Appendix H

Hazardous Building Material Survey

CDM
Smith

West Side WWTP

May 29, 2020

D. Craig Wagner, PE, BCEE
CDM Smith
77 Hartland Street, Suite 201
East Hartford, Connecticut 06108

Re: Hazardous Building Materials Survey Report
City of Bridgeport West Plant Wastewater Treatment Facility
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Dear Mr. Wagner:

Eolas Environmental, LLC (Eolas) has prepared this letter report to summarize the results of the Hazardous Building Materials (HBM) survey of the structures located at the City of Bridgeport West Plant Wastewater Treatment Facility located at 205 Bostwick Avenue in Bridgeport, Connecticut (herein referred to as the “Site” or “West Plant”). The on-site survey activities were conducted on February 18, 19 and 20, 2020; were completed to physically assess the structures’ building materials for the presence of asbestos, lead, and polychlorinated biphenyls (PCBs); and were completed to obtain an inventory of miscellaneous building materials that may require special handling and/or disposal at the time of building renovation and/or demolition.

It is our understanding that ATC Associates Inc. (ATC) completed asbestos and lead paint testing of the Incinerator/Sludge Handling building and Gravity Thickener Tank Area (Pump House Rooms) at the Site in 2010. Asbestos containing materials (ACM) were identified in the Incinerator Room, Second Floor Level, Elevator Room, and Exterior. Lead paint was identified on Yellow Concrete Flooring of the Pump House at the Site. The exact locations of the identified lead and ACM were not specified in the report

Based on the above and in accordance with our scope of services, the February 2020 assessment was completed with the goal of quantifying building materials for asbestos, lead, PCBs, and miscellaneous HBM. The assessment included the collection and analysis of select building materials for the presence of asbestos and PCBs; a lead-based paint screening of building surfaces using X-Ray Fluorescence (XRF) instrumentation; and a visual inventory of miscellaneous HBM (e.g. batteries, light ballasts, fluorescent bulbs, miscellaneous drums, and containers).

Floor plans that depict the layout of the building and sample locations are included in Attachment A of this letter report. Tabulated summaries of the various HBM identified at the Site are included in Attachments B through E of this letter report. Laboratory analytical reports are included in Attachment F.

1.0 FIELD SURVEY ACTIVITIES

1.1 Asbestos Containing Materials

The asbestos survey included a visual and physical assessment of safely accessible suspect ACM, and the bulk sampling of representative building materials by Kimberly M. Walsh, a State of Connecticut Licensed Asbestos Inspector (#000580). A copy of Ms. Walsh's license is included in Attachment G. The visual assessment involved observations of accessible interior and exterior areas of each site building to identify homogeneous areas of suspect ACM. A homogeneous area includes building materials that appear similar in color, texture, and date of application/installation. The physical assessment of suspect building materials involved an evaluation of the condition and friability of the materials. The term friable is defined by the United States Environmental Protection Agency (EPA) as a material that can be crumbled, pulverized, or reduced to powder by hand pressure. Materials that are inaccessible must be assumed to be ACM until such time access is available and laboratory analysis is performed to determine asbestos content.

The survey and bulk sampling was conducted in general accordance with the methods prescribed in the EPA guidance document entitled, *Guidance for Controlling Asbestos-Containing Materials in Buildings* (Document No. 560/5-85/024) and in general accordance with 40 CFR Part 763, the Asbestos Hazard Emergency Response Act (AHERA). In addition, the asbestos survey was conducted, in part, to support compliance with Subpart M of 40 CFR Part 61, the EPA National Emission Standard for Hazardous Air Pollutants Act (NESHAP) as amended November 10, 1990, and state and local permitting requirements for renovation and demolition. The NESHAP final rule requires the identification and removal of all regulated ACM in a building prior to demolition or renovation. In order to comply with the EPA renovation/demolition rules, additional representative sampling of materials to be disturbed must be performed since this survey was limited to sampling of safely accessible materials.

The AHERA stipulates the number of samples and types of asbestos materials to be sampled. Material types are classified into one of three EPA-defined categories, sampled in accordance with recommended protocols and guidance documents, and quantified in linear or square footage. The three categories of suspect ACM include thermal system insulation (TSI) (e.g. pipe insulation, pipe fittings, boiler insulation, etc.), surfacing materials (spray-applied fireproofing, ceiling and wall plaster, etc.), and miscellaneous materials (e.g. floor and ceiling tiles, wallboard, etc.). TSI includes those materials that are typically used for the prevention of heat loss or gain or water condensation on mechanical systems. Surfacing ACM includes all ACM that is sprayed-on, troweled-on or otherwise applied to an existing surface, and miscellaneous materials include all ACM not listed in thermal or surfacing category. The Occupational Safety and Health Administration (OSHA) further defines a presumed ACM (PACM) as TSI and surfacing material found in buildings constructed no later than 1980.

Samples that were collected as part of this inspection were collected by licensed personnel using proper safety measures including the use of appropriate personal protective equipment (PPE) (i.e. respirator, gloves, eye protection), wetting surfaces prior to sample collection, and cleaning the area following sample collection. Coring tools and knives were used to penetrate materials to be sampled and samples were placed into labeled, airtight containers under chain-of-custody control for shipment to the laboratory for analysis.

A total of 59 samples were collected for possible asbestos analysis during the inspection. Destructive sampling of roofing materials was not included as part of this survey; readily accessible roofing materials that would not require destructive sampling were collected. It should be noted that additional materials may be present in the site buildings that were inaccessible and could not be sampled as part of this survey. Additional sampling may be necessary to fully characterize potential ACM in the buildings (e.g. elevator brake shoes, electrical wiring, fire doors, electrical panel jacketing, vermiculite filled concrete block, etc.). Following the collection of samples from representative building materials, Eolas transferred the samples to a Connecticut Department of Public Health (DPH)-approved laboratory, EMSL Analytical, Inc. for analysis by Polarized Light Microscopy (PLM). PLM is the EPA-accepted method (EPA Method 600/R-93/116) of analysis for identification of asbestos in bulk matrices. A sample set is systematically analyzed until one sample is determined to contain asbestos. Upon determination that one sample in the set contains asbestos, analysis of the remaining samples in the set is discontinued. If no asbestos was observed during analysis of the set of samples, the suspect material is determined to be negative for asbestos content. A single sample of certain suspect materials are collected where appropriate. Sample analysis results are reported in percentage of asbestos and non-asbestos components. The EPA defines any material that contains greater than one percent asbestos (1%), utilizing PLM, as being ACM. Any material determined to contain >1% asbestos is regulated by the EPA, DPH, the Connecticut Department of Energy and Environmental Protection (CTDEEP), and the United States Department of Labor. OSHA regulates materials found to be less than or equal to 1% asbestos, per 29 CFR 1926.1101.

No asbestos was reported in the samples submitted for laboratory analysis.

Asbestos sampling locations are depicted on floor plans included in Attachment A. A summary of the samples collected for asbestos content during this survey and respective results is provided in Table 1 included in Attachment B. The laboratory analytical reports associated with this survey are included in Attachment F.

1.2 Lead-Based Paint

A lead-based paint (LBP) inspection of the site buildings was completed by Alexander K. Clarke, a State of Connecticut Licensed Lead Inspector (#002217). A copy of Mr. Clarke’s license is included in Attachment G. Painted surfaces were tested in a random manner using a Protec LPA-1B X-Ray Fluorescence (XRF) Lead Paint Spectrum Analyzer, serial #3690. A reading of 1.0 milligrams lead per square centimeter of surface area (1.0 mg/cm^2) or greater is defined as a toxic level of lead by the State of Connecticut Department of Public Health (DPH), *Regulations for Lead Poisoning Prevention and Control*, Section 19a-111-1a of the Regulations of Connecticut State Agencies (RCSA). In accordance with OSHA, any result of lead constitutes the material is lead-containing. Lead-based paint was detected in the following building components at the Site:

- Control Building, Basement – Yellow-painted wall.
- Pipe Gallery - Green-painted wall.
- Pump Station, Foyer and Room 105 – Blue-painted walls.

In addition to the above, testing of several additional locations yielded a result of 1.0 mg/cm^2 with an inconclusive measurement. An inconclusive measurement is a reading within the tolerance limits of the XRF instrument and a measurement within this tolerance cannot be confirmed to contain LBP without additional laboratory testing. The locations which yielded positive LBP results and the inconclusive measurements of 1.0 mg/cm^2 are depicted on site floor plan figures included in Attachment A. The results of the XRF screening survey are provided in Table 2A through 2I, included in Attachment C.

1.3 Polychlorinated Biphenyls

As part of the HBM survey, five representative building samples (e.g. window glazing, caulk, paint) were collected and submitted for analysis for PCBs using EPA Method 8082 extracted using Soxhlet method 3540 by Phoenix Environmental Laboratories (Phoenix), Inc., a State of Connecticut DPH-approved laboratory. PCBs were reported above laboratory detection limits in three of five samples collected from the Site as follows.

SAMPLE ID:	BUILDING	LOCATION	PCB	RESULT (mg/kg)
RSPCB-001	Control Building	Green Paint Return Sludge Pump Room	Aroclor 1254	2.7
SB-102-PCB	Screen Building	Room 102 Tan Caulk	Aroclor 1254	3.2
PS-104-PCB	Pump Station	Blue Paint on Foyer Wall	Aroclor 1260	9,300*

* Due to matrix interferences, dilution of this sample was required, resulting in a laboratory reporting limit of 770 mg/kg.

It should be noted, building samples collected for PCB analysis were received by the analytical laboratory after the analytical method holding time, due to a courier shipment error. While the analytical method holding time was exceeded, the data is expected to be representative of the PCB concentrations in the building materials samples based on the following. No preservation is necessary at the time of sample collection and, therefore, potential changes resulting from sample contact with a preservative could not occur. Further, PCBs are classified as a persistent organic pollutant and, therefore, degradation of PCBs in the building materials samples subsequent to collection is unlikely to have occurred. PCB sample locations are depicted on floor plans included in Attachment A. A summary of the samples collected for PCB analysis during this survey is provided in Table 3 included in Attachment D. The laboratory analytical reports are included in Attachment F.

1.4 Miscellaneous Building Materials

As part of this HBM survey, an Eolas representative visually inspected the site buildings for the presence of miscellaneous building components that may contain mercury, PCBs, Freon®, or other HBM that may require special handling and disposal at the time of building renovation and/or demolition. This component of the survey included a visual inspection of lamps potentially containing mercury vapor and switches potentially containing liquid mercury, electrical devices that have the potential to contain capacitors or transformers housing PCB-containing oil, electronic equipment such as refrigerators, copiers, and portable air conditioning units that may contain Freon®, and other miscellaneous equipment that may contain HBM.

The inventory of miscellaneous HBM at the Site is summarized in Table 4 included in Attachment E.

2.0 REGULATORY OVERVIEW

2.1 Asbestos

The EPA, OSHA, CTDEEP, and DPH regulate the inspection, management, and/or disposal of asbestos in buildings. The owner or operator of a facility must provide the DPH with written notification of planned removal activities at least 10 days prior to the commencement of asbestos abatement activities. The abatement of ACM must be performed by Connecticut-licensed asbestos abatement contractor(s) in accordance with project design requirements prepared by a DPH-licensed Project Designer. Third-party air monitoring must be conducted at the completion of certain abatement activities. Management plans developed for the in-place management of ACM must be developed by a DPH-licensed Management Planner.

Notification requirements to the EPA apply whenever the threshold of asbestos to be abated is equal to or greater than 160 square feet, 260 linear feet or 35 cubic feet for renovations and for all demolitions, even when there is no asbestos present. The EPA requires 10 working days for notification. EPA notification lists information not presently included on the Connecticut notification form. EPA requires notification for renovation or demolition in a NESHAP–defined facility, regardless of the amount of ACM to be abated, down to zero asbestos present. The requirement to notify the EPA, in addition to the DPH, became effective in Connecticut on December 14, 2017.

OSHA regulates workplace exposure to asbestos through the asbestos standard for general industry (29 CFR 1910.1001) and asbestos standard for construction (29 CFR 1926.1101). Within these standards, OSHA established several provisions employers must follow to comply with the asbestos standards including, but not necessarily limited to, strict exposure limits and guidelines for exposure monitoring, medical surveillance, recordkeeping, identification of regulated areas, and communication of hazards. Additionally, the construction standard classifies construction and maintenance activities that could disturb ACM and specifies work practices and precautions that employers must follow when engaging in each class of regulated work.

2.2 Lead-Based Paint

The EPA regulates the use, removal, and disposal of lead through the administration and implementation of multiple laws including, but not necessarily limited to, the Toxic Substances Control Act (TSCA), Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X), Clean Air Act, Clean Water Act, Safe Drinking Water Act, Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The EPA defines lead-based paint (LBP) as paint or other surface coatings that contain lead equal to or greater than 1.0 mg/cm^2, 5,000 milligrams per kilogram (mg/kg), or 0.5 percent by dry weight as calculated by laboratory analysis.

OSHA defines lead as metallic lead, all inorganic lead compounds, and organic lead soaps and, does not define LBP based on content. Rather, any detectable level of lead in paint makes it LBP for the purposes of complying with OSHA regulations to determine worker exposure. The OSHA Lead Standard for Construction (29 CFR 1926.62) applies to all construction work where an employee may be occupationally exposed to lead, including all work related to construction, alteration, and/or repair. Employers are responsible for ensuring that no employee will be exposed, without adequate protection, to lead at concentrations greater than the permissible exposure limit (PEL) of 50 micrograms per cubic meter (ug/m^3) averaged over an 8-hour period. The OSHA standard also establishes an action level (AL) of 30 ug/m^3 which, if exceeded, triggers certain requirements including periodic exposure and medical monitoring.

If components of a building targeted for renovation or demolition contain toxic levels of LBP, a Toxicity Characteristic Leaching Procedure (TCLP) analysis needs to be conducted to determine whether debris generated from renovation or demolition should be disposed of as hazardous waste or construction debris. The EPA has established a threshold of 5 milligrams per liter (mg/l); therefore, if the results of TCLP analysis are greater than 5 mg/l, demolition debris must be disposed of as a hazardous waste. If the results of TCLP analysis are less than 5 mg/l, demolition waste can be disposed of as nonhazardous construction debris.

2.3 Polychlorinated Biphenyls

PCBs are a class of anthropogenic chemicals and do not occur naturally in the environment. PCBs were first manufactured commercially in 1929 and were used in a variety of products including, but not limited to, hydraulic fluid, casting wax, pigments, carbonless copy paper, plasticizer, caulks, adhesives, mastics, sealants, vacuum pumps, compressors, and heat transfer systems. PCBs were added to the dielectric fluid in electrical equipment because of the stability and resistance to thermal breakdown, and insulating properties. PCBs were also a common additive to caulk due to the water and chemical resistance, durability, and elasticity characteristics, and were commonly used to seal masonry unit and window joints. PCBs have been documented to leach into existing building substrate materials (brick and concrete) adjacent to suspect PCB materials. The manufacture of PCBs was banned by the EPA in 1979.

PCBs are federally regulated under Title 40 Part 761 of the Code of Federal Regulations (CFR) and Section 22a-463 through 22a-469a of the Connecticut General Statues (CGS). The CTDEEP has developed a guidance table in conjunction with EPA Region 1 that compares remediation and disposal options for caulk and materials contaminated with PCBs and associated substrates. Although specific to caulk, the CTDEEP has indicated the guidance table may generally be applied to other building materials that contain PCBs.

2.4 Miscellaneous Hazardous Building Materials

Miscellaneous HBM at the Site which may include light ballasts, wet-type transformers, electrical switches, capacitors; mercury-containing equipment such as vapor lighting (vapor light tubes), pressure switches, thermostats (thermostatic controls), boiler gauges, and pump/motor tilt switches; and compressors, coolers, freezers, and HVAC equipment that may contain chlorofluorocarbons (CFCs) may require special handling and/or disposal at a permitted facility at the time of building renovation and/or demolition. The majority of fluorescent light ballasts manufactured prior to 1979 contained PCBs and approximately 25 percent of ballasts manufactured after 1979 contained di-ethyl hexyl phthalate (DEHP). Light ballasts, manufactured after July 1, 1978, are required to be marked as non-PCB containing and those that do not possess such a label are generally assumed to contain PCBs at concentrations greater than 50 ppm. The disposal of PCB-containing and DEHP-containing ballasts in landfills is prohibited.

Similarly, miscellaneous HBM waste that contains mercury and CFCs may not be disposed of in a landfill. Depending on the type of HBM waste, materials may require recycling or incineration at a licensed facility.

3.0 SUMMARY AND CONCLUSIONS

Eolas performed an HBM survey of the site buildings to determine whether HBM are present and in quantities that would require special management and/or disposal at the time of building renovation and/or demolition. A summary of the findings is presented below.

3.1 Asbestos

No asbestos was identified in building materials sampled as part of this survey. Historical asbestos survey work has identified the presence of ACM in certain building materials. Prior to conducting renovation and/or demolition work in the site buildings, Eolas recommends completion of a destructive, comprehensive survey of targeted work areas or buildings be performed in accordance with NESHAP regulations and to supplement the findings of this survey. Where renovation and/or demolition have the potential to affect ACM, a State of Connecticut licensed Project Designer should prepare asbestos abatement technical specifications in order to solicit competitive bids for the removal of identified ACM. Notification of renovation, demolition, and/or abatement must be made to the DPH (or EPA, if applicable) at least 10 working days prior to the commencement of asbestos abatement activities. Following abatement, visual inspections and final air clearance sampling is required in certain abatement areas at the completion of the abatement work. The visual inspections and final air clearance sampling must be performed by a State of Connecticut licensed Project Monitor. The abatement areas must meet final visual inspection and final air clearance sampling criteria prior to the abatement area being reoccupied or re-entered.

OSHA regulations require that building owners communicate asbestos hazards to building occupants. Eolas recommends the preparation and implementation of an Asbestos Operations & Maintenance (O&M) program for ACM identified in the buildings. The O&M program should be supplemented with Asbestos Awareness training which is required for employees whose work activities may contact ACM or PACM but, who do not disturb ACM/PACM during their work activities. Asbestos Awareness training is an annual requirement.

3.2 Lead

Lead-based paint was detected in the several building components at the Site, including in the Control **Building Basement (yellow painted walls), Pipe Gallery (green painted walls), and Pump Station (blue painted walls in Foyer and Room 105)**. Several additional locations yielded an inconclusive testing result of 1.0 mg/cm^2, additional laboratory testing would be necessary to confirm whether LBP is present. Metal building materials that contain lead (e.g. fire doors, beams) will likely meet metal recycling criteria. Other lead-containing materials may be managed using guidance in the CTDEEP *Guidance for the Management and Disposal of Lead-Contaminated Material Generated in the Lead Abatement, Renovation, and Demolition Industries* at the time of demolition. Additional characterization of building materials, including collection and analysis of building materials samples for lead following TCLP, should be completed to determine proper waste segregation and compliance with EPA and CTDEEP waste disposal regulations.

Workers who perform renovation or demolition work should be trained and protected in accordance with OSHA regulation 29 CFR 1926.62. Employees who may be occupationally exposed to lead should be trained in personal protection and proper work practice procedures in accordance with OSHA regulations.

3.3 Polychlorinated Biphenyls

PCBs were detected in three of the five samples collected from the buildings, two of which were at concentrations below 50 mg/kg. In one instance, PCBs were reported at a concentration of 9,300 mg/kg in the light blue wall paint in the Pump Station. Additional sampling and analysis of building materials for the presence of PCBs is warranted to fully characterize these materials for the presence of PCBs. For those materials that contain PCBs at concentrations less than 50 mg/kg, the following CTDEEP guidance should be followed:

- **Renovation** – Remove caulk and test substrate. If substrate concentrations exceed 1 mg/kg, implement an interim measure of sealing and encapsulating the substrate and obtain an annual exemption, or remove the >1 mg/kg substrate.

- **Non-Renovation** – Seal and encapsulate, establish plan to address at a later date, and perform annual monitoring to validate effectiveness of encapsulant. Removal is recommended. Test substrate and if >1 mg/kg, establish plan to address at a later date.

- **Full Demolition** – Remove caulk and test substrate. If substrate is >1 mg/kg and <49 mg/kg, dispose of substrate at a RCRA Title D solid waste landfill, a bulky waste facility, a facility permitted to manage non-hazardous waste subject to 40 CFR 257.5 – 257.30, or a RCRA hazardous waste landfill.

For those materials containing PCBs at concentrations greater than or equal to 50 mg/kg, the following CTDEEP guidance should be followed:

- **Renovation/Non-Renovation/Full Demolition** – Remove all caulk and test substrate. If substrate concentrations exceed 1 mg/kg, remediate per 40 CRF 761.61 and 761.62. Wastes should be disposed of at a RCRA hazardous waste landfill, a TSCA-approved disposal facility, a solid waste landfill permitted under 40 CFR Part 258, or facility permitted to manage non-hazardous waste subject to 40 CFR 257.5-257.30.

3.4 Miscellaneous Hazardous Building Materials

With respect to miscellaneous HBM at the site, these materials should be properly containerized, managed, and disposed of according to their specific waste characterization and prevailing local, state and federal disposal regulations. A Connecticut-licensed waste vendor must be retained to properly consolidate, containerize, and remove the miscellaneous HBM from the Site.

We thank you for the opportunity to provide these services to you. If you have any questions regarding this project, please contact me at (860) 990-1827 or via email at kimberly@eolasenv.com.

Sincerely,
EOLAS ENVIRONMENTAL, LLC

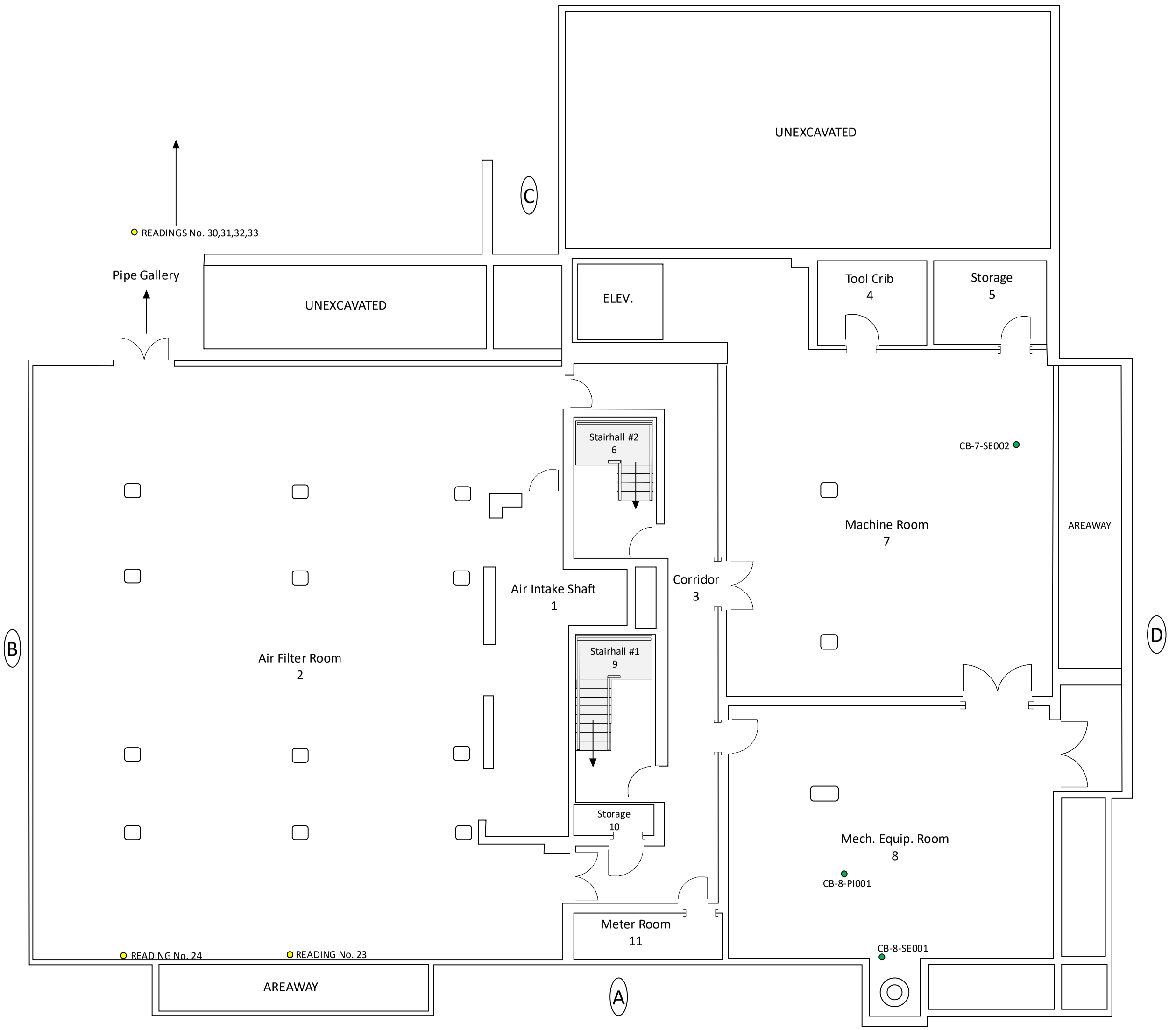
Kimberly M. Walsh, L.E.P.
Owner

Attachments

ATTACHMENTS

ATTACHMENT A

FIGURES



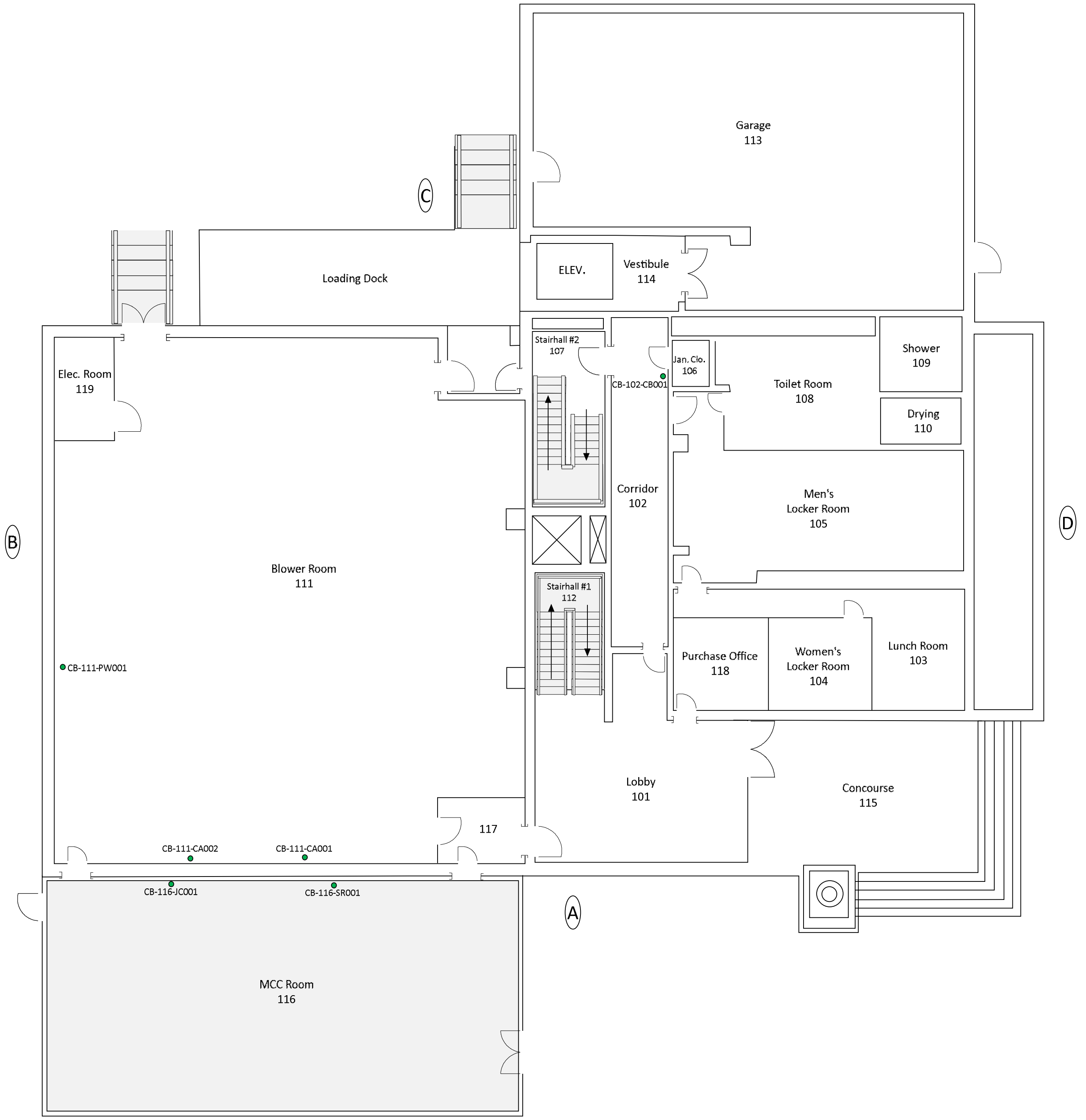
LEGEND:

- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ■ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

CONTROL BUILDING
BASEMENT



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LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
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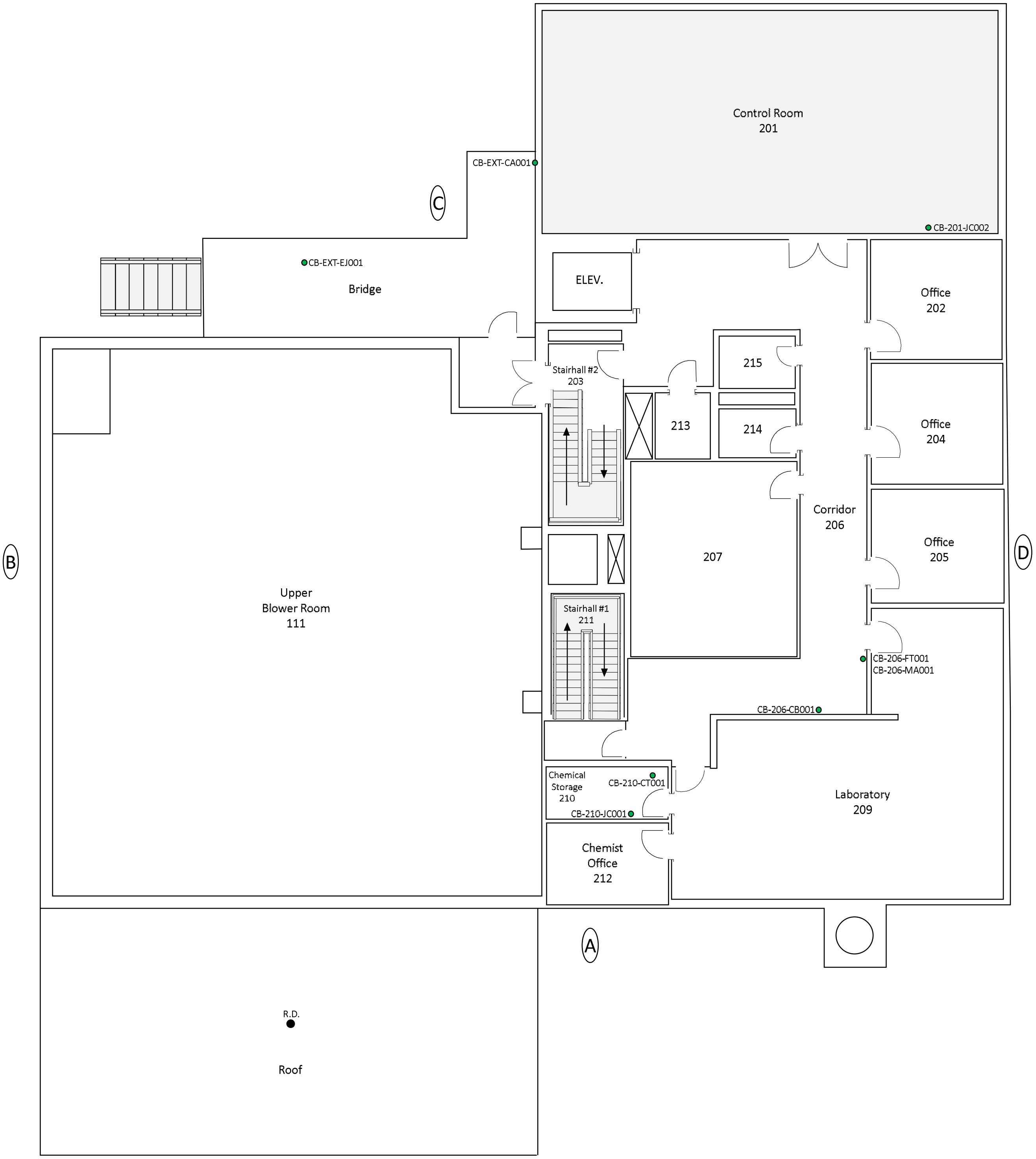
eolas environmental LLC

CONTROL BUILDING
FIRST FLOOR



LEGEND

🔴 Asbestos Positive
🔵 PCB Sample
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▨ MCC Access Floor
🟡 Lead Positive
▭ Window

N

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SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
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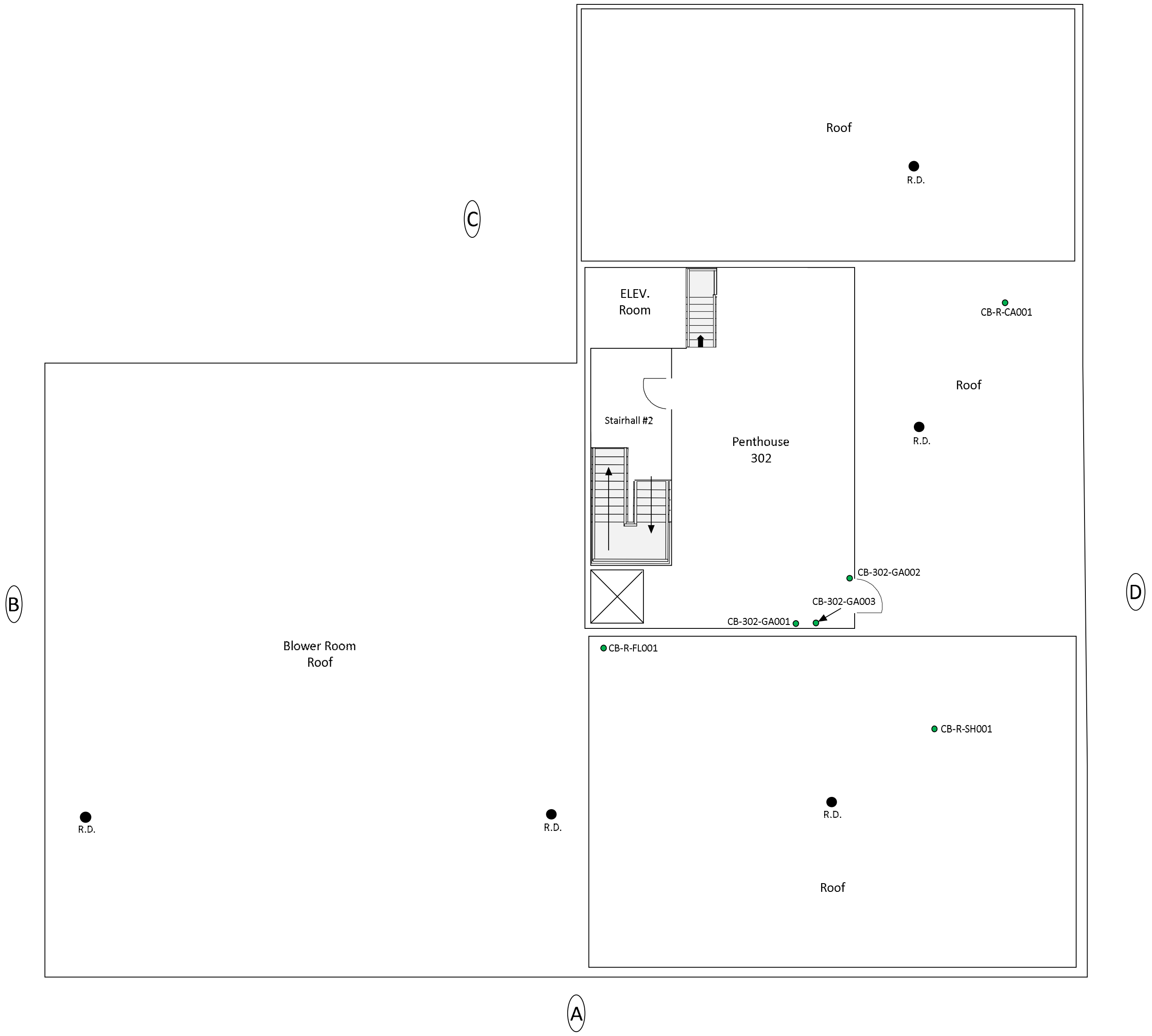
CONTROL BUILDING
SECOND FLOOR



LEGEND

🔴 Asbestos Positive
🟢 Asbestos Non-Detect
🟡 Lead Positive
🔵 PCB Sample
▨ MCC Access Floor
▭ Window

N

PROJECT: Hazardous Building Materials Survey

LOCATION: 205 Bostwick Avenue, Bridgeport, CT

SOURCE: Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992

SCALE: NTS

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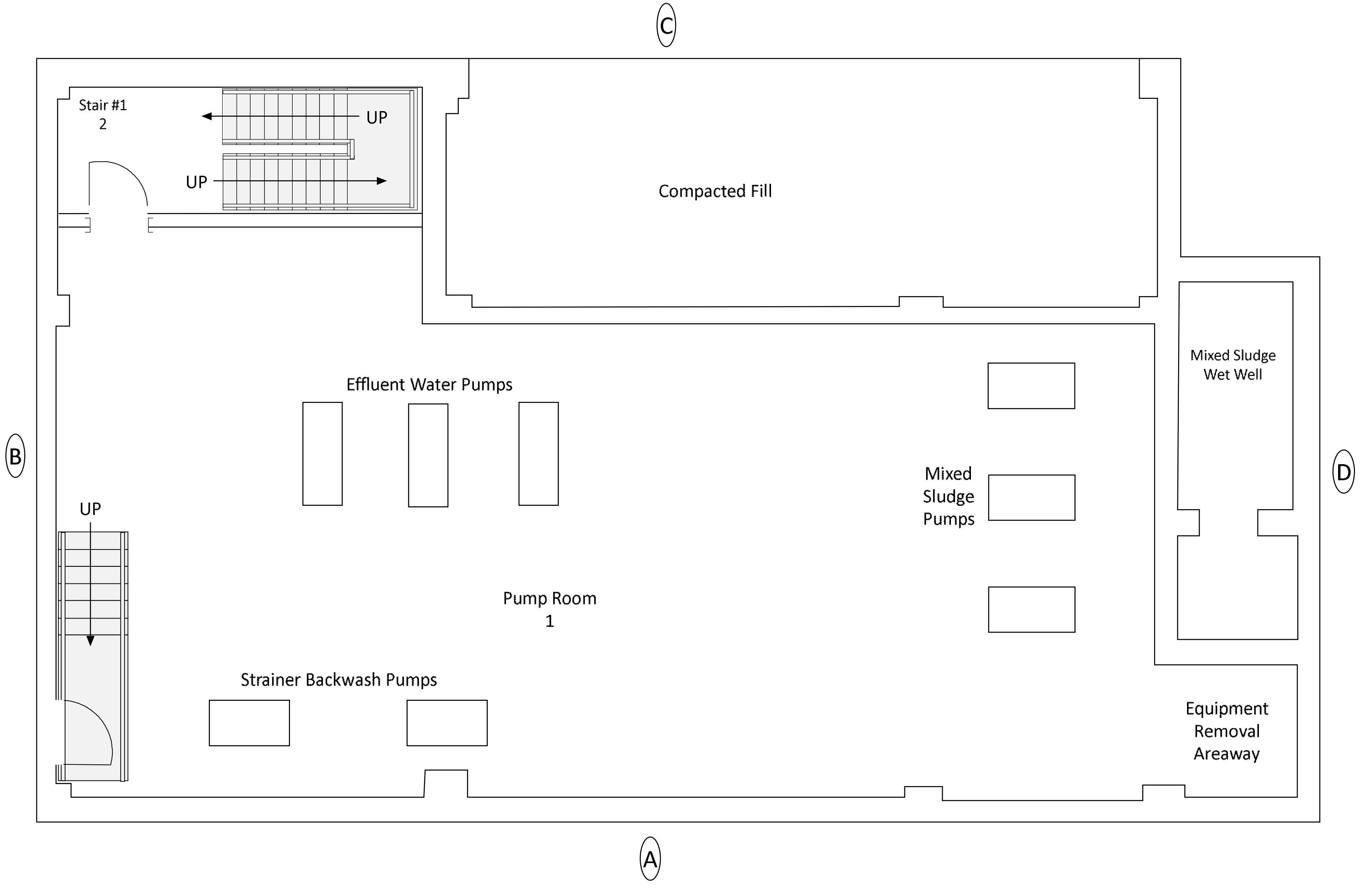
CONTROL BUILDING PENTHOUSE AND ROOF



LEGEND:

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- ▨ MCC Access Floor
- ▭ Window

N

PROJECT: Hazardous Building Materials Survey

LOCATION: 205 Bostwick Avenue, Bridgeport, CT

SOURCE: Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992

SCALE: NTS

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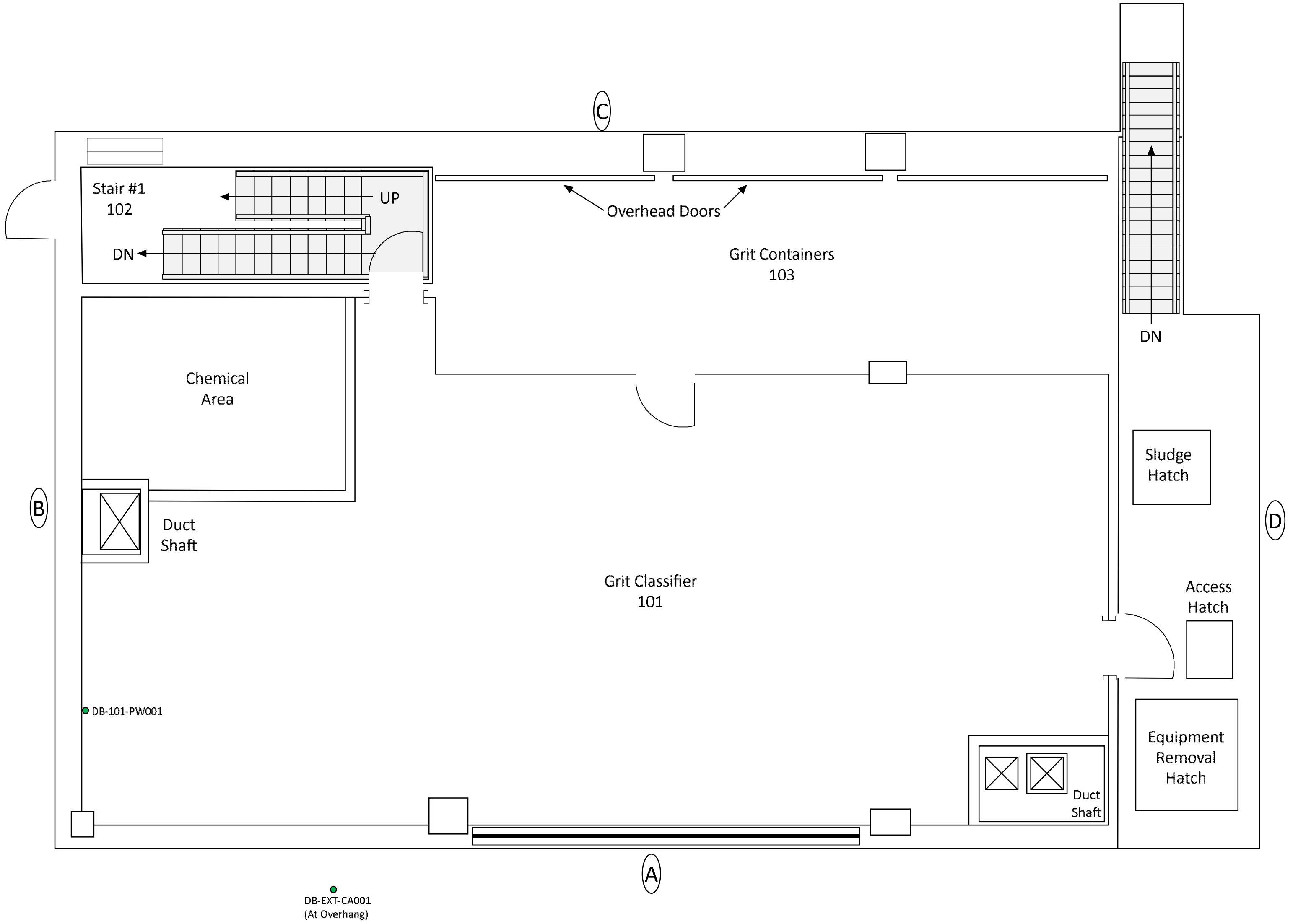
DEGRITTER BUILDING
EL. 14.00’



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N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

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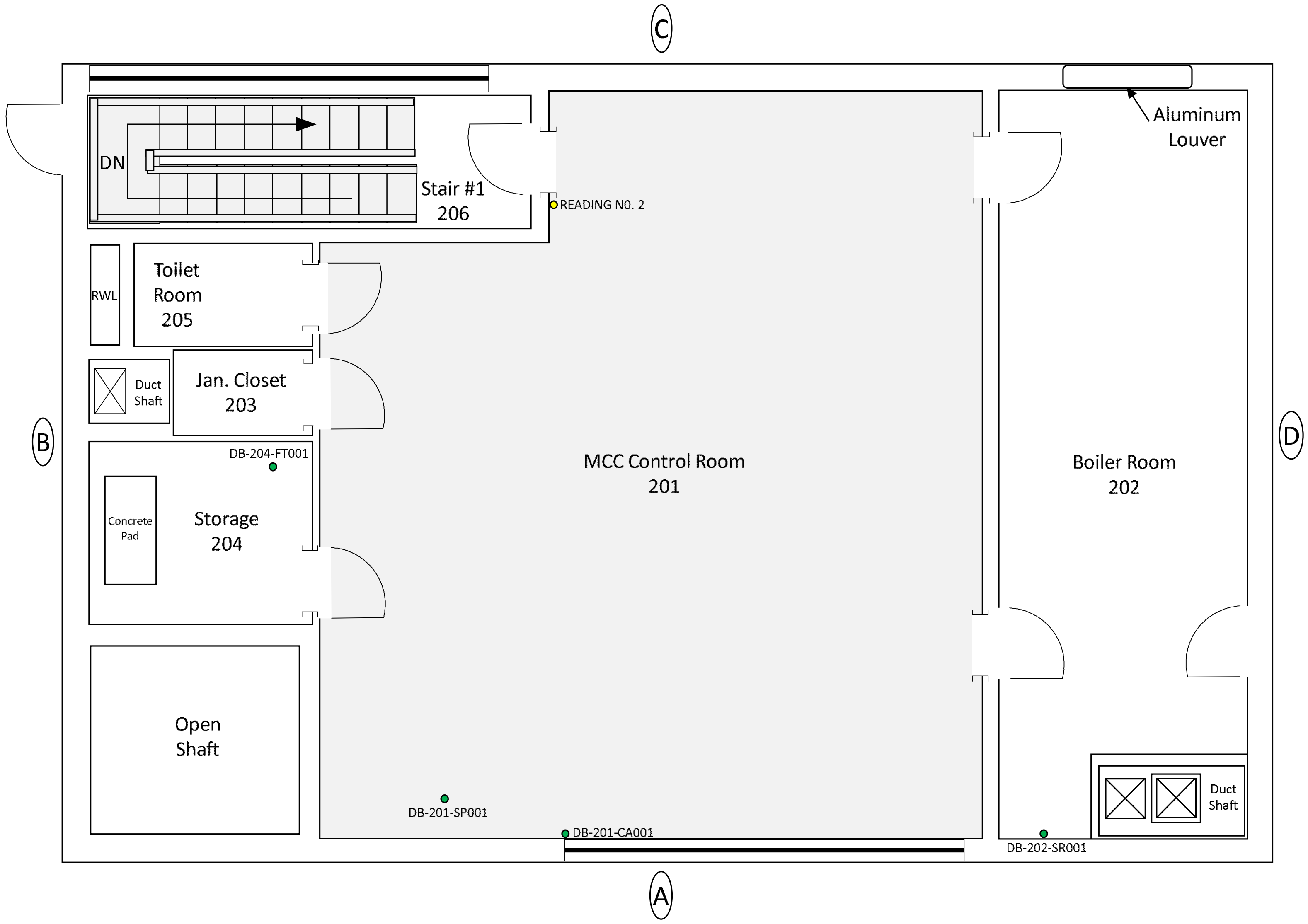
DEGRITTER BUILDING
EL. 32.00’



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N

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SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

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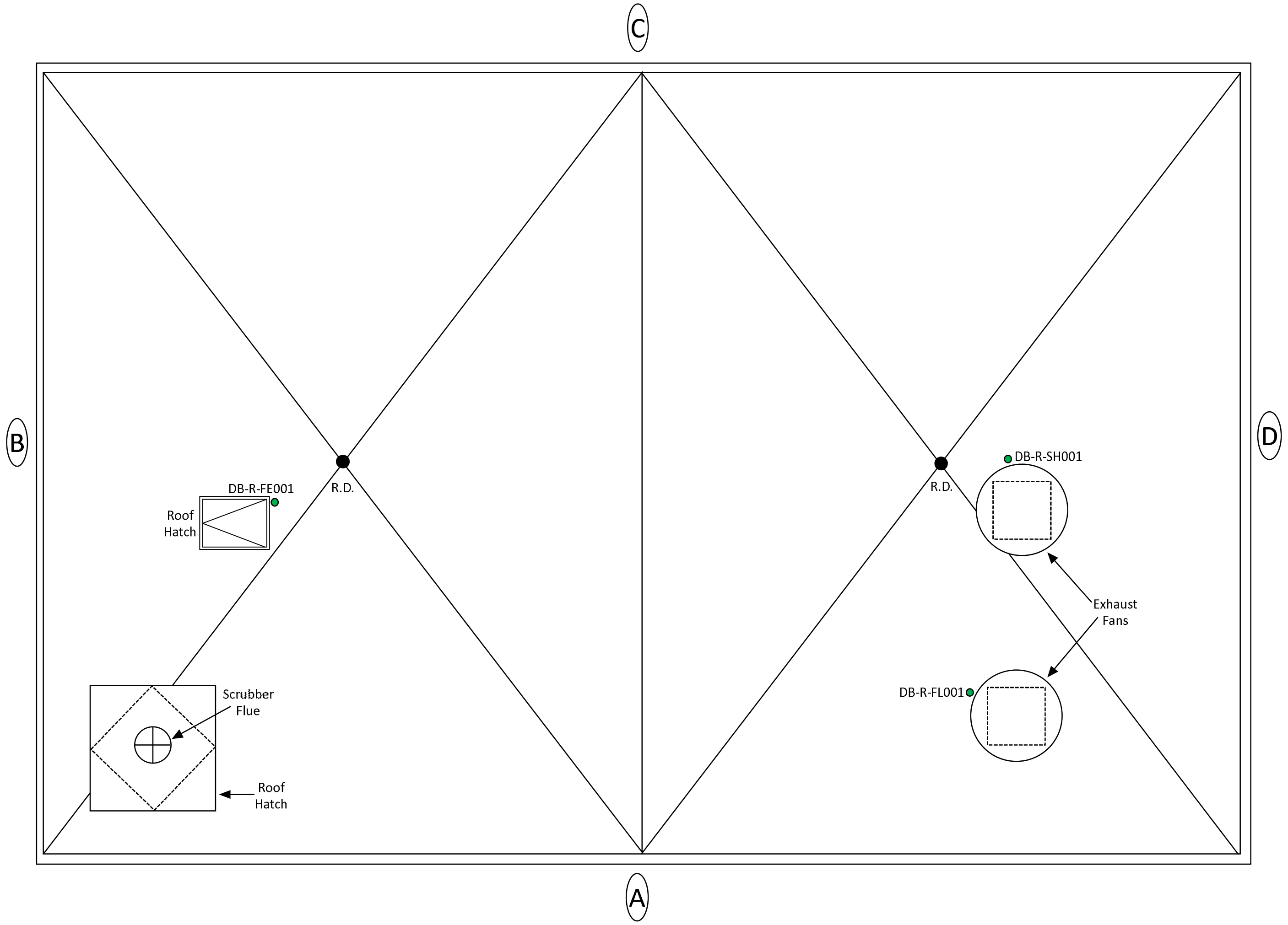
DEGRITTER BUILDING
EL. 49.50’



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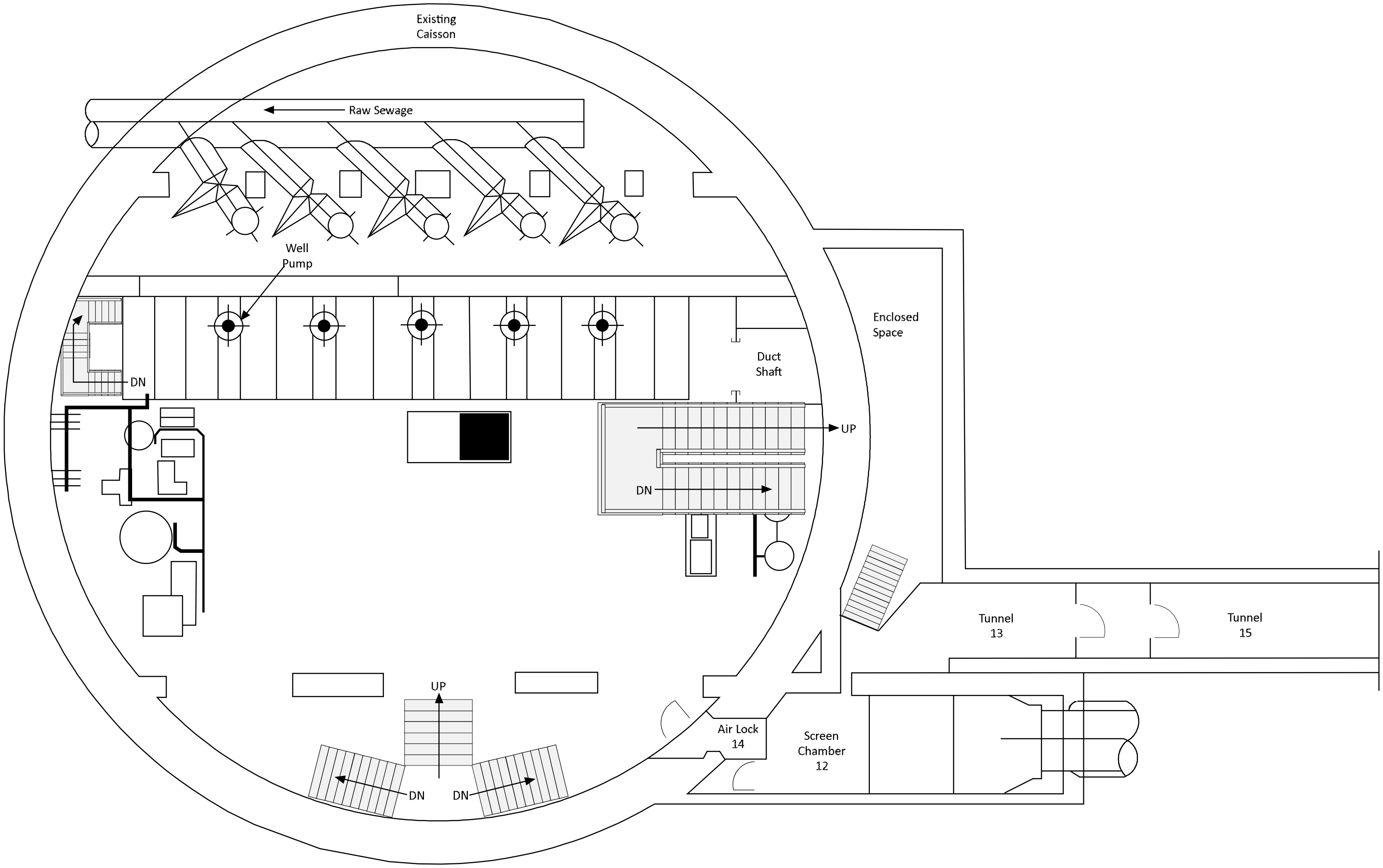
eolas environmental LLC

DEGRITTER BUILDING ROOF



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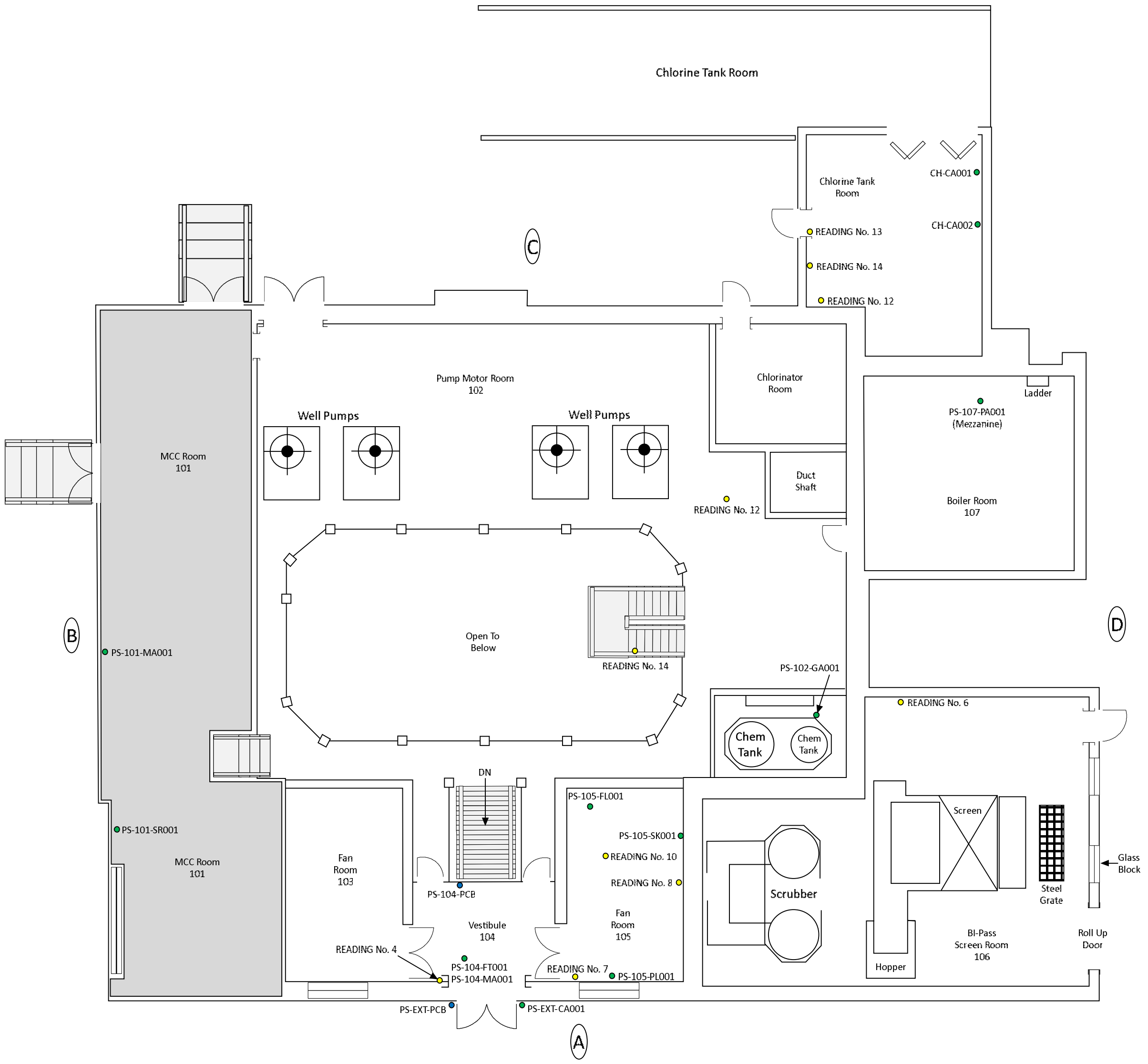
PUMP STATION
EL. 10.50’



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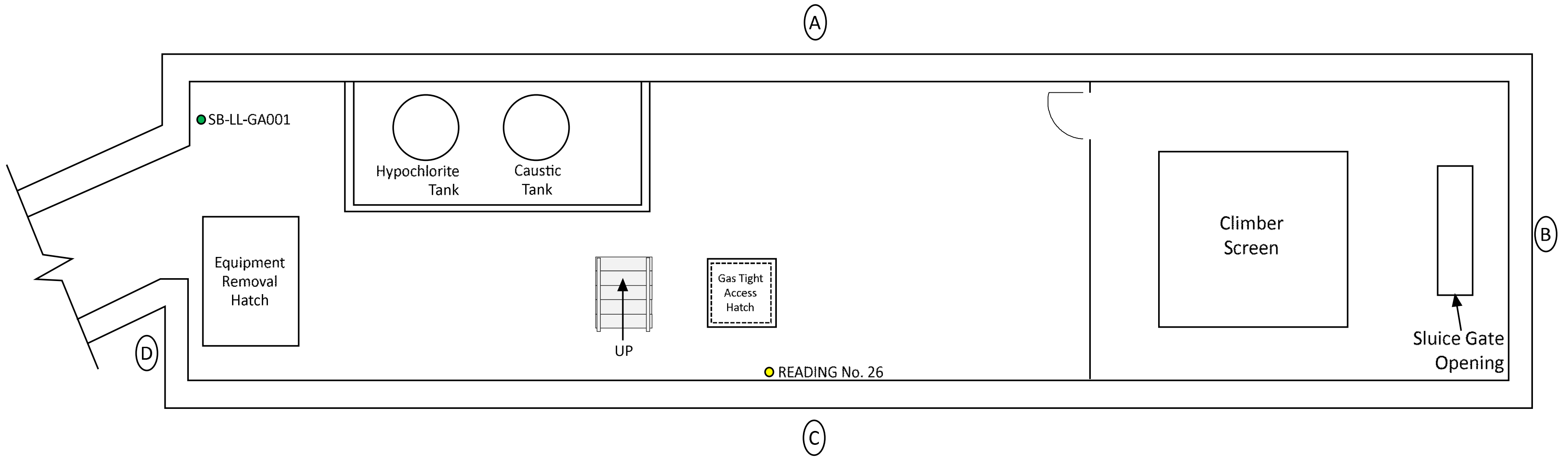
eolas environmental LLC

PUMP STATION
EL. 25.50'



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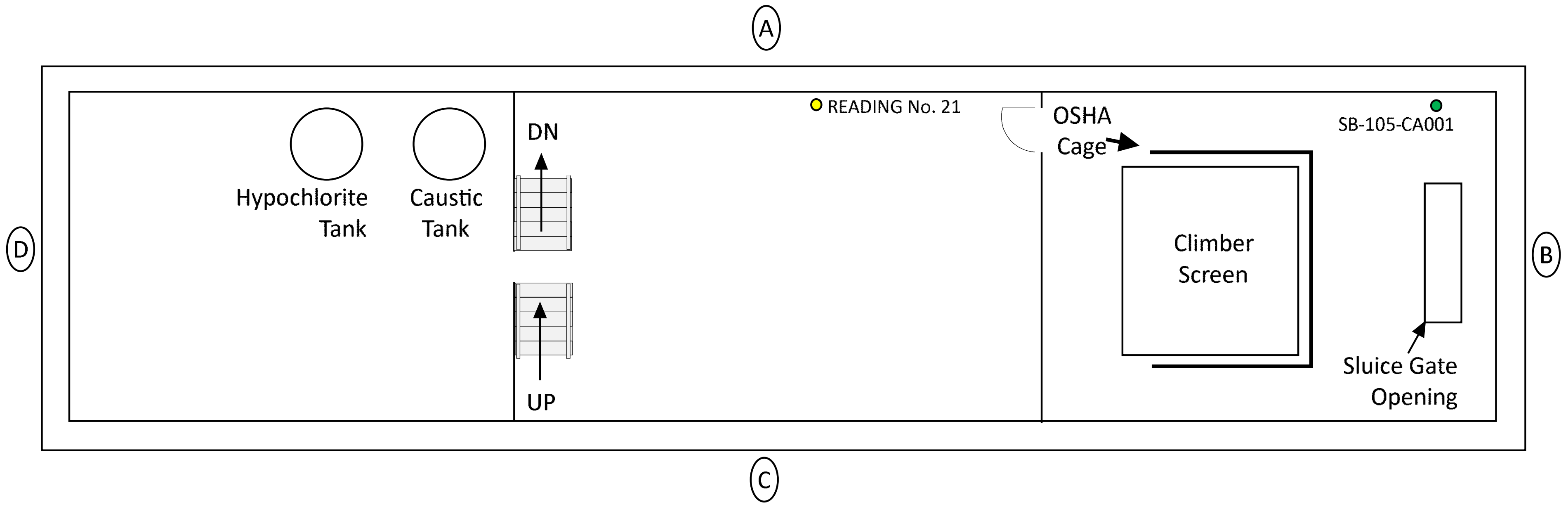
eolas environmental LLC

SCREEN BUILDING
EL. 17.25’



LEGEND

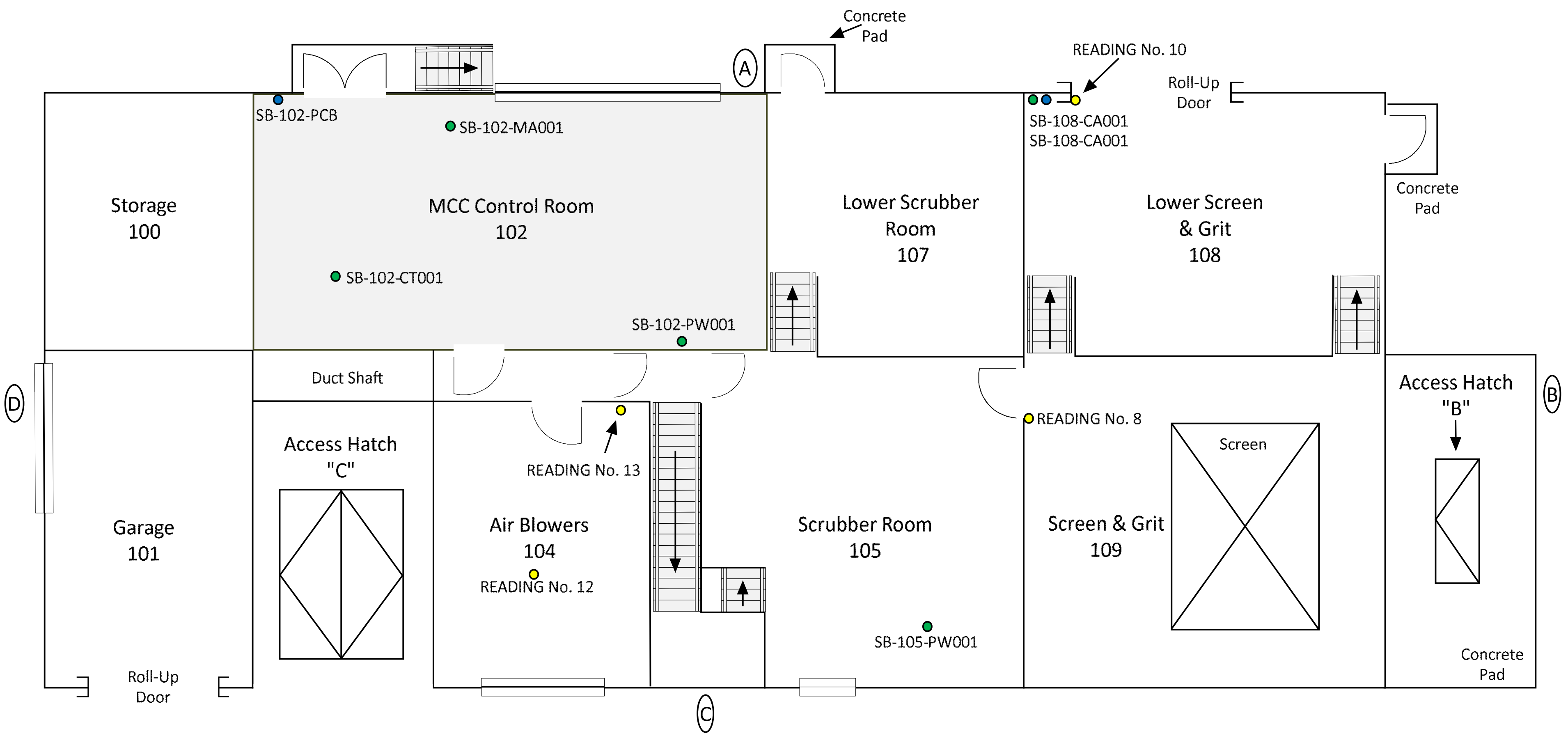
● Asbestos Positive
● Asbestos Non-Detect
● Lead Positive
● PCB Sample
■ MCC Access Floor
▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

SCREEN BUILDING
EL. 27.00’



LEGEND

- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT: Hazardous Building Materials Survey

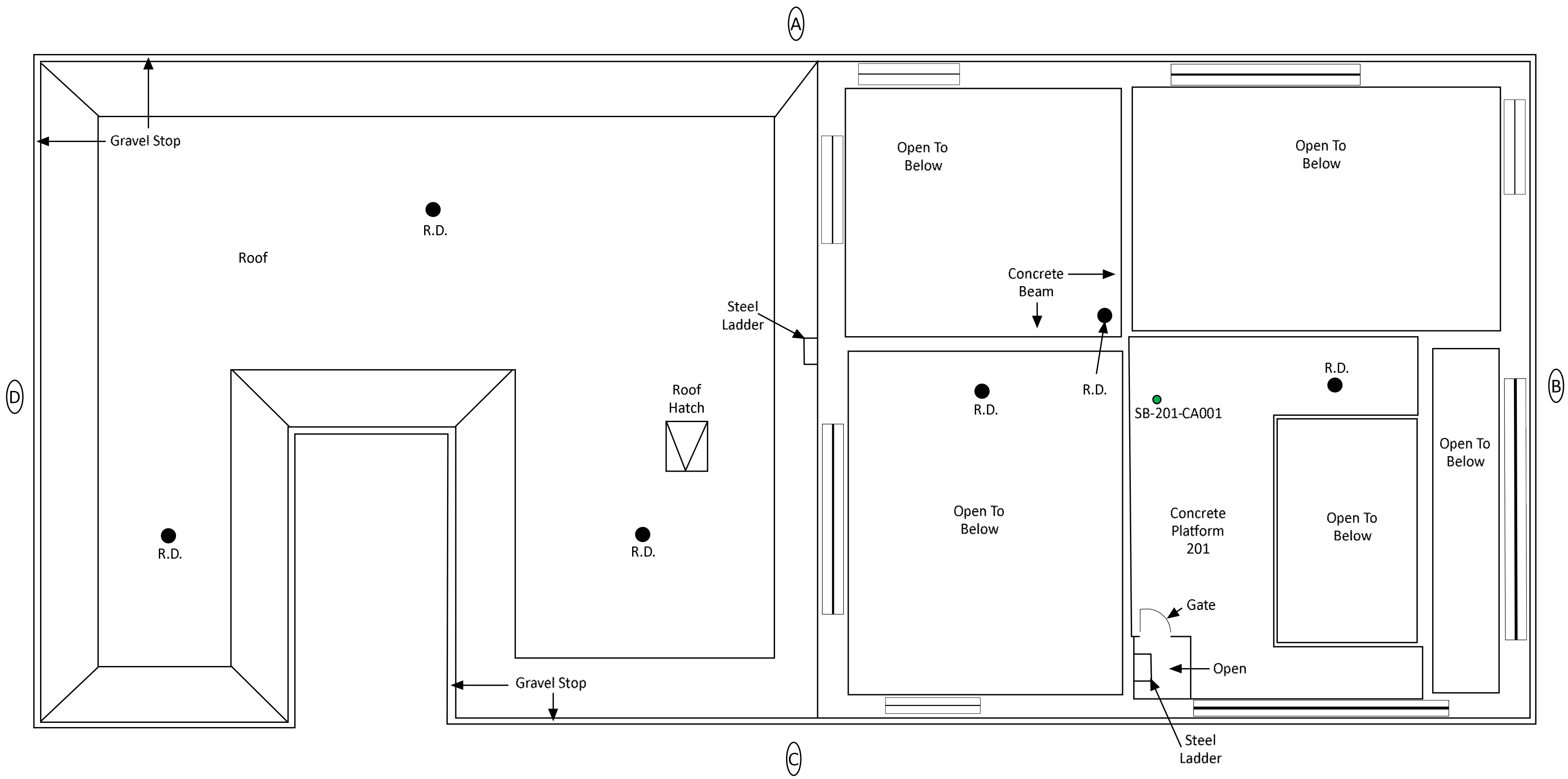
LOCATION: 205 Bostwick Avenue, Bridgeport, CT

SOURCE: Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992

SCALE: NTS

eolas environmental LLC

SCREEN BUILDING
EL. 38.00’



LEGEND

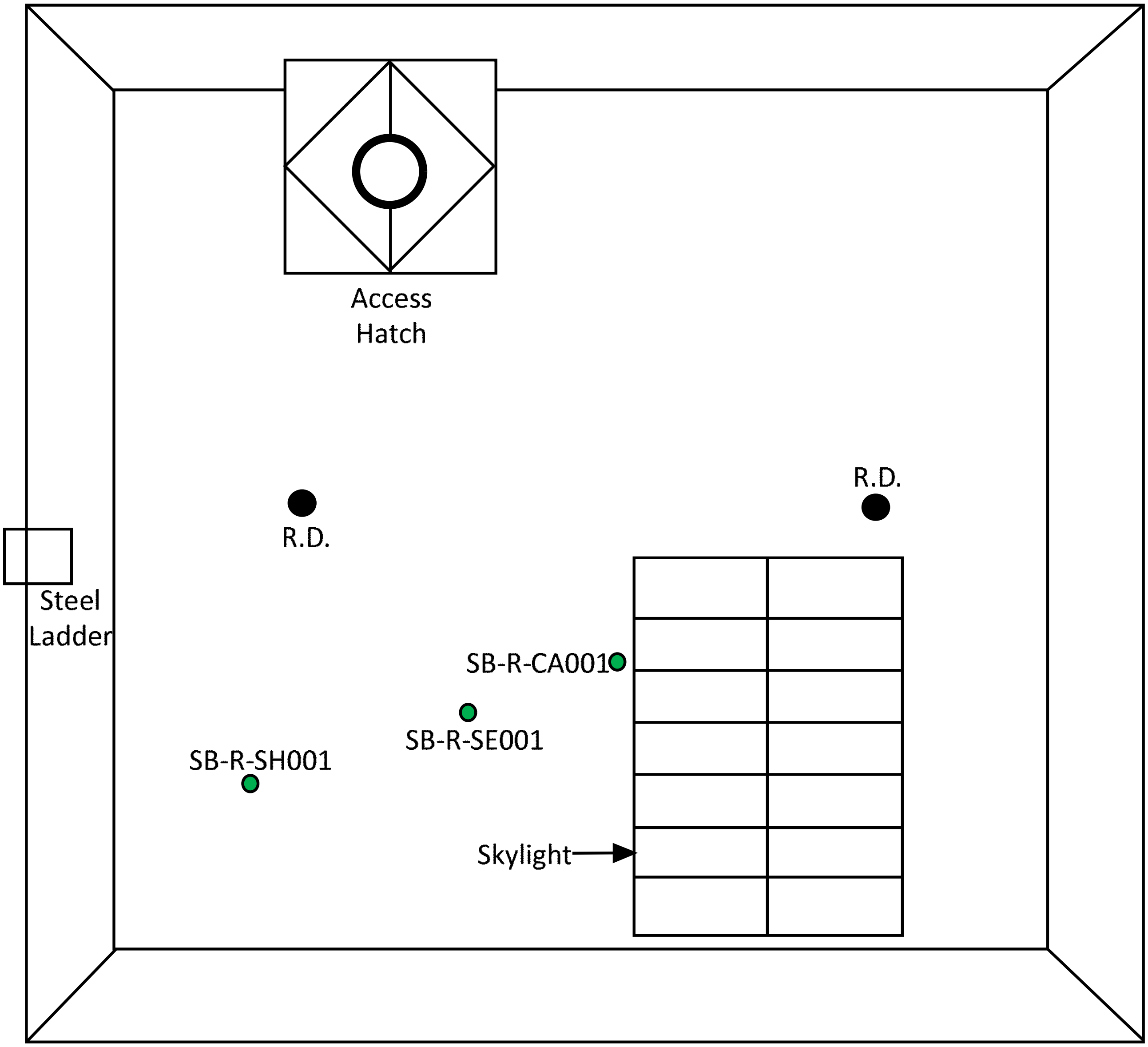
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

SCREEN BUILDING
ROOF, EL. 40.50’

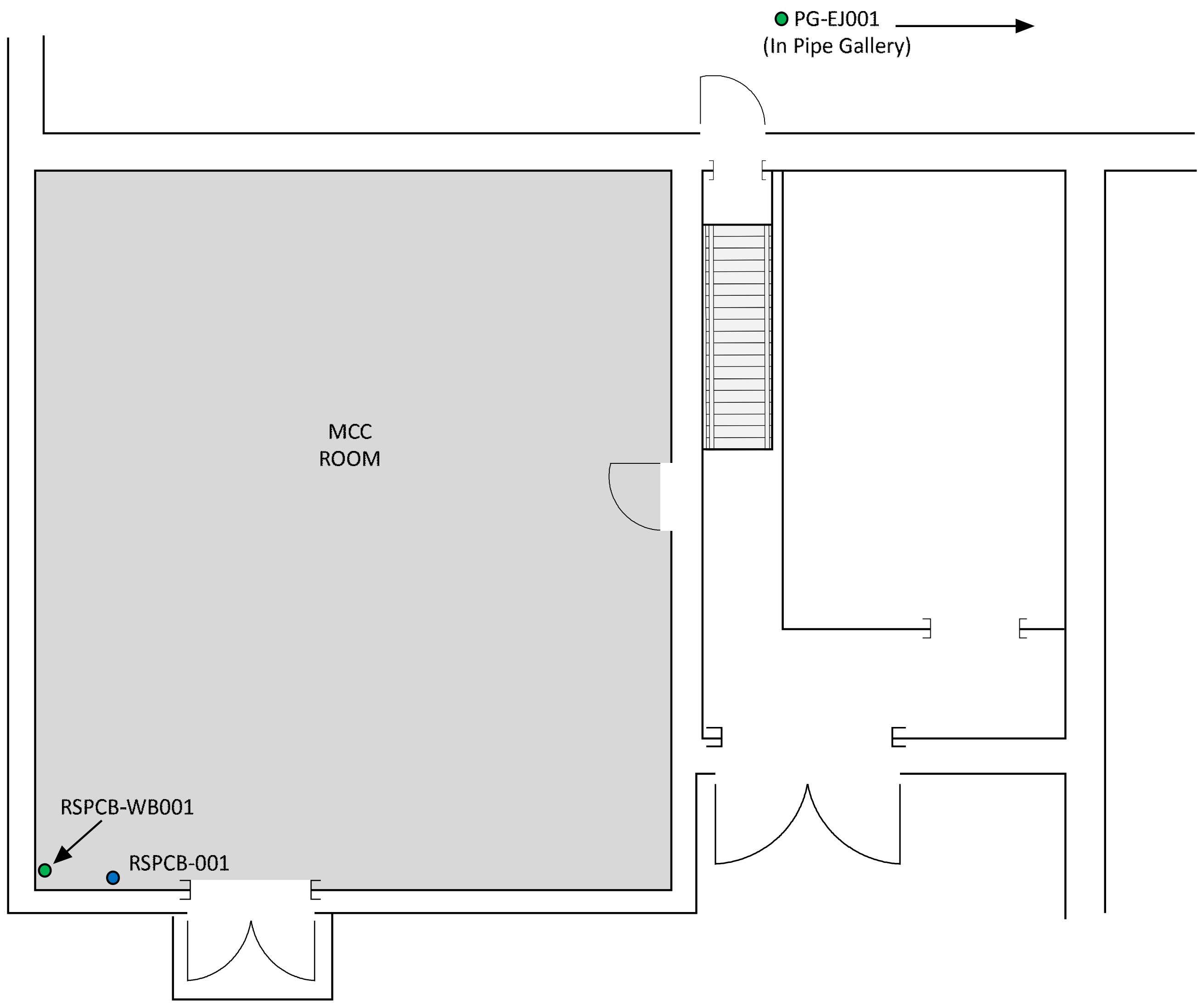


LEGEND

🔴 Asbestos Positive
🟢 Asbestos Non-Detect
🟡 Lead Positive
🔵 PCB Sample
▨ MCC Access Floor
▭ Window
N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

SCREEN BUILDING ROOF



LEGEND

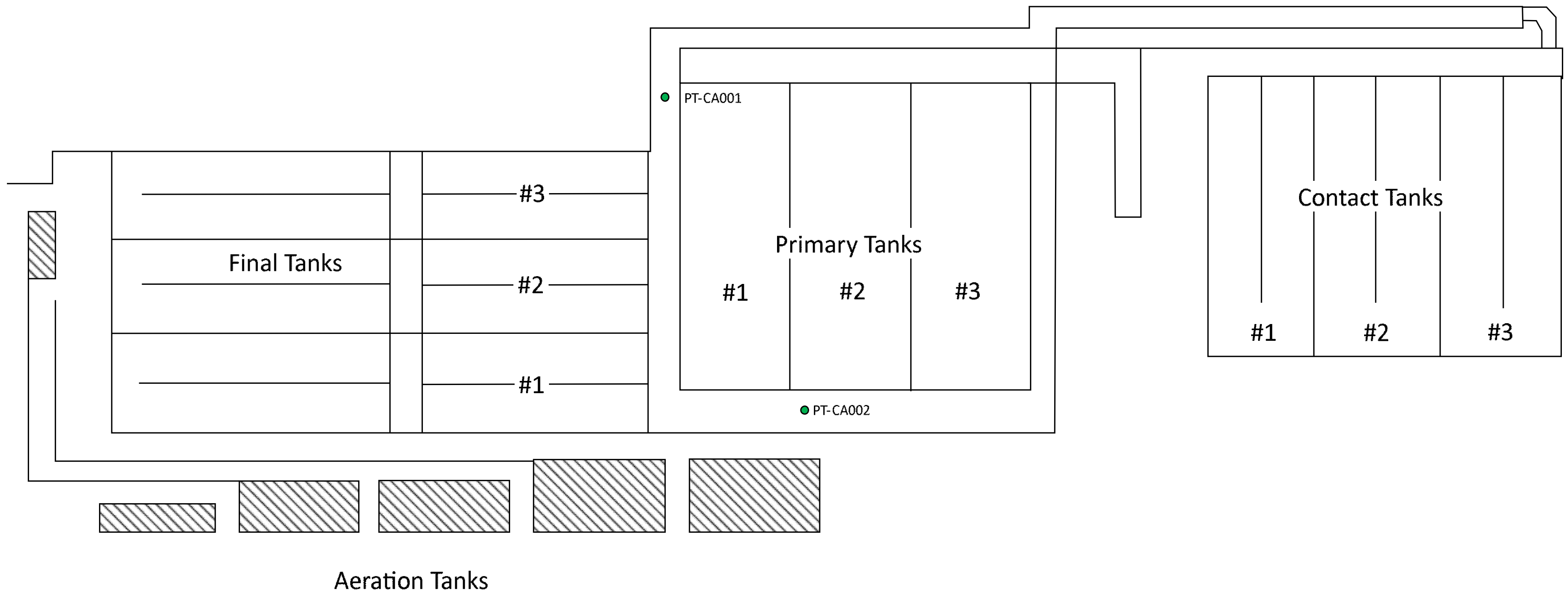
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

RETURN SLUDGE PUMP CONTROL ROOM



LEGEND:

- ● Asbestos Positive
- ● Asbestos Non-Detect
- ● Lead Positive
- ● PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

PROCESS TANKS

ATTACHMENT B

ASBESTOS SUMMARY TABLE

Table 1
Asbestos-Containing Materials Summary
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Building	Location	Sample Number	Material Description	Category	Analytical Results (PLM)	ACM	F/NF	Condition/Other
Control Building	7	CB-7-SE002A CB-7-SE002B	Red-Brown Air Duct Sealant	Miscellaneous	NAD	--	NF	Good
Control Building	8	CB-8-SE001A CB-8-SE001B	Black Chimney Sealant	Miscellaneous	NAD	--	NF	Significantly Damaged
Control Building	8	CB-8-PI001A CB-8-PI001B	White Pipe Insulation	TSI	NAD	--	NF	Good
Control Building	101, 102, 103	CB-102-CB001A CB-102-CB001B	Black Vinyl Cove Base and Orange Mastic	Miscellaneous	NAD	--	NF	Good
Control Building	111	CB-111-CA001A CB-111-CA001B	Gray Duct Gasket/Sealant	Miscellaneous	NAD	--	NF	Good
Control Building	111	CB-111-CA002A CB-111CA002B	Tan-Gray Window Caulk	Miscellaneous	NAD	--	NF	Good
Control Building	111	CB-111-PW001A CB-111-PW001B	Green Painted White Fiber Pipe Wrap	TSI	NAD	--	NF	Good
Control Building	116	CB-116-SR001A CB-116-SR001B	Gray Sheetrock	Miscellaneous	NAD	--	NF	Damaged
Control Building	116	CB-116-JC001A CB-116-JC001B	White Joint Compound	Miscellaneous	NAD	--	NF	Damaged
Control Building	201	CB-201-JC002A CB-201-JC002B	White Joint Compound	Miscellaneous	NAD	--	NF	Significantly Damaged
Control Building	206	CB-206-CB001A CB-206-CB001B	Black Vinyl Cove Base and Tan Mastic	Miscellaneous	NAD	--	NF	Good
Control Building	206	CB-206-FT001A CB-206-FT001B	White-Gray Flecked 12" x 12" Vinyl Floor Tile	Miscellaneous	NAD	--	NF	Good
Control Building	206	CB-206-MA001A CB-206-MA001B	Black Mastic Below White-Gray Vinyl Floor Tile	Miscellaneous	NAD	--	NF	Good
Control Building	210	CB-210-CT001A CB-210-CT001B	White 2' x 2' Acoustical Celling Tile	Miscellaneous	NAD	--	NF	Good
Control Building	210	CB-210-JC001A CB-210-JC001B	White Joint Compound	Miscellaneous	NAD	--	NF	Good
Control Building	302	CB-302-GA001A CB-302-GA001B	Black Wall to Floor Gasket	Miscellaneous	NAD	--	NF	Good
Control Building	302	CB-302-GA002A CB-302-GA002B	Light Gray Door (to Roof) Gasket	Miscellaneous	NAD	--	NF	Good
Control Building	302	CB-302-GA003A CB-302-GA003B	Gray Lower Wall Gasket	Miscellaneous	NAD	--	NF	Good
Control Building	Exterior, 2nd Mezzanine	CB-EXT-EJ001A CB-EXT-EJ001B	Black Expansion Joint Caulk	Miscellaneous	NAD	--	NF	Damaged
Control Building	Aeration Tunnel	PG-EJ001A PG-EJ001B	Gray Expansion Joints	Miscellaneous	NAD	--	NF	Damaged
Control Building	Exterior	CB-EXT-CA001A CB-EXT-CA001B	Black Window Caulk	Miscellaneous	NAD	--	NF	Good

Table 1
Asbestos-Containing Materials Summary
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Building	Location	Sample Number	Material Description	Category	Analytical Results (PLM)	ACM	F/NF	Condition/Other
Control Building	Exterior Walls MCC-Aeration	RSPCB-WB001A RSPCB-WB001B	Green Painted Wallboard	Miscellaneous	NAD	--	NF	Significantly Damaged
Control Building	Roof	CB-R-SH001A CB-R-SH001B	Black Shingle	Miscellaneous	NAD	--	NF	Good
Control Building	Roof	CB-R-CA001A CB-R-CA001B	Tan Caulk	Miscellaneous	NAD	--	NF	Good
Control Building	Roof	CB-R-FL001A CB-R-FL001B	Black Flashing	Miscellaneous	NAD	--	NF	Good
Degritter Building	101	DB-101-PW001A DB-101-PW001B	Yellow Painted Fiberglass Wrapped Gas Line	TSI	NAD	--	NF	Significantly Damaged
Degritter Building	201	DB-201-SP001A DB-201-SP001B	White/Tan Floor Tile Soundproofing	Miscellaneous	NAD	--	NF	Good
Degritter Building	201	DB-201-CA001A DB-201-CA001B	White Window Caulk	Miscellaneous	NAD	--	NF	Good
Degritter Building	202	DB-202-SR001A DB-202-SR001B	Gray Sheetrock	Miscellaneous	NAD	--	NF	Good
Degritter Building	204	DB-204-FT001A DB-204-FT001B	Gray Flecked 12" x 12" Vinyl Floor Tile, Black Mastic	Miscellaneous	NAD	--	NF	Significantly Damaged
Degritter Building	Exterior, Overhang	DB-EXT-CA001A DB-EXT-CA001B	Gray Caulk	Miscellaneous	NAD	--	NF	Good
Degritter Building	Roof Flashing	DB-R-FL001A DB-R-FL001B	Black Equipment Flashing	Miscellaneous	NAD	--	NF	Good
Degritter Building	Roof	DB-R-FE001A DB-R-FE001B	Black Roof Felt	Miscellaneous	NAD	--	NF	Good
Degritter Building	Roof	DB-R-SH001A DB-R-SH001B	Black Roof Shingle	Miscellaneous	NAD	--	NF	Good
Pump Station	101	PS-101-SR001A PS-101-SR001B	Gray Sheetrock	Miscellaneous	NAD	--	NF	Good
Pump Station	101	PS-101-MA001A PS-101-MA001B	Gray Vinyl Covebase, Orange Mastic	Miscellaneous	NAD	--	NF	Good
Pump Station	102	PS-102-GA001A PS-102-GA001B	Red and White Gasket, 6" Pipe	Miscellaneous	NAD	--	NF	Good
Pump Station	Exterior, 102	PS-EXT-CA001A PS-EXT-CA001B	Gray-Brown Door Caulk	Miscellaneous	NAD	--	NF	Good
Pump Station	104	PS-104-FT001A PS-104-FT001B	Gray 12" x 12" Vinyl Floor Tile	Miscellaneous	NAD	--	NF	Significantly Damaged
Pump Station	104	PS-104-MA001A PS-104-MA001B	Gray 12" x 12" Vinyl Floor Tile and Brown Mastic	Miscellaneous	NAD	--	NF	Significantly Damaged
Pump Station	105	PS-105-PL001A PS-105-PL001B	White Lathe and Plaster	Miscellaneous	NAD	--	NF	Damaged, Ceiling
Pump Station	105	PS-105-SK001A PS-105-SK001B	Blue Painted Skim Coat	Surfacing	NAD	--	NF	Good, Concrete Wall

Table 1
Asbestos-Containing Materials Summary
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Building	Location	Sample Number	Material Description	Category	Analytical Results (PLM)	ACM	F/NF	Condition/Other
Pump Station	105	PS-105-FL001A PS-105-FL001B	Black Flexible Duct Connectors	Miscellaneous	NAD	--	NF	Good
Pump Station	107	PS-107-PA001A PS-107-PA001B	White Pipe Insulation Patch	TSI	NAD	--	NF	Good
Pump Station	Chlorine Tank Room	CH-CA001A CH-CA001B	Tan Caulk	Miscellaneous	NAD	--	NF	Good, North Windows
Pump Station	Chlorine Tank Room	CH-CA002A CH-CA002B	Gray Caulk	Miscellaneous	NAD	--	NF	Good, North Wall
Screen Building	102	SB-102-CT001A SB-102-CT001B	White 2' x 2' Acoustical Ceiling Tiles	Miscellaneous	NAD	--	NF	Damaged
Screen Building	102	SB-102-PW001A SB-102-PW001B	Green Painted 2" Pipe Insulation Wrap	TSI	NAD	--	NF	Good
Screen Building	102	SB-102-MA001A SB-102-MA001B	Gray Vinyl Floor Tile with Orange Mastic	Miscellaneous	NAD	--	NF	Good
Screen Building	105	SB-105-PW001A SB-105-PW001B	White Insulation Pipe Wrap	TSI	NAD	--	NF	Significantly Damaged
Screen Building	105	SB-105-CA001A SB-105-CA001B	Gray Caulk	Miscellaneous	NAD	--	NF	Good, Wall Penetration
Screen Building	108	SB-108-CA002A SB-108-CA002B	Gray Door Caulk	Miscellaneous	NAD	--	NF	Good
Screen Building	201	SB-201-CA001A SB-201-CA001B	Gray Duct Caulk	Miscellaneous	NAD	--	NF	Good
Screen Building	Lower Level by Tunnel	SB-LL-GA001A SB-LL-GA001B	Black 12" Pipe Gasket	Miscellaneous	NAD	--	NF	Good
Screen Building	Roof	SB-R-SH001A SB-R-SH001B	Black Roof Shingles	Miscellaneous	NAD	--	NF	Good
Screen Building	Roof	SB-R-SE001A SB-R-SE001B	Black Roof Sealant	Miscellaneous	NAD	--	NF	Good
Screen Building	Roof Skylight	SB-R-CA001A SB-R-CA001B	Gray Window Caulk	Miscellaneous	NAD	--	NF	Good
Primary Tank	Concrete Expansion Joint	PT-CA001A PT-CA001B	Primary Tank Expansion Joint, Gray	Miscellaneous	NAD	--	NF	Good
Primary Tank	Concrete Expansion Joint	PT-CA002A PT-CA002B	Primary Tank Expansion Joint, Black	Miscellaneous	NAD	--	NF	Good

Notes:

NAD	No Asbestos Detected
NF	Not Friable
LF	Linear Feet
SF	Square Feet
TSI	Thermal System Insulation
Assumed Materials	Flex Duct Connectors, Laboratory Benchtops, Gaskets, Fire Doors, until tested should be assumed positive for asbestos content

ATTACHMENT C

LEAD TABLES

Table 2A
Lead Based Paint Inspection
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

REPORT OF LEAD PAINT INSPECTION FOR: **Control Building/Pipe Gallery**

Inspection Date:	2/18/20	
Report Date:	4/22/20	
Abatement Level:	1 mg/cm^2	
Total Readings:	36	
Job Started:	2/18/20	10:26
Job Finished:	2/18/20	16:38
Inspector:	Kimberly M. Walsh	

Reading No.	Side	Component	Location	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Calibration Readings								
1	--	--	--	--	--	--	1	TC
2	--	--	--	--	--	--	0.9	TC
3	--	--	--	--	--	--	1.2	TC
Control Building								
4	D	Door	Left	I	Steel	Black	0.1	QM
5	A	Wall	Lower Center	I	Concrete	Gray	0.3	QM
6	C	Wall	Upper Center	I	Dry wall	Blue	-0.1	QM
7	C	Wall	Upper Center	I	Dry wall	Light Gray	0.1	QM
8	C	Wall	Upper Lower	I	Concrete	Light Blue	0	QM
9	A	Wall	Upper Lower	I	Concrete	Beige	-0.2	QM
10	A	Wall	Upper Lower	I	Dry wall	Blue	0	QM
11	A	Wall	Upper Lower	I	Dry wall	Blue	-0.3	QM
12	D	Wall	Upper Lower	I	Concrete	Yellow	0	QM
13	D	Wall	Upper Lower	I	Concrete	Gray	0.1	QM
14	C	Wall	Upper Lower	I	Concrete	Yellow	-0.3	QM
15	D	Door	Upper	I	Wood	Black	0	QM
16	C	Wall	Left Upper	I	Tiles	Yellow	-0.4	QM
17	C	Wall	Left Lower	I	Tiles	Beige	-0.4	QM
18	C	Wall	Left Lower	I	Dry wall	Green	-0.1	QM
19	D	Wall	Left Lower	I	Concrete	Beige	0	QM
20	D	Door	Lower	I	Steel	Black	0.1	QM
21	A	Column	Left	I	Steel	Green	-0.3	QM
22	B	Cabinet	Left	I	Steel	Tan	-0.2	QM
Pipe Gallery								
23	A	Wall	Lower Center	I	Concrete	Yellow	2.1	QM
24	A	Pipe	Center	I	Cast	Blue	1	QM
25	D	Pipe	Center	I	Fiberglass	Green	-0.3	QM
26	D	Column	Center	I	Concrete	Yellow	-0.3	QM

Table 2A
Lead Based Paint Inspection
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Reading No.	Side	Component	Location	Condition	Substrate	Color	Results (mg/cm^2)	Mode
27	B	Wall	Lower Center	I	Concrete	White	0.1	QM
28	C	Column	Center	I	Concrete	Red	-0.3	QM
29	C	Column	Center	I	Concrete	Red	-0.1	QM
30	B	Wall	W Center	I	Concrete	Yellow	1	QM
31	D	Pipe	Center	I	Steel	Yellow	1	QM
32	D	Pipe	Center	I	Steel	Blue	1	QM
33	A	Wall	Lower Center	I	Concrete	Green	2.2	QM
Calibration Readings								
1	--	--	--	--	--	--	0.3	TC
2	--	--	--	--	--	--	1	TC
3	--	--	--	--	--	--	0.9	TC

Notes:
QM - Quick Mode
TC - Time Corrected

Table 2B
Lead Based Paint Inspection
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

REPORT OF LEAD PAINT INSPECTION FOR: **Screen Building**

Inspection Date: 2/19/20
Report Date: 4/22/20
Abatement Level: 1 mg/cm^2
Total Readings: 30
Job Started: 2/19/20 09:51
Job Finished: 2/19/20 12:05
Inspector: Alexander K. Clarke

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Calibration Readings									
1	--	--	--	--	--	--	--	1.4	TC
2	--	--	--	--	--	--	--	1	TC
3	--	--	--	--	--	--	--	0.9	TC
Room # 105									
4	-	Column	Center	--	Intact (I)	Steel	Turquois	-0.2	QM
5	A	Door	Left	Header	I	Steel	Brown	-0.9	QM
6	A	Wall	Wall Left	--	Peeling (P)	Cement	Beige	0.2	QM
7	A	Door	Left	Left Center	I	Steel	Gray	-0.1	QM
Room #109									
8	D	Door	Center	Door	I	Steel	Brown	1	QM
9	-	Floor	Center	--	I	Concrete	Beige	-0.3	QM
Room #108									
10	D	Door	Center	Door	I	Steel	Brown	1	QM
11	A	Door	Center	Door	I	Fiberglass	Gray	-1.4	QM
Room # 104									
12	A	Ladder	Center	--	I	Steel	Brown	1	QM
13	-	Pipe	Center	--	I	Steel	Turquois	1	QM
14	A	Wall	Wall Center	--	I	Concrete	Turquois	-0.4	QM
15	A	Door	Left	Header	I	Steel	Brown	-0.7	QM
Room # 102									
16	D	Cabinet	Center	--	I	Steel	Gray	-0.3	QM
17	C	Door	Center	Door	I	Steel	Brown	-0.1	QM
18	B	Rack	Center	--	I	Steel	Gray	0.1	QM
19	B	Wall	Wall Center	--	I	Concrete	Beige	-0.3	QM
20	A	Rack	Right	--	I	Steel	Brown	0.1	QM

Table 2B
Lead Based Paint Inspection
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Basement UL									
21	A	Pipe	Center	--	!	Steel	Turquois	1	QM
22	C	Stairs	Center	Wall	I	Concrete	Yellow	-0.3	QM
23	B	Door	Center	Door	I	Steel	Brown	-1.2	QM
Basement LL									
24	B	Column	Center	--	P	Steel	Green	-0.1	QM
25	C	Pipe	Center	--	P	Steel	Blue	-0.3	QM
26	C	Wall	Wall Center	--	P	Concrete	Beige	1	QM
27	B	Column	Right	--	P	Steel	Olive	-0.2	QM
28	-	Ladder	Right	--	P	Steel	Yellow	-0.2	QM
29	A	Wall	Wall Center	--	P	Concrete	Beige	-0.2	QM
30	-	Pipe	Center	--	P	Steel	Green	-0.1	QM

Notes:
QM - Quick Mode
TC - Time Corrected

Table 2C
Lead Based Paint Inspection
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

REPORT OF LEAD PAINT INSPECTION FOR: **Pump Station**

Inspection Date:	2/19/20	
Report Date:	4/22/20	
Abatement Level:	1 mg/cm^2	
Total Readings:	19	
Job Started:	2/19/20	12:14
Job Finished:	2/19/20	14:19
Inspector:	Alexander K. Clarke	

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Room # 106									
1	B	Fence	Center	--	Intact (I)	Steel	Orange	-0.1	QM
2	A	Wall	Center	--	Peeling (P)	Cement	Beige	0.1	QM
3	D	Door	Center	Door	P	Steel	Brown	-0.3	QM
4	D	Door	Center	Door	P	Steel	Gray	-0.1	QM
5	D	Wall	Left	--	P	Brick	Beige	-0.6	QM
6	D	Ladder	Right	--	P	Steel	Brown	1	QM
Room # 102									
7	C	Tank	Center	--	P	Steel	Green	-0.1	QM
8	-	Pipe	Center	--	P	Steel	Yellow	-0.2	QM
9	-	Railing	Center	Left Column	P	Steel	Green	-0.1	QM
10	A	Wall	Center	Lower	I	Dry Wall	Green	0	QM
11	A	Wall	Center	Upper	I	Dry Wall	White	-0.3	QM
12	-	Floor	Center	--	P	Concrete	White	1	QM
13	C	Wall	Center	Lower	P	Concrete	Green	0	QM
14	-	Stairs	Center	Risers	P	Steel	Green	1	QM
Room #101									
15	B	Wall	Center	--	I	Dry Wall	Yellow	0.1	QM
16	-	Pipe	Center	--	P	Steel	Beige	-0.1	QM
Calibration Readings									
17	--	--	--	--	--	--	--	0.8	TC
18	--	--	--	--	--	--	--	0.7	TC
19	--	--	--	--	--	--	--	0.6	TC

Notes:

Additional Pump Station lead readings were collected on 2/20/2020 and can be found on Table 2E-Miscellaneous Buildings

QM - Quick Mode
TC - Time Corrected

Table 2D
Lead Based Paint Inspection
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

REPORT OF LEAD PAINT INSPECTION FOR: **Degritter Building**

Inspection Date: 2/19/20
Report Date: 4/22/20
Abatement Level: 1 mg/cm^2
Total Readings: 14
Job Started: 2/19/20 14:19
Job Finished: 2/19/20 16:02
Inspector: Alexander K. Clarke

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Room # 201									
1	A	Wall	Center	--	Intact (I)	Concrete	Green	-0.1	QM
2	B	Door	Center	Right Jamb	I	Steel	Green	1	QM
Room # 204									
3	A	Wall	Center	--	I	Concrete	Light Gray	-0.1	QM
Room # 101									
4	C	Radiatior	Center	--	I	Steel	Brown	0.1	QM
Room # 102									
5	--	Stairs	Center	Treads	I	Concrete	Green	0	QM
Room #101									
6	A	Wall	Center	Lower	I	Concrete	Beige	-0.3	QM
7	C	Door	Center	Door	I	Steel	Green	-0.1	QM
Room #1									
8	A	Wall	Right	Lower	I	Concrete	Beige	-0.2	QM
9	--	Floor	Center	--	I	Concrete	Beige	-0.4	QM
10	--	Pipe	Center	--	I	Steel	Green	-0.1	QM
DB Tunnel									
11	--	Pipe	Center	--	I	Steel	Blue	-0.1	QM
Calibration Readings									
12	--	--	--	--	--	--	--	1.2	TC
13	--	--	--	--	--	--	--	0.7	TC
14	--	--	--	--	--	--	--	1.1	TC

Notes:
QM - Quick Mode
TC - Time Corrected

Table 2E
Lead Based Paint Inspection
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

REPORT OF LEAD PAINT INSPECTION FOR: **West Plant Miscellaneous Buildings**

Inspection Date:	2/20/20	
Report Date:	4/22/20	
Abatement Level:	1 mg/cm^2	
Total Readings:	19	
Job Started:	2/20/20	09:37
Job Finished:	2/20/20	11:58
Inspector:	Alexander K. Clarke	

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Calibration Readings									
1	--	--	--	--	--	--	--	1.1	TC
2	--	--	--	--	--	--	--	1.4	TC
3	--	--	--	--	--	--	--	1	TC
Pump Station Foyer									
4	A	Wall	Lower Right	Wall	P	Concrete	Blue	4.2	QM
Pump Station Room #105									
5	A	Wall	Lower Left	--	P	Brick	Blue	-0.1	QM
6	A	Wall	Lower Left	--	P	Brick	Blue	-0.2	QM
7	A	Wall	Lower Right	--	P	Plaster	Blue	3.8	QM
8	D	Wall	Lower Right	--	P	Concrete	Blue	1	QM
9	-	Floor	Center	--	P	Concrete	Beige	0.1	QM
10	-	Column	Center	--	P	Steel	Yellow	1	QM
Chlorine Tank Room									
11	B	Wall	Lower Right	--	P	Brick	Beige	0.2	QM
12	A	Pipe	Left	--	P	Steel	Light Gray	1	QM
13	C	Door	Left	Left Casing	P	Steel	Brown	1	QM
14	C	Column	Left	--	I	Steel	Green	1	QM
15	-	Pipe	Left	--	I	Steel	Yellow	-0.3	QM
Aeration Tanks Exterior									
16	-	Pipe	Left	--	I	Steel	Turquois	-0.1	QM
Calibration Readings									
17	--	--	--	--	--	--	--	1	TC
18	--	--	--	--	--	--	--	1	TC
19	--	--	--	--	--	--	--	1.4	TC

Notes:

QM - Quick Mode
TC - Time Corrected

ATTACHMENT D

PCB DATA TABLE

Table 3
Summary of PCB Analytical Results
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Sample ID	Sample Date	Building	Location/Room	Material Description	Result (mg/kg)	Type
RSPCB-001	2/18/20	Control Building	Return Sludge Pump Control Building	Light Green Wall Paint	2.7	1254
PS-104-PCB	2/19/20	Pump Station	Foyer Wall	Light Blue Wall Paint	9,300*	1260
PS-EXT-PCB	2/19/20	Pump Station	Foyer Exterior	Tan-Gray Door Caulk	ND <0.77	NA
SB-108-CA002	2/19/20	Screen Building	108, Exterior Door	Tan Door Caulk	ND <0.78	NA
SB-102-PCB	2/19/20	Screen Building	102, Window	Tan Caulk, Paint	3.2	1254

Notes:

Analysis of building materials was completed using EPA Method 8082 following extraction using the Soxhlet Method 3450.

mg/kg	milligrams per kilogram
LF	Linear Feet
SF	Square Feet
ND	Not Detected above Laboratory Reporting Limit
NA	Not Applicable

* Due to maxtrix interferences, dilution of this sample was required, resulting in a laboratory reporting limit of 400 mg/kg

PCB-containing building materials are considered PCB bulk product waste if the concentration of PCBs is equal to or greater than 50 mg/kg and is regulated under 40 CFR 761.62 of TSCA.

