LEVITTOWN PUBLIC SCHOOLS
Levittown Memorial Education Center
150 Abbey Lane
Levittown, NY 11756

Success For Every Student

Tonie McDonald, Ed.D. Superintendent of Schools
516-434-7020
Fax: 516-520-8314

March 2020

Dear Parents/Guardians:

If you get water service from New York American Water (NYAW), you may have received a letter stating that the tap water in your area is above the NYS desired level of dioxine. Upon receiving this information, we have had our water at Lee Road, East Broadway, Salk and MacArthur independently tested. The results indicated that the water in our schools is similar to the level of dioxine as the water you have in your houses. As a result, we have spoken with the Nassau County Department of Health who has verified that the water is safe to drink.

Nevertheless, we understand that this is a concern for many. Therefore, we have made arrangements through our food service provider (Chartwells) and bottled water will be available for sale in the cafeterias at both Lee Road and East Broadway all day. Salk and MacArthur have always had and will continue to have water available in the vending machines and the cafeterias during a majority of the day. Of course, should you choose, your child may bring water to school.

In addition, we have had several conversations with Chartwells, and they have confirmed that they will not be cooking with tap water to make any dishes.

As mentioned by our environmental specialists, JC Broderick 1,4-dioxine is not absorbed through the skin and does not vaporize into the air. Therefore, hand washing is not a concern. The letter containing the results of our water testing has been posted on our website for your information.

If you have questions about your water, please contact the Nassau County Department of Health at (516) 227-9697. If you have questions about protocols in Levittown surrounding this issue, please contact me directly.

LAURA CURRAN
NASSAU COUNTY EXECUTIVE

LAWRENCE E. EISENSTEIN, MD, MPH, FACP
COMMISSIONER OF HEALTH

NASSAU COUNTY DEPARTMENT OF HEALTH

March 5, 2020

By Email

Peter La Duca
Executive Manager
Nassau BOCES
Health & Safety Training and Information Service
George Farber Administrative Center
71 Clinton Road
Garden City, NY 11530-9195

Mr. La Duca:

In response to your inquiry regarding the water quality of the Nassau County public water systems, I can confirm that all the public water systems in Nassau County are in compliance with the NY State Sanitary Code and that the water quality meets all drinking water standards. The water provided by public water systems is safe to drink, prepare food and use for any other type of consumption.

Please contact me if you have any additional questions regarding this matter.

Very truly yours,

Donald P. Irwin, Director
Division of Environmental Health

J.C. Broderick & Associates, Inc.

Environmental / Construction Consulting & Testing

1775 Expressway Drive North
Hauppauge, NY 11788
631.584.5492
Fax: 631.584.3395
www.jcbroderick.com

March 4, 2020

Mr. Christopher Milano
Levittown Union Free School District
Administration Building
850 Seamans Neck Road
Seaford, New York 11783

Re: **1,4 -Dioxane in Water Sampling at**
East Broadway Elementary School, Lee Road Elementary School, Gen. Douglas MacArthur High School Campus and Jonas E. Salk Middle School

JCB#: **20-45703**

Dear Milano:

J C Broderick & Associates, Inc. (JCB) performed water sampling from representative potable water outlets at the above referenced school buildings. The sampling was performed to confirm the findings reported by New York American Water (NYAW) in their letter dated February 5, 2020 regarding the emerging contaminant 1,4 Dioxane.

1,4-dioxane is classified by the National Toxicology Program as "reasonably anticipated to be a human carcinogen". Traces of 1,4-dioxane are found in some food supplements and food containing residues from packaging adhesives, but is most often found in products that suds, like shampoos, shower gels, dish soaps, and laundry detergents. 1,4-dioxane has also been found in toothpastes, mouthwashes, deodorant, and hair dyes. As a result of these materials being discharged into the ground and then leaching into the groundwater, many water companies throughout Long Island have detected this emerging contaminant in their public water supply wells.

The NYAW had recently sent out, to the Levittown and Wantagh communities, including the Levittown School District, a letter regarding this emerging contaminant 1,4-dioxane. In this letter, NYAW indicated that their Seaman's Neck Well Station located in Levittown revealed detections of 1,4-Dioxane over the proposed Maximum Contaminant Level (MCL) of 1.0 part per billion (ppb). This well provides water to the areas north of the Southern State, including Levittown Union Free School District's Gen. Douglas MacArthur High School Campus, Jonas E. Salk Middle School, Lee Road Elementary School and East Broadway Elementary School.

The results of JCB's sampling and laboratory analysis did confirm the detection of 1,4-dioxane over the proposed MCL of 1.0 ppb from the above referenced school buildings. The table below summarizes the results of the sampling performed. The laboratory report for this sampling is attached to this letter.

Summary of 1,4-dioxane Sampling		
School Building	**Results (ppb)**	**MCL (ppb)**
East Broadway Elementary School	1.2	1.0
Lee Road Elementary School	1.4	
Gen. Douglas MacArthur High School	1.1	
Jonas E. Salk Middle School	1.2	

NYAW has indicated that they are taking immediate action to purchase and install the appropriate treatment equipment to remove 1,4-dioxane from the water before it is delivered to customers. However, this process may take over a year to implement.

The NYAW has stated that the levels are still below current safety standards and that the water is safe to drink. However, we recognize that building occupants may still be hesitant to drink the water being supplied by NYAW to their homes and the above referenced school buildings.

Unfortunately, our research to date have not revealed any currently available commercial building water filters, including activated carbon filters and or reverse osmosis filters, that are completely effective in removing the dioxane from water. Therefore, we can't recommend any systems for your school buildings at this time. However, we will continue to research different options.

There is no immediate concern associated with brushing teeth, hand washing, showering, dish washing and rinsing of fruits and vegetables as these activities **will not** result in significant exposures to 1,4-dioxane since it is not absorbed through the skin and does not vaporize into the air. However, a potential does exist that people can be exposed to 1,4-dioxane by drinking or using water that is provided by this well from water fountains or to make beverages such as tea, coffee or when cooking foods that retain water (i.e., oatmeal).

As an interim, if building occupants don't want to use the water at the building for drinking or cooking, we recommend the following:

- Instruct staff, faculty, children and parents to bring bottled water for their children or make the option to purchase bottled water available at the school building throughout the school day;
- Review current cafeteria procedures and determine if they cook any foods that retain water (i.e., oatmeal, pasta, etc.). Consider removing these options from the cafeteria menu and provide alternatives or provide the kitchen with bottled water for these instances.

Please note that there are currently no requirements to test for 1,4-dioxane in bottled water. Therefore, whatever brand of bottled water is chosen by the school district you should contact the bottler with specific questions about possible 1,4-dioxane content of their water.

We will continue to monitor the NYAW news releases and the general presence of 1,4-dioxane and other emerging contaminants in our public water supply and update your office on any significant findings.

