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December 27, 2013

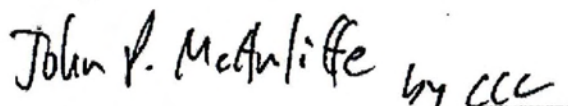
To: Harry Warner, NYSDEC, Region 7 (1 bound)
Holly Sammon, Onondaga County Public Library (1 bound)
Samuel Sage, Atlantic States Legal Foundation (1 bound)
Cara Burton, Solvay Public Library (1 bound)
Mary Ann Coogan, Camillus Town Hall (1 bound)
Moon Library, SUNY ESF (1 bound)
Diane Carlton, NYSDEC, Region 7 (1 PDF)
Joseph J. Heath, Esq., Onondaga Nation (1 bound)
Chris Fitch, Communications (cov ltr – email)

Re: Letter of Transmittal – Onondaga Lake Repository Addition

The below document has been approved by the New York State Department of Environmental Conservation (NYSDEC) and is enclosed for your document holdings:

- Onondaga Lake Remediation, Real-Time Benzene Monitoring Evaluation Results Technical Memorandum, dated November 2013

Sincerely,



John P. McAuliffe, P.E.
Program Director, Syracuse

Enc.

cc: Tim Larson - NYSDEC

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau D, 12th Floor

625 Broadway, Albany, New York 12233-7013

Phone: (518) 402-9676 • **Fax:** (518) 402-9020

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Joe Martens
Commissioner

December 12, 2013

Mr. John P. McAuliffe, P.E.
Program Director, Syracuse
Honeywell
301 Plainfield Road, Suite 330
Syracuse, NY 13212

**Re: Onondaga Lake Remediation, Real-Time Benzene Monitoring Evaluation Results
Technical Memorandum, Dated November 2013**

Dear Mr. McAuliffe:

We have received and reviewed the above-referenced document, transmitted by your November 20, 2013 letter to my attention, and find that the revised technical memorandum has addressed our previous comments. Therefore, the Real-Time Benzene Monitoring Evaluation Results Technical Memorandum, dated November 2013, is hereby approved. Please see that copies of the approved technical memorandum, including this approval letter, are transmitted to the document repositories selected for this site.

Sincerely,

Timothy J. Larson, P.E.
Project Manager

ec: B. Israel, Esq. - Arnold & Porter
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M. Sergott - NYSDOH, Albay
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November 20, 2013

Mr. Tim Larson, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau D, 12th Floor
625 Broadway
Albany, NY 12233-7013

**RE: Real-Time Benzene Monitoring Evaluations Results
Technical Memorandum - November 2013
Onondaga Lake Remediation**

Dear Mr. Larson:

Enclosed is the *Real-Time Benzene Monitoring Evaluation Results – November 2013- Onondaga Lake Remediation Technical Memorandum* prepared by O'Brien & Gere. The document includes the comments provided by the Department during a conference call on November 12, 2013.

Please contact Mark Distler at O'Brien & Gere (315) 956-6536 or me should you have any questions regarding the information presented herein.

Sincerely,



John P. McAuliffe, P.E.
Program Director, Syracuse

Enclosure

cc: William Daigle – NYSDEC, Albany
Donald Hesler – NYSDEC, Albany
Reggie Parker – NYSDEC, Syracuse
Mary Jane Peachey – NYSDEC, Syracuse
Robert Edwards – NYSDEC, Albany
William Hague – Honeywell
Christopher Calkins – O'Brien & Gere
Mark Distler – O'Brien & Gere

REAL-TIME BENZENE MONITORING EVALUATION RESULTS NOVEMBER 2013 ONONDAGA LAKE REMEDIATION

This technical memorandum provides results of an evaluation of a field instrument that measures benzene concentrations in ambient air on a real-time basis. The evaluation was associated with air quality monitoring on the Onondaga Lake remediation program. The purpose of the evaluation was to determine the reliability of the instrument at measuring benzene air concentrations at the sediment consolidation area (SCA) work perimeter.

The evaluation followed a plan prepared by O'Brien & Gere and approved by the New York State Department of Environmental Conservation (NYSDEC) on July 29, 2013. The evaluation was conducted from August 5 to 14, and on September 6, 12 and 13, 2013. It consisted of assessments of the instrument's calibration, precision, separation tube life, and effects from humidity.

The air monitoring instrument was the Ultra RAE 3000 (BPID), which uses photoionization detection and a compound specific separation tube to limit its measurement specifically to benzene¹. The following describes the results of the evaluation and makes recommendations for the future use of the BPID.