ATTACHMENT E

MISCELLANEOUS HAZARDOUS BUILDING MATERIALS TABLE

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Aeration Building	MCC Adjacent	Smoke Detectors	1	Wall-Mounted
Aeration Building	MCC	Ballast	16	Ceiling-Mounted
Aeration Building	MCC	4' Fluorescent Lights	32	Ceiling-Mounted
Aeration Building	MCC	Power Support System	1	SAF Power Support System
Aeration Building	MCC	3/3R Transformer	2	Dry Type
Aeration Building	MCC	Control Panel	8	Anvic Control and Waste Control Panel
Aeration Building	MCC	Controller	1	Anvic
Aeration Building	MCC	UPS Units	1	UPS System
Aeration Building	MCC	Exit Sign	2	Wall-Mounted
Aeration Building	MCC	Strobe Fire Alarm	1	Wall-Mounted
Aeration Building	MCC	Pull Fire Alarm	1	Wall-Mounted
Aeration Building	MCC	Smoke Detectors	2	Wall-Mounted
Aeration Tank East-West Tunnel	Lower Level	Pack Lights	19	Wall-Mounted
Aeration Tank East-West Tunnel	Lower Level	Emergency Lights	5	Wall-Mounted
Aeration Tank East-West Tunnel	Lower Level	Smoke Detectors	5	Wall-Mounted
Aeration Tank East-West Tunnel	Lower Level	Fire Strobe Light	2	Wall-Mounted
Aeration Tank East-West Tunnel	Lower Level	Exit Sign	2	Wall-Mounted
Aeration Tank Tunnel	Aeration Cage	Propane Tank	1	Propane Tank Stored in 55-Gallon Blue
Aeration Tank Tunnel	Aeration Cage	Miscellaneous Paints	10	1-Gallon Paints and Enamel
Aeration Tank Tunnel	Aeration Cage	Vapor Lights	8	Single Bulb Ceiling-Mounted
Aeration Tank Tunnel	Lower Level	Pack Lights	10	Wall-Mounted
Aeration Tank Tunnel	Lower Level	Emergency Lights	1	Wall-Mounted
Aeration Tank Tunnel	Lower Level	Smoke Detectors	5	Wall-Mounted
Aeration Tank Tunnel	Lower Level	Exit Sign	2	Wall-Mounted
Aeration Tank Tunnel	Lower Level	Strobe Fire Alarm	3	Wall-Mounted
Aeration Tank Tunnel	Lower Level	Vapor Lights	54	Ceiling-Mounted
Aeration Tank Tunnel	Lower Level	Pack Lights	55	Ceiling-Mounted
Aeration Tank Tunnel	Lower Level	Smoke Detectors	19	Ceiling-Mounted
Aeration Tank Tunnel	Lower Level	Exit Sign	5	Wall-Mounted
Aeration Tank Tunnel	Lower Level	Strobe Fire Alarm	7	Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Aeration Tank Tunnel	Lower Level	Fire Pull Alarm	2	Wall-Mounted
Aeration Tank Tunnel	Lower Level	CES PACL	4	55-Gallon Drum
Aeration Tank Tunnel	Lower Level	Emergency Lights	7	Wall-Mounted
Aeration Tank Tunnel	Lower Level	Control Panel	7	Anvic Control Panel
Aeration Tank Tunnel	MCC Adjacent	Ballast	6	Ceiling-Mounted
Aeration Tank Tunnel	MCC Adjacent	Belt Press Cleaner	1	55-Gallon Drum
Aeration Tank Tunnel	MCC Adjacent	Exit Sign	1	Wall-Mounted
Aeration Tank Tunnel	MCC Adjacent	Fire Pull Alarm	1	Wall-Mounted
Aeration Tank Tunnel	MCC Adjacent	Fire Strobe Light Alarm	1	Wall-Mounted
Aeration Tank Tunnel	MCC Adjacent	4' Fluorescent Light	12	Ceiling-Mounted
Control Building	1	Fill Synthetic Food Grade Lubricant	5	55-Gallon Red Drums
Control Building	1	Oval Fluorescent Lights and Ballasts	16	Ceiling-Mounted
Control Building	1	Load Monitor	1	Bearing High Temp Monitor
Control Building	1	Exit Sign	2	Wall-Mounted
Control Building	1	Blower Unit	3	Roots Dresser
Control Building	1	Air Handler	2	Circle Aire model: MOD LR-808-SP
Control Building	1	2'x3' Oil Tray	1	Tray of oil With Parts in Oil Bath
Control Building	1	Premelube Synthetic Blend	5	5 Gallon Buckets
Control Building	1	Paint	1	1 Gallon Glidden Primer and Paint
Control Building	1	Fire Strobe Light	2	Wall-Mounted
Control Building	1	Mercury Gauge	1	Weiss Pressure Gauge
Control Building	2	4' Fluorescent Lights	30	Ceiling-Mounted
Control Building	2	Ballasts	15	Ceiling-Mounted
Control Building	2	Exit Sign	2	Wall-Mounted
Control Building	2	Strobe Fire Alarm	2	Wall-Mounted
Control Building	2	Mercury Gauge	1	Weiss Pressure Gauge
Control Building	2	EMI Control Blower	12	EMI Controller Blower Shut Off
Control Building	2	Detergent Disinfection	1	3 lbs. of A-33 Dry Detergent
Control Building	2	Petroleum Grease	1	5-Gallon Bucket
Control Building	2	Joint Compound	12	5-Gallon Bucket

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Control Building	3	4' Light Bulb	12	Ceiling-Mounted
Control Building	3	Ballasts	6	Ceiling-Mounted
Control Building	3	Exit Sign	2	Wall Mounted
Control Building	3	Fire Pull Alarm	2	Wall-Mounted
Control Building	3	Fire Extinguisher	1	Wall-Mounted
Control Building	3	Hazardous Waste	1	55 Gallon Drum With Waste Aerosol Cans
Control Building	7	4' Fluorescent Lights	34	Ceiling-Mounted
Control Building	7	Ballast	17	Ceiling-Mounted
Control Building	7	Mercury Gauge	1	Weiss Pressure Gauge
Control Building	7	Gas Tank	1	5 Gallon Old Metal Tanks
Control Building	7	Speedy-Dry	1	55 lbs. Absorb It- Speedy Dry
Control Building	7	Motor Oil	1	5 Gallon Dryden Motor Oil
Control Building	7	Paint	6	1 Gallon Paint and Primer
Control Building	7	Oil Filter	1	Oil Filter
Control Building	7	Degreaser	1	5 Gallon Simple Green
Control Building	7	Oxygen Cylinder	2	2-4 Feet Cylinders
Control Building	7	Anti-Seize Compound	1	Anti Seize Lubricant Compound
Control Building	7	Parts Cleaner	2	5-Gallon Parts Cleaner
Control Building	8	4' Fluorescent Lights	10	Ceiling-Mounted
Control Building	8	Ballasts	5	Ceiling-Mounted
Control Building	8	Smoke Detectors	1	Wall-Mounted
Control Building	8	Pack Lights	2	EMI Controller Blower Shut Off
Control Building	8	3/3R Transformer	1	Dry Type
Control Building	8	Flame Monitor	1	Webster Flame Monitor
Control Building	8	Flexible Tube Boiler	1	Bryan SN: 75271
Control Building	8	Premalube Xtreme	5	5-Gallon Multi Purpose Green Synthetic Blen
Control Building	8	Premalube Xtreme	5	15.5 oz Tubes
Control Building	8	Hand Cleaner	1	Zep Hand Cleaner
Control Building	10	Flammable Cabinet	1	Inaccessible Fill Flame Cabinet
Control Building	11	Ballasts	1	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Control Building	11	4' Fluorescent Lights	2	Ceiling-Mounted
Control Building	101	Smoke Detectors	1	Ceiling-Mounted
Control Building	101	Exit Sign	1	Wall-Mounted
Control Building	101	Fire Pull Alarm	1	Wall-Mounted
Control Building	101	4' Fluorescent Lights	12	Ceiling-Mounted
Control Building	101	Ballasts	1	Ceiling-Mounted
Control Building	101	Fire Alarm Annunciator	1	TPC Fire Alarm
Control Building	102	LED Lights	6	Ceiling-Mounted
Control Building	102	Exit Sign	2	Wall-Mounted
Control Building	102	Smoke Detectors	2	Ceiling-Mounted
Control Building	102	Fire Extinguisher	1	Wall-Mounted
Control Building	103	2' Fluorescent Lights	12	Ceiling-Mounted
Control Building	103	Ballasts	6	Ceiling-Mounted
Control Building	103	Smoke Detectors	1	Ceiling-Mounted
Control Building	108	4' Fluorescent Lights	7	Ceiling-Mounted
Control Building	108	Ballasts	4	Mounted to Wall and Ceiling
Control Building	109	4' Fluorescent Lights	4	Ceiling-Mounted
Control Building	109	Ballasts	2	Ceiling-Mounted
Control Building	110	4' Fluorescent Lights	12	Ceiling-Mounted
Control Building	110	Ballasts	6	Ceiling-Mounted
Control Building	110	Fire Strobe Light	1	Wall-Mounted
Control Building	116	4' Fluorescent Lights	30	Ceiling-Mounted
Control Building	116	Ballasts	10	Ceiling-Mounted
Control Building	116	Fire Pull Alarm	2	Wall-Mounted
Control Building	116	Exit Sign	2	Wall Mounted
Control Building	116	Smoke Detectors	2	Ceiling-Mounted
Control Building	116	Strobe Fire Alarm	1	Ceiling-Mounted
Control Building	116	Type 3/3R Transformer	4	Dry Type
Control Building	116	Power Support System	1	SAF Power Support System
Control Building	116	Controller	1	Anvic Control System

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Control Building	116	UPS Units	4	Deltec
Control Building	116	Fire Extinguisher	1	Wall-Mounted
Control Building	116	Blower Controller	1	O.O.S
Control Building	116	Blower Control Panel	3	Roots Dresser CP
Control Building	116	Control Panel	6	Honeywell
Control Building	116	Variable Speed Drives	6	Yaskawa
Control Building	116	Control Panel	1	Anvic Control Panel
Control Building	117	Exit Sign	1	Wall-Mounted
Control Building	117	2' Fluorescent Lights	2	Ceiling-Mounted
Control Building	117	Ballasts	1	Ceiling-Mounted
Control Building	119	4' Fluorescent Lights	2	Ceiling-Mounted
Control Building	119	Ballasts	1	Ceiling-Mounted
Control Building	119	Smoke Detectors	1	Ceiling-Mounted
Control Building	119	Used 4' Fluorescent Lights	10	12 oz Red Lion Spray
Control Building	119	Rowland Telecomm	1	
Control Building	201	4' Fluorescent Lights	27	Wall-Mounted
Control Building	201	4-Gas Cylinder	1	34 L Four Gas Calibration Gas
Control Building	201	Gate Alarm	3	Good Condition
Control Building	201	Thermostat	1	Honeywell Digital
Control Building	201	Generator Annunciator	1	
Control Building	201	Paging System	1	Ronen Paging System
Control Building	201	Transformer Cabinet	1	Dukane Cabinet and 3 Controllers
Control Building	201	ESL Control Module	1	Power Supply Packer
Control Building	201	Type 3/3R Transformer	1	Dry Type
Control Building	201	Air Handler	1	Trane Air handler
Control Building	201	Control System	1	Anvic Control System
Control Building	205 Hallway	Fire Extinguisher	1	in Glass Case
Control Building	205 Hallway	Fire Cabinet (Locked)	2	Yellow In Hallway
Control Building	205 Hallway	Exit Sign	4	Wall-Mounted
Control Building	205 Hallway	2'x2' LED Lights	10	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Control Building	205 Hallway	Fire Pull Alarm	2	Wall-Mounted
Control Building	205 Hallway	Fire Strobe Light	3	Wall-Mounted
Control Building	207	2x2 LED Lights	9	Ceiling-Mounted
Control Building	207	Smoke Detectors	1	Ceiling-Mounted
Control Building	207	Thermostat	1	Lockbox Thermostat
Control Building	209	Smoke Detectors	2	Ceiling-Mounted
Control Building	209	Flammables Cabinet	1	Flammables Cabinet
Control Building	209	Fire Extinguisher	2	Wall-Mounted
Control Building	209	4' LED Lights	24	Ceiling-Mounted
Control Building	209	4-10 pH Buffer	8	In Lab Waste Cabinet
Control Building	209	Potassium Permanganate	8	In Lab Waste Cabinet
Control Building	209	Standard Calibration Solution	7	20 NTU Standard Solution
Control Building	209	25 gram Ammonium Chloride	1	Small Bottle of H4CLN
Control Building	209	3 Nitrate Reagent	3	3 Containers
Control Building	209	Bromine Water	1	Sealed Container
Control Building	209	Ammonium Hydroxide	1	Large Sealed Container
Control Building	209	High Range Ammonia	2	Test Tube Containers
Control Building	209	Sodium Aldize	1	500 Gram Metal Container
Control Building	209	Sodium Sulfate	2	500 Gram Glass Jars
Control Building	209	Ethyl Alcohol	2	4 Liter Jar
Control Building	209	Methyl Alcohol Anhydrous	6	500 ml Glass Jars
Control Building	209	Butyl Alcohol	2	500 ml Glass Jars
Control Building	209	Petroleum Ether	1	1-Gallon Glass Jar
Control Building	209	Toluene	1	1-Gallon Glass Jar
Control Building	209	Methanol	2	1-Gallon Glass Jar
Control Building	209	Chloroform	3	2, 1.06 pint Glass, 1, 1.06 Gallon Glass
Control Building	209	Bromine Water	1	500 ml Glass Jars
Control Building	209	Nitric Acid	1	500 ml Glass Jars
Control Building	209	Sodium Hydroxide	4	2.5 kg Plastic
Control Building	209	Potassium Iodide	6	1 Liter Plastic

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Control Building	209	Acetic Acid	2	500 ml Plastic
Control Building	209	Sodium Hydroxide (Liquid)	2	1 liter Plastic
Control Building	210	4' Fluorescent Lights	4	Ceiling-Mounted
Control Building	210	Ballasts	2	Ceiling-Mounted
Control Building	210	Smoke Detectors	1	Ceiling-Mounted
Control Building	212	4' Fluorescent Lights	4	Ceiling-Mounted
Control Building	212	Ballasts	2	Ceiling-Mounted
Control Building	212	Smoke Detectors	1	Ceiling-Mounted
Control Building	302	4' Fluorescent Lights	16	Ceiling-Mounted
Control Building	302	Ballasts	8	Ceiling-Mounted
Control Building	302	Smoke Detectors	58	Ceiling-Mounted
Control Building	302	Exit Signs	1	Wall-Mounted
Control Building	302	Fire Pull Alarm	1	Wall-Mounted
Control Building	302	Strobe Fire Alarm	1	Wall-Mounted
Control Building	302	Pressure Mercury Gauge	4	Attached To Machinery In Room
Control Building	302	2 cu ft. Oxygen Bottles	3	In Box On Floor
Control Building	302	2 cu ft. H2S-N (Empty)	4	In Box On Floor
Control Building	302	Thermostat	1	Honeywell
Control Building	302	Dell Hard Drive	1	On The Floor
Control Building	302	Miscellaneous Hard Drives	3	In Box On Floor
Control Building	Exterior	Gas Tanks	2	5-1 Gallon Tanks on South Wall
Control Building	Main Stairwell	4' Fluorescent Lights	10	Ceiling and Wall-Mounted
Control Building	Main Stairwell	Ballast	5	Ceiling and Wall-Mounted
Control Building	Offices 202-205	2'x2' LED lights	12	Ceiling-Mounted
Control Building	Penthouse/ Elevator Room	4' Light Bulbs	4	Ceiling-Mounted
Control Building	Penthouse/ Elevator Room	Elevator Motor Oil	1	Green Elevator Motor SN: 706884
Control Building	Penthouse/ Elevator Room	AC Capacitor	1	Not in operation SN: 2392798P
Control Building	Penthouse/ Elevator Room	Ballasts	2	Ceiling-Mounted
Control Building	Penthouse/ Elevator Room	Thermostat	1	Honeywell
Control Building	Penthouse Stairwell	4' Fluorescent Lights	16	Ceiling and Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Control Building	Penthouse Stairwell	Ballasts	8	Ceiling and Wall-Mounted
Control Building	Penthouse Stairwell	Smoke Detectors	1	Ceiling-Mounted
Control Building	Penthouse Stairwell	Fire Pull Alarm	1	Wall-Mounted
Control Building	Penthouse Stairwell	Fire Extinguisher	1	Wall-Mounted
Control Building	Penthouse Stairwell	Fire Exit	1	Wall-Mounted
Control Building	Penthouse Stairwell	Fire Strobe Light	1	Wall-Mounted
Control Building	Roof	Pack Lights	5	Wall-Mounted
Control Building	Roof	Flashing Cement	1	5 Gallon Bucket Asbestos Free
Degritter Building	101	Exit Sign	2	Wall-Mounted
Degritter Building	101	Vapor Lights	10	Ceiling-Mounted
Degritter Building	101	Emergency Lights	3	Wall-Mounted
Degritter Building	101	Smoke Detectors	1	Ceiling-Mounted
Degritter Building	101	Fire Extinguisher	2	Wall-Mounted
Degritter Building	201	4' Fluorescent	45	Ceiling-Mounted
Degritter Building	201	Ballasts	15	Ceiling-Mounted
Degritter Building	201	Smoke Detectors	1	Ceiling-Mounted
Degritter Building	201	Fire Strobe Light	2	Wall-Mounted
Degritter Building	201	Fire Extinguisher	1	Wall-Mounted
Degritter Building	201	Control Panel	5	Anvic Control Panel
Degritter Building	201	Control Panel	2	Thickener Under Flow Pump
Degritter Building	201	3/3R Transformer	4	Dry Type
Degritter Building	201	Variable Speed Drives	1	Yaskawa
Degritter Building	201	Controller	1	System Controller
Degritter Building	202	4' Fluorescent Lights	12	Ceiling-Mounted
Degritter Building	202	Ballasts	6	Ceiling-Mounted
Degritter Building	202	Emergency Lights	1	Wall-Mounted
Degritter Building	202	Smoke Detectors	1	Ceiling-Mounted
Degritter Building	202	Open Drum	1	55-Gallon White Open Drum with Trace Oil
Degritter Building	202	Thermostat	1	Honeywell
Degritter Building	202 Stairwell/Lower Level	Pack Lights	5	Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Degritter Building	202 Stairwell	Fire Pull Alarm	1	Wall-Mounted
Degritter Building	202 Stairwell	Exit Sign	2	Wall-Mounted
Degritter Building	204	4' Fluorescent Light	3	Ceiling-Mounted
Degritter Building	204	Ballasts	1	Ceiling-Mounted
Degritter Building	204	Variable Traction Fluid	1	8oz Bottle
Degritter Building	204	Smoke Detectors	1	Ceiling-Mounted
Degritter Building	205	4' Fluorescent Light	3	Ceiling-Mounted
Degritter Building	205	Ballasts	2	Ceiling-Mounted
Degritter Building	205	Circular Fluorescent Light	1	Ceiling-Mounted
Degritter Building	Basement Tunnel	Pack Lights	17	Ceiling-Mounted
Degritter Building	Basement Tunnel	Emergency Lights	4	Wall-Mounted
Degritter Building	Basement Tunnel	Exit Sign	3	Wall-Mounted
Degritter Building	Basement Tunnel	Vapor Lights	5	Wall Mounted
Degritter Building	Basement Tunnel	Smoke Detectors	4	Ceiling-Mounted
Degritter Building	Basement Tunnel	Control Panel	1	Anvic Pump Gallery
Degritter Building	Basement Tunnel	Waste Oil	2	For Pumps
Degritter Building	Basement Tunnel	Power Supply Pumps	5	Yaskawa V1000
Degritter Building	Pump Room	Control Panel	6	Anvic Control Panel
Degritter Building	Pump Room	Vapor Lights	8	Ceiling-Mounted
Degritter Building	Pump Room	Emergency Lights	4	Wall-Mounted
Degritter Building	Pump Room	Pack Lights	1	Ceiling-Mounted
Degritter Building	Pump Room	Smoke Detectors	2	Ceiling-Mounted
Dichlorination Building	Main Level	4' Fluorescent Lights	12	Ceiling-Mounted
Dichlorination Building	Main Level	Ballasts	6	Ceiling-Mounted
Dichlorination Building	Main Level	Emergency Lights	3	Wall-Mounted
Dichlorination Building	Main Level	Sodium Bisulfate	2	2000 Gallons
Dichlorination Building	Main Level	Fire Extinguisher	1	Wall-Mounted
Dichlorination Building	Main Level	3/3R Transformer	1	Siemens Dry Type
Pump Station	101	4' Fluorescent Lights	36	Ceiling-Mounted
Pump Station	101	Ballast	18	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Pump Station	101	Smoke Detectors	3	Ceiling-Mounted
Pump Station	101	Exit Sign	3	Wall-Mounted
Pump Station	101	Fire Extinguisher	2	Wall-Mounted
Pump Station	101	Fire Strobe Light	2	Wall-Mounted
Pump Station	101	Fire Pull Alarm	1	Wall-Mounted
Pump Station	101	3/3R Transformer	2	Dry Type
Pump Station	101	Control Panel	4	Anvic
Pump Station	101	Control Panel	1	Blue, Inflico Degermont
Pump Station	101	Control Panel	1	Rodney Hunt
Pump Station	101	Thermostat	1	Honeywell
Pump Station	102	Vapor Lights	10	Ceiling-Mounted
Pump Station	102	Pack Lights	6	Wall-Mounted
Pump Station	102	Emergency Lights	6	Wall-Mounted
Pump Station	102	Smoke Detectors	1	Ceiling-Mounted
Pump Station	102	Exit Sign	2	Wall-Mounted
Pump Station	102	Fire Strobe Light	4	Wall-Mounted
Pump Station	102	Fire Pull Alarm	1	Wall-Mounted
Pump Station	102	Thermostat	1	Honeywell
Pump Station	102	Control Panel	7	Anvic
Pump Station	102	Bubble System	2	Model 7600
Pump Station	102	Fire Extinguisher	1	Wall-Mounted
Pump Station	102	Propane Tank	1	20 lbs. Propane Tank
Pump Station	102	Flex Safe Food Grade Lubricant	10	55 Gallon Red Drums
Pump Station	102	Control Panel	1	Dyna Jet Control Panel O.O.S
Pump Station	102	Vapor Lights	11	Ceiling-Mounted
Pump Station	102	Pack Lights	6	Wall-Mounted
Pump Station	102	Emergency Lights	6	Wall-Mounted
Pump Station	102	Fire Extinguisher	1	Wall-Mounted
Pump Station	102	Smoke Detectors	1	Hard-Wired
Pump Station	102 Elevator Control Room	4' Fluorescent Lights	2	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Pump Station	102 Elevator Control Room	Ballasts	1	Ceiling-Mounted
Pump Station	102A	Pack Lights	3	Wall-Mounted
Pump Station	102A	Vapor Lights	5	Ceiling-Mounted
Pump Station	102A	Emergency Lights	4	Wall-Mounted
Pump Station	102A	Smoke Detectors	1	Ceiling-Mounted
Pump Station	102A	Thermostat	1	Honeywell
Pump Station	102A	Fire Strobe Light	1	Wall-Mounted
Pump Station	102A/Lower Level	Vapor Lights	10	Ceiling-Mounted
Pump Station	102A/Lower Level	Emergency Lights	3	Wall Mounted
Pump Station	102A/Lower Level	Oil	1	Red 5 Gallon Bucket
Pump Station	102A/Lower Level	Smoke Detectors	1	Ceiling-Mounted
Pump Station	102A/Lower Level	Fire Extinguisher	1	In Corner Paint Chipping
Pump Station	102/Lower Level	Vapor Lights	4	Ceiling-Mounted
Pump Station	102/Lower Level	Emergency Lights	1	Ceiling-Mounted
Pump Station	102/Lower Level	Exit Sign	1	Ceiling-Mounted
Pump Station	102/Lower Level	Fire Pull Alarm	1	Ceiling-Mounted
Pump Station	103	4' Fluorescent Lights	12	Ceiling-Mounted
Pump Station	103	Ballasts	6	Ceiling-Mounted
Pump Station	103	Smoke Detectors	1	Ceiling-Mounted
Pump Station	103	Strobe Fire Alarm	1	Wall-Mounted
Pump Station	103	Thermostat	1	Honeywell
Pump Station	103	Emergency Lights	1	Wall-Mounted
Pump Station	103	Semi Gloss Exterior Paint	4	5-Gallon Buckets White Paint
Pump Station	103	Paint and Primer	25	1-Gallon Paint, 8 Flammable/17 Respiratory
Pump Station	103	Power Bond Adhesive	15	Spray Can
Pump Station	103	Seal-It Coat	21	Spray Can
Pump Station	103	Lubest Lubricant	6	Spray Can
Pump Station	103	EZ Track Slip Resistant	12	Spray Can
Pump Station	103	Rebound Rubberizing Coating	27	Spray Can
Pump Station	103	Hand Sanitizer	2	7 oz. Can

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Pump Station	103	Tough Guy Degreaser	3	1 Gallon
Pump Station	103	Lubriplate Synthetic Lubricant	2	1-Gallon
Pump Station	103	System Purge Lubemaster Oil	3	1-Gallon
Pump Station	103	Windshield Washer Fluid	3	2-Gallon
Pump Station	103	Spectra Xtreme Motor Oil 10w-30	11	1-Gallon
Pump Station	103	Fix Gasoline Treatment	4	1-Gallon
Pump Station	103	Certified Sewer and Drain Clean Compound	4	1-Gallon
Pump Station	103	Bombs Away Insecticide	1	6 oz
Pump Station	103	Molycoat Grease Spray	10	Spray Can
Pump Station	103	Core Liquid Defoamer	5	1-Gallon
Pump Station	103	Molycoat Gear Oil Additive	1	28 oz
Pump Station	103	Chain and Cable Lubricant	10	--
Pump Station	103	Purple Heat Concrete Degreaser	1	1-Gallon
Pump Station	103	Salt Guard Liquid	1	5-Gallon
Pump Station	103	Lubease Grease	1	1 Case
Pump Station	103	Air Conditioner Unit	1	Mounted in Air Duct
Pump Station	103	4' Fluorescent Lights	4	Ceiling-Mounted
Pump Station	103	Ballast	2	Ceiling-Mounted
Pump Station	104 Vestibule Lower Level	4' Fluorescent Lights	2	Ceiling-Mounted
Pump Station	104 Vestibule Lower Level	Ballast	1	Ceiling-Mounted
Pump Station	104 Vestibule Lower Level	Fire Pull Alarm	1	Wall-Mounted
Pump Station	104 Vestibule Lower Level	Smoke Detectors	1	Ceiling-Mounted
Pump Station	104 Vestibule Lower Level	Fire Strobe Light Alarm	1	Wall-Mounted
Pump Station	104 Vestibule Lower Level	Exit Sign	1	Wall-Mounted
Pump Station	104 Vestibule Lower Level	Fire Extinguisher	1	Wall-Mounted
Pump Station	105	Vapor Lights	2	Ceiling-Mounted
Pump Station	105	Smoke Detectors	1	Ceiling-Mounted
Pump Station	105	Emergency Lights	1	Wall-Mounted
Pump Station	105	Lubest Grease	50	8 oz Tubes
Pump Station	105	Chain and Wire Lube	1	16 oz Momar

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Pump Station	105	Aerosol Cans	2	Spray Can
Pump Station	105	Red Grease	1	12 oz Red Lion Spray
Pump Station	105	R.V.T Gasket Maker	1	8 oz Red Lion Flammable Spray
Pump Station	105	White Grease	1	12 oz Red Lion Spray
Pump Station	105	Clear Lubricant	1	12 oz Red Lion Spray
Pump Station	105	Multi Purpose Cleaner	1	Mr. Orange 1-Gallon
Pump Station	105	Synthetic Lubricant	1	Lubriplate 1-Gallon
Pump Station	105	Motor Oil	1	10 w-30 1-Gallon
Pump Station	105	Thermostat	1	Honeywell
Pump Station	105	Gas Cylinder	1	4ft Gas/Oxygen Cylinder
Pump Station	105	Penetrating Oil	3	8 oz Spray
Pump Station	105	Goo Gone	1	8 oz
Pump Station	106	Vapor Lights	7	Ceiling-Mounted
Pump Station	106	Emergency Lights	1	Wall-Mounted
Pump Station	106	Exit Sign	1	Ceiling-Mounted
Pump Station	106	Control Panel	2	Aldat Control Panel
Pump Station	106	Fire Extinguisher	1	Wall-Mounted
Pump Station	106	Fire Pull Alarm	1	Wall-Mounted
Pump Station	106	Control Panel	4	US Filtered Strantrol 880
Pump Station	106	Flex Safe Food Grade Lubricant	1	55-Gallon Drum
Pump Station	106	Premalube Grease	2	5-Gallon Grease
Pump Station	107	Vapor Lights	4	Ceiling-Mounted
Pump Station	107	Thermostat	1	Honeywell
Pump Station	107	Pull Fire Alarm	1	Wall-Mounted
Pump Station	107	Exit Sign	1	Wall-Mounted
Pump Station	107	Fire Strobe Light Alarm	1	Wall-Mounted
Pump Station	107	Ethanol Solution	1	5 Gallon in Black Cabinet
Pump Station	107	Smoke Detectors	1	Ceiling-Mounted
Pump Station	Chlorine Tank Room	Vapor Lights	4	Ceiling-Mounted
Pump Station	Chlorine Tank Room	Emergency Lights	2	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Pump Station	Chlorine Tank Room	Exit Sign	1	Wall-Mounted
Pump Station	Chlorine Tank Room	Control Panel	1	Denver Control Panel
Pump Station	Chlorine Tank Room	Liquid Flow Vacuum Feeder	2	JCS Industries Mod 4100
Pump Station	Chlorine Tank Room	Sodium Hypochlorite	5	3000-Gallon Poly Tank
Pump Station	Chlorine Tank Room	Pack Lights	4	Wall-Mounted
Pump Station	Chlorine Tank Room	Evaporate Controllers	2	Fisher and Porter O.O.S
Pump Station	Chlorine Tank Room	Chlorinator Controllers	4	O.O.S
Pump Station	Chlorine Tank Room	ALCO Controller	1	O.O.S
Pump Station	Chlorine Tank Room	Vapor Lights	2	Wall-Mounted
Pump Station	Chlorine Tank Room	Exit Sign	1	O.O.S
Pump Station	Chlorine Tank Room	Emergency Lights	1	O.O.S
Pump Station	Chlorine Tank Room	Siemens Transformers	2	Possible Oil Dielectric
Pump Station	Elevator Control Room/B	Smoke Detectors	1	Ceiling-Mounted
Screen Building	100	Vapor Lights	1	Ceiling-Mounted
Screen Building	100	Smoke Detectors	1	Ceiling-Mounted
Screen Building	100	Gas Cans	2	2-5 Gallon Tanks
Screen Building	100	Tru Fuel Oil 50:1 Mix	2	8 oz 50:1 2 Stroke Mix
Screen Building	101	Vapor Lights	2	Ceiling-Mounted
Screen Building	101	Smoke Detectors	1	Ceiling-Mounted
Screen Building	101	Thermostat	2	Honeywell
Screen Building	101	Gas Cylinder	2	4ft Gas/Oxygen Cylinder
Screen Building	101	Aerosol Cans	24	Various Aerosol Cans in Use
Screen Building	102	4' Fluorescent Lights	16	Ceiling-Mounted
Screen Building	102	Ballast	8	Ceiling-Mounted
Screen Building	102	Exit Sign	1	Wall-Mounted
Screen Building	102	Fire Extinguisher	1	Wall-Mounted
Screen Building	102	Smoke Detectors	2	Ceiling-Mounted
Screen Building	102	Fire Pull Alarm	1	Wall-Mounted
Screen Building	102	Strobe Fire Alarm	1	Wall-Mounted
Screen Building	102	Screen Bubbler System	2	Model 7600

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Screen Building	102	3/3R Transformer	2	Dry Type
Screen Building	102	Control Panel	1	Anvic Control Panel
Screen Building	102	Main Screen Control	1	Inflico-Degermont Main Control
Screen Building	102	Control Panel	1	Rodney Hunt
Screen Building	102	Control Panels	3	Honeywell
Screen Building	102	Control Panel	1	Odor Control Panel
Screen Building	103	4' Fluorescent Lights	5	Ceiling-Mounted
Screen Building	103	Ballast	2	Ceiling-Mounted
Screen Building	103	Smoke Detectors	1	Ceiling-Mounted
Screen Building	104	Smoke Detectors	1	Ceiling-Mounted
Screen Building	104	4' Fluorescent Light	8	Ceiling-Mounted
Screen Building	104	Ballast	4	Ceiling-Mounted
Screen Building	104	Thermostat	1	Honeywell Wall-Mounted
Screen Building	104	SAE 30 Oil	1	5 Gallon Bucket of SAE 30 Motor Oil
Screen Building	105/Lower Level	4' Fluorescent Lights	24	Ceiling-Mounted
Screen Building	105/Lower Level	Ballast	8	Ceiling-Mounted
Screen Building	105/Lower Level	Emergency Lights	4	Wall-Mounted
Screen Building	105/Lower Level	Control Panel	1	Ceiling-Mounted
Screen Building	105/Lower Level	Exit Sign	2	Wall-Mounted
Screen Building	105/Lower Level	Fire Extinguisher	1	Wall-Mounted
Screen Building	105/Lower Level	Control Panel	1	Inflico-Degermont Control Panel
Screen Building	105/Lower Level	Emergency Lights	6	Wall-Mounted
Screen Building	105/Lower Level	4' Fluorescent Lights	27	Ceiling-Mounted
Screen Building	105/Lower Level	Ballast	9	Ceiling-Mounted
Screen Building	105/Lower Level	Vapor Lights	1	Ceiling-Mounted
Screen Building	105/Lower Level	Exit Sign	1	Ceiling-Mounted
Screen Building	105/Lower Level	Fire Extinguisher	1	Wall-Mounted
Screen Building	105/Lower Level Tunnel	4' Fluorescent Lights	8	Ceiling-Mounted
Screen Building	105/Lower Level Tunnel	Ballast	4	Ceiling-Mounted
Screen Building	105/Lower Level Tunnel	Vapor Lights	1	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
West Wastewater Treatment Plant
205 Bostwick Street, Bridgeport, Connecticut 06605

Building	Location/Room	Material Description	Quantity	Notes
Screen Building	105/Lower Level Tunnel	Emergency Lights	2	Wall-Mounted
Screen Building	105/Lower Level Tunnel	Fire Detector	1	Chemtron
Screen Building	107	Vapor Lights	3	Ceiling-Mounted
Screen Building	107	Emergency Lights	3	Wall-Mounted
Screen Building	107	4' Fluorescent Light	3	Ceiling-Mounted
Screen Building	107	Ballast	1	Ceiling-Mounted
Screen Building	107	Smoke Detectors	1	Ceiling-Mounted
Screen Building	107	Waste Oil	1	Fill 5-Gallon Bucket
Screen Building	107	Fire Extinguisher	1	Wall Mounted
Screen Building	107	Miscellaneous Gas Tanks	4	1-4 Gallon Cans
Screen Building	107	Paint Cans	3	1-Gallon Paint Cans
Screen Building	107	Fire Extinguisher	1	Wall-Mounted
Screen Building	107	Fire Pull Alarm	1	Wall-Mounted
Screen Building	107	Transmitter	2	US Filtered Strantrol 880
Screen Building	108	Fire Extinguisher	1	Wall-Mounted
Screen Building	108	Vapor Lights	2	Ceiling-Mounted
Screen Building	108	Smoke Detectors	2	Ceiling-Mounted
Screen Building	108	4' Fluorescent Lights	9	Ceiling-Mounted
Screen Building	108	Ballast	3	Ceiling-Mounted
Screen Building	108	Control Panel	1	Adalet Control Panel
Screen Building	108	Exit Sign	1	Wall-Mounted
Screen Building	108	Fire Alarm	1	Wall-Mounted
Screen Building	108 Mezzanine	4' Fluorescent Light	6	Ceiling-Mounted
Screen Building	108 Mezzanine	Ballast	2	Ceiling-Mounted
Screen Building	108 Mezzanine	Waste Oil	1	5-Gallon Bucket
Screen Building	108 Mezzanine	Emergency Lights	1	Wall-Mounted

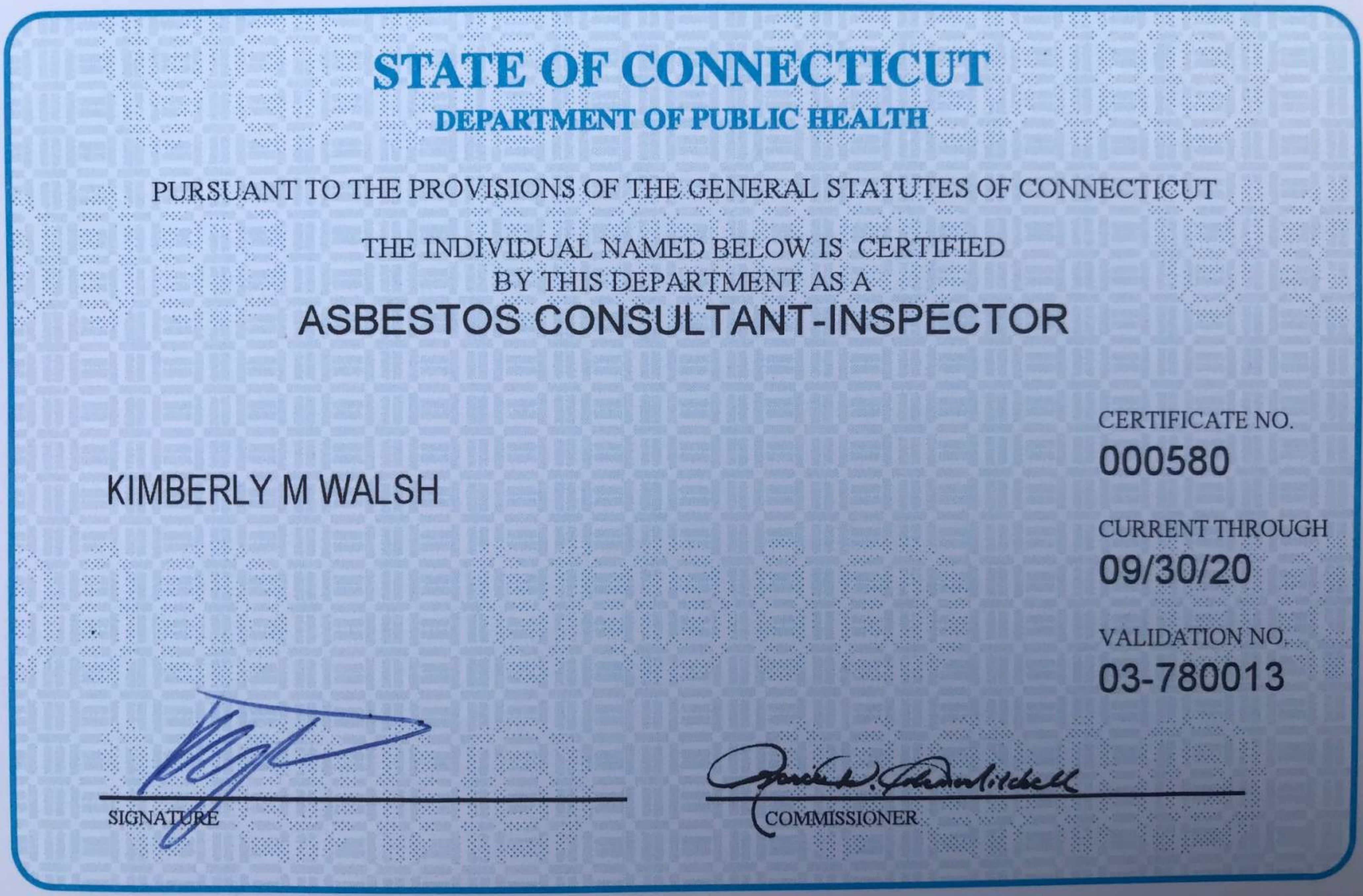
ATTACHMENT F

LABORATORY ANALYTICAL REPORTS

Detailed Laboratory Reports Available Upon Request

ATTACHMENT G

LICENSES



STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A

ASBESTOS CONSULTANT-INSPECTOR

CERTIFICATE NO.
000580

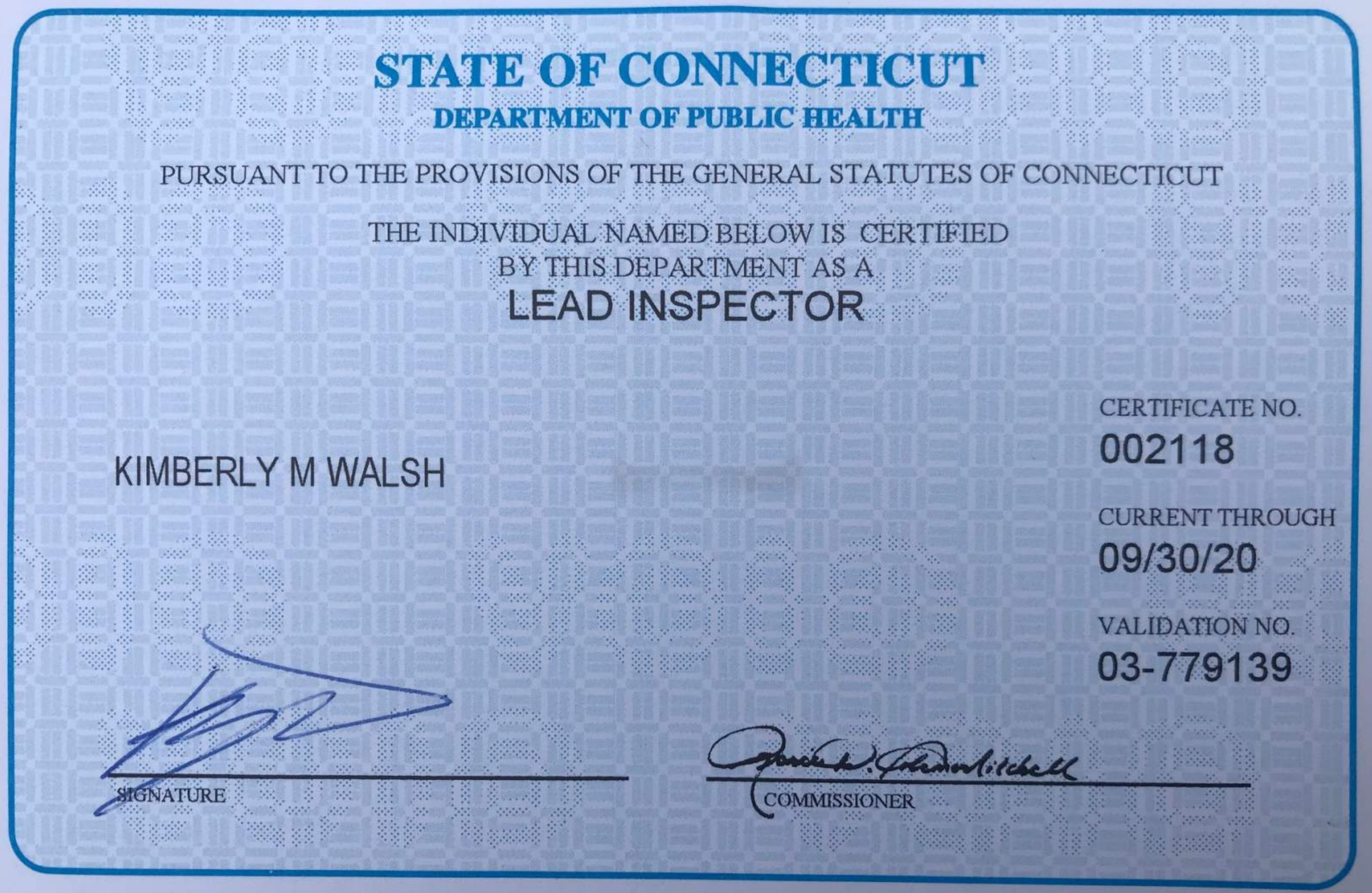
KIMBERLY M WALSH

CURRENT THROUGH
09/30/20

VALIDATION NO.
03-780013

SIGNATURE

COMMISSIONER



STATE OF CONNECTICUT

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PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A
LEAD INSPECTOR

KIMBERLY M WALSH

CERTIFICATE NO.
002118

CURRENT THROUGH
09/30/20

VALIDATION NO.
03-779139

SIGNATURE

COMMISSIONER

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A

LEAD INSPECTOR

ALEXANDER K CLARKE

CERTIFICATE NO.
002217

CURRENT THROUGH
02/29/20

VALIDATION NO.
03-739440

SIGNATURE

COMMISSIONER

East Side WWTP

May 29, 2020

D. Craig Wagner, PE, BCEE
CDM Smith
77 Hartland Street, Suite 201
East Hartford, Connecticut 06108

Re: Hazardous Building Materials Survey Report
City of Bridgeport East Plant Wastewater Treatment Facility
695 Seaview Avenue Bridgeport, Connecticut 06607

Dear Mr. Wagner:

Eolas Environmental, LLC (Eolas) has prepared this letter report to summarize the results of the Hazardous Building Materials (HBM) survey of the structures at the City of Bridgeport East Plant Wastewater Treatment Facility located at 695 Seaview Avenue in Bridgeport, Connecticut (herein referred to as the “Site” or “East Plant”). The on-site survey activities were conducted on February 20, 21, and 25, 2020; were completed to physically assess the structures’ building materials for the presence of asbestos, lead, and polychlorinated biphenyls (PCBs); and were completed to obtain an inventory of miscellaneous building materials that may require special handling and/or disposal at the time of building renovation and/or demolition.

It is our understanding that ATC Associates Inc. (ATC) completed asbestos and lead paint testing of the Incinerator/Sludge Handling building and Gravity Thickener Tank Area (Pump House Rooms) at the Site in 2010. Asbestos containing materials (ACM) were identified in the Incinerator Room, Second Floor Level, Elevator Room, Penthouse, Exterior, and Roof. Lead paint was identified on several surfaces including a Blue Metal Door, Blue Metal Door Frame, Orange Concrete Column, Gray Metal Door Frame, and Elevator Door at the Site. The exact locations of the identified lead and ACM were not specified in the report.

Based on the above and in accordance with our scope of services, the February 2020 assessment was completed with the goal of quantifying building materials for asbestos, lead, PCBs, and miscellaneous HBM. The assessment included the collection and analysis of select building materials for the presence of asbestos and PCBs; a lead-based paint screening of building surfaces using X-Ray Fluorescence (XRF) instrumentation; and a visual inventory of miscellaneous HBM (e.g. batteries, light ballasts, fluorescent bulbs, miscellaneous drums, and containers).

Floor plans that depict the layout of the building and sample locations are included in Attachment A of this letter report. Tabulated summaries of the various HBM identified at the Site are included in Attachments B through E of this letter report. Laboratory analytical reports are included in Attachment F.

1.0 FIELD SURVEY ACTIVITIES

1.1 Asbestos Containing Materials

The asbestos survey included a visual and physical assessment of safely accessible suspect ACM, and the bulk sampling of representative building materials by Kimberly M. Walsh, a State of Connecticut Licensed Asbestos Inspector (#000580). A copy of Ms. Walsh's license is included in Attachment G. The visual assessment involved observations of accessible interior and exterior areas of each site building to identify homogeneous areas of suspect ACM. A homogeneous area includes building materials that appear similar in color, texture, and date of application/installation. The physical assessment of suspect building materials involved an evaluation of the condition and friability of the materials. The term friable is defined by the United States Environmental Protection Agency (EPA) as a material that can be crumbled, pulverized, or reduced to powder by hand pressure. Materials that are inaccessible must be assumed to be ACM until such time access is available and laboratory analysis is performed to determine asbestos content.

The survey and bulk sampling was conducted in general accordance with the methods prescribed in the EPA guidance document entitled, *Guidance for Controlling Asbestos-Containing Materials in Buildings* (Document No. 560/5-85/024) and in general accordance with 40 CFR Part 763, the Asbestos Hazard Emergency Response Act (AHERA). In addition, the asbestos survey was conducted, in part, to support compliance with Subpart M of 40 CFR Part 61, the EPA National Emission Standard for Hazardous Air Pollutants Act (NESHAP) as amended November 10, 1990, and state and local permitting requirements for renovation and demolition. The NESHAP final rule requires the identification and removal of all regulated ACM in a building prior to demolition or renovation. In order to comply with the EPA renovation/demolition rules, additional representative sampling of materials to be disturbed must be performed since this survey was limited to sampling of safely accessible materials.

The AHERA stipulates the number of samples and types of asbestos materials to be sampled. Material types are classified into one of three EPA-defined categories, sampled in accordance with recommended protocols and guidance documents, and quantified in linear or square footage. The three categories of suspect ACM include thermal system insulation (TSI) (e.g. pipe insulation, pipe fittings, boiler insulation, etc.), surfacing materials (spray-applied fireproofing, ceiling and wall plaster, etc.), and miscellaneous materials (e.g. floor and ceiling tiles, wallboard, etc.). TSI includes those materials that are typically used for the prevention of heat loss or gain or water condensation on mechanical systems. Surfacing ACM includes all ACM that is sprayed-on, troweled-on or otherwise applied to an existing surface, and miscellaneous materials include all ACM not listed in thermal or surfacing category. The Occupational Safety and Health Administration (OSHA) further defines a presumed ACM (PACM) as TSI and surfacing material found in buildings constructed no later than 1980.

Samples that were collected as part of this inspection were collected by licensed personnel using proper safety measures including the use of appropriate personal protective equipment (PPE) (i.e. respirator, gloves, eye protection), wetting surfaces prior to sample collection, and cleaning the area following sample collection. Coring tools and knives were used to penetrate materials to be sampled and samples were placed into labeled, airtight containers under chain-of-custody control for shipment to the laboratory for analysis.

A total of 43 samples were collected for possible asbestos analysis during the inspection. Destructive sampling of roofing materials was not included as part of this survey; readily accessible roofing materials that would not require destructive sampling were collected. It should be noted that additional materials may be present in the site buildings that were inaccessible and could not be sampled as part of this survey. Additional sampling may be necessary to fully characterize potential ACM in the buildings (e.g. elevator brake shoes, electrical wiring, fire doors, electrical panel jacketing, vermiculite filled concrete block, etc.).

Following the collection of samples from representative building materials, Eolas transferred the samples to a Connecticut Department of Public Health (DPH)-approved laboratory, EMSL Analytical, Inc. for analysis by Polarized Light Microscopy (PLM). PLM is the EPA-accepted method (EPA Method 600/R-93/116) of analysis for identification of asbestos in bulk matrices. A sample set is systematically analyzed until one sample is determined to contain asbestos. Upon determination that one sample in the set contains asbestos, analysis of the remaining samples in the set is discontinued. If no asbestos was observed during analysis of the set of samples, the suspect material is determined to be negative for asbestos content. A single sample of certain suspect materials are collected where appropriate. Sample analysis results are reported in percentage of asbestos and non-asbestos components. The EPA defines any material that contains greater than one percent asbestos (1%), utilizing PLM, as being ACM. Any material determined to contain >1% asbestos is regulated by the EPA, DPH, the Connecticut Department of Energy and Environmental Protection (CTDEEP), and the United States Department of Labor. OSHA regulates materials found to be less than or equal to 1% asbestos, per 29 CFR 1926.1101.

The following materials were found to be asbestos containing:

BUILDING	SAMPLE LOCATION	MATERIAL	ACM	QUANTITY (Est.)	CONDITION
Control Building	Roof	Black Roof Flashing	6% Chrysotile	10,000 Linear Feet	Good
Degritter Building	Room 101	Black Floor to Wall Sealant	2% Chrysotile	27 Linear Feet	Damaged
Degritter Building	Roof	Black Flashing Cement	3% Chrysotile	200 Linear Feet	Good
Incinerator Building	Blower Stack	Duct Insulation	15% Amosite	70 Square Feet	Damaged
Incinerator Building	Interior Wall	Gray Pipe Insulation	18% Amosite 5% Chrysotile	110 Linear Feet	Significantly Damaged
Incinerator Building	Assumed	Door Gate	Assumed	16 Square Feet	Good
Incinerator Building	Assumed	Blower Duct/Blower Insulation	Assumed	33 Square Feet	Damaged
Sludge Building	Room 200	Gray Pipe Insulation	19% Amosite 4% Chrysotile	100 Linear Feet, 12 Elbows	Damaged
Sludge Building	Roof	Roof Black Felt on Parapet	4% Chrysotile	5,000 Square Feet	Good
Sludge Building	Roof Parapet and Equipment	Black Flashing Sealant	3% Chrysotile	5,000 Linear Feet	Good

Asbestos sampling locations are depicted on floor plans included in Attachment A. A summary of the samples collected for asbestos content during this survey and respective results is provided in Table 1 included in Attachment B. The laboratory analytical reports associated with this survey are included in Attachment F.

1.2 Lead-Based Paint

A lead-based paint (LBP) inspection of the site buildings was completed by Alexander K. Clarke, a State of Connecticut Licensed Lead Inspector (#002217). A copy of Mr. Clarke's license is included in Attachment G. Painted surfaces were tested in a random manner using a Protec LPA-1B X-Ray Fluorescence (XRF) Lead Paint Spectrum Analyzer, serial #3690. A reading of 1.0 milligrams lead per square centimeter of surface area (1.0 mg/cm^2) or greater is defined as a toxic level of lead by the State of Connecticut Department of Public Health (DPH), *Regulations for Lead Poisoning Prevention and Control*, Section 19a-111-1a of the Regulations of Connecticut State Agencies (RCSA). In accordance with OSHA, any result of lead constitutes the material is lead-containing. Lead-based paint was detected in the following building components at the Site:

- Incinerator Building - Red-painted metal framework. Doors can be found on all floors of the building.
- Incinerator Building - Gray-painted door jamb.
- Sludge Building, Room 109 - Gray-painted elevator door frame.
- Sludge Building, Room 109 - Blue-painted concrete columns.
- Sludge Building, Room 109 - Green-painted steel door header.
- Control Building, Room 213 - Beige and gray-painted metal laboratory cabinets.

In addition to the above, testing of several additional locations yielded a result of 1.0 mg/cm^2 with an inconclusive measurement. An inconclusive measurement is a reading within the tolerance limits of the XRF instrument and a measurement within this tolerance cannot be confirmed to contain LBP without additional laboratory testing. The locations which yielded positive LBP results and the inconclusive measurements of 1.0 mg/cm^2 are depicted on site floor plan figures included in Attachment A. The results of the XRF screening survey are provided in Table 2A through 2I, included in Attachment C.

1.3 Polychlorinated Biphenyls

As part of the HBM survey, five representative building samples (e.g. window glazing, caulk, paint) were collected and submitted for analysis for PCBs using EPA Method 8082 extracted using Soxhlet method 3540 by Phoenix Environmental Laboratories (Phoenix), Inc., a State of Connecticut DPH-approved laboratory. PCBs were reported above laboratory detection limits in four of five samples collected from the Site as follows.

SAMPLE ID:	BUILDING	LOCATION	PCB	RESULT (mg/kg)
CB-EXT-CA001	Control Building	Exterior Caulk	Aroclor 1254	2,000*
PG-PA001-PCB	Pipe Gallery	Pipe Gallery Tan/Mustard/ Gray Layered Wall Paint	Aroclor 1248	1.5
SL-301-WG001	Sludge Building	Stairwell, Room 301, Green-Painted, Deteriorated Gray Window Glaze	Aroclor 1248	9.1

SAMPLE ID:	BUILDING	LOCATION	PCB	RESULT (mg/kg)
PT-EXT-CA001	Primary Tank Building	Tank Expansion Joint Caulk	Aroclor 1254	1.0

* Due to matrix interferences, dilution of this sample was required, resulting in a laboratory reporting limit of 400 mg/kg.

It should be noted, building samples collected for PCB analysis were received by the analytical laboratory after the analytical method holding time, due to a courier shipment error. While the analytical method holding time was exceeded, the data is expected to be representative of the PCB concentrations in the building materials samples based on the following. No preservation is necessary at the time of sample collection and, therefore, potential changes resulting from sample contact with a preservative could not occur. Further, PCBs are classified as a persistent organic pollutant and, therefore, degradation of PCBs in the building materials samples subsequent to collection is unlikely to have occurred. PCB sample locations are depicted on floor plans included in Attachment A. A summary of the samples collected for PCB analysis during this survey is provided in Table 3 included in Attachment D. The laboratory analytical reports are included in Attachment F.

1.4 Miscellaneous Building Materials

As part of this HBM survey, an Eolas representative visually inspected the site buildings for the presence of miscellaneous building components that may contain mercury, PCBs, Freon®, or other HBM that may require special handling and disposal at the time of building renovation and/or demolition. This component of the survey included a visual inspection of lamps potentially containing mercury vapor and switches potentially containing liquid mercury, electrical devices that have the potential to contain capacitors or transformers housing PCB-containing oil, electronic equipment such as refrigerators, copiers, and portable air conditioning units that may contain Freon®, and other miscellaneous equipment that may contain HBM.

The inventory of miscellaneous HBM at the Site is summarized in Table 4 included in Attachment E.

2.0 REGULATORY OVERVIEW

2.1 Asbestos

The EPA, OSHA, CTDEEP, and DPH regulate the inspection, management, and/or disposal of asbestos in buildings. The owner or operator of a facility must provide the DPH with written notification of planned removal activities at least 10 days prior to the commencement of asbestos abatement activities. The abatement of ACM must be performed by Connecticut-licensed asbestos abatement contractor(s) in accordance with project design requirements prepared by a DPH-licensed Project Designer. Third-party air monitoring must be conducted at the completion of certain abatement activities. Management plans developed for the in-place management of ACM must be developed by a DPH-licensed Management Planner.

Notification requirements to the EPA apply whenever the threshold of asbestos to be abated is equal to or greater than 160 square feet, 260 linear feet or 35 cubic feet for renovations and for all demolitions, even when there is no asbestos present. The EPA requires 10 working days for notification. EPA notification lists information not presently included on the Connecticut notification form. EPA requires notification for renovation or demolition in a NESHAP–defined facility, regardless of the amount of ACM to be abated, down to zero asbestos present. The requirement to notify the EPA, in addition to the DPH, became effective in Connecticut on December 14, 2017.

OSHA regulates workplace exposure to asbestos through the asbestos standard for general industry (29 CFR 1910.1001) and asbestos standard for construction (29 CFR 1926.1101). Within these standards, OSHA established several provisions employers must follow to comply with the asbestos standards including, but not necessarily limited to, strict exposure limits and guidelines for exposure monitoring, medical surveillance, recordkeeping, identification of regulated areas, and communication of hazards. Additionally, the construction standard classifies construction and maintenance activities that could disturb ACM and specifies work practices and precautions that employers must follow when engaging in each class of regulated work.

2.2 Lead-Based Paint

The EPA regulates the use, removal, and disposal of lead through the administration and implementation of multiple laws including, but not necessarily limited to, the Toxic Substances Control Act (TSCA), Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X), Clean Air Act, Clean Water Act, Safe Drinking Water Act, Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The EPA defines lead-based paint (LBP) as paint or other surface coatings that contain lead equal to or greater than 1.0 mg/cm^2, 5,000 milligrams per kilogram (mg/kg), or 0.5 percent by dry weight as calculated by laboratory analysis.

OSHA defines lead as metallic lead, all inorganic lead compounds, and organic lead soaps and, does not define LBP based on content. Rather, any detectable level of lead in paint makes it LBP for the purposes of complying with OSHA regulations to determine worker exposure. The OSHA Lead Standard for Construction (29 CFR 1926.62) applies to all construction work where an employee may be occupationally exposed to lead, including all work related to construction, alteration, and/or repair. Employers are responsible for ensuring that no employee will be exposed, without adequate protection, to lead at concentrations greater than the permissible exposure limit (PEL) of 50 micrograms per cubic meter (ug/m^3) averaged over an 8-hour period. The OSHA standard also establishes an action level (AL) of 30 ug/m^3 which, if exceeded, triggers certain requirements including periodic exposure and medical monitoring.

If components of a building targeted for renovation or demolition contain toxic levels of LBP, a Toxicity Characteristic Leaching Procedure (TCLP) analysis needs to be conducted to determine whether debris generated from renovation or demolition should be disposed of as hazardous waste or construction debris. The EPA has established a threshold of 5 milligrams per liter (mg/l); therefore, if the results of TCLP analysis are greater than 5 mg/l, demolition debris must be disposed of as a hazardous waste. If the results of TCLP analysis are less than 5 mg/l, demolition waste can be disposed of as nonhazardous construction debris.

2.3 Polychlorinated Biphenyls

PCBs are a class of anthropogenic chemicals and do not occur naturally in the environment. PCBs were first manufactured commercially in 1929 and were used in a variety of products including, but not limited to, hydraulic fluid, casting wax, pigments, carbonless copy paper, plasticizer, caulks, adhesives, mastics, sealants, vacuum pumps, compressors, and heat transfer systems. PCBs were added to the dielectric fluid in electrical equipment because of the stability and resistance to thermal breakdown, and insulating properties. PCBs were also a common additive to caulk due to the water and chemical resistance, durability, and elasticity characteristics, and were commonly used to seal masonry unit and window joints. PCBs have been documented to leach into existing building substrate materials (brick and concrete) adjacent to suspect PCB materials. The manufacture of PCBs was banned by the EPA in 1979.

PCBs are federally regulated under Title 40 Part 761 of the Code of Federal Regulations (CFR) and Section 22a-463 through 22a-469a of the Connecticut General Statues (CGS). The CTDEEP has developed a guidance table in conjunction with EPA Region 1 that compares remediation and disposal options for caulk and materials contaminated with PCBs and associated substrates. Although specific to caulk, the CTDEEP has indicated the guidance table may generally be applied to other building materials that contain PCBs.

2.4 Miscellaneous Hazardous Building Materials

Miscellaneous HBM at the Site which may include light ballasts, wet-type transformers, electrical switches, capacitors; mercury-containing equipment such as vapor lighting (vapor light tubes), pressure switches, thermostats (thermostatic controls), boiler gauges, and pump/motor tilt switches; and compressors, coolers, freezers, and HVAC equipment that may contain chlorofluorocarbons (CFCs) may require special handling and/or disposal at a permitted facility at the time of building renovation and/or demolition. The majority of fluorescent light ballasts manufactured prior to 1979 contained PCBs and approximately 25 percent of ballasts manufactured after 1979 contained di-ethyl hexyl phthalate (DEHP). Light ballasts, manufactured after July 1, 1978, are required to be marked as non-PCB containing and those that do not possess such a label are generally assumed to contain PCBs at concentrations greater than 50 ppm. The disposal of PCB-containing and DEHP-containing ballasts in landfills is prohibited. Similarly, miscellaneous HBM waste that contains mercury and CFCs may not be disposed of in a landfill. Depending on the type of HBM waste, materials may require recycling or incineration at a licensed facility.

3.0 SUMMARY AND CONCLUSIONS

Eolas performed an HBM survey of the site buildings to determine whether HBM are present and in quantities that would require special management and/or disposal at the time of building renovation and/or demolition. A summary of the findings is presented below.

3.1 Asbestos

Asbestos was identified in building materials collected from **the Incinerator Building, Sludge Building, Degritter Building, and Control Building**. These materials will need to be abated by a State of Connecticut licensed asbestos abatement contractor if they are to be disturbed during building renovation/demolition. Prior to conducting renovation and/or demolition work in the site buildings, Eolas recommends completion of a destructive, comprehensive survey of targeted work areas or buildings be performed in accordance with NESHAP regulations and to supplement the findings of this survey. Where renovation and/or demolition have the potential to affect ACM, a State of Connecticut licensed Project Designer should prepare asbestos abatement technical specifications in order to solicit competitive bids for the removal of identified ACM. Notification of renovation, demolition, and/or abatement must be made to the DPH (or EPA, if applicable) at least 10 working days prior to the commencement of asbestos abatement activities. Following abatement, visual inspections and final air clearance sampling is required in certain abatement areas at the completion of the abatement work. The visual inspections and final air clearance sampling must be performed by a State of Connecticut licensed Project Monitor. The abatement areas must meet final visual inspection and final air clearance sampling criteria prior to the abatement area being reoccupied or re-entered.

OSHA regulations require that building owners communicate asbestos hazards to building occupants. Eolas recommends the preparation and implementation of an Asbestos Operations & Maintenance (O&M) program for ACM identified in the buildings. The O&M program should be supplemented with Asbestos Awareness training which is required for employees whose work activities may contact ACM or PACM but, who do not disturb ACM/PACM during their work activities. Asbestos Awareness training is an annual requirement.

3.2 Lead

Lead-based paint was detected in the several building components at the Site, including in the **Incinerator Building (metal framework, metal fire doors, and gray door jamb), Sludge Building (elevator door frame, blue concrete columns, and green steel door header), and Control Building (laboratory cabinets)**. Several additional locations yielded an inconclusive testing result of 1.0 mg/cm^2, additional laboratory testing would be necessary to confirm whether LBP is present. Metal building materials that contain lead (e.g. fire doors, beams) will likely meet metal recycling criteria. Other lead-containing materials may be managed using guidance in the CTDEEP *Guidance for the Management and Disposal of Lead-Contaminated Material Generated in the Lead Abatement, Renovation, and Demolition Industries* at the time of demolition. Additional characterization of building materials, including collection and analysis of building materials samples for lead following TCLP, should be completed to determine proper waste segregation and compliance with EPA and CTDEEP waste disposal regulations.

Workers who perform renovation or demolition work should be trained and protected in accordance with OSHA regulation 29 CFR 1926.62. Employees who may be occupationally exposed to lead should be trained in personal protection and proper work practice procedures in accordance with OSHA regulations.

3.3 Polychlorinated Biphenyls

PCBs were detected in four of the five samples collected from the buildings, three of which were at concentrations below 50 mg/kg. In one instance, PCBs were reported at a concentration of 2,000 mg/kg in exterior expansion joint caulk sample from the Control Building. Additional sampling and analysis of building materials for the presence of PCBs is warranted to fully characterize these materials for the presence of PCBs. For those remaining materials that contain PCBs at concentrations less than 50 mg/kg, the following CTDEEP guidance should be followed:

- **Renovation** – Remove caulk and test substrate. If substrate concentrations exceed 1 mg/kg, implement an interim measure of sealing and encapsulating the substrate and obtain an annual exemption, or remove the >1 mg/kg substrate.

- **Non-Renovation** – Seal and encapsulate, establish plan to address at a later date, and perform annual monitoring to validate effectiveness of encapsulant. Removal is recommended. Test substrate and if >1 mg/kg, establish plan to address at a later date.

- **Full Demolition** – Remove caulk and test substrate. If substrate is >1 mg/kg and <49 mg/kg, dispose of substrate at a RCRA Title D solid waste landfill, a bulky waste facility, a facility permitted to manage non-hazardous waste subject to 40 CFR 257.5 – 257.30, or a RCRA hazardous waste landfill.

For those materials containing PCBs at concentrations greater than or equal to 50 mg/kg, the following CTDEEP guidance should be followed:

- **Renovation/Non-Renovation/Full Demolition** – Remove all caulk and test substrate. If substrate concentrations exceed 1 mg/kg, remediate per 40 CRF 761.61 and 761.62. Wastes should be disposed of at a RCRA hazardous waste landfill, a TSCA-approved disposal facility, a solid waste landfill permitted under 40 CFR Part 258, or facility permitted to manage non-hazardous waste subject to 40 CFR 257.5-257.30.

3.4 Miscellaneous Hazardous Building Materials

With respect to miscellaneous HBM at the site, these materials should be properly containerized, managed, and disposed of according to their specific waste characterization and prevailing local, state and federal disposal regulations. A Connecticut-licensed waste vendor must be retained to properly consolidate, containerize, and remove the miscellaneous HBM from the Site.

We thank you for the opportunity to provide these services to you. If you have any questions regarding this project, please contact me at (860) 990-1827 or via email at kimberly@eolasenv.com.

Sincerely,
EOLAS ENVIRONMENTAL, LLC

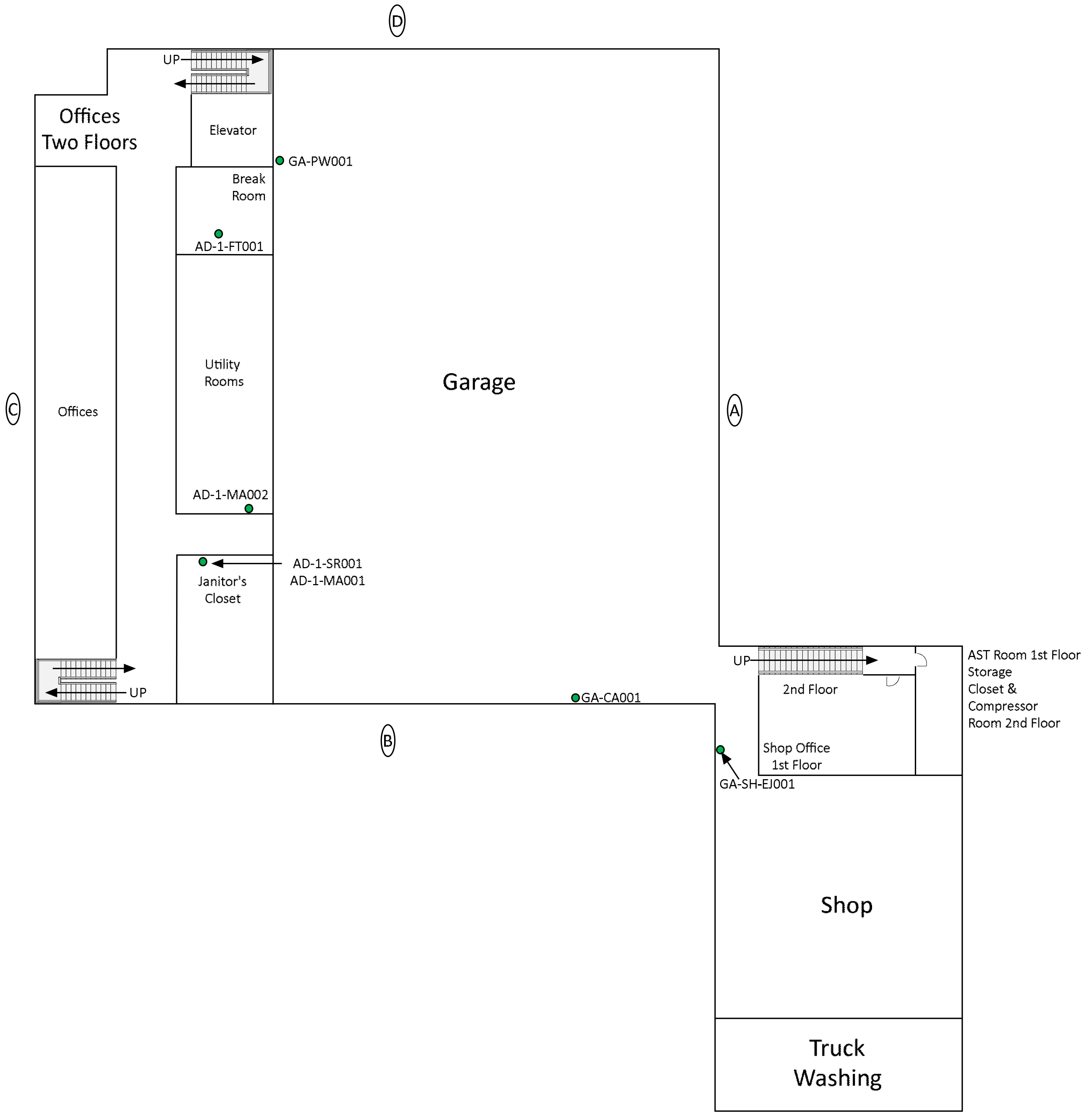
Kimberly M. Walsh, L.E.P.
Owner

Attachments

ATTACHMENTS

ATTACHMENT A

FIGURES



LEGEND

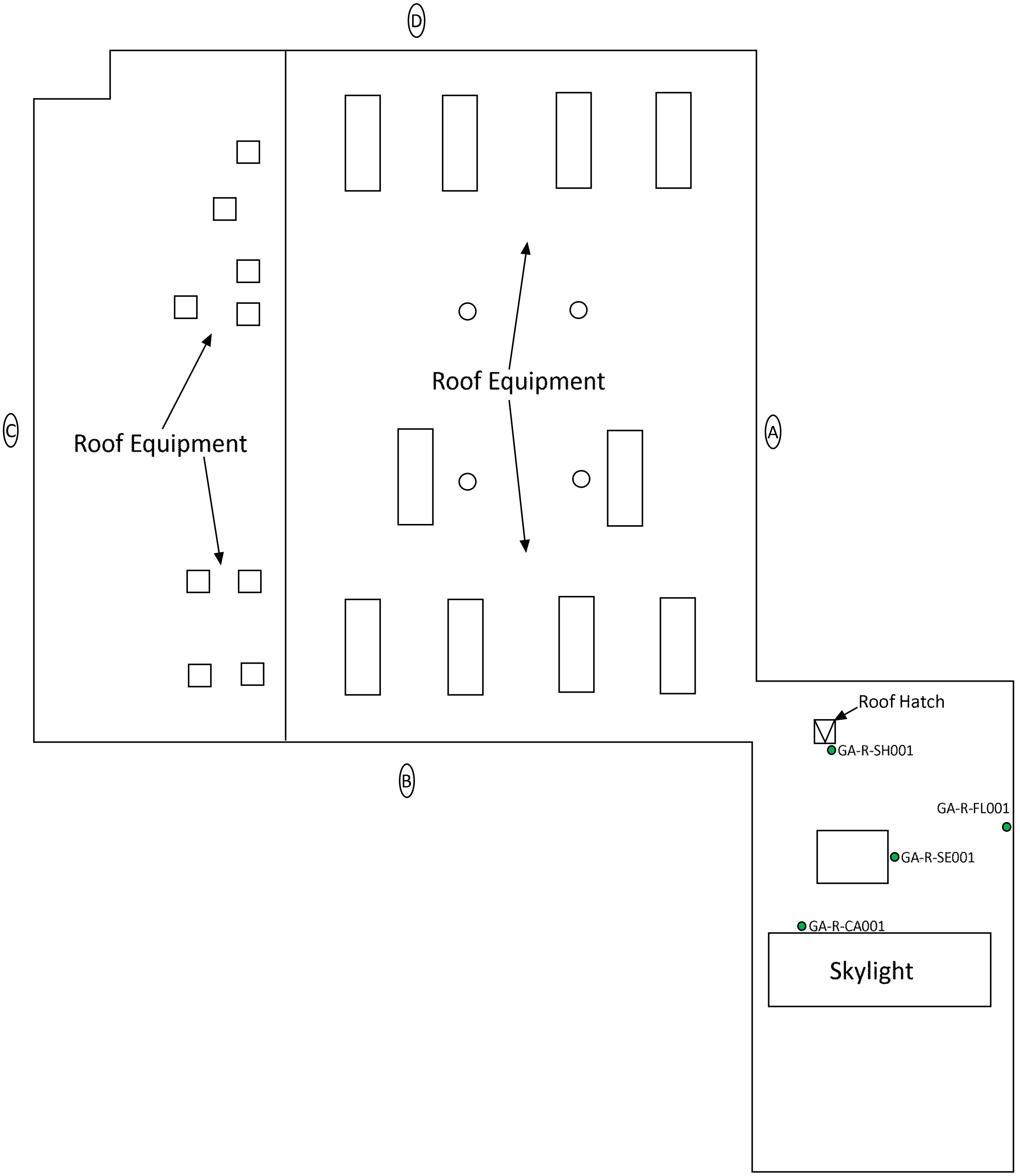
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

ADMINISTRATION BUILDING/GARAGE GROUND FLOOR



LEGEND

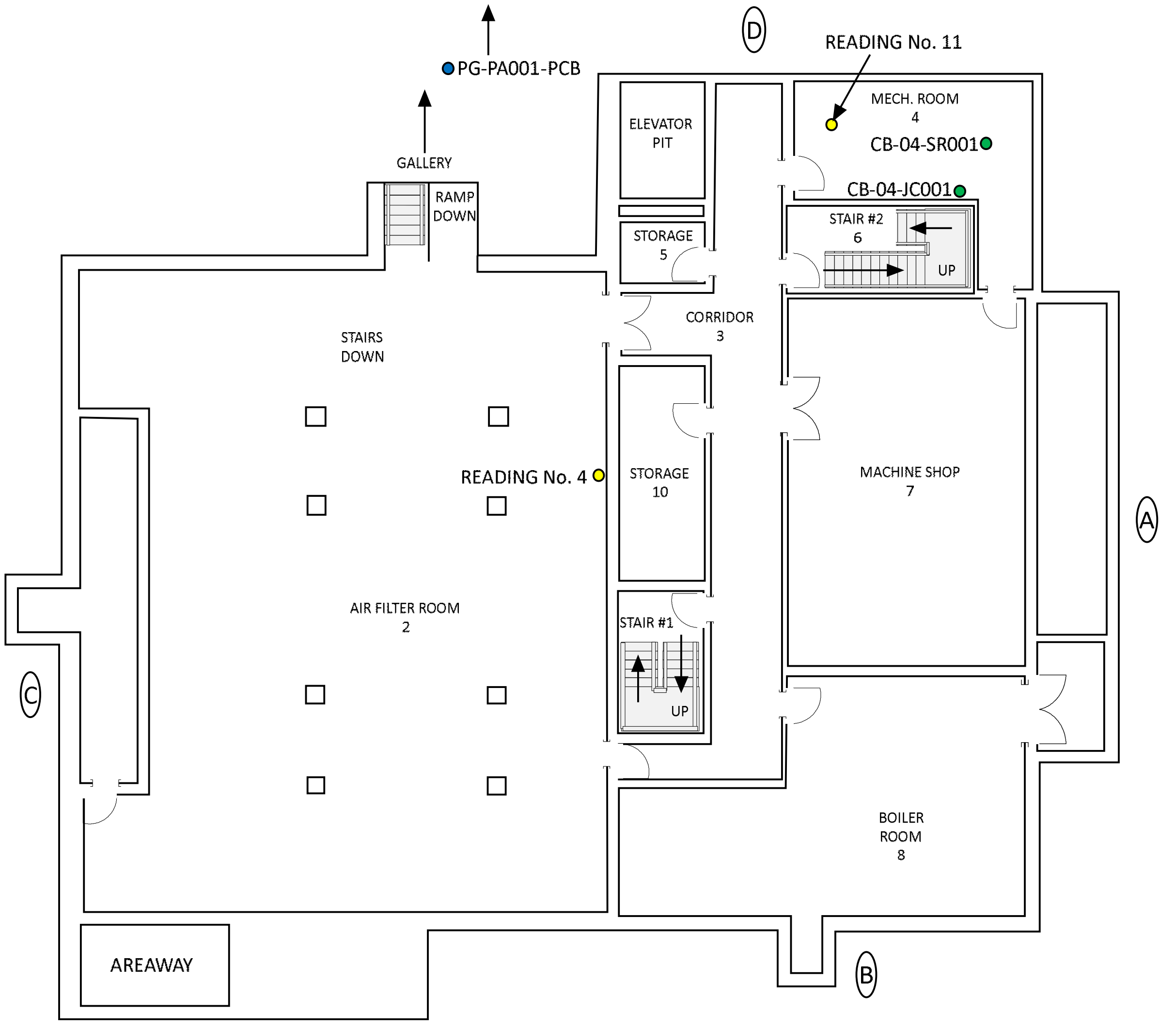
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

ADMINISTRATION BUILDING/GARAGE ROOF

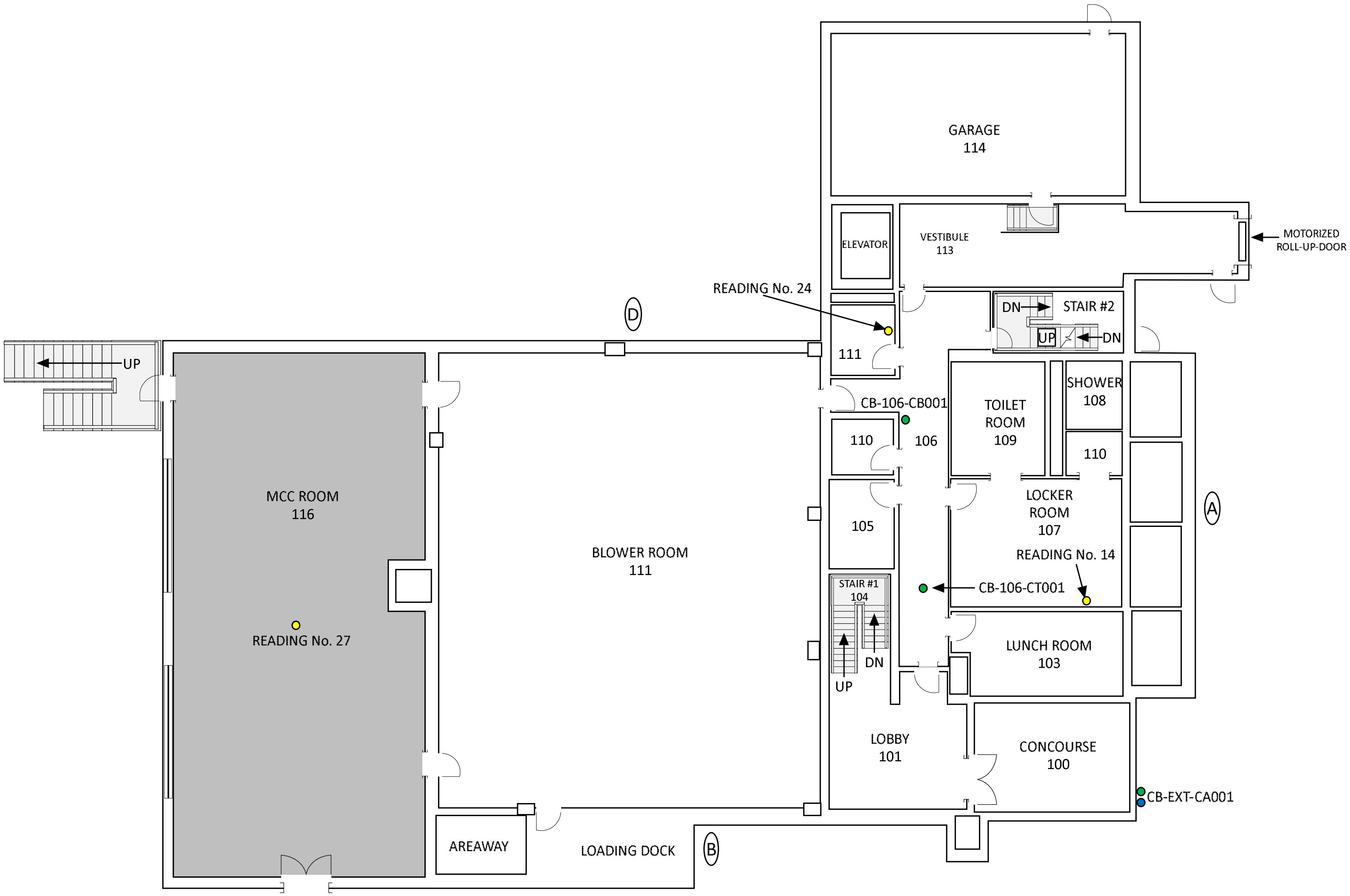


LEGEND:

- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey	eolas environmental LLC
LOCATION:	695 Seaview Avenue, Bridgeport, CT	
SOURCE:	Hazen and Sawyer, NY, 1995	**CONTROL BUILDING EL. 13.00’**
SCALE:	NTS	



LEGEND:

🔴 Asbestos Positive

🟢 Asbestos Non-Detect

🟡 Lead Positive

🔵 PCB Sample

▨ MCC Access Floor

▭ Window

N

PROJECT: Hazardous Building Materials Survey

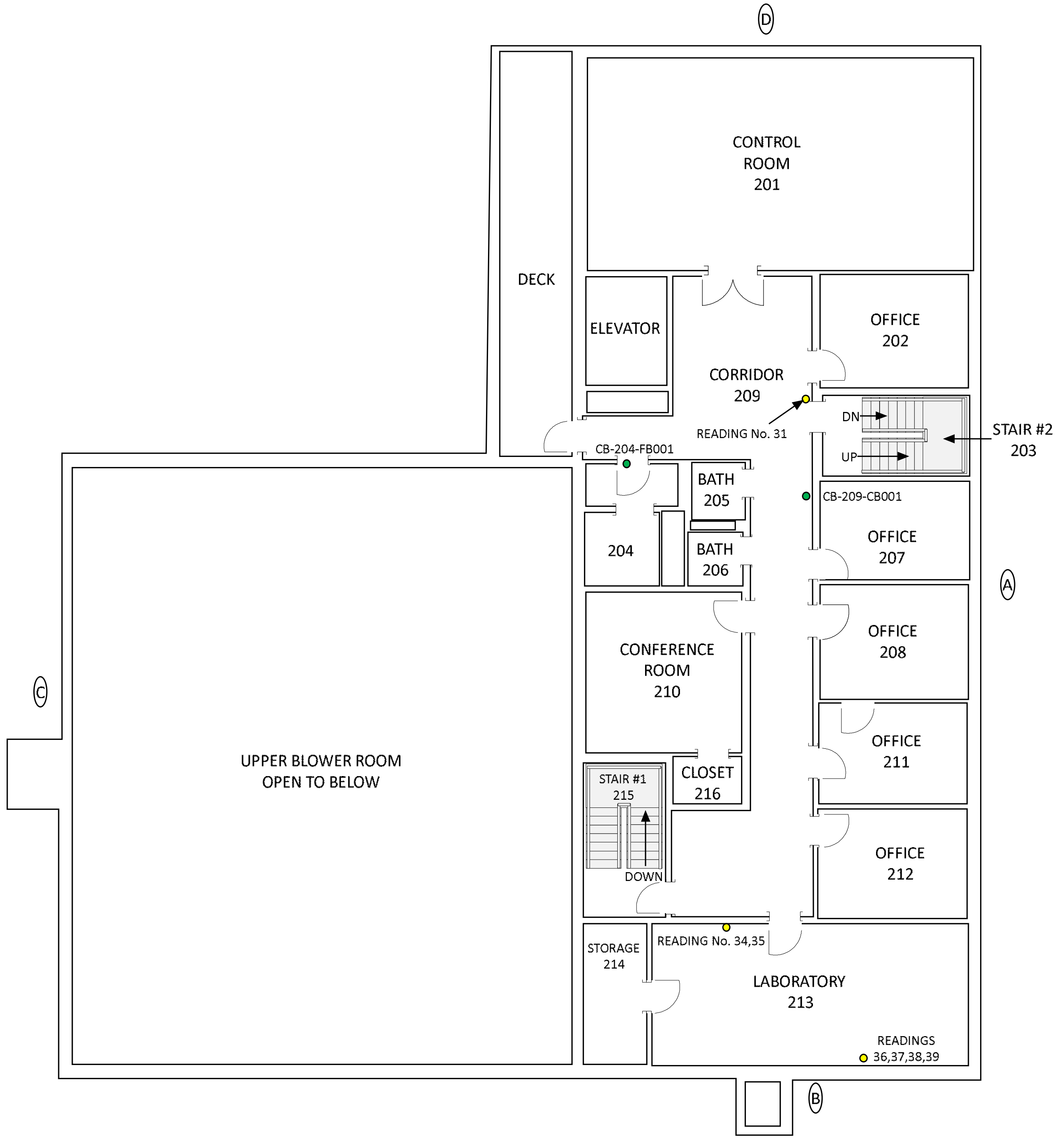
LOCATION: 695 Seaview Avenue, Bridgeport, CT

SOURCE: Hazen and Sawyer, NY, 1995

SCALE: NTS

eolas environmental LLC

CONTROL BUILDING
EL. 26.00’



LEGEND

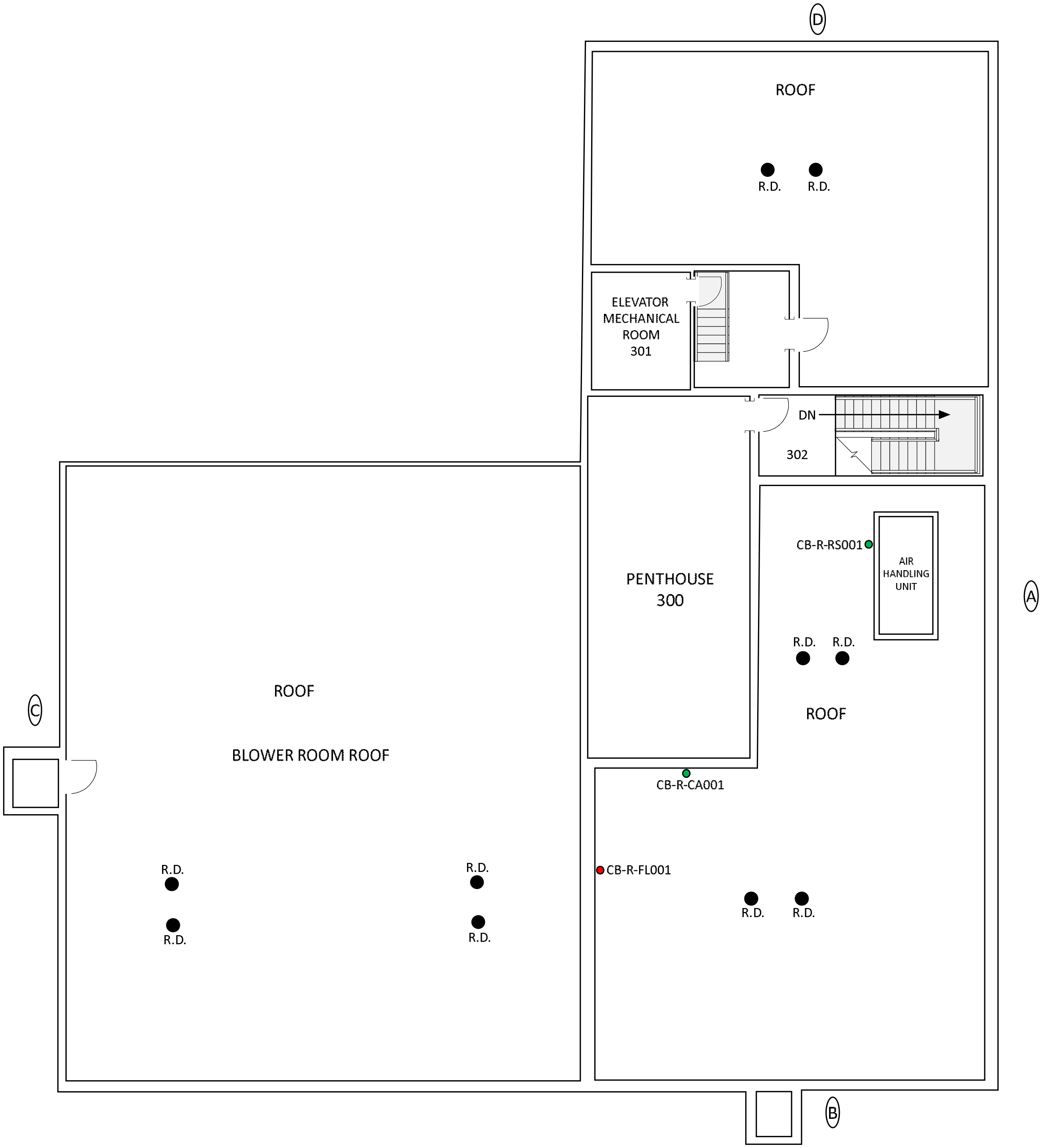
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

CONTROL BUILDING
EL. 37.50’