If you have any question of if more information is needed, please call.

Sincerely,

Brendan G Broderick, PG
J C Broderick & Associates, Inc.

Attch.

NEW YORK
AMERICAN WATER
P.O. Box 578 Alton, IL 62002

02/05/2020

MAINTENANCE GROUNDS COMPLEX
850 SEAMANS NECK RD
SEAFORD, NY 11783-1225

For Service To:
Account Number: 1038-210029999618
Service Address: 850 SEAMANS NECK RD
Seaford, NY 11783

Dear Maintenance Grounds Complex,

New York American Water recently sent you a letter regarding emerging compounds which referenced the wrong service area for your residence. We apologize for the error and any confusion this may have caused. The following letter provides accurate information regarding your water supply.

New York American Water works around the clock to deliver clean, safe drinking water to our customers that meets or surpasses all county, state and federal drinking water standards. The proposed regulation of emerging compounds, such as 1,4-Dioxane and PFOA/PFOS, and their impact on drinking water supplies is a key focus of New York American Water's water quality team. We have proactively tested our water supply sources on Long Island and in upstate New York to determine whether there is the presence of these emerging compounds. As our customer, we want to share the test results with you and outline our plan to develop mitigation measures to meet the proposed regulations.

No water sources in your Service Area had detections of PFOA/PFOS compounds over the proposed Maximum Contaminant Level (MCL) of 10.0 parts per trillion. The Seaman's Neck Well Station in Levittown, NY is the only water source in your Service Area that had detections of 1,4-Dioxane over the proposed MCL of 1.0 part per billion. We have determined that the Seamans Neck Well Station in Levittown will need mitigation measures to address the presence of 1,4-Dioxane. Our immediate action is to purchase and install the appropriate treatment equipment to remove 1,4-Dioxane from the water before it is delivered to customers. Our team is acting proactively to ensure the health and safety of our customers, and we are confident that our immediate plans for treatment will fulfill this goal.

The Seamans Neck Well Station provides water for our customers in Levittown and Wantagh, north of the Southern Parkway. As New York American Water works to permit and construct treatment systems, significant outdoor water conservation measures for customers in these areas may be necessary during periods of peak demand to reduce stress on the water supply. Additional information will be provided to our customers as the NY State Department of Health releases guidance to water utilities on their proposed regulation of emerging compounds. For more information regarding emerging compounds and New York American Water's efforts, please visit: www.nyamwater.com/water-quality/water-safety.

Sincerely,

American Water Customer Service

ADHOCTXTLTR_CRM

Technical Fact Sheet – 1,4-Dioxane

November 2017

TECHNICAL FACT SHEET – 1,4-DIOXANE

At a Glance

- Flammable liquid and a fire hazard. Potentially explosive if exposed to light or air.
- Found at many federal facilities because of its widespread use as a stabilizer in certain chlorinated solvents, paint strippers, greases and waxes.
- Short-lived in the atmosphere, may leach readily from soil to groundwater, migrates rapidly in groundwater and is relatively resistant to biodegradation in the subsurface.
- Classified by EPA as "likely to be carcinogenic to humans" by all routes of exposure.
- Short-term exposure may cause eye, nose and throat irritation; long-term exposure may cause kidney and liver damage.
- Federal screening levels, state health-based drinking water guidance values and federal occupational exposure limits have been established.
- Modifications to existing sample preparation procedures may be required to achieve the increased sensitivity needed for detection of 1,4-dioxane.
- Common treatment technologies include advanced oxidation processes and bioremediation.
- No federal maximum contaminant level (MCL) has been established for 1,4-dioxane in drinking water.

Introduction

This fact sheet, developed by the U.S. Environmental Protection Agency (EPA) Federal Facilities Restoration and Reuse Office (FFRRO), provides a summary of the emerging contaminant 1,4-dioxane, including physical and chemical properties; environmental and health impacts; existing federal and state guidelines; detection and treatment methods; and additional sources of information. This fact sheet is intended for use by site managers who may address 1,4-dioxane at cleanup sites or in drinking water supplies and for those in a position to consider whether 1,4-dioxane should be added to the analytical suite for site investigations.

1,4-Dioxane is a likely human carcinogen and has been found in groundwater at sites throughout the United States. The physical and chemical properties and behavior of 1,4-dioxane create challenges for its characterization and treatment. It is highly mobile and does not readily biodegrade in the environment.

What is 1,4-dioxane?

- 1,4-Dioxane is a synthetic industrial chemical that is completely miscible in water (EPA 2006; ATSDR 2012).
- Synonyms include dioxane, dioxan, p-dioxane, diethylene dioxide, diethylene oxide, diethylene ether and glycol ethylene ether (EPA 2006; ATSDR 2012; Mohr 2001).
- 1,4-Dioxane is unstable at elevated temperatures and pressures and may form explosive mixtures with prolonged exposure to light or air (EPA 2006; HSDB 2011).
- 1,4-Dioxane is a likely contaminant at many sites contaminated with certain chlorinated solvents (particularly 1,1,1-trichloroethane [TCA]) because of its widespread use as a stabilizer for chlorinated solvents (EPA 2013a; Mohr 2001). Historically, the main use (90 percent) of 1,4-dioxane was as a stabilizer of chlorinated solvents such as TCA (ATSDR 2012). Use of TCA was phased out under the 1995 Montreal Protocol and the use of 1,4-dioxane as a solvent stabilizer was terminated (ECJRC 2002; NTP 2016). Lack of recent reports for other previously reported uses suggest that many other industrial, commercial and consumer uses were also stopped.

- It is a by-product present in many goods, including paint strippers, dyes, greases, antifreeze and aircraft deicing fluids, and in some consumer products (deodorants, shampoos and cosmetics) (ATSDR 2012; Mohr 2001).
- 1,4-Dioxane is used as a purifying agent in the manufacture of pharmaceuticals and is a by-product in the manufacture of polyethylene terephthalate (PET) plastic (Mohr 2001).
- Traces of 1,4-dioxane may be present in some food supplements, food containing residues from packaging adhesives or on food crops treated with pesticides that contain 1,4-dioxane (ATSDR 2012; DHHS 2011).