CALIBRATION

Per the approved plan, two BPIDs were deployed at the existing air monitoring station nearest to the SCA (SCA 7) for approximately 8 hours per day for a five day period (August 5 through 9). Humidity levels were high during August 8 and 9. Therefore, two additional days (August 12 and 13) of tests were conducted to further evaluate calibration drift under lower humidity conditions.²

As planned, each BPID was calibrated prior to use each day. During the first four test days, calibration (zero and span) checks were performed at the end of each day to evaluate the calibration drift that day (see Table 1). The expected BPID zero response was 0.00 ppm, and the expected BPID span response was 0.50 ppm (the concentration of the benzene span gas standard). New separation tubes were installed at the beginning of August 5, 7 and 12. Therefore, older/used separation tubes were used on August 6, 8, 9 and 13. After four days of observing variable span drift, calibration checks were conducted immediately after the initial daily calibration and every two hours thereafter over the last three days to assess drift throughout the day (see Table 2).

Except for two zero check readings, zero drift did not seem to be prevalent. However, span check results did not consistently fall within the acceptance criteria of the AQM's program for TVOC PIDs ($\pm 10\%$ of span, which is ± 0.05 ppm). The span checks primarily showed a decrease in span response, which was generally more prevalent (up to 50% of span) during use of older/used separation tubes that had been installed the previous day than during use of separation tubes that had been newly installed the same day (up to 10% of span). The every 2-hour calibration checks showed that span drift (decreased span response) tended to increase throughout the 8-hour period.

An additional evaluation to assess calibration drift was performed on September 6, 12 and 13. In accordance with the manufacturer's technical note on PID use at low VOC concentrations³, the BPIDs were operated for at least 45 minutes each day at SCA 7, prior to initial calibrations, to allow time for the BPIDs' lamps to stabilize. Separation tubes were installed immediately prior to initial calibrations and the BPIDs were operated for

¹ As stated by the instrument's manufacturer, some other compounds are also measured by the BPID and are considered interferences to the measurement of benzene.

² The BPID manufacturer states a warning not to use the BPIDs under high humidity conditions due to potential damage resulting from condensation in the instrument.

³ *Technical Note TN-202, Procedure for PPB-Level VOC Detection with MultiRAE*, Rae Systems

approximately 8 hours each day, similar to previous tests. New separation tubes were installed at the start of testing on September 6 and 12, while older/used tubes were installed on September 13. The results of the calibration checks showed improvement in span drift (within 10% of span during 2-hour calibration checks), during the first day of testing, while using new separation tubes. However, increased span drift (generally up to 30% of span) was observed during the second and third day of testing regardless of separation tube type (new or older/used).

See Table 3 for test results. They show a slightly improved span drift thereby indicating that some of the span drift observed during previous tests was likely due to BPID lamp stability and not allowing enough “warm-up” time prior to initial calibrations.

INSTRUMENT PRECISION

Instrument precision was to be evaluated by the difference in two BPID’s responses. However, over the 7 days of evaluations there were no detections above the BPID’s minimum detection limit of 0.05 ppm. In addition, given the fairly unpredictable span drift, calibration checks did not provide objective precision evaluations. Therefore, on August 14 two recently-calibrated BPIDs were deployed within the SCA bag field, where benzene levels were above the BPID’s detection. The two BPIDs were set aside each other on top of a freshly-filled Geotube. The difference between the two BPIDs was 9% (relative percent difference), which is within the precision acceptance criteria for the AQM program’s TVOC PIDs (15%).

SEPARATION TUBE LIFE

The useful life of the separation tubes was evaluated throughout the 8 days of testing. The tubes are designed to turn color (from yellow to green) when they are depleted and TVOC break-through occurs. During the first seven days of testing, no significant color change was observed, indicating that the tubes were not depleted during conditions of high humidity but low benzene levels. Also, no color change was observed during the precision test within the SCA bag field, where both BPIDs were operated for 4 hours at detectable levels of benzene and TVOCs. Therefore, we conclude the separation tube’s useful life is greater than 4 hours under detectable levels of benzene and TVOCs.

HUMIDITY EFFECTS

With TVOC PIDs, humidity tends to cause an elevated baseline. However, the BPIDs did not exhibit any elevated baseline, even while relative humidity levels were as high as 99% and the misting systems were creating mist around the BPIDs. Therefore, we concluded that high humidity and mists do not cause elevated baseline.

