting requirements be given to appropriate school personnel. [In the section discussing maintenance personnel interviews, a maintenance personnel at the middle school “observed a complete hole in the cap near the back of the middle school building which resulted in exposure of the orange snow fence at the base of the cap.” Because this occurrence was not dated, TASC was unable to determine if it was reported appropriately.]”

See previous response to Comment No. 11. The training and monitoring program for on-site school staff should cover reporting requirements documented in the *O&M Plan* related to cavities and holes in the soil cap.

“With regard to improving the FYR report, TASC recommends:

- Specifically listing the questions required to be answered in terms of the statement of protectiveness and addressing each of these questions:”
 - o “Is the remedy still functioning as designed?”

Soil Cap: Based on the results of the Five Year Review, the soil cap at the site is still functioning as designed.

Sub Slab Ventilation System: When operating, the sub-slab ventilation systems appear to be functioning as designed, to the extent that they were generating vacuum conditions within the piping legs at the time of Fuss & O’Neill’s inspection. However, because piping vacuum measurements are not documented in the quarterly monitoring reports, Fuss & O’Neill cannot confirm that measurable vacuum persists in the system piping legs at all times. Furthermore, in the absence of vacuum measurements in sub-slab environment, Fuss & O’Neill cannot confirm that the vacuum measured in the system piping legs is sufficient to generate vacuum conditions in the surrounding sub-slab environment to adequately mitigate a vapor intrusion pathway in all areas of the buildings. While no evidence was observed that suggested the remedy was not effectively mitigating exposure risks to site users, the sub-slab system beneath the middle school is not functioning as designed at those times when a portion of the system is shut down due to accumulation of water or ice in the moisture knockout tank. Response actions, as detailed herein, are warranted to resolve this condition, or confirm that the system is effective when partially operational.

- o *“Is there any reason to believe that exposure assumptions, toxicity data and remedial objectives used at time of remedy selection are not still valid?”*

Fuss & O'Neill observed no evidence to suggest that site conditions, exposure scenarios, and contaminants of concern at the site have changed in a manner that makes the remedial controls and monitoring thresholds less protective than when they were implemented and established.

- o *“Has any new information come to light that may impact the protectiveness of the remedy?”*

No new information has come to light that has impacted the effectiveness of the remedy.

- *“Adding a discussion of the terms and current status of the Environmental Land Usage Restriction.”*

See previous response to Comment No. 2.

- *“Presenting monitoring data quantitatively in the FYR report. Tabulated data can be included in an appendix.”*

See previous response to Comment No. 2.

- *“Reviewing and discussing the validity of 1999 RAWP action levels for indoor air and soil gas screening identified in the O&M Plan.”*

See previous response to Comment No. 2.

13. Page 25 – TASC Comments in response to “Additional Community Concerns”.

“Although it seems unlikely that contaminants are moving upward into the clean soil cap, this concern could be alleviated by testing a few surface soil samples for chemicals of concern.”

In general, Fuss & O'Neill observed no evidence to suggest that a mechanism is present to facilitate the upward migration of contaminants into the clean fill soil cap from underlying soil or solid waste. Therefore, we do not feel that collection of soil samples from the cap on a site-wide basis is warranted. However, the *O&M Plan* does require collection of a composite soil sample in vicinity of any observed hole that penetrates the cap (i.e. when the orange fence is observed), at the time that the hole observed to evaluate if soil or solid waste from beneath the cap have been brought to the surface. This requirement should be implemented in response to any holes in the cap that extend down to underlying soil or waste observed in the future.

“It is unlikely that ground water is causing contamination of surface water by interacting with the surface water or by ground water coming to the surface. However, after large rain events under certain conditions, ground water

can be forced to the surface. We do not know if this is happening at this Site. This community concern could be alleviated by taking a grab sample of the standing surface water in the area between the two school buildings and testing the water for contaminants of concern.”

Fuss & O'Neill observed no evidence to suggest that a mechanism is present that would facilitate the upward migration of groundwater to discharge at the surface of the site. Data collected over the past 5 years indicate that the depth to groundwater observed at the site typically ranges from approximately 9 to 19 feet below grade, and no wetlands or other features are present that would suggest interaction of groundwater with the surface grade. Additionally, no groundwater samples collected at the site have ever been reported to contain contaminants of concern in excess of applicable RIDEM GB Groundwater Objectives. For these reasons, samples of surface water are not likely representative of groundwater quality or of water impacted by the subsurface contaminants at the site and sampling of puddles is therefore not warranted.