Exhibit 1: Physical and Chemical Properties of 1,4-Dioxane (ATSDR 2012)

Property	1,4-Dioxane
Chemical Abstracts Service (CAS) number	123-91-1
Physical description (physical state at room temperature)	Clear, flammable liquid with a faint, pleasant odor
Molecular weight (g/mol)	88.11
Water solubility	Miscible
Melting point (°C)	11.8
Boiling point (°C) at 760 mm Hg	101.1
Vapor pressure at 25°C (mm Hg)	38.1
Specific gravity	1.033
Octanol-water partition coefficient (log K_{ow})	-0.27
Organic carbon partition coefficient (log K_{oc})	1.23
Henry's law constant at 25 °C (atm-m^3/mol)	4.80 X 10^{-6}

Abbreviations: g/mol – grams per mole; °C – degrees Celsius; mm Hg – millimeters of mercury; atm-m^3/mol – atmosphere-cubic meters per mole

Existence of 1,4-dioxane in the environment

- 1,4-Dioxane is typically found at some solvent release sites and PET manufacturing facilities (ATSDR 2012; Mohr 2001).
- It is short-lived in the atmosphere, with an estimated 1- to 3-day half-life due to photooxidation (ATSDR 2012; DHHS 2011).
- Migration to groundwater is weakly retarded by sorption of 1,4-dioxane to soil particles; it is expected to move rapidly from soil to groundwater (EPA 2006; ATSDR 2012).
- It is relatively resistant to biodegradation in water and soil, although recent studies have identified degrading bacteria (Inoue 2016; Pugazhendi 2015; Sales 2013).
- It does not bioaccumulate, biomagnify, or bioconcentrate in the food chain (ATSDR 2012; Mohr 2001).
- 1,4-Dioxane is frequently present at sites with TCA contamination (Mohr 2001; Adamson 2014).
- It may migrate rapidly in groundwater, ahead of other contaminants (DHHS 2011; EPA 2006).
- Where delineated, 1,4-dioxane is frequently found within previously delineated chlorinated solvent plumes and existing monitoring networks (Adamson 2014).
- As of 2016, 1,4-dioxane had been identified at more than 34 sites on the EPA National Priorities List (NPL); it may be present (but samples were not analyzed for it) at many other sites (EPA 2016b).

What are the routes of exposure and the potential health effects of 1,4-dioxane?

- Exposure may occur through ingestion of contaminated food and water, or dermal contact. Worker exposures may include inhalation of vapors (ATSDR 2012; DHHS 2011; EU 2002).
- Potential exposure could occur during production and use of 1,4-dioxane as a stabilizer or solvent (DHHS 2011; EU 2002).
- Short-term exposure to high levels of 1,4-dioxane may result in nausea, drowsiness, headache, and irritation of the eyes, nose and throat (ATSDR 2012; EPA 2013b; NIOSH 2010; EU 2002). 1,4-Dioxane is readily absorbed through the lungs and gastrointestinal tract. Some 1,4-dioxane may also pass through the skin, but studies indicate that much of it will evaporate before it is absorbed. Distribution is rapid and uniform in the lung, liver, kidney, spleen, colon and skeletal muscle tissue (ATSDR 2012).
- 1,4-Dioxane is weakly genotoxic and reproductive effects in humans are unknown; however, a developmental study on rats indicated that 1,4-dioxane may be slightly toxic to the developing fetus (ATSDR 2012; Giavini and others 1985).
- Animal studies showed increased incidences of nasal cavity, liver and gall bladder tumors after exposure to 1,4-dioxane (ATSDR 2012; DHHS 2011; EPA IRIS 2013).
- EPA has classified 1,4-dioxane as "likely to be carcinogenic to humans" by all routes of exposure (EPA IRIS 2013).
- The U.S. Department of Health and Human Services states that "1,4-dioxane is reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity from studies in experimental animals" (DHHS 2011).
- The National Institute for Occupational Safety and Health (NIOSH) considers 1,4-dioxane a potential occupational carcinogen (NIOSH 2010).
- The European Union has classified 1,4-dioxane as having limited evidence of carcinogenic effect (EU 2002).

Are there any federal and state guidelines and health standards for 1,4-dioxane?

- EPA's Integrated Risk Information System (IRIS) database includes a chronic oral reference dose (RfD) of 0.03 milligrams per kilogram per day (mg/kg/day) based on liver and kidney toxicity in animals and a chronic inhalation reference concentration (RfC) of 0.03 milligrams per cubic meter (mg/m^3) based on atrophy and respiratory metaplasia inside the nasal cavity of animals (EPA IRIS 2013).
- The cancer risk assessment for 1,4-dioxane is based on an oral slope factor of 0.1 mg/kg/day and the drinking water unit risk is 2.9×10^{-6} micrograms per liter (µg/L) (EPA IRIS 2013).
- EPA risk assessments indicate that the drinking water concentration representing a 1×10^{-6} cancer risk level for 1,4-dioxane is 0.35 µg/L (EPA IRIS 2013).
- No federal maximum contaminant level (MCL) for drinking water has been established (EPA 2012).
- 1,4-Dioxane is included on the fourth drinking water contaminant candidate list and is included in the Third Unregulated Contaminant Monitoring Rule (EPA 2009; EPA 2016a).
- EPA's drinking water equivalent level is 1 mg/L (EPA 2012). EPA has calculated a screening level of 0.46 µg/L for tap water, based on a 1 in 10^{-6} lifetime excess cancer risk (EPA 2017b).
- EPA established a 1-day health advisory of 4.0 milligrams per liter (mg/L) and a 10-day health advisory of 0.4 mg/L in drinking water for a 10-kilogram child and a lifetime health advisory of 0.2 mg/L in drinking water (EPA 2012).
- EPA has calculated a residential soil screening level (SSL) of 5.3 milligrams per kilogram (mg/kg) and an industrial SSL of 24 mg/kg. The soil-to-groundwater risk-based SSL is 9.4×10^{-5} mg/kg (EPA 2017b).
- EPA has calculated a residential air screening level of 0.56 micrograms per cubic meter ($\mu g/m^3$) and an industrial air screening level of 2.5 $\mu g/m^3$ (EPA 2017b).
- A reportable quantity of 100 pounds has been established under the Comprehensive Environmental Response, Compensation, and Liability Act (EPA 2011).
- The Occupational Safety and Health Administration (OSHA) established a permissible

exposure limit (PEL) for 1,4-dioxane of 100 parts per million (ppm) or 360 mg/m^3 as an 8-hour time weighted average (TWA). While OSHA has established a PEL for 1,4-dioxane, OSHA has recognized that many of its PELs are outdated and inadequate for ensuring the protection of worker health. OSHA recommends that employers follow the California OSHA limit of 0.28 ppm, the NIOSH recommended exposure limit of 1 ppm as a 30-minute ceiling, or the American Conference of Governmental Industrial Hygienists threshold limit value of 20 ppm (OSHA 2017).

- Various states have established drinking water and groundwater guidelines, including the following:

State	Guideline (µg/L)	Source
Alaska	77	AL DEC 2016
California	1.0	Cal/EPA 2011
Colorado	0.35	CDPHE 2017
Connecticut	3.0	CTDPH 2013
Delaware	6.0	DE DNR 1999
Florida	3.2	FDEP 2005
Indiana	7.8	IDEM 2015
Maine	4.0	MEDEP 2016
Massachusetts	0.3	MADEP 2004
Mississippi	6.09	MS DEQ 2002
New Hampshire	0.25	NH DES 2011
New Jersey	0.4	NJDEP 2015
North Carolina	3.0	NCDENR 2015
Pennsylvania	6.4	PADEP 2011
Texas	9.1	TCEQ 2016
Vermont	3.0	VTDEP 2016
Washington	0.438	WA ECY 2015
West Virginia	6.1	WV DEP 2009

What detection and site characterization methods are available for 1,4-dioxane?

