Environmental Strategies & Management

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MASSACHUSETTS CONTINGENCY PLAN
IMMEDIATE RESPONSE ACTION STATUS REPORT
and
LANDFILL MONITORING REPORT

4TH QUARTER 2013

TOWN OF EASTHAM LANDFILL
255 OLD ORCHARD ROAD
EASTHAM, MASSACHUSETTS

DEP RTN 4-24301

December 30, 2013

Prepared for:

Town of Eastham
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ES&M Project No. 2013-027

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1.0 INTRODUCTION

This Immediate Response Action (IRA) Status report has been prepared in accordance with the Massachusetts Contingency Plan (MCP) by Environmental Strategies & Management, Inc. (ES&M) on behalf of the Town of Eastham. The report addresses activities conducted under Massachusetts Department of Environmental Protection (MassDEP) Release Tracking Number (RTN 4-24301). This report also includes a summary of activities completed under the Town of Eastham's Landfill Monitoring Plan, approved by MassDEP on August 14, 2012.

1.1 Background

The Town's landfill accepted municipal wastes from the 1930's until approximately 1992, and was capped in 1997. The closure of the landfill consisted of the construction of a low permeability cap and the implementation of a groundwater monitoring program. This monitoring program included routine collection and laboratory analysis of groundwater samples from monitoring wells around the landfill and private drinking water wells in the neighborhood of the landfill. The landfill and surrounding properties are shown on the Site Map included as Figure 1.

In March 2004, vinyl chloride was detected in a water sample collected from a private drinking water well at a concentration of 2 micrograms per liter (µg/L). Vinyl chloride is a volatile organic compound or "VOC" that is commonly found in groundwater where chlorinated solvents have been released. At this site, VOCs are likely related to debris buried at the landfill. Since the drinking water standard for vinyl chloride is 2 µg/L, this discovery was reported to MassDEP as required by the MCP. Response actions related to this discovery included collection and analysis of water samples over a five year period. Laboratory results showed diminishing concentrations of vinyl chloride over time. The diminishing concentrations were attributed to the capping of the landfill, which limits the infiltration of rainwater, and hence, the leaching of contaminants to groundwater. A comprehensive report was submitted in 2009 (to supplement other, previous reports) to document that a permanent solution had been achieved under the MCP. The term "permanent solution" as defined by the MCP means that a condition of no significant risk of harm to humans and the environment has been achieved.

On August 14, 2012, MassDEP's Division of Solid Waste issued a letter to the Town to outline revised monitoring and reporting requirements for the landfill and surrounding neighborhood. The requirements of this revised Landfill Monitoring Plan (LMP) includes collection of groundwater samples from monitoring wells and private wells, collection of soil gas samples from the perimeter of the landfill and quarterly reporting. The testing requirements for water samples include VOCs, certain metals, and "indicator" parameters such as pH, alkalinity, nitrates, and other compounds that are typically related to landfill leachate. The testing protocol was established to monitor groundwater quality in drinking water wells closest to the landfill, at a frequency determined by MassDEP. Included in MassDEP's August 14th letter was a requirement

to analyze groundwater samples for 1,4-dioxane. This compound is considered an "emerging" contaminant, meaning that its occurrence in the environment and its potential toxicity have only recently been considered by the regulatory and scientific community. It is for this reason that groundwater within and around the landfill had not previously been tested for 1,4-dioxane.

Following the detection of 1,4-dioxane in monitoring wells and private drinking water wells near and downgradient of the landfill, the Town initiated an extensive drinking water well testing program. Between February and August 2013, water samples were collected from 227 drinking water wells under this program.

The drinking water standard for 1,4-dioxane is currently 3 µg/L, and until recently, laboratories established reporting limits just below this standard (typically about 2.5 µg/L). This reporting limit (RL) sometimes referred to as the method reporting limit (MRL) is the level above which the laboratory can reliably and accurately report a result. The laboratory instruments can detect below that level, but those results are reported as estimated (such data is usually qualified with a "J" value on laboratory reports).

In the spring of 2013, MassDEP published draft regulations (which are still draft at this time) proposing to lower the MCP "GW-1" drinking water standard for 1,4-dioxane from 3 µg/L to 0.3 µg/L. The lowered drinking water standard is in response to several studies, primarily conducted on animals, that suggest that 1,4-dioxane is likely to be carcinogenic to humans. The proposed new standard corresponds to a target excess lifetime cancer risk of one in a million, using the most current toxicity information.