Comment Package No. 2: Comments Recorded at Public Hearing - February 27, 2012

14. Comment from Mr. Steven Fishbach, RI Legal Services:

“...However, there were some questions that were appended to the report that I just want to make sure that DEM also acknowledges this as also being part of the concerns raised by the community and with suggestions on how to meet those concerns, particularly the concern about contaminants that may be moving into the soil cap with a suggestion that some additional soil samples be taken in areas where there's concern with that may have occurred. And coupled with that was one, a concern about ground water potentially coming to the surface with the taking of some additional samples to understand whether or not those two things were happening.”

See previous response to Comment No. 13.

15. Comment from Mr. Steven Fishbach, RI Legal Services:

“...the first recommendation is about sending soil gas samples to a lab off of the soil vapor systems, probably one at the middle school and one at the elementary school before they enter the carbon filter, so as to get a better understanding of the different types of gases that might be underneath the school building.”

See previous response to Comment No. 4.

16. Comment from Mr. Steven Fishbach, RI Legal Services:

“...Now, the second issue has to do with some of the additional substances that Skeo Associates has recommended for testing indoor air, specifically, some of the landfill, common landfill gases. And there are six of them that were referenced, actually, in their report.”

See previous response to Comment No. 4.

17. Comment from Mr. Steven Fishbach, RI Legal Services:

“...We discussed whether PID meters were capable, photo ionization detectors, whether -- because those are what are used currently to evaluate indoor air conditioners here at the schools -- and whether they were capable of doing testing or sampling for those eight different substances. And we think that they can be used and would ask that that issue be looked into, mainly whether PID meters can be used to monitor the eight substances that were listed on page 11 of the longer report.”

See previous response to Comment No. 6.

Comment Package No. 3: RI Legal Services Letter - *Comments on Draft Five Year Review, March 2, 2012*

18. “For the record, plaintiffs endorse all of the recommendations made by Skeo on pages 24 through 26 of their report, including Skeo’s endorsement of recommendations made in the Draft Five Year Review. While all of the recommendations would improve the effectiveness of the remedial actions at the schools, plaintiffs want to highlight some of the more important recommendations:”

- “Confirming the presence of a measurable vacuum beneath the school buildings at all times to demonstrate the effectiveness of the sub-slab ventilation systems”

See previous response to Comment No. 4

- “Increasing the frequency of inspection of the soil cap to two week intervals”

See previous response to Comment No. 10

- “Evaluating whether landfill gases might be migrating into nearby residences”

See previous response to Comment No. 3

- “Lowering the action level for hydrogen sulfide to 2 ppm”

See previous response to Comment No. 2

- “Adding the substances recommended by Skeo to the list of substances in soil gas samples currently analyzed by the laboratory”

See previous response to Comment No. 4

- “Making changes to the blower in the front section of the middle school building to avoid the frequent shutdowns of that blower”

See previous response to Comment No. 9

- “Taking additional soil samples and a grab sample of standing water in the area between the elementary and middle school (adjacent to where raised beds were installed several years ago) to alleviate community concerns about potential contamination in that area”

See previous response to Comment No. 13.

19. “...consider collecting soil gas samples from the ventilation systems for laboratory analysis. This would identify the actual constituents of the soil gas that is removed from the subsurface and provide additional information about the potential risk of vapor intrusion into the school buildings if the ventilation systems are not operating properly...the sample be taken off the port before the carbon filters.”

See previous response to Comment No. 4.

20. “...the plaintiffs request that DEM follow up on information in the Draft Five Year Review that the orange snow fencing was observed by Mr. Conti in the rear of the middle school building. This is the first report of any kind that the snow fencing was observed. At the public meeting on February 15, 2012, DEM noted that the agency never received a report from the City that the snow fencing was visible and the approximate date that the snow fencing was visible. Plaintiffs ask that DEM determine the precise location where the snow fencing was visible and the approximate date that the snow fencing was covered. Moreover, this incident underscores the importance of the maintenance staff receiving training about reporting requirements.”

Because the hole was reportedly addressed by on-site school staff and no holes have reportedly been observed at that location since, confirmation of the exact date and location of the observed hole at this time may not be necessary. However, Fuss & O'Neill agrees that school staff should be made aware of and required to comply with notification requirements pertaining to holes or cavities in the cap. This recommendation is discussed in previous responses to Comments No. 11 and 12.

Comment Package No. 4: Arcadis Letter - Draft Five Year Review Report, March 2, 2012

21. “We would like to note that on page 14 (Section 3.2.1.1) of the Five Year Review Report it incorrectly states that ARCADIS attributed the “elevated ... concentrations of carbon dioxide in soil vapor and in the system influent / effluent to bacterial respiration associated with natural decomposition of buried solid waste.” While we did attribute the presence of carbon dioxide to bacterial respiration associated with natural decomposition processes, we believe these processes could occur in the absence of solid waste.”