- As a result of the limitations in the analytical methods to detect 1,4-dioxane, it has been difficult to identify its occurrence in the environment. The miscibility of 1,4-dioxane in water causes poor purging efficiency and results in high detection limits (ATSDR 2012; EPA 2006; Mohr 2001).
- The Contract Laboratory Program SOW SOM02.3 includes a CRQL of 2.0 µg/L in water, 67 µg/kg in low soil and 2,000 µg/kg in medium soil (EPA 2013c).
- Conventional analytical methods can detect 1,4-dioxane only at concentrations 100 times greater than the concentrations of volatile organic compounds. Modifications of existing analytical methods and their sample preparation procedures may be needed to achieve lower detection limits for 1,4-dioxane (EPA 2006; Mohr 2001).
- High-temperature sample preparation techniques improve the recovery of 1,4-dioxane. These techniques include purging at elevated temperature (EPA SW-846 Method 5030); equilibrium headspace analysis (EPA SW-846 Method 5021); vacuum distillation (EPA SW-846 Method 8261); and azeotropic distillation (EPA SW-846 Method 5031) (EPA 2006).
- NIOSH Method 1602 uses gas chromatography – flame ionization detection (GC-FID) to determine the concentration of 1,4-dioxane in air (ATSDR 2012; NIOSH 2010).
- EPA SW-846 Method 8015D uses gas chromatography (GC) to determine the concentration of 1,4-dioxane in environmental samples. Samples may be introduced into the GC column by a variety of techniques including the injection of the concentrate from azeotropic distillation (EPA SW-846 Method 5031). The lower quantitation limits for 1,4-dioxane in aqueous matrices by azeotropic microdistillation are 12 µg/L (reagent water), 15 µg/L (groundwater) and 16 µg/L (leachate) (EPA 2003).
- EPA SW-846 Method 8260B detects 1,4-dioxane in a variety of solid waste matrices using GC and mass spectrometry (MS). The detection limit

depends on the instrument and choice of sample preparation method (ATSDR 2012).

- A laboratory study is underway to develop a passive flux meter (PFM) approach to enhance the capture of 1,4-dioxane in the PFM sorbent to improve accuracy. Results to date show that the PFM is capable of quantifying low absorbing compounds such as 1,4-dioxane (DoD SERDP 2013b).
- EPA Method 1624 uses isotopic dilution gas chromatography – mass spectrometry (GC-MS) to detect 1,4-dioxane in water, soil and municipal discharges. The detection limit for this method is 10 µg/L (ATSDR 2012; EPA 2001b).
- EPA SW-846 Method 8270 uses liquid-liquid extraction and isotope dilution by capillary column GC-MS. This method is often modified for the detection of low levels of 1,4-dioxane in water (EPA 2007).
- EPA Method 522 uses solid phase extraction and GC-MS with selected ion monitoring for the detection of 1,4-dioxane in drinking water with detection limits as low as 0.02 µg/L (EPA 2008).
- GC-MS detection methods using solid phase extraction followed by desorption with an organic solvent have been developed to remove 1,4-dioxane from the aqueous phase. Detection limits as low as 0.03 µg/L have been achieved by passing the aqueous sample through an activated carbon column, following by elution with acetone-dichloromethane (ATSDR 2012; Kadokami and others 1990).
- Lab studies indicate effective methods for monitoring growth of dioxane-degrading bacteria in culture (Gedalanga 2014).
- Studies are underway to develop and assess methods for performing compound-specific isotope analysis (CSIA) on low levels of 1,4-dioxane in groundwater (DoD SERDP 2016).

What technologies are being used to treat 1,4-dioxane?

- Pump-and-treat remediation can treat dissolved 1,4-dioxane in groundwater and control groundwater plume migration, but requires ex-situ treatment tailored for the unique properties of 1,4-dioxane (e.g., its low octanol-water partition coefficient makes 1,4-dioxane hydrophilic) (EPA 2006; Kiker and others 2010).
- Commercially available advanced oxidation processes using hydrogen peroxide with ultraviolet light or ozone can be used to treat 1,4-dioxane in wastewater (Asano and others 2012; EPA 2006).
- Peroxone and iron activated persulfate oxidation of 1,4-dioxane might aid in the cleanup of VOC-contaminated sites (Eberle 2015; Zhong 2015; Li 2016; SERDP 2013d).
- In-situ chemical oxidation can be successfully combined with bioaugmentation for managing dioxane contamination (DoD SERDP 2013d; Adamson 2015).
- Ex-situ bioremediation using a fixed-film, moving-bed biological treatment system is also used to treat 1,4-dioxane in groundwater (EPA 2006).
- Electrical resistance heating may be an effective treatment method (Oberle 2015).
- Phytoremediation is being explored as a means to remove the compound from shallow groundwater. Pilot-scale studies have demonstrated the ability of hybrid poplars to take up and effectively degrade or deactivate 1,4-dioxane (EPA 2001a, 2013a; Ferro and others 2013).
- Microbial degradation in engineered bioreactors has been documented under enhanced conditions or where selected strains of bacteria capable of degrading 1,4-dioxane are cultured, but the impact of the presence of chlorinated solvent co-contaminants on biodegradation of 1,4-dioxane needs to be further investigated (EPA 2006, 2013a; Mahendra and others 2013).
- Results from a 2012 laboratory study found 1,4-dioxane-transforming activity to be relatively common among monooxygenase-expressing bacteria; however, both TCA and 1,1-dichloroethene inhibited 1,4-dioxane degradation by bacterial isolates (DoD SERDP 2012).
- Isobutane-metabolizing bacteria can consistently degrade low (<100 ppb) concentrations of 1,4-dioxane, often to concentrations <1 ppb. These organisms also can degrade many chlorinated co-contaminants such as TCA and 1,1-dichoroethene (1,1-DCE) (DoD SERDP 2013c).
- Ethane effectively serves as a cometabolite for facilitating the biodegradation of 1,4-dioxane at relevant field concentrations (DoD SERDP 2013f).
- Biodegradation rates are subject to interactions among transition metals and natural organic ligands in the environment. (Pornwongthong 2014; DoD SERDP 2013e).