LEGEND

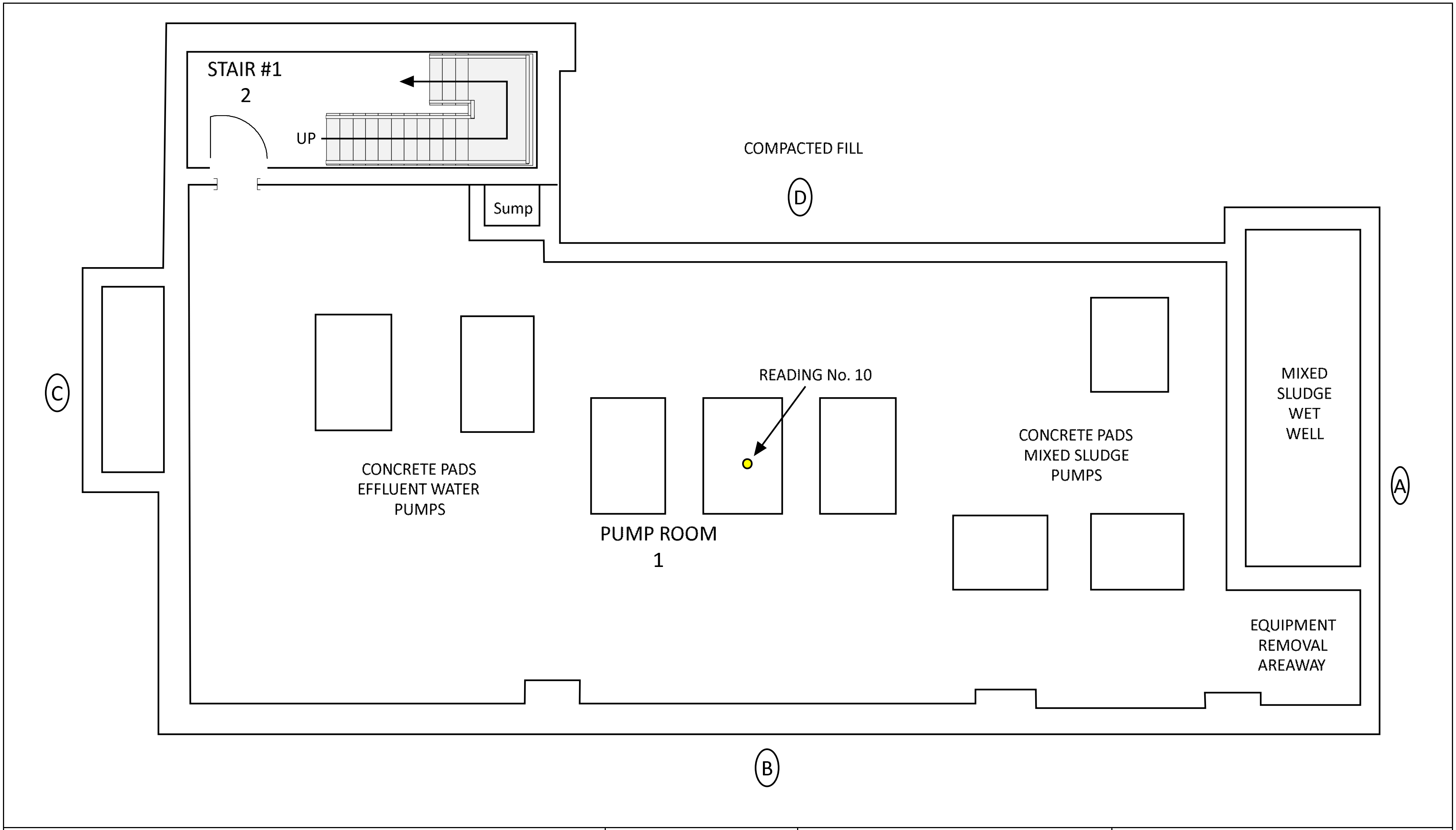
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

CONTROL BUILDING ROOF



LEGEND:

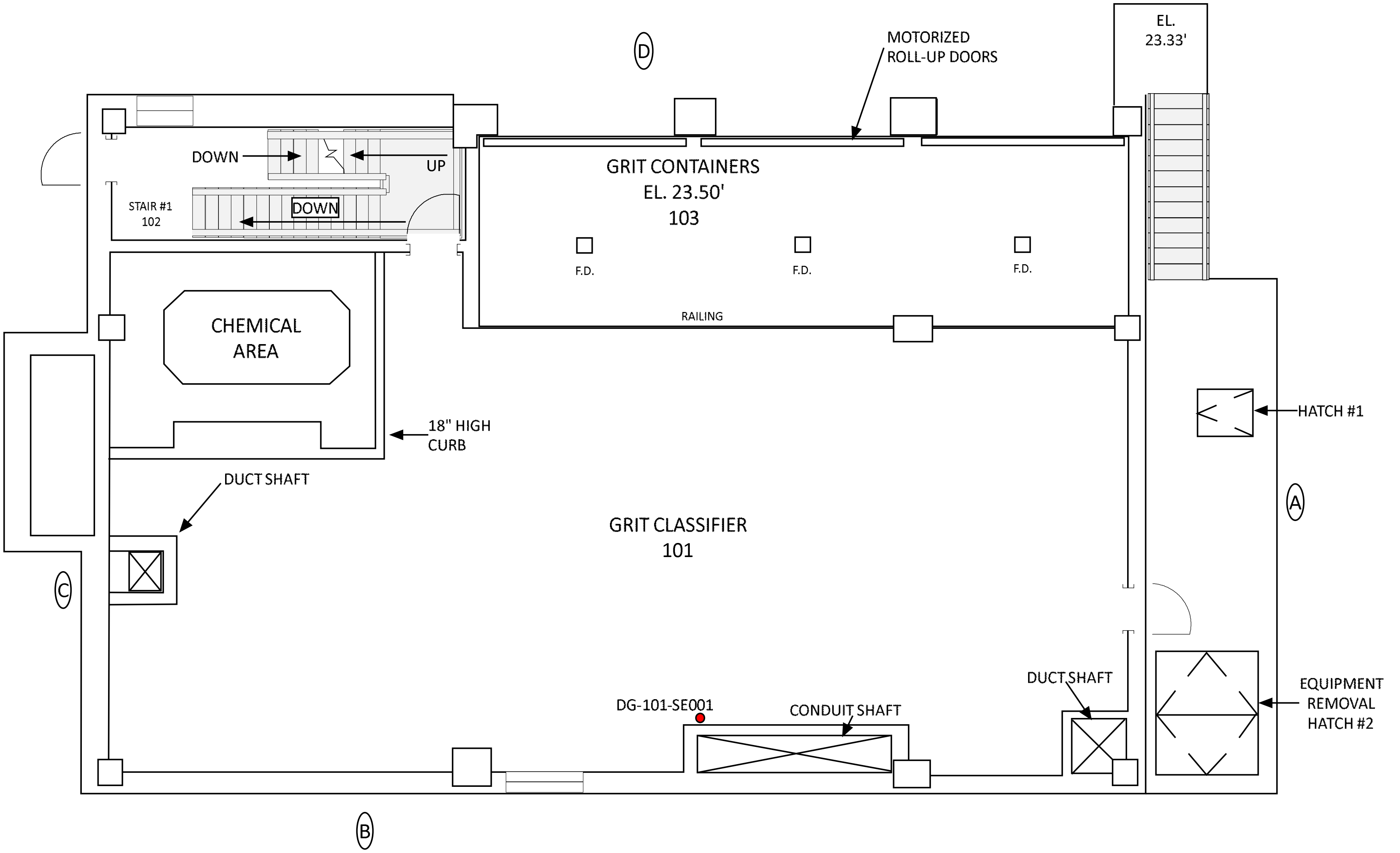
- ● Asbestos Positive
- ● Asbestos Non-Detect
- ● Lead Positive
- ● PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

DEGRITTER BUILDING
EL. 13.50'



LEGEND:

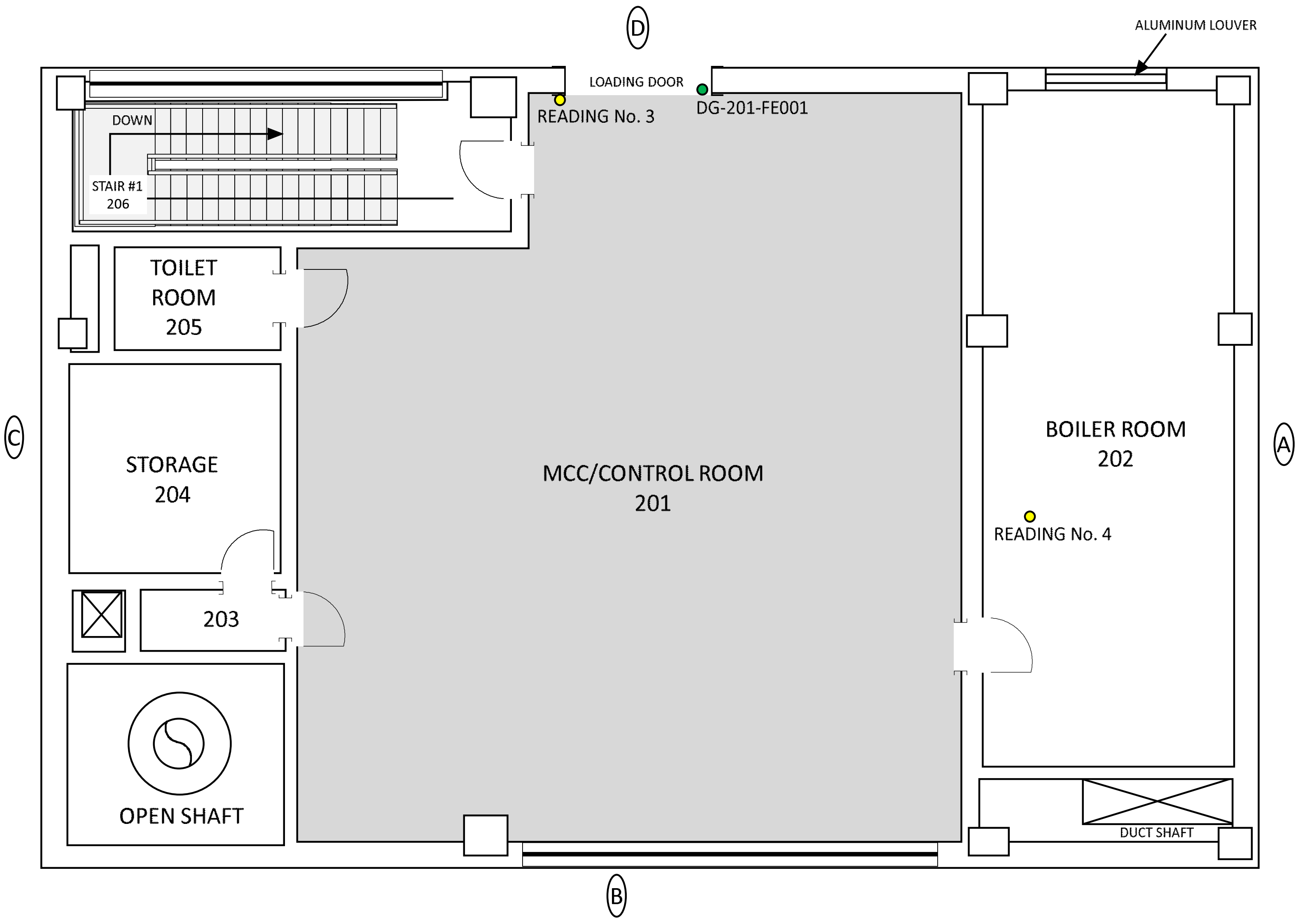
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

DEGRITTER BUILDING
EL. 31.50’



LEGEND:

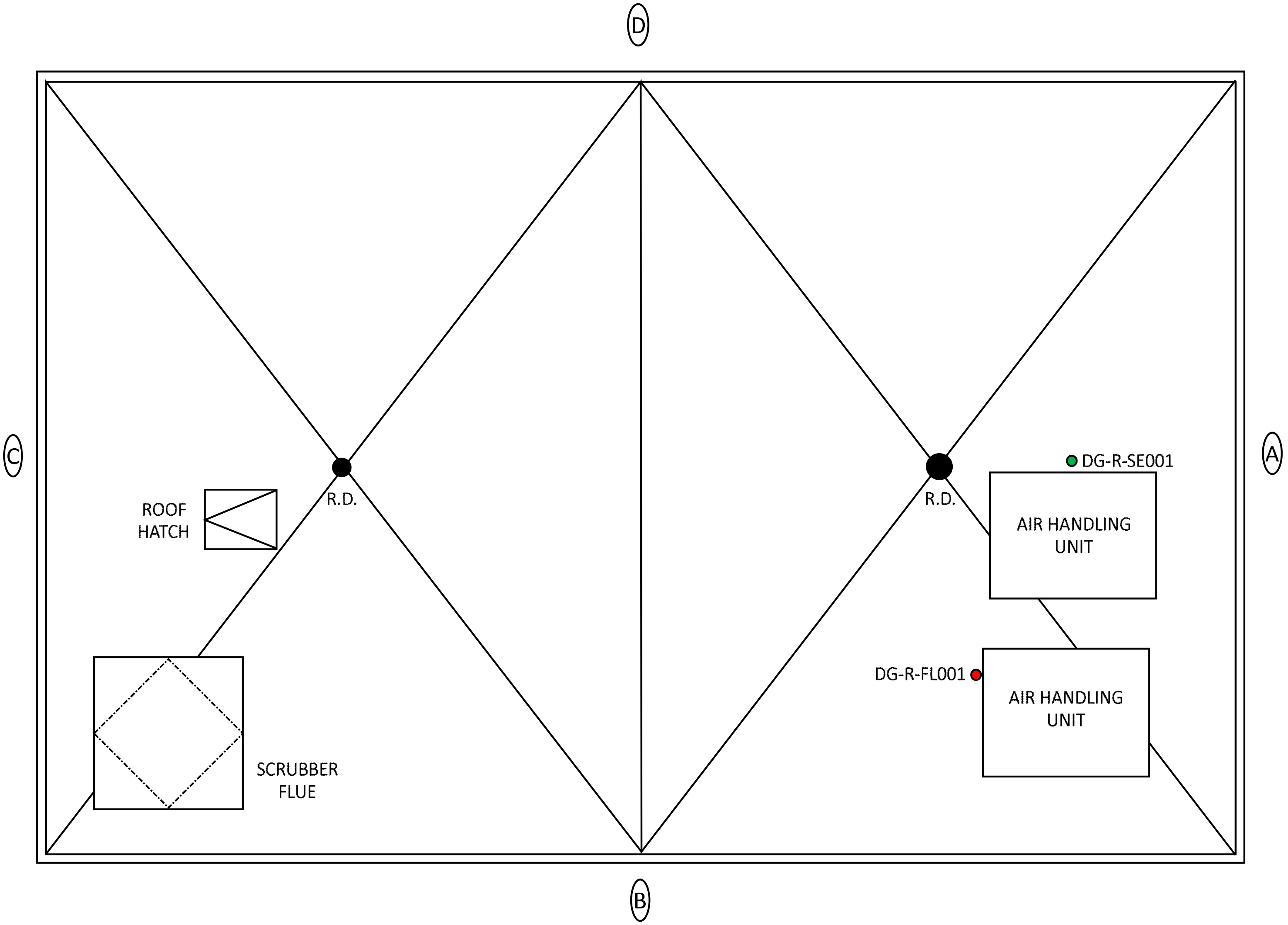
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

DEGRITTER BUILDING
EL. 48.83’



LEGEND:

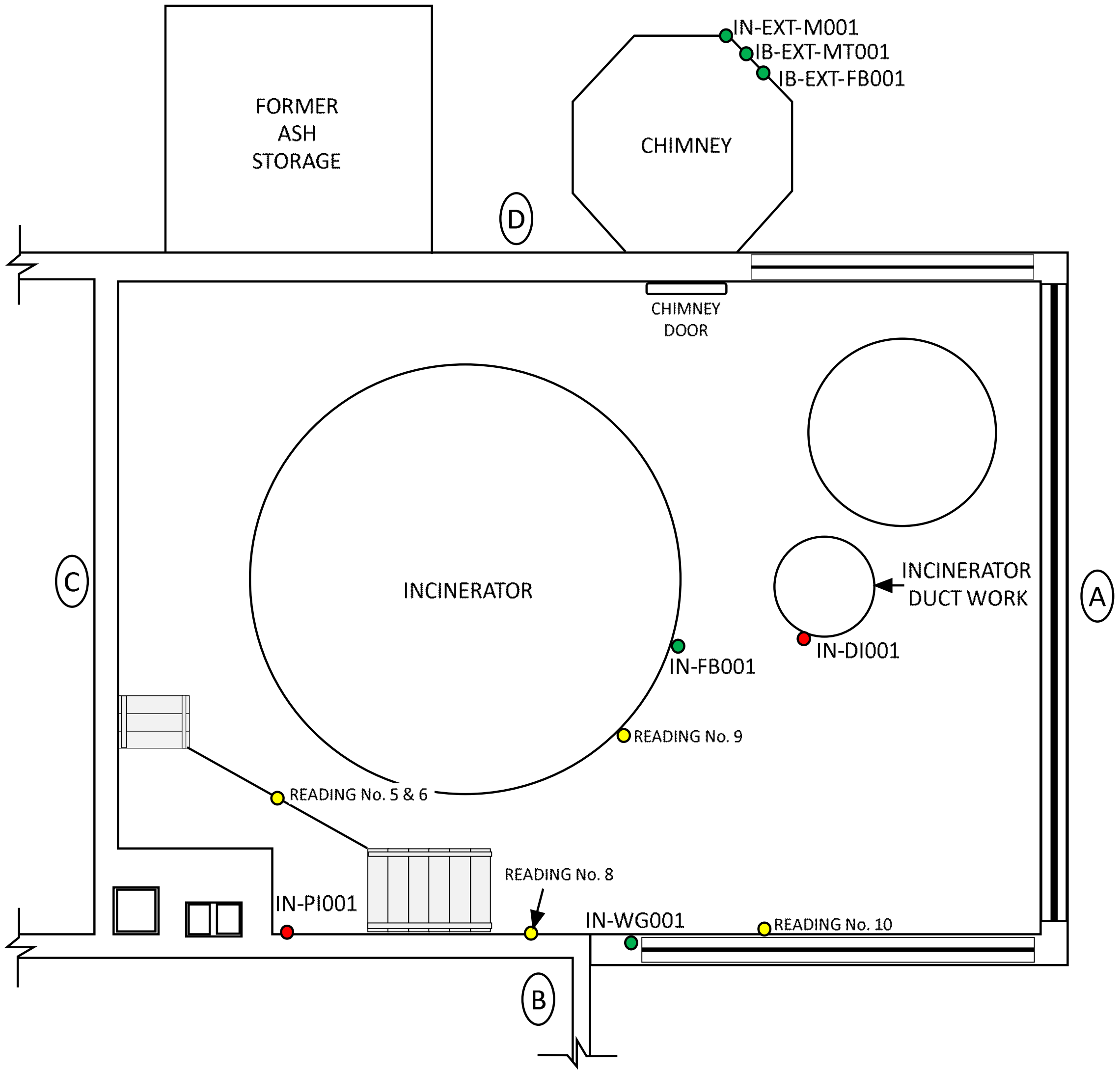
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

DEGRITTER BUILDING ROOF



LEGEND:

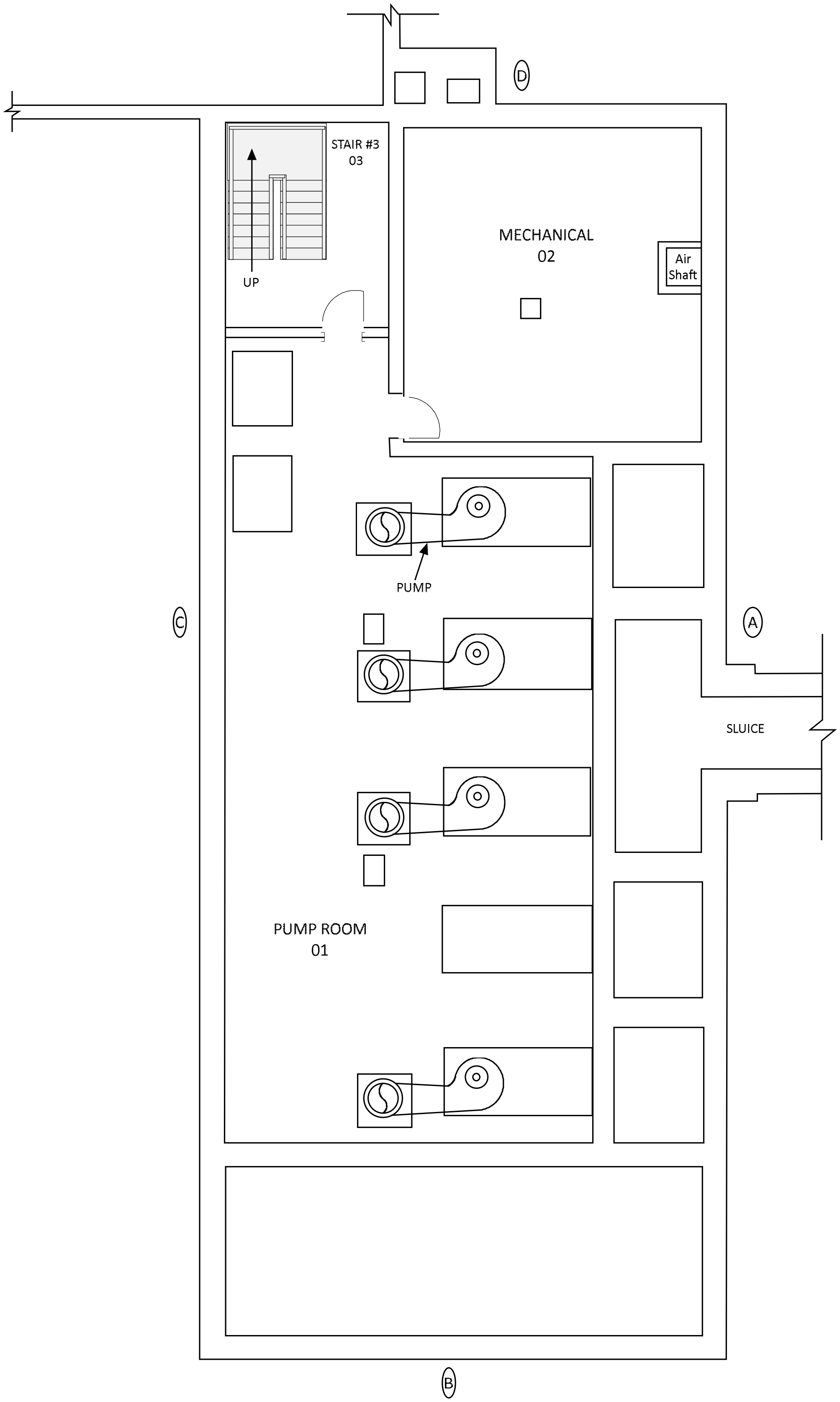
🔴 Asbestos Positive
🟢 Asbestos Non-Detect
🟡 Lead Positive
🔵 PCB Sample
▨ MCC Access Floor
▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

INCINERATOR
EL. 21.00’



LEGEND

🔴 Asbestos Positive

🟢 Asbestos Non-Detect

🟡 Lead Positive

🔵 PCB Sample

▨ MCC Access Floor

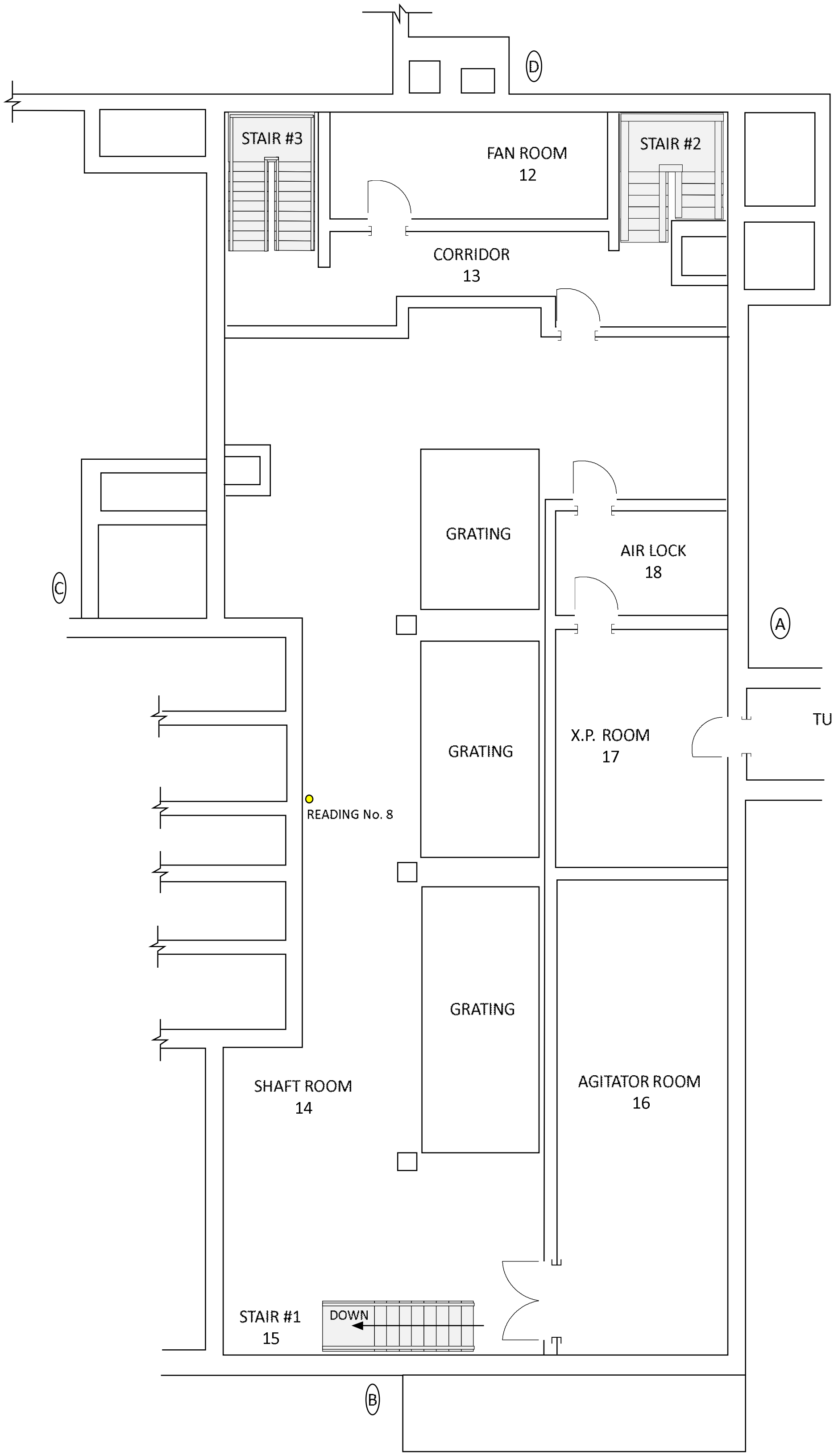
▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

PUMP STATION
EL. 3.00’



LEGEND

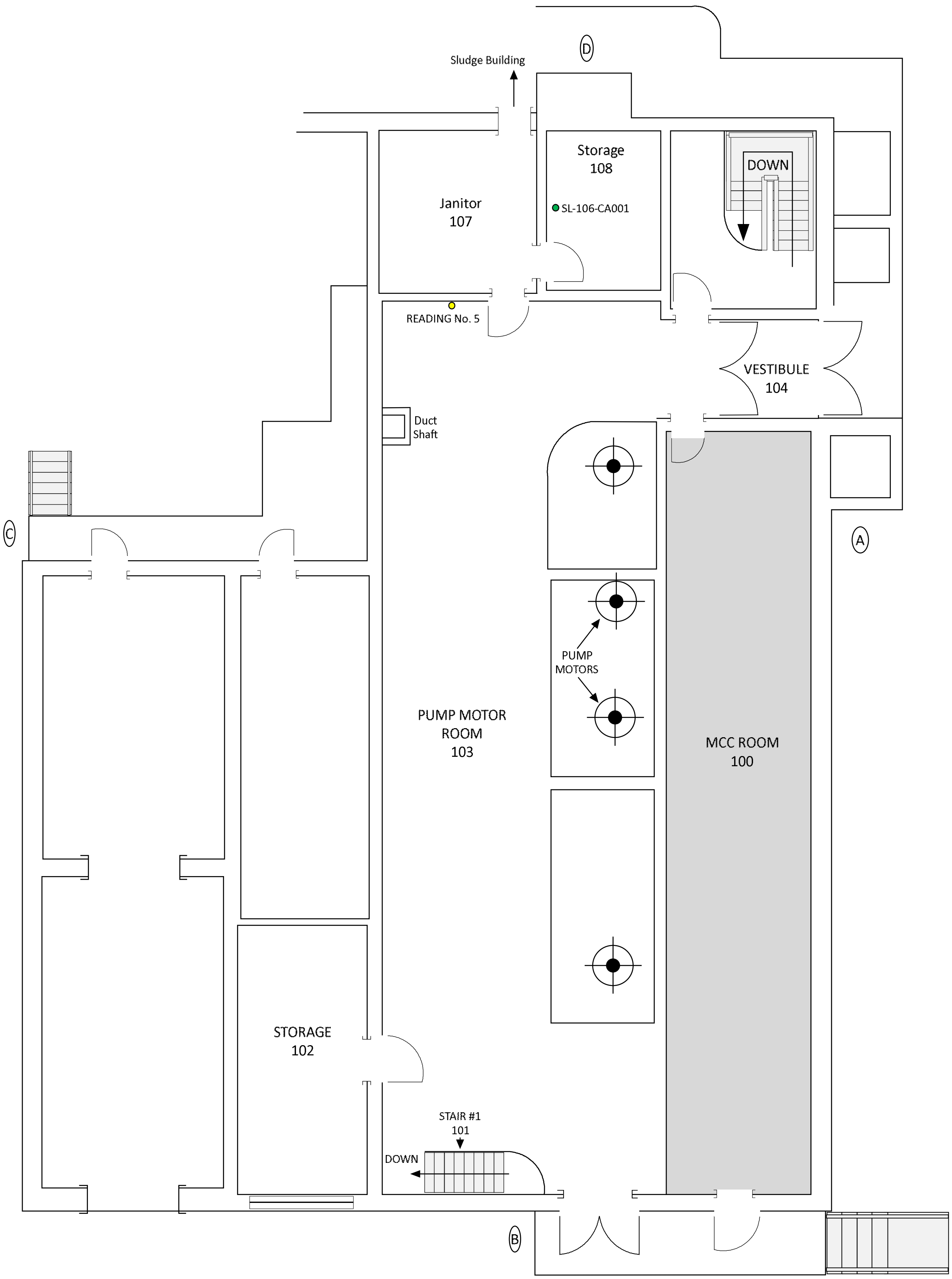
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ■ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

PUMP STATION
EL. 15.00’



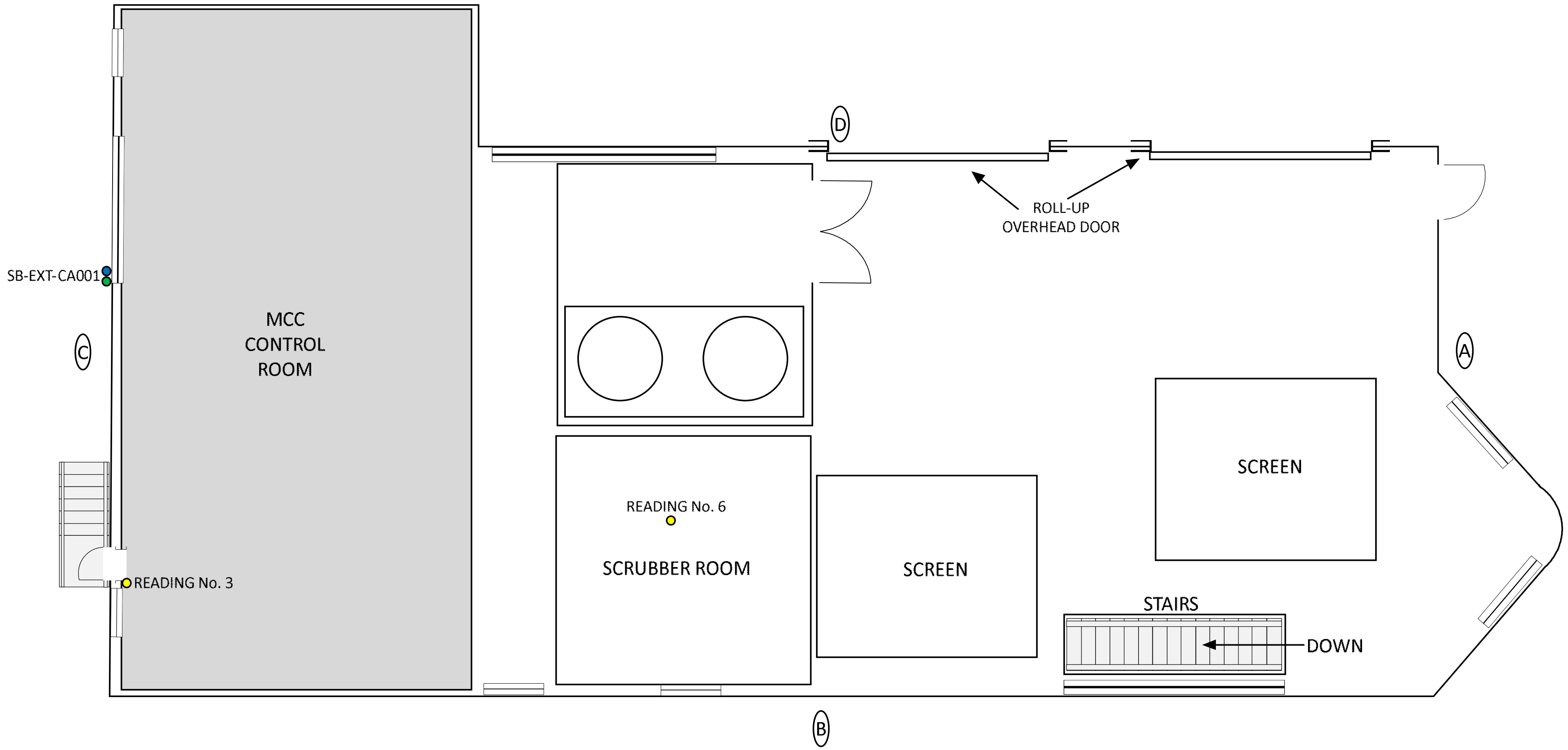
LEGEND

🔴 Asbestos Positive
🟢 Asbestos Non-Detect
🟡 Lead Positive
🔵 PCB Sample
▨ MCC Access Floor
▭ Window
N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

PUMP STATION
EL. 25.50'



LEGEND:

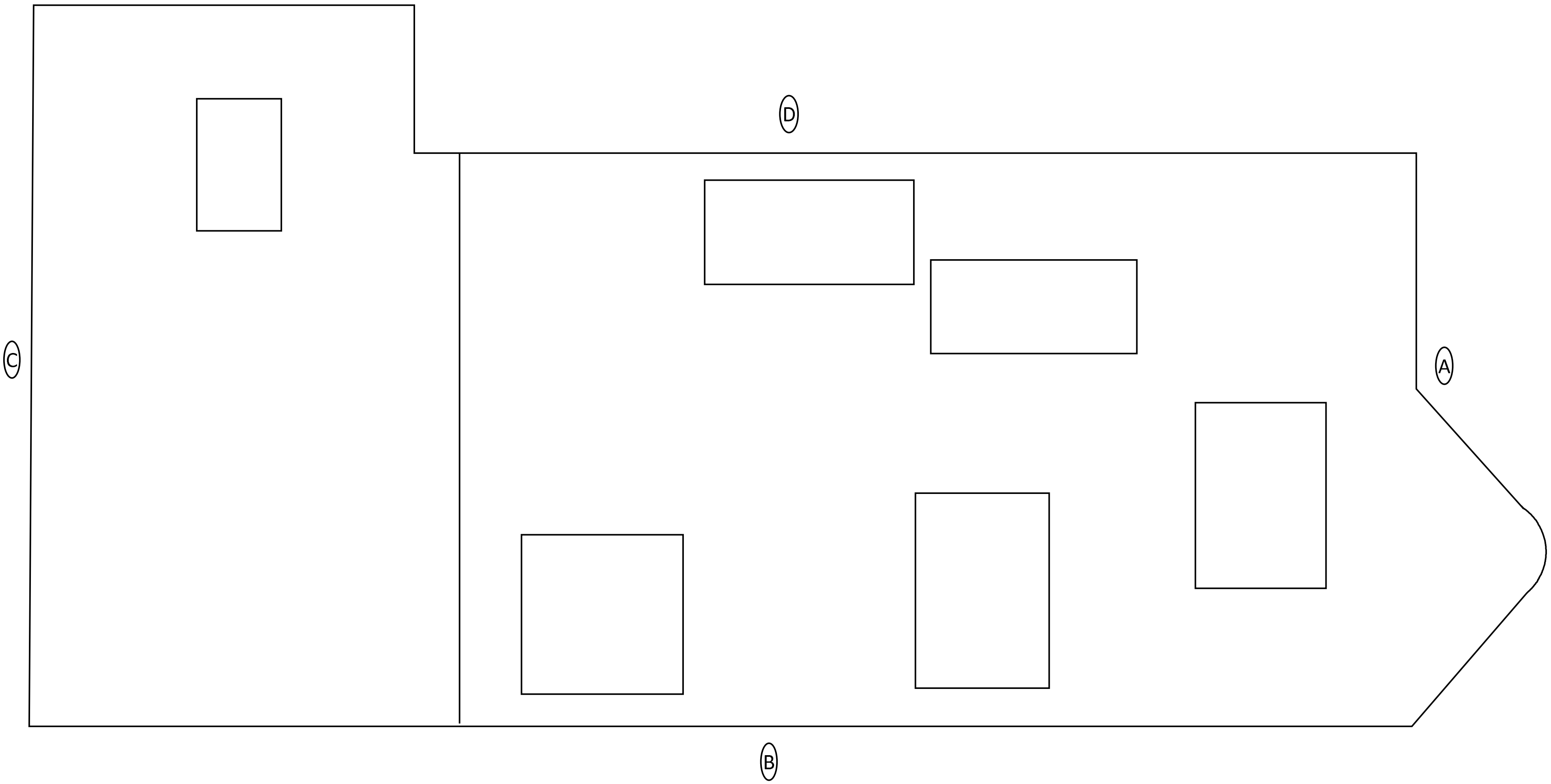
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SCREEN BUILDING
GROUND FLOOR



LEGEND:

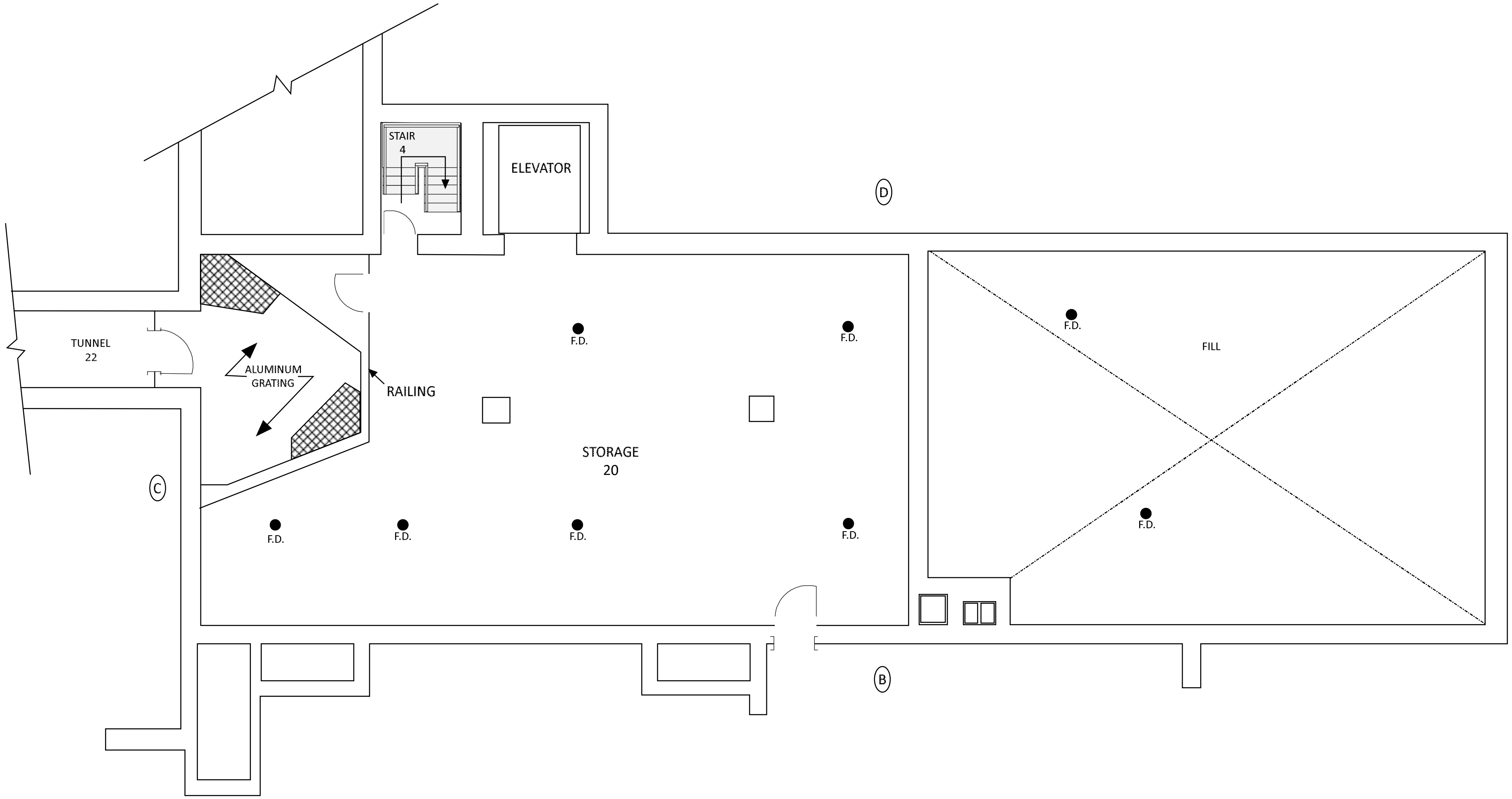
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SCREEN BUILDING ROOF



LEGEND:

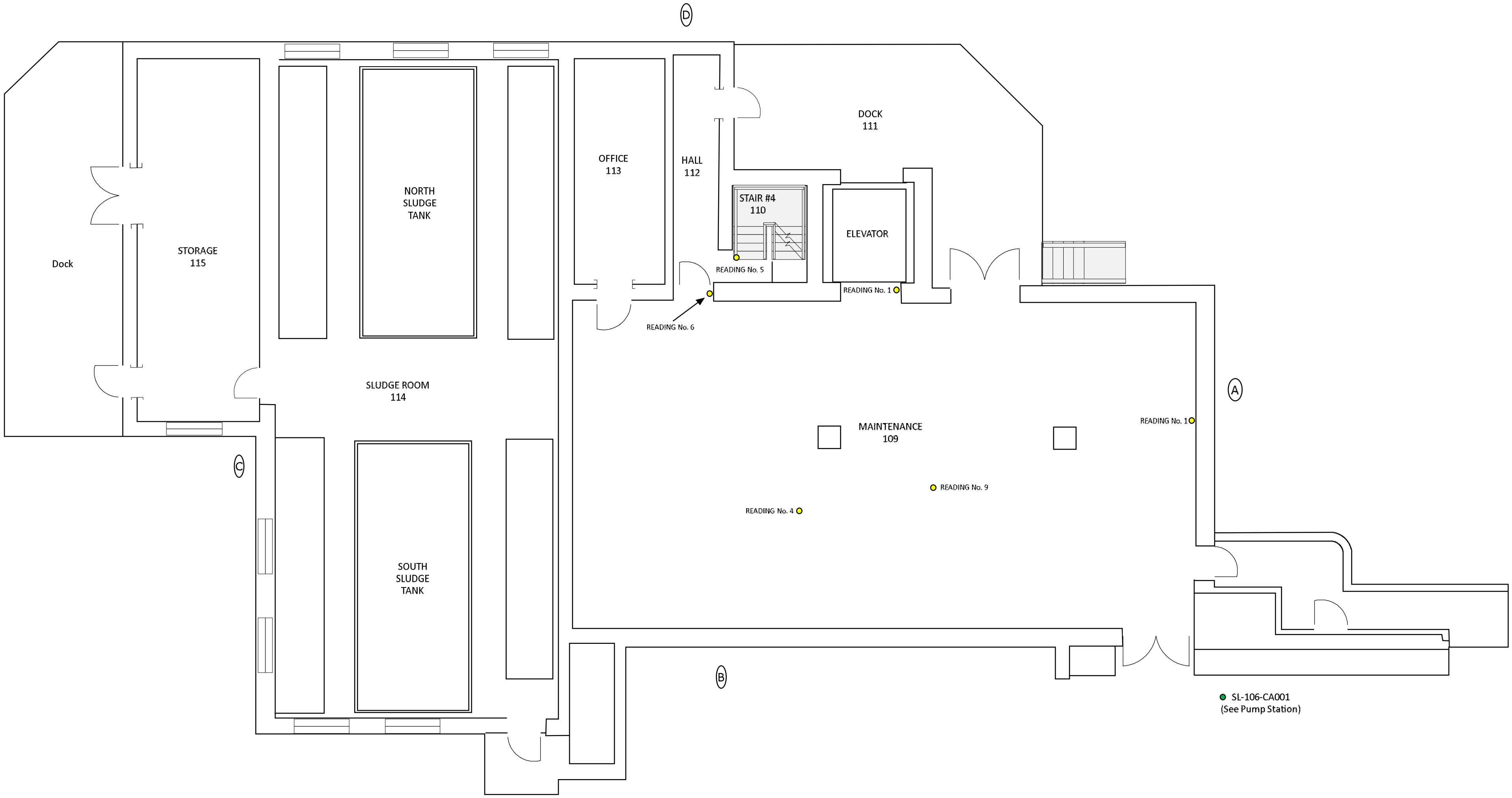
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ■ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SLUDGE BUILDING
EL. 9.00’



LEGEND:

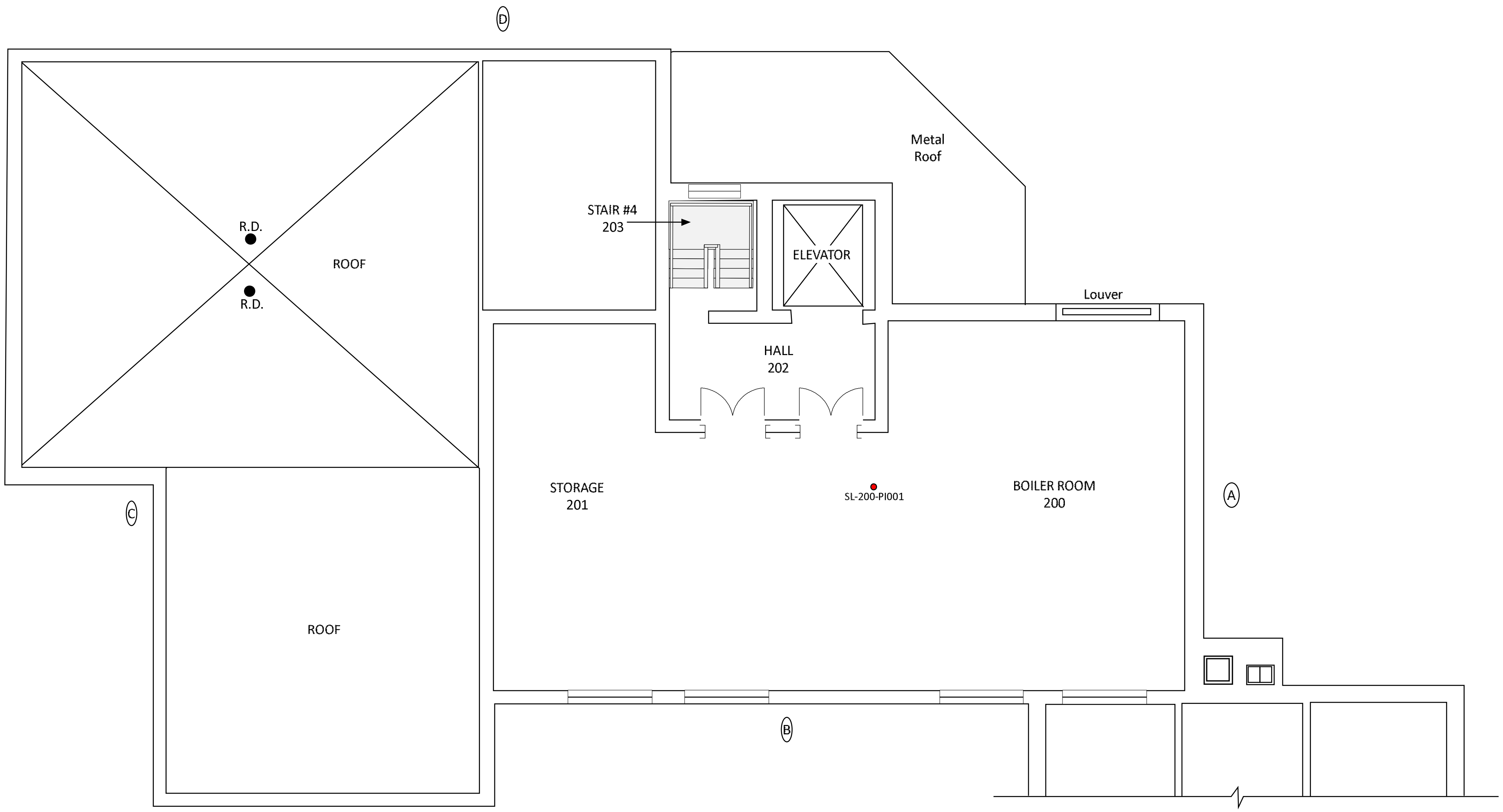
- ● Asbestos Positive
- ● Asbestos Non-Detect
- ● Lead Positive
- ● PCB Sample
- ■ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SLUDGE BUILDING
EL. 25.50’



LEGEND:

🔴 Asbestos Positive

🟢 Asbestos Non-Detect

🟡 Lead Positive

🔵 PCB Sample

▨ MCC Access Floor

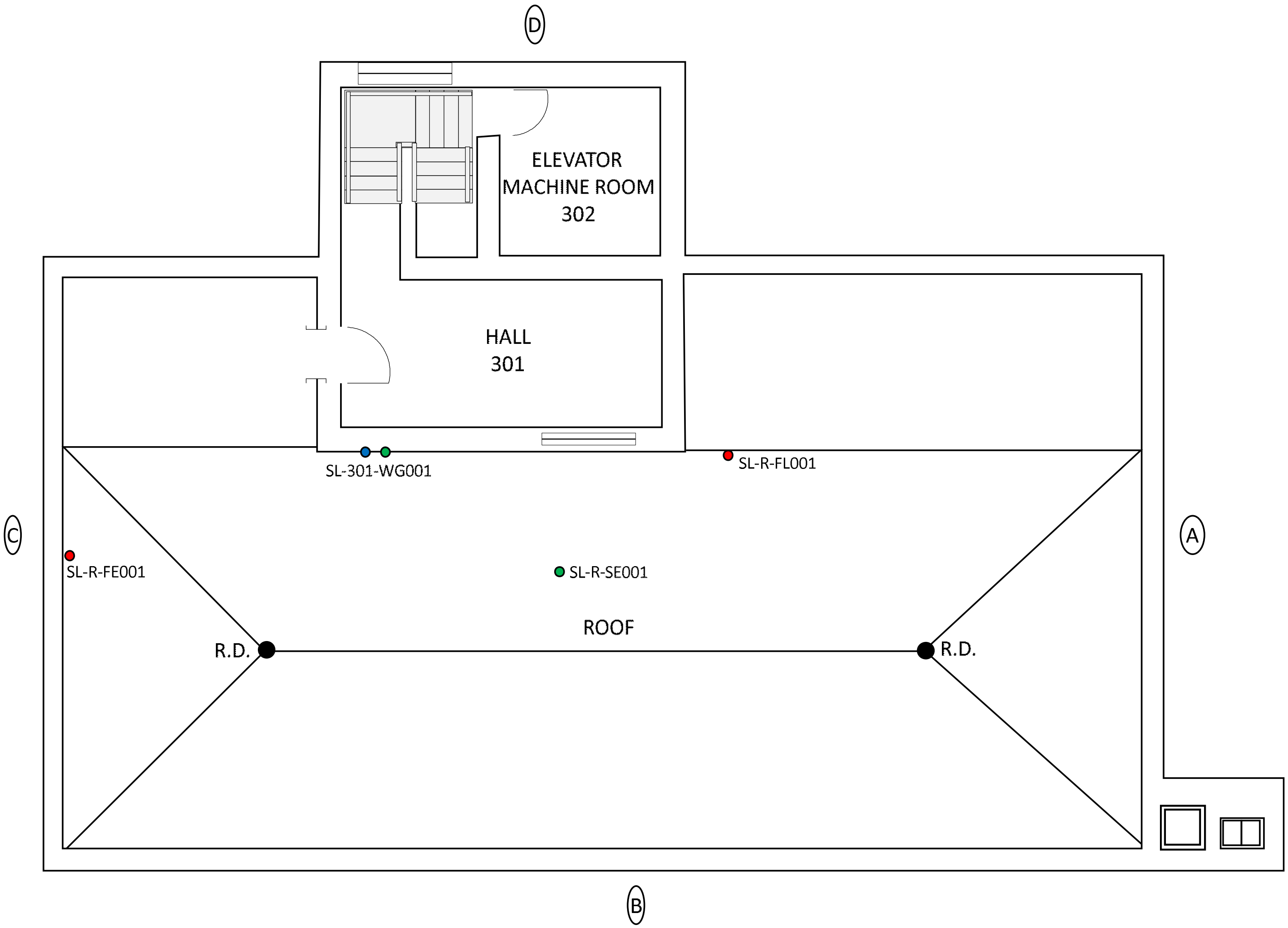
▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SLUDGE BUILDING
EL. 43.50'



LEGEND:

🔴 Asbestos Positive

🟢 Asbestos Non-Detect

🟡 Lead Positive

🔵 PCB Sample

■ MCC Access Floor

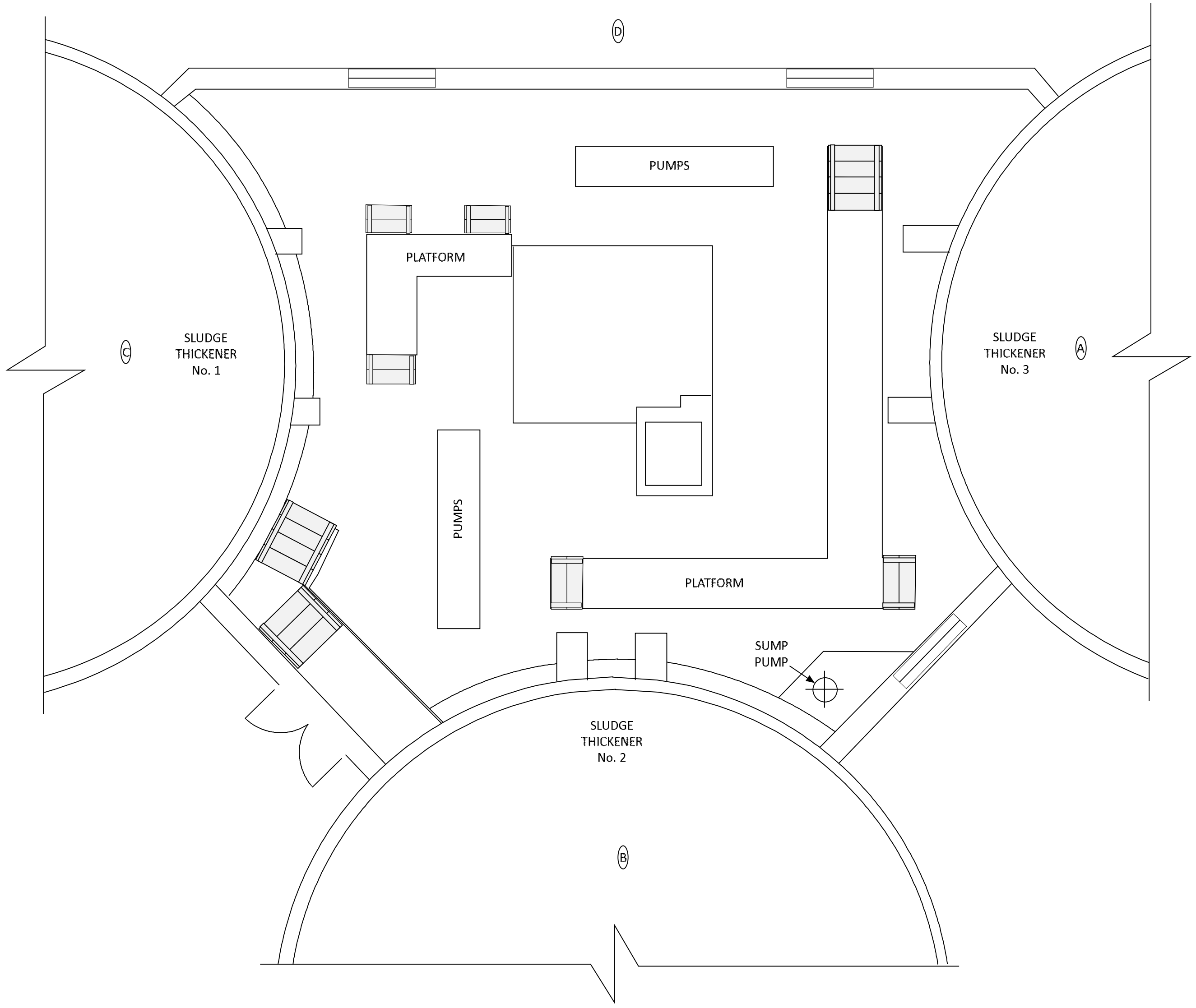
▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SLUDGE BUILDING
EL. 54.00’



LEGEND:

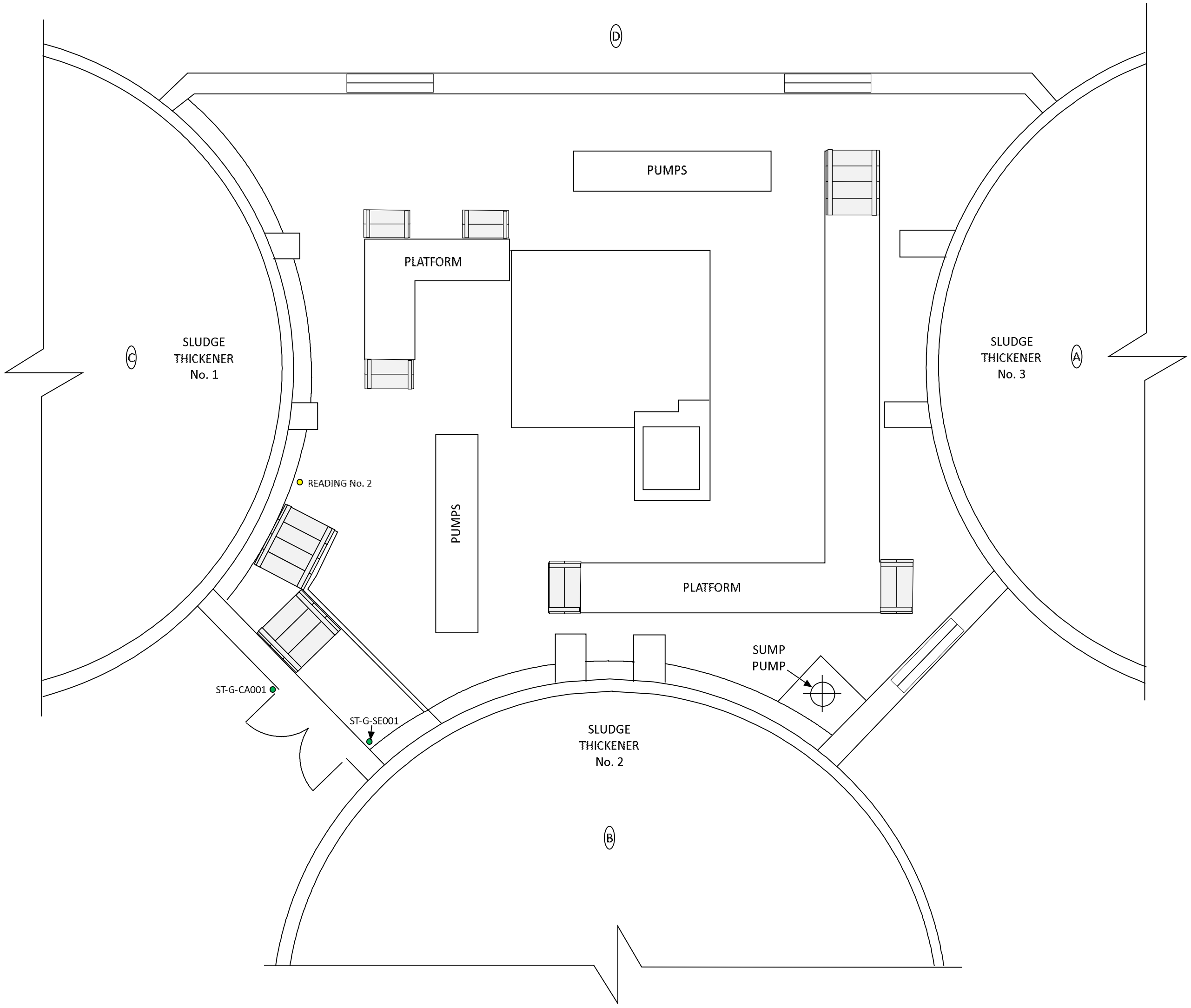
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SLUDGE THICKENER
EL. 18.60’



LEGEND:

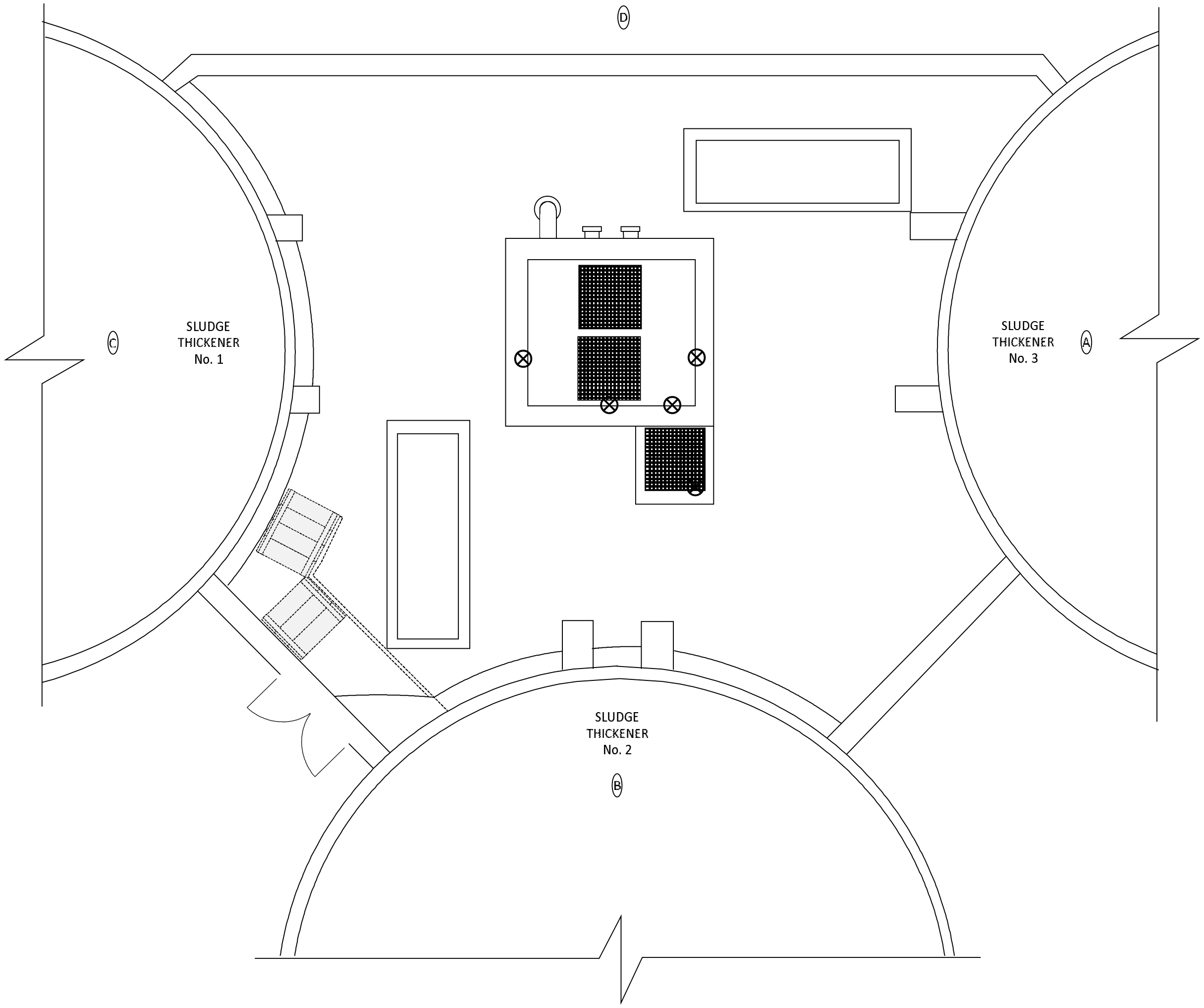
- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SLUDGE THICKENER EL. 24.00’



LEGEND:

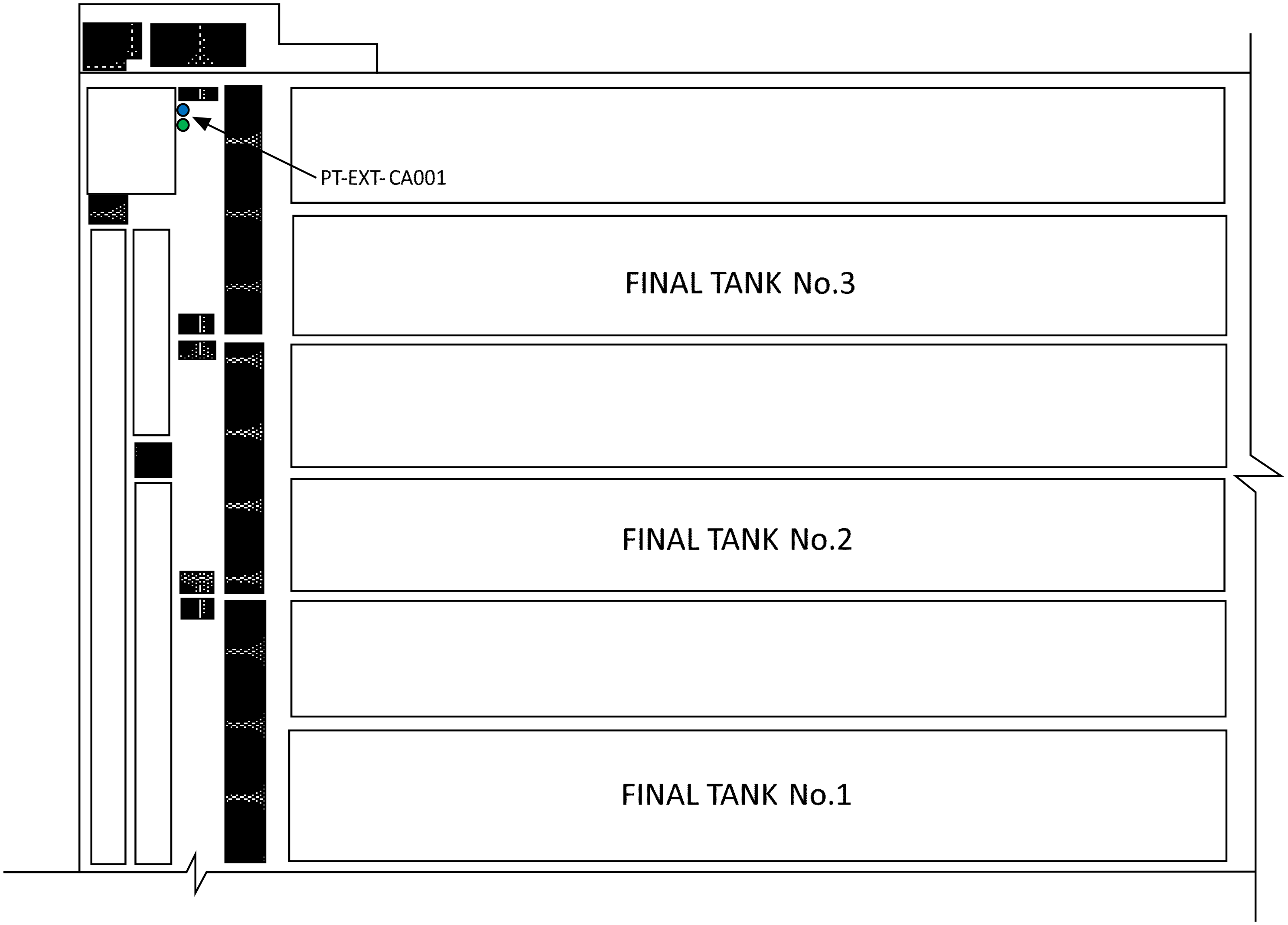
🔴 Asbestos Positive	🔵 PCB Sample
🟢 Asbestos Non-Detect	■ MCC Access Floor
🟡 Lead Positive	▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

SLUDGE THICKENER EL. 36.50’



LEGEND:

- 🔴 Asbestos Positive
- 🟢 Asbestos Non-Detect
- 🟡 Lead Positive
- 🔵 PCB Sample
- ⬜ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

FINAL TANK BUILDING

ATTACHMENT B

ASBESTOS SUMMARY TABLE

Table 1
Asbestos-Containing Materials Summary
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Building	Location	Sample Number	Material Description	Category	Analytical Results (PLM)	ACM	F/NF	Condition/Other
Administration Building	1st Floor Janitor Closet	AD-1-SR001A AD-1-SR001B	Sheetrock	Miscellaneous	NAD	--	NF	Good
Administration Building	1st Floor Janitor Closet	AD-1-MA001A AD-1-MA001B	White Tile Mastic	Miscellaneous	NAD	--	NF	Good
Administration Building	1st Floor Hallway	AD-1-MA002A AD-1-MA002B	Tan Vinyl Cove Base and Tan Mastic	Miscellaneous	NAD	--	NF	Good
Administration Building	Garage	GA-PW001A GA-PW001B	Blue Painted Insulation Wrap	TSI	NAD	--	NF	Damaged
Administration Building	Garage	GA-CA001A GA-CA001B	Tan Door Caulk	Miscellaneous	NAD	--	NF	Damaged
Administration Building	Garage and Admin Roof	GA-R-FL001A GA-R-FL001B	Black Roof Flashing Cement	Miscellaneous	NAD	--	NF	Good/Perimeter
Administration Building	Garage and Admin Roof	GA-R-SE001A GA-R-SE001B	Black Roof Sealant	Miscellaneous	NAD	--	NF	Good
Administration Building	Garage and Admin Roof	GA-R-SH001A GA-R-SH001B	Black-Gray Shingles	Miscellaneous	NAD	--	NF	Good
Administration Building	Garage and Admin Roof	GA-R-CA001A GA-R-CA001B	Gray Caulk, Air Channel	Miscellaneous	NAD	--	NF	Good
Administration Building	Garage Shop Hallway	GA-SH-EJ001A GA-SH-EJ001B	Gray Expansion Joint Sealant	Miscellaneous	NAD	--	NF	Good
Administration Building	Breakroom	AD-1-FT001A AD-1-FT001B	Tan Flecked 12" x 12" Vinyl Floor Tiles	Miscellaneous	NAD	--	NF	Good
Control Building	04	CB-04-SR001A CB-04-SR001B	Gray Sheetrock	Miscellaneous	NAD	--	NF	Damaged
Control Building	04	CB-04-JC001A CB-04-JC001B	White Joint Compound	Miscellaneous	NAD	--	NF	Damaged
Control Building	Corridor 106, 103, 111, 113	CB-106-CB001A CB-106-CB001B	4" Tan Covebase w/Orange Mastics	Miscellaneous	NAD	--	NF	Good
Control Building	Corridor 106, Vestibulte, Foyer, Lunchroom	CB-106-CT001A CB-106-CT001B	White 2' x 4' Acoustical Ceiling Tile	Miscellaneous	NAD	--	NF	Good
Control Building	Bathroom, Janitor, Room 204	CB-204-FB001A CB-204-FB001B	Black Fiber Backings of Floor Tiles	Miscellaneous	NAD	--	NF	Good
Control Building	Corridor 209	CB-209-CB001A CB-209-CB001B	Black 4" Vinyl Cove Base & Orange Mastic	Miscellaneous	NAD	--	NF	Good
Control Building	Roof	CB-R-RS001A CB-R-RS001B	Black Roof Sealant	Miscellaneous	NAD	--	NF	Good
Control Building	Exterior Entry Door	CB-EXT-CA001A CB-EXT-CA001B	Entry Door Gray Caulk	Miscellaneous	NAD	--	NF	Good
Control Building	**Roof**	**CB-R-FL001A** **CB-R-FL001B**	**Black Roof Flashing**	**Miscellaneous**	**6%**	**Chrysotile**	**NF**	**Good, Perimeter and Equipment Perimeters**
Control Building	Roof	CB-R-CA001A CB-R-CA001B	50 LF White Gray Caulk (Repairs)	Miscellaneous	NAD	--	NF	Good
Degritter Building	**101**	**DG-101-SE001A** **DG-101-SE001B**	**Black Floor to Wall Sealant**	**Miscellaneous**	**2%**	**Chrysotile**	**NF**	**Damaged, 27 LF**
Degritter Building	201 Loading Door of MCC	DG-201-FE001A DG-201-FE001B	Black Roof Flashing	Miscellaneous	NAD	--	NF	Good
Degritter Building	**Degritter Roof**	**DG-R-FL001A** **DG-R-FL001B**	**Black Flashing Cement**	**Miscellaneous**	**3%**	**Chrysotile**	**NF**	**Good, Parapet and Equipment Perimeters**

Table 1
Asbestos-Containing Materials Summary
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Building	Location	Sample Number	Material Description	Category	Analytical Results (PLM)	ACM	F/NF	Condition/Other
Degritter Building	Degritter Roof	DG-R-SE001A DG-R-SE001B	Black Shingle with Sealant	Miscellaneous	NAD	--	NF	Good
Incinerator	Incinerator	IN-WG001A IN-WG001B	Green Painted Window Glaze	Miscellaneous	NAD	--	NF	Significantly Damaged, 365 Units
Incinerator	**Incinerator**	**IN-DI001A IN-DI001B**	**Blower Stack Duct Insulation**	**TSI**	**15%**	**Amosite**	**F**	**Damaged, 12 LF x 3' Diameter**
Incinerator	**Incinerator**	**NS**	**Blower Duct/Blower Insulation**	**TSI**	**Assumed**	**Assumed**	**F**	**3' x 5' Exhaust, 6' x 3' Blower**
Incinerator	**Incinerator**	**NS**	**Incinerator Door Gate**	**TSI**	**Assumed**	**Assumed**	**F**	**4' x 4' x 4" Door**
Incinerator	Incinerator	IN-FB001A IN-FB001B	Yellow Fire Brick	Miscellaneous	NAD	--	NF	Damaged
Incinerator	**Incinerator**	**IN-PI001A IN-PI001B**	**Gray Pipe Insulation**	**TSI**	**18% 5%**	**Amosite Chrysotile**	**NF**	**Significantly Damaged 100 LF x 6" Diameter, 11 Elbows, 7 LF 2" Diameter, 2 Elbows**
Incinerator	Chimney	IN-EXT-M001A IN-EXT-M001B	Gray Mortar	Miscellaneous	NAD	--	NF	Significantly Damaged
Incinerator	Stack	IB-EXT-FB001A IB-EXT-FB001B	Tan Fire Brick	Miscellaneous	NAD	--	NF	Good
Incinerator	Stack	IB-EXT-MT001A IB-EXT-MT001B	Gray Mortar	Miscellaneous	NAD	--	NF	Damaged
Pipe Gallery	Gallery, Floor and Walls	PG-EJ001A PG-EJ001B	Black Expansion Joints	Miscellaneous	NAD	--	NF	Good
Screen Building	Screen Building Exterior	SB-EXT-CA001A SB-EXT-CA001B	Tan Window and Door Caulk	Miscellaneous	NAD	--	NF	Good
Sludge Building	**200**	**SL-200-PI001A SL-200-PI001B**	**Gray Pipe Insulation**	**TSI**	**19% 4%**	**Amosite Chrysotile**	**NF**	**Damaged, 100 LF x 3" Diameter Pipe, 12 +/- Elbows**
Sludge Building	301 Stairwell	SL-301-WG001A SL-301-WG001B	Green Painted Window Caulk	Miscellaneous	NAD	--	NF	Significantly Damaged
Sludge Building	**Roof**	**SL-R-FE001A SL-R-FE001B**	**Roof Black Felt on Parapet**	**Miscellaneous**	**4%**	**Chrysotile**	**NF**	**Good, Parapet Perimeter**
Sludge Building	Roof	SL-R-SE001A SL-R-SE001B	Roof Black Crystalized Cement	Miscellaneous	NAD	--	NF	Good
Sludge Building	**Roof**	**SL-R-FL001A SL-R-FL001B**	**Black Flashing Sealant**	**Miscellaneous**	**3%**	**Chrysotile**	**NF**	**Good, Parapet and Equipment Perimeters**
Sludge Building	Waste Room and Utility Room	SL-106-CA001A SL-106-CA001B	Brown Duct Sealant	Miscellaneous	NAD	--	NF	Good
Sludge Thickener	Sludge Thickener Tank Joints	ST-G-SE001A ST-G-SE001B	Black Expansion Joint Sealant	Miscellaneous	NAD	--	NF	Good
Sludge Thickener	Sludge Thickener Double Door	ST-G-CA001A ST-G-CA001B	Tank Door Caulk	Miscellaneous	NAD	--	NF	Good
Primary Tanks	Primary Tank Building	PT-EXT-CA001A PT-EXT-CA001B	Tan Expansion Caulk on Building	Miscellaneous	NAD	--	NF	Good

Notes:

NAD	No Asbestos Detected
NF	Not Friable
LF	Linear Feet
SF	Square Feet
Assumed Materials	Flex Duct Connectors, Gaskets, Fire Doors, until tested should be assumed positive for asbestos content

ATTACHMENT C

LEAD TABLES

Table 2A
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

REPORT OF LEAD PAINT INSPECTION FOR: **Administration Building**

Inspection Date:	2/20/20	
Report Date:	4/24/20	
Abatement Level:	1 mg/cm^2	
Total Readings:	8	
Job Started:	2/20/20	13:08
Job Finished:	2/20/20	13:33
Inspector:	Alexander K. Clarke	

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Calibration Readings									
1	--	--	--	--	--	--	--	0.4	TC
2	--	--	--	--	--	--	--	0.6	TC
3	--	--	--	--	--	--	--	0.9	TC
4	--	--	--	--	--	--	--	0.5	TC
5	--	--	--	--	--	--	--	0.6	TC
6	--	--	--	--	--	--	--	1	TC
Hallway									
7	C	Wall	Left Center	--	Intact (I)	Concrete	Beige	-0.2	QM
8	C	Door	Center	Left Jamb	I	Steel	Brown	1	QM

Notes:
QM - Quick Mode
TC - Time Corrected

Table 2B
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

REPORT OF LEAD PAINT INSPECTION FOR: **Incinerator Building**

Inspection Date: 2/21/20
Report Date: 4/24/20
Abatement Level: 1 mg/cm^2
Total Readings: 10
Job Started: 2/21/20 09:45
Job Finished: 2/21/20 10:35
Inspector: Alexander K. Clarke

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Calibration Readings									
1	--	--	--	--	--	--	--	0.8	TC
2	--	--	--	--	--	--	--	0.4	TC
3	--	--	--	--	--	--	--	0.9	TC
4	--	--	--	--	--	--	--	0.9	TC
Incinerator Room									
5	--	Structure	Center	--	Peeling (P)	Steel	Red	4.5	QM
6	--	Structure	Center	--	P	Steel	Red	6	QM
7	--	Structure	Center	--	P	Steel	Gray	-0.4	QM
8	B	Door	Left	Left Jamb	P	Steel	Gray	2.1	QM
9	--	Incinerator	Left	--	P	Steel	Gray	1	QM
10	B	Window	Right	Right Casing	P	Steel	Green	1	QM

Notes:
QM - Quick Mode
TC - Time Corrected

Table 2C
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

REPORT OF LEAD PAINT INSPECTION FOR: **Sludge Building**

Inspection Date:	2/21/20	
Report Date:	4/24/20	
Abatement Level:	1 mg/cm^2	
Total Readings:	9	
Job Started:	2/21/20	11:05
Job Finished:	2/21/20	11:50
Inspector:	Alexander K. Clarke	

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Room # 109									
1	A	Wall	Center	--	Peeling (P)	Cinder Blk	Gray	1	QM
2	D	Door	Center	Left Casing	P	Steel	Gray	6.1	QM
3	D	Wall	Center	--	P	Cinder Block	White	-0.2	QM
4	C	Column	Center	--	P	Concrete	Blue	7.5	QM
5	-	Stairs	Center	Railing	P	Steel	Beige	1	QM
6	D	Door	Center	Header	P	Steel	Green	7.1	QM
Sludge Building Wash Room									
7	A	Door	Center	--	Intact (I)	Cinder Block	Green	-0.3	QM
8	-	Wall	Right	--	P	Concrete	Beige	0	QM
9	B	Floor	Center	Right Casing	P	Steel	Beige	1	QM

Notes:

QM - Quick Mode

TC - Time Corrected

Table 2D
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

REPORT OF LEAD PAINT INSPECTION FOR: **Pump Station**

Inspection Date: 2/21/20
Report Date: 4/24/20
Abatement Level: 1 mg/cm^2
Total Readings: 9
Job Started: 2/21/20 11:55
Job Finished: 2/21/20 12:29
Inspector: Alexander K. Clarke

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Room #103									
1	A	Wall	Left Center	--	Intact (I)	Cinder Block	Green	-0.3	QM
2	B	Door	Right	Right Jamb	I	Steel	Gray	-0.9	QM
3	-	Curb	Center	--	I	Concrete	Yellow	-0.1	QM
4	B	Cabinet	Center	--	I	Steel	Gray	-0.3	QM
5	D	Pipe	Center	--	I	Steel	Green	1	QM
6	D	Floor	Center	--	I	Concrete	Gray	-0.6	QM
Basement									
7	C	Wall	Left Center	--	Peeling (P)	Plaster	Beige	-0.3	QM
8	C	Pipe	Left	--	I	Concrete	Brown	1	QM
9	-	Column	Center	--	P	Concrete	Gray	-0.1	QM

Notes:
QM - Quick Mode
TC - Time Corrected

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Table 2E
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

REPORT OF LEAD PAINT INSPECTION FOR: Degritter Building

Inspection Date: 2/21/20
Report Date: 4/24/20
Abatement Level 1 mg/cm^2
Total Readings: 10
Job Started: 2/21/20 13:42
Job Finished: 2/21/20 14:34
Inspector: Alexander K. Clarke

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Room #201									
1	A	Wall	Lower Left	--	Intact (I)	Cinder Block	Green	0.1	QM
2	D	Door	Left	Left Jamb	I	Steel	Brown	-0.1	QM
3	D	Door	Left	Door	I	Steel	Brown	1	QM
Room # 202									
4	-	Floor	Left	--	Peeling (P)	Concrete	Beige	1	QM
Basement									
5	A	Wall	Lower Right	--	I	Cinder Block	Beige	-0.4	QM
6	A	Door	Right	Right Jamb	I	Steel	Light Gray	-0.9	QM
7	-	Pipe	Right	--	I	Steel	Brown	0	QM
8	B	Wall	Lower Right	--	I	Concrete	Beige	-0.3	QM
9	-	Floor	Center	--	I	Concrete	Brown	0.1	QM
10	-	Pipe	Center	--	I	Steel	Green	1	QM

Notes:
QM - Quick Mode
TC - Time Corrected

Table 2F
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

REPORT OF LEAD PAINT INSPECTION FOR: **Thickener Building**

Inspection Date: 2/21/20
Report Date: 4/24/20
Abatement Level: 1 mg/cm^2
Total Readings: 6
Job Started: 2/21/20 14:39
Job Finished: 2/21/20 15:07
Inspector: Alexander K. Clarke

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Basement									
1	C	Wall	Lower Left	--	Intact (I)	Concrete	Beige	-0.4	QM
2	--	Pipe	Left	--	Peeling (P)	Steel	Yellow	1	QM
3	--	Pipe	Left	--	P	Steel	Brown	0.1	QM
Calibration Readings									
4	--	--	--	--	--	--	--	1	TC
5	--	--	--	--	--	--	--	0.5	TC
6	--	--	--	--	--	--	--	1.1	TC

Notes:
QM - Quick Mode
TC - Time Corrected

Table 2G
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

REPORT OF LEAD PAINT INSPECTION FOR: **Control Building**

Inspection Date:	2/25/20	
Report Date:	4/24/20	
Abatement Level:	1 mg/cm^2	
Total Readings:	40	
Job Started:	2/21/20	14:39
Job Finished:	2/21/20	15:07
Inspector:	Alexander K. Clarke	

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	ResuLights (mg/cm2)	Mode
Calibration Readings									
1	--	--	--	--	--	--	--	1	TC
2	--	--	--	--	--	--	--	0.5	TC
3	--	--	--	--	--	--	--	1.1	TC
Room #2									
4	A	Wall	Lower Left	--	Intact (I)	Concrete	Beige	1	QM
5	-	Floor	Center	--	Peeling (P)	Concrete	Gray	-0.2	QM
6	-	Foundation	Center	--	P	Concrete	Dark Gray	-0.2	QM
7	C	Door	Center	Door	I	Steel	Black	0	QM
Basement Hallway									
8	A	Wall	Lower Center	--	I	Cinder Block	Dark Gray	0.1	QM
9	A	Wall	Upper Center	--	I	Cinder Block	Beige	-0.1	QM
10	C	Door	Center	Door	I	Steel	Turquois	-0.1	QM
Room # 4									
11	-	Pipe	Center	--	P	Steel	Black	1	QM
12	-	Pipe	Center	--	I	Steel	Blue	0	QM
Room # 107									
13	B	Wall	Lower Center	--	I	Cinder Block	Beige	-0.2	QM
14	B	Wall	Lower Center	--	I	Cinder Block	Blue	1	QM
Room # 106									
15	A	Wall	Lower Center	--	I	Concrete	Cumin	-0.1	QM
16	A	Door	Center	Header	I	Steel	Brown	0	QM
Room # 107									
17	D	Wall	Lower Center	--	I	Cinder Block	Brown	-0.5	QM

Table 2G
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	ResuLights (mg/cm2)	Mode
18	D	Wall	Lower Center	--	I	Tiles	White	0.1	QM
19	-	Floor	Center	--	I	Tiles	Light Gray	-0.2	QM
20	-	Locker	Center	--	P	Steel	Yellow	0	QM
Room # 101									
21	A	Wall	Lower Center	--	I	Concrete	Gray	-0.2	QM
Room # 111									
22	A	Wall	Lower Right	--	I	Concrete	Beige	-0.1	QM
23	-	Floor	Right	--	P	Concrete	Light Gray	-0.1	QM
24	A	Column	Right	--	I	Concrete	Beige	1	QM
Room # 116									
25	A	Column	Center	--	I	Dry wall	Light Green	0	QM
26	C	Column	Right	--	I	Cinder Block	Light Green	-0.6	QM
27	-	Cabinet	Center	--	I	Steel	Gray	1	QM
Room # 112									
28	-	Stairs	Center	Risers	I	Concrete	Gray	0	QM
29	A	Wall	Upper Center	--	I	Concrete	Red	0	QM
Room # 209									
30	A	Wall	Upper Center	--	I	Concrete	Beige	-0.1	QM
31	A	Door	Center	Lft jamb	I	Steel	Brown	1	QM
Room #213									
32	C	Wall	Left Center	--		Concrete	Light Blue	-0.3	QM
33	C	Door	Left	Left Jamb	I	Steel	Black	0.1	QM
34	D	Cabinet	Left	--	I	Steel	Beige	2.2	QM
35	D	Cabinet	Left	--	I	Steel	Beige	1	QM
36	B	Cabinet	Left	--	I	Steel	Beige	4.8	QM
37	B	Cabinet	Left	--	I	Steel	Beige	4.2	QM
38	B	Cabinet	Left	--	I	Steel	Gray	2.4	QM
39	B	Cabinet	Left	--	I	Steel	Gray	6	QM
40	-	Floor	Left	--	I	Tiles	Brown	-0.6	QM

Notes:

QM - Quick Mode

TC - Time Corrected

Table 2H
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

REPORT OF LEAD PAINT INSPECTION FOR: **Screen Building**

Inspection Date:	2/25/20	
Report Date:	4/24/20	
Abatement Level:	1 mg/cm^2	
Total Readings:	10	
Job Started:	2/25/20	14:29
Job Finished:	2/25/20	15:06
Inspector:	Alexander K. Clarke	

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Control Room									
1	C	Wall	Lower Left	--	I	Cinder Blk	Light Green	-0.2	QM
2	D	Door	Left	Right Jamb	I	Steel	Light Gray	-0.2	QM
3	C	Door	Left	Door	I	Steel	Brown	1	QM
Air Blower									
4	-	Foundation	Center	--	I	Concrete	Dark Gray	-0.2	QM
5	-	Floor	Center	--	I	Concrete	Dark Gray	-0.7	QM
6	-	Structure	Center	--	I	Steel	Dark Gray	1	QM
Tank Room									
7	-	Fountain	Center	--	I	Concrete	Light Gray	-0.4	QM
Screen Room									
8	D	Door	Left	Left Jamb	I	Steel	Light Gray	0	QM
9	-	Railing	Center	Railing	I	Steel	Yellow	-0.1	QM
Basement									
10	-	Gate	Center	--	I	Steel	Red	-0.1	QM

Notes:

QM - Quick Mode

TC - Time Corrected

Table 2I
Lead Based Paint Inspection
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

eolas environmental LLC

REPORT OF LEAD PAINT INSPECTION FOR: **Pipe Gallery**

Inspection Date: 2/25/20
Report Date: 4/24/20
Abatement Level: 1 mg/cm^2
Total Readings: 15
Job Started: 2/25/20 15:30
Job Finished: 2/25/20 16:38
Inspector: Alexander K. Clarke

Reading No.	Side	Component	Location	Member	Condition	Substrate	Color	Results (mg/cm^2)	Mode
Pipe Gallery									
1	-	Pipe	Center	--	I	Steel	Brown	-0.2	QM
2	-	Pipe	Center	--	I	Steel	Green	-0.1	QM
3	-	Column	Center	--	I	Concrete	Beige	1	QM
4	-	Foundation	Center	--	I	Concrete	Gray	0	QM
5	-	Foundation	Center	--	I	Concrete	Yellow	0	QM
6	B	Wall	Left Center	--	P	Concrete	Beige	-0.1	QM
7	C	Door	Center	Right Jamb	P	Steel	Light Gray	-1.2	QM
8	D	Foundation	Center	--	P	Steel	Green	-0.3	QM
9	-	Pipe	Center	--	P	Steel	Lt Gray	0.1	QM
Control Room									
10	A	Wall	Left Center	--	I	Cinder Blk	Blue	1	QM
11	-	Bollard	Center	--	I	Concrete	Yellow	1	QM
Calibration Readings									
12	--	--	--	--	--	--	--	0.9	TC
13	--	--	--	--	--	--	--	1	TC
14	--	--	--	--	--	--	--	0.5	TC
15	--	--	--	--	--	--	--	1.2	TC

Notes:
QM - Quick Mode
TC - Time Corrected

ATTACHMENT D

PCB DATA TABLE

Table 3
Summary of PCB Analytical Results
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Sample ID	Sample Date	Building	Location/Room	Material Description	Result (mg/kg)	Type
CB-EXT-CA001	2/25/20	Control Building	Control Building Exterior Wall	Gray, Expansion Joint Caulk, 25 LF	2,000*	1254
PG-PA001-PCB	2/25/20	Pipe Gallery	Pipe Gallery Wall	Tan/Mustard/Gray Layered Wall Paint	1.5	1248
SL-301-WG001	2/21/20	Sludge Building	Stairwell Window, Room 301	Green-Painted, Deteriorated Gray, Window Glaze	9.1	1248
SB-EXT-CA001	2/25/20	Screen Building	Exterior Windows/Doors	Tan-Cream Window/Door Caulk	ND <0.8	NA
PT-EXT-CA001	2/25/20	Primary Tank Building	Expansion Joint Caulk on Building	Tan Expansion Joint Caulk, 50 LF	1	1254

Notes:

Analysis of building materials was completed using EPA Method 8082 following extraction using the Soxhlet Method 3450.

mg/kg	milligrams per kilogram
LF	Linear Feet
ND	Not Detected above Laboratory Reporting Limit
NA	Not Applicable

* Due to maxtrix interferences, dilution of this sample was required, resulting in a laboratory reporting limit of 400 mg/kg

PCB-containing building materials are considered PCB bulk product waste if the concentration of PCBs is equal to or greater than 50 mg/kg and is regulated under 40 CFR 761.62 of TSCA.