The lowered standard has necessitated the use of more sophisticated laboratory techniques to accurately detect 1,4-dioxane to a method reporting limit of about 0.2 µg/L. The Town has been utilizing laboratory methods that achieve this detection limit since the initiation of its drinking water well sampling program in February 2013. It should be noted that 1,4-dioxane is the only contaminant that has been detected above the GW-1 drinking water standards in samples collected during the Eastham private well sampling program.

During the initial phases of the private well sampling program, bottled water was offered to any resident where 1,4-dioxane was detected above one half of the current drinking water standard (1.5 µg/L). The action level for bottled water has been lowered to be consistent with the proposed drinking water standard of 0.3 µg/L. Therefore, bottled water is now being offered to residences where 1,4-dioxane has been detected at 0.3 µg/L or greater. A complete list of properties that meet this criterion is summarized on Table 1.

1.1 Purpose

This IRA Status and Landfill Monitoring Report has been prepared to document activities undertaken from September through November, 2013 for RTN 4-24301.

2.0 IMMEDIATE RESPONSE ACTION ACTIVITIES

The objective of the Immediate Response Action program is to identify private water wells in the vicinity of the landfill that have been impacted by 1,4-dioxane, and to provide alternative safe drinking water to affected residents. In addition, the IRA program includes evaluation of appropriate and feasible mitigating measures to remove 1,4-dioxane and other VOCs related to the Eastham landfill from drinking water. The previous IRA status reports provided details of the initial IRA activities. The most recent status report (ES&M, September 30, 2013) also included an IRA Plan modification which explained the revised bottled water action level, described additional private well sampling that was conducted during that report period, clarified the ongoing monitoring schedule, and outlined future activities including a pilot test to evaluate water treatment technologies that may be used to remove 1,4-dioxane from private water systems in the study area.

The first three Phases of the private well sampling program under the IRA were completed in February, May and July 2013. These sampling events included collection of water samples from private wells hydraulically downgradient and cross-gradient of the landfill. As described in this report, a fourth sampling event (Phase 4) was initiated in December 2013 to further expand the study area to the south and east of the landfill.

Three IRA status reports have been submitted to MassDEP to document the activities completed through August 2013. The following sections discuss IRA activities undertaken during the months of September, October and November 2013.

2.1 Private Well Sampling – Continuation of Phase 3

On September 17, 18 and 19, 2013, water samples were collected from seven residences that had not been included in Phase 3 of the private well sampling program. As with the other sampling events, a field visit form was completed to document the date and time when the sample was collected, the sample location (e.g. kitchen tap, outside spigot), and the configuration of the water system. Field crews also recorded pH, dissolved oxygen (DO), conductivity, and temperature of the water as samples were collected. Field sampling forms summarizing this information are included in Appendix A. Samples were preserved and shipped to Test America Laboratories in Buffalo, New York for analysis of volatile organic compounds by EPA Method 524.2 and 1,4-dioxane by Method 522. Both methods employ reporting limits that are below the drinking water standard for each compound (or below the proposed standard in the case of 1,4-dioxane). Table 2 summarizes the compounds detected in samples collected from these private wells in September 2013, and the laboratory reports are included in Appendix B. As required by 310 CMR 40.1403(10) of the MCP, property owners were notified of the laboratory results for samples collected from their properties. Copies of the notification packages sent following the sampling event in September are included in Appendix C[1].

[1] Lab reports and copies of the notification packages sent to home owners for sampling events conducted prior to September were provided in previous status reports.

Table 3 summarizes all historic water data obtained during all phases of the private well sampling program. The Site Map included as Figure 1 shows the properties within the study area; each parcel is color coded with one of four colors to represent the sampling results:

- Blue = 1,4-dioxane was not detected. Well water test results in this category were below the reporting limit for 1,4-dioxane of 0.2 µg/L. Since an estimated concentration ("J" value) was not reported, it is inferred that 1,4-dioxane is not present above the detection limit (approximately 0.04 µg/L).
- Yellow = 1,4-dioxane detected at a concentration below the proposed GW-1 standard of 0.3 µg/L. Laboratory results that are below 0.3 µg/L but above the reporting limit of 0.2 µg/L are quantified results, while results below 0.2 µg/L and above the method detection limit of 0.04 µg/L are qualified as estimated values (reported with a "J" qualifier).
- Red = 1,4-dioxane detected above 0.3 µg/L. All residents in the category have been offered bottled water and have been advised to not use their well water for consumptive purposes.
- White = well water not tested. These property owners were contacted by certified mail; however, either no response was received, access was not granted, or the property owner was not available to provide access to their well. As discussed in Section 2.3, below, many of these property owners have been contacted again to request access to their wells.