- Photocatalysis has been shown to remove 1,4-dioxane in aqueous solutions. Laboratory studies documented that the surface plasmon resonance of gold nanoparticles on titanium dioxide (Au – TiO2) promotes the photocatalytic degradation of 1,4-dioxane (Min and others 2009; Vescovi and others 2010).
- Other in-well combined treatment technologies being assessed include air sparging; soil vapor extraction (SVE); enhanced bioremediation-oxidation; and dynamic subsurface groundwater circulation (Odah and others 2005).
- 1,4-Dioxane was reduced by greater than 90 percent in the treatment zone with no apparent downward migration of 1,4-dioxane using enhanced or extreme SVE, which uses a combination of increased air flow, sweeping with drier air, increased temperature, decreased infiltration and more focused vapor extraction to enhance 1,4-dioxane remediation in soils (DoD SERDP 2013a).

Where can I find more information about 1,4-dioxane?

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Where can I find more information about 1,4-dioxane? (continued)

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Where can I find more information about 1,4-dioxane? (continued)

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Contact Information

If you have any questions or comments on this fact sheet, please contact: Mary Cooke, FFRRO, at cooke.maryt@epa.gov.

Technical Report

prepared for:

J.C. Broderick
1775 North Express Drive
Hauppauge NY, 11788
Attention: Jeff Nannini

Report Date: 02/17/2020
Client Project ID: 20-45703-EBES
York Project (SDG) No.: 20B0470

CT Cert. No. PH-0723 New Jersey Cert. No. CT005 and NY037 New York Cert. Nos. 10854 and 12058 PA Cert. No. 68-04440

120 RESEARCH DRIVE STRATFORD, CT 06615 132-02 89th AVENUE RICHMOND HILL, NY 11418
www.YORKLAB.com (203) 325-1371 FAX (203) 357-0166 ClientServices@yorklab.com

Report Date: 02/17/2020
Client Project ID: 20-45703-EBES
York Project (SDG) No.: 20B0470

J.C. Broderick
1775 North Express Drive
Hauppauge NY, 11788
Attention: Jeff Nannini

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on February 13, 2020 with a temperature of 2.5 C. The project was identified as your project: **20-45703-EBES**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Sample and Analysis Qualifiers section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the Sample and Data Qualifiers Relating to This Work Order section of this report and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
20B0470-01	EBES-1	Drinking Water	02/13/2020	02/13/2020

General Notes for York Project (SDG) No.: 20B0470

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All analyses conducted met method or Laboratory SOP requirements. See the Sample and Data Qualifiers Section for further information.
6. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
7. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.
8. Analyses conducted at York Analytical Laboratories, Inc. Stratford, CT are indicated by NY Cert. No. 10854; those conducted at York Analytical Laboratories, Inc., Richmond Hill, NY are indicated by NY Cert. No. 12058.

Approved By: 

Date: 02/17/2020

Benjamin Gulizia
Laboratory Director

Sample Information

Client Sample ID: EBES-1 **York Sample ID:** 20B0470-01

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
20B0470	20-45703-EBES	Drinking Water	February 13, 2020 7:15 am	02/13/2020

Analyzed by: Phoenix Environmental Laboratories, Inc. S

1,4-Dioxane by GC/MS/SIM EPA 522 **Log-in Notes:** **Sample Notes:**

Sample Prepared by Method: EPA 3535A/EPA 522

CAS No.	Parameter	Result	Flag	Units	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
123-91-1	**1,4-Dioxane**	**1.2**		ug/L	0.2	1	EPA522	02/17/2020 00:00	02/17/2020 00:00	PHO

Certifications:

Sample and Data Qualifiers Relating to This Work Order

Definitions and Other Explanations

*	Analyte is not certified or the state of the samples origination does not offer certification for the Analyte.
ND	NOT DETECTED - the analyte is not detected at the Reported to level (LOQ/RL or LOD/MDL)
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
LOQ	LIMIT OF QUANTITATION - the minimum concentration of a target analyte that can be reported within a specified degree of confidence. This is the lowest point in an analyte calibration curve that has been subjected to all steps of the processing/analysis and verified to meet defined criteria. This is based upon NELAC 2009 Standards and applies to all analyses.
LOD	LIMIT OF DETECTION - a verified estimate of the minimum concentration of a substance in a given matrix that an analytical process can reliably detect. This is based upon NELAC 2009 Standards and applies to all analyses conducted under the auspices of EPA SW-846.
MDL	METHOD DETECTION LIMIT - a statistically derived estimate of the minimum amount of a substance an analytical system can reliably detect with a 99% confidence that the concentration of the substance is greater than zero. This is based upon 40 CFR Part 136 Appendix B and applies only to EPA 600 and 200 series methods.
Reported to	This indicates that the data for a particular analysis is reported to either the LOD/MDL, or the LOQ/RL. In cases where the "Reported to" is located above the LOD/MDL, any value between this and the LOQ represents an estimated value which is "J" flagged accordingly. This applies to volatile and semi-volatile target compounds only.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two. For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the LOD/MDL, with values between the LOD/MDL and the LOQ being "J" flagged as estimated results.

For analyses by EPA SW-846-8270D, the Limit of Quantitation (LOQ) reported for benzidine is based upon the lowest standard used for calibration and is not a verified LOQ due to this compound's propensity for oxidative losses during extraction/concentration procedures and non-reproducible chromatographic performance.

York Analytical Laboratories, Inc.
120 Research Drive Stratford, CT 06615
132-02 89th Ave Queens, NY 11418
clientservices@yorklab.com
www.yorklab.com

Field Chain-of-Custody Record

NOTE: YORK's Standard Terms & Conditions are listed on the back side of this document.
This document serves as your written authorization for YORK to proceed with the analyses requested below
Your signature binds you to YORK's Standard Terms & Conditions.

YORK Project No. 20B0470

YOUR Information	Report To:	Invoice To:	YOUR Project Number	Turn-Around Time
Company: JC Broderick Associates Inc.	Company: JCB	Company: JCB	20-45703-5BES	RUSH - Next Day X
Address: 1775 Express Dr. N Hauppauge, NY	Address:	Address:	YOUR Project Name: East Broadway	RUSH - Two Day
Phone: 631-584-5492	Phone:	Phone:		RUSH - Three Day
Contact: Jeffrey Nann	Contact:	Contact:		RUSH - Four Day
E-mail: JNann@JCBroderick.com	E-mail:	E-mail:	YOUR PO#:	Standard (5-7 Day)

Please print clearly and legibly. All information must be complete. Samples will not be logged in and the turn-around-time clock will not begin until any questions by YORK are resolved.