ATTACHMENT E

MISCELLANEOUS HAZARDOUS BUILDING MATERIALS TABLE

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Building	Location/Room	Material Description	Quantity	Notes
Admin Building	Shop	John Deere Oil Drain	1	10-Gallon
Admin Building	Shop	Waste Drum	1	55-Gallon Aerosol waste
Admin Building	Shop	Oil Rag Drum	1	21.3-Gallon Drum
Admin Building	Shop	Paint Products	12+	1-Liter-1 Gallon Nason
Admin Building	Shop	Flammable Cabinet	100+	Aerosol Cans
Admin Building	Shop	Aerosol Cans	200+	Flammable Aerosols 12 oz- 5 Gallon
Admin Building	Shop	4' Led Lights	28	Ceiling-Mounted
Admin Building	Shop	Fire Pull Alarm	1	Wall Mounted
Admin Building	Shop	Air Tool Oil	5	1-Gallon
Admin Building	Shop	Fire Extinguishers	1	Wall-Mounted
Admin Building	Shop	Emergency Lights	1	Wall-Mounted
Admin Building	Shop	Exit Signs	1	Wall-Mounted
Admin Building	Shop	Simple Green	1	1-Gallon
Admin Building	Shop	CRC Breklean	2	1-Gallon
Admin Building	Shop	Clean Ammonia	1	1-Gallon
Admin Building	Shop	Motor Oil	50+	1-Quart
Admin Building	Shop	Parts Cleaner	1	White Can 5-Gallon
Admin Building	Shop	WD-40	1	1-Gallon
Admin Building	Shop	Aluminum Wash	1	1-Gallon Dilute Phosphoric Acid
Admin Building	Shop	Aerosol Cans in Flammables Cabinet	50+	Spray Paint and Lubricants
Admin Building	Shop	Lacquer Thinner	1	5-Gallon Buckets
Admin Building	Shop	4 Cycle Fuel	1	5-Gallon
Admin Building	Shop	Forane 134 A	2	5-Gallon Blue Gas Cylinder
Admin Building	Shop	Flammable Cabinet	1	Various Aerosol and Canned Paints
Admin Building	Shop	Vapor lights	9	Ceiling-Mounted
Admin Building	Shop	Fire Pull Alarm	1	Wall-Mounted
Admin Building	Shop	Air Conditioner	1	Wall-Mounted
Admin Building	Shop	Hydraulic Oil	4	5-Gallon Bucket Penwood HWD-AW-32
Admin Building	Shop	Diesel Exhaust Fluid	1 box	2.5-Gallon
Admin Building	Shop	Anti Freeze	1 box	4, 1-Gallon Jugs

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Building	Location/Room	Material Description	Quantity	Notes
Admin Building	Shop	O2 and Acetylene Torch	1 cart	Gas Cylinder
Admin Building	Shop	Diesel Can	1	5-Gallon Bucket
Admin Building	Shop	Cutting Fluid	1	Red Lion 17 oz Aerosol Can
Admin Building	Shop	CO2+ Argon	2	Cylinder
Admin Building	Shop	Acetylene	4	Compressed Gas Cylinder
Admin Building	Shop Hallway	Anti-icing	5	1-Gallon Chinook Can
Admin Building	Shop Hallway	Snow Plow Coating	1	Red Lion 1-Gallon
Admin Building	Shop Hallway	Acrylic Enamel Paint	1	1-Gallon Nason-Select
Admin Building	Shop Hallway	Fire Pull Alarm	1	Wall-Mounted
Admin Building	Shop Hallway	Batteries	6	Acid Batteries
Admin Building	Shop Hallway	4' LED Lights	5	Ceiling-Mounted
Admin Building	Shop Hallway	4' LED Lights	4	Ceiling-Mounted
Admin Building	Shop Hallway	Wells Fargo Alarm	1	Wall-Mounted
Admin Building	1st Floor Hallway	2' Light Bulbs	14	Ceiling-Mounted
Admin Building	1st Floor Hallway	Ballasts	7	Ceiling-Mounted
Admin Building	1st Floor Hallway	Fire Extinguishers	1	Wall-Mounted
Admin Building	1st Floor Hallway	Exit Signs	2	Wall-Mounted
Admin Building	1st Floor Hallway	Smoke Detectors	3	Ceiling-Mounted
Admin Building	1st Floor Hallway	Fire Strobe Lights	2	Wall-Mounted
Admin Building	1st Floor Hallway	Fire Pull Alarm	1	Wall-Mounted
Admin Building	1st Floor Breakroom	2' Light Bulbs	8	Ceiling-Mounted
Admin Building	1st Floor Breakroom	Ballasts	4	Ceiling-Mounted
Admin Building	1st Floor Breakroom	Fire Extinguishers	2	Wall-Mounted
Admin Building	1st Floor Breakroom	Smoke Detectors	1	Ceiling-Mounted
Admin Building	1st Floor Offices	2' Light Bulbs	44	Ceiling-Mounted
Admin Building	1st Floor Offices	4' Light Bulbs	28	Ceiling-Mounted
Admin Building	1st Floor Offices	Ballasts	37	Ceiling-Mounted
Admin Building	2/Office Room	Ballasts	41	Ceiling-Mounted
Admin Building	2/Stairwell	4' Light Bulbs	4	Ceiling-Mounted
Admin Building	2/Stairwell	Ballasts	2	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Building	Location/Room	Material Description	Quantity	Notes
Admin Building	2/Stairwell	Exit Signs	1	Ceiling-Mounted
Admin Building	2/Stairwell	Fire Strobe Lights	1	Wall-Mounted
Admin Building	2/Stairwell	Fire Pull Alarm	1	Wall-Mounted
Admin Building	2/Shop Mezzanine	Smoke Detectors	2	Ceiling-Mounted
Admin Building	2/Shop Mezzanine	Fire Extinguishers	1	Wall-Mounted
Admin Building	2/Shop Mezzanine	4' Light Bulbs	8	Ceiling-Mounted
Admin Building	2/Shop Mezzanine	Ballasts	2	1-Gallon Nason-Select
Admin Building	2/Shop Mezzanine	MRO Paint	1	Seymour, Highly Flammable
Admin Building	2/Shop Mezzanine	Latex Enamel	1	1-Gallon, Non-toxic
Admin Building	2/Shop Mezzanine	California Black Enamel	1	1-Gallon Combustible
Admin Building	2/Shop Mezzanine	Pack light	1	Wall-Mounted
Admin Building	2/Shop Mezzanine	Matching Paint	1	17 oz-Green Flammable
Admin Building	2/Shop Mezzanine	Exit Signs	2	Wall-Mounted
Admin Building	2/Shop Mezzanine	4' LED lights	24	Ceiling-Mounted
Admin Building	2/Shop Mezzanine	Ballasts	12	Ceiling-Mounted
Admin Building	2nd Floor Hallway	2' Light Bulbs	16	Ceiling-Mounted
Admin Building	2nd Floor Hallway	Ballasts	8	Ceiling-Mounted
Admin Building	2nd Floor Hallway	Smoke Detectors	3	Ceiling-Mounted
Admin Building	2nd Floor Hallway	Fire Extinguishers	2	Wall-Mounted
Admin Building	2nd Floor Hallway	Fire Strobe Lights	2	Wall-Mounted
Admin Building	2nd Floor Hallway	Exit Signs	2	Wall-Mounted
Admin Building	2nd Floor Office Room	2' Light Bulbs	44	Ceiling-Mounted
Admin Building	2nd Floor Office Room	4' Light Bulbs	36	Ceiling-Mounted
Admin Building	2nd Floor Office Room	Dextor	6	8 oz
Admin Building	201	4' Light Bulbs	40	Ceiling-Mounted
Admin Building	201	2' Light Bulbs	4	Ceiling-Mounted
Admin Building	201	Ballasts	14	Ceiling-Mounted
Admin Building	201	Smoke Detectors	3	Ceiling-Mounted
Admin Building	Garage	4' Fluorescent Bulbs Waste Drum	1	Cardboard Drum
Admin Building	Garage	Diesel Exhaust Fluid	2	55-Gallon Drums

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
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Building	Location/Room	Material Description	Quantity	Notes
Admin Building	Garage	Antifreeze Waste	1	55-Gallon Plastic Drum
Admin Building	Garage	Antifreeze	3	55 Gallon Plastic Drum
Admin Building	Garage	Cal Chloride	1	55-Gallon Plastic Drum
Admin Building	Garage	Windshield Washer Fluid	2	Momar, 55-Gallon Yellow Drum
Admin Building	Garage	Sewer Line Agent	3	55-gallon drums
Admin Building	Garage	Salt Guard	1	Red 55-Gallon Drum
Admin Building	Garage	Tracer Dye	2	55-Gallon Momar Drum
Admin Building	Garage	Dry Cleaning Compound	1	55-Gallon Momar Drum
Admin Building	Garage	Degritter Compound	1	20-Gallon Grreet Grape
Admin Building	Garage	Natural Solvent Cleaner	1	Cut-thru, 55-Gallon Black Drum
Admin Building	Garage	Salt Neutralizer	1	20-Gallon Momar
Admin Building	Garage	Asphalt Patch	5	5-Gallon Buckets
Admin Building	Garage	Assorted Stripe Paint	72	17 oz Aerosol Can
Admin Building	Garage	Anti Freeze	1	1-Gallon
Admin Building	Garage	Primer Sealer	1	1-Gallon Can
Admin Building	Garage	Deicer	3	Aerosol Cans
Admin Building	Garage	Fast Set Waterstop Mortar	2	5-Gallon White Bucket
Admin Building	Garage	Waste Hydraulic	2	5-Gallon Water Jug
Admin Building	Garage	Hydraulic Oil	1	5-Gallon John Deere Bucket
Admin Building	Garage	Tack Coat	2	5-Gallon Tack Coat Bucket
Admin Building	Garage	Gasoline Treatment	2	5-Gallon Fix Red Bucket
Admin Building	Garage	PVC Primer	4	32 fl oz-Purple Primer
Admin Building	Garage	Crack Repair	2	5-Gallon Buckets
Admin Building	Garage	Masonry Cleaner	1	Sure Klean 5-Gallon Bucket
Admin Building	Garage	Mole Dry Film Lubricant	3	11 oz Can
Admin Building	Garage	Vapor Lights	24	Ceiling-Mounted
Admin Building	Garage	Exit Signs	6	Wall-Mounted
Admin Building	Garage	Fire Pull Alarm	4	Wall-Mounted
Admin Building	Garage	Fire Strobe Lights	4	Wall-Mounted
Admin Building	Garage	Smoke Detectors	9	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
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Building	Location/Room	Material Description	Quantity	Notes
Admin Building	Garage	Emergency Lights	4	Wall-Mounted
Admin Building	Garage	Fire Extinguishers	5	Wall-Mounted
Admin Building	Garage	Non Flammable Mix	5	4' Cylinder
Admin Building	Garage	Motor oil	4	55-Gallon Drums
Admin Building	Garage	Diesel fuel	1	55-Gallon Drums
Admin Building	Garage	Hydraulic oil	7	55-Gallon Drums
Admin Building	Garage	Diesel fuel conditioner	1	55-Gallon Drums
Admin Building	Garage	Transmission fluid	2	55-Gallon Drums
Admin Building	Garage	Lubricant Oil	1	55-Gallon Drums
Admin Building	Garage	Hydraulic Oil	1	5-Gallon Pennwood
Admin Building	Garage	Aerosol Cans	4	In Use
Admin Building	Garage	Tracer Dye	1	55-Gallon
Admin Building	Garage	Asphalt Patch	12	5-Gallon Buckets
Admin Building	Garage	Marine Battery	2	Marine battery
Admin Building	Garage	O2	4	4' Cylinder
Admin Building	Stairwell	2' Light Bulbs	8	Ceiling-Mounted
Admin Building	Stairwell	4' Light Bulbs	8	Ceiling-Mounted
Admin Building	Stairwell	Ballasts	8	Ceiling-Mounted
Admin Building	Stairwell	Smoke Detectors	2	Ceiling-Mounted
Admin Building	Wash Room	Transmission Fluid	1	5-Gallon Allison Transmission
Admin Building	Wash Room	Muriatic Acid	1	3.875 Liter Klean Strip
Admin Building	Wash Room	Construction Adhesive	1	10 oz-DAP Heavy Duty
Admin Building	Wash Room	Gasket Remover	3	11 fl oz-Red Lion Aerosol
Admin Building	Wash Room	6-pack Anti Freeze	3	Prime Red Coolant
Admin Building	Wash Room	Transmission Fluid	17	2.5-5-Gallon
Admin Building	Wash Room	Hydraulic AW-32	3	Penwood 5-Gallon Black Bucket
Admin Building	Wash Room	Super Vehicle Wash	1	30-Gallon
Admin Building	Wash Room	Water Degreaser	1	30-Gallon Black Drum
Admin Building	Wash Room	Degreaser	1	5-Gallon White Bucket
Admin Building	Wash Room	Fire Pull Alarm	1	Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
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Building	Location/Room	Material Description	Quantity	Notes
Admin Building	Wash Room	Exit Signs	1	Wall-Mounted
Admin Building	Wash Room	Vapor Lights	6	Ceiling-Mounted
Admin Building	Wash Room	Hydraulic oil	2	5-Gallon Bio Iso 32
Admin Building	Wash Room	Fire Extinguishers	2	Wall-Mounted
Admin Building	Wash Room	Gear oil	2	Lubemaster 5-Gallon
Admin Building	Outside Shop	Patch Compound	1	Aquaphalt
Admin Building	Outside Shop	Hydroclean	3	Liquid Hydroclean Booster
Admin Building	Exterior Garage	Unknown Drums	15	Poly, Steel Closed and Steel Open
Control Building	2	4' Light Bulbs	32	Ceiling-Mounted
Control Building	2	Ballasts	16	Ceiling-Mounted
Control Building	2	Exit Signs	2	Wall-Mounted
Control Building	2	Gas Heater	1	Sterling
Control Building	2	Air Blower Controller	3	Control Boxes
Control Building	2	Dex-Coat	1	5-Gallon Bucket
Control Building	3	4' LED Lights	10	Ceiling-Mounted
Control Building	3	Ballasts	5	Ceiling-Mounted
Control Building	3	Fire Pull Alarm	2	Wall-Mounted
Control Building	3	Fire Strobe Lights	1	Wall-Mounted
Control Building	3	Exit Signs	1	Wall-Mounted
Control Building	3 Corridor	4' Light Bulbs	10	Ceiling-Mounted
Control Building	3 Corridor	Ballasts	5	Ceiling-Mounted
Control Building	3 Corridor	Exit Signs	2	Wall-Mounted
Control Building	4	Vibratone Alarm	1	Siemens
Control Building	4	Fire Pull Alarm	1	Wall-Mounted
Control Building	4	Exit Signs	1	Wall-Mounted
Control Building	4	Gas Heater	1	Sterling
Control Building	4	GE Transformers	1	Dry Type 9T23Q9875G83
Control Building	4	Compressor	1	Ingersoy Rand T30
Control Building	4	Pack Light	2	Wall-Mounted
Control Building	4	4' Light Bulbs	8	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
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Building	Location/Room	Material Description	Quantity	Notes
Control Building	4	Ballasts	4	Ceiling-Mounted
Control Building	4	Blower Controller	1	Control Box
Control Building	4	Vibratone Alarm	1	Siemens Wall-Mounted
Control Building	4	Machine Oil	1	5-Gallon Cherron ISO 220
Control Building	4	4' Light Bulbs	6	Ceiling-Mounted
Control Building	4	Ballasts	3	Ceiling-Mounted
Control Building	7	4' Light Bulbs	28	Ceiling-Mounted
Control Building	7	Ballasts	14	Ceiling-Mounted
Control Building	7	Paint	1	1-Gallon
Control Building	7	Fire Alarm	1	Wall-Mounted
Control Building	7	Gas Heater	1	Sterling
Control Building	7	Paint	1	5-Gallon
Control Building	7	Tracer Dye	1	Plant Pro
Control Building	9 Stairwell	4' Light Bulbs	20	Ceiling-Mounted
Control Building	B/9 Stairwell	Ballasts	6	Ceiling-Mounted
Control Building	9 Stairwell	Fire Alarm	1	Wall-Mounted
Control Building	9 Stairwell	Fire Pull Alarm	1	Wall-Mounted
Control Building	10	Computer and Monitor	3	O.O.S
Control Building	101	2' Light Bulb Fluorescent	10	Ceiling-Mounted
Control Building	101	Ballasts	5	Ceiling-Mounted
Control Building	101	Fire Pull Alarm	1	Wall-Mounted
Control Building	101	Alarm System	1	Simplex
Control Building	101	Exit Signs	1	Wall-Mounted
Control Building	101	Radiator	1	Wall-Mounted
Control Building	105	4' Fluorescent Light Bulb	4	Ceiling-Mounted
Control Building	105	Ballasts	2	Ceiling-Mounted
Control Building	106	2' Light Bulb Fluorescent	14	Ceiling-Mounted
Control Building	106	Ballasts	7	Ceiling-Mounted
Control Building	106	Exit Signs	3	Wall-Mounted
Control Building	106	Fire Extinguisher	1	Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
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Building	Location/Room	Material Description	Quantity	Notes
Control Building	106	Fire Alarm	1	Wall-Mounted
Control Building	106	Yellow Non Skid Paint	1	5-Gallon
Control Building	107	4' Fluorescent Light Bulb	10	Ceiling-Mounted
Control Building	107	Bleach	1	1-Gallon
Control Building	107	Smoke Detectors	1	Ceiling-Mounted
Control Building	110	Paint	30	1-Gallon Flammable
Control Building	110	4' Fluorescent Light Bulb	1	Ceiling-Mounted
Control Building	110	Ballasts	1	Ceiling-Mounted
Control Building	111	Multi Oil 5W	4	Zn-free 5W20
Control Building	111	Exit Signs	3	Wall-Mounted
Control Building	111	Fire Pull Alarm	1	Wall-Mounted
Control Building	111	Fire Extinguishers	1	Wall-Mounted
Control Building	111	Vapor Lights	16	Ceiling-Mounted
Control Building	111	Altu Controller	2	O.O.S
Control Building	111	4' Fluorescent Light Bulb	35	Waste Storage
Control Building	111	PA System	1	Peavey
Control Building	111	4' Fluorescent Light Bulb	2	Ceiling-Mounted
Control Building	111	Ballasts	2	Ceiling-Mounted
Control Building	111	Smoke Detectors	1	Ceiling-Mounted
Control Building	112	Radiator	2	Wall-Mounted
Control Building	112	4' Light Bulb Fluorescent	8	Ceiling-Mounted
Control Building	112	4' Light Bulb LED	6	Ceiling-Mounted
Control Building	112	Ballasts	2	Ceiling-Mounted
Control Building	112	Exit Signs	1	Wall-Mounted
Control Building	113	4' Light Bulbs Fluorescent	6	Ceiling-Mounted
Control Building	113	Ballasts	3	Ceiling-Mounted
Control Building	113	Fire Alarm	1	Wall-Mounted
Control Building	113	Ice Melt	20	50 lbs Bags
Control Building	113	Exit Signs	2	Wall-Mounted
Control Building	114	Fire Alarm	1	Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
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Building	Location/Room	Material Description	Quantity	Notes
Control Building	114	Exit Signs	1	Wall-Mounted
Control Building	114	Ice Melt	5	Road Runner/SDI, 5-Gallon
Control Building	114	Degreaser	5	Triple Zero Concentrate
Control Building	114	Safe Grit Non Skid	1	Yellow, 5-Gallon
Control Building	114	Dark Gray Paint	10	MRO Seymour 1-Gallon
Control Building	114	Tough Coat Paint	12	--
Control Building	114	Hydroclean	1	25-Gallon
Control Building	114	Degreaser	1	Momar Tiger Liquid 10-Gallon
Control Building	114	Propylene Glycol	1	55-Gallon Concentrate
Control Building	114	Liquid Electric Tape	1	Starbrite Flammable
Control Building	114	Unknown	1	Sealed Open Top
Control Building	114	Hydraulic Oil	2	R.B Birge, 5-Gallon
Control Building	114	Gear oil	1	55-Gallon Mobil
Control Building	114	Momar Lubricant	4	Flex Safe and Synthetic Food Grade
Control Building	114	Ultra Blend	1	55-Gallon JPO-UB-355
Control Building	114	Oily Debris Waste	1	55-Gallon CR05
Control Building	114	Hazardous Waste Aerosol Cans	1	55-Gallon
Control Building	114	Orange 40 Degreaser	2	5-Gallon
Control Building	116	Transformer	1	Dry Type 9T23Q9875G83
Control Building	116	Fire Pull Alarm	2	Wall-Mounted
Control Building	116	Fire Extinguishers	2	Wall-Mounted
Control Building	116	4' Light Bulbs Fluorescent	26	Ceiling-Mounted
Control Building	116	2' Light Bulbs Fluorescent	2	Ceiling-Mounted
Control Building	116	Ballasts	14	Ceiling-Mounted
Control Building	116	UPS	2	Best Power, O.O.S
Control Building	116	Dehumidifier	1	Herrtronic
Control Building	116	Fire Pull Alarm	2	Wall-Mounted
Control Building	116	AHU Controller	3	Apogee
Control Building	201	Fire Alarm Control	1	Simplex
Control Building	201	Blower Controller	1	Control

Table 4
Miscellaneous Hazardous Building Materials Summary
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Building	Location/Room	Material Description	Quantity	Notes
Control Building	201	Control Monitor	1	Milltronics
Control Building	208	Yellow Safety Paint	19	1-Gallon Cans, Flammable
Control Building	213	Buffer Solution	6	500 mL
Control Building	213	Potassium Chromate	2	500 mL
Control Building	213	Silver Nitrate	4	500 mL
Control Building	213	pH Electrode Solution	2	500 mL
Control Building	300	4' Light Bulbs Fluorescent	10	Ceiling-Mounted
Control Building	300	Smoke Detectors	6	Ceiling-Mounted
Control Building	300	Exit Signs	1	Wall Mounted
Control Building	300	Fire Pull Alarm	1	Wall-Mounted
Control Building	300	Fire Extinguishers	1	Wall-Mounted
Control Building	300	Gas Heater	1	Sterling
Control Building	2nd Floor	4' Light Bulbs Fluorescent/LED	37	Ceiling-Mounted
Control Building	2nd Floor	2' Light Bulbs Fluorescent/LED	37	Ceiling-Mounted
Control Building	2nd Floor	Smoke Detectors	3	Ceiling-Mounted
Control Building	2nd Floor	Fire Extinguishers	2	Wall-Mounted
Control Building	2nd Floor	Fire Pull Alarm	2	Wall-Mounted
Control Building	2nd Floor	Exit Signs	2	Wall-Mounted
Control Building	2nd Floor	Fire Detector	2	Ceiling-Mounted
Degritter Building	1	Vapor Lights	8	Ceiling-Mounted
Degritter Building	1	Fire Alarm	1	Wall-Mounted
Degritter Building	1	Exit Signs	2	Wall-Mounted
Degritter Building	1	Fire Pull Alarm	1	Wall-Mounted
Degritter Building	1	Control Panel	1	Sump Pit Control
Degritter Building	1	Emergency Lights	1	Wall-Mounted
Degritter Building	1	Bailey Fisher Porter	1	NA
Degritter Building	1	Pack Light	1	Wall-Mounted
Degritter Building	1	Control Station	1	Mixed Sludge
Degritter Building	101	Vapor Lights	18	Ceiling-Mounted
Degritter Building	101	Fire Extinguishers	2	Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
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Building	Location/Room	Material Description	Quantity	Notes
Degritter Building	101	Exit Signs	2	Wall-Mounted
Degritter Building	101	Soap	1	1-Gallon Sun Triple Clean
Degritter Building	101	Ice Melt	1	50 lbs
Degritter Building	101	Fire Alarm	1	Wall-Mounted
Degritter Building	101	Simple Green	1	1-Gallon
Degritter Building	201	Ballasts	15	Ceiling-Mounted
Degritter Building	201	4' LED Lights	60	Ceiling-Mounted
Degritter Building	201	GE Transformers	1	Dry Type
Degritter Building	201	Thermostat	1	Coleman, Wall-Mounted
Degritter Building	201	Thermostat	1	Honeywell, Electric
Degritter Building	201	Fire Alarm	3	Wall-Mounted
Degritter Building	201	Fire Extinguishers	2	Wall-Mounted
Degritter Building	201	Gas Analyzer Monitoring System	1	Condor, Wall-Mounted
Degritter Building	201	Exit Signs	1	Wall-Mounted
Degritter Building	202	4' Light Bulbs	12	Ceiling-Mounted
Degritter Building	202	Ballasts	6	Ceiling-Mounted
Degritter Building	202	Emergency Lights	1	Wall-Mounted
Degritter Building	202	Fire Alarm	1	Wall-Mounted
Degritter Building	202	Natural Gas Boiler	1	Webster
Degritter Building	203	Smoke Detectors	1	Ceiling-Mounted
Degritter Building	203	4' Light Bulbs	3	Ceiling and Wall-Mounted
Degritter Building	203	Hot Water Heater	1	A.O Smith
Degritter Building	203	Penetrating Oil Aerosol Can	1	17 oz Red Lion
Degritter Building	203	Fire Alarm	1	Wall-Mounted
Pump Station	100	4' Light Bulbs	28	Ceiling-Mounted
Pump Station	100	Ballasts	14	Ceiling-Mounted
Pump Station	100	Thermostat	4	Powers, Siemens, Barber-Coleman, Johnson Controls
Pump Station	100	Fire Extinguishers	2	Wall-Mounted
Pump Station	100	Fire Pull Alarm	2	Wall-Mounted
Pump Station	100	Fire Strobe Lights	2	Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
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Building	Location/Room	Material Description	Quantity	Notes
Pump Station	100	Exit Signs	1	Wall-Mounted
Pump Station	100	Transformer	2	Type QL Dry type
Pump Station	100	Control Panel	4	Yaskawa
Pump Station	100	Control Panel	1	Us Filter Control System
Pump Station	100	Control Panel	1	PCU 200
Pump Station	103	Vapor lights	13	Ceiling-Mounted
Pump Station	103	Emergency Lights	5	Wall-Mounted
Pump Station	103	Exit Signs	3	Wall-Mounted
Pump Station	103	Pack light	3	Wall-Mounted
Pump Station	103	Fire Strobe Lights	2	Wall-Mounted
Pump Station	103	Fire Pull Alarm	2	Wall-Mounted
Pump Station	103	Smoke Detectors	1	Ceiling-Mounted
Pump Station	103	Control Panel	1	Sump Pit Control
Pump Station	103	Control Panel	1	PCU 600
Pump Station	103	Hydraulic Heat Transfer Fluid	1	55-Gallon Blue Plastic
Pump Station	103	Fire Extinguishers	1	Wall-Mounted
Pump Station	103	Bubble Pump Controller	1	Lit-202 Digital Control
Pump Station	103	Thermostat	1	Powers
Pump Station	Lower Level 1	Vapor Lights	14	Ceiling-Mounted
Pump Station	Lower Level 1	Emergency Lights	4	Wall-Mounted
Pump Station	Lower Level 1	Fire Pull Alarm	5	Wall-Mounted
Pump Station	Lower Level 1	Exit Signs	1	Wall-Mounted
Pump Station	Lower Level 1	Compressor	1	Quincy Non-Asbestos
Pump Station	Lower Level 1	AHU	1	O.O.S
Pump Station	Lower Level 1	Vapor Lights	5	Ceiling-Mounted
Pump Station	Lower Level 1	Emergency Lights	1	Wall-Mounted
Pump Station	Lower Level 1	Pack light	1	Wall-Mounted
Pump Station	Lower Level 1	Fire Pull Alarm	1	Wall-Mounted
Pump Station	Lower Level 1	Exit Signs	1	Wall-Mounted
Pump Station	Upper Level 14	Vapor Lights	8	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
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Building	Location/Room	Material Description	Quantity	Notes
Pump Station	Upper Level 14	Thermostat	1	Powers
Pump Station	Upper Level 14	Fire Extinguishers	1	Wall-Mounted
Pump Station	Upper Level 14	Fire Strobe Lights	1	Wall-Mounted
Pump Station	Upper Level 14	Fire Pull Alarm	2	Wall-Mounted
Pump Station	Upper Level 14	Emergency Lights	3	Wall-Mounted
Pump Station	Upper Level 14	Exit Signs	2	Wall-Mounted
Pump Station	Upper Level 14	Pack Light	3	Wall Mounted
Pump Station	Upper Level 16	Vapor Lights	3	Ceiling-Mounted
Pump Station	Upper Level 16	Emergency Lights	1	Wall-Mounted
Pump Station	Upper Level 16	Control Station	1	Drain and Sump Pump
Pump Station	Upper Level 16	Exit Signs	1	Wall-Mounted
Pump Station	Upper Level 17 and 18	Vapor lights	4	Ceiling-Mounted
Pump Station	Upper Level 17 and 18	Fire Strobe Lights	1	Wall-Mounted
Sludge Building	20	Pack light	11	Wall-Mounted
Sludge Building	20	Exit Signs	1	Wall-Mounted
Sludge Building	20	Vapor Lights	10	Ceiling-Mounted
Sludge Building	20	Pump Controller	1	Allen Bradley 1336 plus
Sludge Building	109	Pack Lights	3	Wall-Mounted
Sludge Building	109	Vapor Lights	4	Ceiling-Mounted
Sludge Building	109	Control Panel	1	Devar Inc.
Sludge Building	109	Motor Oil	1	In Use 55-Gallon Blue Drum
Sludge Building	109	BPC Belt Cleaner	1	5-Gallon Yellow Poly Drum
Sludge Building	109	Vapor Lights	5	Ceiling-Mounted
Sludge Building	109	Control Panel	1	Kinetics Hydro K-5 Gravel Belt
Sludge Building	109	Thermostat	1	Wall-Mounted
Sludge Building	109	Clarfiloc C-6266	1	1000-Gallon Plastic in Steel Cage
Sludge Building	109	Fire Extinguishers	1	Wall-Mounted
Sludge Building	109	Tough Coaters	1	1-Gallon Kryton Industrial
Sludge Building	Incinerator	Vapor Lights	7	Ceiling-Mounted
Sludge Building	Incinerator	Smoke Detectors	1	Ceiling-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
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Building	Location/Room	Material Description	Quantity	Notes
Sludge Building	Incinerator-Hallway	Pack Light	1	Wall-Mounted
Sludge Building	Incinerator-Hallway	Vapor Light	1	Ceiling-Mounted
Sludge Building	Incinerator-Hallway	Thermostat	1	Honeywell
Sludge Building	Wash room	4' Light Bulbs	4	Ceiling-Mounted
Sludge Building	Wash room	Ballasts	2	Ceiling-Mounted
Sludge Building	Wash room	Smoke Detectors	2	Ceiling-Mounted
Screen Building	1st Floor MCC	Transformer	2	9T23C2575G83 GE
Screen Building	1st Floor MCC	UPS	2	O.O.S
Screen Building	1st Floor MCC	Exit Signs	3	Wall-Mounted
Screen Building	1st Floor MCC	Fire Extinguishers	1	Wall-Mounted
Screen Building	1st Floor MCC	Fire Pull Alarm	2	Wall-Mounted
Screen Building	1st Floor MCC	4' Light Bulbs Fluorescent	33	Ceiling-Mounted
Screen Building	1st Floor MCC	Fire Pull Alarm	2	Wall-Mounted
Screen Building	1st Floor MCC	Gas Analyzer Monitoring System	2	--
Screen Building	1st Floor Blower Room	Blower Control System Panel	2	Channel Air
Screen Building	1st Floor Blower Room	4' Light Bulbs Fluorescent	10	Ceiling-Mounted
Screen Building	1st Floor Blower Room	Ballasts	5	Ceiling-Mounted
Screen Building	1st Floor Screen Room	Vapor Lights	18	Ceiling-Mounted
Screen Building	1st Floor Screen Room	Emergency Lights	3	Wall-Mounted
Screen Building	1st Floor Screen Room	Fire Exit Sign	3	Ceiling-Mounted
Screen Building	1st Floor Screen Room	Momar Flex Safe	1	55-Gallon Fully Synthetic Food Grade Lubricant
Screen Building	1st Floor Screen Room	Waste Oil	3	5-Gallon Bucket
Screen Building	1st Floor Screen Room	Unknown	1	55-Gallon Drums
Screen Building	1st Floor Screen Room	NaOH	1	55-Gallon Drums
Screen Building	1st Floor Screen Room	NaOh Solution	2	55-Gallon Drums
Screen Building	1st Floor Screen Room	Xtreme Green Lubricant	1	55-Gallon Synthetic Blend
Screen Building	1st Floor Screen Room	ByPass Screen Compactor Control	2	--
Screen Building	1st Floor Screen Room	Multi Oil 5W20	1	55-Gallon
Screen Building	1st Floor Sodium Hypo Room	NaOH Tank	1	Empty O.O.S
Screen Building	1st Floor Sodium Hypo Room	Na-Hypochlorite Solution Tank	1	Empty O.O.S

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Building	Location/Room	Material Description	Quantity	Notes
Screen Building	1st Floor Sodium Hypo Room	Gas Heater	1	Sterling
Screen Building	1st Floor Corridor	4' Light Bulb Fluorescent	10	Ceiling-Mounted
Screen Building	1st Floor Corridor	Ballasts	5	Ceiling-Mounted
Screen Building	1st Floor Corridor	Exit Signs	2	Wall-Mounted
Screen Building	1st Floor Screen Room Exit	Odor Control Panel	1	--
Screen Building	1st Floor Scrubber Tower	Vapor Lights	6	Ceiling-Mounted
Screen Building	1st Floor Scrubber Tower	4' Light Bulbs Fluorescent	3	Ceiling-Mounted
Screen Building	1st Floor Scrubber Tower	Ballasts	1	Ceiling-Mounted
Screen Building	1st Floor Scrubber Tower	Emergency Lights	1	Wall-Mounted
Screen Building	1st Floor Screen Room	Nitrogen Cylinder	2	--
Screen Building	1st Floor Screen Room	Piston Accumulator	1	Gas
Screen Building	Basement Screen Room	4' Light Bulb Fluorescent	21	Ceiling-Mounted
Screen Building	Basement Screen Room	Ballasts	8	Ceiling-Mounted
Screen Building	Basement Screen Room	Exit Signs	5	Wall-Mounted
Screen Building	Basement Screen Room	Fire Extinguishers	1	Wall-Mounted
Screen Building	Basement Screen Room	Gas Heater	2	Sterling
Screen Building	Basement Screen Room	Vapor Lights	15	Ceiling-Mounted
Screen Building	Basement Gallery	Fire Alarm	6	Wall-Mounted
Screen Building	Basement Gallery	Fire Pull Alarm	4	Wall-Mounted
Screen Building	Basement Gallery	Emergency Lights	5	Wall-Mounted
Screen Building	Basement Gallery	Fire Extinguishers	4	Wall-Mounted
Screen Building	Basement Gallery	Exit Signs	2	Wall-Mounted
Screen Building	Basement Gallery	Pack Light	34	Wall-Mounted
Screen Building	Basement Gallery	Vapor Lights	115	Ceiling-Mounted
Screen Building	Loading Dock	4' Light Bulbs Fluorescent	6	Ceiling-Mounted
Screen Building	Loading Dock	Ballasts	2	Ceiling-Mounted
Screen Building	Loading Dock	Vapor Lights	4	Ceiling-Mounted
Screen Building	Loading Dock	Exit Signs	1	Wall-Mounted
Thickener Building	1	Vapor Lights	14	Ceiling-Mounted
Thickener Building	1	Fire Extinguishers	1	Wall-Mounted

Table 4
Miscellaneous Hazardous Building Materials Summary
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Building	Location/Room	Material Description	Quantity	Notes
Thickener Building	1	Exit Signs	1	Wall-Mounted

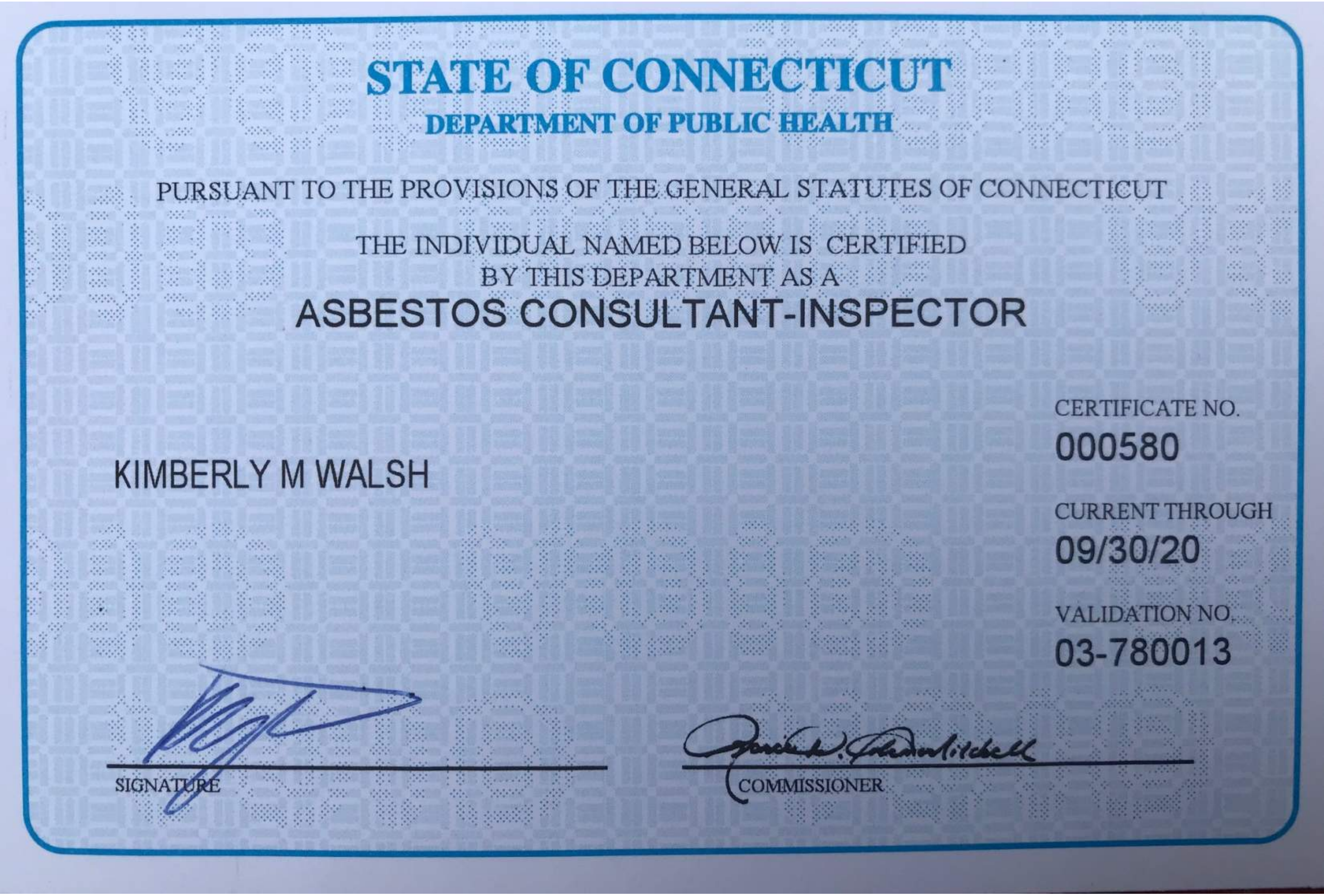
ATTACHMENT F

LABORATORY ANALYTICAL REPORTS

Detailed Laboratory Reports Available Upon Request

ATTACHMENT G

LICENSES



STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A

ASBESTOS CONSULTANT-INSPECTOR

KIMBERLY M WALSH

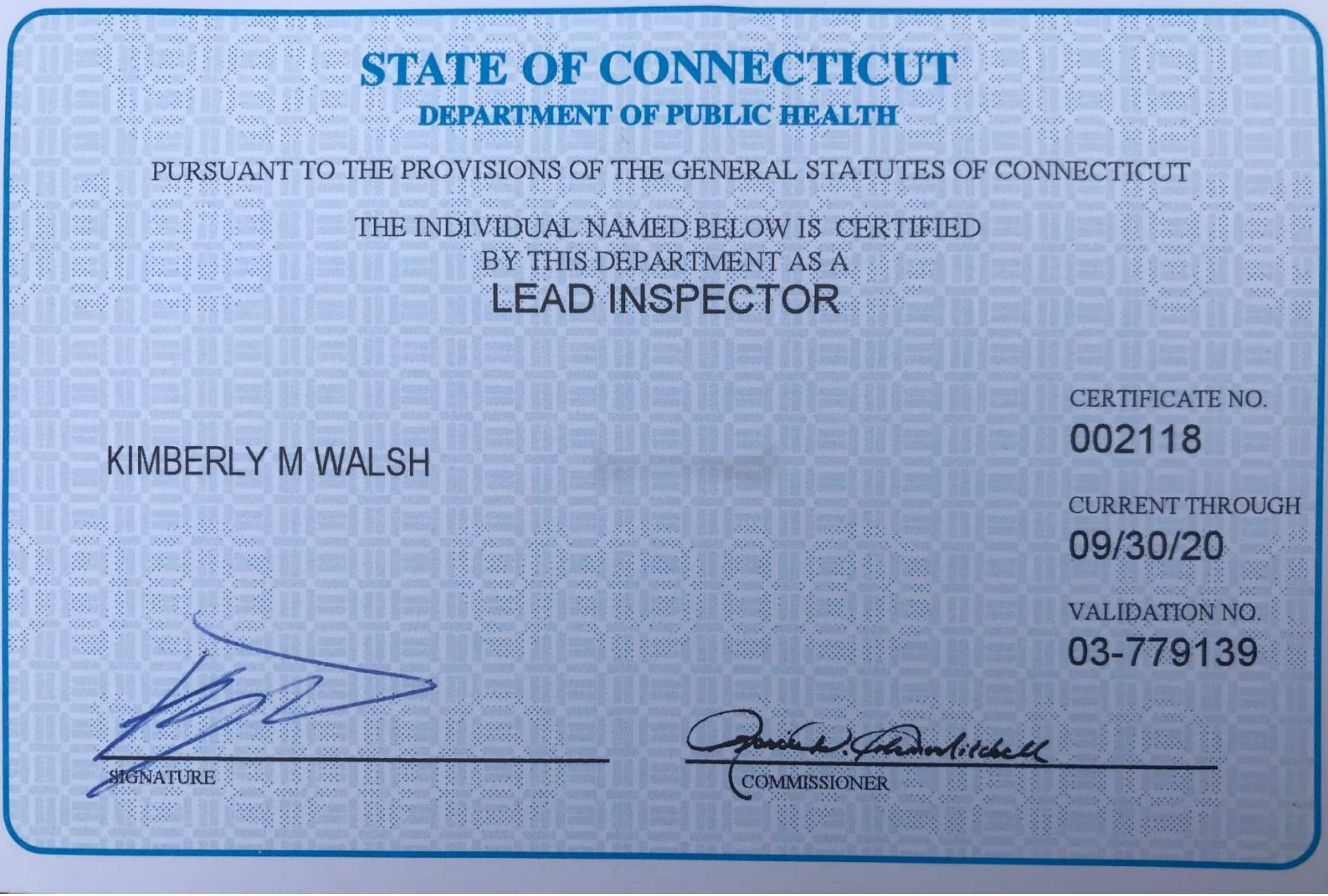
CERTIFICATE NO.
000580

CURRENT THROUGH
09/30/20

VALIDATION NO.
03-780013

SIGNATURE

Renée D. Coleman-Mitchell
COMMISSIONER



STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A

LEAD INSPECTOR

KIMBERLY M WALSH

CERTIFICATE NO.
002118

CURRENT THROUGH
09/30/20

VALIDATION NO.
03-779139

SIGNATURE

COMMISSIONER

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A

LEAD INSPECTOR

ALEXANDER K CLARKE

CERTIFICATE NO.
002217

CURRENT THROUGH
02/29/20

VALIDATION NO.
03-739440

SIGNATURE

COMMISSIONER

Notification Letter from WPCA, City of Bridgeport to US EPA and CTDEEP

WATER POLLUTION CONTROL AUTHORITY
for the City of Bridgeport
695 Seaview Avenue • Bridgeport, Connecticut 06607-1628
Telephone (203) 332-5550 • Fax (203) 576-7005

Lauren McBennett Mappa, P.E.
General Manager

August 13, 2020

Kimberly N. Tisa, Regional PCB Coordinator
United States Environmental Protection Agency
Region 1
5 Post Office Square, Suite 100
Mail Code: OSRR07-2
Boston, Massachusetts 02109-1527

RE: Identification of PCBs in Building Materials and Soil Samples
695 Seaview Avenue, Bridgeport, Connecticut 06607
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Dear Ms. Tisa:

On behalf of the City of Bridgeport Water Pollution Control Authority (WPCA), CDM Smith Inc. and Eolas Environmental, LLC have prepared this letter to provide you notification of the discovery of polychlorinated biphenyls (PCBs) in building materials and shallow soil at two City of Bridgeport owned wastewater treatment plants (WWTPs) located at 695 Seaview Avenue and 205 Bostwick Avenue in Bridgeport, Connecticut (herein, East Side Plant and West Side Plant, respectively). In anticipation of utilizing the EPA's *PCB Facility Approval Streamlining Toolbox (FAST), A Framework for Streamlining PCB Site Cleanup Approvals*, May 2017, we have prepared this letter to initiate communications with the EPA regarding the discovery of PCBs at the East Side Plant and West Side Plant, and ultimately, to facilitate an efficient, approved pathway to remediate PCBs at the WWTPs. The following presents a summary of the sites' histories, background and initial characterization sampling results, and anticipated path forward to address the discovery of PCBs in building materials at each WWTP.

History

The East Side Plant was developed circa 1950 with a filter bed, sludge building, pump house, incinerator, and screen building located on the central portion of the site. The East Side Plant was expanded circa 1970, with the addition of primary, aeration, and final treatment tanks, a control building, and a sludge thickener building. An administration building, garage and a degritter building were constructed circa 2000.

The West Side Plant was first developed with wastewater treatment facilities circa 1920, when a pump station building on the eastern portion of the site was constructed. By 1950, settling basins had been added west of the pump station building, and a control well and screen building were present on the site. Also, in the 1950's, a sludge building was constructed on the northern portion of the site and portions of the site that had been below water were completely filled. Circa 1970, it appears the remainder of the present-day buildings, structures and settling tanks had been constructed. A degritter building was constructed and some facilities were upgraded in the 1990's.

Both the East Side Plant and West Side Plant are located in urbanized areas of the City of Bridgeport and have been operated as municipal WWTPs for well over 70 years. All facilities and infrastructure at both WWTPs have lasted beyond their useful lives and require upgrades. It is the City's intent to complete upgrades at both the East Side Plant and West Side Plant and continue operation as municipal WWTPs. Attached to this letter as Attachment A are figures that depict the location and layout of each WWTP.

Background and Initial Characterization

The City of Bridgeport WPCA initiated a facility-wide evaluation of conditions at the East Side Plant and West Side Plant in early 2020 in anticipation of future facility renovation, demolition (scope to be determined), and WWTP upgrades. Part of the facility-wide evaluation entailed an initial, cursory sampling program that involved the collection and laboratory analysis of select building materials for the presence of PCBs, among other contaminants of concern. The outcome of the initial sampling program resulted in the identification of PCBs in four of five building samples collected from the East Side Plant, three of which were at concentrations below 50 milligrams per kilogram (mg/kg) and one of which was at a concentration of 2,000 mg/kg. There was also identification of PCBs in three of the five samples collected from the West Side Plant, two of which were at concentrations below 50 mg/kg and one of which was at a concentration of 9,300 mg/kg.

Based on the outcome of the initial sampling program, additional building materials (including substrate and shallow soil in the area of those samples in which PCBs were reported at concentrations greater than 50 mg/kg during the initial round of sampling) were sampled to further characterize the nature of PCB contamination in building materials and adjacent soil at the East Side Plant and West Side Plant. A total of 31 additional samples from the East Side Plant and 29 additional samples from the West Side Plant were collected and submitted for analysis for PCBs using EPA Method 8082, extracted using the Soxhlet Method 3540. Of the 31 samples collected and analyzed from the East Side Plant, 21 (including one shallow soil sample) contained PCBs at concentrations above laboratory detection limits, and concentrations in four of the samples were greater than 50 mg/kg. Of the 29 samples collected and analyzed from the West Side Plant, 24 contained PCBs at concentrations above laboratory detection limits, and concentrations in six of the samples were greater than 50 mg/kg. To assist you with an understanding of the above, attached to this letter are a site plan (Attachment A), sample location diagrams (Attachment B), and tabulated summary of data (Attachment C) for the East Side Plant and West Side Plant.

Schedule

The City of Bridgeport WPCA, working with its consultants, is conducting an evaluation of the various cleanup and disposal options detailed in 40 CFR 761, including the self-implementing (Notification) pathway specified in 40 CFR 761.61(a) and risk-based (Application) pathway specified in 40 CFR 761 (c). An integral part of this evaluation is finalizing the overall redevelopment and upgrade plan for each WWTP. This plan is currently underway. In the interim, we are requesting a charrette with the EPA (to which CT DEEP will also be invited) to discuss in greater detail the results of the characterization sampling completed to date, the anticipated facility upgrade plans, additional characterization requirements, the most appropriate cleanup and disposal option for the WWTPs, and the anticipated schedule.

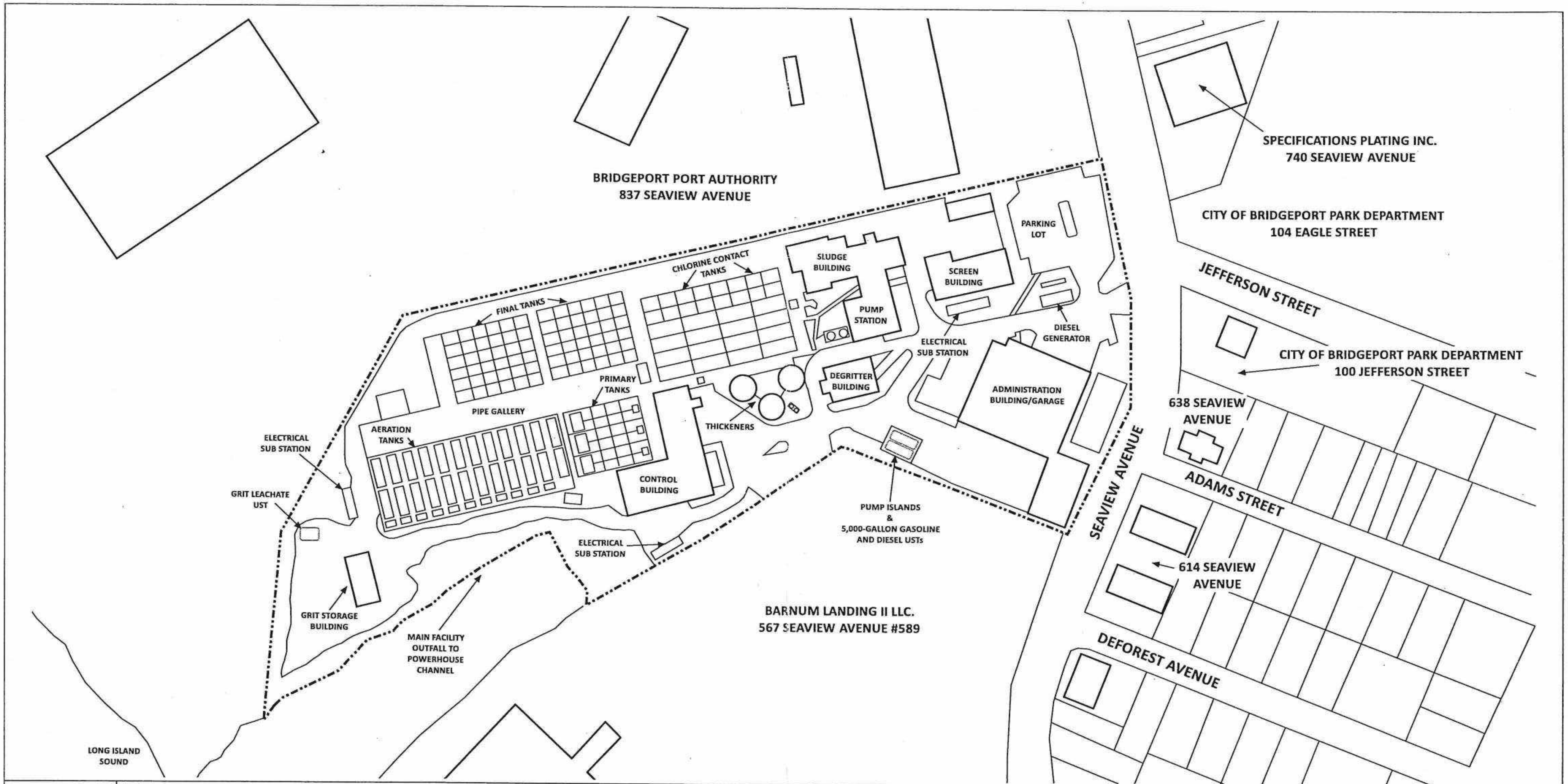
We look forward to the opportunity to meet with you and discuss the above project. Should you require additional information or have any questions in the interim, please contact Kimberly Walsh via email at kimberly@eolasenv.com or by telephone at (860) 990-1827 and Dan Murphy via email at murphydr@cdmsmith.com or by telephone at (860) 808-2265.

Lauren M. Mappa PE
General Manager
WPCA City of Bridgeport

Attachments:

A – East Side Plant Documents – Site Plan, Sample Location Diagrams, Data Summary Table
B – West Side Plant Documents – Site Plan, Sample Location Diagrams, Data Summary Table

CC: Gary Trombly Jr. – Connecticut Department of Energy and Environmental Protection
Amber Trahan – Connecticut Department of Energy and Environmental Protection
Joe Laliberte, Dan Murphy, Craig Wagner – CDM Smith Inc.
Kimberly Walsh – Eolas Environmental, LLC



N

LEGEND:

-··-··- SITE PROPERTY LINE

▭ UNDERGROUND STORAGE TANK

PROJECT:	PCB Characterization
SITE LOCATION:	601 (695) Seaview Avenue, Bridgeport, Connecticut
SOURCE:	City of Bridgeport GIS
SCALE:	NOT TO SCALE

eolas environmental LLC

FIGURE 1
SITE PLAN

Table 1
Summary of PCB Analytical Results
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

Sample ID	Sample Date	Building	Location/Room	Material Description	Result (mg/kg)	Type
CB-EXT-CA001	2/25/20	Control Building	Control Building Exterior Wall	Gray, Expansion Joint Caulk, 25 LF	2,000 [1]	1254
PG-PA001-PCB	2/25/20	Pipe Gallery	Pipe Gallery Wall	Tan/Mustard/Gray Layered Wall Paint	1.5	1248
SL-301-WG001	2/21/20	Sludge Building	Stairwell Window, Room 301	Green-Painted, Deteriorated Gray, Window Glaze	9.1	1248
SB-EXT-CA001	2/25/20	Screen Building	Exterior Windows/Doors	Tan-Cream Window/Door Caulk	ND <0.8	NA
PT-EXT-CA001	2/25/20	Primary Tank Building	Expansion Joint Caulk on Building	Tan Expansion Joint Caulk, 50 LF	1	1254
CB-EXT-CA002	6/25/20	Control Building	Exterior, Main Entrance	White Door Caulk	3.6	1254
CB-EXT-CA003	6/25/20	Control Building	Exterior, East Side, Doorway	White Door Caulk	240	1254
CB-EXT-CA004	6/25/20	Control Building	Exterior, Concrete Panel	White Seam Caulk	0.77	1254
CB-EXT-CC001	6/25/20	Control Building	Exterior, Concrete Panel	Concrete Under White Seam Caulk (CB-EXT-CA004)	ND	NA
CB-EXT-CA005	6/25/20	Control Building	Exterior, Southeastern Corner Joint	White Expansion Joint Caulk	ND	NA
CB-EXT-CC002	6/25/20	Control Building	Exterior, Southeastern Corner Joint	Concrete Under White Expansion Joint Caulk (CB-EXT-CA005)	ND	NA
CB-EXT-CA006	6/25/20	Control Building	Exterior, Southern Side, Horizontal Seam	White Expansion Joint Caulk	ND	NA
CB-EXT-CC003	6/25/20	Control Building	Exterior, Southern Side, Horizontal Seam	Concrete Under White Expansion Joint Caulk (CB-EXT-CA006)	ND	NA
CB-EXT-CA007	6/25/20	Control Building	Exterior, Southern Side, Doorway	White Door Caulk	0.78	NA

Table 1
Summary of PCB Analytical Results
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

CB-EXT-CC004	6/25/20	Control Building	Exterior, Northern Side, Doorway	Concrete Under Gray Expansion Joint Caulk (CB-EXT-CA001)	ND	NA
CB-EXT-CA008	6/25/20	Control Building	Exterior, Northern Side, Between OH Doors	Gray Building Joint Caulk	14,000 [2]	1254
CB-EXT-CC005	6/25/20	Control Building	Exterior, Northern Side, Between OH Doors	Concrete Under Gray Building Joint Caulk (CB-EXT-CA008)	390 [2]	1254
CB-EXT-SS001	6/25/20	Control Building	Exterior, Northern Side, Grass Area	Shallow Soil Sample (2-6")	1.7	1254
CB-EXT-SS002	6/25/20	Control Building	Exterior, Eastern Side, Grass Area	Shallow Soil Sample (2-6")	ND	NA
CB-3-PA001	6/25/20	Control Building	Walls, 3	Slate Blue Over Teal Paint	14 [2]	1254
CB-2-PA002	6/25/20	Control Building	Walls, 2	Tan Over Blue Paint	6.7 [2]	1254
PG-PA003	6/25/20	Pipe Gallery	Walls	Tan Wall Paint	ND	NA
PG-EJ001	6/25/20	Pipe Gallery	Floors	Black Expansion Joint Membrane	17 [2]	1254
GT-EXT-CA001	6/25/20	Gravity Thickeners	Exterior, Window Between Tanks 2 and 3	White Caulk	47	1254
GT-EXT-CA002	6/25/20	Gravity Thickeners	Exterior, Window Between Tanks 1 and 3	White Caulk	0.83	1254
DB-101-CA001	6/25/20	Degritter Building	Floor/Wall Joint, 101	Black Sealant	ND	NA
DB-102-CA002	6/25/20	Degritter Building	Glass Block Window, 102	White Caulk	0.42	1254
PS-103-CA001	6/25/20	Pump Station	Access Door, 103	Gray Caulk	6.6 [2]	1254
PS-100-PA001	6/25/20	Pump Station	Walls	Green Wall Paint	2.2	1248
PS-104-CA002	6/25/20	Pump Station	Vestibule Doors	Gray Caulk	5.2	1248
SL-115-WG001	6/25/20	Sludge Building	Interior Window Glaze, 115	Green Painted Gray Glaze	4.7 [2]	1254

Table 1
Summary of PCB Analytical Results
East Wastewater Treatment Plant
695 Seaview Avenue, Bridgeport, Connecticut 06607

SL-EXT-WG002	6/25/20	Sludge Building	Exterior Window, Exterior of 115	Green Painted Gray Glaze	28,000	1254
SL-EXT-FL001	6/25/20	Sludge Building	Exterior Window, Exterior of 115	Black Window Flashing	8.5 [2]	1254
SL-EXT-CA001	6/25/20	Sludge Building	Exterior, Southern Side, Doorway	Dark Brown Caulk	ND	NA
SL-EXT-BR001	6/25/20	Sludge Building	Exterior, Southern Side, Doorway	Red Brick Under Dark Brown Caulk (SL-EXT-CA001)	6.4	1254
SB-MCC-CA002	6/25/20	Screen Building	Glass Block Window, MCC Room	White Caulk	0.68	1254

Notes:

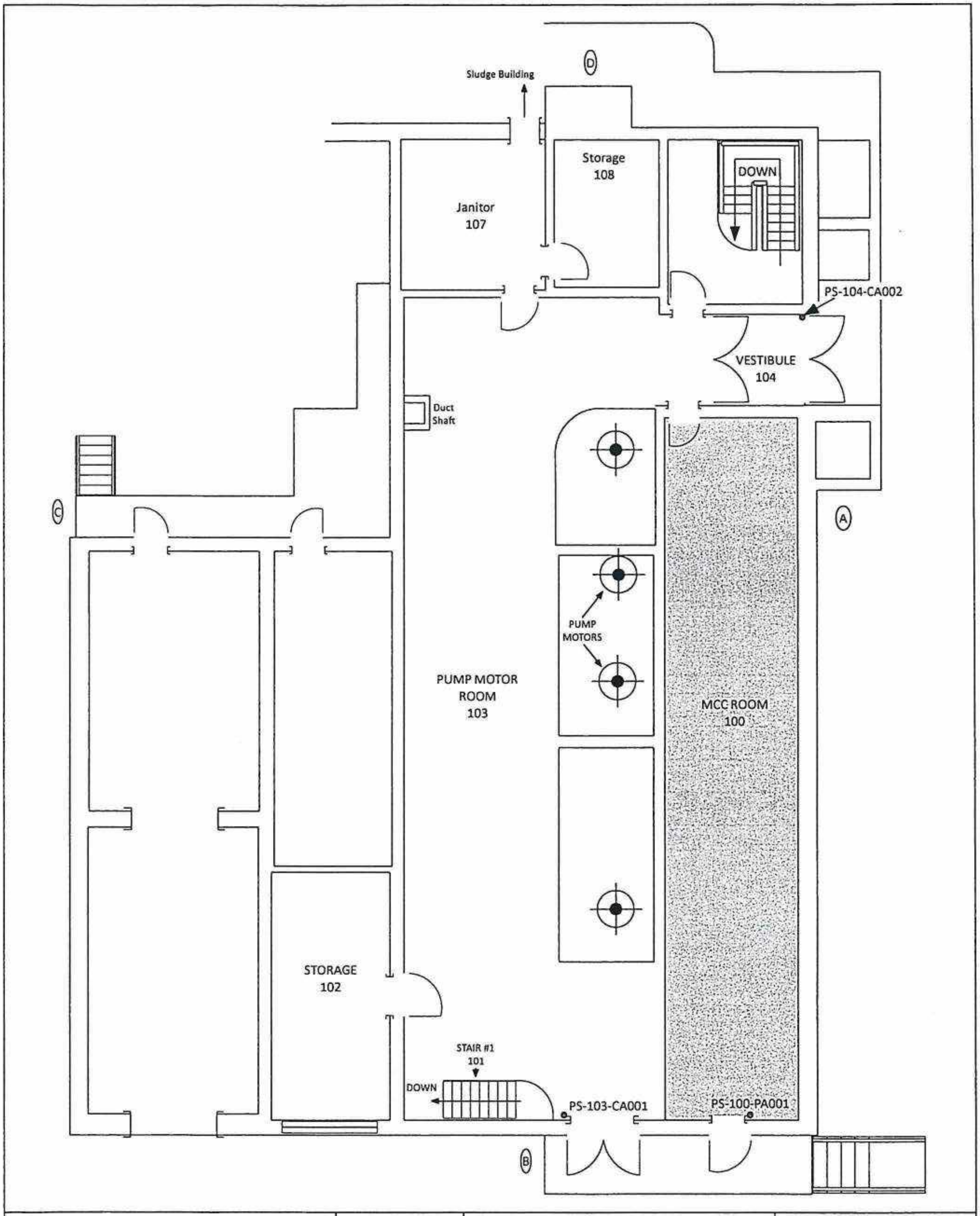
Analysis of building materials was completed using EPA Method 8082 following extraction using the Soxhlet Method 3450.

mg/kg	milligrams per kilogram
ND	Not Detected above Laboratory Reporting Limit
NA	Not Applicable

PCB-containing building materials are considered PCB bulk product waste if the concentration of PCBs is equal to or greater than 50 mg/kg and is regulated under 40 CFR 761.62 of TSCA.

[1] Due to maxtrix interferences, dilution of this sample was required, resulting in a laboratory reporting limit of 400 mg/kg

[2] For PCBs, as per section 11.9.3 of SW846 method 8082, when multiple Aroclor's of PCBs are present and the aroclor is no longer recognizable, quantitation may be performed by comparing the total area of the PCB pattern to that of the aroclor it mostly resembles. The PCB pattern did not resemble any of the standards, but most closely resembles a mixture of the Aroclors 1254 and 1260. The PCB is quantitated as a timed group and is reported as the Aroclor 1254.



LEGEND

● PCB Sample

▨ MCC Access Floor

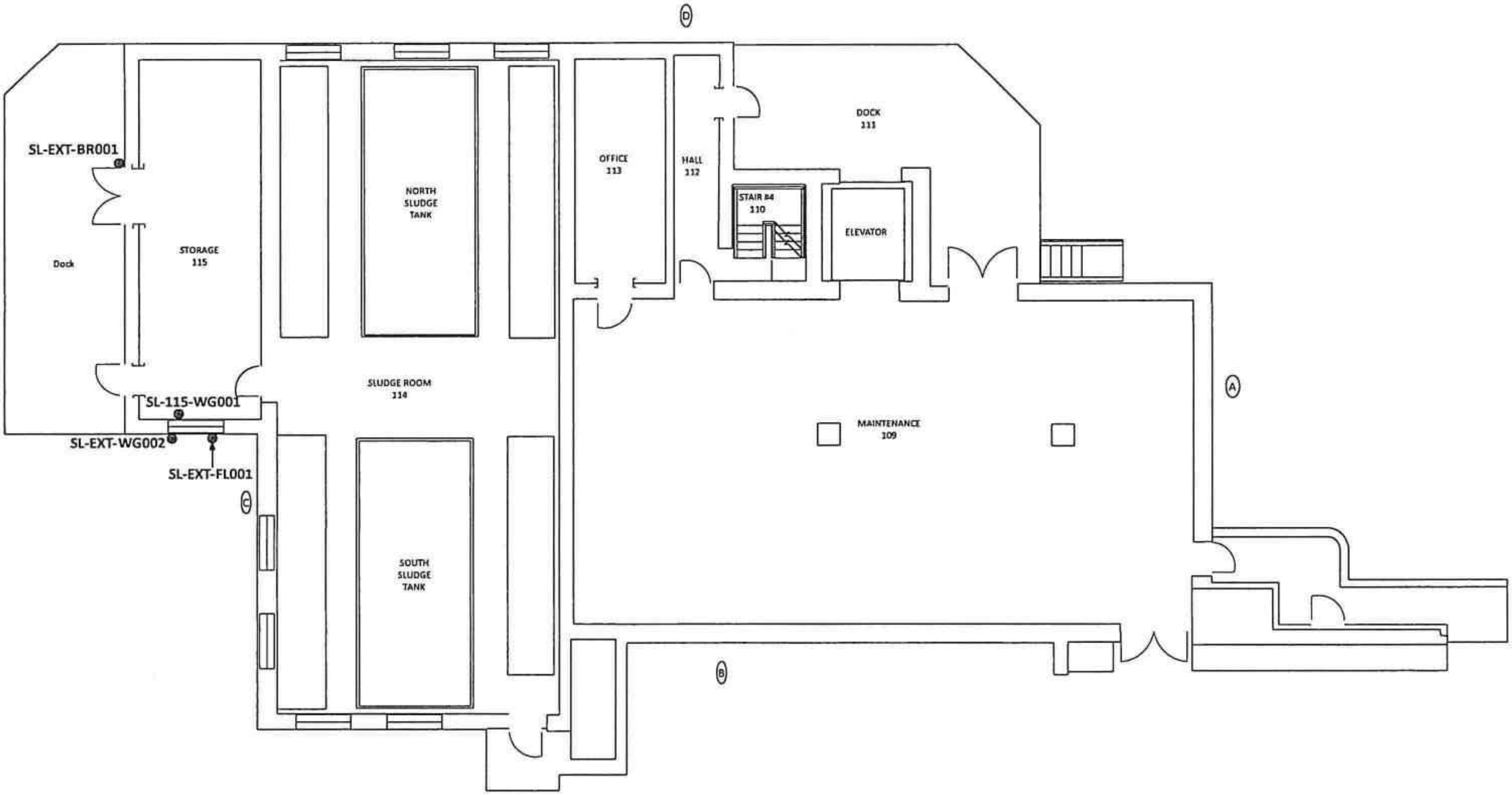
▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

PUMP STATION
EL. 25.50'



LEGEND:

- ● PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

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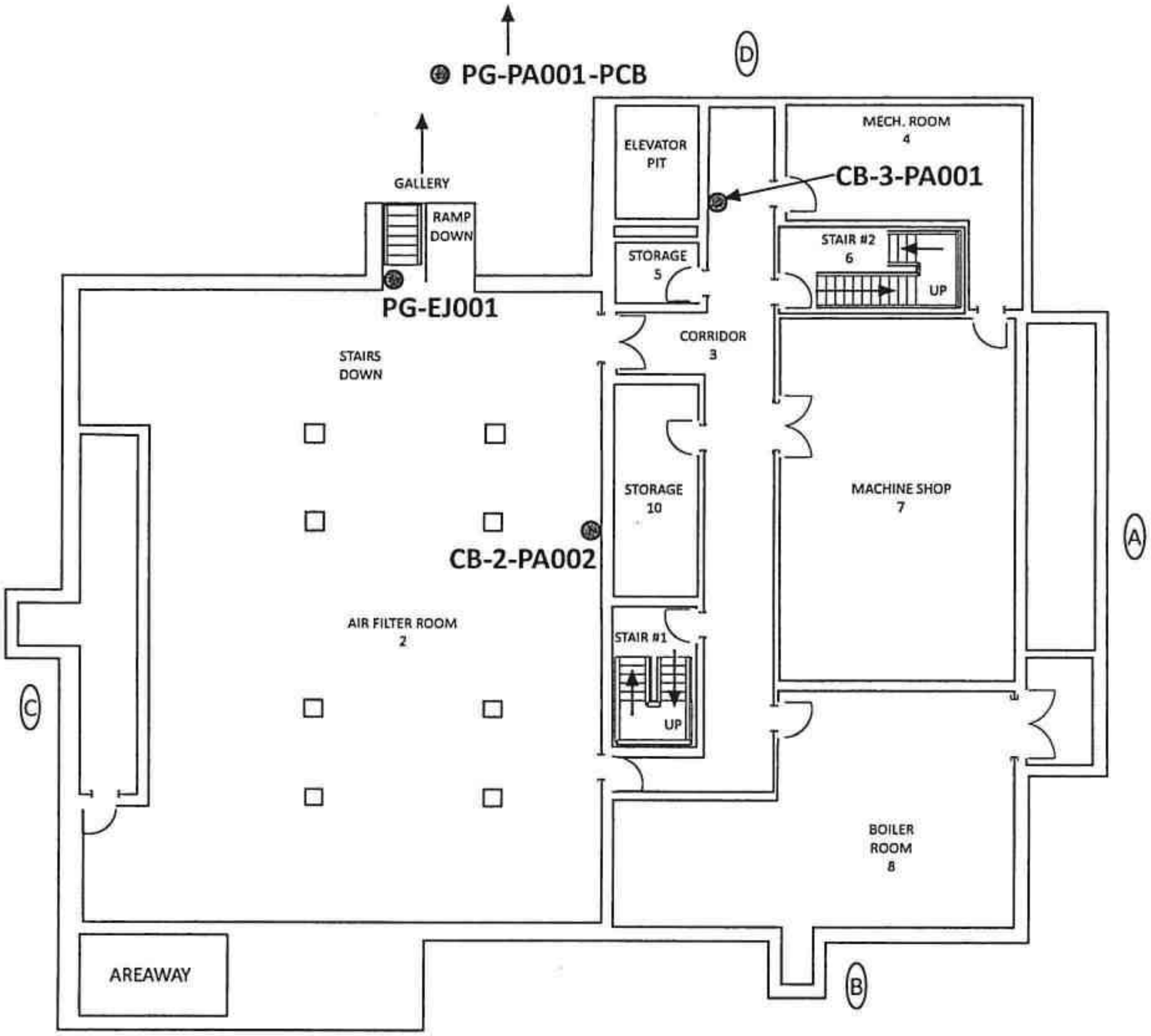
environmental LLC

SLUDGE BUILDING
EL. 25.50'



LEGEND:

● PCB Sample

▨ MCC Access Floor

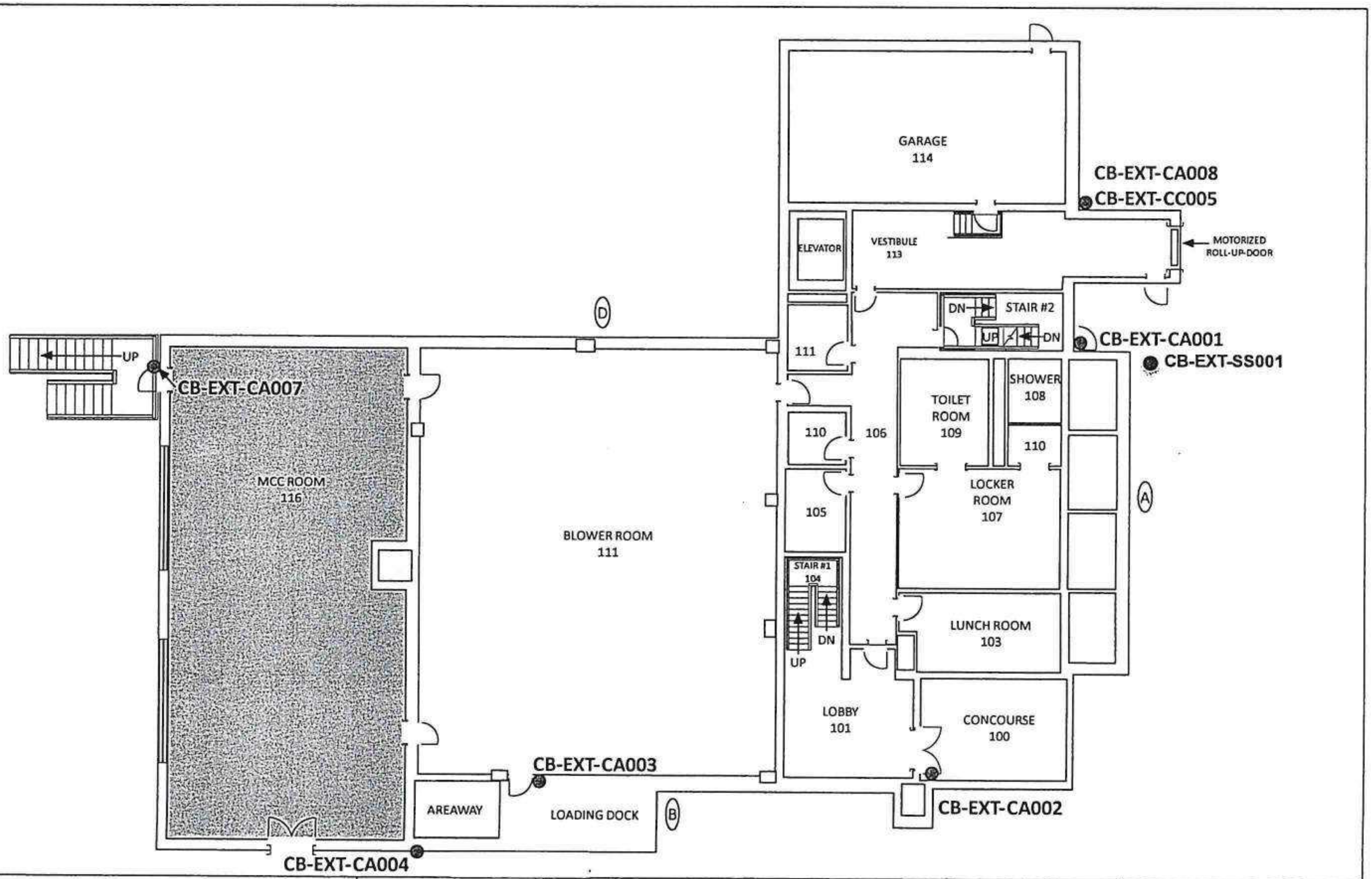
▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental llc

CONTROL BUILDING
EL. 13.00'



LEGEND:

● PCB Sample

▨ MCC Access Floor

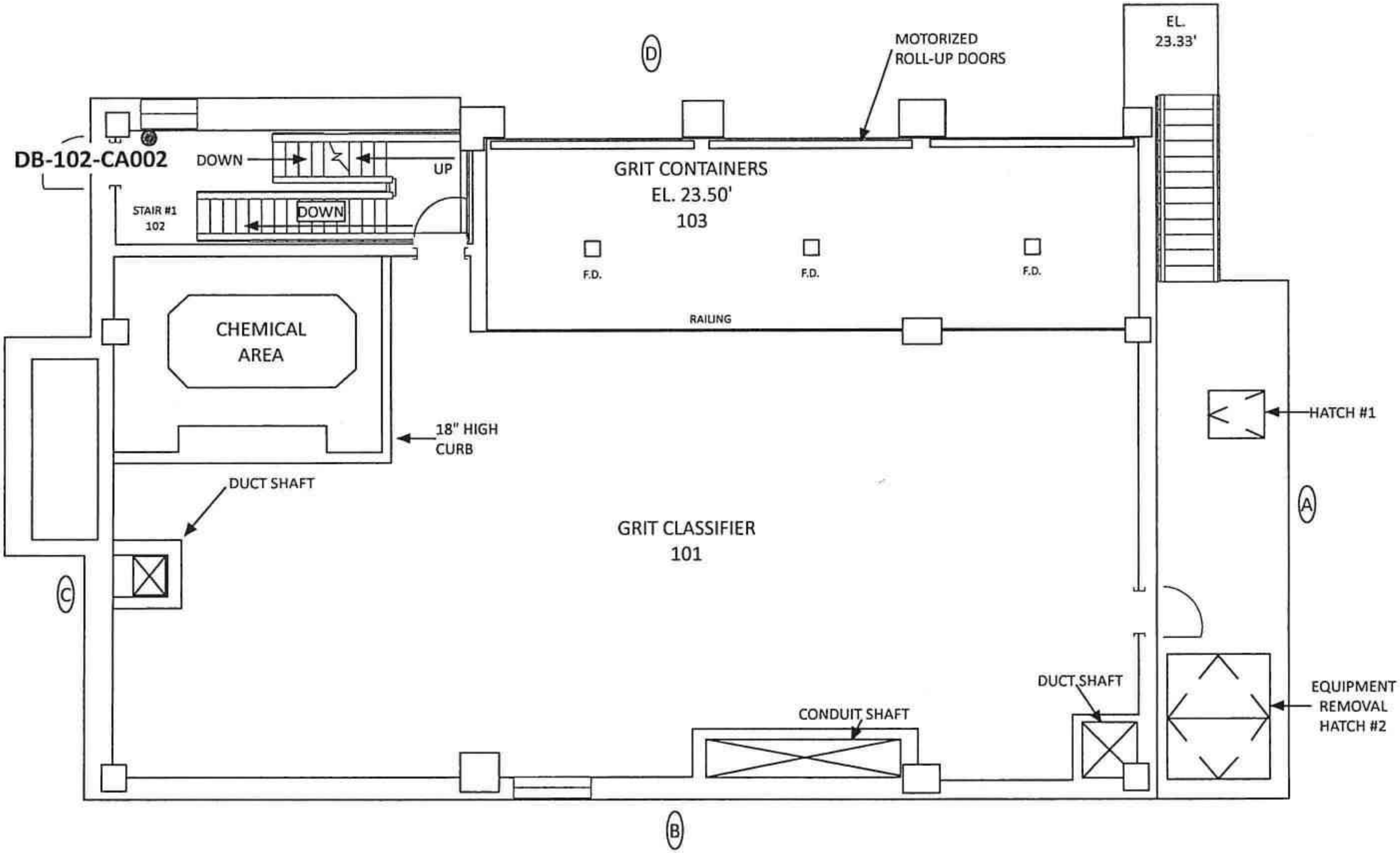
▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

CONTROL BUILDING
EL. 26.00'



LEGEND:

● PCB Sample

▨ MCC Access Floor

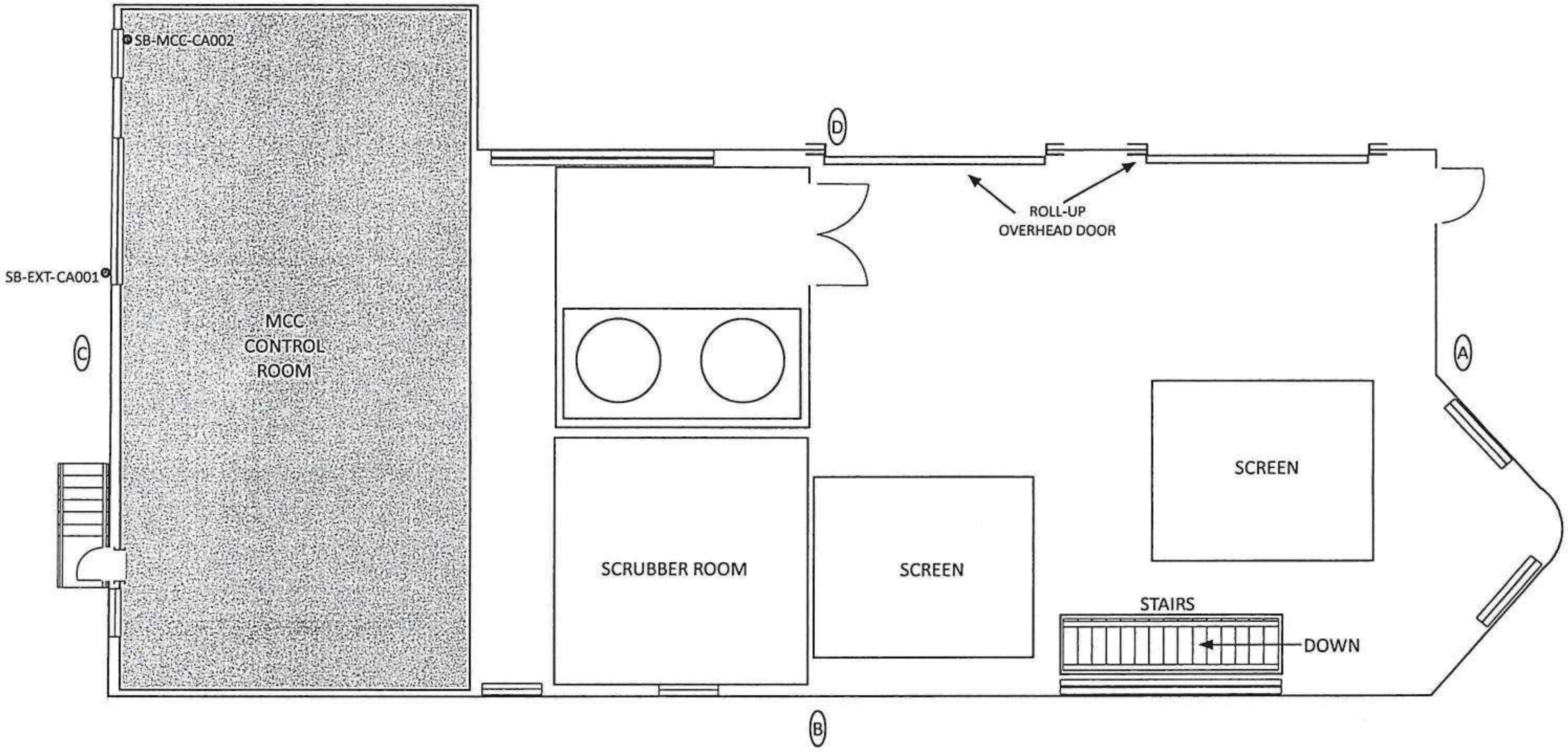
▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental LLC

DEGRITTER BUILDING
EL. 31.50'



LEGEND:

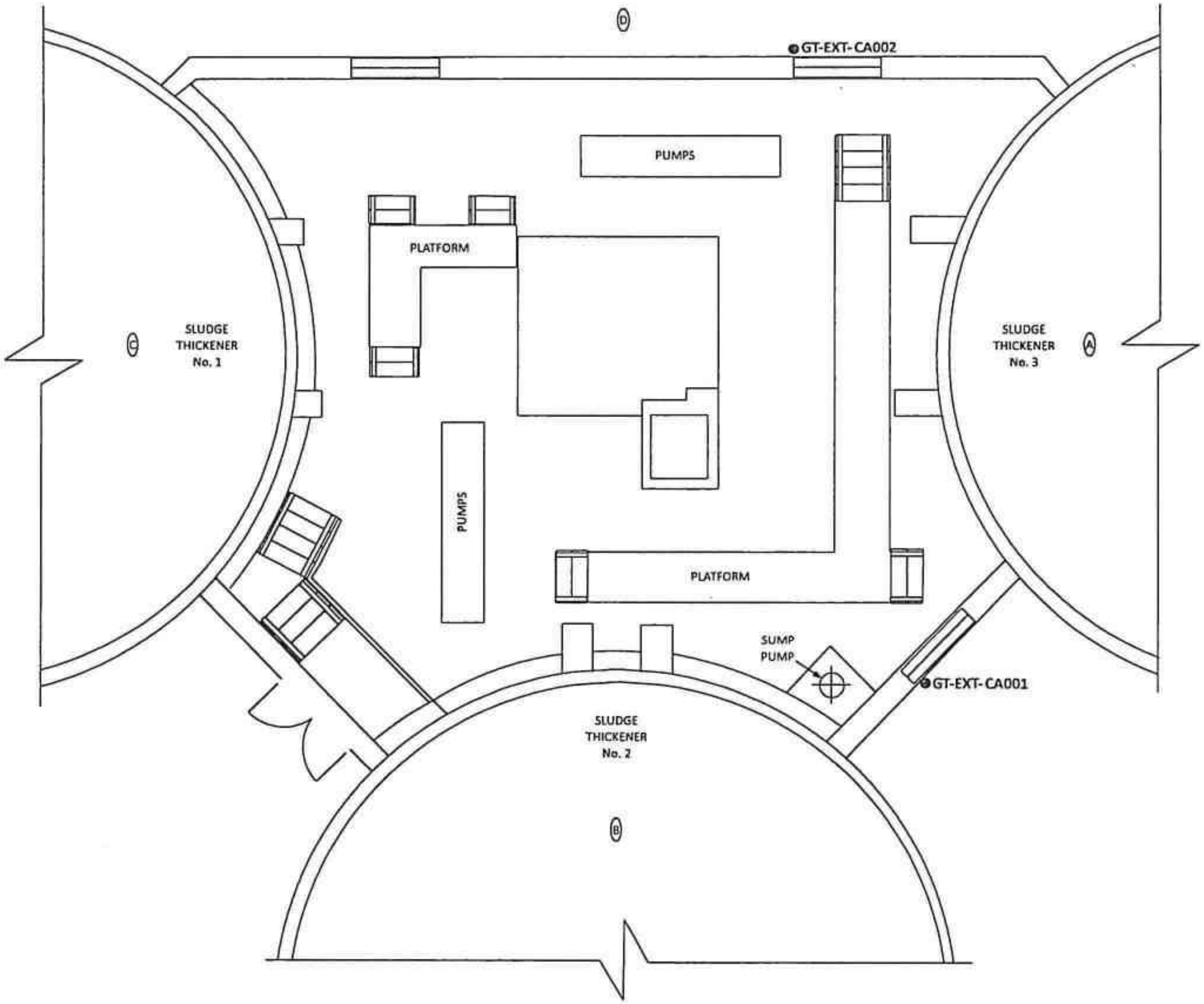
- ● PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	695 Seaview Avenue, Bridgeport, CT
SOURCE:	Hazen and Sawyer, NY, 1995
SCALE:	NTS

eolas environmental llc

SCREEN BUILDING GROUND FLOOR



LEGEND:

- ● PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT: PCB Characterization

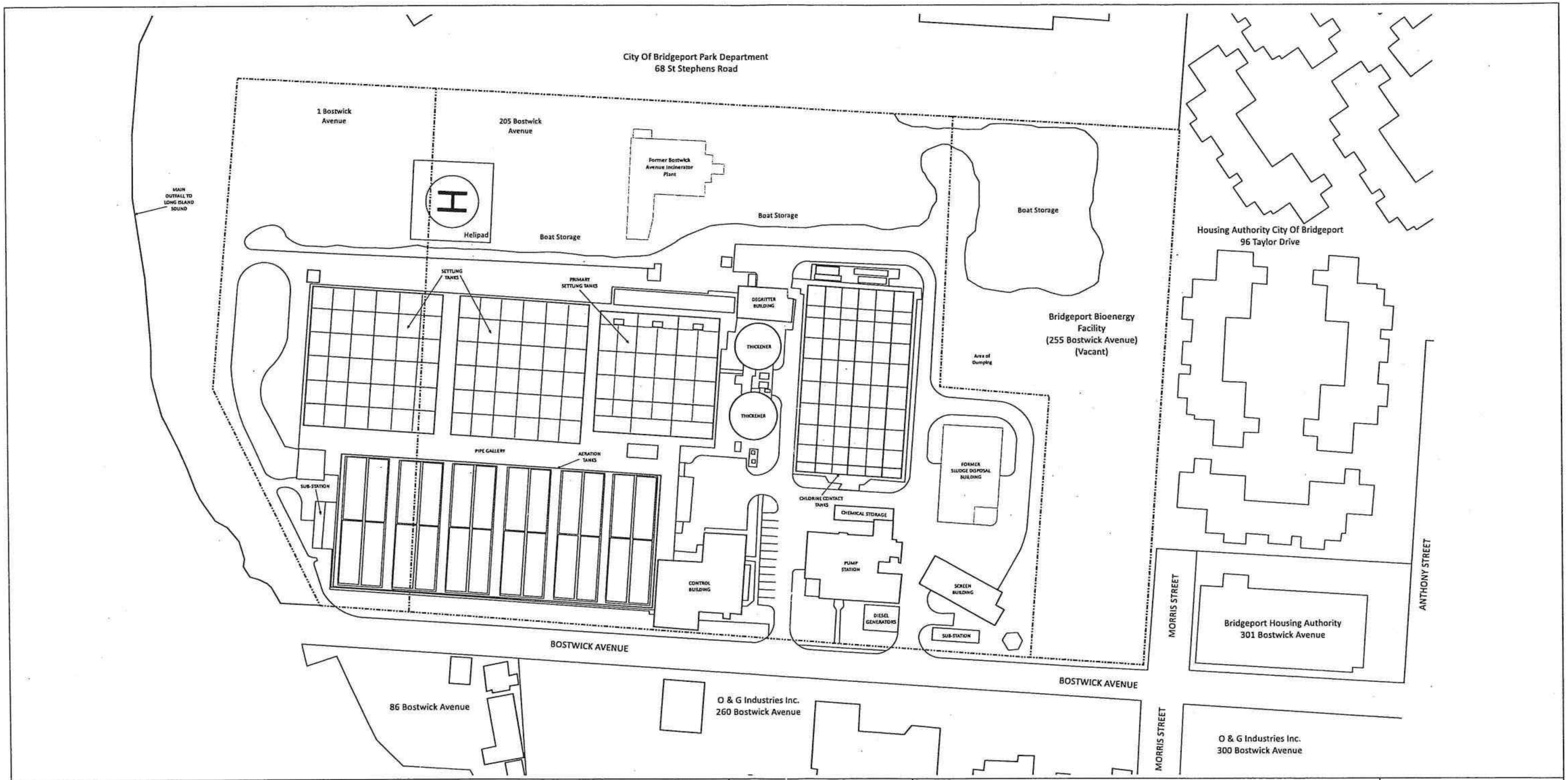
LOCATION: 695 Seaview Avenue, Bridgeport, CT

SOURCE: Hazen and Sawyer, NY, 1995

SCALE: NTS

eolas environmental LLC

SLUDGE THICKENER
EL. 24.00'



N

LEGEND:

-·-·-·-·-·-· PARCEL BOUNDARY

-··-··-··-··- SITE BOUNDARY

PROJECT:	PCB Characterization
SITE LOCATION:	205 Bostwick Avenue, Bridgeport, Connecticut 06605
SOURCE:	City of Bridgeport GIS
SCALE:	NOT TO SCALE

eolas environmental llc

FIGURE 1
SITE PLAN

eolas
environmental LLC

Table 1
Summary of PCB Analytical Results
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

Sample ID	Sample Date	Building	Location/Room	Material Description	Result (mg/kg)	Type
RSPCB-001	2/18/20	Control Building	Return Sludge Pump Control Building	Light Green Wall Paint	2.7	1254
PS-104-PCB	2/19/20	Pump Station	Foyer Wall	Light Blue Wall Paint	9,300 [1]	1260
PS-EXT-PCB	2/19/20	Pump Station	Foyer Exterior	Tan-Gray Door Caulk	ND <0.77	NA
SB-108-CA002	2/19/20	Screen Building	108, Exterior Door	Tan Door Caulk	ND <0.78	NA
SB-102-PCB	2/19/20	Screen Building	102, Window	Tan Caulk, Paint	3.2	1254
PS-102-PA001	6/25/20	Pump Station	Upper Walls, 102	Light Green Wall Paint	76 [2]	1254
PS-102-CC001	6/25/20	Pump Station	Upper Walls, 102	Concrete Under Light Green Wall Paint (PS-102-PA001)	5,500 [2]	1254
PS-104-CC001	6/25/20	Pump Station	Lower Outer Wall, Foyer, 104	Concrete Under Light Blue Wall Paint (Sample PS-104-PCB)	5.6 [2]	1254
PS-105-PA001	6/25/20	Pump Station	Lower Outer Wall, 105	Blue Paint, Black Underside	20	1254
PS-105-CC001	6/25/20	Pump Station	Lower Outer Wall, 105	Concrete Under Blue Paint, Black Underside (PS-105-PA001)	ND	NA
PS-105-BR001	6/25/20	Pump Station	Lower Outer Wall, 105	Brick Under Blue Paint, Black Underside (PS-105-PA001)	ND	NA
PS-102-PA002	6/25/20	Pump Station	Lower Outer Walls, 102	Green Wall Paint	9,800	1260

Table 1
Summary of PCB Analytical Results
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

PS-102-CC002	6/25/20	Pump Station	Lower Outer Walls, 102	Concrete Under Green Wall Paint (PS-102-PA002)	170	1260
PS-102-SR001	6/25/20	Pump Station	Inner Wall, 102	Sheetrock Under Green Wall Paint (PS-102-PA002)	10	1254
PS-LL-PA001	6/25/20	Pump Station	Outer Foundation Wall, Lower Level	Green Wall Paint	12[2]	1254
PS-LL-CC001	6/25/20	Pump Station	Outer Foundation Wall, Lower Level	Concrete Under Green Wall Paint (PS-LL-PA001)	ND	NA
PS-EXT-CA002	6/25/20	Pump Station	Exterior, East Side, Glass Block Window	White Caulk	10	1254
PS-101-PA001	6/25/20	Pump Station	Walls, 101	Tan Paint	1.2	1254
CH-PA001	6/25/20	Chlorine Room	Outer Foundation Wall, North Side	Tan Paint	22[2]	1254
CH-BR001	6/25/20	Chlorine Room	Outer Foundation Wall, North Side	Red Brick Under Tan Paint (CH-PA001)	16[2]	1254
CB-EXT-CA001	6/25/20	Control Building	Exterior Doorway, North Side	Gray Caulk	50,000	1254
CB-EXT-CA002	6/25/20	Control Building	Exterior Joint, Northwest Side	White Caulk	7.7[2]	1254
CB-116-PA001	6/25/20	Control Building	Walls, 116	Green Wall Paint	14	1254
CB-116-SR002	6/25/20	Control Building	Walls, 116	Sheetrock Under Green Wall Paint (CB-116-SR001)	4.1	1254
CB-EXT-CA003	6/25/20	Control Building	Exterior Wall, Northwest Side	White Caulk	3,000	1254

Table 1
Summary of PCB Analytical Results
West Wastewater Treatment Plant
205 Bostwick Avenue, Bridgeport, Connecticut 06605

CB-SW2-PA001	6/25/20	Control Building	Stairwell #2, Wall	Gray Wall Paint	3.6[2]	1254
CB-2-PA001	6/25/20	Control Building	Column, Room 2	Yellow-Green Wall and Column Paint	17[2]	1254
CB-210-PA001	6/25/20	Control Building	Wall, 210	Yellow-Beige Wall Paint	ND	NA
PG-PA001	6/25/20	Pipe Gallery	Walls	Tan Paint	22[2]	1254
PG-PA002	6/25/20	Pipe Gallery	Walls	Green Paint Under Tan Paint (PG-PA001)	6[2]	1254
DB-102-PA001	6/25/20	Degritter Building	Walls, 102	Green Wall Paint	ND	NA
DB-102-CA001	6/25/20	Degritter Building	Glass Block Window	White Caulk	2.4	1254
DB-EXT-EJ001	6/25/20	Degritter Building	Exterior Expansion Joint	White Expansion Joint Caulk	1.4	1254
SB-LL-PA001	6/25/20	Screen Building	Stairwell, Lower Level	Tan Wall Paint	1.6	1254

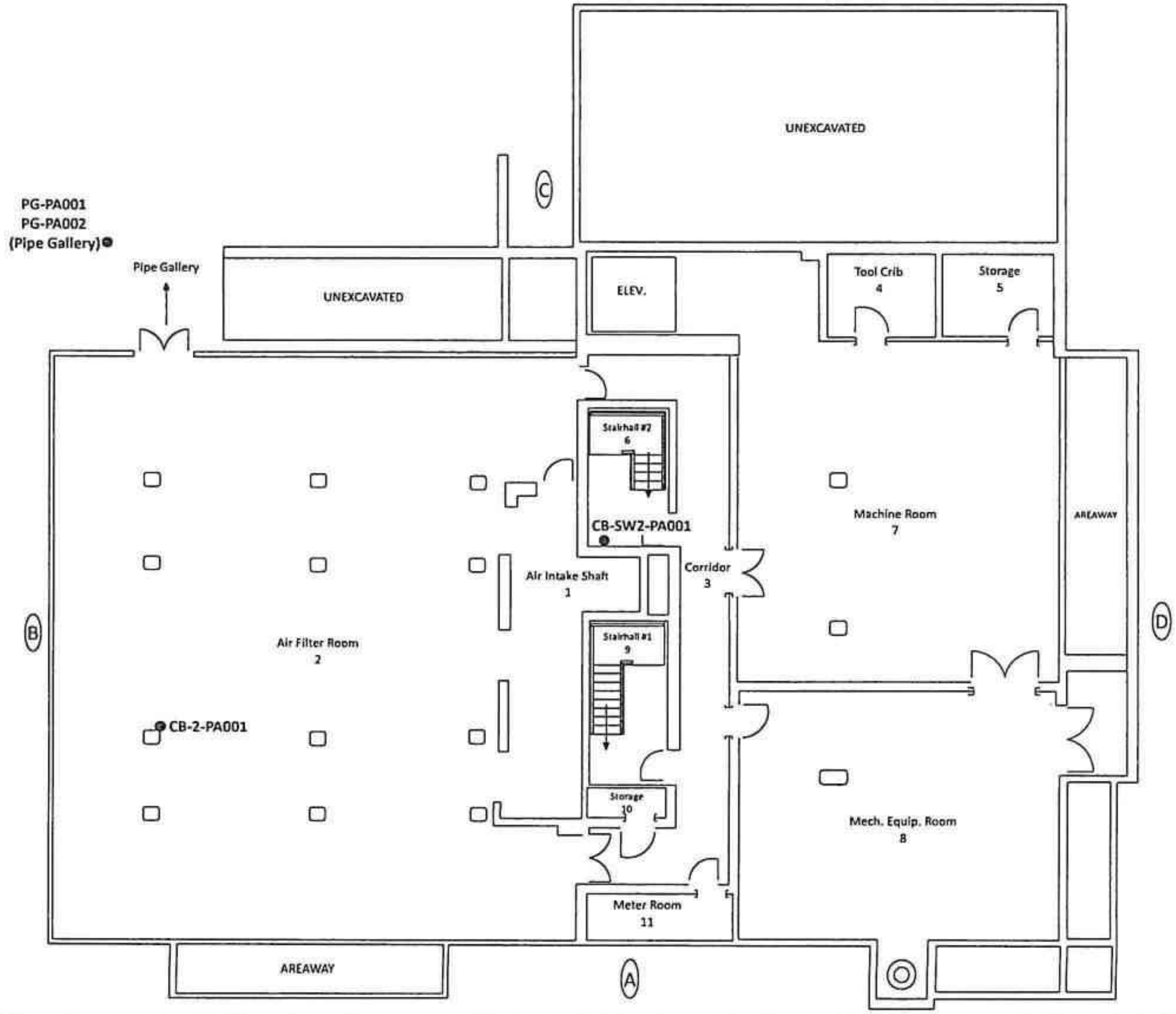
Notes:

Analysis of building materials was completed using EPA Method 8082 following extraction using the Soxhlet Method 3450.

mg/kg	milligrams per kilogram
ND	Not Detected above Laboratory Reporting Limit
NA	Not Applicable

[1] Due to maxtrix interferences, dilution of this sample was required, resulting in a laboratory reporting limit of 400 mg/kg

[2] For PCBs, as per section 11.9.3 of SW846 method 8082, when multiple Aroclor's of PCBs are present and the aroclor is no longer recognizable, quantitation may be performed by comparing the total area of the PCB pattern to that of the aroclor it mostly resembles. The PCB pattern did not resemble any of the standards, but most closely resembles a mixture of the Aroclors 1254 and 1260. The PCB is quantitated as a timed group and is reported as the Aroclor 1254.