2.2 Routine Monitoring

As described in our last status report, the monitoring schedule for several private wells was increased during 2013 to verify the presence of 1,4 dioxane and to establish concentration trends. This enhanced monitoring program included monthly collection of water samples from five residences - 325 Schoolhouse Road, 11 Eldia Lane, 50 Alston Road, and 25 and 30 Knowles Street. Since this sampling program did confirm the presence of 1,4 dioxane and did show that concentrations have been relatively stable, the program objectives were considered complete in September. Laboratory results of samples collected from these residences are included in Table 3.

2.3 Private Well Sampling – Phase 4

The primary IRA activity undertaken during this report period was preparation for Phase 4 of the private well sampling program, scheduled for the first week of December 2013. The Eastham Board of Health compiled the list of properties to be included in the Phase 4 event based on the following criteria:

- Private wells in the study area that had not been tested during previous sampling phases.
- Private wells in areas beyond the study area to the south and east, since 1,4-dioxane has been detected at the furthest extent of the original study area and further definition of the extent of 1,4-dioxane is necessary.

- Properties within the study area where concentrations of 1,4-dioxane were detected above the reporting limit of 0.2 µg/L but below the proposed GW-1 standard of 0.3 µg/L.

In November, the Town of Eastham mailed letters to 141 property owners requesting access to their wells for sampling. Letter recipients were requested to contact ES&M to determine a convenient time for access during the first week of December. For seasonal homes that were closed for the season, property owners were given the option to provide access prior to next summer. Details of the Phase 4 sampling event conducted in December will be discussed in the next status report (Q1 2014), to be issued at the end of March 2014.

2.4 Pilot Test for 1,4-Dioxane Removal/Destruction

Section 4.3 of the previous IRA status report described plans to conduct two field pilot tests to evaluate activated carbon adsorption and ozone/UV light treatment systems for the removal/destruction of 1,4-dioxane. Both tests were initiated in November 2013, and the carbon pilot test is ongoing. The residence at 255 Alston Avenue was selected for pilot testing for the following reasons:

- The concentration of 1,4-dioxane in the water is approximately 2 µg/L. This value is high enough that the laboratory can accurately quantify test results, and is also representative of several other affected wells.
- The owners were agreeable to allowing the testing in their home.
- There was adequate room to install the carbon treatment system and to test the ozone/UV light device.

Below is a summary of the tests that were conducted. The results of these tests will be reported along with an efficiency evaluation in the next status report.

2.4.1 Activated Carbon Adsorption Test

ES&M contracted Premier Water Systems of Norwood, MA, to provide and install a carbon treatment system. The system was installed by a licensed plumber on November 14, 2013. The system was installed by cutting the water supply pipe after the well pump and pressure tank inside the home, and routing the water through two carbon absorbers plumbed in series. A water flow meter/totalizer was installed after the carbon system. Three sample ports were installed to allow for collection of water samples before the system (influent), after the primary carbon adsorber and before the secondary adsorber (mid), and after the secondary adsorber (effluent). Shutoff valves were installed to allow bypass of the system. All water used inside the home is routed through the carbon system. Unheated water that supplies an outside shower is not routed through the carbon treatment system. A photograph of the carbon treatment system is included in Appendix D.

The carbon treatment system consists of the following components:

- Two polyglass adsorbers, each 13 inches diameter by 54 inches tall with integral plumbing;
- 110 pounds of acid-washed, coconut based, 12 x 40 virgin activated carbon;
- Three ball valves that can be used to bypass the carbon treatment system;
- Three sample valves that can be used to collect influent, midpoint and effluent water samples; and
- One Carlon Model 6251MNL 5/8" by ¾" no-lead, eco brass multi-jet water meter.