Jeffrey Nann

Samples Collected by: (print your name above and sign below)

Jeffrey Nann

Matrix Codes	Samples From	Report / EDD Type (circle selections)			YORK Reg. Comp.
S - soil / solid	New York X	(Summary Report)	CT RCP	Standard Excel EDD	Compared to the following Regulation(s). (please fill in)
GW - groundwater	New Jersey	QA Report	CT RCP DQA/DUE	EQuIS (Standard)	
DW - drinking water	Connecticut	NY ASP A Package	NJDEP Reduced Deliverables	NYSDEC EQuIS	
WW - wastewater	Pennsylvania	NY ASP B Package		NJDEP SRP HazSite	
O - Oil ; Other	Other		NJDKQP	Other:	

Sample Identification	Sample Matrix	Date/Time Sampled	Analysis Requested	Container Description
EBES-1	DW	2-13-2020 7:45	1,4-Dioxane	1-1L Amber

Comments: East Broadway E.S.
751 Spagnoli Neck Rd
Seaford, NY 11783

Preservation: (check all that apply)
HCl ___ MeOH ___ HNO_3 ___ H_2SO_4 ___ NaOH ___ ZnAc ___
Ascorbic Acid ___ Other: $NaHSO_4$

Special Instruction
Field Filtered ___
Lab to Filter ___

Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time
JCB	2-13-2020 1145	K Buchanan	2/13/20 1145	K Buchanan	2/13/20 1720
Samples Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time
Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Received in LAB by	Date/Time / Temp. Received at Lab
				TC Hall	2/13/20 1720 / 2.5 Degrees C

Technical Report

prepared for:

J.C. Broderick
1775 North Express Drive
Hauppauge NY, 11788
Attention: Jeff Nannini

Report Date: 02/17/2020
Client Project ID: 20-45703-LRES
York Project (SDG) No.: 20B0467

Report Date: 02/17/2020
Client Project ID: 20-45703-LRES
York Project (SDG) No.: 20B0467

J.C. Broderick
1775 North Express Drive
Hauppauge NY, 11788
Attention: Jeff Nannini

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on February 13, 2020 with a temperature of 2.5 C. The project was identified as your project: **20-45703-LRES**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Sample and Analysis Qualifiers section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the Sample and Data Qualifiers Relating to This Work Order section of this report and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
20B0467-01	LRES-1	Drinking Water	02/13/2020	02/13/2020

General Notes for York Project (SDG) No.: 20B0467

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All analyses conducted met method or Laboratory SOP requirements. See the Sample and Data Qualifiers Section for further information.
6. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
7. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.
8. Analyses conducted at York Analytical Laboratories, Inc. Stratford, CT are indicated by NY Cert. No. 10854; those conducted at York Analytical Laboratories, Inc., Richmond Hill, NY are indicated by NY Cert. No. 12058.

Approved By: 

Date: 02/17/2020

Benjamin Gulizia
Laboratory Director

Sample Information

Client Sample ID: LRES-1 **York Sample ID:** 20B0467-01

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
20B0467	20-45703-LRES	Drinking Water	February 13, 2020 7:00 am	02/13/2020

Analyzed by: Phoenix Environmental Laboratories, Inc. S

1,4-Dioxane by GC/MS/SIM EPA 522 **Log-in Notes:** **Sample Notes:**

Sample Prepared by Method: EPA 3535A/EPA 522

CAS No.	Parameter	Result	Flag	Units	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
123-91-1	1,4-Dioxane	1.4		ug/L	0.2	1	EPA522	02/17/2020 00:00	02/17/2020 00:00	PHO

Certifications:

Sample and Data Qualifiers Relating to This Work Order

Definitions and Other Explanations

*	Analyte is not certified or the state of the samples origination does not offer certification for the Analyte.
ND	NOT DETECTED - the analyte is not detected at the Reported to level (LOQ/RL or LOD/MDL)
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
LOQ	LIMIT OF QUANTITATION - the minimum concentration of a target analyte that can be reported within a specified degree of confidence. This is the lowest point in an analyte calibration curve that has been subjected to all steps of the processing/analysis and verified to meet defined criteria. This is based upon NELAC 2009 Standards and applies to all analyses.
LOD	LIMIT OF DETECTION - a verified estimate of the minimum concentration of a substance in a given matrix that an analytical process can reliably detect. This is based upon NELAC 2009 Standards and applies to all analyses conducted under the auspices of EPA SW-846.
MDL	METHOD DETECTION LIMIT - a statistically derived estimate of the minimum amount of a substance an analytical system can reliably detect with a 99% confidence that the concentration of the substance is greater than zero. This is based upon 40 CFR Part 136 Appendix B and applies only to EPA 600 and 200 series methods.
Reported to	This indicates that the data for a particular analysis is reported to either the LOD/MDL, or the LOQ/RL. In cases where the "Reported to" is located above the LOD/MDL, any value between this and the LOQ represents an estimated value which is "J" flagged accordingly. This applies to volatile and semi-volatile target compounds only.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two. For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the LOD/MDL, with values between the LOD/MDL and the LOQ being "J" flagged as estimated results.

For analyses by EPA SW-846-8270D, the Limit of Quantitation (LOQ) reported for benzidine is based upon the lowest standard used for calibration and is not a verified LOQ due to this compound's propensity for oxidative losses during extraction/concentration procedures and non-reproducible chromatographic performance.

York Analytical Laboratories, Inc.
120 Research Drive, Stratford, CT 06615
132-02 89th Ave, Queens, NY 11418
clientservices@yorklab.com
www.yorklab.com

Field Chain-of-Custody Record

NOTE: YORK's Standard Terms & Conditions are listed on the back side of this document
This document serves as your written authorization for YORK to proceed with the analyses requested below
Your signature binds you to YORK's Standard Terms & Conditions

YORK Project No. 20130467

YOUR Information	Report To:	Invoice To:
Company: JC Broderick & Associates, Inc	Company: JCB	Company: JCB
Address: 1775 Expressway N. Hauppauge NY 11788	Address:	Address:
Phone: 631-584-5492	Phone:	Phone:
Contact: Jeffrey Nan	Contact:	Contact:
E-mail: JNan@JCBroderick.com	E-mail:	E-mail:

YOUR Project Number: 20-4570J-LRES

YOUR Project Name: Lee Road E.S.

YOUR PO#:

Turn-Around Time

RUSH - Next Day	X
RUSH - Two Day	
RUSH - Three Day	
RUSH - Four Day	
Standard (5-7 Day)	

Please print clearly and legibly. All information must be complete. Samples will not be logged in and the turn-around-time clock will not begin until any questions by YORK are resolved.

Jeffrey Nan

Samples Collected by: (print your name above and sign below)

Jeffrey Nan

Matrix Codes

S - soil / solid
GW - groundwater
DW - drinking water
WW - wastewater
O - Oil ⋮ Other

Samples From

New York	X
New Jersey	
Connecticut	
Pennsylvania	
Other	

Report / EDD Type (circle selections)

Summary Report	CT RCP	Standard Excel EDD
QA Report	CT RCP DQA/DUE	EQuIS (Standard)
NY ASP A Package	NJDEP Reduced Deliverables	NYSDEC EQuIS
NY ASP B Package		NJDEP SRP HazSite
	NJDKQP	Other:

YORK Reg. Comp.