LEGEND:

● PCB Sample

▨ MCC Access Floor

▭ Window

N

PROJECT: PCB Characterization

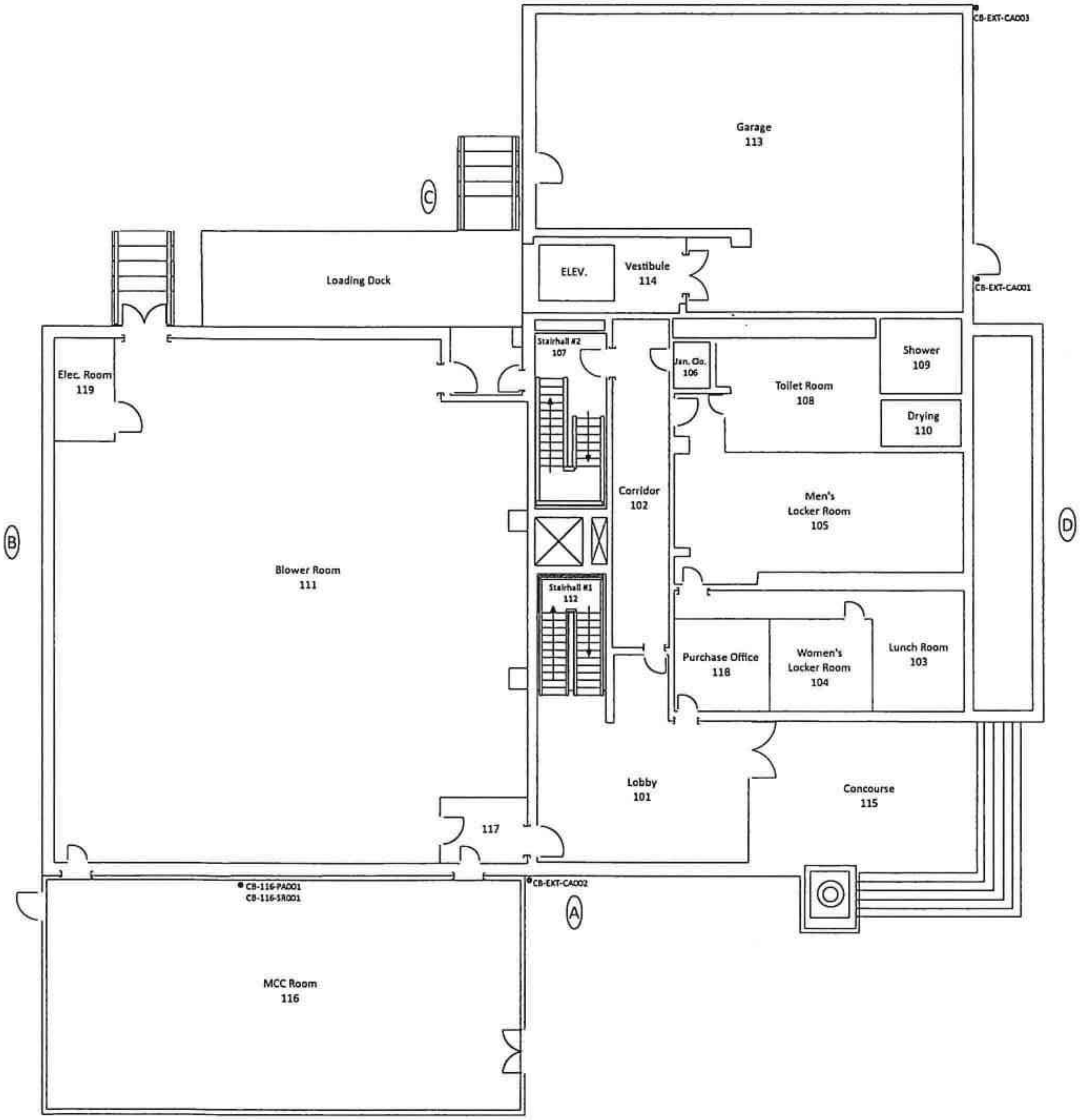
LOCATION: 205 Bostwick Avenue, Bridgeport, CT

SOURCE: Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992

SCALE: NTS

eolas environmental LLC

CONTROL BUILDING BASEMENT



LEGEND

● PCB Sample

▨ MCC Access Floor

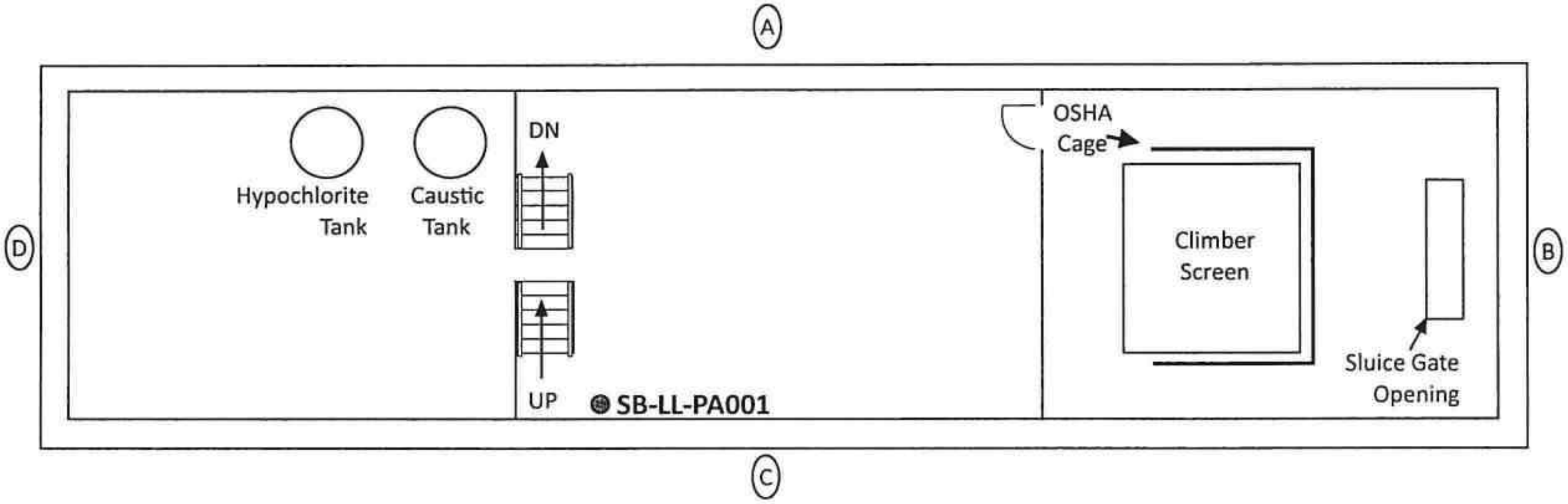
▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

CONTROL BUILDING FIRST FLOOR



LEGEND

● PCB Sample

▨ MCC Access Floor

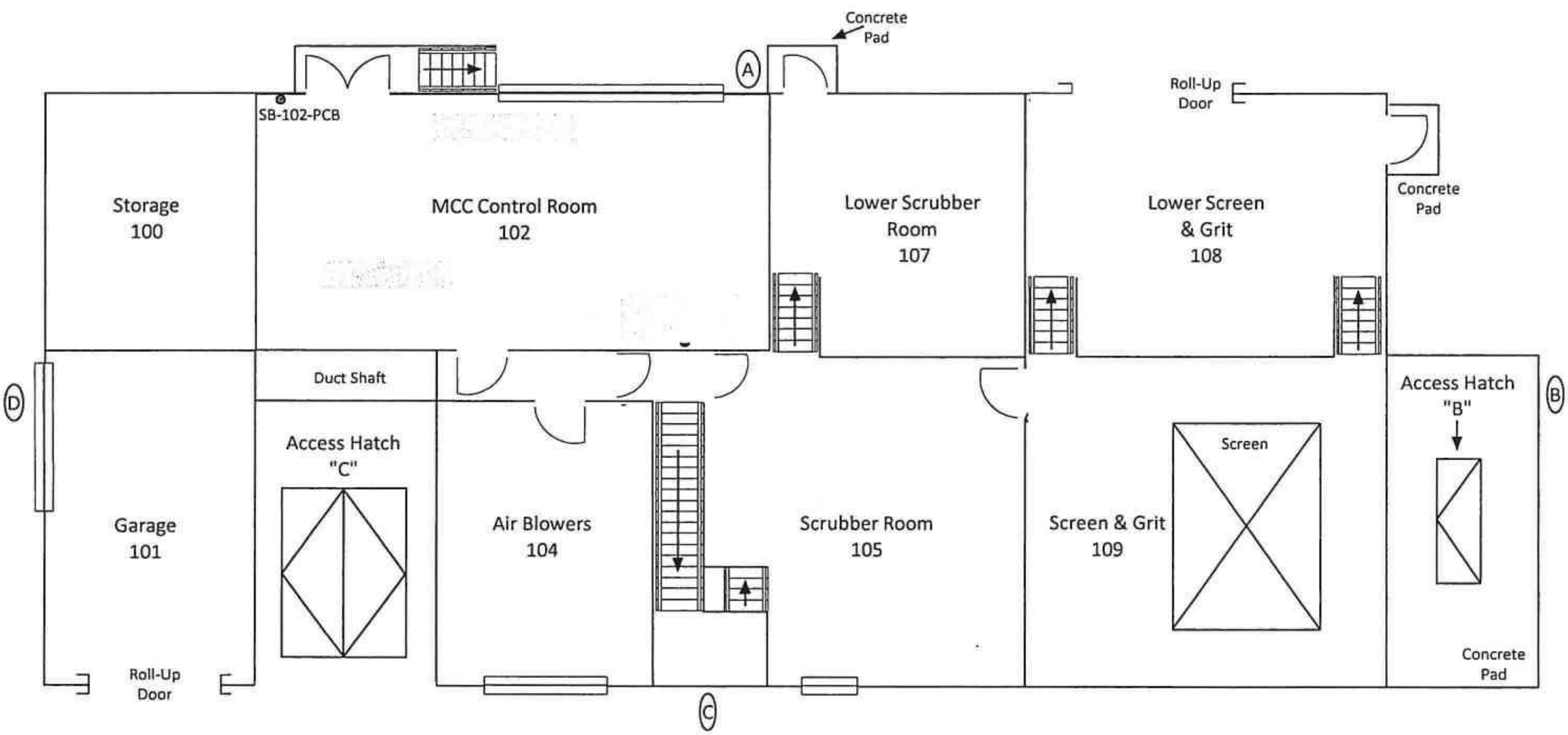
▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

SCREEN BUILDING
EL. 27.00'



LEGEND

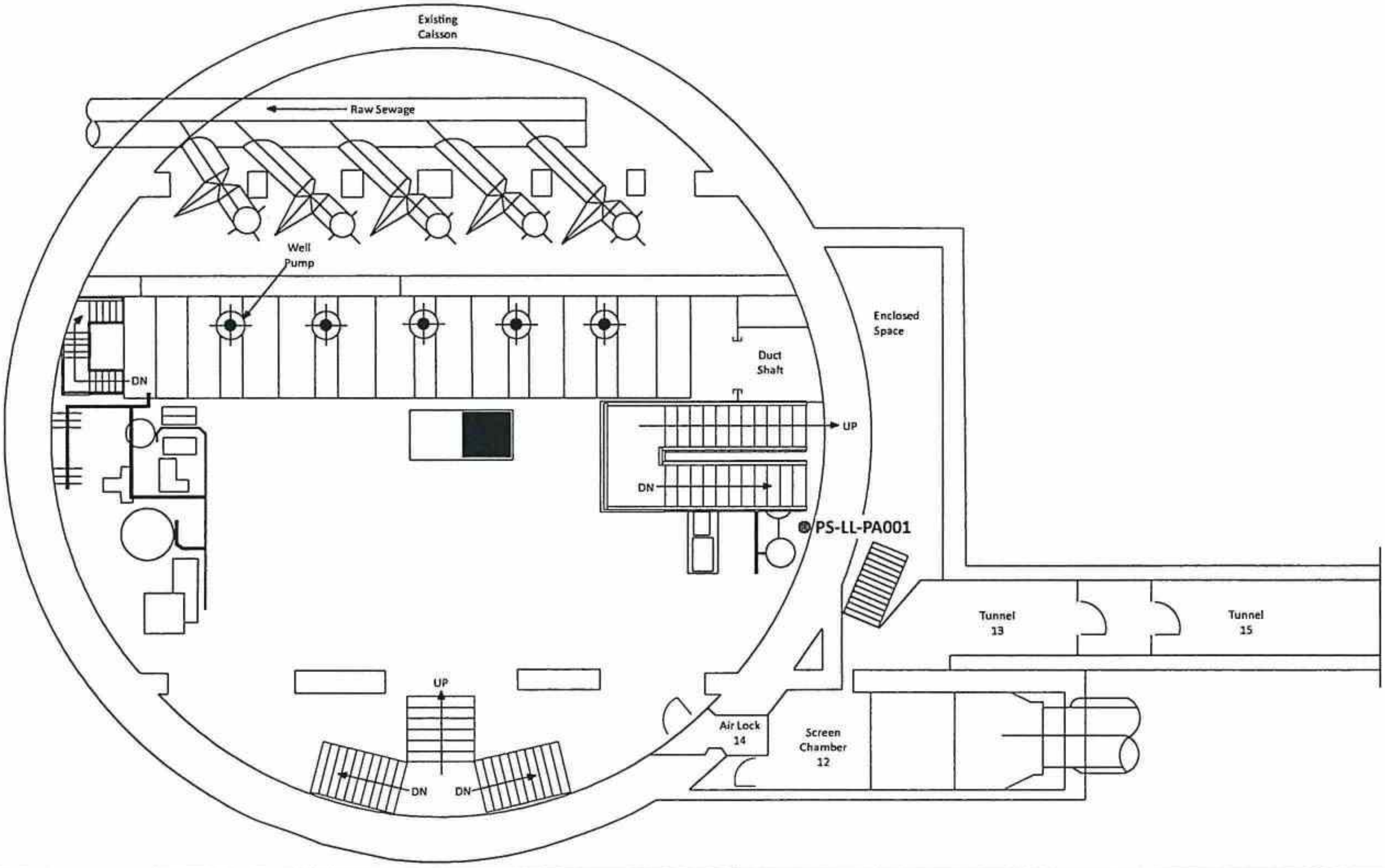
- ● Asbestos Positive
- ● Asbestos Non-Detect
- ○ Lead Positive
- ● PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	Hazardous Building Materials Survey
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

SCREEN BUILDING
EL. 38.00'



LEGEND:

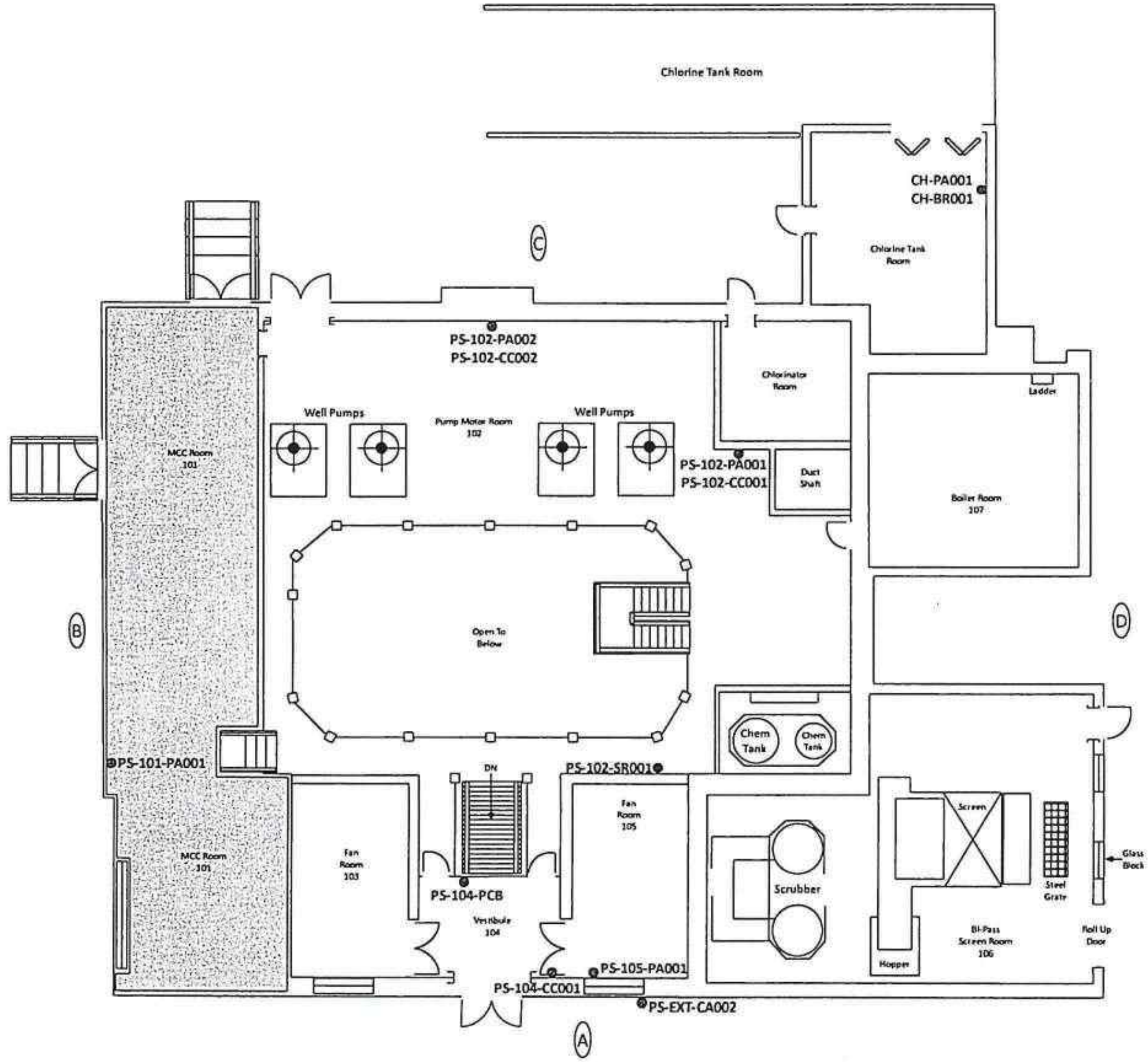
- ● PCB Sample
- ▨ MCC Access Floor
- ▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

PUMP STATION
EL. 10.50'



LEGEND

● PCB Sample

▨ MCC Access Floor

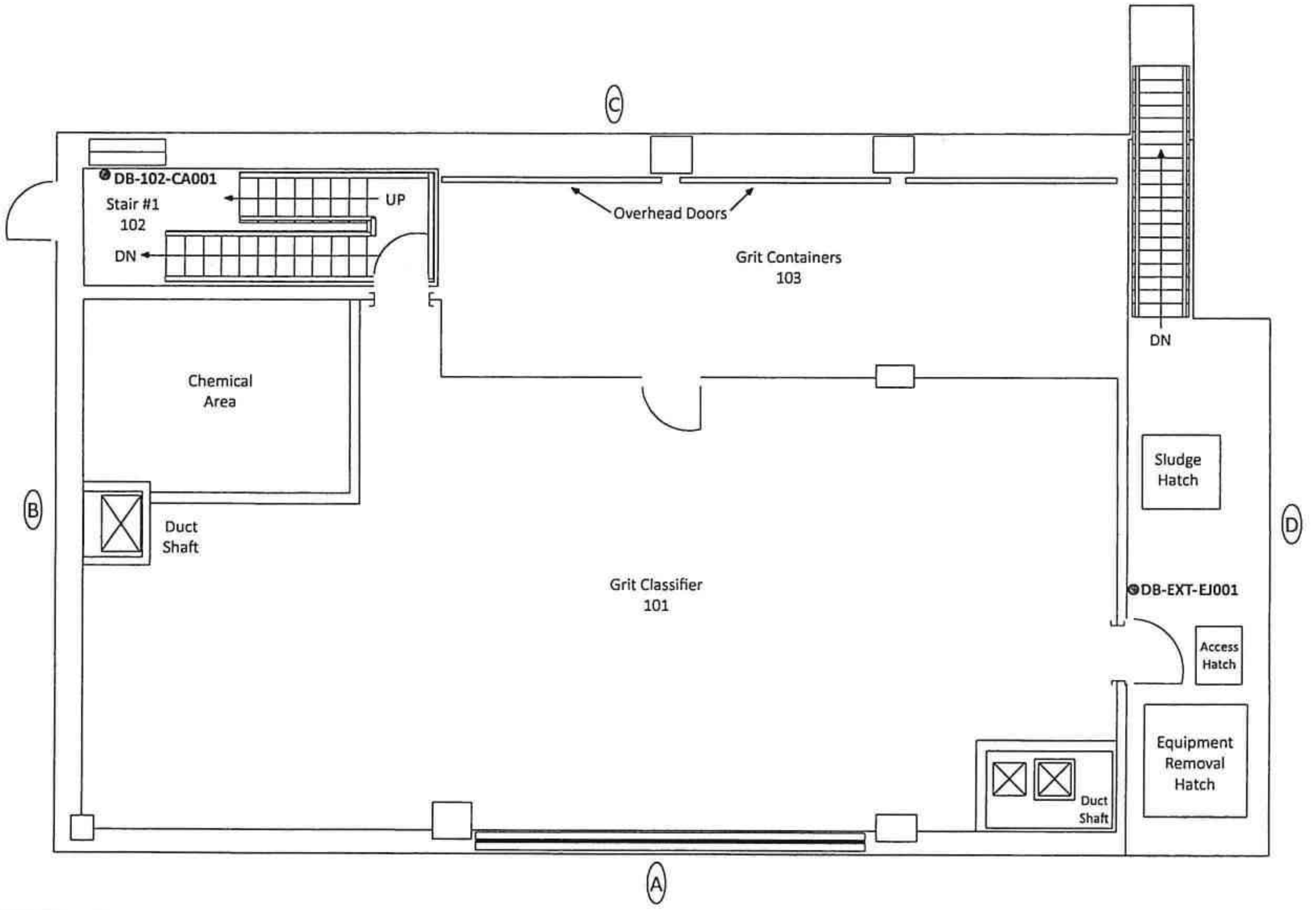
▭ Window

N

PROJECT:	PCB Characterization
LOCATION:	205 Bostwick Avenue, Bridgeport, CT
SOURCE:	Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992
SCALE:	NTS

eolas environmental LLC

PUMP STATION
EL. 25.50'



LEGEND:

● PCB Sample

▨ MCC Access Floor

▭ Window

N

PROJECT: PCB Characterization

LOCATION: 205 Bostwick Avenue, Bridgeport, CT

SOURCE: Kasper Associates, Inc. / Hazen and Sawyer, NY, 1992

SCALE: NTS

eolas environmental LLC

DEGRITTER BUILDING
EL. 32.00'

Appendix I

Subsurface Investigation Reports

West Side WWTP

Subsurface Investigation Report
205 Bostwick Avenue (Portion) and 1 Bostwick Avenue
Bridgeport, Connecticut 06605

Prepared for:
CDM Smith Inc.
77 Hartland Street
Suite 201
East Hartford, Connecticut 06108

Report Date:
November 6, 2020

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ACRONYMS

AMSL	Above Mean Sea Level
AOC	Area(s) of Concern
APA	Aquifer Protection Area
AST	Aboveground Storage Tank
COC	Constituent of Concern
CSM	Conceptual Site Model
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTECO	Connecticut Environmental Conditions Online
DQO	Data Quality Objective
ELUR	Environmental Land Use Restriction
EMI	Electromagnetic Induction
EPA	United States Environmental Protection Agency
ESA	Environmental Site Assessment
ETPH	Extractable Total Petroleum Hydrocarbons
FIRM	Flood Insurance Rate Map
GC/MS	Gas Chromatography/Mass Spectrometry
GIS	Geographic Information System
GPR	Ground Penetrating Radar
GWPC	Groundwater Protection Criteria
IDEC	Industrial/Commercial Direct Exposure Criteria
IVC	Industrial/Commercial Volatilization Criteria
LUST	Leaking Underground Storage Tank
NDDB	Natural Diversity Database
NWI	National Wetland Inventory
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PMC	Pollutant Mobility Criteria
QA/QC	Quality Assurance/Quality Control
RCP	Reasonable Confidence Protocol
RCRA	Resource Conservation and Recovery Act
RCSA	Regulations of Connecticut State Agencies
RDEC	Residential Direct Exposure Criteria
RPD	Relative Percent Difference
RSRs	Remediation Standard Regulations
RVC	Residential Volatilization Criteria
SCGD	Site Characterization Guidance Document
SIM	Selected Ion Monitoring
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	Semivolatile Organic Compound
SWPC	Surface Water Protection Criteria
TCLP	Toxicity Characteristic Leaching Procedure
USFN	Underground Storage Facilities Notification
USGS	United States Geological Survey
UST	Underground Storage Tank
VC	Volatilization Criteria
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

UNITS

fbg	feet below grade
mgd	million gallons per day
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
ppm	parts per million
μg/kg	micrograms per kilogram
μg/l	micrograms per liter

1 INTRODUCTION

Eolas Environmental, LLC (Eolas) was retained by CDM Smith, Inc. to complete a Subsurface Investigation of the property located at 1 Bostwick Avenue and the southern majority of the contiguous property located at 205 Bostwick Avenue in Bridgeport, Fairfield County, Connecticut 06605 (herein referred to as the "Site"). The portion of the Site located at 1 Bostwick Avenue is a 5.74-acre, irregularly-shaped parcel, on which a portion of the City of Bridgeport West Wastewater Treatment Plant (WWTP) facility ("West Side Plant") is located. The contiguous parcel to the north at 205 Bostwick Avenue is an approximately 7.8-acre portion of a larger 10-acre parcel, and on which the remainder of the West Side Plant is located. The Site is improved with four primary buildings, secondary WWTP structures and tanks, associated parking and driveways, and a slab associated with a former sludge building. This Subsurface Investigation Report has been prepared for the exclusive benefit of CDM Smith, Inc., who may rely on it. Assignment of this document and reliance by any other person or entity can be made only with the written permission of Eolas.

1.1 Purpose and Scope

On behalf of CDM Smith, Inc., Eolas recently completed a Phase I Environmental Site Assessment (ESA) of the Site. Based on the findings of the Phase I ESA, Areas of Concern (AOCs) were identified at the Site at which additional investigation is warranted. The purpose of this Subsurface Investigation was to evaluate a subset of AOCs (AOC-1A, AOC-1B, AOC-1C, AOC-2, AOC-3, AOC-12, AOC-13 and AOC-14) identified at the Site in the above-referenced Phase I ESA to determine whether a release of oil and/or hazardous substances has occurred and to characterize soil and groundwater conditions in the AOCs to support an understanding of future management, treatment, and/or disposal requirements during future site redevelopment. A release is considered to have occurred if concentrations of AOC-specific constituents of concern (COCs) are detected above naturally-occurring or background conditions.

The scope of the Subsurface Investigation included the completion of a ground penetrating radar (GPR) and Electromagnetic Induction (EMI) survey on areas of the Site targeted for drilling activities, advancement and sampling of seven soil borings, and the installation, development and sampling of two groundwater monitoring wells. The investigation of the above AOCs was conducted in general accordance with the Connecticut Department of Energy & Environmental Protection (CTDEEP, a.k.a. CTDEP) *Site Characterization Guidance Document,* dated September 2007 and revised to December 2010.

At this time, the Site is not currently in a state clean-up program and, therefore, is not specifically subject to remediation under the Connecticut Remediation Standard Regulations (RSRs) (Section 22a-133k-1 through 22a-133k-3 of the Regulations of Connecticut State Agencies [RCSA], adopted January 1, 1996 and amended June 27, 2013). The environmental data gathered during the conduct of this Subsurface Investigation were evaluated against RSRs criteria to provide CDM Smith, Inc. with a baseline understanding and guidance relative to potential environmental concerns and exposures that may exist at the Site.

1.2 Significant Assumptions

This report is prepared with the assumption that information provided in historical documentation used to develop the Phase I ESA and scope of this Subsurface Investigation is accurate and complete. Eolas assumes the Site has been correctly and accurately identified by CDM Smith, Inc. (User) and designated representatives of the User.

1.3 Limitations and Exceptions

Eolas was retained to perform this work for CDM Smith, Inc. per our December 19, 2019 agreement. Eolas represents only that it provides services in accordance with generally-accepted practices in the environmental assessment field. No other representation, expressed or implied, is included or intended as part of its services, proposals, contracts or reports.

1.4 Special Terms and Conditions/User Reliance

This report has been prepared exclusively for the use and benefit of and may be relied upon by CDM Smith, Inc. and any respective successors and assigns. Any third party agrees by accepting this report that any use or reliance on this report shall be limited by the exceptions and limitations in this report, and with the acknowledgement that actual site conditions may change with time, and that hidden conditions may exist at the property that were not discovered within the authorized scope of this investigation. Any use by or distribution of this report to third parties, without the express written consent of Eolas, is at the sole risk and expense of such third party.

2 SITE OVERVIEW AND HISTORY

This section includes a brief description of the Site, current land use, utility information, and surrounding land use.

SITE SUMMARY	
Site Name	Bridgeport West Wastewater Treatment Plant (West Side Plant)
Site Address	205 Bostwick Avenue (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605
MBLU	Map 9, Block 329, Lot 1/B (1 Bostwick Avenue) Map 12, Block 329, Lot 1/A (205 Bostwick Avenue, portion)
Property Size	13.54-acres
Zoning	I-L, Industrial Light Zone
Building(s)	Pump Station, Screen Building, Control Building, Degritter Building, and Secondary WWTP Structures and Tanks
Construction Date(s)	1918-1957
Current Use(s)	Step feed activated sludge wastewater treatment plant
Site Investigation Dates	August 28, 2020 – September 15, 2020

2.1 Location and Legal Description

The Site is located along the western side of Bostwick Avenue in a mixed residential-, industrial-, commercial-, and municipal-use area of the City of Bridgeport, Fairfield County, Connecticut. The portion of the Site identified as 1 Bostwick Avenue is comprised of a 5.74-acre parcel designated by the City of Bridgeport Tax Assessor as Map 9, Block 329, Lot 1/B. The portion of the Site identified as 205 Bostwick Avenue is the southern 7.8-acres of the parcel designated by the City of Bridgeport as Map 12, Block 329, Lot 1/A. The postal address of the Site is 205 Bostwick Avenue, Bridgeport, Connecticut 06605.

The location of the Site, local topography, surrounding structures, major access routes, and nearby water bodies are depicted on Figure 1, Site Location Map. Figure 1 was developed from the United States Geological Survey (USGS) Bridgeport, Connecticut 7.5-minute series topographic quadrangle printed in 1986. The layout of the Site and the relation of the Site to surrounding properties are depicted on Figure 2, Site Plan and Sample Location Map. Figures 1 and 2 are included in Appendix A of this report.

2.2 Current and Historical Uses of The Site

The Site is operated by the City of Bridgeport as the West Side WWTP (i.e. West Side Plant) step feed activated sludge treatment plant with an average annual design flow capacity of 30 million gallons per day (mgd). The West Side Plant process includes preliminary screening, primary clarification, secondary step feed activated sludge treatment with final clarification, and disinfection by chlorination before final effluent discharge to Cedar Creek and Bridgeport Harbor.

According to various historical record sources, the Site was undeveloped land and partly covered by water in 1891. In 1918, it appears the Site was first developed with the Pump Station Building on the eastern portion of the Site. By 1949, settling basins had been added west of the Pump Station Building, and the Control Well and Screen Building were present on the Site by 1950. In 1951, the Sludge Building was constructed on the northern portion of the Site and, in 1957, the Incinerator Building was constructed on the western portion of the Site. The Incinerator Building was razed sometime between 1995 and 2005. By 1959, portions of the Site that had been below water were completely filled and by 1972, it appears the remainder of the present-day buildings, structures and settling tanks had been constructed on the Site.

2.3 Utilities

UTILITY SUMMARY	
Heating System	Natural Gas
Cooling System	Electric
Water	Aquarion Water Company
Sewer	City of Bridgeport
Stormwater	City of Bridgeport
Generator(s)	Two, diesel fuel-fired systems, adjacent to Pump Station Building
Underground Storage Tanks (USTs)/Aboveground Storage Tanks (ASTs)	Two, 1,900 diesel ASTs integrated with generators

2.4 Current Uses of Adjoining Properties

Adjoining properties were visually evaluated to observe property use and are described as follows:

ADJOINING PROPERTY SUMMARY	
North	Approximately 2.2-acres of 205 Bostwick Avenue parcel (known as 255 Bostwick Avenue), followed by Morris Street, then City of Bridgeport Housing Authority multi-family residential housing complex located at 96 Taylor Drive and 301 Bostwick Ave.
South	City of Bridgeport Park Department marina and waterfront recreational areas located at 68 St. Stephens Road.
East	Bostwick Avenue followed by O&G Industries Inc. asphalt batch plant located at 260 Bostwick Avenue and a marina located at 86 Bostwick Avenue.
West	City of Bridgeport Park Department marina and waterfront recreational areas located at 68 St. Stephens Road.

The relationship of these properties with respect to the Site is depicted on Figure 2 which is included in Appendix A.

2.5 Previous Environmental Assessments

Eolas recently completed a Phase I ESA of the Site (*Phase I Environmental Site Assessment Report, 205 Bostwick Avenue (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605*, July 24, 2020). The following is summary of findings and conclusions of the Phase I ESA:

- The Site is identified and operated as the City of Bridgeport West WWTP ("West Side Plant") and is located along the western side of Bostwick Avenue in a mixed residential-, industrial-, commercial-, and municipal-use area of the City of Bridgeport, Fairfield County, Connecticut. The Site is comprised of 1 Bostwick Avenue, a 5.74-acre parcel designated by the City of Bridgeport Tax Assessor as Map 9, Block 329, Lot 1/B, and the contiguous southern 7.8-acres of the 10-acre parcel designated by the City of Bridgeport as Map 12, Block 329, Lot 1/A and known as 205 Bostwick Avenue.

- The Site is improved with four primary buildings, secondary WWTP structures and tanks, associated parking and driveways, and a slab associated with a former sludge building. The Pump Station Building is a 9,024-square-foot, multi-story, masonry structure with brick veneer and a combination asphaltic shingle-covered gable and flat tar and gravel roof, constructed circa 1918 to 1940. The Screen Building is a 3,175-square-foot, multi-story masonry structure with brick veneer and a flat tar and gravel roof, constructed circa 1940. The Control Building is a 12,348-square-foot, two-story, masonry structure with brick veneer and a flat tar and gravel roof, constructed circa 1960. The Degritter Building is a 5,084-square-foot, two-story, masonry structure with brick veneer and a flat tar and gravel roof, constructed in 1940. The slab of the former Sludge Building encompasses approximately 7,782-square-feet and is underlain by an unfinished basement. Ancillary structures at the Site include: three masonry primary settling tanks; six masonry aeration tanks; three masonry final settling tanks; three masonry chlorine contact tanks; two masonry sludge thickener tanks; a below-grade masonry pipe gallery that bifurcates the aeration tanks and the final settling and primary settling tanks; a masonry pump control building; a masonry influent control well; and various above- and below-ground conveyances and junction chambers.

- The Site is served by public utilities including water provided by the Aquarion Water Company, sewer provided by the City of Bridgeport, natural gas provided by Southern Connecticut Gas Company, and electricity provided by Eversource. The site buildings are heated with natural gas-fired boiler or ceiling mount systems. Cooling systems vary by building and include external HVAC systems powered by electricity. Diesel fuel-fired emergency generators with integrated 1,900-gallon ASTs are located on the eastern side of the Pump Station Building and were installed during the 1990s.

- The Site was undeveloped land and partly covered by water in 1891. In 1918, it appears the Site was first developed with the Pump Station Building on the eastern portion of the Site. By 1949, settling basins had been added west of the Pump Station Building, and the Control Well and Screen Building were present on the Site by 1950. In 1951, the Sludge Building was constructed on the northern portion of the Site and, in 1957, the Incinerator Building was constructed on the western portion of the Site. The Incinerator Building was razed sometime between 1995 and 2005. By 1959, portions of the Site that had been below water were completely filled and by 1972, it appears the remainder of the present-day buildings, structures and settling tanks had been constructed on the Site.

- Groundwater beneath the Site been assigned a classification of GB. Groundwater with a GB classification has designated uses for industrial processes and cooling water and baseflow for hydraulically connected surface water bodies. Class GB groundwater is presumed unsuitable for human consumption without treatment. Depth to groundwater beneath the Site has not been measured but is expected to be approximately three to five feet below grade (fbg). Due to proximity to Long Island Sound, groundwater flow direction and depth to groundwater may be influenced by tidal variations and by factors including, but not limited to, underground utilities and structures, soil and bedrock geology, nearby production wells, seasonal fluctuations, precipitation, and ground cover.

- The Site has been identified in multiple regulatory databases including: CT SPILLS, CT ENF, CT NPDES, CT RGA LUST, ICIS, FINDS, ECHO, US AIRS, CT MANIFEST, CT ASBESTOS, CT UST, and RCRA-VSQG. More than 150 spills of raw or partially-treated sewage were documented for the Site; these appear to relate to storm and precipitation events necessitating a system bypass to accommodate increased flow. The discharge of wastewater from the West Side Plant is managed under NPDES permit CT0100056. The permit was issued December 30, 1974, has been renewed numerous times, and is set to expire June 30, 2024. Several NOVs have been issued in connection with the NPDES permit; however, the details of which could not be ascertained during the conduct of this assessment. The Site is a VSQG of hazardous wastes including various D-, U-, P- and Connecticut Regulated-listed wastes. The Site is listed in the EDR Historical Auto database under 1 Bostwick Avenue as a former Wigwam gasoline station in 2013 (this appears to be an erroneous listing based on a review of historical resources for the Site).

- In addition to the regulatory database listings, a review of records at the offices of the CTDEEP identified a May 6, 1986 Underground Storage Facilities Notification (USFN) to document the installation of one 5,000-gallon, unlined steel Number 2 heating oil UST (Tank A1) and one 5,000-gallon, unlined steel Number 2 heating oil UST (Tank B2) in August 1971 adjacent to the Pump House Building and the Office Building. A second USFN dated April 22, 1991 documents the closure of three, 8,000-gallon, unlined steel Number 2 heating oil USTs (Tanks A1, B2, and C3) in April 1989. According to the USFN, the tanks were filled with sand and closed in place. Based on sketches included with each USFN, it appears the 5,000-gallon USTs correspond to the locations of the 8,000-gallon tanks A1 and B2.

- The State of Connecticut issued Order No. 60 to the City of Bridgeport on June 19, 1967 for causing pollution to the waters of the state. The Order stipulated that the City of Bridgeport evaluate capacity and integrity of the existing system, construct improvements to the West Side Plant, accept sewage from the Town of Trumbull via City of Bridgeport conveyances, and initiate a program for the systematic separation of storm and sanitary sewers. The State of Connecticut modified Order No. 60 on January 19, 1972 requiring that the completion of facility upgrades stipulated under the original order be completed by August 31, 1972. The State of Connecticut issued a second order, Order No. 3493 on May 11, 1983, to the City of Bridgeport for causing pollution to the waters of the state and stipulated that the City evaluate the adequacy of the existing sewage system tributary to Chopsey Hill and Lake Forest areas of the City of Bridgeport and perform upgrades and modifications as necessary to minimize sewage overflows in those areas of the City. According to a CTDEP interoffice memorandum from the CTDEP Water Management Bureau, compliance with the Order was achieved by June 30, 1992. A CTDEP interoffice memorandum from William Hogan, CTDEP Water Pollution Control Engineer, dated January 1, 1985, indicated that any Order issued prior to 1980 should be closed with a completion date of January 1, 1985. For Orders issued subsequent to 1980, Mr. Hogan indicated that all steps should be listed complete if the municipality facility staff confirmed completion.

- Based on a review of available historical documentation, the results of the site reconnaissance visit, and a review of regulatory database and publicly-available information pertaining to the Site, fourteen AOCs have been identified at which additional investigation is warranted.

- Based on the generation of hazardous waste at the Site, it appears the generation of greater than 100 kilograms of hazardous waste has occurred at the Site which would likely qualify the Site as an Establishment. An official determination as to whether the Site qualifies as an Establishment and is subject to the Connecticut Transfer Act upon future transfer must be rendered by legal counsel.

2.6 Summary of Areas of Concern

The Phase I ESA detailed above resulted in the identification of the following AOCs.

AOC	Description
AOC-1A	Former UST – Tank A1
AOC-1B	Former UST – Tank B2
AOC-1C	Former UST – Tank C3
AOC-2	Septic Dump Station
AOC-3	Screen Building Staining
AOC-4	Pump Station Screen Loading
AOC-5	Degritter Staining
AOC-6	Historical Incinerator
AOC-7	Uncharacterized Fill (Western Side of Site)
AOC-8	Leaking Underground Storage Tank (LUST)

AOC	Description
AOC-9	Former Machine Shop
AOC-10	Sewage Holding Pond and Chambers
AOC-11	Upgradient Migration of Contaminated Groundwater
AOC-12	Loading/Unloading Dock
AOC-13	Oil Storage Room
AOC-14	Uncharacterized Fill (Throughout Site)

3 ENVIRONMENTAL SETTING

PHYSICAL AND ENVIRONMENTAL SETTING	
Topography	Based on a review of the USGS topographic quadrangle map for the Bridgeport, Connecticut quadrangle (USGS, 2012) and observations made at the Site, the Site is generally flat. Topography in the area surrounding the Site is generally flat with a mild gradient to the south. The Site is located at 41˚ 09’ 35.93’’ north latitude and -73˚ 12’ 47.46’’ west longitude and lies at an elevation of approximately 11 feet above mean sea level (AMSL).
Surface Water	The nearest surface water body to the Site is Cedar Creek located approximately 75 feet south and southeast of the Site. Based on information obtained from the CTDEEP Geographic Information System (GIS) and Connecticut Environmental Conditions Online (CTECO) website, this surface water has been assigned a classification of “SB”. Based on the distance and direction of Cedar Creek, potentially impacted groundwater has the potential to adversely affect this surface water.
Groundwater	Based on information obtained from the CTDEEP GIS and CTECO website, groundwater beneath the Site has been assigned a classification of “GB”. Groundwater with a GB classification has designated uses for industrial processes and cooling water and baseflow for hydraulically connected surface water bodies, and is presumed unsuitable for human consumption without treatment.
Surficial Geology	Surficial materials beneath the Site are mapped as artificial fill, defined as earth materials and man-made materials that have been artificially emplaced, common along the coast
Bedrock Geology	According to the Bedrock Geological Map of Connecticut, compiled by Rodgers and dated 1985, bedrock beneath the vicinity of the Site is mapped as an unmapped area.
Hydrogeology	Based on regional topography and the location of the nearest surface water body, local groundwater flow direction is expected to be to the south, in the direction of Cedar Creek and Long Island Sound. Due to proximity to Long Island Sound, groundwater flow direction and depth to groundwater may be influenced by tidal variations. Further, actual groundwater flow direction can also be locally influenced by factors including, but not limited to, underground utilities and structures, soil and bedrock geology, nearby production wells, seasonal fluctuations, precipitation, and ground cover.
Wetlands	According to information provided by the CTDEEP GIS, CTECO website, and National Wetland Inventory (NWI), no wetlands are located on the Site.
Floodplain	According to the Flood Insurance Rate Map (FIRM) Panel 09001C0437G for Fairfield County, Connecticut, revised July 8, 2013, the northern and extreme eastern portions of the Site lie in Zone AE, a special flood hazard area where a base flood elevation of 12 feet AMSL has been established. The remainder of the Site lies in Zone X, an area of minimal flood hazard.

PHYSICAL AND ENVIRONMENTAL SETTING	
Natural Diversity Database	According to information obtained from the CTDEEP GIS and CTECO website, the Site is not located in a Natural Diversity Data Base (NDDB) area.
Critical Habitat	According to information obtained from the CTDEEP GIS and CTECO website, no Critical Habitat areas are located on or adjacent to the Site.
Aquifer Protection Areas	According to information obtained from the CTDEEP GIS and CTECO website, the Site is not located in or adjacent to an Aquifer Protection Area (APA).
Public Water Supply Wells	According to the Atlas of Public Water Supply Sources and Drainage Basins of Connecticut (CTDEP, 1982), no public water supply wells were identified within one mile of the Site.
Private Water Supply Wells	The Site is located in an urban area in the City of Bridgeport; the Site and surrounding area are served with public water.
Physical Contact with Soil	The Site is predominantly covered with wastewater treatment facility buildings, asphalt, and concrete walkways; therefore, the potential for direct physical contact with soil is low.
Potential for Vapor Intrusion	Based on preliminary data, volatile organic compounds (VOCs) are not present in groundwater at concentrations that would result in potential vapor intrusion into the site buildings. Additional characterization of groundwater would be necessary to validate this conclusion.

4 SUBSURFACE INVESTIGATION SCOPE AND METHODOLOGIES

This section presents a description of the Subsurface Investigation scope, investigation methods and procedures, and quality assurance/quality control (QA/QC) procedures employed during the completion of the investigation. The data quality objective (DQO) of the investigation sampling program was designed to evaluate soil and groundwater for the presence of a release from the AOCs investigated.

4.1 Investigation Scope

The scope of the Subsurface Investigation included the completion of a GPR and EMI survey on areas of the Site targeted for drilling activities, advancement and sampling of seven soil borings, and the installation, development and sampling of two groundwater monitoring wells. Soil borings and groundwater monitoring wells were advanced in subset of AOCs (AOC-1A, AOC-1B, AOC-1C, AOC-2, AOC-3, AOC-12, AOC-13 and AOC-14) identified at the Site to determine whether a release of oil and/or hazardous substances has occurred and in support of future property redevelopment. A release is considered to have occurred if concentrations of AOC-specific COCs are detected above naturally-occurring or background conditions.

4.2 Data Quality Objectives and Reasonable Confidence Protocols

Data quality objectives (DQOs) are used to ensure that data is collected in a manner such that the data can be used to evaluate a property and support decisions based on the evaluation of data. Procedures used to ensure that the DQOs for the Subsurface investigation were met include the development of a preliminary conceptual site model (CSM) that is used to guide the selection of appropriate COCs; sample locations and appropriate sample intervals; selection of analytical methods to assess an AOC for a release; implementation of sample handling and custody procedures; management of data; documentation of investigation methods; collection of QA/QC samples; and the use of Connecticut's Reasonable Confidence Protocols (RCPs) and laboratory QA/QC procedures.

4.3 Conceptual Site Model

A CSM is a representation of an environmental system that is used as a tool for understanding and demonstrating the basis and rationale for the site investigation[1]. The CSM incorporates site-specific and hydrogeological information to identify COCs, the nature of a release, migration pathways, and points of exposure, and is fundamental to describing fate and transport of environmental impacts at a property. The following table provides a preliminary CSM and summarizes the site AOCs including those specifically investigated as part of this scope, the identified COCs, general fate and transport mechanisms that are likely to be encountered at the Site based on the physical setting, and those mechanisms that generally affect the migration of contaminants at the Site.

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[1] *Site Characterization Guidance Document*, CT DEP, September 2007, Revised December 2010.

AOC	DESCRIPTION	COCs	CONCEPTUAL SITE MODEL
AOC-1A	Former UST – Tank A1	VOCs, SVOCs, ETPH	One 8,000-gallon, unlined steel Number 2 heating oil USTs (Tank A1) was reportedly installed at the Control Building in April 1989. In addition, a 5,000-gallon heating oil UST (also listed as Tank A1) installed in 1971 appears to have been located in the same area as the 8,000-gallon Tank A1. No documentation of the closure of this system was identified. Historical release(s) from the UST and ancillary piping have the potential to migrate through the subsurface and adversely affect soil and groundwater beneath the Site.
AOC-1B	Former UST – Tank B2	VOCs, SVOCs, ETPH	One 8,000-gallon, unlined steel Number 2 heating oil USTs (Tank B2) was reportedly installed at the Pump Station Building in April 1989. In addition, a 5,000-gallon heating oil UST (also listed as Tank B2) installed in 1971 appears to have been located in the same area as the 8,000-gallon Tank B2. No documentation of the closure of this system was identified. Historical release(s) from the UST and ancillary piping have the potential to migrate through the subsurface and adversely affect soil and groundwater beneath the Site.
AOC-1C	Former UST – Tank C3	VOCs, SVOCs, ETPH	One 8,000-gallon, unlined steel Number 2 heating oil USTs (Tank C3) was reportedly installed at the Former Sludge Disposal Building in April 1989. No documentation of the closure of this system was identified. Historical release(s) from the USTs and ancillary piping have the potential to migrate through the subsurface and adversely affect soil and groundwater beneath the Site.
AOC-2	Septic Dump Station	VOCs, SVOCs, ETPH, Metals	A septic waste receiving dump station is operated on the northern portion of the Site, adjacent to the Screen Building. The dump station is used to receive septic wastes that are trucked in by private septic system companies. Releases in the area of the dump station have the potential to migrate through cracks in the asphalt surface, migrate into shallow and deeper soils, and into groundwater.
AOC-3	Screen Building Staining	VOCs, SVOCs, ETPH, PCBs, Metals	Staining observed on the floor of the screen building lower screen and grit building is indicative of release(s) associated with oil-containing equipment and potentially polluted influent and debris. These releases have the potential to migrate through gaps or fissures in the floor, or across the floor surface to the building exterior via an overhead door, and into subsurface soils and/or groundwater.

AOC	DESCRIPTION	COCs	CONCEPTUAL SITE MODEL
AOC-4	Pump Station Screen Loading	VOCs, SVOCs, ETPH, Metals	Staining observed on the floor of the By-Pass Screen Room in the Pump Station Building is indicative of release(s) associated with oil-containing equipment and potentially polluted influent and debris. These releases have the potential to migrate through gaps or fissures in the floor, or across the floor surface to the building exterior via an overhead door, and into subsurface soils and/or groundwater.
AOC-5	Degritter Staining	VOCs, SVOCs, ETPH, Metals	Staining observed on the floor of the Degritter Building is indicative of release(s) associated with oil-containing equipment and potentially polluted influent and debris. These releases have the potential to migrate through gaps or fissures in the floor, or across the floor surface to the building exterior via overhead doors, and into subsurface soils and/or groundwater.
AOC-6	Historical Incinerator	VOCs, SVOCs, ETPH, PCBs, Metals	In 1957, an Incinerator Building was constructed on the western portion of the Site. The Incinerator Building was razed sometime between 1995 and 2005. Runoff associated with potentially contaminated incinerated wastes and ash generated in this building has the potential to adversely affect underlying shallow soil via migration from the surface to underlying soil and groundwater.
AOC-7	Uncharacterized Fill (Western Side of Site)	VOCs, SVOCs, ETPH, PCBs, Metals	An area of fill material is present along the western portion of the Site, the composition of which is unknown. Contact of this fill material has the potential to adversely affect shallow soil. Runoff across and infiltration of precipitation through the fill material would contact shallow soil, and migrate to deeper soil and groundwater.
AOC-8	LUST	VOCs, SVOCs, ETPH	According to the EDR report, the Site is listed in the RGA LUST database for the years 2000 and 2001, with the address of 205 Bostwick Avenue. No other information is provided in the database report. The presence of a former LUST at the Site indicates a release has occurred.
AOC-9	Former Machine Shop	VOCs, SVOCs, ETPH, PCBs, Metals	According to historical record sources, a machine shop was operated in the southern portion of the Pump Station Building from at least 1939 until at least 1972. Potential release(s) associated with the use of oils and/or hazardous substances in a machine shop have the potential to migrate from the surface into underlying soil and/or groundwater.

AOC	DESCRIPTION	COCs	CONCEPTUAL SITE MODEL
AOC-10	Sewage Holding Pond and Chambers	VOCs, SVOCs, ETPH, PCBs, Metals	According to historical record sources, it appears a series of holding ponds and detention chambers were present south of the Pump Station Building between approximately 1949 and 1959. Depending on the nature of the materials stored in this area, infiltration and/or releases to these structures have the potential to adversely affect underlying soil and/or groundwater.
AOC-11	Upgradient Migration of Contaminated Groundwater	VOCs, SVOCs, ETPH, PCBs, Metals	According to an ECAF document submitted for the adjacent property to the north, ash generated from the historical incinerator located on the Site was believed to have been emplaced on the property. Investigations of this property resulted in the identification of petroleum hydrocarbons, metals, PCBs, and PAHs in soil, and petroleum hydrocarbons, VOCs, and PAHs in groundwater. Based on a presumed southerly groundwater flow direction, contaminated groundwater from this property is likely migrating onto the Site.
AOC-12	Loading/Unloading Dock	VOCs, SVOCs, ETPH	An elevated concrete loading platform is located at the western exterior of the blower room and is used for the transfer of maintenance fluids (lubricants for the blowers) and equipment into and out of the building. Potential releases from the transfer of oils into and out of the blower room via the loading dock have the potential to adversely affect underlying soil and/or groundwater via migration through cracks or gaps in the asphalt surface.
AOC-13	Oil Storage Room	VOCs, SVOCs, ETPH	A virgin oil and lubricant, and waste oil storage area is located in a storage room above the tunnel section from the Control Building to the pipe gallery. Potential releases from the transfer of oils into and out of the storage room have the potential to adversely affect underlying soil and/or groundwater via migration through cracks or gaps in the asphalt surface.
AOC-14	Uncharacterized Fill (Throughout Site)	VOCs, SVOCs, ETPH, PCBs, Metals	According to historical record sources, the Site was partly covered by water in 1891. By 1959, portions of the Site that had been below water were filled. The composition and quality of the fill materials is unknown and represents a potential source of contaminants in the subsurface.

4.4 Constituents of Concern

The list of COCs was developed for each AOC to be investigated and to support future characterization of soil; this list comprises those compounds most likely to be released based on the understanding of site operations, material usage, and waste generation. Soil samples collected from the AOCs investigated as part of this scope were analyzed for one or more of the following: VOCs using United States Environmental Protection Agency (EPA) Method 8260C; semivolatile organic compounds (SVOCs) using EPA Method 8270D; petroleum hydrocarbons using the approved Connecticut Extractable Total Petroleum Hydrocarbon (ETPH) Method; polychlorinated biphenyls (PCBs) using EPA Method 8082; chlorinated herbicides using EPA Method 8151CA; pesticides using EPA Method 8081B; cyanide; total Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, mercury, lead, selenium, and silver); and RCRA 8 metals following extraction by the Toxicity Characteristic Leaching Procedure (TCLP). Groundwater samples were analyzed for VOCs, SVOCs, ETPH, PCBs, chlorinated herbicides, pesticides, and total and dissolved RCRA 8 metals using the aforementioned methods. Soil and groundwater samples were submitted to Phoenix Environmental Laboratories, Inc. (Phoenix) of Manchester, Connecticut for laboratory analysis.

The following table includes a summary of soil and groundwater sample locations, corresponding soil sample depths, the AOC from which the samples were collected, and the laboratory analysis performed.

Sample Location	Sample Interval (fbg or as noted)	AOC	VOCs	SVOCs	PCBs	ETPH	Pesticides	Herbicides	RCRA 8 Metals	TCLP Metals	Cyanide
W-SB-001	10-12.5	AOC-2, AOC-3	x	x	x	x	x	X	x		x
W-SB-002	10-12.5	AOC-1B	x	x	x	x	x	X	x		x
W-SB-003	9-11	AOC-1C	x	x	x	x	x	X	x		x
W-SB-004	10-12.5	AOC-14	x	x	x	x	x	X	x		x
W-SB-005	6-8	AOC-14	x	x	x	x	x	X	x		x
W-SB-006	9-11.5	AOC-1A	x	x	x	x			x		
W-SB-007	7.5-10	AOC-12, AOC-13	x	x	x	x	x	X	x	x	x
W-MW-001	Groundwater	AOC-1C	x	x	x	x	x	X	x		
W-MW-002	Groundwater	AOC-12, AOC-13	x	x	x	x	x	X	x		

4.5 Subsurface Investigation Methodologies

4.5.1 Ground Penetrating Radar Survey

In accordance with Section 16-345-4 of the RCSA, prior to advancement of soil borings at the Site, the offices of Call Before You Dig were notified to locate and mark underground utilities. To further identify potential subsurface utilities in the work area and identify locations of subsurface piping, utilities, or other anomalies including suspect USTs and other historical site features, Eolas contracted CorBuilt, LLC to conduct private utility clearance with a GPR and EMI survey on August 28, 2020. A parabola signature which indicates possible evidence of a UST was identified in the area of AOC-1C. No other anomalies were identified by CorBuilt that conflicted with the previously marked out soil boring locations.

4.5.2 Soil Boring Advancement and Soil Sample Collection

Soil boring advancement and soil sampling was conducted to define the nature (i.e. presence) of contaminants associated with specific AOCs in unconsolidated materials in the saturated and unsaturated zones. In addition, soil borings provided information relative to site stratigraphy and physical properties of unconsolidated materials in both the saturated and unsaturated zones with particular emphasis on the characteristics of those materials that affect contaminant migration pathways and transport mechanisms.

Soil borings were advanced by employing Geoprobe® direct-push techniques with a Geoprobe® 6620DT drilling rig, utilizing the Geoprobe® Macro-Core® Soil Sampling system of sampling equipment to obtain soil samples. At each of the soil boring locations, borings were advanced under the supervision of Eolas field personnel. Soil samples were collected continuously with five-foot polyethylene sleeves as soil borings were advanced. A discrete sample was collected from each, approximate two-foot interval, and screened in the field for the presence of VOCs using an organic vapor meter equipped with a portable photoionization detector (PID). All soil samples were examined by the field personnel for indications of contamination such as visible staining, visible separate-phase petroleum products, or the presence of odors. Soil boring logs were prepared for each location documenting the visual classification of the soils encountered. Soil boring locations are depicted on Figure 2, included in Appendix A. Copies of the soil boring logs are provided in Appendix B.

Within minutes after the collection and opening of the sample liners, the soil samples were collected directly into laboratory-supplied glass sample containers with Teflon®-lined lids (or methanol- and deionized water-preserved vials, as appropriate) for submission to Phoenix for analysis. Each soil sample collected for analysis was obtained using dedicated, disposable En-Core® samplers or other disposable equipment. Filled sample containers were labeled using with the sampling date and time hand recorded by the sampler. The filled sample containers were placed into iced sample coolers and transported to the laboratory at the end of the sampling day.

In general, fill material (e.g. slag, asphalt, brick, ceramic) and evidence of filling (i.e. reworking of native soils) were observed in all soil borings to depths of 7.5-10 feet below grade (fbg). During soil sampling, a weathered petroleum odor was noted in the 5-10 fbg interval of location SB-003 and a PID response of 1.2 parts per million (ppm) was recorded for the 9-11 fbg interval of the same soil boring. A weathered petroleum odor was also noted in the 7.5-10 fbg and 15-17.5 fbg intervals of location SB-007. PID responses for SB-007 ranged from 3.3 ppm in the 15-17.5 fbg interval to 14 ppm in the 7.5-10 fbg interval.

4.5.3 Monitoring Well Installation and Development

Monitoring wells were installed at the Site with the objective of evaluating groundwater for the presence of COCs associated with specific AOCs. Monitoring wells were also used to gather data to define groundwater elevations and aquifer characteristics across the Site in order to understand and evaluate potential contaminant fate and transport pathways and mechanisms.

Two monitoring wells (W-MW-001 and W-MW-002) were set to depths of approximately 17 fbg, in overburden materials. The wells were constructed of approximately 10 feet of 1.5-inch diameter, 0.010-inch slotted PVC screen, with 1.5-inch PVC riser. The annular space around the wells was filled with #1 sand from the bottom of the borehole to approximately 1-2 feet above the screen. An approximate one-foot layer of bentonite was placed above the sand pack to form a seal. Native fill was then used to fill the remaining borehole to grade. Each well was finished with an 8-inch steel road box fortified with concrete installed to match the surrounding grade. Monitoring well locations are depicted on Figure 2, included in Appendix A. Well construction logs are included in Appendix B.

Approximately one week following installation of the monitoring wells, the wells were developed using a surge and pump technique to remove entrained sediment from the wells and to facilitate a hydraulic connection between the monitoring well screen and surrounding aquifer. The monitoring wells were surged and pumped until water quality parameters stabilized and turbidity results were adequately low to confirm clear formation groundwater.

4.5.4 Groundwater Sampling

Several days subsequent to redevelopment, groundwater samples were collected from the newly-installed monitoring wells using a peristaltic pump and dedicated tubing, following low-flow sampling techniques. Depth to groundwater measurements were collected from each monitoring well location prior to introduction of sample tubing and were recorded at 8.98 feet below top of riser in W-MW-001 and 8.42 feet below top of riser in W-MW-002. Groundwater quality parameters including pH, specific conductivity, dissolved oxygen, temperature, turbidity, and oxidation/reduction potential were monitored and recorded at approximate three-minute intervals until each parameter was stabilized. Once parameters were stabilized, groundwater was collected directly into laboratory-supplied glass sample containers with Teflon®-lined lids for submission to Phoenix for laboratory analysis. Locations of groundwater monitoring wells are depicted on Figure 2, included in Appendix A.

4.6 Quality Assurance/Quality Control and Data Usability

During the subsurface investigation, QA/QC samples including trip blanks and duplicate samples collected during the soil and groundwater sampling program were collected to determine the potential for cross contamination and analytical precision, respectively. The results for QA/QC samples and laboratory narratives provided with each Phoenix laboratory report were reviewed to identify issues that could affect the usability of the data. The results are summarized below.

4.6.1 Trip Blanks

A trip blank consisting of deionized water was prepared and submitted to the laboratory for analysis for VOCs for each day of field sampling activities. The results of the VOC analysis were reviewed to determine the potential for cross-contamination due to exposure during soil and groundwater sampling, delivery, or laboratory analysis. VOCs were not reported above laboratory detection limits in the trip blank samples collected during the soil and groundwater sampling events.

4.6.2 Duplicate Sample

A duplicate soil sample was collected from location W-SB-001 and a duplicate groundwater sample was collected from location W-MW-002. The relative percent difference (RPD) of reported results for the soil duplicate pair was calculated and ranged between 3.87% and 34.62%. While the upper limit of the calculated RPD values was greater than 30% (an accepted threshold at which analytical precision can be determined), soil heterogeneity and the presence of contaminants in soil can often affect RPD data. The remaining RPD values, which were less than 12.23%, confirm analytical precision and were found to be within QA/QC criteria. The RPD values for the groundwater duplicate pair were calculated to range from 0.57% to 1.72%, well below an accepted RPD threshold of 20% for aqueous samples.

4.6.3 Equipment Blanks

No equipment blanks were prepared or submitted as all samples were collected with dedicated, disposable sampling equipment.

4.6.4 Reasonable Confidence Protocols

Eolas reviewed the case narratives provided by the analytical laboratory under the RCP guidelines. Phoenix reported that “reasonable confidence” was achieved on all analyses conducted. A review of the narratives identified minor QA/QC issues regarding laboratory method controls/blanks that were considered in interpreting the data. These issues were reviewed and it was determined that the usability of the data was not affected.

5 SUBSURFACE INVESTIGATION RESULTS

The results from the Subsurface Investigation field activities, conducted between August 28, 2020 and September 15, 2020, are presented in the following subsections. The analytical data for samples collected during the Subsurface Investigation compared to the default, numeric RSRs criteria are summarized in Tables 1 and 2, included in Appendix C, to provide context to and a baseline understanding of the results. Copies of the Phoenix laboratory analytical reports are provided in Appendix D.

5.1 Soil Sampling Analytical Results

The following seven soil samples and one duplicate soil sample were collected from the seven soil borings advanced at the Site and submitted to Phoenix for laboratory analysis.

- W-SB-001-10-12.5 (10-12.5 fbg) and DUP-912020 (W-SB-001) (10-12.5 fbg)
- W-SB-002-10-12.5 (10-12.5 fbg)
- W-SB-003-9-11 (9-11 fbg)
- W-SB-004-10-12.5 (10-12.5 fbg)
- W-SB-005-6-8 (6-8 fbg)
- W-SB-006-9-11.5 (9-11.5 fbg)
- W-SB-007-7.5-10 (7.5-10 fbg)

5.1.1 Volatile Organic Compounds

The compound tetrachloroethylene was reported at a concentration of 7.3 micrograms per kilogram (µg/kg) in the soil sample collected from the 10-12.5 foot interval of location W-SB-004. The compounds 1,2,4-trichlorobenzene and chloroform were reported at concentrations of 200 µg/kg and 140 µg/kg, respectively, in the soil sample collected from the 6-8 foot interval of location W-SB-005. No other VOCs were reported above laboratory detection limits.

5.1.2 Semi-Volatile Organic Compounds

The following SVOCs and their corresponding concentrations were reported above laboratory detection limits in soil samples collected from the Site:

W-SB-002: benz(a)anthracene (290 µg/kg), benzo(a)pyrene (290 µg/kg), chrysene (300 µg/kg), and fluoranthene (660 µg/kg).

W-SB-003: benz(a)anthracene (320 µg/kg), benzo(a)pyrene (350 µg/kg), benzo(b)fluoranthene (340 µg/kg), benzo(k)fluoranthene (310 µg/kg),chrysene (460 µg/kg), fluoranthene (1,500 µg/kg), phenanthrene (470 µg/kg), and pyrene (1,300 µg/kg).

W-SB-005: benz(a)anthracene (570 µg/kg), benzo(a)pyrene (660 µg/kg), benzo(b)fluoranthene (590 µg/kg), benzo(g,h,i)perylene (480 µg/kg), benzo(k)fluoranthene (570 µg/kg),chrysene (640 µg/kg), fluoranthene (850 µg/kg), ideno(1,2,3-cd) pyrene (540 µg/kg), phenanthrene (450 µg/kg), and pyrene (870 µg/kg).

W-SB-006: acenaphthene (320 µg/kg), anthracene (540 µg/kg), benz(a)anthracene (1,200 µg/kg), benzo(a)pyrene (1,000 µg/kg), benzo(b)fluoranthene (1,000 µg/kg), benzo(g,h,i)perylene (630 µg/kg), benzo(k)fluoranthene (930 µg/kg),chrysene (1,300 µg/kg), fluoranthene (3,000 µg/kg), ideno(1,2,3-cd) pyrene (710 µg/kg), phenanthrene (2,900 µg/kg), and pyrene (2,500 µg/kg).

W-SB-007: 2-methylnaphthalene (1,100 µg/kg), acenaphthene (430 µg/kg), anthracene (410 µg/kg), benz(a)anthracene (720 µg/kg), benzo(a)pyrene (640 µg/kg), benzo(b)fluoranthene (560 µg/kg), benzo(g,h,i)perylene (420 µg/kg), benzo(k)fluoranthene (380 µg/kg),chrysene (760 µg/kg), fluoranthene (1,300 µg/kg), fluorene (420 µg/kg), ideno(1,2,3-cd) pyrene (470 µg/kg), naphthalene (310 µg/kg), phenanthrene (1,100 µg/kg), and pyrene (1,900 µg/kg).

5.1.3 Polychlorinated Biphenyls

PCBs were reported above laboratory detection limits in two (W-SB-005 and W-SB-007) of the seven soil samples that were analyzed for PCBs. Aroclor 1260 was reported at a concentration of 670 µg/kg in W-SB-005 and Aroclor 1254 was reported at a concentration of 1,300 µg/kg in W-SB-007.

5.1.4 Extractable Total Petroleum Hydrocarbons

Petroleum hydrocarbons, reported as ETPH, and their corresponding concentrations were reported above laboratory detection limits in the soil samples collected from locations W-SB-003 (120 milligrams per kilogram [mg/kg]), W-SB-005 (90 mg/kg), and W-SB-007 (1,200 mg/kg).

5.1.5 Metals

The following metals and respective concentration ranges were reported in soil samples collected from the Site:

Arsenic:	0.95 mg/kg in W-SB-004 to 9.96 mg/kg in W-SB-007.
Barium:	13.2 mg/kg in W-SB-001 to 385 mg/kg in W-SB-007.
Cadmium:	0.41 mg/kg in W-SB-006 to 9.12 mg/kg in W-SB-007.
Chromium:	6.91 mg/kg in W-SB-001 to 276 mg/kg in SB-007.
Lead:	5.23 mg/kg in W-SB-001 to 650 mg/kg in W-SB-007.
Mercury:	0.03 mg/kg in W-SB-005 to 0.53 mg/kg in W-SB-007.
Silver:	0.83 mg/kg in W-SB-005 and 7.01 mg/kg in W-SB-007.

Based on the results of the total metals analysis, the soil sample collected from location W-SB-007 exhibited the highest individual metals concentrations and was submitted for analysis for metals following extraction by the TCLP. Although the evaluation of contaminant leaching potential in the subsurface (and the potential for those contaminants to adversely affect groundwater) is typically accomplished by analyzing contaminants following extraction by the Synthetic Precipitation Leaching Procedure (SPLP), TCLP extraction for metals was used in this project scope to characterize soil for potential off-site disposal options during future redevelopment. TCLP data can also be used to evaluate concentrations of metals relative to the GB Pollutant Mobility Criteria (PMC) but, due to the methodology, may yield results that are not representative of the actual potential for contaminants to leach into groundwater. The following is a summary of metals concentrations reported above laboratory detection limits in the TCLP extract for soil collected from location W-SB-007:

Barium:	0.75 milligrams per liter (mg/l).
Cadmium:	0.1 mg/l.
Lead:	2.07 mg/l.

5.1.6 Cyanide

Cyanide was not reported above laboratory detection limits in the six soil samples and duplicate soil sample submitted for cyanide analysis.

5.1.7 Pesticides and Herbicides

Pesticides and herbicides were not reported above laboratory detection limits in the six soil samples and duplicate soil sample submitted for analysis; however, due to matrix interferences caused by the presence of PCBs in W-SB-005 and W-SB-007, elevated reporting limits were presented for various pesticide compounds.

5.2 Groundwater Sampling Analytical Results

Groundwater samples were collected from the newly-installed monitoring wells, W-MW-001 and W-MW-002, on September 15, 2020. A duplicate sample was collected from location W-MW-002. The following is a summary of the groundwater sampling results.

5.2.1 Volatile Organic Compounds

VOCs were not reported above laboratory detection limits in groundwater collected from W-MW-001 and W-MW-002.

5.2.2 Semivolatile Organic Compounds

Groundwater samples were analyzed for SVOCs using EPA Method 8270D which uses gas chromatography/mass spectrometry (GC/MS); however, for certain compounds an adequate reporting limit may not be achievable. To overcome this limitation, the GC/MS can be operated in Selected Ion Monitoring (SIM) mode to increase instrument sensitivity and yield lower reporting limits. The following SVOCs and their respective concentrations were reported in groundwater collected from the Site using the SIM method.

The compound 2-methylnaphthalene was reported in groundwater collected from W-MW-002 and the duplicate at concentrations of 0.57 micrograms per liter (µg/l) and 0.76 µg/l, respectively. Acenaphthene was reported in groundwater collected from W-MW-002 and the duplicate at concentrations of 1.3 µg/l and 1.8 µg/l, respectively. Fluorene was reported in groundwater collected from W-MW-002 and the duplicate at concentrations of 0.98 µg/l and 1.4 µg/l, respectively. Phenanthrene was reported in groundwater collected from W-MW-002 and the duplicate at concentrations of 1.2 µg/l and 1.7 µg/l, respectively.

Fluoranthene (0.59 µg/l) and naphthalene (0.52 µg/l) were reported in the duplicate sample collected from location W-MW-002.

5.2.3 Extractable Total Petroleum Hydrocarbons

ETPH were not reported above laboratory detection limits in the two groundwater analyzed; however, ETPH was detected in the duplicate sample collected from W-MW-002 at a concentration of 0.35 mg/l.

5.2.4 Total Metals

Arsenic was reported in the groundwater sample collected from W-MW-001 at a concentration of 0.004 mg/l.

Barium was reported in groundwater collected from W-MW-001 at a concentration of 0.057 mg/l, W-MW-002 at a concentration of 0.35 mg/l, and the duplicate at a concentration of 0.351 mg/l.

Chromium was reported in groundwater collected from W-MW-002 and the duplicate at a concentration of 0.005 mg/l.

No other metals were reported above laboratory detection limits.

5.2.5 Dissolved Metals

Arsenic was reported in the groundwater sample collected from W-MW-001 at concentration of 0.006 mg/l.

Barium was reported in groundwater collected from W-MW-001 at a concentration of 0.057 mg/l, W-MW-002 at a concentration of 0.348 mg/l, and the duplicate at a concentration of 0.351 mg/l.

Chromium was reported in groundwater collected from W-MW-002 and the duplicate at a concentration of 0.004 mg/l.

Lead was reported in the groundwater sample collected from W-MW-001 and the duplicate sample at a concentration of 0.002 mg/l.

No other metals were reported above laboratory detection limits in the dissolved metals samples.

5.2.6 Pesticides and Herbicides

Pesticides and herbicides were not reported above laboratory detection limits in the groundwater samples and duplicate groundwater sample submitted for analysis.

5.2.7 PCBs

PCBs were not reported above laboratory detection limits in the groundwater samples and duplicate groundwater sample submitted for analysis.

5.3 Remediation Criteria

This section includes a preliminary evaluation of the analytical data for soil and groundwater relative to tabulated numeric criteria listed in Appendices A through D of Sections 22a-133k-1 through 22a-133k-3 of the RCSA, otherwise referred to as the RSRs. The RSRs include baseline criteria that may be used at a property to determine whether remediation is necessary; self-implementing alternatives to the criteria for use under specific circumstances; self-implementing exceptions to the criteria for use under specific circumstances; and mechanisms to request approval for site-specific alternatives to the criteria and remedial options. Before an evaluation of compliance with the RSRs can be completed, it must first be demonstrated that the investigation was adequate to identify whether releases have occurred and, if so, whether the nature and extent of contamination has been adequately characterized. Compliance with the RSRs can only be demonstrated when the nature and extent of releases at a property are fully characterized. Further, since the Site has is not engaged in a formal State program, the RSRs may not apply at this time and, as such, are used for guidance purposes only.

5.3.1 Soil Remediation Criteria

Soil remediation criteria established in the RSRs are risk-based and designed to (1) protect human health and the environment from risks associated with direct exposure and (2) protect groundwater quality from contaminants that may migrate into from soil into groundwater. Relative to protection of human health and the environment from risks associated with direct exposure, the CTDEEP established two sets of criteria using exposure assumptions based on land use type; these include the Residential Direct Exposure Criteria (RDEC) and Industrial/Commercial Direct Exposure Criteria (IDEC). To avoid the need for an environmental land use restriction (ELUR) at a property, the RDEC established in the RSRs must be met. Further, soils within fifteen feet of the ground surface must exhibit contaminant concentrations lower than the default, numeric RDEC, unless an ELUR is in effect that ensures that such soil will remain inaccessible and will not be disturbed as the result of excavation, demolition, or similar activities.

Relative to protection of groundwater from migration or leaching of contaminants into groundwater, the CTDEEP established the PMC, further classified by the quality and classification of groundwater (i.e. GA, GB). The Site is located in an area with a GB classification. In general, the PMC applies to all soil in the unsaturated zone from the ground surface to the seasonal high water table in GB-classified areas. The PMC does not apply to areas which are rendered environmentally-isolated and polluted with substances other than VOCs, provided an ELUR has been filed and is in effect. Environmentally-isolated soils are defined as certain contaminated soils below the seasonal low water table, beneath an existing building, and not a source of ongoing contamination.

The soil data collected from this Subsurface Investigation are compared to the RDEC, IDEC, and the GB PMC of the RSRs to provide an understanding of the magnitude of concentrations of constituents detected in soil to criteria established by the State of Connecticut as protective of human health and the environment, and protective to groundwater.

5.3.2 Groundwater Remediation Criteria

Groundwater remediation criteria established in the RSRs are dependent on the groundwater classification with the objectives of (1) protect and preserve groundwater in GA-classified areas; (2) protect existing groundwater use regardless of classification; (3) prevent further degradation of groundwater quality; (4) prevent degradation of surface water from discharges of contaminated groundwater; and (5) protect human health and the environment.

Portions of the RSRs which govern groundwater regulate remediation of groundwater based on each substance present within the plume and by each distinct plume of contamination. Several factors influence the remediation goal at a given site, including: background water quality, the groundwater classification, proximity of nearby surface water, existing groundwater uses, and the presence of buildings and their usage. When assessing general groundwater remediation requirements, all of these factors must be considered in conjunction with the major numeric components of the RSRs. The RSRs include the following criteria: Groundwater Protection Criteria (GWPC), Surface Water Protection Criteria (SWPC), and Groundwater Volatilization Criteria (VC) further classified by land use (i.e. residential or industrial/commercial).

Groundwater located in a GA-classified area may be remediated to the GWPC provided (1) the background groundwater concentrations are less than or equal to the GWPC; (2) a public water distribution system is available within 200 feet of the Site; (3) the groundwater plume is not located in an APA; and (4) the groundwater plume is not located in an area of influence of a public water supply well.

Groundwater in a GA-classified area must be remediated such that the concentration of each substance in groundwater is equal to or less than the background concentration for that substance. Generally, background groundwater conditions are determined by areas that are not located in known or suspected release areas.

The SWPC applies to any plume that discharges to surface water and compliance with the SWPC, in general, is achieved when the average concentration of a compound in groundwater emanating from a site is equal to or less than the SWPC.

The VC apply to all groundwater contaminated with a VOC within 15 feet of the ground surface or a building. According to the regulations, the VOC of concern will be remediated to a concentration that is equal to or less than the applicable residential volatilization criterion (RVC) for groundwater. If groundwater contaminated with a VOC is below a building used solely for industrial or commercial activity, groundwater may be remediated such that the concentration of the substance is equal to or less than the applicable industrial/commercial volatilization criteria (IVC), provided that an ELUR is in effect with respect to the parcel (or portion of the parcel covered by the building). The ELUR must also ensure that the parcel (or portion thereof beneath the building) will not be used for any residential purpose in the future and that future use is limited to industrial or commercial activity.

Because the Site is located in a GB-classified area, the groundwater data collected from this Subsurface Investigation are compared to the SWPC and the VC of the RSRs to provide an understanding of the magnitude of concentrations of constituents detected in groundwater to criteria established by the State of Connecticut as protective of groundwater and surface waters.

5.3.3 Additional Polluting Substances

Soil and groundwater remediation criteria listed in the RSRs contain default, numeric criteria for 88 substances. When a contaminant at a property is identified and not included in the list of 88 substances, unless background conditions are met, numeric criteria must be requested from and approved by the

Commissioner of the CTDEEP in order to complete cleanup under the RSRs. The Commissioner may approve the use of site-specific cleanup criteria for these Additional Polluting Substances (APS) and certain alternative criteria for soil and groundwater.

5.4 Evaluation of Results

5.4.1 Evaluation of Soil Data

Of the seven soil samples analyzed for VOCs, three compounds were reported above laboratory detection limits in two soil samples. The compound tetrachloroethylene was reported at a concentration of 7.3 µg/kg in the 10-12.5 foot interval of location W-SB-004; this concentration is below default, numeric RDEC, IDEC, and GB PMC. The compounds 1,2,4-trichlorobenzene and chloroform were reported at concentrations of 200 µg/kg and 140 µg/kg, respectively, in the 6-8 foot interval of location W-SB-005. There are currently no established RDEC, IDEC, nor GB PMC for 1,2,4-trichlorobenzene and the concentration of chloroform are below the default, numeric RSRs criteria. Locations W-SB-004 and W-SB-005 were advanced to assess historical fill placement across the Site (AOC-14).

Several SVOCs were reported above the laboratory detection limits in five of the seven soil samples submitted for analysis. Of the reported compounds, the concentration of benz(a)anthracene (1,200 µg/kg) in the 9-11.5 foot interval of location W-SB-006 was greater than the RDEC and GB PMC. The concentration of chrysene (1,300 µg/kg) in the same soil boring was greater than the GB PMC APS criterion. Soil boring W-SB-006 was advanced adjacent to a suspect historical UST (AOC-1A).

ETPH was reported above laboratory detection limits in three samples collected from locations W-SB-003 (120 mg/kg), W-SB-005 (90 mg/kg), and W-SB-007 (1,600 mg/kg). The concentration of ETPH reported in soil from location W-SB-007 is greater than the RDEC. Soil boring W-SB-007 was advanced to assess releases associated with the loading dock (AOC-12) and the oil storage room (AOC-13).

PCBs were reported above the laboratory detection limits in the 6-8 foot interval of location W-SB-005 (670 µg/kg) and the 7.5-10 foot interval of W-SB-007 (1,300 µg/kg). The concentration of PCBs in soil from location W-SB-007 is greater than the RDEC.

Pesticides and herbicides were not reported above laboratory detection limits in the six soil samples and duplicate soil sample submitted for analysis; however, due to matrix interferences caused by the presence of PCBs in W-SB-005 and W-SB-007, elevated reporting limits were presented for various pesticide compounds. Several pesticide compound reporting limits were greater than the GB PMC and in two samples, for the compound toxaphene, the reporting limit was also greater than the RDEC.

One or more metals including arsenic, barium, cadmium, chromium, lead, mercury, and silver were reported above laboratory detection limits in the seven soil samples collected from the Site, with the highest overall concentrations reported in soil collected from the 7.5-10 foot interval of location W-SB-007. The concentrations of chromium (276 mg/kg) and lead (650 mg/kg) are greater than the RDEC and IDEC for chromium, and the RDEC for lead.

Relative to an evaluation of metals data to the GB PMC, the soil sample collected from location W-SB-007, which exhibited the highest individual metals concentrations, was submitted for analysis for metals following extraction using the TCLP. The concentrations of cadmium (0.1 mg/l) and lead (2.07 mg/l) in the TCLP extract are above the GB PMC.

5.4.2 Evaluation of Groundwater Data

No VOCs, PCBs, pesticides, or herbicides were reported above laboratory detection limits in the two groundwater samples collected from the Site during this investigation.

Several SVOCs were reported above the laboratory detection limits in groundwater collected from W-MW-002 and the duplicate pair. With the exception of the concentration of phenanthrene reported in groundwater from W-MW-002 and its duplicate (1.2 µg/l and 1.7 µg/l, respectively), none of the reported SVOC concentrations were above the default, numeric SWPC. Monitoring well W-MW-002 was installed adjacent to an out-of-service heating oil UST (AOC-1B).

No ETPH were reported above laboratory detection limits in the two groundwater samples; however, ETPH was reported at a concentration of 0.35 mg/l in the duplicate sample of W-MW-002. No SWPC have been established for ETPH. The concentration of 0.35 mg/l reported in groundwater from W-MW-002 is above the SWPC APS criterion of 0.25 mg/l.

Total metals including arsenic and barium were reported in groundwater collected from W-MW-001 at concentrations of 0.004 mg/l and 0.057 mg/l, respectively. Total metals including barium and chromium were reported in groundwater collected from W-MW-002 at concentrations of 0.35 mg/l and 0.005 mg/l, respectively. None of the concentrations of total metals reported in groundwater are above default, numeric SWPC.

Dissolved metals including arsenic, barium, and lead were reported in groundwater collected from W-MW-001 at concentrations of 0.006 mg/l, 0.057 mg/l, and 0.002 mg/l, respectively. Dissolved metals including barium and chromium were reported in groundwater collected from W-MW-002 at concentrations of 0.348 mg/l and 0.004 mg/l, respectively. The concentrations of arsenic reported in groundwater from location W-MW-001 is above default, numeric SWPC.

6 SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Eolas was retained by CDM Smith, Inc. to complete a Subsurface Investigation of the property located at 1 Bostwick Avenue and a portion of the property located at 205 Bostwick Avenue, Bridgeport, Connecticut 06605. The purpose of the investigation was to evaluate the potential for a release in select AOCs at the Site including AOC-1A: Former UST- Tank A1, AOC-1B: Former UST-Tank B2; AOC-1C: Former UST-Tank C3; AOC-2: Septic Dump Station; AOC-3: Screen Building Staining; AOC-12: Loading Dock; AOC-13: Oil Storage Room; and AOC-14: Uncharacterized Fill. The scope of the investigation included completion of a geophysical survey to assess for subsurface utilities and anomalies in the area of drilling locations, advancement of seven soil borings, collection and analysis of seven soil samples, installation and development of two groundwater monitoring wells, and collection and analysis of groundwater samples from each of the wells. The following is an overview of the findings of the investigation.

6.1 Findings

Soil samples collected from the 10-12.5 foot interval of W-SB-004 and the 6-8 foot interval of W-WB-005, exhibited low concentrations of VOCs including tetrachloroethylene (W-SB-004) and, 1,2,4-trichlorobenzene and chloroform (W-SB-005). None of the reported concentrations are above default, numeric RSRs criteria. Both soil borings were advanced in areas of the Site to assess the potential for releases associated with the historical placement of polluted fill (AOC-14).

Several SVOCs were reported above the laboratory detection limits in five of the seven soil samples submitted for analysis. Of the reported compounds, the concentration of benz(a)anthracene (1,200 µg/kg) in the 9-11.5 foot interval of location W-SB-006 was greater than the RDEC and GB PMC. The concentration of chrysene (1,300 µg/kg) in the same soil boring was greater than the GB PMC APS criterion. Soil boring W-SB-006 was advanced adjacent to a suspect historical UST (AOC-1A).

ETPH was reported above laboratory detection limits in three soil samples at concentrations ranging from 120 mg/kg in location W-SB-003 to 1,600 mg/kg in location W-SB-007. Only the concentration of ETPH reported in soil collected from the 7.5-10 foot interval from location W-SB-007 is greater than the RDEC. Soil boring W-SB-007 was advanced to assess releases associated with the loading dock (AOC-12) and the oil storage room (AOC-13).

PCBs were reported above the laboratory detection limits in the 6-8 foot interval of location W-SB-005 (670 µg/kg) and the 7.5-10 foot interval of W-SB-007 (1,300 µg/kg). The concentration of PCBs in soil from location W-SB-007 is greater than the RDEC.

Pesticides and herbicides were not reported above laboratory detection limits in the six soil samples and duplicate soil sample submitted for analysis; however, due to matrix interferences caused by the presence of PCBs in W-SB-005 and W-SB-007, elevated reporting limits were presented for various pesticide compounds. Several pesticide compound reporting limits were greater than the GB PMC and in two samples, for the compound toxaphene, the reporting limit was also greater than the RDEC.

One or more metals including arsenic, barium, cadmium, chromium, lead, mercury, and silver were reported above laboratory detection limits in the seven soil samples collected from the Site, with the highest overall concentrations reported in soil collected from the 7.5-10 foot interval of location W-SB-007. The concentrations of chromium (276 mg/kg) and lead (650 mg/kg) in location W-SB-007 are greater than the RDEC and IDEC for chromium, and the RDEC for lead. The concentrations of cadmium (0.1 mg/l) and lead (2.07 mg/l) are greater than their respective GB PMC.

Relative to groundwater, no VOCs, PCBs, pesticides, or herbicides were reported above laboratory detection limits.

Several SVOCs were reported above the laboratory detection limits in groundwater collected from W-MW-002 and the duplicate pair, with the concentrations of phenanthrene (1.2 µg/l and 1.7 µg/l, respectively), above the default, numeric SWPC. Monitoring well W-MW-002 was installed adjacent to an out-of-service heating oil UST (AOC-1B).

No ETPH were reported above laboratory detection limits in the two groundwater samples; however, ETPH was reported at a concentration of 0.35 mg/l in the duplicate sample of W-MW-002. The concentration of 0.35 mg/l reported in groundwater from W-MW-002 is above the SWPC APS criterion of 0.25 mg/l.

Total metals including arsenic and barium were reported in groundwater collected from W-MW-001 at concentrations of 0.004 mg/l and 0.057 mg/l, respectively. Total metals including barium and chromium were reported in groundwater collected from W-MW-002 at concentrations of 0.35 mg/l and 0.005 mg/l, respectively. None of the concentrations of total metals reported in groundwater are above default, numeric SWPC.

Dissolved metals including arsenic, barium, and lead were reported in groundwater collected from W-MW-001 at concentrations of 0.006 mg/l, 0.057 mg/l, and 0.002 mg/l, respectively. Dissolved metals including barium and chromium were reported in groundwater collected from W-MW-002 at concentrations of 0.348 mg/l and 0.004 mg/l, respectively. The concentrations of arsenic reported in groundwater from location W-MW-001 is above default, numeric SWPC.

6.2 Conclusions

The Subsurface Investigation detailed herein has resulted in the identification of releases of oil and/or hazardous substances in AOC-1A: Former UST-Tank A1, AOC-1B: Former UST-Tank B2; AOC-1C: Former UST-Tank C3; AOC-12: Loading Dock; AOC-13: Oil Storage Room; and AOC-14: Uncharacterized Fill. In two locations, W-SB-006 and W-SB-007, soil exhibited concentrations of one or more of SVOCs, PCBs, ETPH, and metals at concentrations above default, numeric RSRs criteria, and groundwater collected from the Site exhibited concentrations of SVOCs and/or metals indicative of a release.

Based on the results of soil sampling conducted as part of this Subsurface Investigation, several options exist for the handling, management, and off-site disposal of soil from the Site at the time of site redevelopment. While additional characterization will be necessary to satisfy specific disposal facility requirements, final disposition of contaminated soil from the Site to either a lined or unlined landfill and/or incineration facility appear to be feasible options.

Relative to groundwater, metals, ETPH, PCBs, VOCs, and/or SVOCs were reported above laboratory detection limits in site groundwater. The concentrations of arsenic (dissolved) in groundwater collected from location W-MW-001, and phenanthrene in groundwater collected from location W-MW-002 were reported above default, numeric RSRs criteria. The concentration of ETPH reported in groundwater from W-MW-002 is also above the SWPC APS criterion.

During site redevelopment, it is anticipated that it will be necessary to dewater and manage groundwater in several excavation areas. Dewatered groundwater may be managed by containment and off-site disposal to a treatment facility or discharged to an adjacent surface water. In order to discharge groundwater as dewatered wastewater to the adjacent surface water during site redevelopment under the *General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities* (effective date October 1, 2019, expiration date extended to December 30, 2020, proposed modifications expiration date September 30, 2024), the discharge shall not cause nor contribute to an exceedance of water quality standards in the receiving surface water body. The existing groundwater data set indicates that a discharge to the adjacent surface water without treatment, under the construction general permit, may not be feasible. An alternative option for the discharge of groundwater to the adjacent surface water is under the *General Permit for the Discharge of Groundwater Remediation Wastewater* (issuance date February 21, 2018, expiration date February 20, 2023). Based on the groundwater dataset, in order to satisfy the permit requirements, treatment of impacted groundwater prior to discharge may be necessary.

6.3 Recommendations

Based on the results of the Subsurface Investigation, additional investigation is warranted to evaluate those AOCs that were not included in this of this scope of work and to delineate the presence of SVOCs, ETPH, PCBs, and metals reported in soil and groundwater samples collected from AOC-1A, AOC-1B, AOC-1C, AOC-12, AOC-13, and AOC-14. Additional soil and groundwater data will also be necessary to fully characterize environmental media to determine final disposition options prior to site redevelopment.

7 REFERENCES

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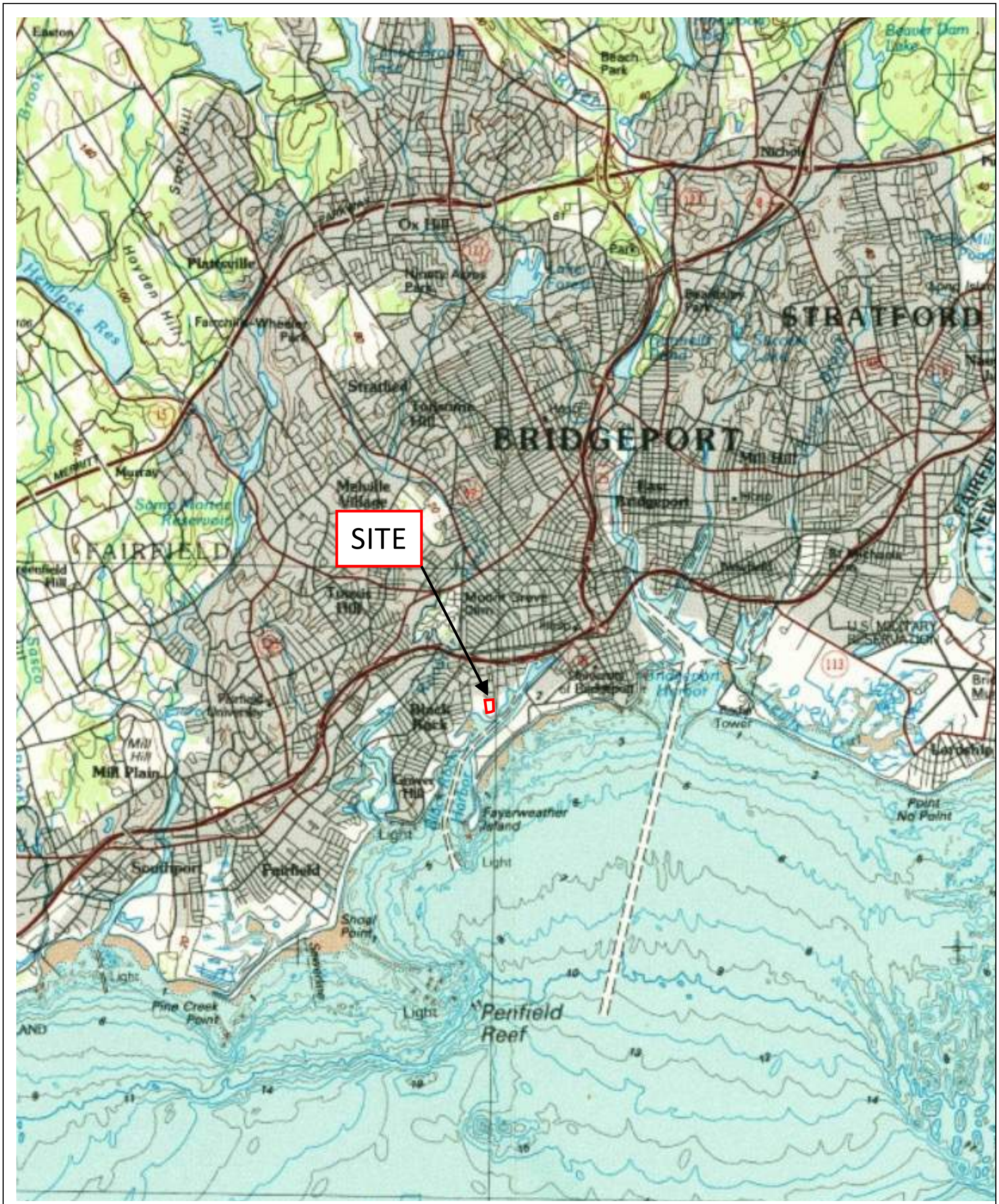
APPENDICES

APPENDIX A

Figures



PROJECT:	Subsurface Investigation
SITE LOCATION:	205 Bostwick Avenue (Portion) and 1 Bostwick Avenue, Bridgeport, CT 06605
SOURCE:	USGS 7.5 Minute Topographic Map Bridgeport, Connecticut 1986
SCALE:	1:24000 Approximate

N

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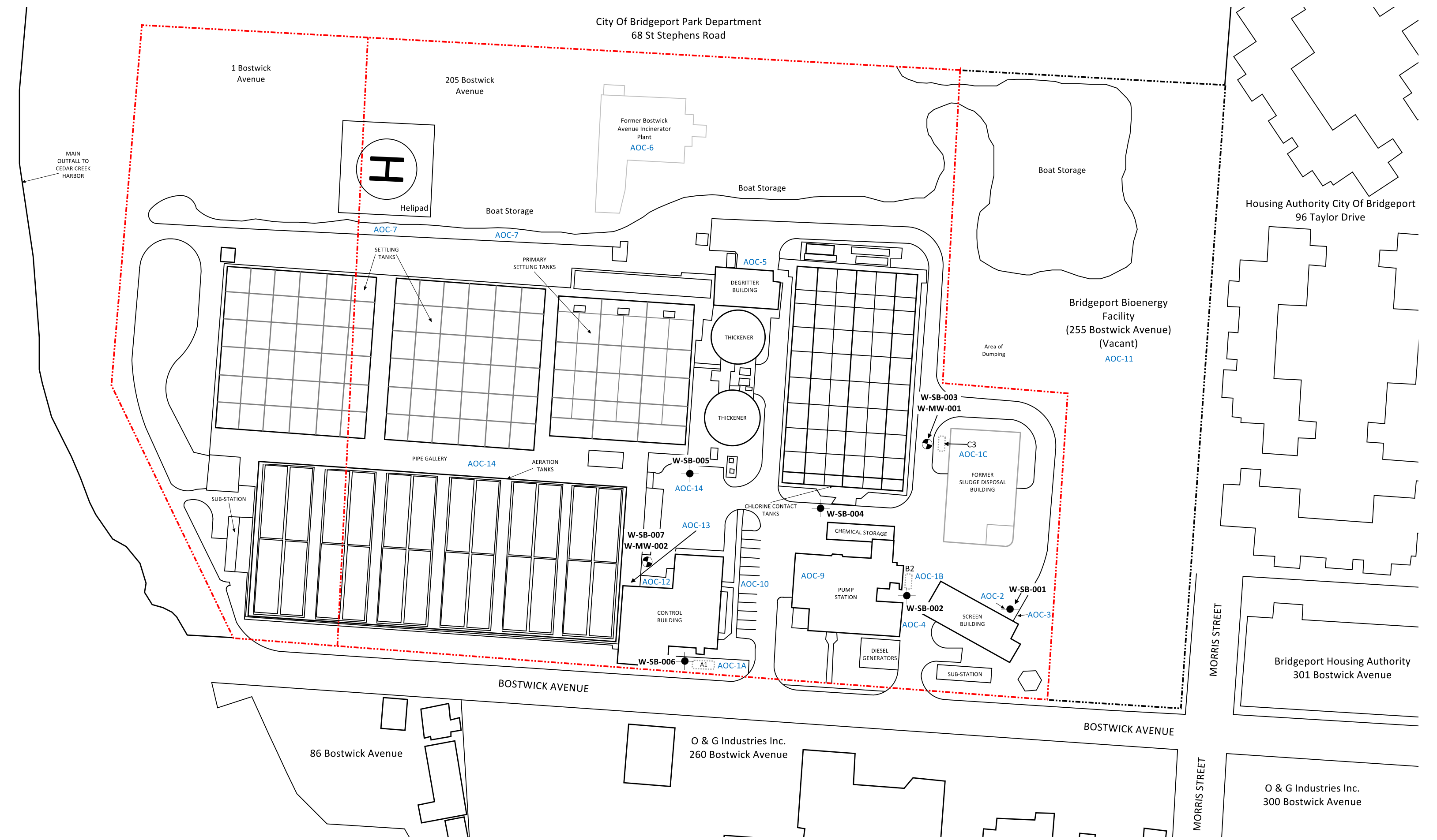
FIGURE 1
SITE LOCATION MAP



N

LEGEND:

-·-·-·- PARCEL BOUNDARY

⌖ SOIL BORING LOCATION

◐ MONITORING WELL

-·-·-·- SITE BOUNDARY

▭ UST (Closed-In-Place)

PROJECT: Subsurface Investigation

SITE LOCATION: 205 Bostwick Avenue (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605

SOURCE: City of Bridgeport GIS

SCALE: NOT TO SCALE

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FIGURE 2
SITE PLAN AND SAMPLE LOCATION MAP

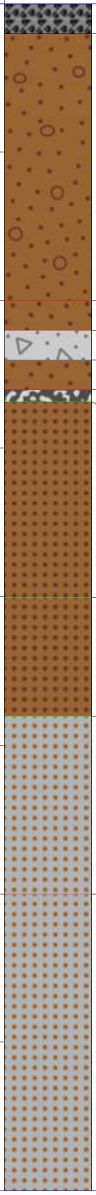
APPENDIX B

Soil Boring Logs

Site Location: West Plant, 205 Bostwick Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

BORING LOCATION: W-SB-001	**GROUND SURFACE ELEVATION AND DATUM:** NA
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-1-2020 @ 0806 **DATE & TIME FINISHED:** 9-1-2020 @ 0818
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 20 fbg
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** NA
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke
HAMMER WEIGHT: NA **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh



DEPTH (feet)	SAMPLES		PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) Soil Classification: Modified Burmister	COMMENTS
	Sample ID	Recovery Inches			
0 1 2 3 4	-	48/60	0.0 0.0	0"-4" ASPHALT, SUB-BASE 4"- 48" Brown medium to very fine SAND and GRAVEL, trace fractured Gravel and Brick-like material, moderately dense, moist	
5 6 7 8 9	-	33/60	0.0 0.0	0"-5" SAME AS ABOVE 5"-10" Fractured Cobble 10"-15" SAME AS 0"- 60" ABOVE 15"-17" BLACK ASPHALTIC MATERIAL 17"-33" Brown fine to very fine SAND, moderately dense, very moist to wet ▼	
10 11 12 13 14	W-SB-001-10-12.5 @ 0820 & DUP-912020 @ 0830	60/60	0.0 0.0	0"- 24" SAME AS ABOVE 24"- 60" SAME AS ABOVE but gray-brown and very wet	
15 16 17 18 19 20	- -	60/60	0.0 0.0	0"- 60" SAME AS ABOVE	Bottom of Boring @ 20'

NOTES:

▼ Observed depth to water

Site Location: West Plant, 205 Bostwick Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

BORING LOCATION: W-SB-002

GROUND SURFACE ELEVATION AND DATUM: NA

DRILLING CONTRACTOR: Cisco Geotechnical, LLC

DATE & TIME STARTED: 9-1-2020 @ 0850

DATE & TIME FINISHED: 9-1-2020 @ 0910

DRILLING METHOD: Direct Push

BORING DEPTH (ft.): 20 fbg

DRILLING EQUIPMENT: Geoprobe 6620DT

DEPTH TO WATER: NA

SAMPLING METHOD: Macro Core/Grab

LOGGED BY: Alexander Clarke

HAMMER WEIGHT: NA

DROP: NA

PROJECT MANAGER: Kimberly Walsh

DEPTH (feet)	SAMPLES		PID (ppm)	**SOIL DESCRIPTION/ LITHOLOGY** (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**	**COMMENTS**
	Sample ID	Recovery Inches			
0				0"-4" ASPHALT, SUB-BASE	
1			0.0	4"-30" Brown fine to very fine SAND and GRAVEL, little pulverized Cobbles	
2	-	48/60			
3					
4			0.0	30"-48" Brown fine to very fine SAND, some Silt from 30" to 35" moderatley dense, moist	
5					
6			0.0		
7	-	50/60		0"-50" SAME AS ABOVE, but very moist from 40"- 50" and trace Charred Wood fragments from 40"- 50"	
8					
9			0.0		
10					
11			0.0	▼	
12	W-SB-002-10-12.5 @ 0905	60/60		0"-60" SAME AS ABOVE but no wood and wet at 12"	
13					
14			0.0		
15	-				
16			0.0		
17		60/60		0"-60" SAME AS ABOVE	
18	-				
19			0.0		Bottom of Boring @ 20'
20					

NOTES:
▼ Observed depth to water

Site Location: West Plant, 205 Bostwick Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING AND MONITORING WELL LOG

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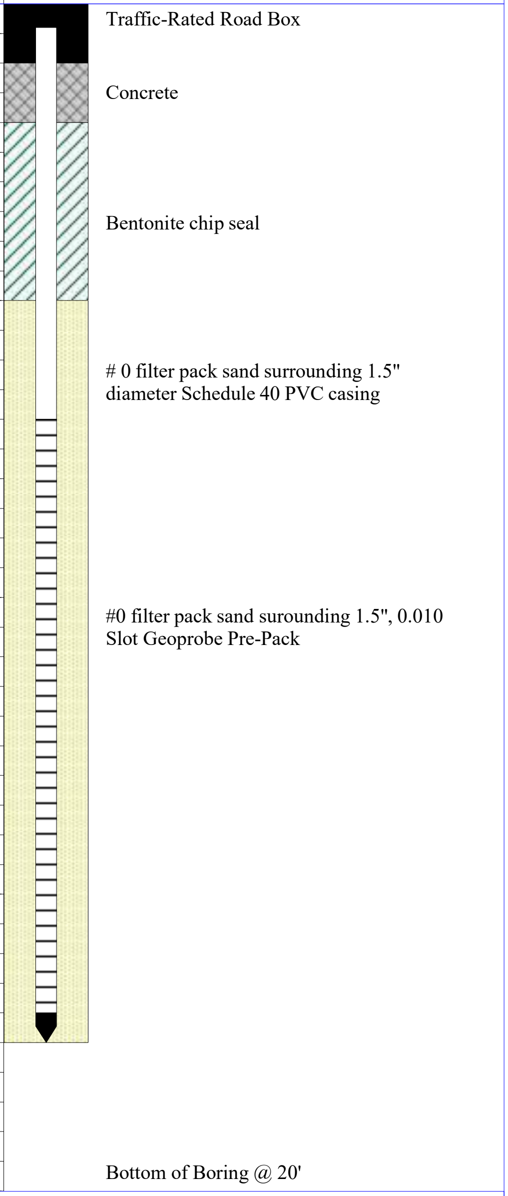
BORING LOCATION: W-SB-003 / W-MW-001	**GROUND SURFACE ELEVATION AND DATUM:** NA	
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-1-2020 @ 0915	**DATE & TIME FINISHED:** 9-1-2020 @ 0950
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 20 fbg	**SCREEN INTERVAL (ft.):** 7-17
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** NA	**CASING:** 1.5" Sch.40PVC
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke	
HAMMER WEIGHT: NA **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh	

DEPTH (feet)	SAMPLES Sample ID	SAMPLES Recovery Inches	PID (ppm)	**SOIL DESCRIPTION/ LITHOLOGY** (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**
0		52/60		0"- 4" ASPHALT, SUB-BASE
1			0.0	4"-30" Brown fine to very fine SAND and GRAVEL, little pulverized Cobbles
2.5			0.0	30"-52" Brown fine to very fine SAND, some Silt from 30" to 35" moderately dense, moist
5	W-SB-003-9-11 @ 0935	50/60	0.0	0"-40" Brown fine to very fine SAND, trace fine to very fine Gravel
8			1.2	40"-50" Black fine to very fine SAND with little Silt with mild weathered petroleum odor, moderately dense, moist to very moist
10		60/60	0.0 0.0	0"-60" Brown fine to very fine SAND, moderately dense, wet @ 10.5" ▼
15		60/60	0.0 0.0	0"-60" SAME AS ABOVE but very wet
20				