The test protocol included the following procedures:

- Install the carbon system;
- Purge the adsorbers to remove fine carbon particles;
- Record the starting totalizer reading;
- Collect effluent, midpoint, and influent water samples on the day of system activation;
- Ship the preserved water samples via laboratory courier and under chain-of-custody to Test America in Buffalo, NY for laboratory analysis of VOCs by EPA Method 524.2 and for 1,4-dioxane by EPA Method 522.1; and
- At one week intervals, collect samples of the effluent, midpoint, and influent water until 1,4-dioxane is detected in the effluent.

During this report period effluent, midpoint and influent samples were collected on November 14, 20, and 26, 2013. As of the close of this report period (end of November), only the result from the startup sample event on November 14 had been received and evaluated. These results showed that 1,4-dioxane was detected at a concentration of 1.6 ug/L in the influent but was not detected in the system effluent. In the next status report, ES&M will report on the performance of the carbon system, including the total volume of water treated, the mass of 1,4-dioxane removed and the mass of 1,4-dioxane adsorbed per unit mass of carbon. Laboratory reports for all samples analyzed as part of the pilot study will be appended to the next IRA status report.

2.4.2 Ozone/UV Light Test

ES&M purchased a small, under sink treatment device which the manufacturer claims employs a five-step process to disinfect water and remove lead (ozone, UV light, photo oxidation, filtration and post filtration UV). This device (Zuvo water filtration system series 300) was selected for testing because it is an inexpensive treatment unit that reportedly uses ozone and UV light, which have successfully been used at other sites to destroy 1,4-dioxane in water. A test was conducted on November 20, 2013 using untreated water obtained from the 255 Alston Avenue residence. A photograph of the test set up is included in Appendix D.

The test protocol included the following procedures:

- Set up the Zuvo system. Water from the influent to the carbon system (before carbon treatment) was routed via flexible tubing to the inlet connection of the

Zuvo unit. The effluent water discharged into a laundry sink. The unit was plugged into a nearby 110v receptacle.
- Water was supplied to the Zuvo and the start time was recorded;
- The flow rate was determined by measuring the time required to fill a 5-gallon container two times;
- Effluent and influent water samples were collected after 97 minutes of operation and after 155 minutes of operation;
- The preserved water samples were shipped via laboratory courier under chain-of-custody to Test America for laboratory analysis of VOCs by EPA Method 524.2 and for 1,4-dioxane by EPA Method 522.1; and
- The unit was disassembled and removed.

The laboratory results did not indicate that the Zuvo unit was effective at removing 1,4 dioxane. A more detailed evaluation of the performance of this unit will be included in the next IRA status report.

2.5 Status of Activated Carbon System - 325 Schoolhouse Road

An activated carbon system consisting of two fiberglass carbon tanks was installed several years ago at the 325 Schoolhouse Road residence to remove VOCs from their drinking water. In early 2013, 1,4-dioxane was detected above the drinking water standard in water samples collected from this property. This prompted monthly collection of samples from the influent and effluent of the system to determine the removal efficiency for 1,4 dioxane. However, monthly sampling was discontinued after the September sampling event because the home is vacant and water usage has been erratic. The monthly sampling data will be evaluated in parallel with the data from the 255 Alston Avenue pilot test to more thoroughly determine the potential removal efficiency of activated carbon.

2.6 MCP Notifications for IRA Status Report Submittal

As required by the MCP, notice of the electronic submittal of this IRA status report to MassDEP is provided to the Town of Eastham Board of Health and Chief Municipal Officer. A copy of the notification letter pertaining to this report is included in Appendix E.

3.0 LANDFILL MONITORING PROGRAM ACTIVITIES

The Landfill Monitoring Plan (LMP) was revised in August 2012 to expand the monitoring requirements while discontinuing analysis for some parameters at other locations. In addition, the revised LMP required that the Town analyze groundwater samples for 1,4-dioxane (utilizing EPA Method 8260B or 8270 SIM, with a reporting limit of less than 3 µg/L) at six of the groundwater monitoring locations. A summary of the Landfill Monitoring Plan sampling requirements and schedule are shown on Table 4. The following sections describe sampling and monitoring activities completed during this report period.