Compared to the following Regulation(s): (please fill in)

Sample Identification	Sample Matrix	Date/Time Sampled	Analysis Requested	Container Description
LRES-1	DW	2-17-2020 7:00	1,4-Dioxane	1-1L Amber

Comments: Lee Road E.S.
901 Lee Road
Wantagh, NY 11793

Preservation: (check all that apply)
HCl ___ MeOH ___ HNO_3 ___ H_2SO_4 ___ NaOH ___ ZnAc ___
Ascorbic Acid ___ Other: $NaHSO_4$

Special Instruction
Field Filtered ___
Lab to Filter ___

Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time
Jeffrey Nan / JCB	2-17-2020 1145	K Bodycomb	2/13/20 1145	K Bodycomb	2/13/20 1720
Samples Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time
Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Received in LAB by	Date/Time / Temp. Received at Lab
				TC Gabel	2/13/20 1720 / 2.5 Degrees C

Technical Report

prepared for:

J.C. Broderick
1775 North Express Drive
Hauppauge NY, 11788
Attention: Jeff Nannini

Report Date: 02/17/2020
Client Project ID: 20-45703-MHS
York Project (SDG) No.: 20B0462

Report Date: 02/17/2020
Client Project ID: 20-45703-MHS
York Project (SDG) No.: 20B0462

J.C. Broderick
1775 North Express Drive
Hauppauge NY, 11788
Attention: Jeff Nannini

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on February 13, 2020 with a temperature of 2.5 C. The project was identified as your project: **20-45703-MHS**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Sample and Analysis Qualifiers section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the Sample and Data Qualifiers Relating to This Work Order section of this report and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
20B0462-01	MHS-1	Drinking Water	02/13/2020	02/13/2020

General Notes for York Project (SDG) No.: 20B0462

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All analyses conducted met method or Laboratory SOP requirements. See the Sample and Data Qualifiers Section for further information.
6. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
7. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.
8. Analyses conducted at York Analytical Laboratories, Inc. Stratford, CT are indicated by NY Cert. No. 10854; those conducted at York Analytical Laboratories, Inc., Richmond Hill, NY are indicated by NY Cert. No. 12058.

Approved By: 

Date: 02/17/2020

Benjamin Gulizia
Laboratory Director

Sample Information

Client Sample ID: MHS-1 **York Sample ID:** 20B0462-01

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
20B0462	20-45703-MHS	Drinking Water	February 13, 2020 6:30 am	02/13/2020

Analyzed by: Phoenix Environmental Laboratories, Inc. S

1,4-Dioxane by GC/MS/SIM EPA 522 **Log-in Notes:** **Sample Notes:**

Sample Prepared by Method: EPA 3535A/EPA 522

CAS No.	Parameter	Result	Flag	Units	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
123-91-1	1,4-Dioxane	1.1		ug/L	0.2	1	EPA522	02/17/2020 00:00	02/17/2020 00:00	PHO

Certifications:

Sample and Data Qualifiers Relating to This Work Order

Definitions and Other Explanations

*	Analyte is not certified or the state of the samples origination does not offer certification for the Analyte.
ND	NOT DETECTED - the analyte is not detected at the Reported to level (LOQ/RL or LOD/MDL)
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
LOQ	LIMIT OF QUANTITATION - the minimum concentration of a target analyte that can be reported within a specified degree of confidence. This is the lowest point in an analyte calibration curve that has been subjected to all steps of the processing/analysis and verified to meet defined criteria. This is based upon NELAC 2009 Standards and applies to all analyses.
LOD	LIMIT OF DETECTION - a verified estimate of the minimum concentration of a substance in a given matrix that an analytical process can reliably detect. This is based upon NELAC 2009 Standards and applies to all analyses conducted under the auspices of EPA SW-846.
MDL	METHOD DETECTION LIMIT - a statistically derived estimate of the minimum amount of a substance an analytical system can reliably detect with a 99% confidence that the concentration of the substance is greater than zero. This is based upon 40 CFR Part 136 Appendix B and applies only to EPA 600 and 200 series methods.
Reported to	This indicates that the data for a particular analysis is reported to either the LOD/MDL, or the LOQ/RL. In cases where the "Reported to" is located above the LOD/MDL, any value between this and the LOQ represents an estimated value which is "J" flagged accordingly. This applies to volatile and semi-volatile target compounds only.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
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If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two. For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the LOD/MDL, with values between the LOD/MDL and the LOQ being "J" flagged as estimated results.

For analyses by EPA SW-846-8270D, the Limit of Quantitation (LOQ) reported for benzidine is based upon the lowest standard used for calibration and is not a verified LOQ due to this compound's propensity for oxidative losses during extraction/concentration procedures and non-reproducible chromatographic performance.

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120 Research Drive Stratford, CT 06615
132-02 89th Ave Queens, NY 11418
clientservices@yorklab.com
www.yorklab.com

Field Chain-of-Custody Record

NOTE: YORK's Standard Terms & Conditions are listed on the back side of this document.
This document serves as your written authorization for YORK to proceed with the analyses requested below.
Your signature binds you to YORK's Standard Terms & Conditions.

YORK Project No. 20B0462

YOUR Information	Report To:	Invoice To:
Company: JCB Broadway Assembly, Inc	Company: JCB	Company: JCB
Address: 1775 Express Dr. N Maryland, NY 11788	Address:	Address:
Phone: 631.584-5492	Phone:	Phone:
Contact: Jeffrey Nanni	Contact:	Contact:
E-mail: JNanni@JCBroadway.com	E-mail:	E-mail:

YOUR Project Number: 20-45703-MHS

YOUR Project Name: MacArthur H.S.

YOUR PO#:

Turn-Around Time

RUSH - Next Day	X
RUSH - Two Day	
RUSH - Three Day	
RUSH - Four Day	
Standard (5-7 Day)	

Please print clearly and legibly. All information must be complete. Samples will not be logged in and the turn-around-time clock will not begin until any questions by YORK are resolved.