WELL CONSTRUCTION DETAILS

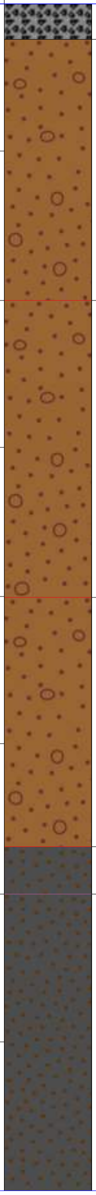


NOTES:
▼ Observed depth to water

Site Location: West Plant, 205 Bostwick Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

BORING LOCATION: W-SB-004	**GROUND SURFACE ELEVATION AND DATUM:** NA
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-1-2020 @ 1005
	DATE & TIME FINISHED: 9-1-2020 @ 1020
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 20 fbg
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** NA
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke
HAMMER WEIGHT: NA **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh



DEPTH (feet)	SAMPLES		PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**	WELL CONSTRUCTION DETAILS
	Sample ID	Recovery Inches			
0 1 2 3 4	-	50/60	0.0 0.0	0"-6" ASPHALT, SUB-BASE 6"-50" Brown fine to very fine SAND, trace fine to very fine GRAVEL and black Asphaltic Granules, moderately dense, moist	
5 6 7 8 9	-	48/60	0.0 0.0	0"-48" SAME AS ABOVE but no Asphaltic Granules, very moist from 40"- 48"	
10 11 12 13 14	W-SB-004-10-11 @ 1018	58/60	0.0 0.0	▼ 0"-48" SAME AS ABOVE but wet at 10" 48"- 58" SAME AS ABOVE but gray-brown	
15 16 17 18 19 20	- -	60/60	0.0 0.0	0"-60" Gray-brown fine to very fine SAND with some Silt and layering	Bottom of Boring @ 20'

NOTES:
▼ Observed depth to water

Site Location: West Plant, 205 Bostwick Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

BORING LOCATION: W-SB-005	**GROUND SURFACE ELEVATION AND DATUM:** NA	
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-1-2020 @ 1030	**DATE & TIME FINISHED:** 9-1-2020 @ 1040
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 8 fbg	
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** NA	
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke	
HAMMER WEIGHT: NA **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh	

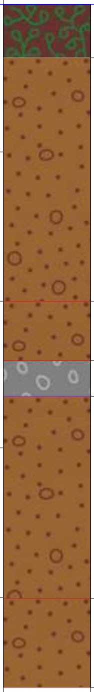
DEPTH (feet)	SAMPLES Sample ID	SAMPLES Recovery Inches	PID (ppm)	**SOIL DESCRIPTION/ LITHOLOGY** (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**	**WELL CONSTRUCTION DETAILS**
0	-	50/60	0.0 0.0	0"-6" ASPHALT, SUB-BASE 6"-50" Brown fine to very fine SAND, GRAVEL with trace Asphaltic Granules and Slag-Like Material, moderately dense, moist	
5	W-SB-005-6-8 @ 1038	36/60	0.0	0"-36" SAME AS ABOVE but trace Brick and Ceramic-Like Material (FILL) moderately dense, moist	Refusal @ 8'
10	-				
15	- -				
20					

NOTES:
▼ Observed depth to water

Site Location: West Plant, 205 Bostwick Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

BORING LOCATION: W-SB-006	**GROUND SURFACE ELEVATION AND DATUM:** NA
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-1-2020 @ 1052 **DATE & TIME FINISHED:** 9-1-2020 @ 1105
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 11.5 fbg
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** NA
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke
HAMMER WEIGHT: NA **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh



DEPTH (feet)	SAMPLES Sample ID	SAMPLES Recovery Inches	PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) Soil Classification: Modified Burmister	WELL CONSTRUCTION DETAILS
0				0"-10" TOPSOIL	
1			0.0		
2	-	46/60		10"- 46" Brown fine to very fine SAND, trace Silt and fine to very fine Gravel, moderately dense, moist	
3					
4			0.0		
5				0"-12" SAME AS ABOVE	
6			0.0	12"-14" Gray MEDIUM GRAVEL	
7				▼	
8		36/60		14"- 36" Red-brown fine to very fine SAND and GRAVEL, moderately dense, wet, but very wet from 24"- 25.5"	
9	W-SB-006-9-11.5 @ 1110, DUP-9 12020 @ 1120		0.0		
10					
11			0.0	SAME AS ABOVE	Refusal @ 11.5'
12					
13					
14	-				
15					
16					
17					
18	-				
19					
20					

NOTES:
▼ Observed depth to water

Site Location: West Plant, 205 Bostwick Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING AND MONITORING WELL LOG

eolas environmental LLC

BORING LOCATION: W-SB-007 / W-MW-002

GROUND SURFACE ELEVATION AND DATUM: NA

DRILLING CONTRACTOR: Cisco Geotechnical, LLC

DATE & TIME STARTED: 9-1-2020 @ 1120

DATE & TIME FINISHED: 9-1-2020 @ 1215

DRILLING METHOD: Direct Push

BORING DEPTH (ft.): 20 fbg

SCREEN INTERVAL (ft.): 7-17

DRILLING EQUIPMENT: Geoprobe 6620DT

DEPTH TO WATER: 8 fbg

CASING: 1.5" Sch.40PVC

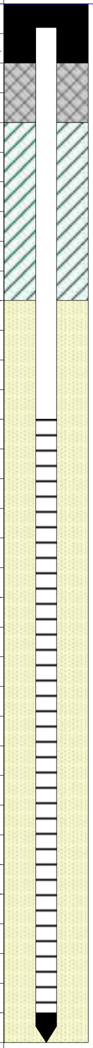
SAMPLING METHOD: Macro Core/Grab

LOGGED BY: Alexander Clarke

HAMMER WEIGHT: NA

DROP: NA

PROJECT MANAGER: Kimberly Walsh



DEPTH (feet)	SAMPLES Sample ID	SAMPLES Recovery Inches	PID (ppm)	**SOIL DESCRIPTION/ LITHOLOGY** (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**	**WELL CONSTRUCTION DETAILS**
0				0"- 8" ASPHALT, SUB-BASE	Traffic-Rated Road Box
1			0.0		Concrete
2	-	46/60			
3				8"- 46" Brown fine to very fine SAND and GRAVEL, trace Silt, moderately dense, moist	
4			0.0		Bentonite chip seal
5					
6			0.0	0"- 24" SAME AS ABOVE but very moist from 18"-24"	# 0 filter pack sand surrounding 1.5" diameter Schedule 40 PVC casing
7	W-SB-007-7.5-10 @ 1135	38/60			
8				▼ 24"- 38" Blackish-brown fine to very fine SAND, some Silt, trace fine to very fine Gravel, moderately dense, wet with mild organic/weathered petroleum odor	
9			14.0		
10					#0 filter pack sand surounding 1.5", 0.010 Slot Geoprobe Pre-Pack
11			0.0		
12	-	49/60		0"-46" SAME AS ABOVE	
13					
14			0.0		
15				46"- 49" Brown Peat	
16			3.3	0"- 24" Black-brown fine to very fine SAND and SILT, some Organic Matter with mild organic weathered petroleum odor	
17	-	60/60			
18					
19			0.0	24"- 60" Gray-brown fine to very fine SAND, moderately dense, wet	
20					Bottom of Boring @ 20'

NOTES:
▼ Observed depth to water

APPENDIX C

Analytical Data Tables

eolas environmental

Table 1
Summary of Soil Sampling Results
City of Bridgeport West Wastewater Treatment Plant
205 Bostwick (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605

						Sample Location	W-SB-001	W-SB-002	W-SB-003	W-SB-004	W-SB-005	W-SB-006	W-SB-007	Duplicate (SB-001)	Trip Blank	Trip Blank
						Sample ID	W-SB-001-10-12.5	W-SB-002-10-12.5	W-SB-003-9-11	W-SB-004-10-12.5	W-SB-005-6-8	W-SB-006-9-11.5	W-SB-007-7.5-10	DUP-912020	TB-9122020 High	TB-912020 Low
						Lab Sample ID	CG66894	CG66895	CG66896	CG66897	CG66898	CG66899	CG66900	CG66892	CG66902	CG66891
						Collection Date	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020
						Depth (fbg)	10-12.5	10-12.5	9.0-11.0	10.0-12.5	6.0-8.0	9.0-11.5	7.5-10.0	10-12.5	N/A	N/A
Parameter	**GB PMC**	**GB PMC APS**	**RDEC**	**RDEC APS**	**IDEC**	**IDEC APS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Miscellaneous (RDEC, IDEC - mg/kg) (PMC - mg/l by SPLP/TCLP)																
Cyanide	2	--	1,400	--	41,000	--	<0.50	<0.61	<0.59	<0.56	<0.56	--	<0.62	<0.54	--	--
Metals (RDEC, IDEC - mg/kg) (PMC - mg/l by SPLP/TCLP) (*20X PMC)																
Arsenic	10*	--	10	--	10	--	**1.58**	**2.86**	**3.11**	**0.95**	**5.41**	**1.81**	**9.96**	**1.52**	--	--
Arsenic - SPLP/TCLP	0.5	--	NE	--	NE	--	NA	NA	NA	NA	NA	NA	<0.1	NA	--	--
Barium	200*	--	4,700	--	140,000	--	**13.2**	**47.2**	**67.8**	**26.6**	**70.7**	**41.1**	**385**	**14.7**	--	--
Barium - SPLP/TCLP	10	--	NE	--	NE	--	NA	NA	NA	NA	NA	NA	**0.75**	NA	--	--
Cadmium	1*	--	34	--	1,000	--	<0.33	**0.57**	**1.7**	**0.55**	**1.51**	**0.41**	**9.12**	<0.42	--	--
Cadmium - SPLP/TCLP	0.05	--	NE	--	NE	--	NA	NA	NA	NA	NA	NA	**0.1**	NA	--	--
Chromium	10*	--	100	--	100	--	**6.91**	**11.1**	**37.9**	**9.68**	**67.9**	**13.1**	**276**	**7.81**	--	--
Chromium - SPLP/TCLP	0.5	--	NE	--	NE	--	NA	NA	NA	NA	NA	NA	<0.1	NA	--	--
Lead	3*	--	400	--	1,000	--	**5.23**	**73.7**	67.5	**10**	**74.6**	**27.6**	**650**	**7.42**	--	--
Lead - SPLP/TCLP	0.15	--	NE	--	NE	--	NA	NA	NA	NA	NA	NA	**2.07**	NA	--	--
Mercury	0.4*	--	20	--	610	--	<0.03	**0.05**	0.1	**0.08**	**0.03**	**0.17**	**0.53**	<0.03	--	--
Mercury - SPLP/TCLP	0.02	--	NE	--	NE	--	NA	NA	NA	NA	NA	NA	<0.0002	NA	--	--
Selenium	10*	--	340	--	10,000	--	<1.3	<1.7	<1.7	<1.6	<1.6	<1.5	<1.5	<1.7	--	--
Selenium - SPLP/TCLP	0.5	--	NE	--	NE	--	NA	NA	NA	NA	NA	NA	<0.1	NA	--	--
Silver	7.2*	--	340	--	10,000	--	<0.33	<0.43	<0.43	<0.41	**0.83**	<0.38	**7.01**	<0.42	--	--
Silver - SPLP/TCLP	0.36	--	NE	--	NE	--	NA	NA	NA	NA	NA	NA	<0.1	NA	--	--
Total Petroleum Hydrocarbons (mg/kg)																
Ext. Petroleum H.C. (C9-C36)	2,500	--	500	--	2,500	--	<49	<60	**120**	<60	**90**	<54	**1,600**	<59	--	--
Polychlorinated Biphenyls (RDEC, IDEC - µg/kg) (PMC - mg/l by SPLP/TCLP)																
PCB-1016	0.005	--	1000	--	10000	--	<330	<400	<430	<400	<370	<370	<400	<390	--	--
PCB-1221	0.005	--	1000	--	10000	--	<330	<400	<430	<400	<370	<370	<400	<390	--	--
PCB-1232	0.005	--	1000	--	10000	--	<330	<400	<430	<400	<370	<370	<400	<390	--	--
PCB-1242	0.005	--	1000	--	10000	--	<330	<400	<430	<400	<370	<370	<400	<390	--	--
PCB-1248	0.005	--	1000	--	10000	--	<330	<400	<430	<400	<370	<370	<400	<390	--	--
PCB-1254	0.005	--	1000	--	10000	--	<330	<400	<430	<400	<370	<370	**1,300**	<390	--	--
PCB-1260	0.005	--	1000	--	10000	--	<330	<400	<430	<400	**670**	<370	<400	<390	--	--
PCB-1262	0.005	--	1000	--	10000	--	<330	<400	<430	<400	<370	<370	<400	<390	--	--
PCB-1268	0.005	--	1000	--	10000	--	<330	<400	<430	<400	<370	<370	<400	<390	--	--
Volatile Organic Compounds (µg/kg)																
1,1,1,2-Tetrachloroethane	200	--	24,000	--	220,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<200	<5.0
1,1,1-Trichloroethane	40,000	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,1,2,2-Tetrachloroethane	100	--	3,100	--	29,000	--	<2.9	<3.0	<3.2	<3.8	<2.9	<2.8	<3.0	<3.2	<100	<3.0
1,1,2-Trichloroethane	1,000	--	11,000	--	100,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,1-Dichloroethane	14,000	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,1-Dichloroethylene	1,400	--	1,000	--	9,500	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,1-Dichloropropene	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,2,3-Trichlorobenzene	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,2,3-Trichloropropane	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,2,4-Trichlorobenzene	NE	14,000	NE	21,000	NE	200,000	<4.8	<4.9	<5.3	<340	**200**	<4.7	<4.9	<5.4	<250	<5.0
1,2,4-Trimethylbenzene	NE	28,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,2-Dibromo-3-chloropropane	NE	40	NE	90	NE	820	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<100	<5.0
1,2-Dibromoethane	100	--	7	--	67	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<100	<5.0
1,2-Dichlorobenzene	3,100	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,2-Dichloroethane	200	--	6,700	--	63,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<200	<5.0
1,2-Dichloropropane	1,000	--	9,000	--	84,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,3,5-Trimethylbenzene	NE	28,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,3-Dichlorobenzene	120,000	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,3-Dichloropropane	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
1,4-Dichlorobenzene	15,000	--	26,000	--	240,000	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
2,2-Dichloropropane	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
2-Chlorotoluene	NE	28,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
2-Hexanone	NE	7,000	NE	340,000	NE	1,000,000	<24	<25	<27	<32	<24	<24	<25	<27	<1,300	<25
2-Isopropyltoluene	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
4-Chlorotoluene	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
4-Methyl-2-pentanone	14,000	--	500,000	--	1,000,000	--	<24	<25	<27	<32	<24	<24	<25	<27	<1,300	<25
Acetone	140,000	--	500,000	--	1,000,000	--	<240	<250	<270	<320	<240	<240	<250	<270	<5,000	<250

Table 1
Summary of Soil Sampling Results
City of Bridgeport West Wastewater Treatment Plant
205 Bostwick (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605

						Sample Location	W-SB-001	W-SB-002	W-SB-003	W-SB-004	W-SB-005	W-SB-006	W-SB-007	Duplicate (SB-001)	Trip Blank	Trip Blank
						Sample ID	W-SB-001-10-12.5	W-SB-002-10-12.5	W-SB-003-9-11	W-SB-004-10-12.5	W-SB-005-6-8	W-SB-006-9-11.5	W-SB-007-7.5-10	DUP-912020	TB-9122020 High	TB-912020 Low
						Lab Sample ID	CG66894	CG66895	CG66896	CG66897	CG66898	CG66899	CG66900	CG66892	CG66902	CG66891
						Collection Date	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020
						Depth (fbg)	10-12.5	10-12.5	9.0-11.0	10.0-12.5	6.0-8.0	9.0-11.5	7.5-10.0	10-12.5	N/A	N/A
Parameter	**GB PMC**	**GB PMC APS**	**RDEC**	**RDEC APS**	**IDEC**	**IDEC APS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Acrylonitrile	100	--	1,100	--	11,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<100	<5.0
Benzene	200	--	21,000	--	200,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<200	<5.0
Bromobenzene	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Bromochloromethane	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Bromodichloromethane	NE	210	NE	18,000	NE	170,000	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<210	<5.0
Bromoform	800	--	78,000	--	720,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Bromomethane	NE	700	NE	34,000	NE	1,000,000	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Carbon Disulfide	NE	8,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Carbon tetrachloride	1,000	--	4,700	--	44,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Chlorobenzene	20,000	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Chloroethane	NE	1,500	NE	130,000	NE	1,000,000	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Chloroform	1,200	--	100,000	--	940,000	--	<4.8	<4.9	<5.3	<6.4	**140**	<4.7	<4.9	<5.4	<250	<5.0
Chloromethane	NE	3,600	NE	180,000	NE	1,000,000	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
cis-1,2-Dichloroethylene	14,000	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
cis-1,3-Dichloropropene	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<100	<5.0
Dibromochloromethane	100	--	7,300	--	68,000	--	<2.9	<3.0	<3.2	<3.8	<2.9	<2.8	<3.0	<3.2	<100	<3.0
Dibromomethane	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Dichlorodifluoromethane	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Ethylbenzene	10,100	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Hexachlorobutadiene	NE	1,500	NE	130,000	NE	1,200,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Isopropylbenzene	NE	5,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
m&p-Xylene	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Methyl ethyl ketone	80,000	--	500,000	--	1,000,000	--	<29	<30	<32	<38	<29	<28	<30	<32	<3,000	<30
Methyl t-butyl ether (MTBE)	20,000	--	500,000	--	1,000,000	--	<9.5	<9.9	<11	<13	<9.8	<9.4	<9.9	<11	<250	<10
Methylene chloride	1,000	--	82,000	--	760,000	--	<9.5	<9.9	<11	<13	<9.8	<9.4	<9.9	<11	<500	<10
Naphthalene	56,000	--	1,000,000	--	2,500,000	--	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
n-Butylbenzene	NE	70,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
n-Propylbenzene	NE	10,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
o-Xylene	NE	--	NE	--	NE	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
p-Isopropyltoluene	NE	5,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
sec-Butylbenzene	NE	70,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Styrene	20,000	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
tert-Butylbenzene	NE	70,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<340	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Tetrachloroethylene	1,000	--	12,000	--	110,000	--	<4.8	<4.9	<5.3	**7.3**	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Tetrahydrofuran (THF)	NE	800	NE	61,000	NE	570,000	<9.5	<9.9	<11	<13	<9.8	<9.4	<9.9	<11	<500	<10
Toluene	67,000	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Total Xylenes	19,500	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
trans-1,2-Dichloroethylene	20,000	--	500,000	--	1,000,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
trans-1,3-Dichloropropene	100	--	3,400	--	32,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<100	<5.0
trans-1,4-dichloro-2-butene	NE	--	NE	--	NE	--	<9.5	<9.9	<11	<680	<9.8	<9.4	<9.9	<11	<500	<10
Trichloroethene	1,000	--	56,000	--	520,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Trichlorofluoromethane	NE	200,000	NE	500,000	NE	1,000,000	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Trichlorotrifluoroethane	NE	200,000	NE	500,000	NE	1,000,000	<9.5	<9.9	<11	<13	<9.8	<9.4	<9.9	<11	<250	<10
Vinyl chloride	400	--	320	--	3,000	--	<4.8	<4.9	<5.3	<6.4	<4.9	<4.7	<4.9	<5.4	<250	<5.0
Semivolatile Organic Compounds (µg/kg)																
1,2,4,5-Tetrachlorobenzene	NE	1,000	NE	20,000	NE	610,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
1,2,4-Trichlorobenzene	NE	14,000	NE	21,000	NE	200,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
1,2-Dichlorobenzene	NE	--	NE	--	NE	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
1,2-Diphenylhydrazine	NE	1,000	NE	770	NE	7,200	<330	<400	<430	<410	<370	<370	<400	<390	--	--
1,3-Dichlorobenzene	NE	--	NE	--	NE	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
1,4-Dichlorobenzene	NE	--	NE	--	NE	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2,4,5-Trichlorophenol	NE	140,000	NE	1,000,000	NE	2,500,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2,4,6-Trichlorophenol	NE	1,000	NE	56,000	NE	520,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2,4-Dichlorophenol	4,000	--	200,000	--	2,500,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2,4-Dimethylphenol	NE	28,000	NE	1,000,000	NE	2,500,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2,4-Dinitrophenol	NE	2,800	NE	140,000	NE	2,500,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
2,4-Dinitrotoluene	NE	1,000	NE	900	NE	8,400	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2,6-Dinitrotoluene	NE	1,000	NE	900	NE	8,400	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2-Chloronaphthalene	NE	110,000	NE	500,000	NE	1,000,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2-Chlorophenol	7,200	--	340,000	--	2,500,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--

Table 1
Summary of Soil Sampling Results
City of Bridgeport West Wastewater Treatment Plant
205 Bostwick (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605

						Sample Location	W-SB-001	W-SB-002	W-SB-003	W-SB-004	W-SB-005	W-SB-006	W-SB-007	Duplicate (SB-001)	Trip Blank	Trip Blank
						Sample ID	W-SB-001-10-12.5	W-SB-002-10-12.5	W-SB-003-9-11	W-SB-004-10-12.5	W-SB-005-6-8	W-SB-006-9-11.5	W-SB-007-7.5-10	DUP-912020	TB-9122020 High	TB-912020 Low
						Lab Sample ID	CG66894	CG66895	CG66896	CG66897	CG66898	CG66899	CG66900	CG66892	CG66902	CG66891
						Collection Date	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020
						Depth (fbg)	10-12.5	10-12.5	9.0-11.0	10.0-12.5	6.0-8.0	9.0-11.5	7.5-10.0	10-12.5	N/A	N/A
Parameter	**GB PMC**	**GB PMC APS**	**RDEC**	**RDEC APS**	**IDEC**	**IDEC APS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
2-Methylnaphthalene	NE	5,600	NE	270,000	NE	1,000,000	<230	<280	<300	<280	<260	<260	**1,100**	<270	--	--
2-Methylphenol (o-cresol)	NE	28,000	NE	1,000,000	NE	2,500,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
2-Nitroaniline	NE	2,000	NE	31,000	NE	290,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
2-Nitrophenol	NE	--	NE	--	NE	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
3&4-Methylphenol (m&p-cresol)	NE	--	NE	--	NE	--	<330	<400	<430	<410	<370	<370	<400	<390	--	--
3,3'-Dichlorobenzidine	NE	1,000	NE	1,400	NE	13,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
3-Nitroaniline	NE	2,000	NE	31,000	NE	290,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
4,6-Dinitro-2-methylphenol	NE	2,000	NE	20,000	NE	610,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
4-Bromophenyl phenyl ether	NE	--	NE	--	NE	--	<330	<400	<430	<410	<370	<370	<400	<390	--	--
4-Chloro-3-methylphenol	NE	140,000	NE	1,000,000	NE	2,500,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
4-Chloroaniline	NE	1,000	NE	3,100	NE	29,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
4-Chlorophenyl phenyl ether	NE	--	NE	--	NE	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
4-Nitroaniline	NE	2,000	NE	31,000	NE	290,000	<520	<640	<690	<650	<590	<590	<640	<630	--	--
4-Nitrophenol	NE	--	NE	--	NE	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Acenaphthene	NE	84,000	NE	1,000,000	NE	2,500,000	<230	<280	<300	<280	<260	**320**	**430**	<270	--	--
Acenaphthylene	84,000	--	1,000,000	--	2,500,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Acetophenone	NE	--	NE	--	NE	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Aniline	NE	1,200	NE	110,000	NE	1,000,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
Anthracene	400,000	--	1,000,000	--	2,500,000	--	<230	<280	<300	<280	<260	**540**	**410**	<270	--	--
Benz(a)anthracene	1,000	--	1,000	--	7,800	--	<230	**290**	**320**	<280	**570**	**1,200**	**720**	<270	--	--
Benzidine	NE	1,000	NE	200	NE	200	<200	<200	<200	<200	<200	<200	<200	<200	--	--
Benzo(a)pyrene	1,000	--	1,000	--	1,000	--	<230	**290**	**350**	<280	**660**	**1,000**	**640**	<270	--	--
Benzo(b)fluoranthene	1,000	--	1,000	--	7,800	--	<230	<280	**340**	<280	**590**	**1,000**	**560**	<270	--	--
Benzo(ghi)perylene	NE	1,000	NE	8,400	NE	78,000	<230	<280	<300	<280	**480**	**630**	**420**	<270	--	--
Benzo(k)fluoranthene	1,000	--	8,400	--	78,000	--	<230	<280	**310**	<280	**570**	**930**	**380**	<270	--	--
Benzoic acid	NE	200,000	NE	1,000,000	NE	2,500,000	<660	<800	<860	<810	<730	<740	<800	<780	--	--
Benzyl butyl phthalate	200,000	--	1,000,000	--	2,500,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Bis(2-chloroethoxy)methane	NE	4,200	NE	200,000	NE	2,500,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Bis(2-chloroethyl)ether	2,400	--	1,000	--	5,200	--	<330	<400	<430	<410	<370	<370	<400	<390	--	--
Bis(2-chloroisopropyl)ether	2,400	--	8,800	--	82,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Bis(2-ethylhexyl)phthalate	11,000	--	44,000	--	410,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Carbazole	NE	1,000	NE	31,000	NE	290,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
Chrysene	NE	1,000	NE	84,000	NE	780,000	<230	**300**	**460**	<280	**640**	**1,300**	**760**	<270	--	--
Dibenz(a,h)anthracene	NE	1,000	NE	1,000	NE	1,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Dibenzofuran	NE	1,400	NE	68,000	NE	1,000,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Diethyl phthalate	NE	200,000	NE	1,000,000	NE	2,500,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Dimethylphthalate	NE	200,000	NE	1,000,000	NE	2,500,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Di-n-butylphthalate	140,000	--	1,000,000	--	2,500,000	--	<330	<400	<430	<410	<370	<370	<400	<390	--	--
Di-n-octylphthalate	20,000	--	1,000,000	--	2,500,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Fluoranthene	56,000	--	1,000,000	--	2,500,000	--	<230	**660**	**1,500**	<280	**850**	**3,000**	**1,300**	<270	--	--
Fluorene	56,000	--	1,000,000	--	2,500,000	--	<230	<280	<300	<280	<260	<260	**420**	<270	--	--
Hexachlorobenzene	1,000	--	1,000	--	3,600	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Hexachlorobutadiene	NE	1,500	NE	130,000	NE	1,200,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Hexachlorocyclopentadiene	NE	8,400	NE	410,000	NE	1,000,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Hexachloroethane	1,000	--	44,000	--	410,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Indeno(1,2,3-cd)pyrene	NE	1,000	NE	1,000	NE	7,800	<230	<280	<300	<280	**540**	**710**	**470**	<270	--	--
Isophorone	NE	7,400	NE	640,000	NE	2,500,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Naphthalene	56,000	--	1,000,000	--	2,500,000	--	<230	<280	<300	<280	<260	<260	**310**	<270	--	--
Nitrobenzene	NE	1,000	NE	4,000	NE	41,000	<230	<280	<300	<280	<260	<260	<280	<270	--	--
N-Nitrosodimethylamine	NE	1,000	NE	200	NE	360	<200	<200	<200	<200	<200	<200	<200	<200	--	--
N-Nitrosodi-n-propylamine	NE	1,000	NE	200	NE	820	<200	<200	<200	<200	<200	<200	<200	<200	--	--
N-Nitrosodiphenylamine	NE	1,400	NE	130,000	NE	1,200,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
Pentachloronitrobenzene	NE	1,400	NE	68,000	NE	2,000,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
Pentachlorophenol	1,000	--	5,100	--	48,000	--	<330	<400	<430	<410	<370	<370	<400	<390	--	--
Phenanthrene	40,000	--	1,000,000	--	2,500,000	--	<230	**520**	**470**	<280	**450**	**2,900**	**1,100**	<270	--	--
Phenol	800,000	--	1,000,000	--	2,500,000	--	<230	<280	<300	<280	<260	<260	<280	<270	--	--
Pyrene	40,000	--	1,000,000	--	2,500,000	--	<230	**570**	**1,300**	<280	**870**	**2,500**	**1,900**	<270	--	--
Pyridine	NE	1,000	NE	20,000	NE	610,000	<330	<400	<430	<410	<370	<370	<400	<390	--	--
Pesticides (μg/kg)																
4,4'-DDD	NE	20	NE	1,800	NE	17,000	<6.6	<8.1	<8.5	<8.1	<7.3	--	<8.1	<7.7	--	--

Table 1
Summary of Soil Sampling Results
City of Bridgeport West Wastewater Treatment Plant
205 Bostwick (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605

						Sample Location	W-SB-001	W-SB-002	W-SB-003	W-SB-004	W-SB-005	W-SB-006	W-SB-007	Duplicate (SB-001)	Trip Blank	Trip Blank
						Sample ID	W-SB-001-10-12.5	W-SB-002-10-12.5	W-SB-003-9-11	W-SB-004-10-12.5	W-SB-005-6-8	W-SB-006-9-11.5	W-SB-007-7.5-10	DUP-912020	TB-9122020 High	TB-912020 Low
						Lab Sample ID	CG66894	CG66895	CG66896	CG66897	CG66898	CG66899	CG66900	CG66892	CG66902	CG66891
						Collection Date	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020	9/1/2020
						Depth (fbg)	10-12.5	10-12.5	9.0-11.0	10.0-12.5	6.0-8.0	9.0-11.5	7.5-10.0	10-12.5	N/A	N/A
Parameter	**GB PMC**	**GB PMC APS**	**RDEC**	**RDEC APS**	**IDEC**	**IDEC APS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
4,4'-DDE	NE	20	NE	1,800	NE	17,000	<6.6	<8.1	<8.5	<8.1	<7.3	--	<8.1	<7.7	--	--
4,4'-DDT	NE	20	NE	1,800	NE	17,000	<6.6	<8.1	<8.5	<8.1	<60	--	<61	<7.7	--	--
a-BHC	NE	10	NE	340	NE	3,200	<6.6	<8.1	<8.5	<8.1	<7.3	--	<8.1	<7.7	--	--
Alachlor	400	--	7,700	--	72,000	--	<6.6	<8.1	<8.5	<8.1	<37	--	<40	<7.7	--	--
Aldrin	NE	10	NE	40	NE	340	<3.3	<4.0	<4.3	<4.0	<7.3	--	<8.1	<3.9	--	--
b-BHC	NE	10	NE	340	NE	3,200	<6.6	<8.1	<8.5	<8.1	<7.3	--	<8.1	<7.7	--	--
Chlordane	66	66	490	490	2,200	2,200	<33	<40	<43	<40	<73	--	<81	<39	--	--
d-BHC	NE	10	NE	340	NE	3,200	<6.6	<8.1	<8.5	<8.1	<7.3	--	<8.1	<7.7	--	--
Dieldrin	7	--	38	--	360	--	<3.3	<4.0	<4.3	<4.0	<28	--	<8.1	<3.9	--	--
Endosulfan I	NE	840	NE	41,000	NE	1,000,000	<6.6	<8.1	<8.5	<8.1	<37	--	<40	<7.7	--	--
Endosulfan II	NE	840	NE	41,000	NE	1,000,000	<6.6	<8.1	<8.5	<8.1	<37	--	<40	<7.7	--	--
Endosulfan sulfate	NE	840	NE	41,000	NE	1,000,000	<6.6	<8.1	<8.5	<8.1	<37	--	<40	<7.7	--	--
Endrin	400	400	20,000	20,000	610,000	610,000	<6.6	<8.1	<8.5	<8.1	<37	--	<40	<7.7	--	--
Endrin aldehyde	NE	400	NE	20,000	NE	610,000	<6.6	<8.1	<8.5	<8.1	<37	--	<40	<7.7	--	--
Endrin ketone	NE	400	NE	20,000	NE	610,000	<6.6	<8.1	<8.5	<8.1	<37	--	<40	<7.7	--	--
g-BHC	40	--	20,000	--	610,000	--	<1.3	<1.6	<1.7	<1.6	<7.3	--	<8.1	<1.5	--	--
Heptachlor	13	--	140	--	1,300	--	<6.6	<8.1	<8.5	<8.1	<18	--	<46	<7.7	--	--
Heptachlor epoxide	20	--	67	--	630	--	<6.6	<8.1	<8.5	<8.1	<18	--	<20	<7.7	--	--
Methoxychlor	8000	--	340,000	--	10,000,000	--	<33	<40	<43	<40	<180	--	<200	<39	--	--
Toxaphene	600	--	560	--	5,200	--	<130	<160	<170	<160	<730	--	<810	<150	--	--
Herbicides (µg/kg)																
2,4,5-T	NE	--	NE	--	NE	--	<83	<100	<110	<100	<93	--	<100	<98	--	--
2,4,5-TP (Silvex)	NE	--	NE	--	NE	--	<83	<100	<110	<100	<93	--	<100	<98	--	--
2-4D	14,000	--	680,000	--	20,000,000	--	<170	<200	<210	<200	<190	--	<200	<200	--	--
2,4-DB	NE	--	NE	--	NE	--	<1,700	<2,000	<2,100	<2,000	<1,900	--	<2,000	<2,000	--	--
Dalapon	NE	--	NE	--	NE	--	<83	<100	<110	<100	<93	--	<100	<98	--	--
Dicamba	NE	42,000	NE	500,000	NE	1,000,000	<83	<100	<110	<100	<93	--	<100	<98	--	--
Dichloroprop	NE	5,000	NE	240,000	NE	1,000,000	<170	<200	<210	<200	<190	--	<200	<200	--	--
Dinoseb	NE	--	NE	--	NE	--	<170	<200	<210	<200	<190	--	<200	<200	--	--

Notes:

Standards derived from RSRs Sections 22a-133k-1 through 22a-133k-3, Appendix A through F.

RDEC - Residential Direct Exposure Criteria

IDEC - Industrial Direct Exposure Criteria

GB PMC - GB Pollutant Mobility Criteria

mg/kg - milligrams per kilogram

mg/l - milligrams per liter

µg/kg - micrograms per kilogram

µg/l - micrograms per liter

N/A - Not Applicable

NE - None Established

-- Not Analyzed or Not Applicable

Results Detected Above Laboratory Reporting Limit

Reporting Limit Exceeds One or More Criteria

Result Exceeds One or More Criteria

Table 2
Summary of Groundwater Sampling Results
City of Bridgeport West Wastewater Treatment Plant
205 Bostwick Avenue (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605

						Sample Location	W-MW-001	W-MW-002	Duplicate (MW-002)	Trip Blank
						Sample ID	W-MW-001	W-MW-002	W-DUP-09152020	W-TB-09152020
						Lab Sample ID	CG77960	CG77958	CG77960	CG77957
						Collection Date	9/15/2020	9/15/2020	9/15/2020	9/15/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
Metals, Total (mg/l)										
Arsenic	0.004	--	NE	--	NE	--	**0.004**	<0.004	<0.004	--
Barium	NE	2.2	NE	--	NE	--	**0.057**	**0.35**	**0.351**	--
Cadmium	0.006	--	NE	--	NE	--	<0.001	<0.001	<0.001	--
Chromium	0.11	--	NE	--	NE	--	<0.001	**0.005**	**0.005**	--
Lead	0.013	--	NE	--	NE	--	<0.002	<0.002	<0.002	--
Mercury	0.0004	--	NE	--	NE	--	<0.0002	<0.0002	<0.0002	--
Selenium	0.05	--	NE	--	NE	--	<0.010	<0.010	<0.010	--
Silver	0.012	--	NE	--	NE	--	<0.001	<0.001	<0.001	--
Metals, Dissolved (mg/l)										
Arsenic	0.004	--	NE	--	NE	--	**0.006**	<0.004	<0.004	--
Barium	NE	2.2	NE	--	NE	--	**0.057**	**0.348**	**0.351**	--
Cadmium	0.006	--	NE	--	NE	--	<0.001	<0.001	<0.001	--
Chromium	0.11	--	NE	--	NE	--	<0.001	**0.004**	**0.004**	--
Lead	0.013	--	NE	--	NE	--	**0.002**	<0.002	**0.002**	--
Mercury	0.0004	--	NE	--	NE	--	<0.0002	<0.0002	<0.0002	--
Selenium	0.05	--	NE	--	NE	--	<0.011	<0.011	<0.011	--
Silver	0.012	--	NE	--	NE	--	<0.001	<0.001	<0.001	--
Total Petroleum Hydrocarbons (mg/l)										
Ext. Petroleum H.C. (C9-C36)	NE	0.25	NE	--	NE	--	<0.066	<0.067	**0.35**	--
Polychlorinated Biphenyls (µg/l)										
PCB-1016	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
PCB-1221	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
PCB-1232	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
PCB-1242	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
PCB-1248	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
PCB-1254	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
PCB-1260	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
PCB-1262	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
PCB-1268	0.5	--	NE	--	NE	--	<0.095	<0.095	<0.095	--
Volatile Organic Compounds (µg/l)										
1,1,1,2-Tetrachloroethane	NE	330	12	--	50	--	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	62,000	--	20,400	--	50,000	--	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	110	--	23	--	100	--	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	1,260	--	8,000	--	19,600	--	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	NE	4,100	34,600	--	50,000	--	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	96	--	1	--	6	--	<1.0	<1.0	<1.0	<1.0
1,1-Dichloropropene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichloropropane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
1,2,4-Trichlorobenzene	NE	9.6	NE	12	NE	660	<1.0	<1.0	<1.0	<1.0
1,2,4-Trimethylbenzene	NE	150	NE	940	NE	12,800	<1.0	<1.0	<1.0	<1.0
1,2-Dibromo-3-chloropropane	NE	1.1	NE	--	NE	--	<0.50	<0.50	<0.50	<0.50
1,2-Dibromoethane	NE	--	4	--	16	--	<0.50	<0.50	<0.50	<0.50
1,2-Dichlorobenzene	170,000	--	30,500	--	50,000	--	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	2,970	--	21	--	90	--	<0.60	<0.60	<0.60	<0.60
1,2-Dichloropropane	NE	150	14	--	60	--	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	NE	260	NE	730	NE	10,000	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	26,000	--	24,200	--	50,000	--	<1.0	<1.0	<1.0	<1.0
1,3-Dichloropropane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	26,000	--	50,000	--	50,000	--	<1.0	<1.0	<1.0	<1.0
2,2-Dichloropropane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
2-Chlorotoluene	NE	10,000	NE	2,100	NE	28,300	<1.0	<1.0	<1.0	<1.0
2-Hexanone	NE	10,000	NE	7,600	NE	94,000	<5.0	<5.0	<5.0	<5.0
2-Isopropyltoluene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
4-Chlorotoluene	NE	10,000	NE	1,900	NE	25,200	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-pentanone	NE	--	50,000	--	50,000	--	<5.0	<5.0	<5.0	<5.0
Acetone	NE	10,000	50,000	--	50,000	--	<25	<25	<25	<25
Acrylonitrile	20	--	NE	--	NE	--	<0.50	<0.50	<0.50	<0.50
Benzene	710	--	215	--	530	--	<0.70	<0.70	<0.70	<0.70
Bromobenzene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
Bromochloromethane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	NE	510	NE	1.1	NE	35	<0.50	<0.50	<0.50	<0.50
Bromoform	10,800	--	920	--	3,800	--	<1.0	<1.0	<1.0	<1.0
Bromomethane	NE	160	NE	83	NE	1,100	<1.0	<1.0	<1.0	<1.0
Carbon Disulfide	NE	150	NE	2,100	NE	5,200	<5.0	<5.0	<5.0	<5.0
Carbon tetrachloride	132	--	16	--	40	--	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	420,000	--	1,800	--	6,150	--	<1.0	<1.0	<1.0	<1.0
Chloroethane	NE	10,000	NE	22	NE	360	<1.0	<1.0	<1.0	<1.0
Chloroform	14,100	--	287	--	710	--	<1.0	<1.0	<1.0	<1.0
Chloromethane	NE	10,000	NE	130	NE	1,800	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethylene	NE	6,200	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
cis-1,3-Dichloropropene	NE	--	NE	--	NE	--	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	1,020	--	NE	--	NE	--	<0.50	<0.50	<0.50	<0.50
Dibromomethane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane	NE	10,000	NE	53	NE	720	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	580,000	--	50,000	--	50,000	--	<1.0	<1.0	<1.0	<1.0
Hexachlorobutadiene	NE	10	NE	--	NE	--	<0.40	<0.40	<0.40	<0.40
Isopropylbenzene	NE	210	NE	900	NE	2,200	<1.0	<1.0	<1.0	<1.0
m&p-Xylene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0

Table 2
Summary of Groundwater Sampling Results
City of Bridgeport West Wastewater Treatment Plant
205 Bostwick Avenue (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605

						Sample Location	W-MW-001	W-MW-002	Duplicate (MW-002)	Trip Blank
						Sample ID	W-MW-001	W-MW-002	W-DUP-09152020	W-TB-09152020
						Lab Sample ID	CG77960	CG77958	CG77960	CG77957
						Collection Date	9/15/2020	9/15/2020	9/15/2020	9/15/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
Methyl ethyl ketone	NE	10,000	50,000	--	50,000	--	<5.0	<5.0	<5.0	<5.0
Methyl t-butyl ether (MTBE)	NE	10,000	50,000	--	50,000	--	1.4	<1.0	<1.0	<1.0
Methylene chloride	48,000	--	50,000	--	50,000	--	<1.0	<1.0	<1.0	<1.0
Naphthalene	NE	210	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
n-Butylbenzene	NE	10,000	NE	1,600	NE	21,800	<1.0	<1.0	<1.0	<1.0
n-Propylbenzene	NE	10,000	NE	1,200	NE	2,900	<1.0	<1.0	<1.0	<1.0
o-Xylene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
p-Isopropyltoluene	NE	200	NE	870	NE	2,100	<1.0	<1.0	<1.0	<1.0
sec-Butylbenzene	NE	10,000	NE	1,500	NE	20,100	<1.0	<1.0	<1.0	<1.0
Styrene	NE	320	580	--	2,065	--	<1.0	<1.0	<1.0	<1.0
tert-Butylbenzene	NE	10,000	NE	1,900	NE	25,300	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	88	--	1,500	--	3,820	--	<1.0	<1.0	<1.0	<1.0
Tetrahydrofuran (THF)	NE	9,600	NE	250	NE	3,700	<2.5	<2.5	<2.5	<2.5
Toluene	4,000,000	--	23,500	--	50,000	--	<1.0	<1.0	<1.0	<1.0
Total Xylenes	NE	270	21,300	--	50,000	--	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethylene	NE	10,000	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	34,000	--	6	--	25	--	<0.40	<0.40	<0.40	<0.40
trans-1,4-dichloro-2-butene	NE	--	NE	--	NE	--	<5.0	<5.0	<5.0	<5.0
Trichloroethylene	2,340	--	219	--	540	--	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	NE	10,000	NE	1,300	NE	4,300	<1.0	<1.0	<1.0	<1.0
Trichlorotrifluoroethane	NE	320	NE	330	NE	810	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	15,750	--	2	--	2	--	<1.0	<1.0	<1.0	<1.0
Semivolatile Organic Compounds (µg/l)										
1,2,4,5-Tetrachlorobenzene	NE	11	NE	--	NE	--	<3.4	<3.4	<3.4	--
1,2,4-Trichlorobenzene	NE	9.6	NE	12	NE	660	<4.8	<4.8	<4.8	--
1,2-Dichlorobenzene	NE	--	NE	--	NE	--	<2.4	<2.4	<2.4	--
1,2-Diphenylhydrazine	NE	6	NE	--	NE	--	<4.8	<4.8	<4.8	--
1,3-Dichlorobenzene	NE	--	NE	--	NE	--	<2.4	<2.4	<2.4	--
1,4-Dichlorobenzene	NE	--	NE	--	NE	--	<2.4	<2.4	<2.4	--
2,4,5-Trichlorophenol	NE	28	NE	--	NE	--	<0.96	<0.96	<0.96	--
2,4,6-Trichlorophenol	NE	49	NE	--	NE	--	<0.96	<0.96	<0.96	--
2,4-Dichlorophenol	15,800	--	NE	--	NE	--	<0.96	<0.96	<0.96	--
2,4-Dimethylphenol	NE	150	NE	--	NE	--	<0.96	<0.96	<0.96	--
2,4-Dinitrophenol	NE	710	NE	--	NE	--	<0.96	<0.96	<0.96	--
2,4-Dinitrotoluene	NE	100	NE	--	NE	--	<4.8	<4.8	<4.8	--
2,6-Dinitrotoluene	NE	46	NE	--	NE	--	<4.8	<4.8	<4.8	--
2-Chloronaphthalene	NE	10,000	NE	27,300	NE	50,000	<4.8	<4.8	<4.8	--
2-Chlorophenol	NE	420	NE	--	NE	--	<0.96	<0.96	<0.96	--
2-Methylphenol (o-cresol)	NE	670	NE	--	NE	--	<0.96	<0.96	<0.96	--
2-Nitroaniline	NE	210	NE	--	NE	--	<4.8	<4.8	<4.8	--
2-Nitrophenol	NE	560	NE	--	NE	--	<0.96	<0.96	<0.96	--
3&4-Methylphenol (m&p-cresol)	NE	--	NE	--	NE	--	<9.6	<9.6	<9.6	--
3,3'-Dichlorobenzidine	NE	5	NE	--	NE	--	<4.8	<4.8	<4.8	--
3-Nitroaniline	NE	70	NE	--	NE	--	<4.8	<4.8	<4.8	--
4,6-Dinitro-2-methylphenol	NE	10	NE	--	NE	--	<0.96	<0.96	<0.96	--
4-Bromophenyl phenyl ether	NE	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
4-Chloro-3-methylphenol	NE	73	NE	--	NE	--	<0.96	<0.96	<0.96	--
4-Chloroaniline	NE	9.9	NE	--	NE	--	<4.8	<4.8	<4.8	--
4-Chlorophenyl phenyl ether	NE	--	NE	--	NE	--	<0.96	<0.96	<0.96	--
4-Nitroaniline	NE	1,200	NE	--	NE	--	<4.8	<4.8	<4.8	--
4-Nitrophenol	NE	--	NE	--	NE	--	<0.96	<0.96	<0.96	--
Acetophenone	NE	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
Aniline	NE	41	NE	--	NE	--	<4.8	<4.8	<4.8	--
Benzidine	NE	5	NE	--	NE	--	<4.8	<4.8	<4.8	--
Benzoic acid	NE	9,000	NE	--	NE	--	<48	<48	<48	--
Benzyl butyl phthalate	NE	230	NE	--	NE	--	<4.8	<4.8	<4.8	--
Bis(2-chloroethoxy)methane	NE	10,000	NE	--	NE	--	<4.8	<4.8	<4.8	--
Bis(2-chloroethyl)ether	42	--	NE	--	NE	--	<0.96	<0.96	<0.96	--
Bis(2-chloroisopropyl)ether	3,400,000	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
Bis(2-ethylhexyl)phthalate	59	--	NE	--	NE	--	<0.96	<0.96	<0.96	--
Carbazole	NE	53	NE	--	NE	--	<4.8	<4.8	<4.8	--
Dibenzofuran	NE	40	NE	460	NE	5,800	<0.96	<0.96	<0.96	--
Diethyl phthalate	NE	2,200	NE	--	NE	--	<4.8	<4.8	<4.8	--
Dimethylphthalate	NE	10,000	NE	--	NE	--	<4.8	<4.8	<4.8	--
Di-n-butylphthalate	120,000	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
Di-n-octylphthalate	NE	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
Hexachloroethane	89	--	NE	--	NE	--	<0.96	<0.96	<0.96	--
Isophorone	NE	9,200	NE	--	NE	--	<4.8	<4.8	<4.8	--
N-Nitrosodimethylamine	NE	90	NE	--	NE	--	<4.8	<4.8	<4.8	--
N-Nitrosodi-n-propylamine	NE	15	NE	--	NE	--	<4.8	<4.8	<4.8	--
N-Nitrosodiphenylamine	NE	180	NE	--	NE	--	<4.8	<4.8	<4.8	--
Pentachloronitrobenzene	NE	25	NE	--	NE	--	<2.4	<2.4	<2.4	--
Phenol	92,000,000	--	NE	--	NE	--	<0.96	<0.96	<0.96	--
Semivolatile Organic Compounds (SIM) (µg/l)										
2-Methylnaphthalene	NE	62	NE	1,000	NE	13,100	<0.48	**0.57**	**0.76**	--
Acenaphthene	NE	150	NE	30,500	NE	50,000	<0.48	**1.3**	**1.8**	--
Acenaphthylene	0.3	--	NE	--	NE	--	<0.29	<0.29	<0.29	--
Anthracene	1,100,000	--	NE	--	NE	--	<0.48	<0.48	<0.48	--
Benz(a)anthracene	0.3	--	NE	--	NE	--	<0.05	<0.05	<0.05	--
Benzo(a)pyrene	0.3	--	NE	--	NE	--	<0.19	<0.19	<0.19	--
Benzo(b)fluoranthene	0.3	--	NE	--	NE	--	<0.07	<0.07	<0.07	--

Table 2
Summary of Groundwater Sampling Results
City of Bridgeport West Wastewater Treatment Plant
205 Bostwick Avenue (Portion) and 1 Bostwick Avenue, Bridgeport, Connecticut 06605

eolas environmental

						Sample Location	W-MW-001	W-MW-002	Duplicate (MW-002)	Trip Blank
						Sample ID	W-MW-001	W-MW-002	W-DUP-09152020	W-TB-09152020
						Lab Sample ID	CG77960	CG77958	CG77960	CG77957
						Collection Date	9/15/2020	9/15/2020	9/15/2020	9/15/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
Benzo(ghi)perylene	NE	150	NE	--	NE	--	<0.46	<0.46	<0.46	--
Benzo(k)fluoranthene	0.3	--	NE	--	NE	--	<0.29	<0.29	<0.29	--
Chrysene	NE	0.54	NE	--	NE	--	<0.48	<0.48	<0.48	--
Dibenz(a,h)anthracene	NE	0.3	NE	--	NE	--	<0.10	<0.10	<0.10	--
Fluoranthene	3,700	--	NE	--	NE	--	<0.48	<0.48	**0.59**	--
Fluorene	140,000	--	NE	--	NE	--	<0.48	**0.98**	**1.4**	--
Hexachlorobenzene	0.077	--	NE	--	NE	--	<0.06	<0.06	<0.06	--
Hexachlorobutadiene	NE	10	NE	--	NE	--	<0.48	<0.48	<0.48	--
Hexachlorocyclopentadiene	NE	0.7	NE	--	NE	--	<0.48	<0.48	<0.48	--
Indeno(1,2,3-cd)pyrene	NE	0.54	NE	--	NE	--	<0.10	<0.10	<0.10	--
Naphthalene	NE	210	NE	--	NE	--	<0.48	<0.48	**0.52**	--
Nitrobenzene	NE	2,300	NE	51	NE	750	<0.48	<0.48	<0.48	--
Pentachlorophenol	NE	30	NE	--	NE	--	<0.48	<0.48	<0.48	--
Phenanthrene	0.077	14	NE	--	NE	--	<0.06	**1.2**	**1.7**	--
Pyrene	110,000	--	NE	--	NE	--	<0.48	<0.48	<0.48	--
Pyridine	NE	260	NE	1,900	NE	23,500	<0.48	<0.48	<0.48	--
Pesticides (µg/l)										
4,4'-DDD	NE	0.05	NE	--	NE	--	<0.048	<0.048	<0.048	--
4,4'-DDE	NE	0.05	NE	--	NE	--	<0.048	<0.048	<0.048	--
4,4'-DDT	NE	0.05	NE	--	NE	--	<0.048	<0.048	<0.048	--
a-BHC	NE	0.11	NE	--	NE	--	<0.024	<0.024	<0.024	--
Alachlor	NE	450	NE	--	NE	--	<0.071	<0.071	<0.071	--
Aldrin	NE	0.05	NE	--	NE	--	<0.001	<0.001	<0.001	--
b-BHC	NE	0.11	NE	--	NE	--	<0.005	<0.005	<0.005	--
Chlordane	0.3	0.3	NE	--	NE	--	<0.29	<0.29	<0.29	--
d-BHC	NE	0.11	NE	--	NE	--	<0.024	<0.024	<0.024	--
Dieldrin	0.1	--	NE	--	NE	--	<0.001	<0.001	<0.001	--
Endosulfan I	NE	0.56	NE	--	NE	--	<0.048	<0.048	<0.048	--
Endosulfan II	NE	0.56	NE	--	NE	--	<0.048	<0.048	<0.048	--
Endosulfan Sulfate	NE	0.56	NE	--	NE	--	<0.048	<0.048	<0.048	--
Endrin	0.1	0.1	NE	--	NE	--	<0.048	<0.048	<0.048	--
Endrin Aldehyde	NE	0.1	NE	--	NE	--	<0.048	<0.048	<0.048	--
Endrin ketone	NE	0.1	NE	--	NE	--	<0.048	<0.048	<0.048	--
g-BHC (Lindane)	NE	0.11	NE	--	NE	--	<0.024	<0.024	<0.024	--
Heptachlor	0.05	--	NE	--	NE	--	<0.024	<0.024	<0.024	--
Heptachlor epoxide	0.05	--	NE	--	NE	--	<0.024	<0.024	<0.024	--
Methoxychlor	NE	0.5	NE	--	NE	--	<0.095	<0.095	<0.095	--
Toxaphene	1	--	NE	--	NE	--	<0.95	<0.95	<0.95	--
Chlorinated Herbicides (µg/l)										
2,4,5-T	NE	--	NE	--	NE	--	<2.5	<2.5	<2.5	--
2,4,5-TP (Silvex)	NE	--	NE	--	NE	--	<2.5	<2.5	<2.5	--
2,4-D	NE	1,700	NE	--	NE	--	<5.0	<5.0	<5.0	--
2,4-DB	NE	--	NE	--	NE	--	<50	<50	<50	--
Dalapon	NE	--	NE	--	NE	--	<2.5	<2.5	<2.5	--
Dicamba	NE	2,200	NE	--	NE	--	<2.5	<2.5	<2.5	--
Dichloroprop	NE	120	NE	--	NE	--	<5.0	<5.0	<5.0	--
Dinoseb	NE	--	NE	--	NE	--	<5.0	<5.0	<5.0	--

Notes:

Standards derived from RSRs Sections 22a-133k-1 through 22a-133k-3, Appendix A through F.

GWPC - Groundwater Protection Criteria

SWPC - Surface Water Protection Criteria

VC - Volatilization Criteria

RES - Residential

I/C - Industrial/Commercial

µg/l - micrograms per liter

mg/l - milligrams per liter

NA - Not Analyzed

NE - None Established

-- Not Analyzed or Not Applicable

Results Detected Above Laboratory Reporting Limit

Reporting Limit Exceeds One or More Criteria

Result Exceeds One or More Criteria

Result Exceeds One or More APS Criteria

APPENDIX D

Laboratory Analytical Reports

Detailed Laboratory Reports Available Upon Request

East Side WWTP

Subsurface Investigation Report

601 (695) Seaview Avenue
Bridgeport, Connecticut 06607

Prepared for:
CDM Smith, Inc
77 Hartland Street
Suite 201
East Hartford, Connecticut 06108

Report Date:
November 6, 2020

Transforming Challenges into Solutions.

eolas environmental LLC

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ACRONYMS

AMSL	Above Mean Sea Level
AOC	Area(s) of Concern
APA	Aquifer Protection Area
AST	Aboveground Storage Tank
COC	Constituent of Concern
CSM	Conceptual Site Model
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTECO	Connecticut Environmental Conditions Online
DQO	Data Quality Objective
ELUR	Environmental Land Use Restriction
EMI	Electromagnetic Induction
EPA	United States Environmental Protection Agency
ESA	Environmental Site Assessment
ETPH	Extractable Total Petroleum Hydrocarbons
FIRM	Flood Insurance Rate Map
GC/MS	Gas Chromatography/Mass Spectrometry
GIS	Geographic Information System
GPR	Ground Penetrating Radar
GWPC	Groundwater Protection Criteria
IDEC	Industrial/Commercial Direct Exposure Criteria
IVC	Industrial/Commercial Volatilization Criteria
LUST	Leaking Underground Storage Tank
NDDB	Natural Diversity Database
NWI	National Wetland Inventory
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PMC	Pollutant Mobility Criteria
QA/QC	Quality Assurance/Quality Control
RCP	Reasonable Confidence Protocol
RCRA	Resource Conservation and Recovery Act
RCSA	Regulations of Connecticut State Agencies
RDEC	Residential Direct Exposure Criteria
RPD	Relative Percent Difference
RSRs	Remediation Standard Regulations
RVC	Residential Volatilization Criteria
SCGD	Site Characterization Guidance Document
SIM	Selected Ion Monitoring
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	Semivolatile Organic Compound
SWPC	Surface Water Protection Criteria
TCLP	Toxicity Characteristic Leaching Procedure
USFN	Underground Storage Facilities Notification
USGS	United States Geological Survey
UST	Underground Storage Tank
VC	Volatilization Criteria
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

UNITS

fbg	feet below grade
mgd	million gallons per day
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
ppm	parts per million
µg/kg	micrograms per kilogram
µg/l	micrograms per liter

1 INTRODUCTION

Eolas Environmental, LLC (Eolas) was retained by CDM Smith, Inc. to complete a Subsurface Investigation of the property located at 601 (695) Seaview Avenue, Bridgeport, Fairfield County, Connecticut 06607 (herein referred to as the "Site"). The Site is comprised of one, irregularly-shaped 9.16-acre parcel, on which the City of Bridgeport East Wastewater Treatment Plant (WWTP) facility ("East Side Plant") is located. The Site is improved with five primary buildings, secondary WWTP structures and tanks, and associated parking and driveways. This Subsurface Investigation Report has been prepared for the exclusive benefit of CDM Smith, Inc., who may rely on it. Assignment of this document and reliance by any other person or entity can be made only with the written permission of Eolas.

1.1 Purpose and Scope

On behalf of CDM Smith, Inc., Eolas recently completed a Phase I Environmental Site Assessment (ESA) of the Site. Based on the findings of the Phase I ESA, Areas of Concern (AOCs) were identified at the Site at which additional investigation is warranted. The purpose of the Subsurface Investigation was to evaluate a subset of AOCs (AOC-1, AOC-2A, AOC-2B, AOC-3, AOC-4, AOC-8, AOC-12, and AOC-13) identified at the Site in the above-referenced Phase I ESA to determine whether a release of oil and/or hazardous substances has occurred and to characterize soil and groundwater conditions in the AOCs to support an understanding of future management, treatment, and/or disposal requirements during future site redevelopment. A release is considered to have occurred if concentrations of AOC-specific contaminants of concern (COCs) are detected above naturally-occurring or background conditions.

The scope of the Subsurface Investigation included the completion of a ground penetrating radar (GPR) and Electromagnetic Induction (EMI) survey on areas of the Site targeted for drilling activities, advancement and sampling of seven soil borings, and the installation, development and sampling of two groundwater monitoring wells. The investigation of the above AOCs was conducted in general accordance with the Connecticut Department of Energy & Environmental Protection (CTDEEP, a.k.a. CTDEP) *Site Characterization Guidance Document,* dated September 2007 and revised to December 2010.

At this time, the Site is not currently in a state clean-up program and, therefore, is not specifically subject to remediation under the Connecticut Remediation Standard Regulations (RSRs) (Section 22a-133k-1 through 22a-133k-3 of the Regulations of Connecticut State Agencies [RCSA], adopted January 1, 1996 and amended June 27, 2013). The environmental data gathered during the conduct of this Subsurface Investigation were evaluated against RSRs criteria to provide CDM Smith, Inc. with a baseline understanding and guidance relative to potential environmental concerns and exposures that may exist at the Site.

1.2 Significant Assumptions

This report is prepared with the assumption that information provided in historical documentation used to develop the Phase I ESA and scope of this Subsurface Investigation is accurate and complete. Eolas assumes the Site has been correctly and accurately identified by CDM Smith, Inc. (User) and designated representatives of the User.

1.3 Limitations and Exceptions

Eolas was retained to perform this work for CDM Smith, Inc. per our December 19, 2019 agreement. Eolas represents only that it provides services in accordance with generally-accepted practices in the environmental assessment field. No other representation, expressed or implied, is included or intended as part of its services, proposals, contracts or reports.

1.4 Special Terms and Conditions/User Reliance

This report has been prepared exclusively for the use and benefit of and may be relied upon by CDM Smith, Inc. and any respective successors and assigns. Any third party agrees by accepting this report that any use or reliance on this report shall be limited by the exceptions and limitations in this report, and with the acknowledgement that actual site conditions may change with time, and that hidden conditions may exist at the property that were not discovered within the authorized scope of this investigation. Any use by or distribution of this report to third parties, without the express written consent of Eolas, is at the sole risk and expense of such third party.

2 SITE OVERVIEW AND HISTORY

This section includes a brief description of the Site, current land use, utility information, and surrounding land use.

SITE SUMMARY	
Site Name	Bridgeport East Wastewater Treatment Plant (East Side Plant)
Site Address	601 (695) Seaview Avenue, Bridgeport, Connecticut 06607
MBLU	Map 30, Block 664, Lot 1/A
Property Size	9.16-acre
Zoning	I-H, General Industrial Use and MU-W, Mixed Use, Waterfront Zone
Building(s)	Pump Station, Screen Building, Control Building, Degritter Building, Sludge Building, Administration Building/Garage, and Secondary WWTP Structures and Tanks
Construction Date(s)	1940-2000
Current Use(s)	Step feed activated sludge wastewater treatment plant
Site Investigation Dates	August 28, 2020 – September 29, 2020

2.1 Location and Legal Description

The Site is located along the western side of Seaview Avenue in mixed residential-, industrial-, commercial-, and municipal-use area of the City of Bridgeport, Fairfield County, Connecticut. The Site is comprised of a 9.16-acre, irregularly-shaped parcel designated by the City of Bridgeport Tax Assessor as Map 30, Block 664, Lot 1/A. The postal address of the Site is 601 Seaview Avenue, Bridgeport, Connecticut 06607. The Site is also commonly known by the street address of 695 Seaview Avenue.

The location of the Site, local topography, surrounding structures, major access routes, and nearby water bodies are depicted on Figure 1, Site Location Map. Figure 1 was developed from the United States Geological Survey (USGS) Bridgeport, Connecticut7.5-minute series topographic quadrangle printed in 1986. The layout of the Site and the relation of the Site to surrounding properties are depicted on Figure 2, Site Plan and Sample Location Map. Figures 1 and 2 are included in Appendix A of this report.

2.2 Current and Historical Uses of The Site

The Site is operated by the City of Bridgeport as the East Side WWTP (i.e. East Side Plant) step feed activated sludge treatment plant with an average annual design flow capacity of ten million gallons per day (mgd). The East Side Plant process includes preliminary screening, primary clarification, secondary step feed activated sludge treatment with final clarification, and disinfection by chlorination before final effluent discharge to the Powerhouse Channel and Bridgeport Harbor.

According to historical topographic maps, the Site was first developed circa 1898 with a coal-fired powerhouse on the eastern portion of the Site. An inlet encompassed the south-central portion of the Site and appears to have been used to transport coal, via barge, to an offloading area southwest of the powerhouse. The powerhouse was operated under different entities until approximately 1949, at which time it was razed. Construction of the East Side Plant appears to have started circa 1950 with a filter bed, sludge building, pump house, incinerator, and screen building located on the central portion of the Site. The East Side Plant was expanded circa 1971, with the addition of the primary, aeration, and final tanks, and the Control Building, and Sludge Thickener Building. The Administration Building and Garage, and the Degritter Building appear to have been added to the eastern portion of the Site circa 2000.

2.3 Utilities

UTILITY SUMMARY	
Heating System	Natural Gas
Cooling System	Electric
Water	Aquarion Water Company
Sewer	City of Bridgeport
Stormwater	City of Bridgeport
Generator(s)	Single, diesel fuel-fired system, north of the Administration Building
USTs/ASTs	One 1,900-gallon diesel AST integrated with generator

2.4 Current Uses of Adjoining Properties

Adjoining properties were visually evaluated to observe property use and are described as follows:

ADJOINING PROPERTY SUMMARY	
North	Bridgeport Port Authority property at 837 Seaview Avenue and Spec Plating Inc., an industrial-use property at 740 Seaview Avenue.
South	Powerhouse Channel and unoccupied, former industrial-use property owned by Barnum Landing II LLC and located at 567 Seaview Avenue.

ADJOINING PROPERTY SUMMARY	
East	Seaview Avenue followed by undeveloped Bridgeport Port Authority property at 730 Seaview Avenue, a City of Bridgeport park at 104 Eagle Street, Jefferson Street, and residential buildings located along Seaview Avenue.
West	Bridgeport Port Authority property at 837 Seaview Avenue occupied by Bridgeport Boatworks.

The relationship of these properties with respect to the Site is depicted on Figure 2 which is included in Appendix A.

2.5 Previous Environmental Assessments

Eolas recently completed a Phase I ESA of the Site (*Phase I Environmental Site Assessment 601 (695) Seaview Avenue Bridgeport, Connecticut 06607,* July 24, 2020). The following is the summary of the findings and conclusions of the Phase I ESA.

- The Site is identified and operated as the City of Bridgeport East WWTP ("East Side Plant") and is located along the western side of Seaview Avenue in a mixed residential-, industrial-, commercial-, and municipal-use area of the City of Bridgeport , Fairfield County, Connecticut. The Site is comprised of a 9.16-acre, irregularly-shaped parcel, designated by the City of Bridgeport Tax Assessor as Map 30, Block 664, Lot 1/A. The postal address of the Site is 601 Seaview Avenue, Bridgeport, Connecticut 06607. The Site is also commonly known by the street address of 695 Seaview Avenue.

- The Site is improved with five primary buildings, secondary WWTP structures and tanks, and associated parking and driveways. The Control Building is a 18,536 square-foot, two-story, masonry structure with a flat tar and gravel roof, constructed on grade in 1971. The Sludge Building and Pump Station is a 21,098-square-foot, two-story, masonry structure with a flat tar and gravel/rubber system roof, constructed on grade in 1940. The Screen Building is a single-story masonry structure with a flat tar and gravel roof, constructed on grade in 2000. The Degritter Building is a 2,314-square-foot, single-story, masonry structure with a flat tar and gravel roof, constructed on grade in 2000. The Administrative Building/Maintenance Building is a 25,354-square-foot, two-story, masonry structure with a flat tar and gravel/rubber system roof, constructed on grade built in 1993. Ancillary structures at the Site include: three masonry built primary settling tanks, each encompassing 99 feet by 26 feet by 10.7 feet deep (partially below grade); three masonry built aeration tanks, each encompassing 43.25 feet by 20 feet by 13.67 feet deep (partially below grade); three masonry built final settling tanks, each encompassing 240 feet by 28 feet by 10.25 feet (partially below grade); and three masonry built chlorine contact tanks, each encompassing 210 feet by 34 feet by 18 feet deep (partially below grade); three masonry 30-foot diameter by 10-foot deep sludge thickener tanks; a below-grade masonry built pipe gallery; a Quonset-style grit storage building, and various above- and below-ground conveyances and junction chambers.

- The Site is served by public utilities including water provided by the Aquarion Water Company, sewer provided by the City of Bridgeport, natural gas provided by Southern Connecticut Gas Company, and electricity provided by Eversource. The heating, ventilation, and air conditioning (HVAC) systems at the East Side Plant consist of several split systems, rooftop units, three natural gas-fired boilers, and hydronic heating systems. The lowest level of the Control Building is heated with a natural gas-fired boiler with two hot water circulation pumps. The Degritter Building is heated with a natural gas-fired boiler with two hot water circulation pumps and a rooftop unit that provides heating and ventilation. A diesel fuel-fired emergency generator with an integrated 1,900-gallon AST is located to the north of the Administration Building.

- The Site was first developed circa 1898 with a coal-fired powerhouse on the eastern portion of the Site. An inlet encompassed the south-central portion of the Site and appears to have been used to transport coal, via barge, to an offloading area southwest of the powerhouse. The powerhouse was operated under different entities until approximately 1949, at which time it was razed. Construction of the East Side Plant appears to have started circa 1950 with a filter bed, sludge building, pump house, incinerator, and screen building located on the central portion of the Site. The East Side Plant was expanded circa 1971, with the addition of the primary, aeration, and final tanks, and the Control Building, and Sludge Thickener Building. The Administration Building and Garage, and the Degritter Building appear to have been added to the eastern portion of the Site circa 2000.

- Groundwater beneath the Site been assigned a classification of GB. Groundwater with a GB classification has designated uses for industrial processes and cooling water and baseflow for hydraulically connected surface water bodies. Class GB groundwater is presumed unsuitable for human consumption without treatment. Depth to groundwater beneath the Site has not been measured but is expected to be approximately three to five feet below grade (fbg). Due to proximity to Long Island Sound, groundwater flow direction and depth to groundwater may be influenced by tidal variations and by factors including, but not limited to, underground utilities and structures, soil and bedrock geology, nearby production wells, seasonal fluctuations, precipitation, and ground cover.

- The Site has been identified in multiple regulatory databases under two different address (601 and 695 Seaview Avenue) including: CT MANIFEST, CT UST, CT SPILLS, and LWDS. The East Side Plant facility was listed in the CT MANIFEST database for a shipment of a two 55-gallon drums of F001-listed hazardous waste in 1996, and for the shipment of two drums of D008-listed hazardous waste solid in in 2002. The East Side Plant was listed in the CT UST database for two 5000-gallon bare steel or asphalt-coated heating oil USTs, Tank A1 and B2, both of which were installed September 1, 1971. The tanks were last used in June 1, 1989, were filled with inert material, and permanently closed. The East Side Plant was listed on the CT SPILLS database for a September 27, 2010 release of sewage during an emergency bypass. The spill occurred when less than 0 gallons of sewage was released to the environment and washed away with rainwater and was discharged to the surface water. No response was taken, and the spill was closed. Case #201005835 was assigned. On April 5, 2019, one gallon of hydraulic oil was released to the ground surface. The spill was contained by sanding the area and the spill was closed. Case # 201901548 was assigned. Lastly, the Site is listed in the LWDS database under identification number 7000066 for an active discharge of wastewater.

- In addition to the regulatory database listings, a review of records at the offices of the CTDEEP identified a May 6, 1986 Underground Storage Facilities Notification (USFN) to document the installation of one 5,000-gallon, unlined steel Number 2 heating oil UST (Tank A1) and one 5,000-gallon, unlined steel Number 2 heating oil UST (Tank B2). Both tanks were installed September 1971 with a fifteen year life expectancy. The tanks are depicted on a sketch adjacent to the Pump House

Building (A1) and the Office Building (B2). The USFN was stamped “Rejected. A second USFN dated April 22, 1991 was filed to document the closure of two, 7,500-gallon, unlined steel Number 2 heating oil USTs (Tanks A1 and B2) in June 1989. According to the USFN, the tanks were filled with sand and closed in place. A corresponding site sketch depicts the locations of the USTs adjacent to the eastern side of the Pump Station Building (Tank A1) and a “new” building (Tank B2). Based on a review of the sketch, the new building appears to be the Control Building and the 5,000-gallon and 7,500-gallon tanks appear to reference the same systems.

- Based on a review of available historical documentation, the results of the site reconnaissance visit, and a review of regulatory database and publicly-available information pertaining to the Site, thirteen AOCs have been identified at which additional investigation is warranted.
- Based on the generation of hazardous waste at the Site, it appears the generation of greater than 100 kilograms of hazardous waste has occurred at the Site which could qualify the Site as an Establishment. An official determination as to whether the Site qualifies as an Establishment and is subject to the Connecticut Transfer Act upon future transfer must be rendered by legal counsel.

2.6 Summary of Areas of Concern

The Phase I ESA detailed above resulted in the identification of the following AOCs.

AOC	Description
AOC-1	Gasoline and Diesel USTs
AOC-2A	Former UST – Tank A1
AOC-2B	Former UST – Tank B2
AOC-3	Screen Building Staining
AOC-4	Degritter Staining
AOC-5	Sludge Building Loading Platform
AOC-6	Oil Staining Sludge Thickener Floor
AOC-7	Historical Powerhouse
AOC-8	Uncharacterized Fill
AOC-9	Grit Storage and Leachate UST
AOC-10	Filled Inlet
AOC-11	Equipment Maintenance and Oil Storage
AOC-12	Exterior Materials Storage and Surface Staining
AOC-13	Hazardous Waste and Used Oil Storage Area, Control Building

3 PHYSICAL AND ENVIRONMENTAL SETTING

PHYSICAL AND ENVIRONMENTAL SETTING	
Topography	Based on a review of the USGS topographic quadrangle map for the Bridgeport, Connecticut quadrangle (USGS, 1986) and observations made at the Site, the Site is generally flat. Topography in the area surrounding the Site is generally flat with a mild gradient to the south. The Site is located at 41˚ 10’ 20.26’’ north latitude and -73˚ 10’ 24.28’’ west longitude and lies at an elevation of approximately 18 feet above mean sea level (AMSL).
Surface Water	The nearest surface water body to the Site is Powerhouse Channel which abuts the Site to the south and Bridgeport Harbor to the south and west. Based on information obtained from the CTDEEP Geographic Information System (GIS) and Connecticut Environmental Conditions Online (CTECO) website, these surface waters have been assigned a classification of “SB”. Based on the distance and direction of Powerhouse Channel, potentially impacted groundwater has the potential to adversely affect this surface water.
Groundwater	Based on information obtained from the CTDEEP GIS and CTECO website, groundwater beneath the Site has been assigned a classification of “GB”. Groundwater with a GB classification has designated uses for industrial processes and cooling water and baseflow for hydraulically connected surface water bodies, and is presumed unsuitable for human consumption without treatment.
Surficial Geology	Surficial materials beneath the Site are mapped as artificial fill, defined as earth materials and man-made materials that have been artificially emplaced, common along the coast.
Bedrock Geology	According to the Bedrock Geological Map of Connecticut, compiled by Rodgers and dated 1985, bedrock beneath the vicinity of the Site is mapped as an unmapped area.
Hydrogeology	Based on regional topography and the location of the nearest surface water body, local groundwater flow direction is expected to be to the south, in the direction of Bridgeport Harbor and Long Island Sound. Due to proximity to Long Island Sound, groundwater flow direction and depth to groundwater may be influenced by tidal variations. Further, actual groundwater flow direction can also be locally influenced by factors including, but not limited to, underground utilities and structures, soil and bedrock geology, nearby production wells, seasonal fluctuations, precipitation, and ground cover.
Wetlands	According to information provided by the CTDEEP GIS, CTECO website, and National Wetland Inventory (NWI), the marine system to the south of the Site in Powerhouse Channel and Bridgeport Harbor is an Estuarine and Marine Deepwater environment.

PHYSICAL AND ENVIRONMENTAL SETTING	
Floodplain	According to the Flood Insurance Rate Map (FIRM) Panel 09001C0441G for Fairfield County, Connecticut, revised July 8, 2013, the Site is inside a floodplain zoned AE, a special flood hazard area where a base flood elevation of 14 feet AMSL has been established.
Natural Diversity Database	According to CTDEEP Natural Diversity Data Base (NDDB), the extreme southwestern corner of the Site is located in a Natural Diversity Database area.
Critical Habitat	According to information obtained from the CTDEEP GIS and CTECO website, no Critical Habitat areas are located on or adjacent to the Site.
Aquifer Protection Areas	According to information obtained from the CTDEEP GIS and CTECO website, the Site is not located in or adjacent to an Aquifer Protection Area (APA).
Public Water Supply Wells	According to the Atlas of Public Water Supply Sources and Drainage Basins of Connecticut (CTDEP, 1982), no public water supply wells were identified within one mile of the Site.
Private Water Supply Wells	The Site is located in an urban area in the City of Bridgeport; the Site and surrounding area are served with public water.
Physical Contact with Soil	The Site is predominantly covered with wastewater treatment facility buildings, asphalt, and concrete walkways; therefore, the potential for direct physical contact with soil is low.
Potential for Vapor Intrusion	Based on preliminary data, volatile organic compounds (VOCs) are not present in groundwater at concentrations that would result in potential vapor intrusion into the site buildings. Additional characterization of groundwater would be necessary to validate this conclusion.

4 SUBSURFACE INVESTIGATION SCOPE AND METHODOLOGIES

This section presents a description of the Subsurface Investigation scope, investigation methods and procedures, and quality assurance/quality control (QA/QC) procedures employed during the completion of the investigation. The data quality objective (DQO) of the investigation sampling program was designed to evaluate soil and groundwater for the presence of a release from the AOCs investigated.

4.1 Investigation Scope

The scope of the Subsurface Investigation included the completion of a GPR and EMI survey on areas of the Site targeted for drilling activities, advancement and sampling of seven soil borings, and the installation, development and sampling of two groundwater monitoring wells. Soil borings and groundwater monitoring wells were advanced in subset of AOCs (AOC-1, AOC-2A, AOC-2B, AOC-3, AOC-4, AOC-8, AOC-12, and AOC-13) identified at the Site to determine whether a release of oil and/or hazardous substances has occurred and in support of future property redevelopment. A release is considered to have occurred if concentrations of AOC-specific COCs are detected above naturally-occurring or background conditions.

4.2 Data Quality Objectives and Reasonable Confidence Protocols

Data quality objectives (DQOs) are used to ensure that data is collected in a manner such that the data can be used to evaluate a property and support decisions based on the evaluation of data. Procedures used to ensure that the DQOs for the Subsurface investigation were met include the development of a preliminary conceptual site model (CSM) that is used to guide the selection of appropriate COCs; sample locations and appropriate sample intervals; selection of analytical methods to assess an AOC for a release; implementation of sample handling and custody procedures; management of data; documentation of investigation methods; collection of QA/QC samples; and the use of Connecticut's Reasonable Confidence Protocols (RCPs) and laboratory QA/QC procedures.

4.3 Conceptual Site Model

A CSM is a representation of an environmental system that is used as a tool for understanding and demonstrating the basis and rationale for the site investigation[1]. The CSM incorporates site-specific and hydrogeological information to identify COCs, the nature of a release, migration pathways, and points of exposure, and is fundamental to describing fate and transport of environmental impacts at a property. The following table provides a preliminary CSM and summarizes the site AOCs including those specifically investigated as part of this scope, the identified COCs, general fate and transport mechanisms that are likely to be encountered at the Site based on the physical setting, and those mechanisms that generally affect the migration of contaminants at the Site.

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[1] *Site Characterization Guidance Document*, CT DEP, September 2007, Revised December 2010.

AOC	Description	COCs	Conceptual Site Model
AOC-1	Gasoline and Diesel USTs	VOCs, SVOCs, ETPH	Two 5,000-gallon double-walled USTs used for the storage of gasoline and diesel were present at the Site and used to fuel facility vehicles from East Side Plant and West Plant. The USTs are located southwest of the garage and, according to plant personnel, were last tested approximately five years ago. No active registration for these USTs was identified during the conduct of this Phase I ESA. Releases from the UST and/or ancillary piping have the potential to adversely affect shallow and deeper soil, and groundwater beneath the Site.
AOC-2A	Former UST – Tank A1	VOCs, SVOCs, ETPH	A 5,000-gallon, unlined steel Number 2 heating oil UST (Tank A1) was reportedly installed at the Pump Station Building in September 1971. A second USFN form indicates Tank A1 is a 7,500-gallon unlined steel Number 2 heating oil UST. The USFN forms and regulatory database report indicates the tank has been filled and closed in place. Based on sketches attached to the USFN forms, it appears the 5,000-gallon and 7,500-gallon tanks are the same, with the capacity incorrectly noted. Regardless, no documentation of the closure of this system was identified. Historical release(s) from the UST and ancillary piping have the potential to migrate through the subsurface and adversely affect soil and groundwater beneath the Site.
AOC-2B	Former UST – Tank B2	VOCs, SVOCs, ETPH	A 5,000-gallon, unlined steel Number 2 heating oil UST (Tank B2) was reportedly installed at the Control Building in September 1971. A second USFN form indicates Tank B2 is a 7,500-gallon unlined steel Number 2 heating oil UST. The USFN forms and regulatory database report indicates the tank has been filled and closed in place. Based on sketches attached to the USFN forms, it appears the 5,000-gallon and 7,500-gallon tanks are the same, with the capacity incorrectly noted. Regardless, no documentation of the closure of this system was identified. Historical release(s) from the UST and ancillary piping have the potential to migrate through the subsurface and adversely affect soil and groundwater beneath the Site.
AOC-3	Screen Building Staining	VOCs, SVOCs, ETPH, PCBs, Metals	Staining observed on the floor of the screen building lower screen and grit building is indicative of release(s) associated with oil-containing equipment and potentially polluted influent and debris. These releases have the potential to migrate through gaps or fissures in the floor, or across the floor surface to the building exterior via an overhead door, and into subsurface soils and/or groundwater.

AOC	Description	COCs	Conceptual Site Model
AOC-4	Degritter Staining	VOCs, SVOCs, ETPH, Metals	Staining observed on the floor of the Degritter Building is indicative of release(s) associated with oil-containing equipment and potentially polluted influent and debris. These releases have the potential to migrate through gaps or fissures in the floor, or across the floor surface to the building exterior via overhead doors, and into subsurface soils and/or groundwater.
AOC-5	Sludge Building Loading Platform	VOCs, SVOCs, ETPH, Metals	A loading platform located on the northern side of the Sludge Building is used to store empty chlorine totes and appears to have historically been used to for the transfer of incinerated waste. Releases during transfer of materials at the loading platform have the potential to adversely affect soil and groundwater beneath the Site.
AOC-6	Oil Staining Sludge Thickener Floor	VOCs, SVOCs, ETPH	During the site reconnaissance visit, staining was observed beneath compressor equipment in the Sludge thickener building. Releases from equipment in this area has the potential to migrate through cracks or expansion joints in the floor into underlying soil and groundwater.
AOC-7	Historical Powerhouse	VOCs, SVOCs, ETPH, PCBs, Metals	A coal-fired powerhouse was present on the eastern portion of the Site between approximately 1898 and 1949. Coal storage and transfer to the powerhouse occurred on the western side of the powerhouse and appears to have been transported to the area of the powerhouse via Powerhouse Channel, a portion of which was located on the southern portion of the Site. Storage of coal, operation of boiler units, and operation of ancillary equipment in the powerhouse has the potential to have resulted in a release to the ground, and to have migrated into subsurface soil and groundwater.
AOC-8	Uncharacterized Fill	VOCs, SVOCs, ETPH, PCBs, Metals	Historical aerial photographs depict areas of fill piles located on the southwestern corner of the Site. The composition of this material is unknown. Contact of this fill material with underlying soil has the potential to adversely affect shallow soil. Runoff across and infiltration of precipitation through the fill material would contact shallow soil, and migrate to deeper soil and groundwater.
AOC-9	Grit Storage and Leachate UST	VOCs, SVOCs, ETPH, PCBs, Metals	A Quonset hut-style storage building and a grit leachate UST is present on the southwestern corner of the Site. Grit from both the East Side Plant and West Plant is temporarily stored in this area to await loading, and transportation and disposal at a licensed disposal facility. Based on the nature of materials and influent

AOC	Description	COCs	Conceptual Site Model
			entering the Site, grit may contain a variety of contaminants. Surface storage and collection of grit leachate in a UST in this area have the potential to adversely affect shallow and subsurface soil, and groundwater.
AOC-10	Filled Inlet	VOCs, SVOCs, ETPH, PCBs, Metals	According to historical record sources, the inlet that is presently located to the south of the Site formerly extended onto the southern portion of the Site. Between approximately 1959 and 1979, the portion of the inlet that was located on the Site was filled. The composition and quality of the fill materials is unknown and represents a potential source of contaminants in the subsurface.
AOC-11	Equipment Maintenance and Oil Storage	VOCs, SVOCs, ETPH, PCBs, Metals	The garage located on the eastern portion of the Site is used to service City of Bridgeport WPCF equipment. Various oils, lubricants, hydraulic fluids, and cleaning fluids are stored and used in the garage area. A release of these materials has the potential to migrate across the garage floor or through cracks or gaps in the floor, and migrate to surficial and subsurface soil, and groundwater.
AOC-12	Exterior Materials Storage and Surface Staining	VOCs, SVOCs, ETPH, Metals	During the site reconnaissance visit, staining was observed beneath parked facility equipment on the southern portion of the Site. This area was also observed to be used for the storage of soil and other materials from off-site excavation work. The oil staining beneath the equipment represents a direct release to the surface and storage of fill material of unknown composition has the potential to adversely affect the quality of underlying soil and groundwater.
AOC-13	Hazardous Waste and Used Oil Storage Area, Control Building	VOCs, SVOCs, ETPH, Metals	Bulk storage and use of virgin motor oil, hydraulic oil, transmission oil, antifreeze, foam vehicle cleaner, tracer dye, citrus degreaser, diesel fuel, gear oil, and waste oil is present in the garage and annex on the eastern portion of the Site. Several flammables cabinets and work bench tops were observed to contain smaller quantities of oils and cleaners in both areas. Staining consistent with vehicle servicing and maintenance operations was observed on the floor of the garage and services bays in the annex. A release of these materials has the potential to migrate across the garage and annex floor or through cracks or expansion joints in the floors, and migrate to surficial and subsurface soil, and groundwater.

4.4 Constituents of Concern

The list of COCs was developed for each AOC to be investigated and to support future characterization of soil; this list comprises those compounds most likely to be released based on the understanding of site operations, material usage, and waste generation. Soil samples collected from the AOCs investigated as part of this scope were analyzed for one or more of the following: VOCs using United States Environmental Protection Agency (EPA) Method 8260C; semivolatile organic compounds (SVOCs) using EPA Method 8270D; petroleum hydrocarbons using the approved Connecticut Extractable Total Petroleum Hydrocarbon (ETPH) Method; polychlorinated biphenyls (PCBs) using EPA Method 8082; chlorinated herbicides using EPA Method 8151CA; pesticides using EPA Method 8081B; cyanide; total Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, mercury, lead, selenium, and silver); and RCRA 8 metals following extraction by the Toxicity Characteristic Leaching Procedure (TCLP). Groundwater samples were analyzed for VOCs, SVOCs, ETPH, PCBs, chlorinated herbicides, pesticides, and total and dissolved RCRA 8 metals using the aforementioned methods. Soil and groundwater samples were submitted to Phoenix Environmental Laboratories, Inc. (Phoenix) of Manchester, Connecticut for laboratory analysis.

The following table includes a summary of soil sample locations, corresponding depths, the AOC from which the samples were collected, and the laboratory analysis performed.

Sample Location	Sample Interval (fbg or as noted)	AOC	VOCs	SVOCs	PCBs	ETPH	Pesticides	Herbicides	RCRA 8 Metals	TCLP Metals	Cyanide
E-SB-001	10-12.5	AOC-8	X	X	X	X	X	X	X		X
E-SB-002	10-12.5	AOC-2B and AOC-12	X	X	X	X	X	X	X	X	X
E-SB-003	9-11	AOC-13	X	X	X	X	X	X	X	X	X
E-SB-004	7-9	AOC-1	X	X	X	X	X	X	X	X	X
E-SB-005	4-6	AOC-4	X	X	X	X	X	X	X		X
E-SB-006	6-8	AOC-2A	X	X	X	X	X	X	X	X	X
E-SB-007	2.5-5	AOC-3	X	X	X	X			X		
E-MW-001	Groundwater	AOC-8	X	X	X	X	X	X	X		
E-MW-002	Groundwater	AOC-2B and AOC-12	X	X	X	X	X	X	X		

4.5 Subsurface Investigation Methodologies

4.5.1 Ground Penetrating Radar Survey

In accordance with Section 16-345-4 of the Regulations of Connecticut State Agencies (RCSA), prior to advancement of soil borings at the Site, the offices of Call Before You Dig were notified to locate and mark underground utilities. To further identify potential subsurface utilities in the work area and identify locations of subsurface piping, utilities, or other anomalies including suspect USTs and other historical site features, Eolas contracted CorBuilt, LLC to conduct private utility clearance with a Ground Penetrating

Radar (GPR) and Electromagnetic Induction (EMI) survey on August 28, 2020. No anomalies were identified by CorBuilt that conflicted with the previously marked out soil boring locations.

4.5.2 Soil Boring Advancement and Soil Sample Collection

Soil boring advancement and soil sampling was conducted to define the nature (i.e. presence) of contaminants associated with site AOCs in unconsolidated materials in the saturated and unsaturated zones. In addition, soil borings provided information relative to site stratigraphy and physical properties of unconsolidated materials in both the saturated and unsaturated zones with particular emphasis on the characteristics of those materials that affect contaminant migration pathways and transport mechanisms.

Soil borings were advanced by employing Geoprobe® direct-push techniques with a Geoprobe® 6620DT drilling rig, utilizing the Geoprobe® Macro-Core® Soil Sampling system of sampling equipment to obtain soil samples. At each of the soil boring locations, borings were advanced under the supervision of Eolas field personnel. Soil samples were collected continuously with five-foot polyethylene sleeves as soil borings were advanced. A discrete sample was collected from each, approximate two-foot interval, and screened in the field for the presence of VOCs using an organic vapor meter equipped with a portable photoionization detector (PID). All soil samples were examined by the field personnel for indications of contamination such as visible staining, visible separate-phase petroleum products, or the presence of odors. Soil boring logs were prepared for each location documenting the visual classification of the soils encountered. Soil boring locations are depicted on Figure 2, included in Appendix A. Copies of the soil boring logs are provided in Appendix B.

Within minutes after the collection and opening of the sample liners, the soil samples were collected directly into laboratory-supplied glass sample containers with Teflon®-lined lids (or methanol- and deionized water-preserved vials, as appropriate) for submission to Phoenix for analysis. Each soil sample collected for analysis was obtained using dedicated, disposable En-Core® samplers or other disposable equipment. Filled sample containers were labeled using with the sampling date and time hand recorded by the sampler. The filled sample containers were placed into iced sample coolers and transported to the laboratory at the end of the sampling day.

In general, fill material (e.g. slag, asphalt, concrete) and evidence of filling (i.e. reworking of native soils) were observed in all soil borings to depths of 0-20 feet below grade (fbg). During soil sampling, a creosote odor was noted in the 5-17.5 fbg interval of location SB-002 with PID responses ranging from 0.8 parts per million (ppm) in the 17.5-20 fbg interval to 5.7 ppm in the 10-12.5 fbg interval. A sheen was observed on saturated soils from the 10-12.5 fbg interval of SB-002. A creosote odor was also noted at 5-10 fbg interval of location SB-003 with PID responses ranging from 0.3 ppm in the 5-7.5 fbg interval to 4.1 ppm in the 7.5-10 fbg interval.

4.5.3 Monitoring Well Installation and Development

Monitoring wells were installed at the Site with the objective of evaluating groundwater for the presence of COCs associated with identified AOCs. Monitoring wells were also used to gather data to define groundwater elevations and aquifer characteristics across the Site in order to understand and evaluate potential contaminant fate and transport pathways and mechanisms.

Two monitoring wells (E-MW-001 and E-MW-002) were set to depths of approximately 17 fbg, in overburden materials. The wells are constructed of approximately 10 feet of 1.5-inch diameter, 0.010-inch slotted PVC screen, with 1.5-inch PVC riser. The annular space around the wells was filled with #1 sand from the bottom of the borehole to approximately 1-2 feet above the screen. An approximate one-foot layer of bentonite was placed above the sand pack to form a seal. Native fill was then used to fill the remaining borehole to grade. Each well was finished with an 8-inch steel road box fortified with concrete installed to match the surrounding grade. Monitoring well locations are depicted on Figure 2, included in Appendix A. Well construction logs are included in Appendix B.

Approximately one week following installation of the monitoring wells, the wells were developed using a surge and pump technique to remove entrained sediment from the wells and to facilitate a hydraulic connection between the monitoring well screen and surrounding aquifer. The monitoring wells were surged and pumped until water quality parameters stabilized and turbidity results were adequately low to confirm clear formation groundwater.

4.5.4 Groundwater Sampling

Several days subsequent to redevelopment, groundwater samples were collected from the newly-installed monitoring wells using a peristaltic pump and dedicated tubing, following low-flow sampling techniques. Depth to groundwater measurements were collected from each monitoring well location prior to introduction of sample tubing and were recorded at 9.78 feet below top of riser in E-MW-001 and 6.65 feet below top of riser in E-MW-002. Groundwater quality parameters including pH, specific conductivity, dissolved oxygen, temperature, turbidity, and oxidation/reduction potential were monitored and recorded at approximate three-minute intervals until each parameter was stabilized. Once parameters were stabilized, groundwater was collected directly into laboratory-supplied glass sample containers with Teflon®-lined lids for submission to Phoenix for laboratory analysis. Locations of groundwater monitoring wells are depicted on Figure 2, included in Appendix A.

4.6 Quality Assurance/Quality Control and Data Usability

During the subsurface investigation, QA/QC samples including trip blanks and duplicate samples collected during the soil and groundwater sampling program were collected to determine the potential for cross contamination and analytical precision, respectively. The results for QA/QC samples and laboratory narratives provided with each Phoenix laboratory report were reviewed to identify issues that could affect the usability of the data. The results are summarized below.

4.6.1 Trip Blanks

A trip blank consisting of deionized water was prepared and submitted to the laboratory for analysis for VOCs for each day of field sampling activities. The results of the VOC analysis were reviewed to determine the potential for cross-contamination due to exposure during soil and groundwater sampling, delivery, or laboratory analysis. VOCs were not reported above laboratory detection limits in the trip blank samples collected during the soil and groundwater sampling events.

4.6.2 Duplicate Sample

A duplicate soil sample was collected from location E-SB-002 and a duplicate groundwater sample was collected from location E-MW-002. The relative percent difference (RPD) of reported results for the soil duplicate pair was calculated and ranged between 6.19% and 105.32%, with the majority of calculated RPD values below 30% indicating overall analytical precision. While the upper limit of the calculated RPD values was greater than 30% in some instances (an accepted threshold at which analytical precision can be determined), soil heterogeneity and the presence of contaminants in soil can often affect RPD data. The RPD values for the groundwater duplicate pair were calculated to range from 5.71% to 66.67%, with the majority of calculated RPD values below 20%, the accepted RPD threshold of 20% for aqueous samples.

4.6.3 Equipment Blanks

No equipment blanks were prepared or submitted as all samples were collected with dedicated, disposable sampling equipment.

4.6.4 Reasonable Confidence Protocols

Eolas reviewed the case narratives provided by the analytical laboratory under the RCP guidelines. Phoenix reported that “reasonable confidence” was achieved on all analyses conducted. A review of the narratives identified minor QA/QC issues regarding laboratory method controls/blanks that were considered in interpreting the data. These issues were reviewed and it was determined that the usability of the data was not affected.

5 SUBSURFACE INVESTIGATION RESULTS

The results from the Subsurface Investigation field activities, conducted between August 28, 2020 and September 29, 2020, are presented in the following subsections. The analytical data for samples collected during the Subsurface Investigation compared to the default, numeric RSRs criteria are summarized in Tables 1 and 2, included in Appendix C, to provide context to and a baseline understanding of the results. Copies of the Phoenix laboratory analytical reports are provided in Appendix D.

5.1 Soil Sampling Analytical Results

The following seven soil samples and one duplicate soil sample were collected from the seven soil borings advanced at the Site and submitted to Phoenix for laboratory analysis.

- E-SB-001-10-12.5 (10-12.5 fbg)
- E-SB-002-10-12.5 (10-12.5 fbg) and DUP-922020 (E-SB-002) (10-12.5 fbg)
- E-SB-003-9-11 (9-11 fbg)
- E-SB-004-7-9 (7-9 fbg)
- E-SB-005-4-6 (4-6 fbg)
- E-SB-006-6-8 (6-8 fbg)
- E-SB-007-2.5-5 (2.5-5 fbg)

5.1.1 Volatile Organic Compounds

The compound 1,2,4-trichlorobenzene was reported at a concentration of 200 micrograms per kilogram (µg/kg) in SB-005. Carbon disulfide was reported above laboratory detection limits in three of the five soil borings, E-SB-001, E-SB-002, and E-SB-003, at concentrations ranging from 5.5 µg/kg in E-SB-001 to 21 µg/kg in E-SB-003. Chloroform was reported above laboratory detection limits in location SB-005 at a concentration of 140 µg/kg. Naphthalene was reported above laboratory detection limits in location SB-003 at a concentration of 6.6 µg/kg. No other VOCs were reported above laboratory detection limits.

5.1.2 Semi-volatile Organic Compounds

The following SVOCs and their corresponding concentrations were reported above laboratory detection limits in soil samples collected from the Site:

E-SB-001: 2-methylnapthalene (380 µg/kg), benz(a)anthracene (1,000 µg/kg), benzo(a)pyrene (1,300 µg/kg), benzo(b)fluoranthene (1,200 µg/kg), benzo(ghi)perylene (1,000 µg/kg), benzo(k)fluoranthene (1,400 µg/kg), chrysene (880 µg/kg), fluoranthene (1,500 µg/kg), indeno(1,2,3-cd)pyrene (1,200 µg/kg), naphthalene (280 µg/kg), phenanthrene (520 µg/kg), and pyrene (1,300 µg/kg).

E-SB-002: Benz(a)anthracene (610 µg/kg), benzo(a)pyrene (650 µg/kg), benzo(b)fluoranthene (610 µg/kg), benzo(ghi)perylene (500 µg/kg), benzo(k)fluoranthene (550 µg/kg), bis(2-ethylhexyl)phthalate (470 µg/kg), chrysene (710 µg/kg), fluoranthene (1,200 µg/kg), indeno(1,2,3-cd)pyrene (520 µg/kg), phenanthrene (760 µg/kg), and pyrene (1,200 µg/kg).

E-SB-003: Benz(a)anthracene (400 µg/kg), benzo(a)pyrene (390 µg/kg), benzo(b)fluoranthene (370 µg/kg), benzo(ghi)perylene (300 µg/kg), benzo(k)fluoranthene (300 µg/kg), chrysene (420 µg/kg), fluoranthene (890 µg/kg), indeno(1,2,3-cd)pyrene (300 µg/kg), phenanthrene (520 µg/kg), and pyrene (860 µg/kg).

E-SB-004: 2-methylnapthalene (490 µg/kg), benz(a)anthracene (290 µg/kg), chrysene (400 µg/kg), fluoranthene (510 µg/kg), phenanthrene (680 µg/kg) ,and pyrene (500 µg/kg).

E-SB-005: Benz(a)anthracene (570 µg/kg), benzo(a)pyrene (660 µg/kg), benzo(b)fluoranthene (590 µg/kg), benzo(ghi)perylene (480 µg/kg), benzo(k)fluoranthene (570 µg/kg), chrysene (640 µg/kg), fluoranthene (850 µg/kg), indeno(1,2,3-cd)pyrene (540 µg/kg), phenanthrene (450 µg/kg), and pyrene (870 µg/kg).

E-SB-006: Benz(a)anthracene (360 µg/kg), benzo(a)pyrene (360 µg/kg), benzo(b)fluoranthene (310 µg/kg), benzo(k)fluoranthene (300 µg/kg), chrysene (410 µg/kg), fluoranthene (1,000 µg/kg), phenanthrene (930 µg/kg), and pyrene (830 µg/kg).

E-SB-007: Benz(a)anthracene (1,000 µg/kg), benzo(a)pyrene (940 µg/kg), benzo(b)fluoranthene (840 µg/kg), benzo(ghi)perylene (540 µg/kg) benzo(k)fluoranthene (820 µg/kg), chrysene (1,000 µg/kg), fluoranthene (2,100 µg/kg), Indeno(1,2,3-cd)pyrene (590 µg/kg), phenanthrene (900 µg/kg), and pyrene (1,900 µg/kg).

5.1.3 Polychlorinated Biphenyls

PCBs (PCB-1248) were detected in six of the seven of the soil sample locations ranging in concentration from 800 mg/kg in location E-SB-007 to 16,000 mg/kg in location E-SB-002.