In the quarterly monitoring reports reviewed by Fuss & O'Neill, Arcadis concluded by stating that “the detection of carbon dioxide in soil gas is typical of what has been detected during previous monitoring events and appears to be a result of naturally occurring bacterial activity in the subsurface.” Fuss & O'Neill agrees with the above comment by Arcadis that generation of carbon dioxide in soil gas is likely due to natural bacterial decomposition. Given the presence of buried solid waste in the subsurface, the concentration of carbon dioxide in soil gas at the site is likely primarily driven by decomposition of solid waste by naturally-occurring bacteria. This opinion is reiterated

in SKEO's summary report, which states that "...carbon dioxide levels may be elevated due to decomposition of waste materials buried on site."

22. "The statements in this section inaccurately describe statements supposedly made by Donna Pallister of ARCADIS regarding cracks in the building facades. First, per the monitoring plan, the cap is inspected on a quarterly basis. Since the building facade is not part of the cap, it is not inspected by ARCADIS. Second, I do not have an opinion regarding whether cracks are more prevalent at one building or the other since it is not part of our inspections. Third, I did state that the middle school was constructed on pilings and that the elementary school was constructed on clean fill after the geotechnically unsuitable solid waste and fill were removed. However, I do not believe that the fact that the middle school was constructed on pilings would make it any more prone to uneven shifting or damage due to settling of underlying soil. In fact, I believe that construction of the building on pilings should protect it from potential damage due to settling of the soil."

Fuss & O'Neill recognizes Arcadis' comments that inspection of the building façade is not a requirement of the O&M Plan, that Arcadis has no opinion regarding the prevalence of cracks in the buildings, and that the extent of cracking in the buildings may not be affected by foundation construction.

23. "Based on the results of monitoring over more than 10 years, there is no evidence of a vapor intrusion risk at the Site. Therefore, we do not see any reason to perform additional investigation of the sub-slab ventilation system as recommended, since there is no identified risk."

"In addition, since no risks have been identified, we do not believe that any additional inspections of the system are necessary to prevent the occasional short interruptions caused by water collecting in the tank of the eastern blower at the middle school. The middle school building has two blowers, one located in the front part of the building and one in the back. Only the blower in the front occasionally shuts down due to water in the knockout tank. Since the second blower in the back is still operating, it continues to evacuate air from the crawl space beneath the building when the other blower is not operating."

Fuss & O'Neill agrees that data generated by the current monitoring program do not suggest that an active vapor intrusion pathway exists or that subsurface vapors are currently migrating into the indoor air space of the on-site buildings. However, it is well documented that landfill gasses and other contaminants are present within the subsurface environment at the site. Therefore, until such a time when subsurface vapors are not present, a potential vapor intrusion risk does and will exist at the site.

One simple and definitive approach to confirm that a vapor intrusion pathway does not exist is the measurement of the differential pressures between the indoor air space of the buildings and the sub-slab environment. The confirmation of a sub-slab vacuum beneath the entire footprint of both schools would be extremely useful data in determining the effectiveness of the remedial systems and the absence or presence of a potential intrusion pathway.

Regardless of the concentrations or individual contaminants present in soil gas beneath the buildings, if a suitable vacuum is measured in the sub slab environment, a more

definitive statement regarding the protectiveness of the remedial systems could be made. Additionally, these measurements could demonstrate whether one operating leg of the ventilation system beneath the middle school is sufficient to generate vacuum conditions beneath the entire extent of the building, thereby mitigating vapor intrusion risks in the absence of two fully operating system legs when shutdowns due to entrainment of water in the system occur.

Table 2
Summary of Threshold Exceedances Observed During Quarterly Monitoring Events
Draft Five-Year Review Report

Anthony Carnevale Elementary School and Del Sesto Middle School
50-152 Springfield Street
Providence, RI