Samples Collected by: (print your name above and sign below)
Jeffrey Nanni
Jeffrey Nanni

Matrix Codes

S - soil / solid
GW - groundwater
DW - drinking water
WW - wastewater
O - Oil ; Other

Samples From

New York	X
New Jersey	
Connecticut	
Pennsylvania	
Other	

Report / EDD Type (circle selections)

Summary Report	CT RCP	Standard Excel EDD
QA Report	CT RCP DQA/DUE	EQuIS (Standard)
NY ASP A Package	NJDEP Reduced Deliverables	NYSDEC EQuIS
NY ASP B Package	NJDKQP	NJDEP SRP HazSite
		Other:

YORK Reg. Comp.
Compared to the following Regulation(s): (please fill in)

Sample Identification	Sample Matrix	Date/Time Sampled	Analysis Requested	Container Description
MHS-1	DW	2-13-2020/0730	1,4-Dioxane	1-1L Amb

Comments:
MacArthur H.S.
3249 Jerusalem Ave
Levittown, NY 11756

Preservation: (check all that apply)
HCl ___ MeOH ___ HNO3 ___ H2SO4 ___ NaOH ___ ZnAc ___
Ascorbic Acid ___ Other: NaHSO4

Special Instruction
Field Filtered ____
Lab to Filter ____

Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time
JCB	2-13-2020 1145 Am		2/13/20 1145 Am		2/13/20 1720
Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time
Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Received in LAB by	Date/Time
				TC Hall	2/13/20 1720

Temp. Received at Lab: 2.5 Degrees C

Technical Report

prepared for:

J.C. Broderick
1775 North Express Drive
Hauppauge NY, 11788
Attention: Jeff Nannini

Report Date: 02/17/2020
Client Project ID: 20-45703-SMS
York Project (SDG) No.: 20B0471

Report Date: 02/17/2020
Client Project ID: 20-45703-SMS
York Project (SDG) No.: 20B0471

J.C. Broderick
1775 North Express Drive
Hauppauge NY, 11788
Attention: Jeff Nannini

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on February 13, 2020 with a temperature of 2.5 C. The project was identified as your project: **20-45703-SMS**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Sample and Analysis Qualifiers section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the Sample and Data Qualifiers Relating to This Work Order section of this report and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
20B0471-01	SMS-1	Drinking Water	02/13/2020	02/13/2020

General Notes for York Project (SDG) No.: 20B0471

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All analyses conducted met method or Laboratory SOP requirements. See the Sample and Data Qualifiers Section for further information.
6. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
7. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.
8. Analyses conducted at York Analytical Laboratories, Inc. Stratford, CT are indicated by NY Cert. No. 10854; those conducted at York Analytical Laboratories, Inc., Richmond Hill, NY are indicated by NY Cert. No. 12058.

Approved By: 

Date: 02/17/2020

Benjamin Gulizia
Laboratory Director

Sample Information

Client Sample ID: SMS-1 **York Sample ID:** 20B0471-01

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
20B0471	20-45703-SMS	Drinking Water	February 13, 2020 6:45 am	02/13/2020

Analyzed by: Phoenix Environmental Laboratories, Inc. S

1,4-Dioxane by GC/MS/SIM EPA 522 **Log-in Notes:** **Sample Notes:**

Sample Prepared by Method: EPA 3535A/EPA 522

CAS No.	Parameter	Result	Flag	Units	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
123-91-1	1,4-Dioxane	1.2		ug/L	0.2	1	EPA522	02/17/2020 00:00	02/17/2020 00:00	PHO

Certifications:

Sample and Data Qualifiers Relating to This Work Order

Definitions and Other Explanations

*	Analyte is not certified or the state of the samples origination does not offer certification for the Analyte.
ND	NOT DETECTED - the analyte is not detected at the Reported to level (LOQ/RL or LOD/MDL)
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
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LOD	LIMIT OF DETECTION - a verified estimate of the minimum concentration of a substance in a given matrix that an analytical process can reliably detect. This is based upon NELAC 2009 Standards and applies to all analyses conducted under the auspices of EPA SW-846.
MDL	METHOD DETECTION LIMIT - a statistically derived estimate of the minimum amount of a substance an analytical system can reliably detect with a 99% confidence that the concentration of the substance is greater than zero. This is based upon 40 CFR Part 136 Appendix B and applies only to EPA 600 and 200 series methods.
Reported to	This indicates that the data for a particular analysis is reported to either the LOD/MDL, or the LOQ/RL. In cases where the "Reported to" is located above the LOD/MDL, any value between this and the LOQ represents an estimated value which is "J" flagged accordingly. This applies to volatile and semi-volatile target compounds only.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
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Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two. For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the LOD/MDL, with values between the LOD/MDL and the LOQ being "J" flagged as estimated results.

For analyses by EPA SW-846-8270D, the Limit of Quantitation (LOQ) reported for benzidine is based upon the lowest standard used for calibration and is not a verified LOQ due to this compound's propensity for oxidative losses during extraction/concentration procedures and non-reproducible chromatographic performance.

York Analytical Laboratories, Inc.
120 Research Drive Stratford, CT 06615
132-02 89th Ave Queens, NY 11418
clientservices@yorklab.com
www.yorklab.com

Field Chain-of-Custody Record

NOTE: YORK's Standard Terms & Conditions are listed on the back side of this document.
This document serves as your written authorization for YORK to proceed with the analyses requested below. .
Your signature binds you to YORK's Standard Terms & Conditions.

YORK Project No. 20B0471

YOUR Information	Report To:	Invoice To:	YOUR Project Number	Turn-Around Time
Company: JC Babcock & Associates, Inc	Company: JCB	Company: JCB	20-45703-SMS	RUSH - Next Day X
Address: 1775 Expressway Dr. N Melville, NY 11780	Address:	Address:	YOUR Project Name: Salk MS	RUSH - Two Day
Phone: 631-594-5442	Phone:	Phone:		RUSH - Three Day
Contact: Jeffry Nanna	Contact:	Contact:		RUSH - Four Day
E-mail: JNanna@JCBabcock.com	E-mail:	E-mail:	YOUR PO#:	Standard (5-7 Day)

Please print clearly and legibly. All information must be complete. Samples will not be logged in and the turn-around-time clock will not begin until any questions by YORK are resolved.

Jeffry Nanna

Samples Collected by: (print your name above and sign below)

Matrix Codes: S - soil / solid; GW - groundwater; DW - drinking water; WW - wastewater; O - Oil ; Other

Samples From: New York X; New Jersey; Connecticut; Pennsylvania; Other

Report / EDD Type (circle selections): Summary Report; QA Report; NY ASP A Package; NY ASP B Package; CT RCP; CT RCP DQA/DUE; NJDEP Reduced Deliverables; NJDKQP; Standard Excel EDD; EQuIS (Standard); NYSDEC EQuIS; NJDEP SRP HazSite; Other:

YORK Reg. Comp.: Compared to the following Regulation(s): (please fill in)

Sample Identification	Sample Matrix	Date/Time Sampled	Analysis Requested	Container Description
SMS-1	DW	7.13.2020 / 0945	1,4-Dioxane	1-1L Amber

Comments: Salk MS.
3754 Old Jerusalem Rd
Lee Town, NY 11756

Preservation: (check all that apply)
HCl ___ MeOH ___ HNO_3 ___ H_2SO_4 ___ NaOH ___ ZnAc ___
Ascorbic Acid ___ Other: $NaHSO_4$

Special Instruction: Field Filtered ____ Lab to Filter ____

Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time
JCB	7-13-2020 1145 AM	KBabcock	7/13/20 11:45 AM	KBabcock	7/13/20 1720
Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time
Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Received in LAB by	Date/Time / Temp. Received at Lab
				TC	7/13/20 1720 / 2.5 Degrees C