5.1.4 Extractable Total Petroleum Hydrocarbons

Petroleum hydrocarbons, reported as ETPH, were reported in two soil samples, E-SB-002 and E-SB-004, at a concentrations of 270 mg/kg and 78 mg/kg, respectively.

5.1.5 Metals

The following metals and respective concentration ranges were reported in soil samples collected from the Site:

Arsenic:	6.35 mg/kg in E-SB-003 to 26.5 mg/kg in E-SB-004.
Barium:	87.2 mg/kg in E-SB-001 to 215 mg/kg in E-SB-002.
Cadmium:	2.11 mg/kg in E-SB-007 to 20.8 mg/kg in E-SB-002.
Chromium:	37.3 mg/kg in E-SB-007 to 167 mg/kg in E-SB-006.
Lead:	74.6 mg/kg in E-SB-005 to 561 mg/kg in E-SB-002.
Mercury:	0.03 mg/kg in E-SB-005 to 1.28 mg/kg in E-SB-002.
Selenium:	1.9 mg/kg in E-SB-004 to 4.1 mg/kg in E-SB-002
Silver:	0.7 mg/kg in E-SB-007 to 7.31 mg/kg in E-SB-003.

Based on the results of the total metals analysis, select metals from the soil samples collected from locations E-SB-002, E-SB-003, E-SB-004, and E-SB-006 which exhibited the highest individual metals concentrations and were submitted for analysis for metals following extraction by the TCLP. Although the evaluation of contaminant leaching potential in the subsurface (and the potential for those contaminants to adversely affect groundwater) is typically accomplished by analyzing contaminants following extraction by the Synthetic Precipitation Leaching Procedure (SPLP), TCLP extraction for metals was used in this project scope to characterize soil for potential off-site disposal options during future redevelopment. TCLP data can also be used to evaluate concentrations of metals relative to the GB Pollutant Mobility Criteria (PMC) but, due to the methodology, may yield results that are not representative of the actual potential for contaminants to leach into groundwater. The following is a summary of metals concentrations reported above laboratory detection limits in the TCLP extract:

Barium:	0.53 milligram per liter (mg/l) (E-SB-002).
Cadmium:	0.092 mg/l (E-SB-002).
Mercury:	0.0056 mg/l (E-SB-002).

5.1.6 Cyanide

Cyanide was reported above laboratory detection limits in two soil samples, SB-001 and SB-004, at concentrations of 2.91 mg/kg and 0.91 mg/kg, respectively.

5.1.7 Pesticides and Herbicides

With the exception of 4,4'-DDD (12 µg/kg), 4,4'DDE (41 µg/kg), and 4,4' DDT (35 µg/kg) reported in soil from location E-SB-005, and heptachlor epoxide (73 µg/kg) reported in soil from location E-SB-003, no other pesticides nor herbicides were reported in the remaining soil samples that were analyzed for these constituents.

5.2 Groundwater Sampling Analytical Results

Groundwater samples were collected from the newly-installed monitoring wells, E-MW-001 and E-MW-002, on September 29, 2020. A duplicate sample was collected from location E-MW-002. The following is a summary of the groundwater sampling results.

5.2.1 Volatile Organic Compounds

The compounds 1,2,4-trimethylbenzene (1.9 micrograms per liter [µg/l]), methyl t-butyl ether (MTBE) (1.3 µg/l), and naphthalene (2.0 µg/l) were reported in groundwater collected from E-MW-002.

5.2.2 Semivolatile Organic Compounds

Groundwater samples were analyzed for SVOCs using EPA Method 8270D which uses gas chromatography/mass spectrometry (GC/MS); however, for certain compounds an adequate reporting limit may not be achievable. To overcome this limitation, the GC/MS can be operated in Selected Ion Monitoring (SIM) mode to increase instrument sensitivity and yield lower reporting limits. The following SVOCs and their respective concentrations were reported in groundwater collected from the Site using the SIM method.

The compound 2,4-dimethylphenol (9.2 µg/l), 2-methylphenol (o-cresol) (2.4 µg/l), phenol (32 µg/l), 2-methylnaphthalene (0.73 µg/l), naphthalene (1.4 µg/l), and phenanthrene (0.44 µg/l) were reported in groundwater collected from E-MW-002.

5.2.3 Extractable Total Petroleum Hydrocarbons

ETPH were reported above laboratory detection limits in E-MW-002 at a concentration of 0.31 µg/l.

5.2.4 Total Metals

Arsenic was reported in groundwater collected from E-MW-001 at a concentration of 0.007 mg/l and E-MW-002 at a concentration of 0.006mg/l.

Barium was reported in groundwater collected from E-MW-001 at a concentration of 0.041 mg/l and E-MW-002 at a concentration of 0.389 mg/l.

Chromium was reported in groundwater collected from E-MW-001 at a concentration of 0.045 mg/l and E-MW-002 at a concentration of 0.005 mg/l.

Lead was reported in groundwater collected from E-MW-002 at a concentration of 0.007 mg/l.

No other metals were reported above laboratory detection limits.

5.2.5 Dissolved Metals

Arsenic was reported in groundwater collected from E-MW-002 at a concentration of 0.007 mg/l.

Barium was reported in groundwater collected from E-MW-001 at a concentration of 0.038 mg/l and E-MW-002 at a concentration of 0.4 mg/l.

Chromium was reported in groundwater collected from E-MW-001 at a concentration of 0.007 mg/l and E-MW-002 at a concentration of 0.003 mg/l.

Lead was reported in groundwater collected from E-MW-002 at a concentration of 0.006 mg/l.

No other metals were reported above laboratory detection limits.

5.2.6 Pesticides and Herbicides

Pesticides and herbicides were not reported above laboratory detection limits in the groundwater samples and duplicate groundwater sample submitted for analysis.

5.2.7 PCBs

PCBs (PCB-1242) were reported above laboratory detection limits in the groundwater sample collected from E-MW-002 at a concentration of 1.7 µg/l.

5.3 Remediation Criteria

This section includes a preliminary evaluation of the analytical data for soil and groundwater relative to tabulated numeric criteria listed in Appendices A through D of Sections 22a-133k-1 through 22a-133k-3 of the RCSA, otherwise referred to as the RSRs. The RSRs include baseline criteria that may be used at a property to determine whether remediation is necessary; self-implementing alternatives to the criteria for use under specific circumstances; self-implementing exceptions to the criteria for use under specific circumstances; and mechanisms to request approval for site-specific alternatives to the criteria and remedial options. Before an evaluation of compliance with the RSRs can be completed, it must first be demonstrated that the investigation was adequate to identify whether releases have occurred and, if so, whether the nature and extent of contamination has been adequately characterized. Compliance with the RSRs can only be demonstrated when the nature and extent of releases at a property are fully characterized.

5.3.1 Soil Remediation Criteria

Soil remediation criteria established in the RSRs are risk-based and designed to (1) protect human health and the environment from risks associated with direct exposure and (2) protect groundwater quality from contaminants that may migrate into from soil into groundwater. Relative to protection of human health and the environment from risks associated with direct exposure, the CTDEEP established two sets of criteria using exposure assumptions based on land use type; these include the Residential Direct Exposure Criteria (RDEC) and Industrial/Commercial Direct Exposure Criteria (IDEC). To avoid the need for an environmental land use restriction (ELUR) at a property, the RDEC established in the RSRs must be met. Further, soils within fifteen feet of the ground surface must exhibit contaminant concentrations lower than the default, numeric RDEC, unless an ELUR is in effect that ensures that such soil will remain inaccessible and will not be disturbed as the result of excavation, demolition, or similar activities.

Relative to protection of groundwater from migration or leaching of contaminants into groundwater, the CTDEEP established the Pollutant Mobility Criteria (PMC), further classified by the quality and classification of groundwater (i.e. GA, GB). The Site is located in an area with a GA classification. In general, the PMC applies to all soil in the unsaturated zone from the ground surface to the low water table in GA-classified areas. The PMC does not apply to areas which are rendered environmentally-isolated and polluted with substances other than VOCs, provided an ELUR has been filed and is in effect. Environmentally-isolated soils are defined as certain contaminated soils below the seasonal low water table, beneath an existing building, and not a source of ongoing contamination.

The soil data collected from this Subsurface Investigation are compared to the RDEC, IDEC, and the GB PMC of the RSRs to provide an understanding of the magnitude of concentrations of constituents detected in soil to criteria established by the State of Connecticut as protective of human health and the environment, and protective to groundwater.

5.3.2 Groundwater Remediation Criteria

Groundwater remediation criteria established in the RSRs are dependent on the groundwater classification with the objectives of (1) protect and preserve groundwater in GA-classified areas; (2) protect existing groundwater use regardless of classification; (3) prevent further degradation of groundwater quality; (4) prevent degradation of surface water from discharges of contaminated groundwater; and (5) protect human health and the environment.

Portions of the RSRs which govern groundwater regulate remediation of groundwater based on each substance present within the plume and by each distinct plume of contamination. Several factors influence the remediation goal at a given site, including: background water quality, the groundwater classification, proximity of nearby surface water, existing groundwater uses, and the presence of buildings and their usage. When assessing general groundwater remediation requirements, all of these factors must be considered in conjunction with the major numeric components of the RSRs. The RSRs include the following criteria: Groundwater Protection Criteria (GWPC), Surface Water Protection Criteria (SWPC), and Groundwater Volatilization Criteria (VC) further classified by land use (i.e. residential or industrial/commercial).

Groundwater located in a GA-classified area may be remediated to the GWPC provided (1) the background groundwater concentrations are less than or equal to the GWPC; (2) a public water distribution system is available within 200 feet of the Site; (3) the groundwater plume is not located in an APA; and (4) the groundwater plume is not located in an area of influence of a public water supply well.

Groundwater in a GA-classified area must be remediated such that the concentration of each substance in groundwater is equal to or less than the background concentration for that substance. Generally, background groundwater conditions are determined by areas that are not located in known or suspected release areas.

The SWPC applies to any plume that discharges to surface water and compliance with the SWPC, in general, is achieved when the average concentration of a compound in groundwater emanating from a site is equal to or less than the SWPC.

The VC apply to all groundwater contaminated with a VOC within 15 feet of the ground surface or a building. According to the regulations, the VOC of concern will be remediated to a concentration that is equal to or less than the applicable residential volatilization criterion (RVC) for groundwater. If groundwater contaminated with a VOC is below a building used solely for industrial or commercial activity, groundwater may be remediated such that the concentration of the substance is equal to or less than the applicable industrial/commercial volatilization criteria (IVC), provided that an ELUR is in effect with respect to the parcel (or portion of the parcel covered by the building). The ELUR must also ensure that the parcel (or portion thereof beneath the building) will not be used for any residential purpose in the future and that future use is limited to industrial or commercial activity.

Because the Site is located in a GB-classified area, the groundwater data collected from this Subsurface Investigation are compared to the SWPC and the VC of the RSRs to provide an understanding of the magnitude of concentrations of constituents detected in groundwater to criteria established by the State of Connecticut as protective of groundwater and surface waters.

5.3.3 Additional Polluting Substances

Soil and groundwater remediation criteria listed in the RSRs contain default, numeric criteria for 88 substances. When a contaminant at a property is identified and not included in the list of 88 substances, unless background conditions are met, numeric criteria must be requested from and approved by the

Commissioner of the CTDEEP in order to complete cleanup under the RSRs. The Commissioner may approve the use of site-specific cleanup criteria for these Additional Polluting Substances (APS) and certain alternative criteria for soil and groundwater.

5.4 Evaluation of Results

5.4.1 Evaluation of Soil Data

Of the seven soil samples analyzed for VOCs, 1,2,4-trichlorobenzene, carbon disulfide, chloroform, and naphthalene were reported above laboratory detection limits in four soil samples. There are currently no established RDEC, IDEC, nor GB PMC for 1,2,4-trichlorobenzene and carbon disulfide and, the concentrations of chloroform and naphthalene are below the default, numeric RSRs criteria.

Several SVOCs were reported above the laboratory detection limits in the seven soil samples submitted for analysis. Of the reported compounds, the concentration of benzo(a)pyrene (1,300 µg/kg), benzo(b)fluoranthene (1,200 µg/kg), and benzo(k)fluoranthene (1,400 µg/kg) in the 10-12.5 foot interval of location E-SB-001 were greater than the GB PMC. The concentrations of benzo(a)pyrene and benzo(b)fluoranthene are also greater than the RDEC. The concentration of indeno(1,2,3-cd)pyrene (1,200 µg/kg) in the 10-12.5 foot interval of E-SB-001 was reported above the GB PMC APS criterion. Soil boring E-SB-001 was advanced in an area of uncharacterized fill (AOC-8).

ETPH was reported above laboratory detection limits in two samples collected from locations E-SB-002 (270 mg/kg), and E-SB-004 (78 mg/kg). Both concentration are below the default, RDEC, IDEC and GB PMC.

PCBs were reported above the laboratory detection limits in six of the seven soil sample submitted for analysis. The concentrations of PCBs in soil from location E-SB-002, E-SB-003, E-SB-004, E-SB-005, and E-SB-006 are greater than the RDEC and, the concentration of PCBs in the 10-12.5 fbg interval of location E-SB-002 (16,000 µg/kg) is also greater than the IDEC.

One pesticide, heptachlor epoxide, was reported at a concentration of 73 µg/kg in the 9-11 fbg interval of location E-SB-003; this concentration is greater than the default, numeric GB PMC and RDEC. The pesticides 4,4’-DDE and 4,4’-DDT were reported at concentrations of 41 µg/kg and 35 µg/kg, respectively, in the 4-6 fbg interval of E-SB-005; these concentrations are greater than the GB PMC APS criteria. Several pesticide compound reporting limits were greater the GB PMC, GB PMC APS, and/or the RDEC; the elevated reporting limits are attributed to matrix interferences caused by the presence of PCBs in E-SB-002, E-SB-003, E-SB-004, E-SB-005 and E-SB-006.

One or more metals including arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver were reported above laboratory detection limits in the seven soil samples collected from the Site, with the highest overall concentrations reported in soil collected from the 10-12.5 foot interval of location E-SB-002 and the 7-9 foot interval of E-SB-004. The concentration of lead (561 mg/kg) in the sample from E-SB-002 and the concentration of arsenic (26.5 mg/kg) in the sample from E-SB-004 are greater than the RDEC, and the concentration of arsenic in E-SB-004 is also greater than the IDEC.

Relative to an evaluation of metals data to the GB PMC, the soil samples collected from locations E-SB-002, E-SB-003, E-SB-004, and E-SB-006 which exhibited the highest individual metals concentrations, were submitted for analysis for select metals following extraction using the TCLP. The concentration of cadmium in the TCLP extract of the sample from location E-SB-002 was reported above the GB PMC.

5.4.2 Evaluation of Groundwater Data

No pesticides or herbicides were reported above laboratory detection limits in the two groundwater samples collected from the Site during this investigation.

VOCs including 1,2,4-trimethylbenzene, MTBE, and naphthalene were reported above laboratory detection limits in groundwater collected from E-MW-002 and the duplicate pair. None of the reported concentrations were above SWPC, RVC, or IVC.

Several SVOCs were reported above the laboratory detection limits in groundwater collected from E-MW-002 and the duplicate pair. With the exception of the concentration of phenanthrene reported in groundwater from E-MW-002 and its duplicate (0.44 µg/l and 0.48 µg/l, respectively), none of the reported SVOC concentrations were above the default, numeric SWPC. Monitoring well E-MW-002 is located adjacent to an out-of-service heating oil UST (AOC-2B).

ETPH were reported above laboratory detection limits in the groundwater sample E-MW-002 and its duplicate at concentrations of 0.31 mg/l and 0.19 mg/l, respectively. The concentration of 0.31 mg/l reported in groundwater from E-MW-002 is above the SWPC APS criterion of 0.25 mg/l.

Total metals including arsenic, barium, and chromium were reported above laboratory detection limits in E-MW-001 and E-MW-002, and lead was reported above laboratory detection limits in E-MW-002. The concentrations of arsenic reported E-MW-001 (0.007 mg/l) and E-MW-002 (0.006 mg/l) are above the default, numeric SWPC. None of the remaining reported concentrations of metals are above the default, numeric SWPC.

Dissolved metals including barium, and chromium were reported in groundwater collected from E-MW-001 at concentrations of 0.038 mg/l, and 0.007 mg/l, respectively. Dissolved metals including arsenic (0.007 mg/l), barium (0.4 mg/l), chromium (0.003 mg/l), and lead (0.006 mg/l) were reported in groundwater collected from E-MW-002. The concentration of arsenic reported in groundwater from location E-MW-002 is above default, numeric SWPC.

6 SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Eolas was retained by CDM Smith, Inc. to complete a Subsurface Investigation of the property located at 601 (695) Seaview Avenue, Bridgeport, Connecticut 06607. The purpose of the investigation was to evaluate the potential for a release in select AOCs at the Site including AOC-1: Former Gasoline and Diesel UST, AOC-2A: Former UST-Tank A1; AOC-2B: Former UST-Tank B2; AOC-3: Screen Building Staining; AOC-4: Degritter Staining; AOC-8: Uncharacterized Fill; AOC-12: Exterior Materials Storage and Surface Staining, and AOC-13: Hazardous Waste and Used Oil Storage Area, Control Building. The scope of the investigation included completion of a geophysical survey to assess for subsurface utilities and anomalies in the area of drilling locations, advancement of seven soil borings, collection and analysis of seven soil samples, installation and development of two groundwater monitoring wells, and collection and analysis of groundwater samples from each of the wells. The following is an overview of the findings of the investigation.

6.1 Findings

Soil samples collected from locations E-SB-001, E-SB-002, E-SB-003, and E-SB-005 exhibited low concentrations of VOCs including 1,2,4-trichlorobenzene (E-SB-005), carbon disulfide (E-SB-001, E-SB-002, and E-SB-003), chloroform (E-SB-005), and naphthalene (E-SB-003). None of the reported concentrations are above default, numeric RSRs criteria. Location E-SB-001 was advanced to assess AOC-8, location E-SB-002 was advanced to assess AOC-2b and AOC-12, location E-SB-003 was advanced to assess AOC-13, and location E-SB-005 was advanced to assess AOC-4.

Several SVOCs were reported above the laboratory detection limits in the seven soil samples submitted for analysis. Of the reported compounds, the concentration of benzo(a)pyrene (1,300 µg/kg), benzo(b)fluoranthene (1,200 µg/kg), and benzo(k)fluoranthene (1,400 µg/kg) in the 10-12.5 foot interval of location E-SB-001 were greater than the GB PMC and/or the RDEC. The concentration of indeno(1,2,3-cd)pyrene (1,200 µg/kg) in the 10-12.5 foot interval of E-SB-001 was reported above the GB PMC APS criterion. Soil boring E-SB-001 was advanced in an area of uncharacterized fill (AOC-8).

ETPH was reported above laboratory detection limits in two samples collected from locations E-SB-002 (270 mg/kg), and E-SB-004 (78 mg/kg). Both concentrations were below the default, RDEC, IDEC and GB PMC.

PCBs were reported above the laboratory detection limits in six of the seven soil sample submitted for analysis, with each concentration greater than the RDEC. The concentration of PCBs in the 10-12.5-foot interval of location E-SB-002 (16,000 mg/kg) is also above the IDEC.

One pesticide, heptachlor epoxide, was reported at a concentration of 73 µg/kg in the 9-11 fbg interval of location E-SB-003; this concentration is greater than the default, numeric GB PMC and RDEC. The pesticides 4,4'-DDE and 4,4'-DDT were reported at concentrations of 41 µg/kg and 35 µg/kg, respectively, in the 4-6 fbg interval of E-SB-005; these concentrations are greater than the GB PMC APS criteria. Several pesticide compound reporting limits were greater the GB PMC, GB PMC APS, and/or the RDEC; the elevated reporting limits are attributed to matrix interferences caused by the presence of PCBs in E-SB-002, E-SB-003, E-SB-004, E-SB-005 and E-SB-006.

One or more metals including arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver were reported above laboratory detection limits in the seven soil samples collected from the Site, with the highest overall concentrations reported in soil collected from the 10-12.5 foot interval of location E-SB-002 and the 7-9 foot interval of E-SB-004. The concentration of lead (561 mg/kg) in E-SB-002 is greater than the RDEC for lead. The concentration of arsenic (26.5 mg/kg) in E-SB-004 is greater than the RDEC and IDEC. Relative to an evaluation of metals data to the GB PMC, the soil samples collected from locations E-SB-002, E-SB-003, E-SB-004, and E-SB-006 which exhibited the highest individual metals concentrations, were submitted for analysis for select metals following extraction using the TCLP. With the exception of the concentration of cadmium (0.092 mg/l) in the TCLP extract of soil from location E-SB-002, no other TCLP metals concentrations were reported above the GB PMC.

VOCs including 1,2,4-trimethylbenzene, MTBE, and naphthalene were reported above laboratory detection limits in groundwater collected from E-MW-002 and the duplicate pair. None of the reported concentrations were above SWPC, RVC, or IVC.

Several SVOCs were reported above the laboratory detection limits in groundwater collected from E-MW-002 and the duplicate pair. With the exception of the concentration of phenanthrene reported in groundwater from E-MW-002 and its duplicate (0.44 µg/l and 0.48 µg/l, respectively), none of the reported SVOC concentrations were above the default, numeric SWPC. Monitoring well E-MW-002 is located adjacent to an out-of-service heating oil UST (AOC-2B).

ETPH were reported above laboratory detection limits in the groundwater sample E-MW-002 and its duplicate at concentrations of 0.31 mg/l and 0.19 mg/l, respectively. The concentration of 0.31 mg/l reported in groundwater from E-MW-002 is above the SWPC APS criterion of 0.25 mg/l.

Total metals including arsenic, barium, and chromium were reported above laboratory detection limits in E-MW-001 and E-MW-002, and lead was reported above laboratory detection limits in E-MW-002. The concentrations of arsenic reported E-MW-001 (0.007 mg/l) and E-MW-002 (0.006 mg/l) are above the default, numeric SWPC. None of the remaining reported concentrations of metals are above the default, numeric SWPC.

Dissolved metals including barium, and chromium were reported in groundwater collected from E-MW-001 at concentrations of 0.038 mg/l, and 0.007 mg/l, respectively. Dissolved metals including arsenic (0.007 mg/l), barium (0.4 mg/l), chromium (0.003 mg/l), and lead (0.006 mg/l) were reported in groundwater collected from E-MW-002. The concentration of arsenic reported in groundwater from location E-MW-002 is above default, numeric SWPC

No pesticides, or herbicides were reported above laboratory detection limits in the two groundwater samples collected from the Site during this investigation.

6.2 Conclusions

The Subsurface Investigation detailed herein has resulted in the identification of releases of oil and/or hazardous substances AOC-1: Former Gasoline and Diesel UST, AOC-2A: Former UST-Tank A1; AOC-2B: Former UST-Tank B2; AOC-3: Screen Building Staining; AOC-4: Degritter Staining; AOC-8: Uncharacterized Fill; AOC-12: Exterior Materials Storage and Surface Staining and AOC-13: Hazardous Waste and Used Oil Storage Area, Control Building.

Mass concentrations of arsenic and lead were reported above the RDEC and/or IDEC in soil collected from AOC-1, AOC-2B, and AOC-12, and cadmium in the TCLP extract of soil collected from AOC-12 was reported above the GB PMC. Low concentrations of ETPH, below default, numeric RSRs criteria, were reported in soil collected from AOC-1, AOC-2B, and AOC-12. PCBs appear to be somewhat pervasive in soil collected from the Site, identified at depths ranging from 2.5 fbg to 12.5 fbg, and found in concentrations ranging from 800 mg/kg to 16,000 mg/kg above the RDEC and/or the IDEC. Similarly, numerous SVOCs were identified in soil samples collected from the AOCs at the Site. With the exception of select SVOCs reported in soil collected from AOC-8, none were reported at concentrations above default, numeric RSRs criteria. One pesticide was identified in soil collected from the 9-11 foot interval of soil collected from AOC-13 at a concentration that is above the default, numeric GB PMC; however, the sample collected from this AOC was below the water table and, as such, the GB PMC would not apply. Conversely, pesticides including 4,4’-DDE and 4,4’-DDT were reported in soil collected above the water table in E-SB-005 (AOC-4) at concentrations greater than the GB PMC APS criteria. Although low concentrations of VOCs were identified in site soils, no individual VOC concentration was reported above default, numeric RSRs criteria.

Based on the results of soil sampling conducted as part of this Subsurface Investigation, several options exist for the handling, management, and off-site disposal of soil from the Site at the time of site redevelopment. While additional characterization will be necessary to satisfy specific disposal facility requirements, final disposition of contaminated soil from the Site to either a lined or unlined landfill and/or incineration facility appear to be feasible options.

Relative to groundwater, metals, ETPH, PCBs, VOCs, and/or SVOCs were reported above laboratory detection limits in site groundwater. The concentrations of arsenic (total and dissolved), PCBs, and phenanthrene in groundwater collected from location E-MW-002, and arsenic (total) in groundwater collected from location E-MW-001 were reported above default, numeric RSRs criteria. The concentration of ETPH reported in groundwater from E-MW-002 is also above the SWPC APS criterion.

During site redevelopment, it is anticipated that it will be necessary to dewater and manage groundwater in several excavation areas. Dewatered groundwater may be managed by containment and off-site disposal to a treatment facility or discharged to an adjacent surface water. In order to discharge groundwater as dewatered wastewater to the adjacent surface water during site redevelopment under the *General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities* (effective date October 1, 2019, expiration date extended to December 30, 2020, proposed modifications expiration date September 30, 2024), the discharge shall not cause nor contribute to an exceedance of water quality standards in the receiving surface water body. The existing groundwater data set indicates that a discharge to the adjacent surface water without treatment, under the construction general permit, is not feasible. An alternative option for the discharge of groundwater to the adjacent surface water is under the *General Permit for the Discharge of Groundwater Remediation Wastewater* (issuance date February 21, 2018, expiration date February 20, 2023). Based on the groundwater dataset, in order to satisfy the permit requirements, treatment of impacted groundwater prior to discharge will likely be necessary.

6.3 Recommendations

Based on the results of the Subsurface Investigation, additional investigation is warranted to evaluate those AOCs that were not included in this of this scope of work and to delineate the presence of metals, SVOCs, and PCBs reported in soil and groundwater samples collected from AOC-1, AOC-2A, AOC-2B, AOC-3, AOC-4, AOC-8, AOC-12 and AOC-13. Additional soil and groundwater data will also be necessary to fully characterize environmental media to determine final disposition options prior to site redevelopment.

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APPENDICES

APPENDIX A

Figures

PROJECT:	Subsurface Investigation
SITE LOCATION:	601 (695) Seaview Avenue, Bridgeport, Connecticut 06607
SOURCE:	USGS 7.5 Minute Topographic Map Bridgeport, Connecticut 1986
SCALE:	1:24000 Approximate

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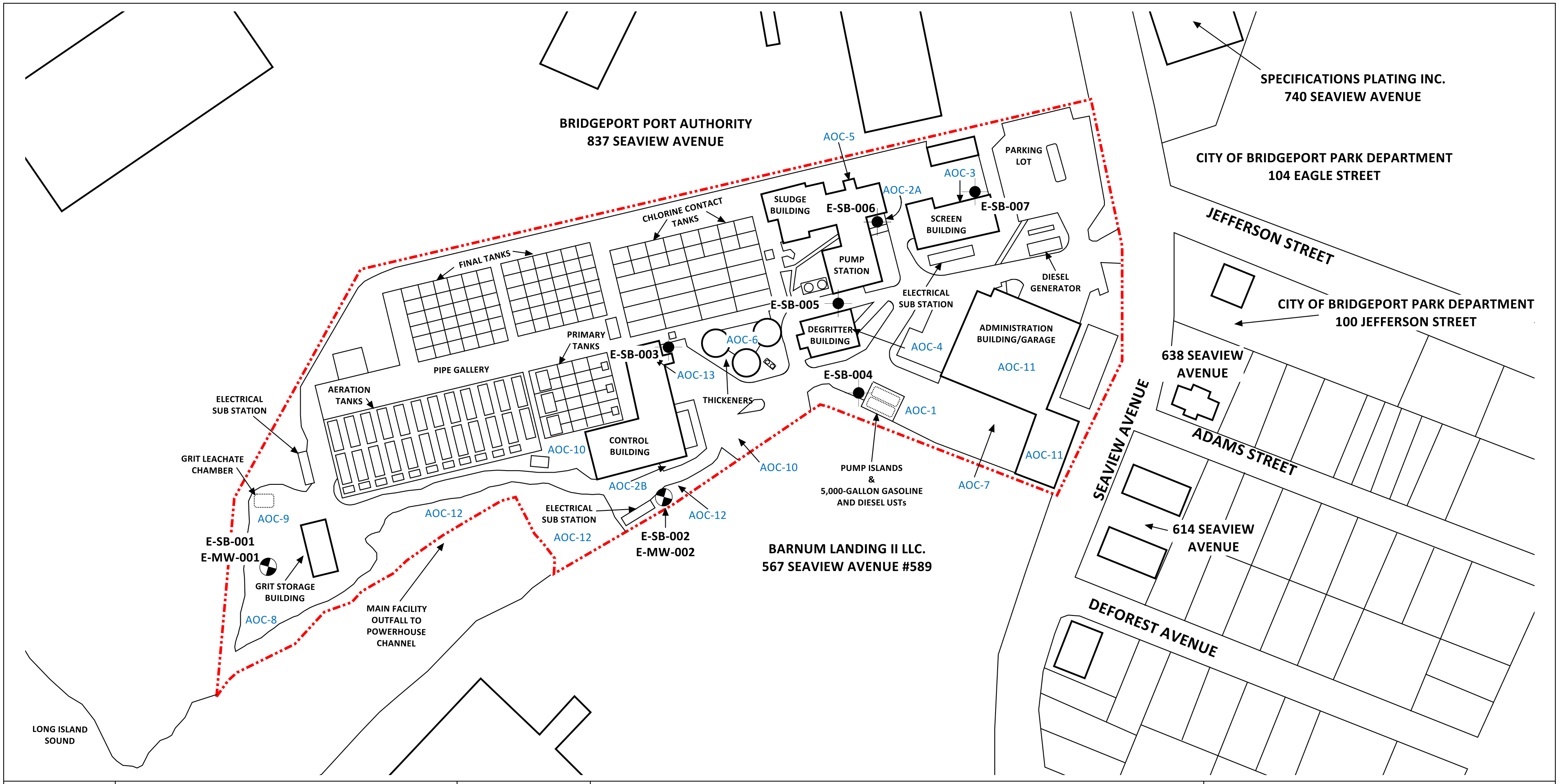
eolas environmental LLC

FIGURE 1
SITE LOCATION MAP



N

LEGEND

-·-·-·- PARCEL BOUNDARY

⊕ SOIL BORING LOCATION

◐ MONITORING WELL

-··-··- SITE BOUNDARY

☐ UST (Closed-In-Place)

PROJECT: Subsurface Investigation

SITE LOCATION: 601 (695) Seaview Avenue, Bridgeport, Connecticut

SOURCE: City of Bridgeport GIS

SCALE: NOT TO SCALE

eolas environmental

FIGURE 2

SITE PLAN AND SAMPLE LOCATION MAP

APPENDIX B

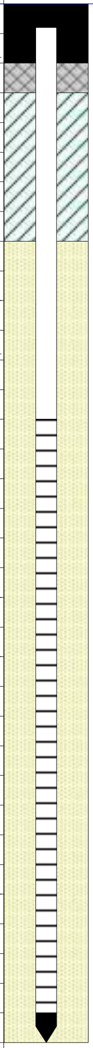
Soil Boring Logs

Site Location: East Plant, 695 Seaview Avenue, Bridgeport, CT **Client:** CDM Smith, Inc. **Project:** Subsurface Investigation	**GEOLOGIC BORING AND MONITORING WELL LOG**

eolas environmental LLC

BORING LOCATION: E-SB-001 / E-MW-001	**GROUND SURFACE ELEVATION AND DATUM:** NA	
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-2-2020 @ 0827	**DATE & TIME FINISHED:** 9-2-2020 @ 1015
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 20 fbg	**SCREEN INTERVAL (ft.):** 7-17
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** NA	**CASING:** 1.5" Sch.40PVC
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke	
HAMMER WEIGHT: NA **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh	

DEPTH (feet)	SAMPLES Sample ID	SAMPLES Recovery Inches	PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**	WELL CONSTRUCTION DETAILS
0	-	30/60		0"- 10" Pulverized ASPHALTIC CONCRETE	Traffic-Rated Road Box
1			0.0	10"-30" Brown, dark-brown medium to fine SAND and GRAVEL, moderately dense, very moist	Concrete
2					
3					
4			0.0		Bentonite chip seal
5	-	18/60		0"-10" SAME AS ABOVE	
6			0.0	0"- 18" SAME AS ABOVE, but with ASPHALTIC and CONCRETE RUBBLE, very moist at tip	# 1 filter pack sand surrounding 1.5" diameter Schedule 40 PVC casing
7					
8					
9			1.2		
10	E-SB-001-10-12.5 @ 0845	24/60		0"-12" SAME AS ABOVE but with trace Slag-Like Material, wet @ 12" ▼	#0 filter pack sand surounding 1.5", 0.010 Slot Geoprobe Pre-Pack
11			0.0	12"-24" Dark-brown fine to very fine SAND, GRAVEL, and fractured COBBLES, moderately dense, wet	
12					
13					
14			0.0		
15	-	36/60		0"-36" Black medium to fine GRAVEL, trace Silt, mild organic odor, very wet	
16			0.0		
17					
18					
19			0.0		
20					Bottom of Boring @ 20'



NOTES:

▼ Observed depth to water

Site Location: East Plant, 695 Seaview Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

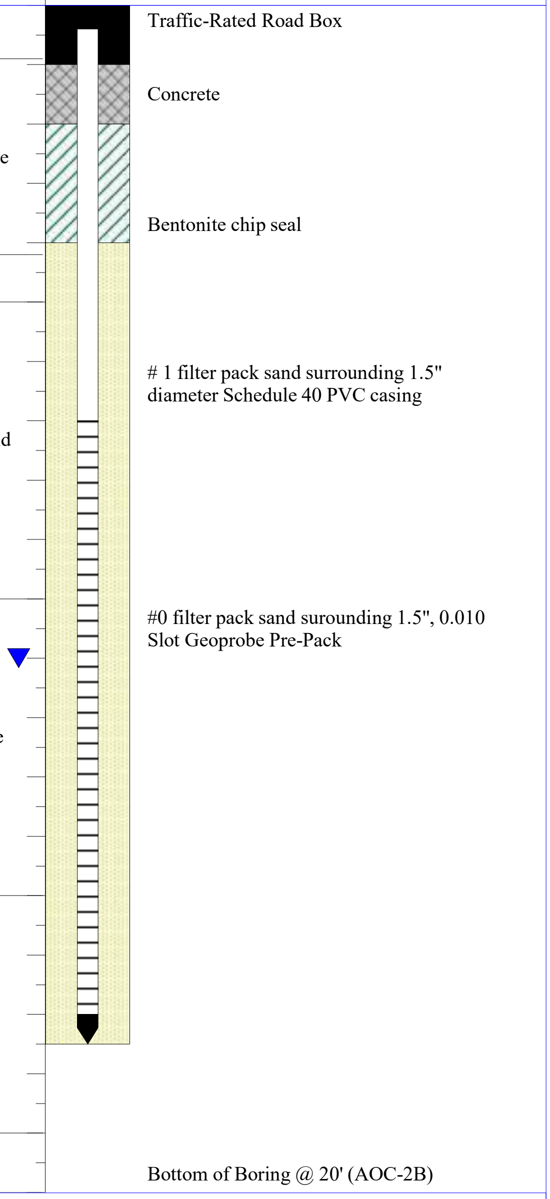
GEOLOGIC BORING AND MONITORING WELL LOG

eolas environmental LLC

BORING LOCATION: E-SB-002 / E-MW-002	**GROUND SURFACE ELEVATION AND DATUM:** NA	
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-2-2020 @ 0827	**DATE & TIME FINISHED:** 9-2-2020 @ 1135
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 20 fbg	**SCREEN INTERVAL (ft.):** 7-17
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** 8 fbg	**CASING:** 1.5" Sch.40PVC
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke	
HAMMER WEIGHT: NA / **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh	

DEPTH (feet)	SAMPLES		PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**
	Sample ID	Recovery Inches		
0 1 2 3 4	-	60/60	0.0 0.0	0"- 10" TOPSOIL 10"-50" Brown fine to very fine SAND and GRAVEL, some medium Gravel and pulverized Cobbles, little Silt and Concrete Fragments moderately dense, very moist 50"-60" Black very fine SAND, moderately dense, moist
5 6 7 8 9	-	60/60	0.0 0.1	0"- 60" SAME AS 10"-50" ABOVE, but black-brown with mild creosote-like odor, very moist @ 60"
10 11 12 13 14	E-SB-002-10-12.5 @ 1105 DUP-922020 @ 1110	60/60	5.7 4.2	0"-60" SAME AS ABOVE but wet @ 18", some creosote-like odor with little sheen on the water
15 16 17 18 19 20	-	60/60	2.0 0.8	0"-48" SAME AS ABOVE but very wet 48"- 60" Black-brown to gray-brown fine to very fine SAND, trace Silt with mild creosote-like odor, very wet

WELL CONSTRUCTION DETAILS



NOTES:
▼ Observed depth to water

Site Location: East Plant, 695 Seaview Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

eolas environmental LLC

BORING LOCATION:
E-SB-003

GROUND SURFACE ELEVATION AND DATUM:
NA

DRILLING CONTRACTOR:
Cisco Geotechnical, LLC

DATE & TIME STARTED:
9-2-2020 @ 1143

DATE & TIME FINISHED:
9-2-2020 @ 1205

DRILLING METHOD:
Direct Push

BORING DEPTH (ft.):
20 fbg

DRILLING EQUIPMENT:
Geoprobe 6620DT

DEPTH TO WATER:
NA

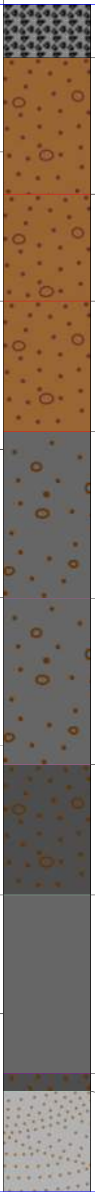
SAMPLING METHOD:
Macro Core/Grab

LOGGED BY:
Alexander Clarke

HAMMER WEIGHT:
NA

DROP:
NA

PROJECT MANAGER:
Kimberly Walsh



DEPTH (feet)	SAMPLES Sample ID	SAMPLES Recovery Inches	PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) Soil Classification: Modified Burmister	COMMENTS
0	-	47/60		0"-10" ASPHALT, SUB-BASE	
1			0.0	10"-37" Brown fine to very fine SAND and GRAVEL, some medium Gravel and Silt, moderately dense, moist	
3			0.0	37"-47" SAME AS ABOVE but with little Asphaltic Granules	
5	-	56/60	0.3	0"-28" SAME AS ABOVE, but with Wood from 8"- 12"	
7			4.1	28"-56" SAME AS ABOVE but dark-brown to black-brown, very moist from 46"- 56" with mild creosote-like odor	
9	E-SB-003-9-11 @ 1205				
10		60/60	2.3	0"-30" SAME AS ABOVE but very wet	▼
13	-		1.4	30"- 60" Dark to black-brown fine to very fine SAND and Gravel, some Silt, moderately dense, very wet	
15	-	50/60	0.1	0"-36" SLUFF	
18			0.1	36"- 40" SAME AS 30"- 60" ABOVE	
18.5				40"- 50" Gray-brown fine to very fine SAND	Bottom of Boring @ 20'
20					

NOTES:
▼ Observed depth to water

Site Location: East Plant, 695 Seaview Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

eolas environmental llc

BORING LOCATION: E-SB-004

GROUND SURFACE ELEVATION AND DATUM: NA

DRILLING CONTRACTOR: Cisco Geotechnical, LLC

DATE & TIME STARTED: 9-2-2020 @ 1215

DATE & TIME FINISHED: 9-2-2020 @ 1240

DRILLING METHOD: Direct Push

BORING DEPTH (ft.): 20 fbg

DRILLING EQUIPMENT: Geoprobe 6620DT

DEPTH TO WATER: NA

SAMPLING METHOD: Macro Core/Grab

LOGGED BY: Alexander Clarke

HAMMER WEIGHT: NA

DROP: NA

PROJECT MANAGER: Kimberly Walsh

DEPTH (feet)	SAMPLES		PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) Soil Classification: Modified Burmister	COMMENTS
	Sample ID	Recovery Inches			
0	-	58/60	0.0 0.0	0"-8" ASPHALT, SUB-BASE	
1				8"-58" Brown to black-brown medium to very fine SAND and GRAVEL, some Concrete Fragments and Asphaltic Granules, little Creosote-Crystal-Like Granules, Slag-Like Material (FILL) moderately dense, moist	
5	E-SB-004-7-9 @ 1235	30/60	0.2 0.4	0"-12" SAME AS ABOVE but very moist	
6				12"-24" SAME AS ABOVE, but very wet with mild petroleum odor and sheen	
7				24"-30" Gray SILTY CLAY with ORGANIC MATTER, dense, very moist	
10	-	0/60	- -	NO RECOVERY ▼	
15	- -	56/60	0.0 0.0	0"- 28" SLUFF	
				28"- 56" Brown to gray-brown fine to very fine SAND, moderately dense, wet	Bottom of Boring @ 20'
20					

NOTES:

▼ Observed depth to water

Site Location: East Plant, 695 Seaview Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

eolas environmental LLC

BORING LOCATION: E-SB-005

GROUND SURFACE ELEVATION AND DATUM: NA

DRILLING CONTRACTOR: Cisco Geotechnical, LLC

DATE & TIME STARTED: 9-2-2020 @ 1310

DATE & TIME FINISHED: 9-2-2020 @ 1330

DRILLING METHOD: Direct Push

BORING DEPTH (ft.): 12 fbg

DRILLING EQUIPMENT: Geoprobe 6620DT

DEPTH TO WATER: NA

SAMPLING METHOD: Macro Core/Grab

LOGGED BY: Alexander Clarke

HAMMER WEIGHT: NA

DROP: NA

PROJECT MANAGER: Kimberly Walsh

DEPTH (feet)	SAMPLES Sample ID	SAMPLES Recovery Inches	PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**	COMMENTS
0–1	-	55/60	0.0	0"-10" ASPHALT, SUB-BASE	
1–2.5				10"-50" Dark-brown fine to very fine SAND and GRAVEL, little fractured coarse Gravel, and Concrete, Asphaltic and Brick Granules, trace Silt and Slag-Like Material (FILL) moderately dense, moist	
2.5–4.6			0.0		
4.6–5	E-SB-005-4-6 @ 1330			50"-55" SAME AS ABOVE but very moist	
5–5.9		48/60	0.0	0"-10" SAME AS ABOVE	
5.9–7.5				10"-48" Brown to dark-brown fine to very fine SAND and GRAVEL, some coarse to medium Gravel, little Silt, trace Brick, very wet	
7.5–10			0.0		
10–12	-	28/24	0.0	0"-28" Coarse to medium GRAVEL with little dark-brown fine to very fine Sand, loose, very wet ▼	Refusal @ 12'
12.5–15			-		
15–17.5	-	-	-		
17.5–20			-		

NOTES:

▼ Observed depth to water

Site Location: East Plant, 695 Seaview Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

BORING LOCATION: E-SB-006	**GROUND SURFACE ELEVATION AND DATUM:** NA
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-2-2020 @ 1340 / **DATE & TIME FINISHED:** 9-2-2020 @ 1350
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 12 fbg
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** NA
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke
HAMMER WEIGHT: NA / **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh

DEPTH (feet)	SAMPLES		PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**	COMMENTS
	Sample ID	Recovery Inches			
0				0"-6" TOPSOIL	
1			0.0		
2	-	56/60		6"-56" Brown to dark-brown fine to very fine SAND and GRAVEL, some coarse to medium Gravel, little Silt and Brick Granules, trace Asphaltic Granules, moderately dense, moist	
3					
4			0.0		
5					
6			0.0	0"-15" SAME AS ABOVE but very moist	
7	E-SB-006-6-8 @ 1350	32/60			
8				15"-32" SAME AS ABOVE but wet ▼	
9			0.0		
10				0"-12" SAME AS ABOVE	
11		24/28	0.0		
12	-			12"-24" SAME AS ABOVE but black-brown	Refusal @ 12.5'
13					
14			-		
15					
16			-		
17	-	-			
18					
19			-		
20					

NOTES:
▼ Observed depth to water

Site Location: East Plant, 695 Seaview Avenue, Bridgeport, CT
Client: CDM Smith, Inc.
Project: Subsurface Investigation

GEOLOGIC BORING LOG

eolas environmental LLC

BORING LOCATION: E-SB-007	**GROUND SURFACE ELEVATION AND DATUM:** NA	
DRILLING CONTRACTOR: Cisco Geotechnical, LLC	**DATE & TIME STARTED:** 9-2-2020 @ 1400	**DATE & TIME FINISHED:** 9-2-2020 @ 1440
DRILLING METHOD: Direct Push	**BORING DEPTH (ft.):** 20 fbg	
DRILLING EQUIPMENT: Geoprobe 6620DT	**DEPTH TO WATER:** NA	
SAMPLING METHOD: Macro Core/Grab	**LOGGED BY:** Alexander Clarke	
HAMMER WEIGHT: NA **DROP:** NA	**PROJECT MANAGER:** Kimberly Walsh	

DEPTH (feet)	SAMPLES		PID (ppm)	SOIL DESCRIPTION/ LITHOLOGY (e.g. color, primary grain size, secondary grain size, moisture, sorting, sphericity, angularity, sedimentary structure, density, cohesiveness, other) **Soil Classification: Modified Burmister**	COMMENTS
	Sample ID	Recovery Inches			
0				0"-4" ASPHALT, SUB-BASE	
1 2 3 4 5	E-SB-007-2.5-5 @ 1435	42/60	0.0 0.0	4"-42" Same (FILL) but wet from 34"- 42" ▼	
6 7 8 9 10	-	36/60	0.0 0.0	0"-36" SAME AS ABOVE but very wet	
11 12 13 14 15	-	50/60	0.0 0.0	0"-28" SAME AS ABOVE 28"-50" Brown very fine SAND and SILT laminations, moderatley dense, wet	
16 17 18 19 20	-	60/60	0.0 0.0	SAME AS ABOVE	Bottom of Boring @ 20'

NOTES:
▼ Observed depth to water

APPENDIX C

Analytical Data Tables

Table 1
Summary of Soil Sampling Results
City of Bridgeport East Wastewater Treatment Plant
601 (695) Seaview Avenue, Bridgeport, Connecticut 06607

						Sample Location	E-SB-001	E-SB-002	E-SB-003	E-SB-004	E-SB-005	E-SB-006	E-SB-007	Duplicate Sample (E-SB-002)	Trip Blank	Trip Blank
						Sample ID	E-SB-001-10-12.5	E-SB-002-10-12.5	E-SB-003-9-11	E-SB-004-7-9	E-SB-005-4-6	E-SB-006-6-8	E-SB-007-2.5-5	DUP-922020	TB-9122020 High	TB-912020 LOW
						Lab Sample ID	CG69828	CG69829	CG69830	CG69831	CG69832	CG69833	CG69835	CG9827	CG69836	CG69826
						Collection Date	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/20
						Depth (fbg)	10-12.5	10-12.5	9.0-11.0	7.0-9.0	4.0-6.0	6.0-8.0	2.5-5.0	--	Trip Blank High	Trip Blank Low
Parameter	**GB PMC**	**GB PMC APS**	**RDEC**	**RDEC APS**	**IDEC**	**IDEC APS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Miscellaneous (RDEC, IDEC - mg/kg) (PMC - mg/l by SPLP/TCLP)																
Cyanide	2	--	1,400	--	41,000	--	**2.91**	<0.55	<0.55	**0.91**	<0.59	<0.55	--	<0.61	--	--
Metals (RDEC, IDEC - mg/kg) (PMC - mg/l by SPLP/TCLP) (*20X PMC)																
Arsenic	10*	--	10	--	10	--	**9.65**	**7.12**	**6.35**	**26.5**	**8.11**	**8.13**	**7.49**	**7.63**	--	--
Arsenic - SPLP/TCLP	0.5	--	NE	--	NE	--	NA	NA	NA	<0.10	NA	NA	NA	NA	--	--
Barium	200*	--	4,700	--	140,000	--	**87.2**	**215**	**97.1**	**87.6**	**147**	**93.7**	**117**	**174**	--	--
Barium - SPLP/TCLP	10	--	NE	--	NE	--	NA	**0.53**	NA	NA	NA	NA	NA	NA	--	--
Cadmium	1*	--	34	--	1,000	--	**2.4**	**20.8**	**3.8**	**2.24**	**13**	**4.97**	**2.11**	**6.45**	--	--
Cadmium - SPLP/TCLP	0.05	--	NE	--	NE	--	NA	**0.092**	NA	NA	NA	NA	NA	NA	--	--
Chromium	10*	--	100	--	100	--	**134**	**128**	**159**	**89.1**	**159**	**167**	**37.3**	**202**	--	--
Chromium - SPLP/TCLP	0.5	--	NE	--	NE	--	NA	NA	NA	NA	NA	<0.10	NA	NA	--	--
Lead	3*	--	400	--	1,000	--	**87.8**	**561**	**234**	**89**	**74.6**	**243**	**160**	**444**	--	--
Lead - SPLP/TCLP	0.15	--	NE	--	NE	--	NA	<0.10	NA	NA	NA	NA	NA	NA	--	--
Mercury	0.4*	--	20	--	610	--	**0.53**	**1.28**	**0.29**	**0.25**	**0.03**	**0.35**	**0.31**	**0.92**	--	--
Mercury - SPLP/TCLP	0.02	--	NE	--	NE	--	NA	**0.0056**	NA	NA	NA	NA	NA	NA	--	--
Selenium	10*	--	340	--	10,000	--	<1.5	**4.1**	<1.6	**1.9**	<1.6	<1.6	<1.4	<1.5	--	--
Selenium - SPLP/TCLP	0.5	--	NE	--	NE	--	NA	<0.10	NA	NA	NA	NA	NA	NA	--	--
Silver	7.2*	--	340	--	10,000	--	<0.37	**5.1**	**7.31**	**2.9**	**0.83**	**4.99**	**0.7**	**5.67**	--	--
Silver - SPLP/TCLP	0.36	--	NE	--	NE	--	NA	NA	<0.10	NA	NA	NA	NA	NA	--	--
Total Petroleum Hydrocarbons (mg/kg)																
Ext. Petroleum H.C. (C9-C36)	2,500	--	500	--	2,500	--	<52	**270**	<60	**78**	<58	<61	<57	**240**	--	--
Polychlorinated Biphenyls (RDEC, IDEC - µg/kg) (PMC - mg/l by SPLP/TCLP)																
PCB-1016	0.005	--	1,000	--	10,000	--	<350	**<4,000**	**<2,000**	<390	<390	**<2,000**	<370	**<2,000**	--	--
PCB-1221	0.005	--	1,000	--	10,000	--	<350	**<4,000**	**<2,000**	<390	<390	**<2,000**	<370	**<2,000**	--	--
PCB-1232	0.005	--	1,000	--	10,000	--	<350	**<4,000**	**<2,000**	<390	<390	**<2,000**	<370	**<2,000**	--	--
PCB-1242	0.005	--	1,000	--	10,000	--	<350	**<4,000**	**<2,000**	<390	<390	**<2,000**	<370	**<2,000**	--	--
PCB-1248	0.005	--	1,000	--	10,000	--	<350	**16,000**	**7,500**	**2,100**	**3,500**	**4,200**	**800**	**8,900**	--	--
PCB-1254	0.005	--	1,000	--	10,000	--	<350	**<4,000**	**<2,000**	<390	<390	**<2,000**	<370	**<2,000**	--	--
PCB-1260	0.005	--	1,000	--	10,000	--	<350	**<4,000**	**<2,000**	<390	<390	**<2,000**	<370	**<2,000**	--	--
PCB-1262	0.005	--	1,000	--	10,000	--	<350	**<4,000**	**<2,000**	<390	<390	**<2,000**	<370	**<2,000**	--	--
PCB-1268	0.005	--	1,000	--	10,000	--	<350	**<4,000**	**<2,000**	<390	<390	**<2,000**	<370	**<2,000**	--	--
Volatile Organic Compounds (µg/kg)																
1,1,1,2-Tetrachloroethane	200	--	24,000	--	220,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<200	<5.0
1,1,1-Trichloroethane	40,000	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
1,1,2,2-Tetrachloroethane	100	--	3,100	--	29,000	--	<2.5	<3.4	<3.0	<3.8	<2.9	<3.9	<3.4	<3.4	<100	<3.0
1,1,2-Trichloroethane	1,000	--	11,000	--	100,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
1,1-Dichloroethane	14,000	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
1,1-Dichloroethylene	1,400	--	1,000	--	9,500	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
1,1-Dichloropropene	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
1,2,3-Trichlorobenzene	NE	--	NE	--	NE	--	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
1,2,3-Trichloropropane	NE	--	NE	--	NE	--	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
1,2,4-Trichlorobenzene	NE	14,000	NE	21,000	NE	200,000	<290	<320	<5.0	<380	**200**	<6.5	<320	<340	<250	<5.0
1,2,4-Trimethylbenzene	NE	28,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
1,2-Dibromo-3-chloropropane	NE	40	NE	90	NE	820	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<100	<5.0
1,2-Dibromoethane	100	--	7	--	67	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<100	<5.0
1,2-Dichlorobenzene	3,100	--	500,000	--	1,000,000	--	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
1,2-Dichloroethane	200	--	6,700	--	63,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<200	<5.0
1,2-Dichloropropane	1,000	--	9,000	--	84,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
1,3,5-Trimethylbenzene	NE	28,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
1,3-Dichlorobenzene	120,000	--	500,000	--	1,000,000	--	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
1,3-Dichloropropane	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
1,4-Dichlorobenzene	15,000	--	26,000	--	240,000	--	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
2,2-Dichloropropane	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
2-Chlorotoluene	NE	28,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
2-Hexanone	NE	7,000	NE	340,000	NE	1,000,000	<20	<28	<25	<32	<24	<32	<28	<28	<1,300	<25
2-Isopropyltoluene	NE	--	NE	--	NE	--	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
4-Chlorotoluene	NE	--	NE	--	NE	--	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
4-Methyl-2-pentanone	14,000	--	500,000	--	1,000,000	--	<20	<28	<25	<32	<24	<32	<28	<28	<1,300	<25

Table 1
Summary of Soil Sampling Results
City of Bridgeport East Wastewater Treatment Plant
601 (695) Seaview Avenue, Bridgeport, Connecticut 06607

						Sample Location	E-SB-001	E-SB-002	E-SB-003	E-SB-004	E-SB-005	E-SB-006	E-SB-007	Duplicate Sample (E-SB-002)	Trip Blank	Trip Blank
						Sample ID	E-SB-001-10-12.5	E-SB-002-10-12.5	E-SB-003-9-11	E-SB-004-7-9	E-SB-005-4-6	E-SB-006-6-8	E-SB-007-2.5-5	DUP-922020	TB-9122020 High	TB-912020 LOW
						Lab Sample ID	CG69828	CG69829	CG69830	CG69831	CG69832	CG69833	CG69835	CG9827	CG69836	CG69826
						Collection Date	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/20
						Depth (fbg)	10-12.5	10-12.5	9.0-11.0	7.0-9.0	4.0-6.0	6.0-8.0	2.5-5.0	--	Trip Blank High	Trip Blank Low
Parameter	**GB PMC**	**GB PMC APS**	**RDEC**	**RDEC APS**	**IDEC**	**IDEC APS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Acetone	140,000	--	500,000	--	1,000,000	--	<200	<280	<250	<320	<240	<320	<280	<280	<5,000	<250
Acrylonitrile	100	--	1,100	--	11,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<100	<5.0
Benzene	200	--	21,000	--	200,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<200	<5.0
Bromobenzene	NE	--	NE	--	NE	--	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
Bromochloromethane	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Bromodichloromethane	NE	210	NE	18,000	NE	170,000	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<210	<5.0
Bromoform	800	--	78,000	--	720,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Bromomethane	NE	700	NE	34,000	NE	1,000,000	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Carbon Disulfide	NE	8,000	NE	500,000	NE	1,000,000	**5.5**	**21**	**8.8**	<6.3	<4.9	<6.5	<5.7	**24**	<250	<5.0
Carbon tetrachloride	1,000	--	4,700	--	44,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Chlorobenzene	20,000	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Chloroethane	NE	1,500	NE	130,000	NE	1,000,000	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Chloroform	1,200	--	100,000	--	940,000	--	<4.1	<5.7	<5.0	<6.3	**140**	<6.5	<5.7	<5.6	<250	<5.0
Chloromethane	NE	3,600	NE	180,000	NE	1,000,000	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
cis-1,2-Dichloroethylene	14,000	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
cis-1,3-Dichloropropene	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<100	<5.0
Dibromochloromethane	100	--	7,300	--	68,000	--	<2.5	<3.4	<3.0	<3.8	<2.9	<3.9	<3.4	<3.4	<100	<3.0
Dibromomethane	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Dichlorodifluoromethane	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Ethylbenzene	10,100	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Hexachlorobutadiene	NE	1,500	NE	130,000	NE	1,200,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
Isopropylbenzene	NE	5,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
m&p-Xylene	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Methyl ethyl ketone	80,000	--	500,000	--	1,000,000	--	<25	<34	<30	<38	<29	<39	<34	<34	<3000	<30
Methyl t-butyl ether (MTBE)	20,000	--	500,000	--	1,000,000	--	<8.2	<11	<10	<13	<9.8	<13	<11	<11	<250	<10
Methylene chloride	1,000	--	82,000	--	760,000	--	<8.2	<11	<10	<13	<9.8	<13	<11	<11	<500	<10
Naphthalene	56,000	--	1,000,000	--	2,500,000	--	<290	<320	**6.6**	<380	<4.9	<6.5	<320	<340	<250	<5.0
n-Butylbenzene	NE	70,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
n-Propylbenzene	NE	10,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
o-Xylene	NE	--	NE	--	NE	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
p-Isopropyltoluene	NE	5,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
sec-Butylbenzene	NE	70,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
Styrene	20,000	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
tert-Butylbenzene	NE	70,000	NE	500,000	NE	1,000,000	<290	<320	<5.0	<380	<4.9	<6.5	<320	<340	<250	<5.0
Tetrachloroethylene	1,000	--	12,000	--	110,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Tetrahydrofuran (THF)	NE	800	NE	61,000	NE	570,000	<8.2	<11	<10	<13	<9.8	<13	<11	<11	<500	<10
Toluene	67,000	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Total Xylenes	19,500	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
trans-1,2-Dichloroethylene	20,000	--	500,000	--	1,000,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
trans-1,3-Dichloropropene	100	--	3,400	--	32,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<100	<5.0
trans-1,4-dichloro-2-butene	NE	--	NE	--	NE	--	<580	<640	<10	<770	<9.8	<13	<650	<690	<500	<10
Trichloroethene	1,000	--	56,000	--	520,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Trichlorofluoromethane	NE	200,000	NE	500,000	NE	1,000,000	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Trichlorotrifluoroethane	NE	200,000	NE	500,000	NE	1,000,000	<8.2	<11	<10	<13	<9.8	<13	<11	<11	<250	<10
Vinyl chloride	400	--	320	--	3,000	--	<4.1	<5.7	<5.0	<6.3	<4.9	<6.5	<5.7	<5.6	<250	<5.0
Semivolatile Organic Compounds (μg/kg)																
1,2,4,5-Tetrachlorobenzene	NE	1,000	NE	20,000	NE	610,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
1,2,4-Trichlorobenzene	NE	14,000	NE	21,000	NE	200,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
1,2-Dichlorobenzene	NE	--	NE	--	NE	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
1,2-Diphenylhydrazine	NE	1,000	NE	770	NE	7,200	<350	<400	<400	<400	<370	<410	<370	<410	--	--
1,3-Dichlorobenzene	NE	--	NE	--	NE	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
1,4-Dichlorobenzene	NE	--	NE	--	NE	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2,4,5-Trichlorophenol	NE	140,000	NE	1,000,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2,4,6-Trichlorophenol	NE	1,000	NE	56,000	NE	520,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2,4-Dichlorophenol	4,000	--	200,000	--	2,500,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2,4-Dimethylphenol	NE	28,000	NE	1,000,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2,4-Dinitrophenol	NE	2,800	NE	140,000	NE	2,500,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--
2,4-Dinitrotoluene	NE	1,000	NE	900	NE	8,400	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2,6-Dinitrotoluene	NE	1,000	NE	900	NE	8,400	<250	<280	<280	<280	<260	<280	<260	<280	--	--

Table 1
Summary of Soil Sampling Results
City of Bridgeport East Wastewater Treatment Plant
601 (695) Seaview Avenue, Bridgeport, Connecticut 06607

						Sample Location	E-SB-001	E-SB-002	E-SB-003	E-SB-004	E-SB-005	E-SB-006	E-SB-007	Duplicate Sample (E-SB-002)	Trip Blank	Trip Blank
						Sample ID	E-SB-001-10-12.5	E-SB-002-10-12.5	E-SB-003-9-11	E-SB-004-7-9	E-SB-005-4-6	E-SB-006-6-8	E-SB-007-2.5-5	DUP-922020	TB-9122020 High	TB-912020 LOW
						Lab Sample ID	CG69828	CG69829	CG69830	CG69831	CG69832	CG69833	CG69835	CG9827	CG69836	CG69826
						Collection Date	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/20
						Depth (fbg)	10-12.5	10-12.5	9.0-11.0	7.0-9.0	4.0-6.0	6.0-8.0	2.5-5.0	--	Trip Blank High	Trip Blank Low
Parameter	**GB PMC**	**GB PMC APS**	**RDEC**	**RDEC APS**	**IDEC**	**IDEC APS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
2-Chloronaphthalene	NE	110,000	NE	500,000	NE	1,000,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2-Chlorophenol	7,200	--	340,000	--	2,500,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2-Methylnaphthalene	NE	5,600	NE	270,000	NE	1,000,000	**380**	<280	<280	**490**	<260	<280	<260	<280	--	--
2-Methylphenol (o-cresol)	NE	28,000	NE	1,000,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
2-Nitroaniline	NE	2,000	NE	31,000	NE	290,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--
2-Nitrophenol	NE	--	NE	--	NE	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
3&4-Methylphenol (m&p-cresol)	NE	--	NE	--	NE	--	<350	<400	<400	<400	<370	<410	<370	<410	--	--
3,3'-Dichlorobenzidine	NE	1,000	NE	1,400	NE	13,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
3-Nitroaniline	NE	2,000	NE	31,000	NE	290,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--
4,6-Dinitro-2-methylphenol	NE	2,000	NE	20,000	NE	610,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--
4-Bromophenyl phenyl ether	NE	--	NE	--	NE	--	<350	<400	<400	<400	<370	<410	<370	<410	--	--
4-Chloro-3-methylphenol	NE	140,000	NE	1,000,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
4-Chloroaniline	NE	1,000	NE	3,100	NE	29,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
4-Chlorophenyl phenyl ether	NE	--	NE	--	NE	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
4-Nitroaniline	NE	2,000	NE	31,000	NE	290,000	<560	<640	<640	<640	<590	<650	<600	<650	--	--
4-Nitrophenol	NE	--	NE	--	NE	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Acenaphthene	NE	84,000	NE	1,000,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Acenaphthylene	84,000	--	1,000,000	--	2,500,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Acetophenone	NE	--	NE	--	NE	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Aniline	NE	1,200	NE	110,000	NE	1,000,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--
Anthracene	400,000	--	1,000,000	--	2,500,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Benz(a)anthracene	1,000	--	1,000	--	7,800	--	**1,000**	**610**	**400**	**290**	**570**	**360**	**1,000**	**480**	--	--
Benzidine	NE	1,000	NE	200	NE	200	<200	<200	<200	<200	<200	<200	<200	<200	--	--
Benzo(a)pyrene	1,000	--	1,000	--	1,000	--	**1,300**	**650**	**390**	<280	**660**	**360**	**940**	**540**	--	--
Benzo(b)fluoranthene	1,000	--	1,000	--	7,800	--	**1,200**	**610**	**370**	<280	**590**	**310**	**840**	**570**	--	--
Benzo(ghi)perylene	NE	1,000	NE	8,400	NE	78,000	**1,000**	**500**	**300**	<280	**480**	<280	**540**	**470**	--	--
Benzo(k)fluoranthene	1,000	--	8,400	--	78,000	--	**1,400**	**550**	**300**	<280	**570**	**300**	**820**	**490**	--	--
Benzoic acid	NE	200,000	NE	1,000,000	NE	2,500,000	<700	<800	<800	<800	<730	<810	<750	<810	--	--
Benzyl butyl phthalate	200,000	--	1,000,000	--	2,500,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Bis(2-chloroethoxy)methane	NE	4,200	NE	200,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Bis(2-chloroethyl)ether	2,400	--	1,000	--	5,200	--	<350	<400	<400	<400	<370	<410	<370	<410	--	--
Bis(2-chloroisopropyl)ether	2,400	--	8,800	--	82,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Bis(2-ethylhexyl)phthalate	11,000	--	44,000	--	410,000	--	<250	**470**	<280	<280	<260	<280	<260	**330**	--	--
Carbazole	NE	1,000	NE	31,000	NE	290,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--
Chrysene	NE	1,000	NE	84,000	NE	780,000	**880**	**710**	**420**	**400**	**640**	**410**	**1,000**	**580**	--	--
Dibenz(a,h)anthracene	NE	1,000	NE	1,000	NE	1,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Dibenzofuran	NE	1,400	NE	68,000	NE	1,000,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Diethyl phthalate	NE	200,000	NE	1,000,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Dimethylphthalate	NE	200,000	NE	1,000,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Di-n-butylphthalate	140,000	--	1,000,000	--	2,500,000	--	<350	<400	<400	<400	<370	<410	<370	<410	--	--
Di-n-octylphthalate	20,000	--	1,000,000	--	2,500,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Fluoranthene	56,000	--	1,000,000	--	2,500,000	--	**1,500**	**1,200**	**890**	**510**	**850**	**1,000**	**2,100**	**970**	--	--
Fluorene	56,000	--	1,000,000	--	2,500,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Hexachlorobenzene	1,000	--	1,000	--	3,600	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Hexachlorobutadiene	NE	1,500	NE	130,000	NE	1,200,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Hexachlorocyclopentadiene	NE	8,400	NE	410,000	NE	1,000,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Hexachloroethane	1,000	--	44,000	--	410,000	--	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Indeno(1,2,3-cd)pyrene	NE	1,000	NE	1,000	NE	7,800	**1,200**	**520**	**300**	<280	**540**	<280	**590**	**450**	--	--
Isophorone	NE	7,400	NE	640,000	NE	2,500,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
Naphthalene	56,000	--	1,000,000	--	2,500,000	--	**280**	<280	<280	<280	<260	<280	<260	**340**	--	--
Nitrobenzene	NE	1,000	NE	4,000	NE	41,000	<250	<280	<280	<280	<260	<280	<260	<280	--	--
N-Nitrosodimethylamine	NE	1,000	NE	200	NE	360	<200	<200	<200	<200	<200	<200	<200	<200	--	--
N-Nitrosodi-n-propylamine	NE	1,000	NE	200	NE	820	<200	<200	<200	<200	<200	<200	<200	<200	--	--
N-Nitrosodiphenylamine	NE	1,400	NE	130,000	NE	1,200,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--
Pentachloronitrobenzene	NE	1,400	NE	68,000	NE	2,000,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--
Pentachlorophenol	1,000	--	5,100	--	48,000	--	<350	<400	<400	<400	<370	<410	<370	<410	--	--
Phenanthrene	40,000	--	1,000,000	--	2,500,000	--	**520**	**760**	**520**	**680**	**450**	**930**	**900**	**660**	--	--
Phenol	800,000	--	1,000,000	--	2,500,000	--	<250	<280	<280	<280	<260	<280	<260	**540**	--	--
Pyrene	40,000	--	1,000,000	--	2,500,000	--	**1,300**	**1,200**	**860**	**500**	**870**	**830**	**1,900**	**1,000**	--	--
Pyridine	NE	1,000	NE	20,000	NE	610,000	<350	<400	<400	<400	<370	<410	<370	<410	--	--

Table 1
Summary of Soil Sampling Results
City of Bridgeport East Wastewater Treatment Plant
601 (695) Seaview Avenue, Bridgeport, Connecticut 06607

						Sample Location	E-SB-001	E-SB-002	E-SB-003	E-SB-004	E-SB-005	E-SB-006	E-SB-007	Duplicate Sample (E-SB-002)	Trip Blank	Trip Blank
						Sample ID	E-SB-001-10-12.5	E-SB-002-10-12.5	E-SB-003-9-11	E-SB-004-7-9	E-SB-005-4-6	E-SB-006-6-8	E-SB-007-2.5-5	DUP-922020	TB-9122020 High	TB-912020 LOW
						Lab Sample ID	CG69828	CG69829	CG69830	CG69831	CG69832	CG69833	CG69835	CG9827	CG69836	CG69826
						Collection Date	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/2020	9/2/20
						Depth (fbg)	10-12.5	10-12.5	9.0-11.0	7.0-9.0	4.0-6.0	6.0-8.0	2.5-5.0	--	Trip Blank High	Trip Blank Low
Parameter	**GB PMC**	**GB PMC APS**	**RDEC**	**RDEC APS**	**IDEC**	**IDEC APS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Pesticides (µg/kg)																
4,4'-DDD	NE	20	NE	1,800	NE	17,000	<7.1	<16	<16	<28	**12**	<8.0	--	<16	--	--
4,4'-DDE	NE	20	NE	1,800	NE	17,000	<7.1	<16	<42	<18	**41**	<8.0	--	<16	--	--
4,4'-DDT	NE	20	NE	1,800	NE	17,000	<7.1	<16	<16	<7.9	**35**	<8.0	--	<16	--	--
a-BHC	NE	10	NE	340	NE	3,200	<7.1	<16	<16	<7.9	<7.8	<8.0	--	<16	--	--
Alachlor	400	--	7,700	--	72,000	--	<7.1	<79	<79	<39	<39	<40	--	<79	--	--
Aldrin	NE	10	NE	40	NE	340	<3.5	<16	<16	<7.9	<7.8	<8.0	--	<16	--	--
b-BHC	NE	10	NE	340	NE	3,200	<7.1	<16	<16	<7.9	<7.8	<8.0	--	<16	--	--
Chlordane	66	66	490	490	2,200	2,200	<35	<160	<160	<79	<78	<80	--	**<160**	--	--
d-BHC	NE	10	NE	340	NE	3,200	<7.1	<16	<16	<7.9	<7.8	<8.0	--	<16	--	--
Dieldrin	7	--	38	--	360	--	<3.5	**<64**	**<16**	**<7.9**	**<7.8**	**<8.0**	--	**<16**	--	--
Endosulfan I	NE	840	NE	41,000	NE	1,000,000	<7.1	<79	<79	<39	<39	<40	--	<79	--	--
Endosulfan II	NE	840	NE	41,000	NE	1,000,000	<7.1	<79	<79	<39	<39	<40	--	<79	--	--
Endosulfan sulfate	NE	840	NE	41,000	NE	1,000,000	<7.1	<79	<79	<39	<39	<40	--	<79	--	--
Endrin	400	400	20,000	20,000	610,000	610,000	<7.1	<79	<79	<39	<39	<40	--	<79	--	--
Endrin aldehyde	NE	400	NE	20,000	NE	610,000	<7.1	<79	<79	<39	<39	<40	--	<79	--	--
Endrin ketone	NE	400	NE	20,000	NE	610,000	<7.1	<79	<79	<39	<39	<40	--	<79	--	--
g-BHC	40	--	20,000	--	610,000	--	<1.4	**<200**	<16	<7.9	<7.8	<8.0	--	<16	--	--
Heptachlor	13	--	140	--	1,300	--	<7.1	**<40**	**<40**	**<20**	**<19**	**<20**	--	**<40**	--	--
Heptachlor epoxide	20	--	67	--	630	--	<7.1	**<40**	**73**	<20	<19	<20	--	**<64**	--	--
Methoxychlor	8,000	--	340,000	--	10,000,000	--	<35	<400	<400	<200	<190	<200	--	<400	--	--
Toxaphene	600	--	560	--	5,200	--	<140	**<1,600**	**<1,600**	**<790**	**<780**	**<800**	--	**<1,600**	--	--
Herbicides (µg/kg)																
2,4,5-T	NE	--	NE	--	NE	--	<87	<200	<100	<100	<97	<100	--	<100	--	--
2,4,5-TP (Silvex)	NE	--	NE	--	NE	--	<87	<200	<100	<100	<97	<100	--	<100	--	--
2-4D	14,000	--	680,000	--	20,000,000	--	<170	<400	<200	<200	<190	<200	--	<200	--	--
2,4-DB	NE	--	NE	--	NE	--	<1,700	<4,000	<2,000	<2,000	<1,900	<2,000	--	<2,000	--	--
Dalapon	NE	--	NE	--	NE	--	<87	<200	<100	<100	<97	<100	--	<100	--	--
Dicamba	NE	42,000	NE	500,000	NE	1,000,000	<87	<200	<100	<100	<97	<100	--	<100	--	--
Dichloroprop	NE	5,000	NE	240,000	NE	1,000,000	<170	<400	<200	<200	<190	<200	--	<200	--	--
Dinoseb	NE	--	NE	--	NE	--	<170	<400	<200	<200	<190	<200	--	<200	--	--

Notes:

Standards derived from RSRs Sections 22a-133k-1 through 22a-133k-3, Appendix A through F.

RDEC- Residential Direct Exposure Criteria

IDEC- Industrial Direct Exposure Criteria

APS - Additional Polluting Substances

VC - Volatilization Criteria

GA PMC- GA Pollutant Mobility Criteria

GB PMC- GB Pollutant Mobility Criteria

fbg - feet below grade

mg/kg- milligrams per kilogram

mg/l - milligrams per liter

NE - Not Established

NA - Not Analyzed

Results Detected Above Laboratory Reporting Limit

Reporting Limit Exceeds One or More Criteria

Result Exceeds One or More Criteria

Result Exceeds One or More APS Criteria

Table 2
Summary of Groundwater Sampling Results
City of Bridgeport East Wastewater Treatment Plant
601 (695) Seaview Avenue, Bridgeport, Connecticut 06607

						Sample Location	MW-001	MW-002	MW-002	Trip Blank
						Sample ID	E-MW-001	E-MW-002	DUP-09292020	TB-09292020
						Lab Sample ID	CG87503	CG87505	CG87506	CG87503
						Collection Date	9/29/2020	9/29/2020	9/29/2020	9/29/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
Metals, Total (mg/l)										
Arsenic	0.004	--	NE	--	NE	--	**0.007**	**0.006**	**0.008**	--
Barium	NE	2.2	NE	--	NE	--	**0.041**	**0.389**	**0.392**	--
Cadmium	0.006	--	NE	--	NE	--	<0.001	<0.001	<0.001	--
Chromium	0.11	--	NE	--	NE	--	**0.045**	**0.005**	**0.005**	--
Lead	0.013	--	NE	--	NE	--	<0.002	**0.007**	**0.004**	--
Mercury	0.0004	--	NE	--	NE	--	<0.0002	<0.0002	<0.0002	--
Selenium	0.05	--	NE	--	NE	--	<0.010	<0.010	<0.010	--
Silver	0.012	--	NE	--	NE	--	<0.001	<0.001	<0.001	--
Metals, Dissolved (mg/l)										
Arsenic	0.004	--	NE	--	NE	--	<0.004	**0.007**	**0.006**	--
Barium	NE	2.2	NE	--	NE	--	**0.038**	**0.4**	**0.397**	--
Cadmium	0.006	--	NE	--	NE	--	<0.005	<0.001	<0.001	--
Chromium	0.11	--	NE	--	NE	--	**0.007**	**0.003**	**0.003**	--
Lead	0.013	--	NE	--	NE	--	<0.011	**0.006**	**0.003**	--
Mercury	0.0004	--	NE	--	NE	--	<0.0002	<0.0002	<0.0002	--
Selenium	0.05	--	NE	--	NE	--	<0.05	<0.05	<0.05	--
Silver	0.012	--	NE	--	NE	--	<0.005	<0.001	<0.001	--
Total Petroleum Hydrocarbons (mg/l)										
Ext. Petroleum H.C. (C9-C36)	NE	0.25	NE	--	NE	--	<0.067	**0.31**	**0.19**	--
Polychlorinated Biphenyls (µg/l)										
PCB-1016	0.5	--	NE	--	NE	--	<0.094	<0.47	<0.47	--
PCB-1221	0.5	--	NE	--	NE	--	<0.094	<0.47	<0.47	--
PCB-1232	0.5	--	NE	--	NE	--	<0.094	<0.47	<0.47	--
PCB-1242	0.5	--	NE	--	NE	--	<0.094	**1.7**	**1.8**	--
PCB-1248	0.5	--	NE	--	NE	--	<0.094	<0.47	<0.47	--
PCB-1254	0.5	--	NE	--	NE	--	<0.094	<0.47	<0.47	--
PCB-1260	0.5	--	NE	--	NE	--	<0.094	<0.47	<0.47	--
PCB-1262	0.5	--	NE	--	NE	--	<0.094	<0.47	<0.47	--
PCB-1268	0.5	--	NE	--	NE	--	<0.094	<0.47	<0.47	--
Volatile Organic Compounds (µg/l)										
1,1,1,2-Tetrachloroethane	NE	330	12	--	50	--	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	62,000	--	20,400	--	50,000	--	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	110	--	23	--	100	--	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	1,260	--	8,000	--	19,600	--	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	NE	4,100	34,600	--	50,000	--	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	96	--	1	--	6	--	<1.0	<1.0	<1.0	<1.0
1,1-Dichloropropene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0

Table 2
Summary of Groundwater Sampling Results
City of Bridgeport East Wastewater Treatment Plant
601 (695) Seaview Avenue, Bridgeport, Connecticut 06607

						Sample Location	MW-001	MW-002	MW-002	Trip Blank
						Sample ID	E-MW-001	E-MW-002	DUP-09292020	TB-09292020
						Lab Sample ID	CG87503	CG87505	CG87506	CG87503
						Collection Date	9/29/2020	9/29/2020	9/29/2020	9/29/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
1,2,3-Trichlorobenzene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichloropropane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
1,2,4-Trichlorobenzene	NE	9.6	NE	12	NE	660	<1.0	<1.0	<1.0	<1.0
1,2,4-Trimethylbenzene	NE	150	NE	940	NE	12,800	<1.0	**1.9**	**1.9**	<1.0
1,2-Dibromo-3-chloropropane	NE	1.1	NE	--	NE	--	<0.50	<0.50	<0.50	<0.50
1,2-Dibromoethane	NE	--	4	--	16	--	<0.50	<0.50	<0.50	<0.50
1,2-Dichlorobenzene	170,000	--	30,500	--	50,000	--	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	2,970	--	21	--	90	--	<0.60	<0.60	<0.60	<0.60
1,2-Dichloropropane	NE	150	14	--	60	--	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	NE	260	NE	730	NE	10,000	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	26,000	--	24,200	--	50,000	--	<1.0	<1.0	<1.0	<1.0
1,3-Dichloropropane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	26,000	--	50,000	--	50,000	--	<1.0	<1.0	<1.0	<1.0
2,2-Dichloropropane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
2-Chlorotoluene	NE	10,000	NE	2,100	NE	28,300	<1.0	<1.0	<1.0	<1.0
2-Hexanone	NE	10,000	NE	7,600	NE	94,000	<5.0	<5.0	<5.0	<5.0
2-Isopropyltoluene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
4-Chlorotoluene	NE	10,000	NE	1,900	NE	25,200	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-pentanone	NE	--	50,000	--	50,000	--	<5.0	<5.0	<5.0	<5.0
Acetone	NE	10,000	50,000	--	50,000	--	<25	<25	<25	<25
Acrylonitrile	20	--	NE	--	NE	--	<0.50	<0.50	<0.50	<0.50
Benzene	710	--	215	--	530	--	<0.70	<0.70	<0.70	<0.70
Bromobenzene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
Bromochloromethane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	NE	510	NE	1.1	NE	35	<0.50	<0.50	<0.50	<0.50
Bromoform	10,800	--	920	--	3,800	--	<1.0	<1.0	<1.0	<1.0
Bromomethane	NE	160	NE	83	NE	1,100	<1.0	<1.0	<1.0	<1.0
Carbon Disulfide	NE	150	NE	2,100	NE	5,200	<5.0	<5.0	<5.0	<5.0
Carbon tetrachloride	132	--	16	--	40	--	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	420,000	--	1,800	--	6,150	--	<1.0	<1.0	<1.0	<1.0
Chloroethane	NE	10,000	NE	22	NE	360	<1.0	<1.0	<1.0	<1.0
Chloroform	14,100	--	287	--	710	--	<1.0	<1.0	<1.0	<1.0
Chloromethane	NE	10,000	NE	130	NE	1,800	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethylene	NE	6,200	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
cis-1,3-Dichloropropene	NE	--	NE	--	NE	--	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	1,020	--	NE	--	NE	--	<0.50	<0.50	<0.50	<0.50
Dibromomethane	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane	NE	10,000	NE	53	NE	720	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	580,000	--	50,000	--	50,000	--	<1.0	<1.0	<1.0	<1.0
Hexachlorobutadiene	NE	10	NE	--	NE	--	<0.40	<0.40	<0.40	<0.40

Table 2
Summary of Groundwater Sampling Results
City of Bridgeport East Wastewater Treatment Plant
601 (695) Seaview Avenue, Bridgeport, Connecticut 06607

						Sample Location	MW-001	MW-002	MW-002	Trip Blank
						Sample ID	E-MW-001	E-MW-002	DUP-09292020	TB-09292020
						Lab Sample ID	CG87503	CG87505	CG87506	CG87503
						Collection Date	9/29/2020	9/29/2020	9/29/2020	9/29/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
Isopropylbenzene	NE	210	NE	900	NE	2,200	<1.0	<1.0	<1.0	<1.0
m&p-Xylene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
Methyl ethyl ketone	NE	10,000	50,000	--	50,000	--	<5.0	<5.0	<5.0	<5.0
Methyl t-butyl ether (MTBE)	NE	10,000	50,000	--	50,000	--	<1.0	**1.3**	**1.3**	<1.0
Methylene chloride	48,000	--	50,000	--	50,000	--	<1.0	<1.0	<1.0	<1.0
Naphthalene	NE	210	NE	--	NE	--	<1.0	**2**	**2**	<1.0
n-Butylbenzene	NE	10,000	NE	1,600	NE	21,800	<1.0	<1.0	<1.0	<1.0
n-Propylbenzene	NE	10,000	NE	1,200	NE	2,900	<1.0	<1.0	<1.0	<1.0
o-Xylene	NE	--	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
p-Isopropyltoluene	NE	200	NE	870	NE	2,100	<1.0	<1.0	<1.0	<1.0
sec-Butylbenzene	NE	10,000	NE	1,500	NE	20,100	<1.0	<1.0	<1.0	<1.0
Styrene	NE	320	580	--	2,065	--	<1.0	<1.0	<1.0	<1.0
tert-Butylbenzene	NE	10,000	NE	1,900	NE	25,300	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	88	--	1,500	--	3,820	--	<1.0	<1.0	<1.0	<1.0
Tetrahydrofuran (THF)	NE	9,600	NE	250	NE	3,700	<2.5	<2.5	<2.5	<2.5
Toluene	4,000,000	--	23,500	--	50,000	--	<1.0	<1.0	<1.0	<1.0
Total Xylenes	NE	270	21,300	--	50,000	--	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethylene	NE	10,000	NE	--	NE	--	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	34,000	--	6	--	25	--	<0.40	<0.40	<0.40	<0.40
trans-1,4-dichloro-2-butene	NE	--	NE	--	NE	--	<5.0	<5.0	<5.0	<5.0
Trichloroethylene	2,340	--	219	--	540	--	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	NE	10,000	NE	1,300	NE	4,300	<1.0	<1.0	<1.0	<1.0
Trichlorotrifluoroethane	NE	320	NE	330	NE	810	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	15,750	--	2	--	2	--	<1.0	<1.0	<1.0	<1.0
Semivolatile Organic Compounds (µg/l)										
1,2,4,5-Tetrachlorobenzene	NE	11	NE	--	NE	--	<3.3	<3.3	<3.3	--
1,2,4-Trichlorobenzene	NE	9.6	NE	12	NE	660	<4.8	<4.8	<4.8	--
1,2-Dichlorobenzene	NE	--	NE	--	NE	--	<2.4	<2.4	<2.4	--
1,2-Diphenylhydrazine	NE	6	NE	--	NE	--	<4.8	<4.8	<4.8	--
1,3-Dichlorobenzene	NE	--	NE	--	NE	--	<2.4	<2.4	<2.4	--
1,4-Dichlorobenzene	NE	--	NE	--	NE	--	<2.4	<2.4	<2.4	--
2,4,5-Trichlorophenol	NE	28	NE	--	NE	--	<0.95	<0.95	<0.95	--
2,4,6-Trichlorophenol	NE	49	NE	--	NE	--	<0.95	<0.95	<0.95	--
2,4-Dichlorophenol	15,800		NE	--	NE	--	<0.95	<0.95	<0.95	--
2,4-Dimethylphenol	NE	150	NE	--	NE	--	<0.95	**9.2**	**10**	--
2,4-Dinitrophenol	NE	710	NE	--	NE	--	<0.95	<0.95	<0.95	--
2,4-Dinitrotoluene	NE	100	NE	--	NE	--	<4.8	<4.8	<4.8	--
2,6-Dinitrotoluene	NE	46	NE	--	NE	--	<4.8	<4.8	<4.8	--
2-Chloronaphthalene	NE	10,000	NE	27,300	NE	50,000	<4.8	<4.8	<4.8	--

Table 2
Summary of Groundwater Sampling Results
City of Bridgeport East Wastewater Treatment Plant
601 (695) Seaview Avenue, Bridgeport, Connecticut 06607

						Sample Location	MW-001	MW-002	MW-002	Trip Blank
						Sample ID	E-MW-001	E-MW-002	DUP-09292020	TB-09292020
						Lab Sample ID	CG87503	CG87505	CG87506	CG87503
						Collection Date	9/29/2020	9/29/2020	9/29/2020	9/29/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
2-Chlorophenol	NE	420	NE	--	NE	--	<0.95	<0.95	<0.95	--
2-Methylphenol (o-cresol)	NE	670	NE	--	NE	--	<0.95	**2.4**	**2.9**	--
2-Nitroaniline	NE	210	NE	--	NE	--	<4.8	<4.8	<4.8	--
2-Nitrophenol	NE	560	NE	--	NE	--	<0.95	<0.95	<0.95	--
3&4-Methylphenol (m&p-cresol)	NE	--	NE	--	NE	--	<9.5	<9.5	<9.5	--
3,3'-Dichlorobenzidine	NE	5	NE	--	NE	--	<4.8	<4.8	<4.8	--
3-Nitroaniline	NE	70	NE	--	NE	--	<4.8	<4.8	<4.8	--
4,6-Dinitro-2-methylphenol	NE	10	NE	--	NE	--	<0.95	<0.95	<0.95	--
4-Bromophenyl phenyl ether	NE	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
4-Chloro-3-methylphenol	NE	73	NE	--	NE	--	<0.95	<0.95	<0.95	--
4-Chloroaniline	NE	9.9	NE	--	NE	--	<4.8	<4.8	<4.8	--
4-Chlorophenyl phenyl ether	NE	--	NE	--	NE	--	<0.95	<0.95	<0.95	--
4-Nitroaniline	NE	1,200	NE	--	NE	--	<4.8	<4.8	<4.8	--
4-Nitrophenol	NE	--	NE	--	NE	--	<0.95	<0.95	<0.95	--
Acetophenone	NE	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
Aniline	NE	41	NE	--	NE	--	<4.8	<4.8	<4.8	--
Benzidine	NE	5	NE	--	NE	--	<4.8	<4.8	<4.8	--
Benzoic acid	NE	9,000	NE	--	NE	--	<48	<48	<48	--
Benzyl butyl phthalate	NE	230	NE	--	NE	--	<4.8	<4.8	<4.8	--
Bis(2-chloroethoxy)methane	NE	10,000	NE	--	NE	--	<4.8	<4.8	<4.8	--
Bis(2-chloroethyl)ether	42	--	NE	--	NE	--	<0.95	<0.95	<0.95	--
Bis(2-chloroisopropyl)ether	3,400,000	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
Bis(2-ethylhexyl)phthalate	59	--	NE	--	NE	--	<0.95	<0.95	<0.95	--
Carbazole	NE	53	NE	--	NE	--	<4.8	<4.8	<4.8	--
Dibenzofuran	NE	40	NE	460	NE	5,800	<0.95	<0.95	<0.95	--
Diethyl phthalate	NE	2,200	NE	--	NE	--	<4.8	<4.8	<4.8	--
Dimethylphthalate	NE	10,000	NE	--	NE	--	<4.8	<4.8	<4.8	--
Di-n-butylphthalate	120,000	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
Di-n-octylphthalate	NE	--	NE	--	NE	--	<4.8	<4.8	<4.8	--
Hexachloroethane	89	--	NE	--	NE	--	<0.95	<0.95	<0.95	--
Isophorone	NE	9,200	NE	--	NE	--	<4.8	<4.8	<4.8	--
N-Nitrosodimethylamine	NE	90	NE	--	NE	--	<4.8	<4.8	<4.8	--
N-Nitrosodi-n-propylamine	NE	15	NE	--	NE	--	<4.8	<4.8	<4.8	--
N-Nitrosodiphenylamine	NE	180	NE	--	NE	--	<4.8	<4.8	<4.8	--
Pentachloronitrobenzene	NE	25	NE	--	NE	--	<2.4	<2.4	<2.4	--
Phenol	92,000,000	--	NE	--	NE	--	<0.95	**32**	**43**	--
Semivolatile Organic Compounds (SIM) (µg/l)										
2-Methylnaphthalene	NE	62	NE	1,000	NE	13,100	<0.48	**0.73**	**0.82**	--
Acenaphthene	NE	150	NE	30,500	NE	50,000	<0.48	<0.48	<0.48	--

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						Sample Location	MW-001	MW-002	MW-002	Trip Blank
						Sample ID	E-MW-001	E-MW-002	DUP-09292020	TB-09292020
						Lab Sample ID	CG87503	CG87505	CG87506	CG87503
						Collection Date	9/29/2020	9/29/2020	9/29/2020	9/29/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
Acenaphthylene	0.3	--	NE	--	NE	--	<0.29	<0.29	<0.29	--
Anthracene	1,100,000	--	NE	--	NE	--	<0.48	<0.48	<0.48	--
Benz(a)anthracene	0.3	--	NE	--	NE	--	<0.05	<0.05	<0.05	--
Benzo(a)pyrene	0.3	--	NE	--	NE	--	<0.19	<0.19	<0.19	--
Benzo(b)fluoranthene	0.3	--	NE	--	NE	--	<0.07	<0.07	<0.07	--
Benzo(ghi)perylene	NE	150	NE	--	NE	--	<0.46	<0.46	<0.46	--
Benzo(k)fluoranthene	0.3	--	NE	--	NE	--	<0.29	<0.29	<0.29	--
Chrysene	NE	0.54	NE	--	NE	--	<0.48	<0.48	<0.48	--
Dibenz(a,h)anthracene	NE	0.3	NE	--	NE	--	<0.10	<0.10	<0.10	--
Fluoranthene	3,700	--	NE	--	NE	--	<0.48	<0.48	<0.48	--
Fluorene	140,000	--	NE	--	NE	--	<0.48	<0.48	<0.48	--
Hexachlorobenzene	0.077	--	NE	--	NE	--	<0.06	<0.06	<0.06	--
Hexachlorobutadiene	NE	10	NE	--	NE	--	<0.48	<0.48	<0.48	--
Hexachlorocyclopentadiene	NE	0.7	NE	--	NE	--	<0.48	<0.48	<0.48	--
Indeno(1,2,3-cd)pyrene	NE	0.54	NE	--	NE	--	<0.10	<0.10	<0.10	--
Naphthalene	NE	210	NE	--	NE	--	<0.48	**1.4**	**1.5**	--
Nitrobenzene	NE	2,300	NE	51	NE	750	<0.48	<0.48	<0.48	--
Pentachlorophenol	NE	30	NE	--	NE	--	<0.48	<0.48	<0.48	--
Phenanthrene	0.077	14	NE	--	NE	--	<0.06	**0.44**	**0.48**	--
Pyrene	110,000	--	NE	--	NE	--	<0.48	<0.48	<0.48	--
Pyridine	NE	260	NE	1,900	NE	23,500	<0.48	<0.48	<0.48	--
Pesticides (µg/l)										
4,4'-DDD	NE	0.05	NE	--	NE	--	<0.047	<0.019	<0.019	--
4,4'-DDE	NE	0.05	NE	--	NE	--	<0.047	<0.019	<0.019	--
4,4'-DDT	NE	0.05	NE	--	NE	--	<0.047	<0.019	<0.019	--
a-BHC	NE	0.11	NE	--	NE	--	<0.024	<0.019	<0.019	--
Alachlor	NE	450	NE	--	NE	--	<0.071	<0.71	<0.71	--
Aldrin	NE	0.05	NE	--	NE	--	<0.001	<0.014	<0.014	--
b-BHC	NE	0.11	NE	--	NE	--	<0.005	<0.047	<0.047	--
Chlordane	0.3	0.3	NE	--	NE	--	<0.28	<0.19	<0.19	--
d-BHC	NE	0.11	NE	--	NE	--	<0.024	<0.019	<0.019	--
Dieldrin	0.1	--	NE	--	NE	--	<0.001	<0.019	<0.019	--
Endosulfan I	NE	0.56	NE	--	NE	--	<0.047	<0.47	<0.47	--
Endosulfan II	NE	0.56	NE	--	NE	--	<0.047	<0.47	<0.47	--
Endosulfan Sulfate	NE	0.56	NE	--	NE	--	<0.047	<0.47	<0.47	--
Endrin	0.1	0.1	NE	--	NE	--	<0.047	<0.047	<0.047	--
Endrin Aldehyde	NE	0.1	NE	--	NE	--	<0.047	<0.047	<0.047	--
Endrin ketone	NE	0.1	NE	--	NE	--	<0.047	<0.047	<0.047	--
g-BHC (Lindane)	NE	0.11	NE	--	NE	--	<0.024	<0.019	<0.019	--

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						Lab Sample ID	CG87503	CG87505	CG87506	CG87503
						Collection Date	9/29/2020	9/29/2020	9/29/2020	9/29/2020
Parameter	**SWPC**	**SWPC APS**	**RVC**	**RVC APS**	**IVC**	**IVC APS**	**Result**	**Result**	**Result**	**Result**
Heptachlor	0.05	--	NE	--	NE	--	<0.024	<0.047	<0.047	--
Heptachlor epoxide	0.05	--	NE	--	NE	--	<0.024	<0.047	<0.047	--
Methoxychlor	NE	0.5	NE	--	NE	--	<0.094	<0.047	<0.047	--
Toxaphene	1	--	NE	--	NE	--	<0.94	<1.9	<1.9	--
Chlorinated Herbicides (µg/l)										
2,4,5-T	NE	--	NE	--	NE	--	<2.5	<2.5	<2.5	--
2,4,5-TP (Silvex)	NE	--	NE	--	NE	--	<2.5	<2.5	<2.5	--
2,4-D	NE	1,700	NE	--	NE	--	<5.0	<5.0	<5.0	--
2,4-DB	NE	--	NE	--	NE	--	<50	<50	<50	--
Dalapon	NE	--	NE	--	NE	--	<2.5	<2.5	<2.5	--
Dicamba	NE	2,200	NE	--	NE	--	<2.5	<2.5	<2.5	--
Dichloroprop	NE	120	NE	--	NE	--	<5.0	<5.0	<5.0	--
Dinoseb	NE	--	NE	--	NE	--	<5.0	<5.0	<5.0	--

Notes:

Standards derived from RSRs Sections 22a-133k-1 through 22a-133k-3, Appendix A through F.
GWPC - Groundwater Protection Criteria
SWPC - Surface Water Protection Criteria
IVC - Industrial/Commercial Volatilization Criteria
RVC - Residential Volatilization Criteria
µg/l - micrograms per liter
mg/l - milligrams per liter
NA - Not Analyzed
NE - Not Established
-- Not Analyzed or Not Applicable
Results Detected Above Laboratory Reporting Limit
Reporting Limit Exceeds One or More Criteria
Result Exceeds One or More Criteria
Result Exceeds One or More APS Criteria

APPENDIX D

Laboratory Analytical Reports

Detailed Laboratory Reports Available Upon Request

Appendix J

Clean Water Fund Guidance

Clean Water Fund Memorandum 4 (CWFM-4)

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Clean Water Fund Memorandum (CWFM - 4)
May 2, 2002

To: All Connecticut Municipalities and Consultants

Re: Thirty percent (30%) Grant for construction costs related to BNR removal

The following list outlines the processes and their maximum eligibility for 30% grant monies required by the latest changes to Section 22a-478 (c) of the General Statutes of Connecticut for BNR construction projects:

1.	Preliminary treatment	zero %
2.	Primary treatment	zero %
3.	Secondary treatment:	
	a. Methanol feed systems	100 %
	b. Baffles - Anoxic zones	100 %
	c. Recycle pumps, VFDs, & associated piping	100 %
	d. Anoxic zone mixers	100 %

e. Additional tankage or an increase in size of tankage - increased costs associated with BNR to be evaluated using TR-16.
If a facility is already designed to operate in year-round nitrification mode no additional grant will be provided. If a facility is already designed to operate in a seasonal nitrification mode the additional tankage required to meet year-round nitrification and denitrification will be eligible.

f. Blowers, piping, diffuser grids, & associated equipment - increased costs associated with BNR to be evaluated based on the increase in oxygen needed at 20 year average daily design flow. Increased oxygen needed for nit/denit is approximately:

Secondary: 1.1ppm x lbs BOD = 1.1ppm x (200ppm x 0.65) = 1193 lb/MG
Nit: 4.6ppm x TKN = 4.6ppm x 25 x 8.34 = 960 lb/MG
Nit/denit: (4.6ppm x TKN - 2.9ppm x NO_3) x 8.34 = 960 - (2.9 ppm x 20 x 8.34) = 960 - 484 = 476 lb/MG

This shows an 80% increase needed over secondary for nitrification only and a 40% increase over secondary needed for nit/denit.

Facilities with O_2, TKN and/or NO_3 values that differ significantly from the above values will be required to supply appropriate backup information to justify a departure to the above assumptions.

g. Return sludge pumps - increased costs associated with BNR to be evaluated using TR-16.

h. High biomass - increased costs associated with BNR to be evaluated using TR-16. If the high biomass is necessary only for nit/denit it would be eligible. If the biomass is to alleviate capacity problems as well as nit/denit the eligible amount will be prorated.

4. Secondary clarifiers:
    a. Density current baffles 100%
    b. Additional tankage - increased costs associated with BNR to be evaluated using a maximum SOR of 1200 gpd/sf for straight secondary and 800 gpd/sf for AWT.