November 2011 (revised April 2012)

| Monitoring Event | Samples Collected from Influent and Effluent Sample Ports Connected to Piping of the Sub-Slab Ventilation Systems | | Samples Collected from Exterior Soil Vapor Monitoring Wells Located Around Perimeter of Site | | Screening of Indoor Air at Locations Throughout Buildings | |
|---------------------|---|---|--|---|---|---|
| | <i>Exceeding Compound (number of exceedances)</i> | <i>Exceeding Concentration Range in ppm</i> | <i>Exceeding Compound (number of exceedances)</i> | <i>Exceeding Concentration Range in ppm</i> | <i>Exceeding Compound (number of exceedances)</i> | <i>Exceeding Concentration Range in ppm</i> |
| First Quarter 2006 | | | carbon dioxide (14) | 2,000 - 126,000 | | |
| Second Quarter 2006 | <i>no monitoring report available</i> | | | | | |
| Third Quarter 2006 | carbon dioxide (1) | 2,000 | carbon dioxide (20) | 2,000 - 139,000 | | |
| Fourth Quarter 2006 | carbon dioxide (5) | 3,000 - 4,000 | carbon dioxide (17) | 3,000 - 111,000 | | |
| First Quarter 2007 | carbon dioxide (5) | 2,000 - 3,000 | carbon dioxide (24) | 2,000 - 48,000 | | |
| Second Quarter 2007 | | | carbon dioxide (22) | 2,000 - 42,000 | | |
| Third Quarter 2007 | carbon dioxide (5) | 3,000 - 5,000 | carbon dioxide (22) | 2,000 - 132,000 | | |
| Fourth Quarter 2007 | carbon dioxide (7) | 2,000 - 5,000 | carbon dioxide (22) | 2,000 - 89,000 | | |
| First Quarter 2008 | | | carbon dioxide (16) | 2,000 - 54,000 | | |
| Second Quarter 2008 | carbon dioxide (5) | 3,000 - 4,000 | carbon dioxide (22) | 3,000 - 83,000 | | |
| Third Quarter 2008 | carbon dioxide (4) | 3,000 - 5,000 | carbon dioxide (22) | 3,000 - 118,000 | | |
| Fourth Quarter 2008 | carbon dioxide (7) | 3,000 - 5,000 | carbon dioxide (28) | 2,000 - 99,000 | carbon dioxide (2) | 1,190 - 1,747 |
| | | | | | hydrogen sulfide (2) | 7 |
| | | | | | methane (21) | 1,000 - 3,000 |
| First Quarter 2009 | carbon dioxide (4) | 2,000 - 3,000 | carbon dioxide (20) methane (2) | 2,000 - 32,000 10,000 - 14,000 | | |
| Second Quarter 2009 | carbon dioxide (1) | 2,000 | carbon dioxide (19) carbon monoxide (1) | 2,000 - 79,000 16 | | |
| Third Quarter 2009 | | | carbon dioxide (26) | 6,000 - 139,000 | | |
| Fourth Quarter 2009 | <i>no monitoring report available</i> | | | | | |
| First Quarter 2010 | carbon dioxide (4) | 2,000 - 3,000 | carbon dioxide (23) carbon monoxide (2) | 2,000 - 50,000 10 - 11 | carbon dioxide (2) | 1,004 - 1,011 |
| Second Quarter 2010 | carbon dioxide (5) | 2,000 - 3,000 | carbon dioxide (21) | 4,000 - 78,000 | carbon dioxide (4) | 1,174 - 1,229 |
| Third Quarter 2010 | carbon dioxide (4) | 3,000 - 6,000 | carbon dioxide (24) | 2,000 - 97,000 | | |
| Fourth Quarter 2010 | carbon dioxide (7) | 2,000 - 5,000 | carbon dioxide (25) | 2,000 - 102,000 | | |
| First Quarter 2011 | carbon dioxide (5) | 2,000 | carbon dioxide (14) | 2,000 - 65,000 | carbon dioxide (2) | 1,175 - 1,223 |
| | | | methane (1) | 10,000 | | |
| Second Quarter 2011 | carbon dioxide (4) | 2,000 - 3,000 | carbon dioxide (21) | 2,000 - 105,000 | | |

| Current Thresholds (ppm) | | | |
|--------------------------|------------|--------------------|----------|
| Compound | Indoor Air | Influent/Effluent* | Soil Gas |
| methane | 500 | 5,000 | 5,000 |
| carbon monoxide | 9 | 9 | 9 |
| carbon dioxide | 1,000 | 1,000 | 1,000 |
| hydrogen sulfide | 5 | 10 | 10 |
| total VOC | 5 | 5 | 5 |

*No thresholds specific to system influent and effluent were documented in Long-Term Operation and Maintenance Plan. During quarterly monitoring events, documented thresholds for soil gas were used to evaluate system influent/effluent screening results.

Notes

- ppm: parts per million
- VOC: volatile organic compounds
- All exceedances listed herein identified via field screening using portable instruments
- Quarterly Monitoring Thresholds referenced from *Long-Term Operation and Maintenance Plan* appended to April 1999 *Remedial Action Work Plan* by ATC Associates, Inc.