3.1 Landfill Monitoring Plan Quarterly Sampling

3.1.1 Private Wells

The LMP includes periodic sampling of private well water from homes around the landfill. On November 20, 2013, ES&M collected quarterly drinking water samples from three residential properties that are included in the sampling program - 100 Meetinghouse Road, 180 Old Orchard Road, and 285 Alston Avenue. Field sampling forms for this sampling event are included in Appendix A. Samples collected from the residences were preserved and submitted to Test America for analysis of VOCs, 1,4-dioxane and arsenic. The laboratory results are presented on Table 5 and the laboratory report is included in Appendix B. As required by 310 CMR 40.1403(10) of the MCP, property owners were notified of the laboratory results for samples collected from their properties during this report period. Copies of the notification packages are included in Appendix C.

3.1.2 Landfill Monitoring Wells

During this reporting period, LMP monitoring included the collection of groundwater samples from monitoring wells MW-3I and MW-3D (located on the landfill property) on November 25, 2013. Samples were collected by Barnstable County Health Department personnel and submitted to their laboratory for analysis of VOCs, metals and indicator parameters. The laboratory test results are summarized on Table 5, which includes applicable regulatory standards and/or guidelines. The complete laboratory reports from Test America and Barnstable County are included in Appendix B.

Groundwater samples have been collected from monitoring well MW-21S semi-annually under the LMP in the past and were due to be collected during this report period. However, Barnstable County field personnel were unable to collect samples from this well during this report period.

4.0 FUTURE SCHEDULE OF IRA AND LMP ACTIVITIES

4.1 Immediate Response Action

- Collect drinking water samples from residences identified under the Phase 4 sampling event for VOC and 1,4-dioxane analysis.
- Gather well construction information for select wells in the study area, and any new well that is included in the expanded study area.
- Review the Phase 4 sample results and provide bottled water to any new resident whose laboratory result indicates a concentration of 1,4 dioxane above 0.3 ug/L.
- Prepare sampling results notification packages for all residents included in the December 2013 Phase 4 sampling event.

- Evaluate sampling data for the site as a whole to determine if the extent of 1,4 dioxane in groundwater is adequately defined.
- Complete the activated carbon system pilot test at the 255 Alston Avenue residence, and evaluate sampling data (in concert with sampling data from the 325 Schoolhouse carbon system) to estimate the efficacy of activated carbon as a possible treatment method for 1,4 dioxane.
- Document the pilot testing results for the ozone/UV light treatment system.

4.2 Landfill Monitoring Plan

- Review the objectives of the LMP and propose revisions to the sampling plan to be consistent with the current status of the IRA. For example, several residences that are sampled routinely are already being provided bottled water; therefore, continued sampling may provide limited beneficial information.
- Monitor soil gas monitoring wells at the landfill in December 2013 for methane, hydrogen sulfide, and oxygen; and field screen soil gas samples for volatile organic compounds.
- Collect quarterly groundwater samples from wells MW-3I and MW-3D in February 2014 for analysis of indicator parameters, metals and VOCs including 1,4-dioxane. Collect groundwater samples from well MW-21S, if possible, for analysis of VOCs and 1,4-dioxane.
- Collect quarterly private well samples from the 285 Alston Avenue, 100 Meetinghouse Road and 180 Old Orchard Road residences in February for analysis of VOCs, 1,4-dioxane and arsenic.

5.0 PUBLIC OUTREACH

As stated in the last status report, the Town of Eastham and ES&M are committed to open communication with the residents of Eastham so that any and all questions can be answered. Our communication plan includes the following elements to keep the public informed of all aspects of this project:

Availability of Reports

All reports required by MassDEP are available on their website (http://public.dep.state.ma.us/fileviewer/Rtn.aspx?rtn=4-0024301). The Town of Eastham's also posts these reports on their website (http://www.eastham-ma.gov/Public_Documents/index). Hard copies of reports are available at Town Hall and at the Eastham Public Library.

Direct Communications
Questions on the ongoing work related to this matter may be directed to:

Jane Crowley, Health Agent, Eastham Board of Health
508-240-5900, x229
jcrowley@eastham-ma.gov

Doug Heely, Licensed Site Professional, Environmental Strategies & Mgmt.
508-226-1800
dheely@esm-inc.com

Public Meeting

The Town of Eastham will host a public meeting in early February 2014 to present an update of IRA activities and answer any questions. The date and time of this meeting will be posted on the Town's website in the coming weeks.