Tests were also conducted of humidity tubes placed on the BPID inlet to eliminate moisture in the air sample. When relative humidity levels were high (>78%), a calibration check was performed on the BPID without a humidity tube. Next, a humidity tube was applied to the inlet for 30 minutes, and the calibration was checked again. The span was 0.20 ppm without the humidity tube and 0.25 ppm with the humidity tube. Although there was some improvement in the span response, the humidity tube was not effective in correcting the instrument’s response to the expected span value of 0.5 ppm.

RECOMMENDATIONS FOR FUTURE USE

The following recommendations were derived from the evaluation results:

1. Given the interference from other compounds existing at the SCA and the potential for calibration (span) drift, the BPID is more suitable for screening purposes rather than a definitive measure of benzene concentrations.

2. Calibrate BPIDs immediately before use and after at least 45 minutes of warm-up time (if possible). Use new separation tubes at the start of measurements. Perform calibration checks every two hours. Replace separation tubes and re-calibrate as needed.
3. Use of humidity tubes is not recommended due to their ineffectiveness to improve calibration (span) drift and the infrequent occurrence of BPID elevated baselines.

Based on this evaluation and using these recommendations, a procedure will be developed for NYSDEC approval to utilize BPIDs as a screening instrument for evaluating the benzene concentration during periods of elevated TVOC at the SCA work perimeter.

Attachments: Tables 1, 2 and 3

Table 1. End-of-day Calibration Check Results

Date	BPID ID	Zero (ppm)	Span (ppm) ^a
8/5/13	1	0.00 ^b	0.40
	2	0.00	0.35
8/6/13	1	NP	0.25
	2	NP	0.25
8/7/13	1	0.00	0.50
	2	0.00	0.80
8/8/13	1	0.00	0.20
	2	0.00	0.20
8/9/13	1	0.00	0.30
	2	0.00	0.25
8/12/13	1	0.00	0.30
	2	0.00	0.50
8/13/13	1	0.00	0.50
	2	0.00	0.40
9/6/13	1	0.00	0.35
	2	0.00	0.45
9/12/13	1	0.00	0.40
	2	0.00	0.45
9/13/13	1	0.00	0.60
	2	0.00	0.55

NP = not performed

^aExpected response: 0.5 ppm (concentration of benzene span gas standard)

^bInstrument reading is 0.00; actual value is <0.05

Table 2. Two-hour Calibration Check Results - August 2013 Tests

Date	BPID ID	Hour	Zero (ppm)	Span (ppm) ^a
8/8/13	1	0	0.00 ^b	0.40
		2	0.00	0.30
		4	0.00	0.25
		6	0.00	0.20
		8	0.00	0.35
	2	0	0.00	0.50
		2	0.00	0.30
		4	0.00	0.25
		6	0.00	0.20
		8	0.00	NP
8/12/13	1	0	0.20	0.45
		2	0.00	0.30
		4	0.00	0.30
		6	0.00	0.30
		8	0.00	NP
	2	0	0.25	0.55
		2	0.00	0.00
		4	0.00	0.55
		6	0.00	0.50
		8	0.00	NP
8/13/13	1	0	0.00	0.50
		2	0.05	0.55
		4	0.00	0.50
		6	0.00	0.35
		8	0.00	0.50
	2	0	0.00	0.50
		2	0.00	0.45
		4	0.00	0.40
		6	0.00	0.40
		8	0.00	0.40

NP = not performed

^aExpected response: 0.5 ppm (concentration of benzene span gas standard)

^bInstrument reading is 0.00; actual value is <0.05

Table 3. Two-hour Calibration Check Results - September 2013 Tests^a

Date	BPID ID	Hour	Zero (ppm)	Span (ppm) ^b
9/6/13	1	0	0.00 ^c	0.50
		2	0.00	0.40
		4	0.00	0.35
		6	0.00	0.35
		8	0.00	0.35
	2	0	0.00	0.50
		2	0.00	0.45
		4	0.00	0.45
		6	0.00	0.45
		8	0.00	0.45
9/12/13	1	0	0.00	0.50
		2	0.20	0.90
		4	0.00	0.40
		6	0.00	0.35
		8	0.00	0.40
	2	0	0.00	0.50
		2	0.00	0.40
		4	0.00	0.40
		6	0.00	0.40
		8	0.00	0.45
9/13/13	1	0	0.00	0.50
		2	0.05	0.65
		4	0.00	0.60
		6	0.00	0.60
		8	0.00	0.60
	2	0	0.00	0.50
		2	0.00	0.65
		4	0.05	0.60
		6	0.00	0.55
		8	0.00	0.55

^aInstrument response after at least 45-minutes warm-up time.

^bExpected response: 0.5 ppm (concentration of benzene span gas standard)

^cInstrument reading is 0.00; actual value is <0.05