5. Denitrification Filters 100%

6. Intermediate pumping - If necessary for hydraulic profile due to added BNR facilities 100%

7. Laboratory nutrient testing equipment - not to include autoanalyzers 100%

8. Solids handling/processing zero%

9. Sitework:
    a. Demolition, dewatering, & piles - if required to construct BNR facilities 100%
    b. Other - piping, bedding, restoration, . . . to be determined with the following formula:

$$\frac{\text{Construction costs eligible for 30\% BNR grant}}{\text{CWF eligible construction costs}} \text{ x [CWF eligible site work costs - demolition]}$$

10. Electrical - to be determined with the following formula:

$$\frac{\text{Construction costs eligible for 30\% BNR grant}}{\text{CWF eligible construction costs}} \text{ x [CWF eligible electrical costs]}$$

11. Plant water system - Only those costs related to aeration system foam sprays.

12. Engineering services - to be determined with the following formula:

$$\frac{\text{Construction costs eligible for 30\% BNR grant}}{\text{CWF eligible construction costs}} \text{ x [CWF eligible design and construction engineering costs]}$$

13. Construction Contingency - to be determined with the following formula:

$$\frac{\text{Construction costs eligible for 30\% BNR grant}}{\text{CWF eligible construction costs}} \text{ x [reasonable CWF eligible construction costs]}$$

Very truly yours,

Thomas M. Morrissey

Thomas M. Morrissey, Director
Planning & Standards Division
Bureau of Water Management

Clean Water Fund Memorandum 2015-002 (CWFM-2015-002)

CDM
Smith

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

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FINAL Clean Water Fund Memorandum (2015-002)

TO: **All Connecticut Municipalities and Consultants**

RE: **Combined Sewer Overflow Treatment Plant Project Grant / Loan Eligibility for Clean Water Fund Projects**

I. PURPOSE

To provide a clear and consistent methodology for determining Connecticut Clean Water Fund (CWF) eligibility and funding grant percentage for combined sewer overflow (CSO) treatment plant projects.

II. GOVERNING STATUTES

The Connecticut General Statutes (CGS) Section 22a-475 (3) defines combined sewer projects as

"…any project undertaken to mitigate pollution due to combined sewer and storm drain systems, including, but not limited to, components of regional water pollution control facilities undertaken to prevent the overflow of untreated wastes due to collection system inflow, provided the state share of the cost of such components is less than the state share of the estimated cost of eliminating such inflow by means of physical separation at the sources of such inflow."

Section 22a-478 (c) (2) indicates the following funding allotment for combined sewer projects:

"A combined sewer project shall receive (A) a project grant of fifty per cent of the cost of the project, and (B) a loan for the remainder of the costs of the project, not exceeding one hundred per cent of the eligible water quality project costs."

III. ELIGIBILITY

Many CSO Long Term Control Plans (LTCPs) propose to expand treatment capacity at the plant in order to manage extraneous combined flows that will not be separated from the collection system. In order for a treatment plant project to be considered for CSO eligibility, some portion of the treatment plant upgrade must be part of the CSO LTCP strategy to reduce the intensity, frequency, or duration of CSO events. Wastewater process components that shall be eligible for 50% CSO grant participation as CSO components are as follows:

- Those where additional capacity is required to treat combined sewer flows in excess of the facility's normal treatment capacity, when CSO and other flows will share the same process train/equipment; or
- If a new process train will be dedicated to CSO flow, whatever capacity will be required to treat the additional flow routed away from the other process train(s).

Often CSO projects have both CSO and non-CSO components. Only the parts of CSO projects that directly address the reduction of CSOs shall be eligible for 50% CSO grant.

A. Determination of Design and Construction Grant Percentages

Design and construction grant funding for wastewater treatment plants upgrades that include CSO abatement shall be developed based on a blended grant percentage:

- The portion of the CWF eligible work related to CSO abatement (50% grant);
- The portion of the CWF eligible work related to nutrient removal (30% grant); and
- The remainder of CWF eligible work related to neither nutrient nor CSO removal (20% grant).

A blended grant percentage shall be developed from the most recent engineer's cost estimates to determine the CWF grant award for both design and construction services. The blended grant percentage shall be used to determine the grant award on all CWF eligible construction costs for that project.

B. Eligibility Determinations of Wastewater Plant Processes and Equipment

The following list outlines the methodology for determining the eligibility of wastewater treatment plant processes and equipment for **combined sewer funding**:

1. **Preliminary Treatment: If additional CSO flow will receive preliminary treatment and additional preliminary equipment capacity is required (pumps, screens, grit collectors), CSO grant eligible costs shall be determined with following formula:**

   CSO Grant Eligible Costs =

   $$\text{CWF Eligible Construction Costs X} \left(\frac{\text{(CSO Flow Capacity – Normal Treatment Capacity)}}{\text{CSO Flow Capacity}} \right)$$

   Preliminary treatment equipment solely dedicated to the CSO train and CSO flow shall be eligible for the 50% CSO grant.

2. **Primary Treatment: If additional CSO flow will receive primary treatment and additional primary tank capacity is required but will be shared with other flow trains, CSO grant eligible costs shall be determined with following formula:**

   CSO Grant Eligible Costs =

   $$\text{CWF Eligible Construction Costs X} \left(\frac{\text{(CSO Flow Capacity – Normal Treatment Capacity)}}{\text{CSO Flow Capacity}} \right)$$

   Primary treatment equipment solely dedicated to the CSO train and CSO flow shall be eligible for the 50% CSO grant.

3. **Secondary Treatment/Clarifiers**..ineligible for 50% CSO grant

4. **Intermediate pumping:** If necessary for hydraulic profile due to added CSO facilities..eligible for 50% CSO grant

5. **Tertiary Treatment (e.g., filters, ballasted flocculation)**...................... ineligible for 50% CSO grant

6. **Laboratory Equipment**..ineligible for 50% CSO grant

7. **Solids Handling/Processing** ....ineligible for 50% CSO grant

8. **Disinfection**: If CSO flow will receive disinfection treatment and additional disinfection capacity is required but will be shared with other flow trains, CSO grant eligible costs shall be determined with following formula:

   CSO Grant Eligible Costs =

   $$\text{CWF Eligible Construction Costs X} \left(\frac{\text{(CSO Flow Capacity – Normal Treatment Capacity)}}{\text{CSO Flow Capacity}} \right)$$

   Disinfection equipment solely dedicated to the CSO train and CSO flow shall be eligible for the 50% CSO grant.

9. **Plant water system**..ineligible for 50% CSO grant

10. **Sitework:**

    a. Demolition, dewatering & piles – if required for CSO facilities..........eligible for 50% CSO grant

    b. Other – piping, bedding, restoration

       CSO grant eligible costs shall be determined with the following formula:

       CSO Grant Eligible Costs =

       $$\left(\frac{\text{CSO Grant Eligible Construction Costs}}{\text{CWF Eligible Construction Costs}} \right) \text{ X (CWF Eligible Site Work Costs – Demo Costs)}$$

       When it is difficult to differentiate the CSO Grant Eligible Construction Costs, the following formula may be used instead to determine CSO grant eligible costs:

       CSO Grant Eligible Costs = Blended Grant Percentage X (CWF Eligible Site Work Costs – Demo Costs)

11. **Relocation of structures:**

    a. The demolition of structures that do not manage any CSO flows (e.g., garages and administration buildings) shall be ineligible for 50% CSO grant, unless those structures are being demolished to provide space for a CSO treatment component.

    b. The replacement of structures demolished shall not be eligible for 50% CSO grant, unless those structures are being demolished to provide space for a CSO treatment component.

12. **Electrical/Instrumentation & Controls (I&C):** CSO grant eligible costs shall be determined with the following formula:

    $$\text{CSO Grant Eligible Costs} = \left(\frac{\text{CSO Grant Eligible Construction Costs}}{\text{CWF Eligible Construction Costs}} \right) \text{ X CWF eligible electrical/I\&C}$$

When it is difficult to differentiate the CSO Grant Eligible Construction Costs, the following formula may be used instead to determine CSO grant eligible costs:

CSO Grant Eligible Costs = Blended Grant Percentage X CWF eligible electrical/I&C costs

13. **Upsized pipes/pumps for CSO flow:** CSO grant eligible costs shall be determined with following formula:

    CSO Grant Eligible Costs =

    Incremental Cost of Equipment Upsize Required for Additional CSO Flow =

    Equipment Cost for CSO Flow Capacity – Equipment Cost for Normal Treatment Capacity

14. **Odor control system:** CSO grant eligible costs shall be determined with following formula:

$$\text{CSO Grant Eligible Costs} = \left(\frac{\text{CSO Train Process Floor Area}}{\text{Total Process Floor Area}}\right) \text{ X CWF eligible odor control costs}$$

$$\text{OR} \quad = \left(\frac{\text{Volumetric Airflow Rate for CSO features}}{\text{Total Volumetric Airflow Rate}}\right) \text{ X CWF eligible odor control costs}$$

IV. DEFINITIONS

Blended Grant Percentage: Grant percentage developed from a combination of cost items where it is possible to evaluate what components may be eligible for 20% general upgrade grant, 30% nitrogen removal grant, and/or 50% CSO grant. This blended grant percentage may be applied to determine the grant award for cost items where it is not clear what components may be associated with nitrogen and/or CSO removal.

CGS: Connecticut General Statutes

Combined Sewer Project: Any project undertaken to mitigate pollution due to combined sewer and storm drain systems, including, but not limited to, components of regional water pollution control facilities undertaken to prevent the overflow of untreated wastes due to collection system inflow, provided the state share of the cost of such components is less than the state share of the estimated cost of eliminating such inflow by means of physical separation at the sources of such inflow.

CSO: Combined Sewer Overflow

CSO Components: Processes and components of processes intended to reduce the intensity, frequency, or duration of CSO events.

CSO Grant Eligible: Costs eligible for 50% CSO grant and loan.

CSO Flow Capacity: The maximum flow rate at which the plant is designed to operate while bypassing secondary treatment, in accordance with its NPDES permit.

CSO Train Process Floor Area: Total floor area devoted to the storage and operation of CSO train process equipment.

CWF: Clean Water Fund

CWF Eligible: Costs eligible for some percentage of grant award and/or loan under the CWF program.

DEEP: Connecticut Department of Energy and Environmental Protection

EPA: United States Environmental Protection Agency

LTCP: Long Term Control Plan

Normal Treatment Capacity: The maximum flow rate at which the plant is designed to operate after all combined sewer separation projects identified in the Long Term Control Plan have been completed.

NPDES: National Pollutant Discharge Elimination System

Total Process Floor Area: Total floor area devoted to the storage and operation of process equipment.

TR-16: Technical Report #16 *Guides for the Design of Wastewater Treatment Works*, New England Interstate Water Pollution Control Commission.

October 13, 2015
Date

Denise Ruzicka
Denise Ruzicka
Director of Planning & Standards
Bureau of Water Protection & Land Reuse

Appendix K

West Side WWTP BioWin Modeling Report

CDM Smith

CDM Smith

Memorandum

To: *WPCA, Bridgeport, CT*

From: *Alexandra Bowen, PE*

Date: *November 9, 2020*

Subject: *West Side WWTP BioWin Modeling Report for WPCA Facilities Planning*

A biological process model for liquids and solids unit process at the WPCA's West Side WWTP (WWTP) is one of the tools being developed as part of the Facilities Planning project. The goal of the process modeling work is to generate a tool that can be used for evaluating how variations in flow and loading affect the West Side WWTP treatment processes, as well as support alternatives analysis and eventually design of potential improvements. Following completion of the facilities plan, the Process Model will provide the WPCA with new in-house capabilities for process analysis of operational changes and design engineering at the WWTP.

Wastewater process modeling represents the industry's best tool to understand the complex relationships between the chemical, physical, and biological processes that provide successful wastewater treatment. Nearly 50 years of research have gone into characterizing the behavior of approximately 60 of the most critical wastewater treatment processes that are intricately related. The numerical models developed to describe observed chemical, physical, and biological reactions continue to evolve as understanding of these processes improves. This project uses BioWin modeling software (Version 5.3.0. 1208, EnviroSim Associates, Ltd.). This memorandum documents the results of the process model calibration and validation exercise, including the results from wastewater sampling, development of interceptor-specific ratios and fractions, calibration and validation of the BioWin model, and results from a sensitivity analysis exercise.

1. Wastewater Sampling

Fourteen days of special sampling were performed at the WWTP from June 17 to June 30, 2020. The plant influent flow and influent temperature for each day of sampling as reported on the relevant Monthly Operating Reports are shown in **Table 1**. Note that thirteen of the fourteen days occurred without precipitation and without any primary bypass flow and so can be considered reflective of dry weather conditions. June 27 was the only day that occurred during wet weather conditions—that is, on days with non-zero precipitation and/or non-zero primary effluent bypass flow.

Table 1. Weather and Flow Conditions for Special Sampling Events as Reported on WPCA Monthly Operating Reports

Date	Precipitation Recorded at WWTP (in)	Plant Influent Temperature (°F/°C)	Total Plant Influent Flow (mgd)	Maximum Hour Influent Flow (mgd)	Primary Effluent Bypass Flow (mgd)
June 17, 2020	0	64.9/18.3	16.8	26	0
June 18, 2020	0	65.5/18.6	16.5	23	0
June 19, 2020	0	67.6/19.8	16.4	22	0
June 20, 2020	0		16.5	22	0
June 21, 2020	0		16.7	29	0
June 22, 2020	0	69.4/20.8	17.7	23	0
June 23, 2020	0	68.5/20.3	16.7	25	0
June 24, 2020	0	69.1/20.6	16.3	25	0
June 25, 2020	0	67.3/19.6	16.5	22	0
June 26, 2020	0	67.1/19.5	16.7	25	0
June 27, 2020	0.49		24.5	74	1.35
June 28, 2020	0		18.3	26	0
June 29, 2020	0	70.9/21.6	17.4	29	0
June 30, 2020	0	69.1/20.6	23.8	55	0

This special sampling was conducted in addition to the WWTP's routine monitoring. Details related to sample collection, preparation, and analysis, as well as sampling results for both the composite and grab samples, are presented below.

1.1 Sample Collection

Subconsultant, Eolas collected composite samples during the fourteen-day sampling period.. Eolas also collected grab samples for: primary sludge, RAS/WAS, gravity thickener overflow (No. 1 and No. 2), mixed liquor, and thickened hauled sludge (primary + WAS), Both composite and grab samples were processed as needed by the lab before analysis.

A summary of the composite and grab samples collected for analysis is provided in **Table 2** and **Table 3**, respectively.

Table 2. Summary of Parameters Analyzed for Composite Sample Locations

Parameter Number	Parameter Name	Number of Samples at Each Composite Sample Location		
		Raw Influent	Primary Effluent	Secondary Effluent
1	TSS (mg/L)	14	14	14
2	VSS (mg/L)	14	14	14
3	COD, total (mg/L)	14	14	0
4	COD, 1.2-µm filtered (mg/L)	14	0	14
5	COD, filtered-flocculated (mg/L)	14	0	0
6	BOD, total (mg/L)	14	14	14
7	BOD, 1.2-µm filtered (mg/L)	14	0	0
8	TP, total (mg P/L)	14	0	0
9	Orthophosphate, filtered (mg P/L)	14	0	0
10	TKN (mg N/L)	14	14	14
11	NH_3-N (mg N/L)	14	0	14
12	Nitrate+nitrite (mg N/L)	0	0	14
13	Alkalinity (mg/L as $CaCO_3$)	14	0	0

Table 3. Summary of Parameters Analyzed for Grab Sample Locations

Parameter Number	Parameter Name (Units)	Number of Grab Samples at Each Location				
		Primary Sludge	RAS/WAS	GT Overflow	Mixed Liquor	Thickened Hauled Sludge
1	TSS (mg/L)	--	10	10	30	--
2	VSS (mg/L)	--	--	--	30	--
3	Total Solids (%)	10	--	--	--	10

1.2 Sample Preparation

All sample preparation and analysis was done by Phoenix Environmental Laboratories- an independent laboratory. After sample collection, composite and grab samples were analyzed as described by EPA methods except for filter/flocculated COD which was prepared as follows. Stock aluminum sulfate solution [$Al(SO_4)_3$-15 H_2O; stock at 50 g/L] was added to sample (10 mL stock to 1,000 mL sample). The sample was rapidly mixed at 200 rpm for 2 minutes and then slowly mixed at 5 rpm for 30 minutes to maximize flocculation. Mixing was turned off, and the flocculated sample was allowed to settle. Supernatant was withdrawn and filtered through a 1.2µm-glass fiber filter.

Sample analysis was performed in accordance with standard methods or EPA methods.

1.3 Sampling Results

The composite sample results are summarized in **Table 4**, while grab sample results are shown in **Table 5**.

Table 4. Summary of Results for Composite Samples

Parameter No.	Parameter Name	Raw Influent			Primary Effluent			Secondary Effluent		
		Avg.	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*
1	TSS (mg/L)	244	130 to 750	165	130	30.0 to 250	64	9.65	3.30 to 40.0	12.8
2	VSS (mg/L)	212	120 to 540	116	113	18.0 to 230	57.8	8.14	3.00 to 33.0	10.6
3	COD, total (mg/L)[1]	438	268 to 636	113	383	302 to 598	85.2	--	--	--
4	COD, 1.2-µm filtered (mg/L)[2]	173	113 to 276	46	--	--	--	44.5	37.0 to 61.0	9.22
5	COD, filtered-flocculated (mg/L)[3]	100	50 to 173	35	--	--	--	--	--	--
6	BOD, total (mg/L)[4]	150	110 to 210	32.2	136	79.0 to 220	37.3	10.8	4.00 to 33.0	9.80
7	BOD, 1.2-µm filtered (mg/L)[5]	48.5	28 to 69	13.1	--	--	--	--	--	--
8	TP, total (mg P/L)	3.83	3.19 to 4.32	0.36	--	--	--	--	--	--
9	Ortho-phosphate, filtered (mg P/L)	2.09	1.92 to 2.32	0.13	--	--	--	--	--	--
10	TKN (mg N/L)	34.1	27.9 to 39.6	3.12	31.7	26.7 to 37.1	2.93	5.12	3.36 to 7.60	1.30
11	NH_3-N (mg N/L)	20.6	15.4 to 23.1	2.00	--	--	--	3.32	1.94 to 5.96	1.26
12	Nitrate+nitrite (mg N/L)	--	--	--	--	--	--	1.99	0.58 to 3.13	0.91

Parameter No.	**Parameter Name**	**Raw Influent**			**Primary Effluent**			**Secondary Effluent**		
		Avg.	***Range***	***Std. Dev.***	***Avg.***	***Range***	***Std. Dev.***	***Avg.***	***Range***	***Std. Dev.***
13	Alkalinity (mg/L as $CaCO_3$)	142	106 to 158	12.7	--	--	--	--	--	--

Notes:

1. One raw influent COD value was excluded from the calculation on 6/28/20 (756 mg/L) because it was unreasonably high.
2. Two secondary effluent fCOD values were excluded from the calculation on 6/24/20 (111 mg/L) and 6/26/2020 (132 mg/L) because they were both unreasonably low based on the corresponding COD:BOD value.
3. One raw influent BOD value was excluded from the calculation on 6/28/20 (380 mg/L) because it was unreasonably low compared to COD.
4. One fBOD value was excluded from the calculation on 6/18/20 (13 mg/L) because it was unreasonably low based on the corresponding fBOD:BOD. Value.

Table 5. Summary of Results for Grab Samples

Para-meter No.	Parameter Name	Primary Sludge			RAS/WAS			GT Overflow			Mixed Liquor			Thickened Hauled Sludge		
		Avg.	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*
1	TSS (mg/L)	--	--	--	8,960	6,700 to 11,000	1,250	140	100 to 180	28.8	4,323	3,500 to 4,900	348	--	--	--
2	VSS (mg/L)	--	--	--	--	--	--	--	--	--	3,630	2,600 to 4,200	347	--	--	--
3	Total Solids (%)	0.48	0.15-0.66	0.18	--	--	--	--	--	--	--	--	--	6.21	4.04-10.4	2.1

2. Wastewater Characterization

The data collected as part of the intensive sampling provides critical information needed for model calibration. The ratios between various constituents in the influent establish a reference for various process considerations.

2.1 General Ratios and Fractions

Ratios can be used to screen historical data and determine high or low outliers in individual parameter values. Ratios can also be helpful in correlating the data collected during periods of special sampling with historical data used during calibration and validation. Commonly considered domestic wastewater influent parameter ratios, along with typical values (compiled from Metcalf and Eddy 2014[1], WEF 2017[2], and CDM Smith experience), are shown in **Table 6**. Average ratios from the special sampling program and from three years of daily plant data (TSS:BOD, and TP:BOD values only; January 1, 2017 through December 31, 2019) are also presented in **Table 7**, and described below.

The **VSS:TSS** ratio indicates the proportion of influent solids that are organic. Inorganic suspended solids (ISS) are calculated by the difference between TSS and VSS. ISS is considered to be inert (that is, does not undergo biological transformation) and has a substantial impact on solids production within the facility. Typical VSS:TSS ratios in raw influent range from 0.75 to 0.85. The WWTP's VSS:TSS influent ratios determined during special sampling averaged 0.90 ± 0.07. With the standard deviation taken into consideration, the inert solids at West Side WWTP are within typical ranges. No historical data are available for VSS to allow for comparison. The plant influent has a higher fraction of volatile solids than typical, indicating a higher degree of biodegradability.

The **BOD:TSS** ratio indicates the solids content and quality of wastewater. Typical domestic wastewater has a wide range of BOD:TSS between 0.82 and 1.43. The ESTP's influent ratios calculated from special sampling data was 0.78 ± 0.19 which is lower than typical wastewater ranges. This was lower, however, than the value calculated from the historical dataset. Historical BOD:TSS ratio was 0.94 ± 0.54. Due to variability in the system, the standard deviation between special sampling and historical data overlaps indicating no statistically significant difference.

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[1] Metcalf & Eddy | AECOM (2014) *Wastewater Engineering: Treatment and Resource Recovery.* McGraw-Hill Education. New York.

[2] WEF Manual of Practice 8, ASCE Manual and Report On Engineering Practice No.76 (2017) *Design of Municipal Wastewater Treatment Plants*, Sixth Edition. ASCE.

Table 6. Summary of Ratios for Raw Influent

Ratio	Typical Raw Domestic Wastewater[1]	Raw Influent				
		Minimum	Maximum	Average	Standard Deviation	Number of Values
Special Sampling Program						
VSS:TSS	0.75 -0.85	0.72	1.00	**0.90**	0.07	14
BOD:TSS	0.82 -1.43	0.48	1.08	**0.78**	0.19	13
COD:BOD	1.8-2.2	2.17	4.53	**2.94**	0.59	13
fCOD:COD	0.3-0.5	0.25	0.55	**0.40**	0.07	13
ffCOD:COD[2]	< 0.3	0.16	0.33	**0.23**	0.06	12
fBOD:BOD[3]	~0.5	0.19	0.63	**0.33**	0.13	12
TP:BOD	0.02-0.05	0.020	0.037	**0.026**	0.005	13
Ortho-P:TP	~0.5	0.45	0.68	**0.55**	0.06	13
BOD:TKN	4.2-7.1	2.81	5.57	**4.40**	0.80	13
NH_3:TKN	0.5-0.8	0.45	0.71	**0.61**	0.04	14
Historical Plant Data (January 2017 through December 2019; unscreened)						
BOD:TSS	0.82 -1.43	0.17	2.29	**0.94**	054	470
TP:BOD	0.02-0.05	0.01	0.06	**0.03**	0.05	156
BOD:TKN	4.2-7.1	2.33	13.5	**6.33**	4.34	314
NH_3:TKN	0.5-0.8	0.35	0.74	**0.59**	0.34	314

Notes:

1. See text for information on sources for typical raw wastewater values.
2. One ffCOD value was missing from the lab analyses on 6/27/20.
3. One fBOD value was excluded from calculation of any fBOD-containing ratios: < 15 mg/L reported on 6/18/20.

The **COD:BOD** ratio is an indicator of the amount of the organic matter that is biodegradable. Typical domestic wastewater has a COD:BOD ratio of 1.8 to 2.2. The WRRF influents had averages of 2.94 ± 0.59 based on the special sampling. This is higher than typical, indicating that possibly more biodegradation of organic matter is occurring in the collection system than for an average collection system and/or more inert, organic solids are present. No historical data are available for COD to allow for comparison.

The **fCOD:COD** ratio indicates the fraction of total COD that passes through a filter, including both soluble and colloidal COD. As shown in **Figure 1** in Section 2.2.1 below, soluble COD can be biodegradable or unbiodegradable. Similarly, colloidal COD can be (slowly) biodegradable or unbiodegradable. Readily biodegradable soluble COD (discussed in the next section below) is more rapidly degraded in biological treatment. Typical fCOD:COD ratios in raw influent range from 0.3 to 0.5. The WRRF's influent ratios determined during special sampling were 0.40 ± 0.07 which is within the expected range. No historical data are available for COD to allow for comparison.

The **ffCOD:COD** ratio indicates the fraction of total COD that is truly soluble (dissolved, not colloidal), including both biodegradable soluble and unbiodegradable soluble COD. It is necessarily lower than fCOD:COD. The WRRF's influent ratios determined during special sampling were 0.23 ± 0.06. No historical data are available for COD to allow for comparison.

The **TP:BOD ratio** is an indicator of how much carbon may be available for enhanced biological phosphorus removal. The more readily biodegradable carbon, in the form of VFAs or fermentable soluble BOD that can be quickly converted to VFAs, the more potential there is for enhanced biological phosphorus removal. A typical ratio for TP:BOD is between 0.02 and 0.05. The WRRF's influent ratios were at the low end of this range - 0.026 ± 0.005, indicating a relatively large amount of carbon relative to phosphorus. Historical data were comparable to the special sampling findings: 0.03 ± 0.05.

The **Ortho-P:TP ratio** is the fraction of total phosphorus present as filterable reactive phosphorus, most of which is orthophosphate, or the phosphorus that is readily available for biological metabolism. Typically, about half of total phosphorus in wastewater influent is present as orthophosphate. The WRRF's ortho-P:TP ratios were consistent with 0.5: 0.55 ± 0.06. No historical data are available for ortho-P to allow for comparison.

The **BOD:TKN ratio** is an indicator of how much carbon may be available for nitrogen removal. The more biodegradable carbon the greater the extent of denitrification that can occur in the biological process. Typical domestic wastewater has a BOD:TKN ratio of 4.2 to 7.1. The WWT's influent ratio determined during special sampling was 4.40 ± 0.80 which is on the low end of typical for municipal wastewater and shows that there may be a lack of carbon available for denitrification. This is slightly lower than the average value from historical plant data, 6.3 ± 4.3.

The **NH_3:TKN ratio** is the fraction of total Kjeldahl nitrogen present as filterable mineralized ammonia or the nitrogen that is readily available for biological metabolism (nitrogen update for the synthesis of proteins and DNA or nitrification). Typical domestic wastewater has an NH3:TKN ratio of 0.5 to 0.8. The ESTP's influent ratio determined during special sampling was 0.61 ± 0.07 is typical for municipal wastewater. This was consistent with the value from historical plant data, 0.59 ± 0.34.

Table 7. Historical Plant Data (January 2017 through December 2019; Unscreened

Ratio	Typical Raw Domestic Wastewater	Raw Influent			
		Minimum	Maximum	Average	Standard Deviation
BOD:TSS	0.82 -1.43	0.17	2.29	**0.94**	0.0.54
TP:BOD	0.02-0.05	0.01	0.52	**0.03**	0.04
BOD:TKN	4.2-7.1	2.33	13.5	**6.33**	4.34
NH_3:TKN	0.5-0.8	0.35	0.74	**0.59**	0.34

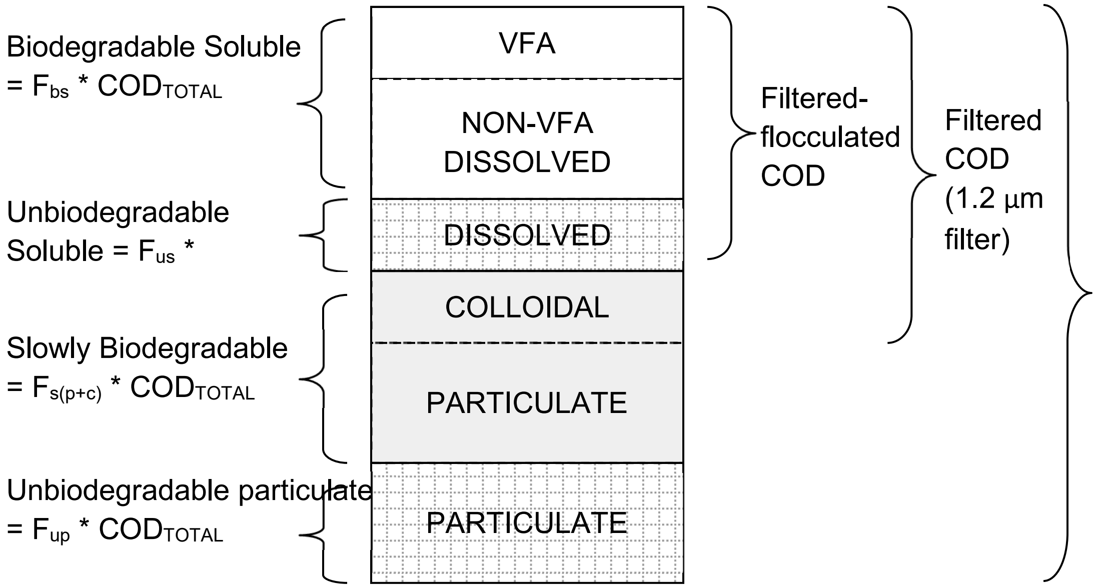
2.2 Fractions Needed for Modeling

The wastewater ratios provide an overview of the character of the WRRF's wastewater. Closely related to the ratios, the wastewater fractions—specifically for COD and N—are important for model calibration because they determine the fate of parameters in the biological treatment process. Note that while concentrations of typical domestic wastewater may vary from day to day and month to month, parameter fractions are usually assumed to remain constant over time because the sources and types of contribution within a collection system are generally constant. These fractions are also considered to be constant within the process model.

2.2.1 COD Fractions

COD is the base unit of measurement of all carbonaceous components in biological process models and consists of both biodegradable and unbiodegradable portions. Biodegradable COD is further broken down into readily biodegradable (soluble) or slowly biodegradable (colloidal or particulate). Colloidal COD is COD that passes through a 1.2-µm filter but does not settle, while particulate COD is retained by a 1.2-µm filter and does typically settle. Unbiodegradable COD can either be soluble or particulate. **Figure 1** illustrates the breakdown of the various COD fractions.

Figure 1. COD Fractions



The fractions of each of these COD types are shown in **Table 8**, and are calculated as follows for BioWin input:

- **Unbiodegradable soluble COD fraction (F_{us})** = effluent filtered COD / influent total COD
- **Biodegradable soluble COD fraction (F_{bs})** = [Influent ffCOD – unbiodegradable influent soluble COD] / total influent COD = [Influent ffCOD – F_{us} x influent total COD] / total influent COD
- **Unbiodegradable particulate COD fraction (F_{up})** is estimated via iteration using the procedure outlined in WERF (2003)[3], equation 6.2.1, or with the BioWin influent specifier (described in Section 2.3)
- **Slowly biodegradable COD fraction, including colloidal and particulate ($F_{s(p+c)}$)** = 1 – F_{us} – F_{bs} - F_{up}

Table 8. Calculated Dry Weather COD Influent Fractions Used for BioWin Model Calibration

Fraction	Model Default Value	West Side WWTP
Unbiodegradable soluble (F_{us})	0.050	0.101
Biodegradable soluble (F_{bs})	0.160	0.128
Unbiodegradable particulate (F_{up})	0.130	0.130
Slowly biodegradable COD (F_{xs})	0.660	0.621
Particulate slowly biodegradable (F_{sp}) as fraction of slowly biodegradable	0.250	0.269
Colloidal slowly biodegradable (F_{xsp}) as fraction of slowly biodegradable	0.750	0.731

Note: 2% of influent COD is assumed to be present as heterotrophic microorganisms, per the default value assumed by EnviroSim. Therefore, F_{us} + F_{bs} + F_{up} + F_{xs} = 0.98.

The values of these COD fractions determine how much COD is degraded in the modeled biological process (biodegradable COD), how much is removed as inert particulate with the primary sludge and WAS, and the amount that passes through the plant (unbiodegradable soluble COD). For example, a treatment plant with a higher F_{us} will have higher filterable COD in its effluent, whereas a plant with higher F_{up} will have a higher solids yield.

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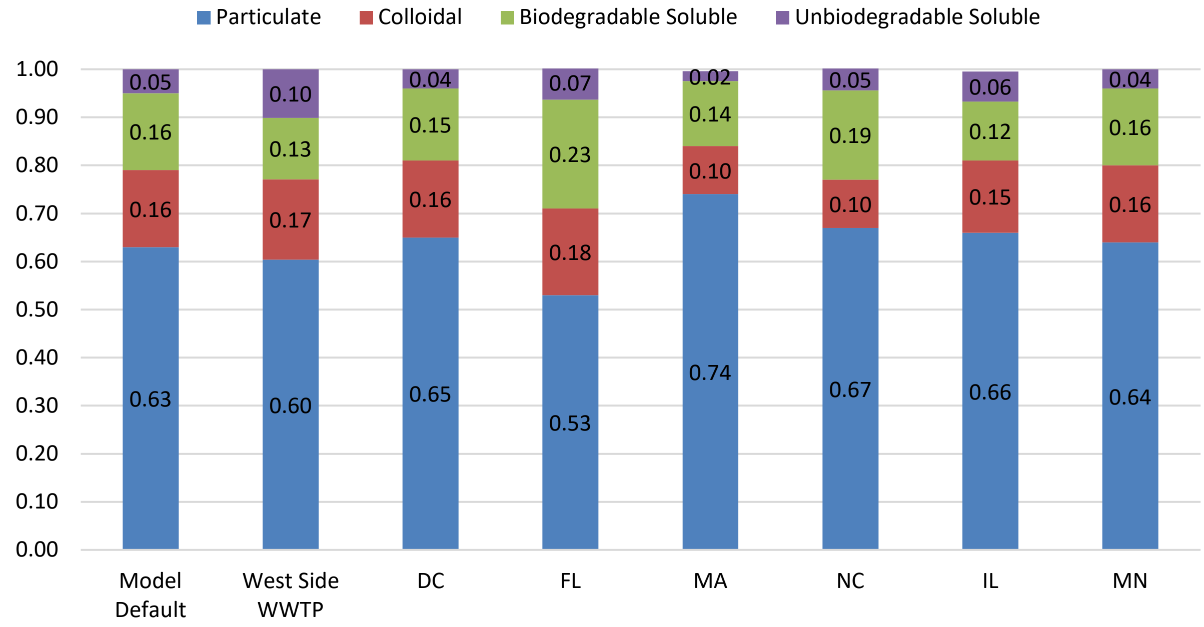
[3] WERF (Water Environment Research Foundation). 2003. *Methods for Wastewater Characterization in Activated Sludge Modeling.* WERF Report 99-WWF-03. WERF: Alexandria, VA and IWA: London.

Note that the COD fractions can also be presented as soluble (unbiodegradable and readily biodegradable), colloidal and particulate fractions. **Figure 2** shows the breakdown of COD into these fractions for the West Side WWTP, as measured during this study along with CDM Smith's sampling results from 6 other WWTPs for comparison. The calculated biodegradable soluble COD fractions were within the expected range for municipal WRRFs (0.07 to 0.23, based on CDM Smith's sampling results at 6 other WRRFs and 0.12 to 0.25, based on BioWin default values). There is no typical colloidal COD fraction in wastewater, although BioWin uses 0.2 as the default value—which is close to the 0.17 calculated from the CDM Smith sampling.

Figure 2. Raw Wastewater COD Fractions, Data for Model Calibration compared to COD Fractions at other Selected WWTPs



2.2.2 Phosphorus Fractions

Although not included in the West Side WWTP's discharge permit, phosphorus is an essential nutrient for biological growth. Influent phosphorus is collected weekly. Phosphorus species are divided into soluble and particulate components, each of which is further broken down into acid hydrolyzable, reactive and organic components, for a total of six phosphorus fractions. The soluble non-reactive forms (including acid-hydrolyzable and organic) are not easily removed in biological and chemical treatment processes.

The following phosphorus fractions are used in BioWin:

- $\mathbf{F_{po4}}$ **=** soluble reactive phosphorus (assumed to be mostly orthophosphate) / total phosphorus

- **$F_{up,P}$ =** fraction of unbiodegradable particulate COD that is phosphorus, which is mostly particulate acid hydrolyzable phosphorus (polyphosphates) = assumed to be 0.011 g P/g COD

The values for the phosphorus fractions used for the three interceptors are shown in **Table 9**.

Table 9. Calculated Dry Weather Phosphorus Influent Fractions Needed for BioWin Model Calibration

Fraction	Model Default Value	West Side WWTP
Phosphate (F_{po4}) as fraction of total phosphorus	0.500	0.5526
Unbiodegradable particulate phosphorus (F_{upP}) as fraction of unbiodegradable particulate COD	0.0220	0.0220

2.2.3 Nitrogen Fractions

Nitrogen is also an essential nutrient for biological growth and is included in the WWTP's current permit limits. The WWTP has an effluent annual average mass loading limit of 1,041 lbs/day total nitrogen.

Further, the BioWin model should accurately capture the potential for nitrification because the oxygen demand exerted by nitrification can impact overall WWTP oxygen requirements, airflow requirements, and blower size. Nitrogen species are divided into soluble and particulate components, as well as inorganic and organic types, defined as follows:

- Soluble inorganic nitrogen = ammonia + nitrite + nitrate
- Soluble organic nitrogen = filtered TKN – ammonia
- Particulate organic nitrogen = unfiltered TKN – filtered TKN
- Total nitrogen = unfiltered TKN + nitrite/nitrate

For the purposes of BioWin, the following nitrogen fractions are calculated:

- F_{na} = fraction of TKN as ammonia = influent ammonia / influent TKN
- F_{nox} = fraction of particulate organic nitrogen = influent particulate TKN / influent TKN
- F_{nus} = fraction of soluble unbiodegradable TKN = effluent soluble TKN / influent TKN
- F_{upN} = fraction of unbiodegradable particulate COD that is N = assumed to be 0.5 g N/g COD

The values for each are provided in **Table 10**.

Table 10. Calculated Dry Weather Nitrogen Influent Fractions Used for BioWin Model Calibration

Fraction	Model Default Value	West Side WWTP
Ammonia (Fna) as fraction of TKN	0.660	0.6041
Particulate organic nitrogen (Fnox) as fraction of organic N	0.500	0.500
Soluble unbiodegradable TKN (Fnus) as fraction of total TKN	0.020	0.020
Unbiodegradable particulate nitrogen (FupN) as fraction of unbiodegradable particulate COD	0.070	0.070

2.3 BioWin Influent Specifiers

To calculate the WWTP's influent wastewater fractions shown in **Tables 8, 9** and **10**, average parameter concentrations determined during the special sampling program were entered into a calculation tool (the "Raw Influent Specifier") provided by EnviroSim, the developers of BioWin. Note that EnviroSim uses the term "carbonaceous BOD" in the influent specifier input. However, these "carbonaceous BOD" values are based on uninhibited BOD measurements. Therefore, total BOD values from the special sampling were used as input to the Influent Specifiers.

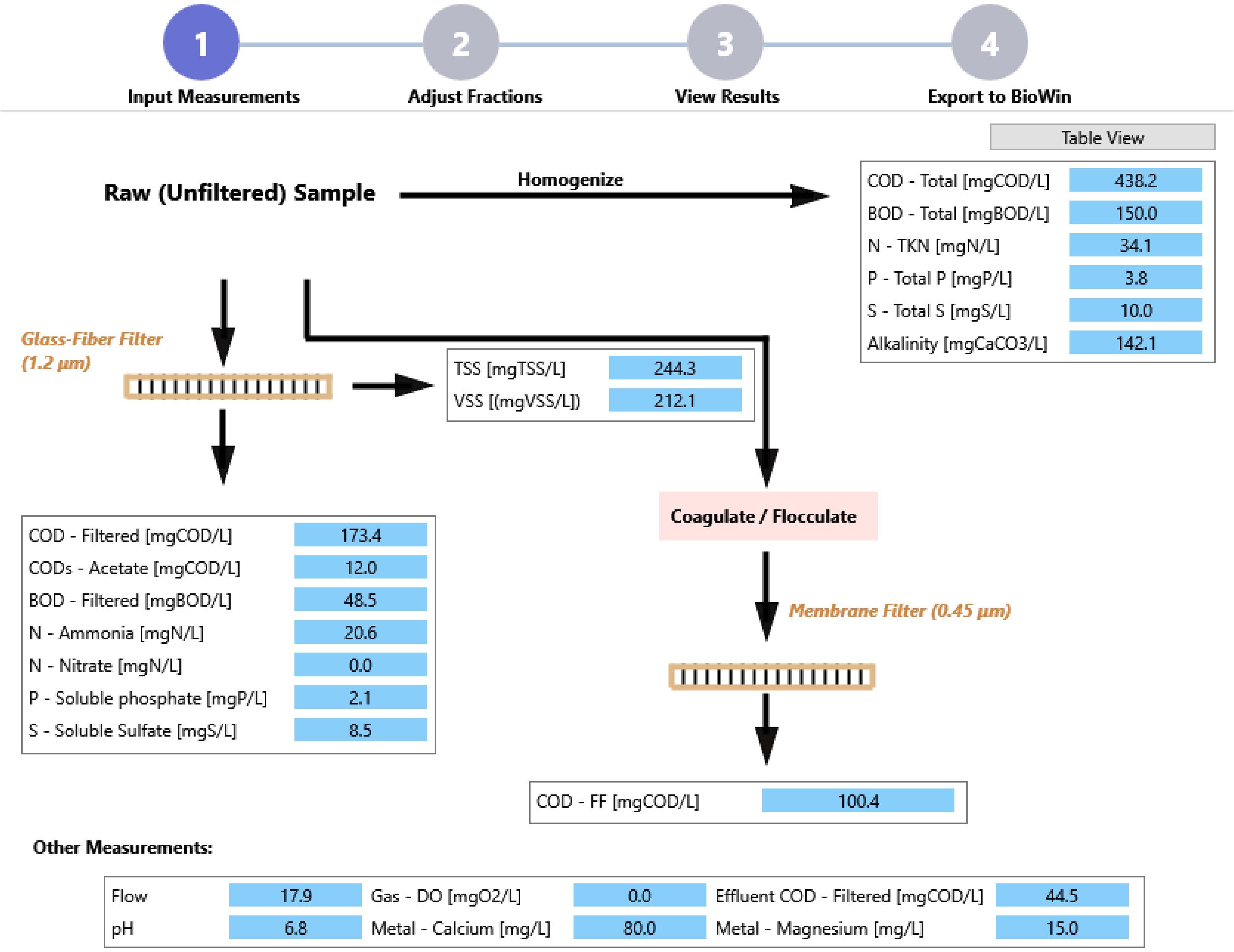
The Influent Specifier calculation tool indicates how well the influent COD, VSS, TSS, and BOD parameter concentrations measured during the sampling program (**Figure 3**) agrees with the influent COD parameters calculated from estimated fractions within the calculation tool (**Figure 4**). To use the influent specifier for developing COD fractions, the modeler modifies the following ratios and fractions, generally in this order (shown in blue under the "Adjust Fractions" tab):

- Particulate Biodegradable COD:VSS ratio
- Particulate Inert COD:VSS ratio
- Cellulose COD:VSS ratio
- $F_{up,cellulose}$
- F_{up}
- $F_{biomass}$
- k1 for X_{sc}
- k2 for X_{sp}

These are adjusted through an iterative process until there is agreement between the measured and calculated values. BioWin defines the level of agreement in their calculation tool as “match status”. Based on the special sampling, every calculated parameter achieved a match status of “Excellent” so that the difference between estimated and measured values were consistently <10%, except for filtered carbonaceous BOD which achieved a match status of “Acceptable”.

The influent COD fractions modified to achieve the match status shown in **Figure 4** were particulate bidegradable COD:VSS, particulate inert COD:VSS, cellulose COD:VSS. Other parameters that were modified to achieve the match status shown in **Figure 4** were k1 for X_{sc} and k2 for X_{sp} which are both rate constants used in the calculations to covert COD to BOD. The rate constants are used to convert slowly biodegradable colloidal COD and slowly biodegradable particulate COD respectively. For a COD/BOD ratio less than or equal to 2.1, these values are typically 0.5. For a COD/BOD ratio greater than 2.4 these values are typically 0.3. For a COD/BOD ratio between 2.1 and 2.4 these rate constants are typically 0.4. The COD/BOD ratio for the ESTP is 2.94 so a rate constant of 0.1 was used for k1 and 0.3 was used for k2. These rate constants do not have to be the same value.

Figure 3. Input Measurements Tab from Influent Specifier



COD - Total [mgCOD/L]	438.2
BOD - Total [mgBOD/L]	150.0
N - TKN [mgN/L]	34.1
P - Total P [mgP/L]	3.8
S - Total S [mgS/L]	10.0
Alkalinity [mgCaCO3/L]	142.1

TSS [mgTSS/L]	244.3
VSS [(mgVSS/L])	212.1

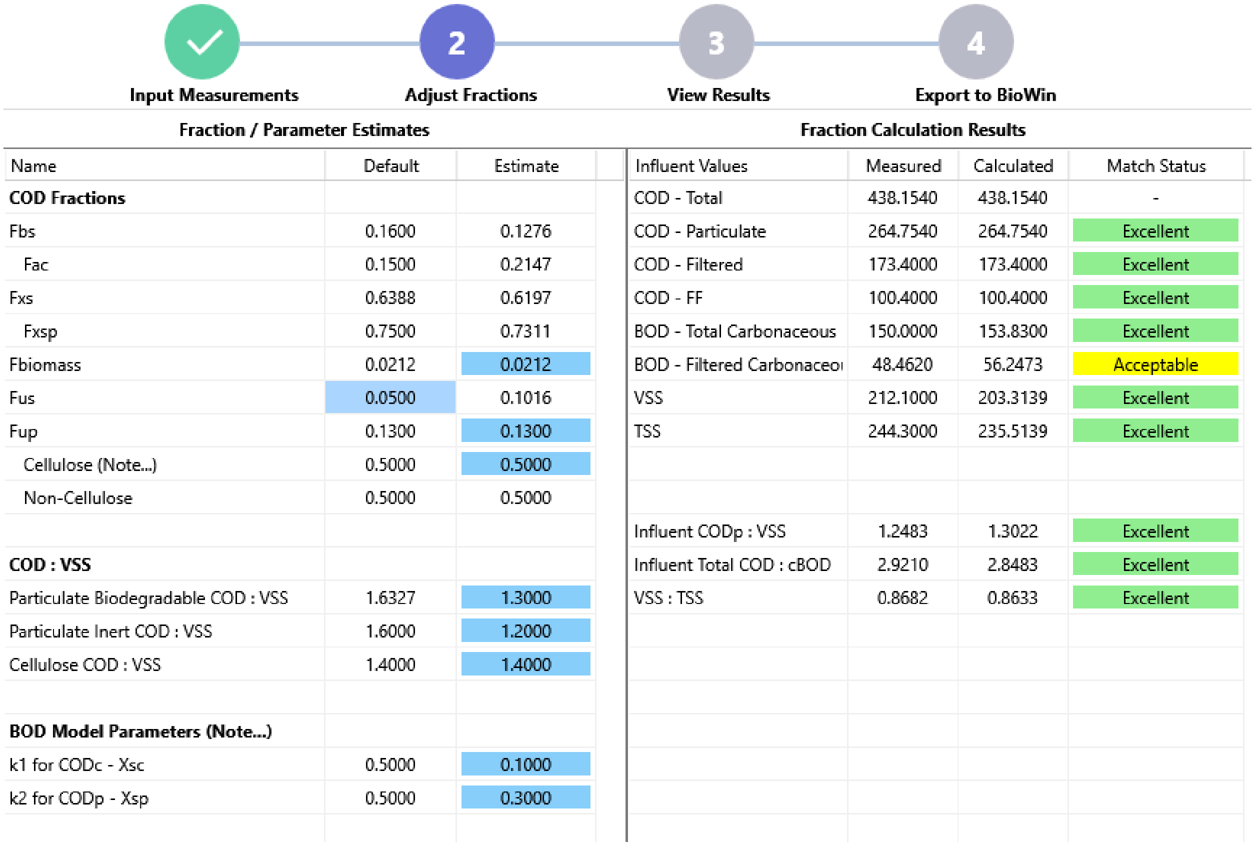
COD - Filtered [mgCOD/L]	173.4
CODs - Acetate [mgCOD/L]	12.0
BOD - Filtered [mgBOD/L]	48.5
N - Ammonia [mgN/L]	20.6
N - Nitrate [mgN/L]	0.0
P - Soluble phosphate [mgP/L]	2.1
S - Soluble Sulfate [mgS/L]	8.5

COD - FF [mgCOD/L]	100.4

Other Measurements:

Flow	17.9	Gas - DO [mgO2/L]	0.0	Effluent COD - Filtered [mgCOD/L]	44.5
pH	6.8	Metal - Calcium [mg/L]	80.0	Metal - Magnesium [mg/L]	15.0

Figure 4. "Adjust Fractions" Tab from Influent Specifier



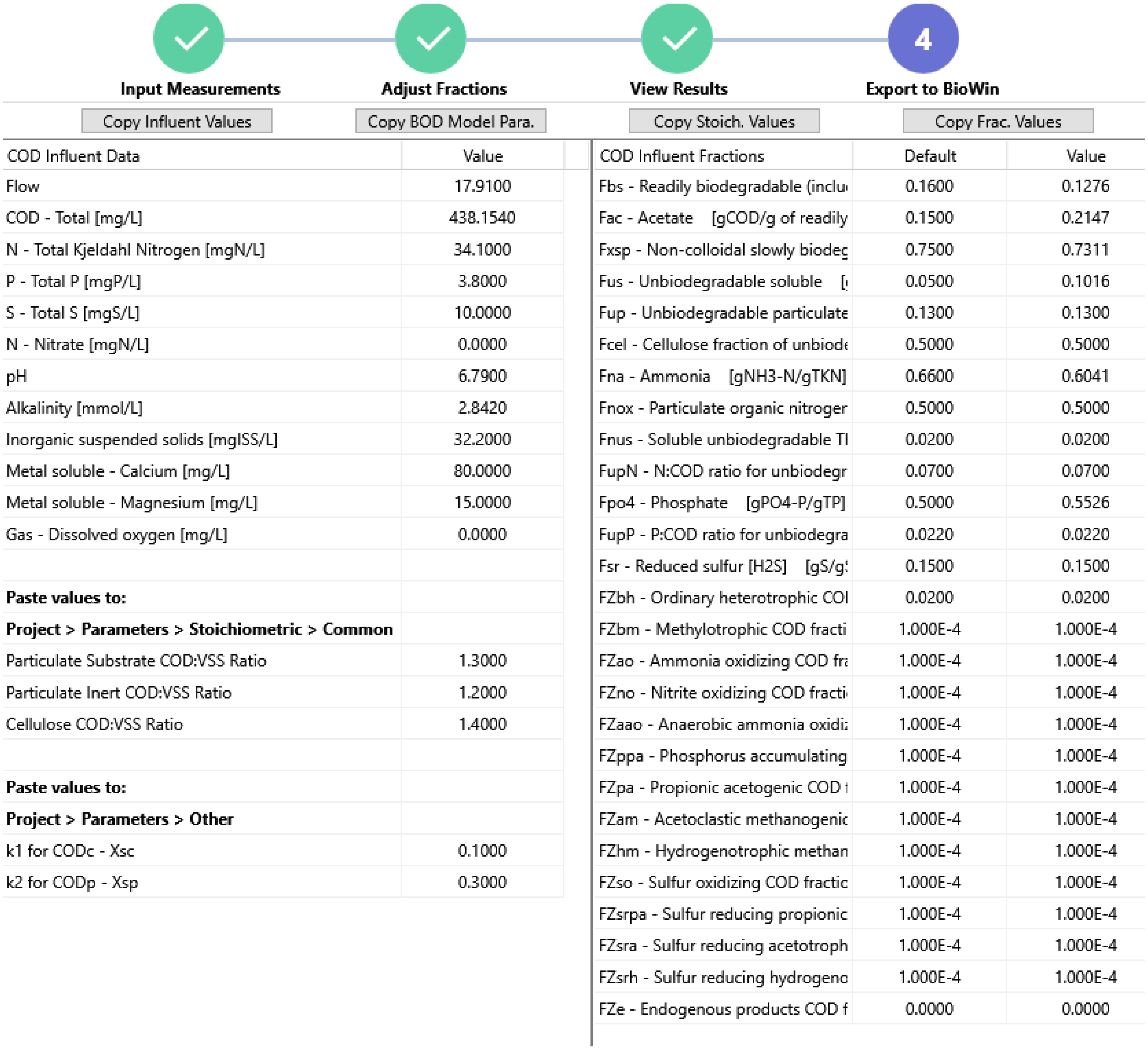
Fraction / Parameter Estimates

Name	Default	Estimate
COD Fractions		
Fbs	0.1600	0.1276
Fac	0.1500	0.2147
Fxs	0.6388	0.6197
Fxsp	0.7500	0.7311
Fbiomass	0.0212	0.0212
Fus	0.0500	0.1016
Fup	0.1300	0.1300
Cellulose (Note...)	0.5000	0.5000
Non-Cellulose	0.5000	0.5000
COD : VSS		
Particulate Biodegradable COD : VSS	1.6327	1.3000
Particulate Inert COD : VSS	1.6000	1.2000
Cellulose COD : VSS	1.4000	1.4000
BOD Model Parameters (Note...)		
k1 for CODc - Xsc	0.5000	0.1000
k2 for CODp - Xsp	0.5000	0.3000

Fraction Calculation Results

Influent Values	Measured	Calculated	Match Status
COD - Total	438.1540	438.1540	-
COD - Particulate	264.7540	264.7540	Excellent
COD - Filtered	173.4000	173.4000	Excellent
COD - FF	100.4000	100.4000	Excellent
BOD - Total Carbonaceous	150.0000	153.8300	Excellent
BOD - Filtered Carbonaceo	48.4620	56.2473	Acceptable
VSS	212.1000	203.3139	Excellent
TSS	244.3000	235.5139	Excellent
Influent CODp : VSS	1.2483	1.3022	Excellent
Influent Total COD : cBOD	2.9210	2.8483	Excellent
VSS : TSS	0.8682	0.8633	Excellent

Figure 5. "Export to Biowin" Tab from Influent Specifier



COD Influent Data	Value
Flow	17.9100
COD - Total [mg/L]	438.1540
N - Total Kjeldahl Nitrogen [mgN/L]	34.1000
P - Total P [mgP/L]	3.8000
S - Total S [mgS/L]	10.0000
N - Nitrate [mgN/L]	0.0000
pH	6.7900
Alkalinity [mmol/L]	2.8420
Inorganic suspended solids [mgISS/L]	32.2000
Metal soluble - Calcium [mg/L]	80.0000
Metal soluble - Magnesium [mg/L]	15.0000
Gas - Dissolved oxygen [mg/L]	0.0000
Paste values to:	
Project > Parameters > Stoichiometric > Common	
Particulate Substrate COD:VSS Ratio	1.3000
Particulate Inert COD:VSS Ratio	1.2000
Cellulose COD:VSS Ratio	1.4000
Paste values to:	
Project > Parameters > Other	
k1 for CODc - Xsc	0.1000
k2 for CODp - Xsp	0.3000

COD Influent Fractions	Default	Value
Fbs - Readily biodegradable (inclu	0.1600	0.1276
Fac - Acetate [gCOD/g of readily	0.1500	0.2147
Fxsp - Non-colloidal slowly biode	0.7500	0.7311
Fus - Unbiodegradable soluble [	0.0500	0.1016
Fup - Unbiodegradable particulate	0.1300	0.1300
Fcel - Cellulose fraction of unbiod	0.5000	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.6600	0.6041
Fnox - Particulate organic nitroge	0.5000	0.5000
Fnus - Soluble unbiodegradable T	0.0200	0.0200
FupN - N:COD ratio for unbiodegr	0.0700	0.0700
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000	0.5526
FupP - P:COD ratio for unbiodegra	0.0220	0.0220
Fsr - Reduced sulfur [H2S] [gS/g	0.1500	0.1500
FZbh - Ordinary heterotrophic CO	0.0200	0.0200
FZbm - Methylotrophic COD fracti	1.000E-4	1.000E-4
FZao - Ammonia oxidizing COD fr	1.000E-4	1.000E-4
FZno - Nitrite oxidizing COD fract	1.000E-4	1.000E-4
FZaao - Anaerobic ammonia oxidi	1.000E-4	1.000E-4
FZppa - Phosphorus accumulating	1.000E-4	1.000E-4
FZpa - Propionic acetogenic COD	1.000E-4	1.000E-4
FZam - Acetoclastic methanogeni	1.000E-4	1.000E-4
FZhm - Hydrogenotrophic methan	1.000E-4	1.000E-4
FZso - Sulfur oxidizing COD fracti	1.000E-4	1.000E-4
FZsrpa - Sulfur reducing propionic	1.000E-4	1.000E-4
FZsra - Sulfur reducing acetotroph	1.000E-4	1.000E-4
FZsrh - Sulfur reducing hydrogen	1.000E-4	1.000E-4
FZe - Endogenous products COD	0.0000	0.0000

2.4 *Uncertainty in Influent Fractions*

As explained in Section 1 above, there is variability inherent in the measured TSS, VSS, COD, BOD and TKN values used as input into the influent specifier. This variability derives from true day-to-day variation for each parameter, but also from any error introduced by sampling or analytical techniques. Both types of variability are reflected in the variation in daily values measured for each of the fourteen days of special sampling.

To use the influent specifier, a single value (e.g., influent TSS) needs to be entered into the spreadsheet. For the purposes of this model, the *average* of all daily values from the special sampling (e.g., 244.3 mg/L for influent TSS) were used. Because the average of all measured values was used as influent specifier input, the parameter ratios for the values used in the influent specifier are slightly different than the average of the individual ratios presented in **Table 6.** For example, taking the average of the fourteen daily VSS:TSS ratio values yields 0.90 (as shown in **Table 6**). However, the ratio between the overall average VSS (212.1 mg/L) and the overall average TSS (244.3 mg/L) is 0.87. The differences between ratios calculated from the average of daily ratio values vs. the ratios calculated from the overall average values are not significant, as highlighted in **Table 11**. Therefore, using the average of the daily values as influent specifier inputs appears to be reasonable.

Table 11. Ratios Calculated from Average Daily Ratio Values vs. Overall Averages of Parameter Values

Ratio	West Side WWTP	
	Calculated from Daily Ratios	Calculated from Parameter Averages
BOD:TSS	**0.90 ± 0.07**	0.61 ± 0.43
COD:BOD	**2.94 ± 0.59**	2.92 ± 0.98
fCOD:COD	**0.40 ± 0.07**	0.40 ± 0.15
ffCOD:COD	**0.23 ± 0.06**	0.22 ± 0.09
fBOD:BOD	**0.33 ± 0.13**	0.32 ± 0.11
TP:BOD	**0.026 ± 0.005**	0.02 ± 0.006
Ortho-P:TP	**0.55 ± 0.06**	0.55 ± 0.06
BOD:TKN	**4.04 ± 0.80**	4.39 ± 1.0
NH3:TKN	**0.61 ± 0.07**	0.60 ± 0.08

3. Modeling Assumptions and Limitations

The ability of any model to accurately represent reality depends on the quality of the inputs. Measuring conditions at a wastewater treatment plant is arguably the weakest component of modeling. There is uncertainty inherent to sampling and analysis, which suggests that models might not always reflect actual conditions at a plant. This is often the case, despite the best efforts of the modelers. Explanations for such discrepancies can often be deduced, which improves understanding of the plant. Good and reliable agreement between model results and plant data is only possible if the data is verified and vetted by identifying inconsistencies and quantifying uncertainty in sample collection at the plant and sample analyses in the lab. Obtaining good agreement between model results and plant data was the goal of the calibration exercise for this project, but it is likely that some discrepancies will exist even after calibration is completed.

4. Model Set Up

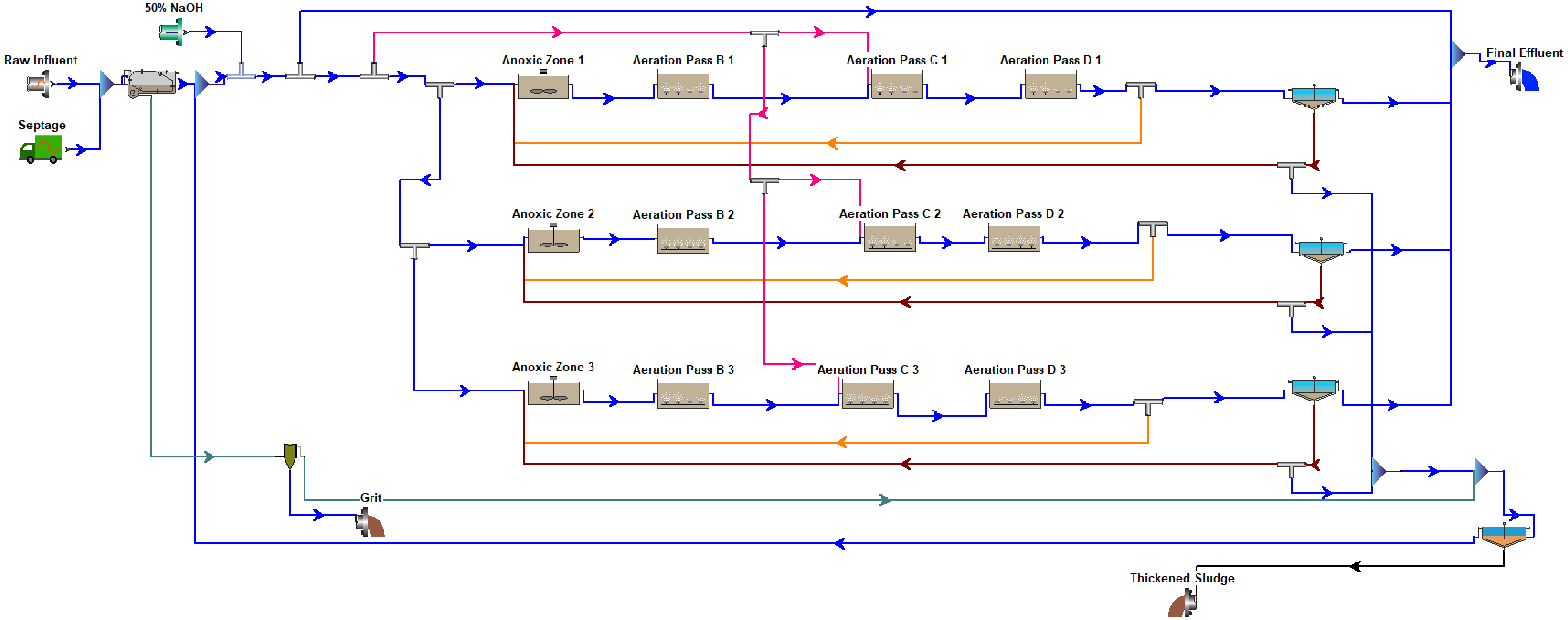
Both the liquid and solids unit processes were modeled, as shown in **Figure 6**, with all sidestreams from solids processing returned to the appropriate locations within the WWTP. The configured model was then calibrated and validated, as discussed in Sections 5 and 6, respectively. A key aspect of the model set up, calibration and validation exercises was the identification of appropriate influent datasets for each.

The calibration period used corresponded with the period of special sampling (June 17, 2020 through June 30, 2020). This dataset was used as it was the most complete including daily samples for many parameters as opposed to data collected just 1-3 times per week as is done as part of routine plant operations. Additionally, more parameters were analyzed (e.g. COD, fCOD, etc) during this period than historically and plant recycles were well defined (e.g. gravity thickener overflow recycle to head of aeration rather than plant headworks).

Data was supplemented with MOR data as needed to provide model inputs and calibration parameters that were not recorded as part of special sampling (e.g. influent flow, DO in the aeration basin, WAS generated, etc). Where both special sampling and MORs analyzed the same parameter (e.g . effluent ammonia) there was generally good agreement between the duplicate measurements. Calibrating the model required adjusting the ‘P in biomass’ fraction from Biowin default of 0.022 mg P/mgCOD to 0.01 mg P/mgCOD to clear nutrient limitation errors and adjusting the dissolved oxygen switching function of autotrophs from the Biowin default of 0.25 mg/L to 0.5 mg/L. The switching function was modified to partially inhibit nitrifying bacteria (as observed by high effluent ammonia during the calibration period despite seemingly optimum conditions for nitrification) while keeping kinetic parameters within a typical range. The switching function should be measured prior to use of the model in detailed design as it is very unusual for modifying kinetic parameters from default. The modified value is still within the typical range as determined in Activated Sludge Model 1.

Due to the unusual need to modify biokinetics in the calibration and atypical plant performance during calibration, an extended validation was selected. The validation period was one year of plant MOR data; 2019 was selected since this year had the coldest winter of the data sets available with the associated adverse impact of cold weather on nitrification. No special sampling data was available for the validation period so only plant MOR data was used. To develop the influent itinerary for the validation, the COD:BOD ratio from special sampling was used to convert measured BOD to COD for use in the COD input. The VSS:TSS ratio was used to estimate ISS from measured TSS.

Figure 6. BioWin Model Configuration



For days that did not include a measured BOD concentration, flow was used to predict the BOD load based on the linear regression of flow on BOD load from the measured values (**Figure 7**). The regressed BOD load was used along with a liner regression on the TSS:BOD ratio (**Figure 8**) to determine a TSS:BOD ratio for days when TSS was not measured. The regressed TSS:BOD ratio was multiplied by the BOD load to estimate the influent TSS load. The regressed BOD load was used along with a nonlinear regression on the TKN:BOD ratio (**Figure 9**) to determine a TKN:BOD ratio for days when TSS was not measured. The regressed TKN:BOD ratio was multiplied by the BOD load to estimate the influent TKN load. Phosphorus and sulfur were assumed constant since there is no permit limit for these constituents.

Figure 7. Regression of BOD load on flow

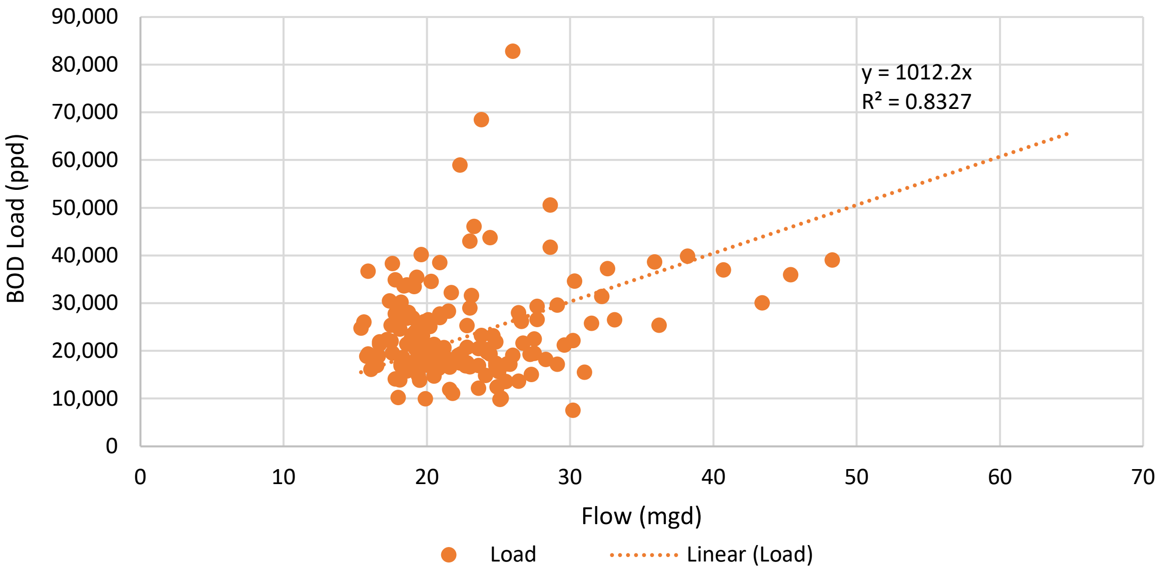


Figure 8. Regression influent TSS:BOD ratio on BOD load

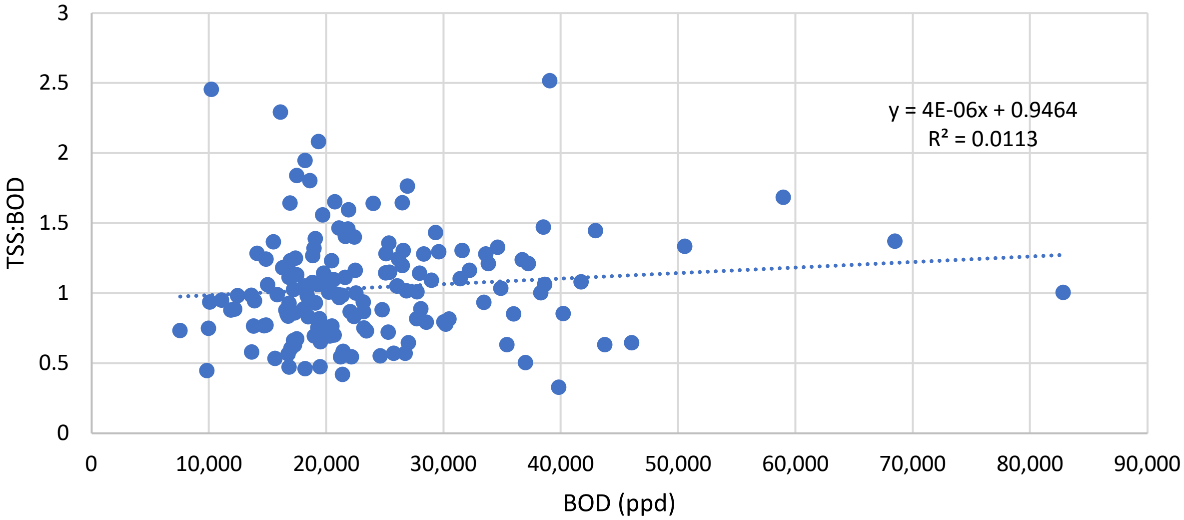
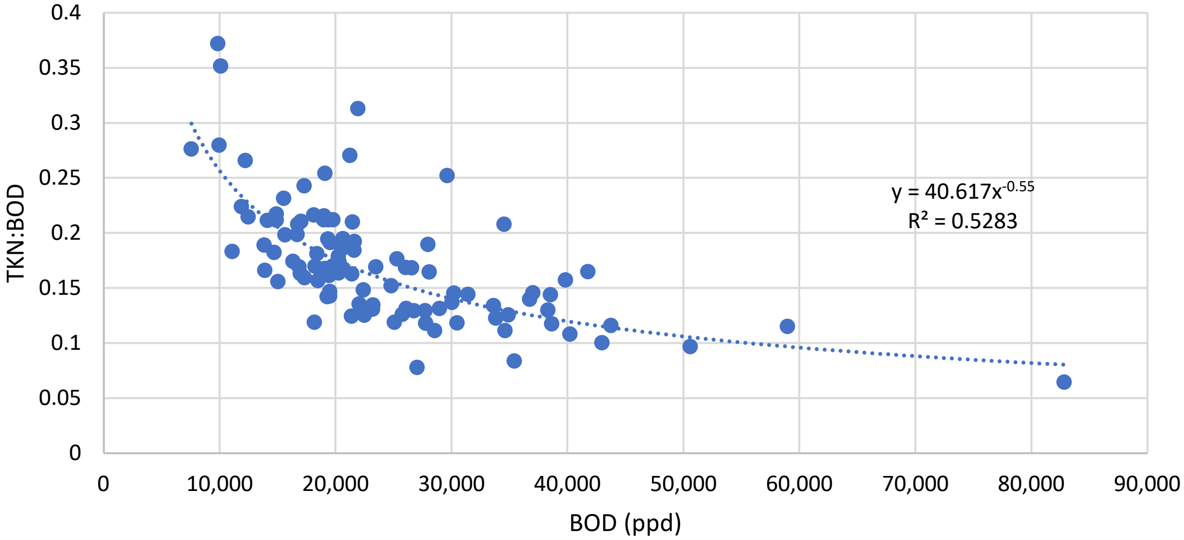


Figure 9. Regression of influent TKN:BOD ratio on BOD Load



Influent

The influent model used is the COD influent element which requires the following inputs:

- Total COD
- TKN
- TP
- Total Sulfur[4]
- Nitrate
- pH
- Alkalinity
- ISS
- Calcium
- Magnesium
- Dissolved Oxygen

For the calibration period, the itinerary for the "Raw Influent" was established based on plant reported influent flow and special sampling results. The inputs needed for the COD influent element are directly measured during special sampling or are calculated from directly measured values (e.g. ISS is calculated from measured VSS and TSS). The exception is calcium and magnesium which are counterions which undergo transformations during biological phosphorus removal which is not a goal of this project and as such were not measured.

For the validation period, Total COD in the Raw Influent element was based on BOD reported in the MOR and the COD:BOD ratio determined from special sampling. Other parameters were as reported in plant MOR data or the method described above if not measured.

BioWin uses the directly-entered data, combined with COD fractions, to calculate parameters that are not entered directly, such as BOD, NH_3-N, and ortho-P.

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[4] Biowin has the ability to track sulfur which is of interest in some industrial applications or in municipal plants that include anaerobic digestion in the biosolids processing train. Since the WWTP is not concerned about sulfur (no sulfur limit and no anaerobic digestion) it was not included in the special sampling campaign. Biowin default value (10 mg/L) was used for this project.

Septage

A 'SSO Input" element was used to represent septage flow (and load) to the WWTP. The SSO input allows the municipal COD:VSS ratio to be decoupled from the septage COD:VSS ratio. These parameters have significant impact on sludge production rates. The SSO Input element requires the following inputs:

- CODp: Degradable external organics
- N- Particulate degradable external organics
- P- Particulate degradeable external organis
- CODp: Undegradable non-cellulose
- ISS

Septage characterization was based on typical septage concentrations from Table 1 in the appendix of 10 State Standards[5]. Septage characterization varies greatly by site, this assumed characterization data is a source of imprecision within the model. Dynamic septage flows were based on daily septage received quantities recorded on the June MOR for each day.

Primary Clarification

One 'Ideal primary settling tank' elements were used to model the two primary settling tanks (of three) in service. One of the important differences between data collecting during the two-week special sampling event compared to data collected from the validation period (2019 MORs) is the location of the primary effluent composite sampler. The WWTP's primary effluent sampler is located downstream of gravity thickener overflow (GTO) return flow. To avoid impacts of the GTO return during the sampling, the primary effluent sampler during the two-week period was placed upstream of the GTO return.

Percent TSS removals were entered based on a calculated mass balance determined as follows:

Flow balance

Primary effluent flow was the sum of raw influent flow and septage with primary sludge flow subtracted. For the 2019 validation data, primary effluent flow was the sum of raw influent flow, septage, and estimated GTO return with primary sludge flow subtracted. GTO flow was determined based on the capacity of the supernatant pump (2 mgd) which runs continuously. The primary

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[5] Wastewater Committee of the Great Lakes-Mississippi River Board of State and Provincial Public Health and Environmental Managers. 2014. *Recommended Standards for Wastewater Facilities.* Health Research Inc., Albany, NY. Accessed here: http://10statesstandards.com/wastewaterstandards.pdf

sludge flow assumed two continuously operated primary sludge pumps in service (one pump per clarifier) each 350 gpm, for a total primary sludge flow of 1.008 mgd. Primary sludge flows reported on MORs exceeds the primary sludge pumping capacity, so it was set at a constant flowrate of 1.008 mgd.

Mass balance

The mass balance used the flows as determined above with the concentration determined from special sampling. In general, the mass balance around the primary settling tanks did not close mostly due to the high concentration (and as such load) associated with the primary sludge. Sludge samples, especially grit laden primary sludge samples such as those collected at the WWTP, are notoriously inaccurate due to diurnal variability and large amount of grit in sample lines. Since primary effluent is by definition lighter material, it is easier to suspend in channels with mixing and less prone to sampling error, primary effluent was assumed to be correct and was used in the model development.

Primary performance
The calculated capture was 50% during the two week period. The calibration period reported primary capture is low for municipal wastewater treatment plants but is biased by an exceptionally low values: negative calculated value of -61.6% removal on the fourth day of special sampling. Replacing this outlier with 0% removal results in an average capture of 54% which is typical for municipal wastewater treatment plants with no chemical addition. The reason for the low capture on this one days is unknown.

The average TSS removal for the calibration period (which is consistent with other years of historic data) was determined to be negative- -41.4%. This discrepancy in the mass balance is inexplicable, likely attributed to septage and GTO impacts, yet consistent with previous analyses conducted by other consultants. For the validation period, with all negative values removed, the average TSS removal in the primaries was determined to be 41.3%. For days with negative percent TSS removals, this average ‘positive’ removal was used.

Dynamic percent TSS removals were input the primary clarifier model element, based on the daily percent TSS removal. **Figure 10a** shows modeled (solid line) vs. measured (points) primary effluent TSS and VSS calibration simulation. **Figure 10b** shows the same for BOD and COD.

Figure 10a. BioWin-Predicted vs. Measured Primary Effluent TSS and VSS for the Calibration Period

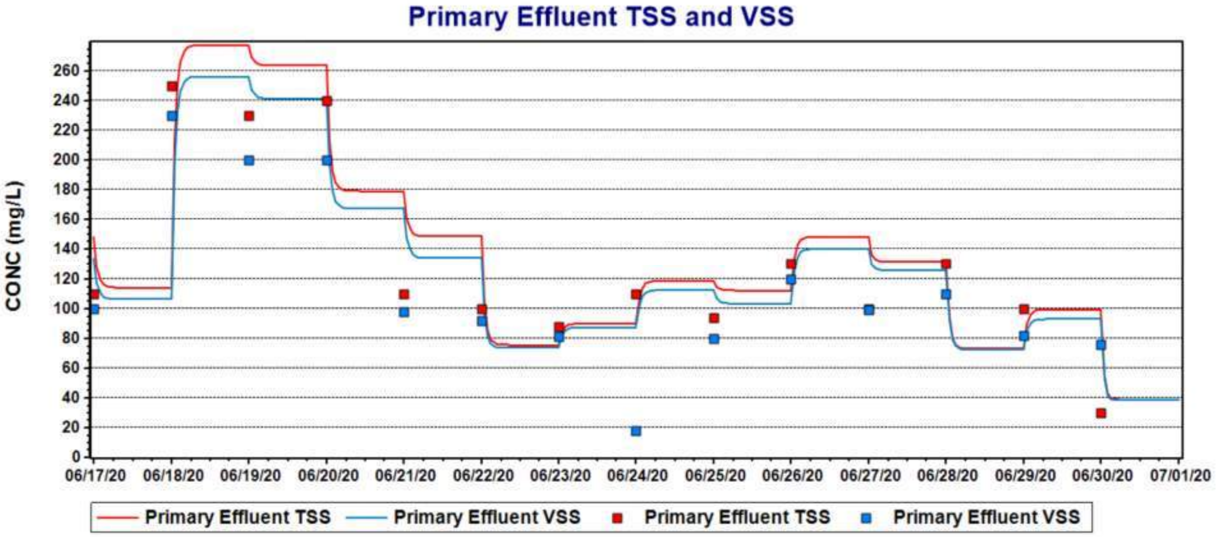
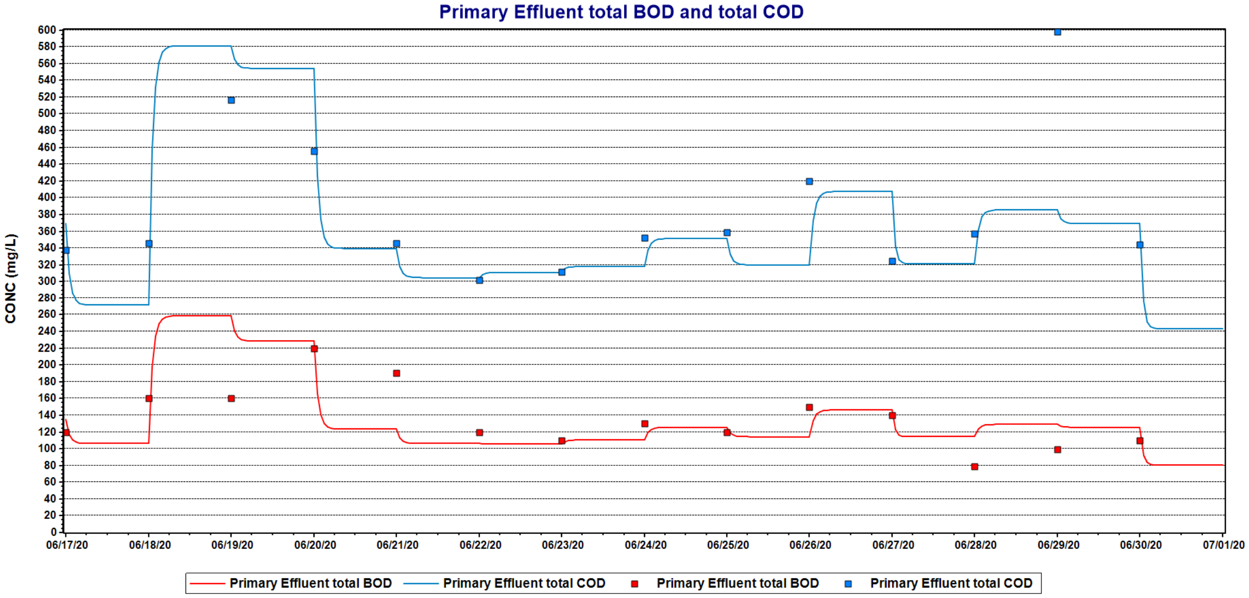


Figure 10b. BioWin-Predicted vs. Measured Primary Effluent COD and BOD for the Calibration Period



Aeration

There are a total of six aeration tank with three pairs of tanks each dedicated to a pair of rectangular final clarifiers that each have dedicated return activated sludge lines. There is no cross connection between the pairs of aeration tanks and final clarifiers, interconnecting channels, nor piping. Each pair of aeration tanks functions as a separate activated sludge system and as such was modeled independently.

Although not evaluated for this project, this will allow the model to be used in the future to assess the impact of flow split on overall plant performance. A series of 'Bioreactor' elements were used to model the four individual zones for the aeration trains, with a total of 6.6 million gallons (MG) of tank volume in operation. The dimensions were updated from the record drawings. Each train was modeled as four zones. The input for each bioreactor was specified by the "Area and depth" method with values as shown in **Table 12**.

Table 12. Geometry Used in the Bioreactor Models

Bioreactor	# Tanks in service	Area (SF)	Depth (ft)	Width (ft)
Zone A	2	4,455	16.4	60
Zone B	2	4,455	16.4	60
Zone C	2	4,455	16.4	60
Zone D	2	4,455	16.4	60

The "Splitter" element was used to for the bypass flow and to split simulated primary effluent between the modeled tanks in service. On days which had plant bypass, the 'rate in side' of this splitter was set to a non-zero value based on reported bypass flow in the MOR. For the flow split to trains 2 and 3, the 'Ratio [S/M]' method was used with constant value of 2 (i.e. two times the flow going tanks 2 and 3 than going to tank 1). For the flow split to train 3, the 'Ratio [S/M]' method was used with constant value of 1 (i.e. equal flow going tanks 3 than going to tank 2). In this way, equal flow split was modeled. These ratios can be adjusted once a hydraulic model is complete.

There is no online data acquisition for dissolved oxygen (DO). DO is recorded along the length of the aeration tank multiple times per day and a daily 'High' and 'Low' value are recorded for plant MORs. There was relatively high effluent ammonia during the model calibration period which is surprising given the seemingly optimum conditions for nitrification. These conditions include:

- Warm temperatures
- Sufficiently long SRT
- Neutral pH
- Lack of inhibition
- High dissolved oxygen

The WWTP generally has all these conditions with the exception of high DO. During the calibration period, the reported ‘Low’ DO varied from a low of 0.2 mg/L to a high of 1.7 mg/L; the ‘High’ DO varied from a low of 4.2 mg/L to a high of 9.2 mg/L. Although the theoretical fraction of maximum specific growth rate of nitrifying bacteria increases slightly from a DO of 2.0 to 4.0 mg/L, experience shows there hasn’t been a noticeable difference in effluent ammonia when the DO is greater than 2 mg/L and this value is often targeted to ensure complete nitrification.

The tanks are configured in a modified Ludzack Ettinger (MLE) configuration with Zone A unaerated with an anoxic mixer to promote denitrification and total nitrogen removal. Based on an aerial view of the WWTP (**Figure 11**), there is minimal surface agitation of Zone D implying minimal aeration of this Zone. As such this zone was modeled as unaerated. Zones B and C were modeled using the ‘Low’ DO reported on the MOR as this best predicted effluent ammonia and total nitrogen as discussed in more detail below.

Aeration

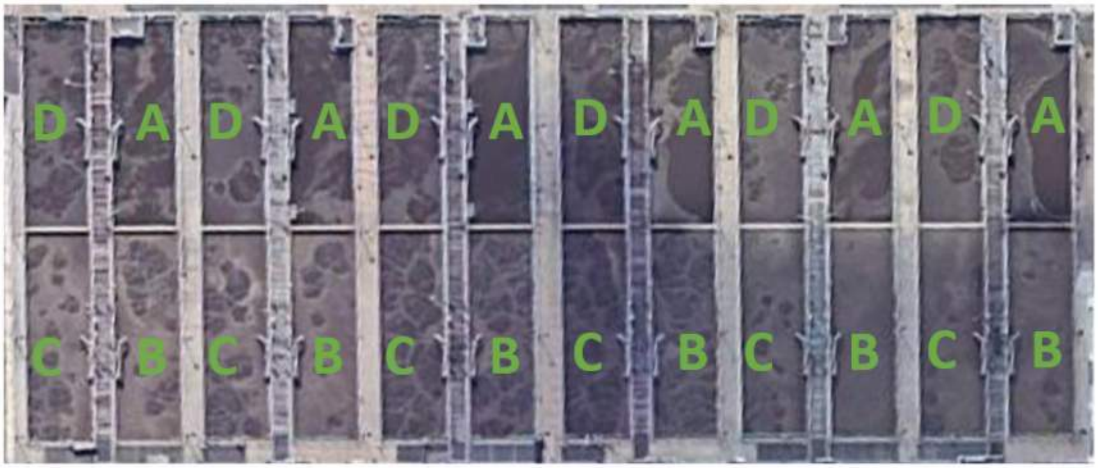
A series of ‘Bioreactor’ elements were used to model the individual zones of the bioreactors. Three trains of four bioreactor zones in series were used to model the six bioreactors, for a total volume of 6.62 million gallons (MG) of bioreactor volume. The dimensions were specified by the “Area” and depth” method. A sidewater depth of 16.4 ft was used per hydraulic profiles in record drawings. Geometries are shown in **Table 13**.

Table 13. Geometry Used in the Bioreactor Models

Bioreactor	# Tanks in service	Area (SF)	Depth (ft)	Width (ft)	# Diffusers
Zone A	5	9341.5	16.4	148.75	2,500
Zone B	5	9341.5	16.4	148.75	2,500
Zone C	5	9341.5	16.4	148.75	2,500
Zone D	5	9341.5	16.4	148.75	2,500

The “Splitter” element was used to split simulated primary effluent between the modeled bioreactors in service. Daily DO setpoints were set equal to the values in the Monthly Operating Reports for the relevant calibration or validation periods. DO setpoint were set equal to the daily values reported in the MORs, with all zones within the pair of bioreactors having the same DO setpoints on a given day. flow split was modeled. These ratios can be adjusted once a hydraulic model is complete.

Figure 11. Aerial view of the ESTP



Secondary Clarification

The secondary clarifiers were modeled using three 'Model clarifier' elements for each bioreactor train. Area in the model clarifier was set equal to the area of the secondary clarifiers (16,250 square feet), and side water depth = 11ft. The Modified Vesilind model was selected, and the settling parameters were based on the correlations in Daigger and Roper (1985)[6] as follows:

- Maximum Vesilind settling velocity (V_0) = 0.387 ft/min
- Vesilind hindered zone settling parameter (K) = 0.148 + 0.0021 * SVI (mL/g)

The SVI varies slightly for each of the six aeration tanks. Since the aeration tanks were modeled in pairs, the SVI uses was the average of the two aeration tanks feeding the model clarifiers. The SVI for the three aeration tanks was 89.9 mL/g, 96.8 mL/g, and 113.8 mL/g for aeration trains 1, 2, and 3 respectively during the model calibration period. To simplify the model, each model clarifier was assigned a corresponding k value of 0.314.

The SVI for the three aeration tanks during validation period was 100.6 mL/g (k=0.32), 96.4 mL/g (k=0.32), and 91.1 mL/g (k=0.31) for aeration trains 1, 2, and 3 respectively. The universal k value used for all clarifiers was 0.32 (SVI=96.0 mL/g).

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[6] Daigger G.T. and R.E. Roper, Jr. 1985. The Relationship between SVI and Activated Sludge Settling Characteristics. *Journal (Water Pollution Control Federation)* Vol. 57, No. 8, WPCF Conference Preview Issue, pp. 859-866

The SVI for the calibration was low at the beginning of the sampling period and did was not consistent until the second week of sampling (**Figure 12a**). This is consistent with the validation SVI which was variable as shown in **Figure 12b**. Therefore, the settling model in BioWin should be expected to overestimate settling performance at the beginning of the calibration period which will also impact the WAS sludge load.

Figure 12a. SVI for the calibration period.

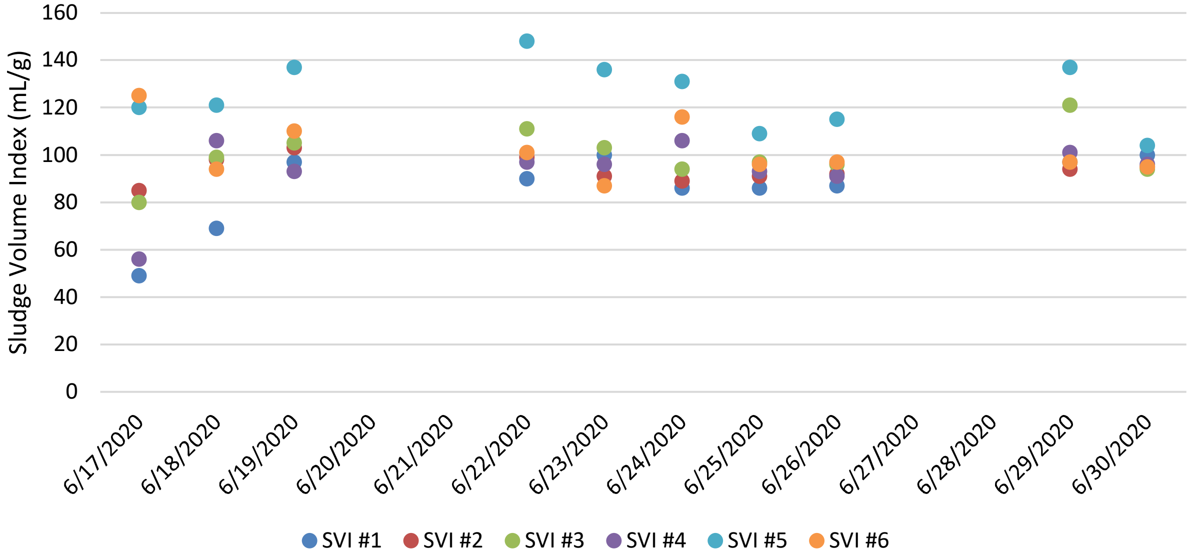
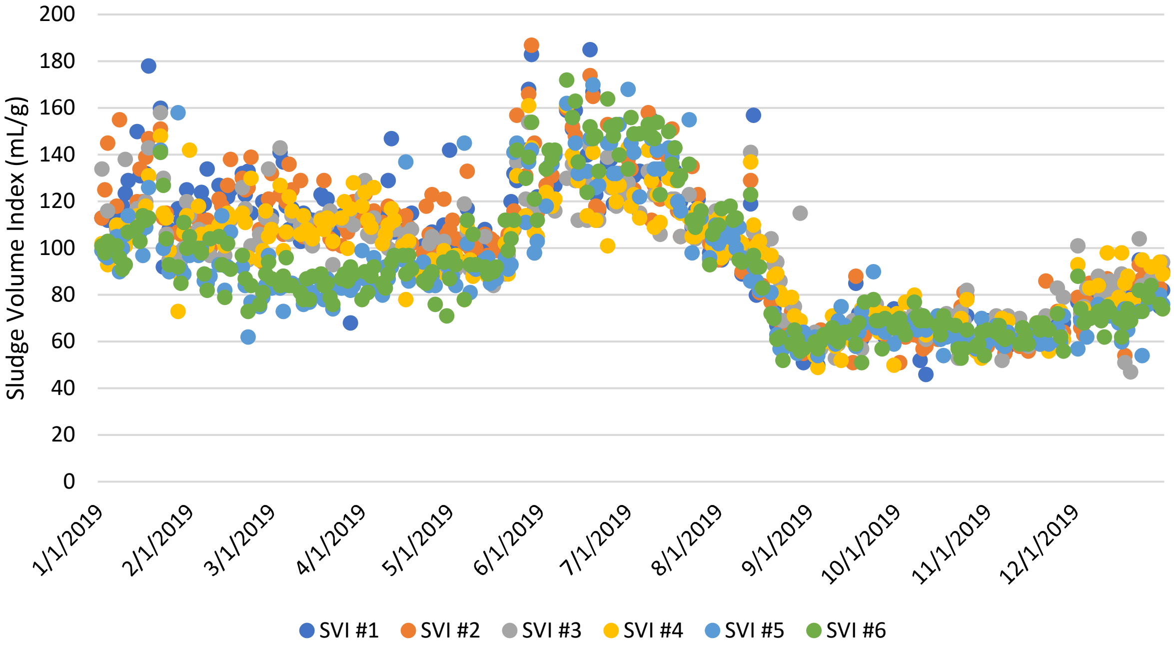


Figure 12b. SVI for the validation period.



Return activated sludge flow is reported as a percent which was assumed to be percent of forward flow. Because WAS is wasted off the RAS header, clarifier underflow was set to the reported RAS flow. There are no WAS pumps, nor flowmeters on the WAS line. WAS flow was estimated from the estimated WAS load and RAS concentration. Because the reported WAS pounds on MOR are approximated, reported WAS pounds are not considered to be reliable. Through model iterations and trial and error trying to match model predicted RAS concentrations and MLSS within each clarifier, it is suspected that reported WAS is underreported by 55%. Calculated WAS flows were adjusted by +55% and those daily estimated flows were input into the WAS splitter as “rate in side”.

Solids Processing

Primary sludge is degritted and degritted primary sludge is sent to gravity thickeners. WAS is co-thickened with primary sludge in the gravity thickeners. These unit processes are described in more detail below.

Primary Sludge Grit Removal

The primary sludge grit removal system was modeled using a ‘Separator – Cyclone (ISS) element’ with 50% ISS removal and an underflow fraction of 0.002.

Gravity Thickening

The two gravity thickeners (No. 1 and No. 2) were modeled using a single 'Ideal clarifier' element. The total area of the element was equal to the area of the two, 50-ft diameter gravity thickeners (3,925 square feet) and the depth was set to12.5 ft. Capture of the modeled gravity thickeners was 96%. The underflow from the GT was set to 0.059 mgd based on Synagro thickened sludge reports for the month of June (157, 5,600-gal trucks during two-week period). The thickened primary and WAS slow was sent to a sludge element.

Chemical Addition

Due to the acid produced as a side product, nitrification results in a net pH decrease. To maintain neutral pH in the reactor and optimum conditions for nitrification, 50% sodium hydroxide is added downstream of the primary clarifiers. Chemical addition was modeled using the 'Influent – State variable' element with flow of 600 gpd and 'Other Cations (strong bases) equal to 19,100 meq/L.

5. Model Calibration

As discussed above, June 17, 2020 through June 30, 2020 was selected for the calibration period to overlap the period of special sampling. Dynamic model results were compared with plant data from the calibration period and percent differences between modeled and measured values were calculated for both daily values and monthly average values. Note that positive percent differences corresponding to days for which the modeled values are higher than the measured values and negative percent differences corresponding to days for which the modeled values are lower than the measured values. The goal of the calibration was to achieve the stop criteria shown in **Table 14**, which were selected from Table 6.5 in Rieger *et al*. (2012)[7] and correspond to values suitable for the following applications of the calibrated West Side WWTP model:

- Assessing overall oxygen transfer requirements,
- Considering various process configurations for nitrogen removal; and
- Process optimization.

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[7] Rieger, L., S. Gillot, G. Langergraber, T. Ohtsuki, A. Shaw, I. Takács and S. Winkler. 2013. *Guidelines for Using Activated Sludge Models.* Scientific and Technical Report No. 22. IWA Publishing. New York, NY.

Table 14. Calibration Stop Criteria Used for Calibration

Target Variable	Acceptable Error Range (±)
MLSS	10%
MLVSS:MLSS	5%
WAS Mass Load	5%
SRT	1 day
Effluent TSS	5 mg/L
Effluent NH_3-N	1.0 mg/L
Effluent NO_x-N	1.0 mg/L
Effluent TN	1.0 mg/L

The stop criteria presented in Table 14 are based on monthly average values. Special sampling was only performed for a two-week period and as such the average of this period was used to establish stop criteria.

MLSS

Modeled vs. measured MLSS for the three modeled trains are shown in **Figures 13a**, **13b**, and **13c**, respectively. **Figure 13d** shows the modeled vs measured MLSS for the overall average of the three trains. **Figures 14a**, **14b**, and **14c** show the corresponding percent difference between daily modeled and measured MLSS for each aeration train. **Figure 14d** shows the corresponding percent difference between daily modeled and measured MLSS for the overall average of the three trains. Note that the daily differences exceeded ± 10% on five (out of 14) days for Train 1, six days for Train 2, and five days for Train 3. Based on the average of all three trains, daily difference exceeded +/-10% on one day.

The relative percent difference between modeled and measured average MLSS for the entire calibration month were:

- Train No. 1: -7.1%
- Train No. 2: 12.5%
- Train No. 3: -9.7%
- Overall Average: -1.3%

Despite Train No. 2 not achieve IWA stop criteria, the overall average value is consistent with the IWA stop criteria (±10%). The difference between these three values is an indicator of unequal flow split between the three trains. Modeling results indicate that it could be possible that Train No. 2 receives less flow, compared to Train No. 1 and Train No. 3.

Figure 13a. BioWin-Predicted MLSS vs. Measured MLSS in Aeration Tank No. 1 for Calibration Period

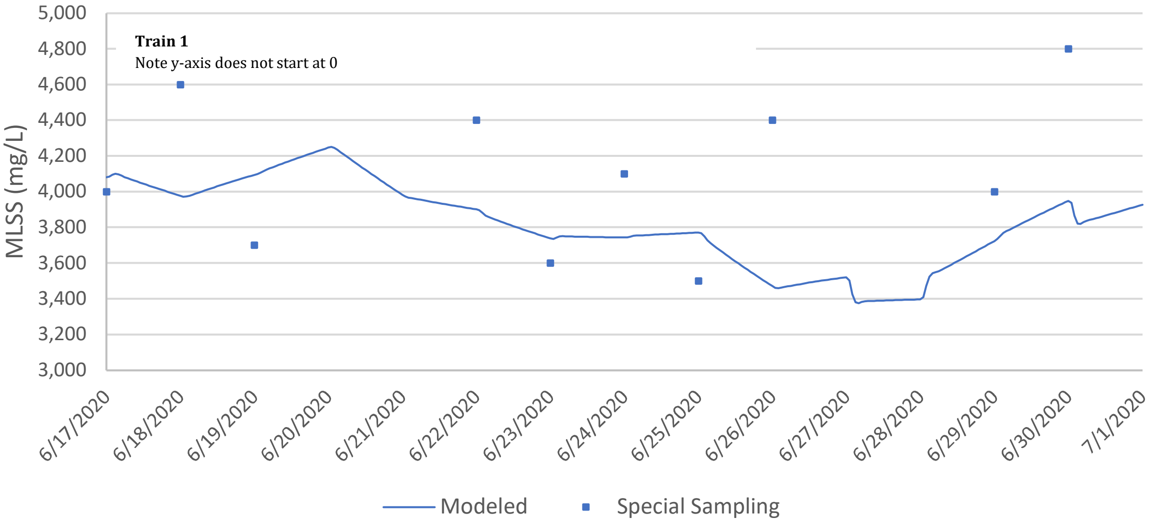


Figure 14a. Difference Between BioWin-Predicted Value and Measured Values for Aeration Tank No. 1
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

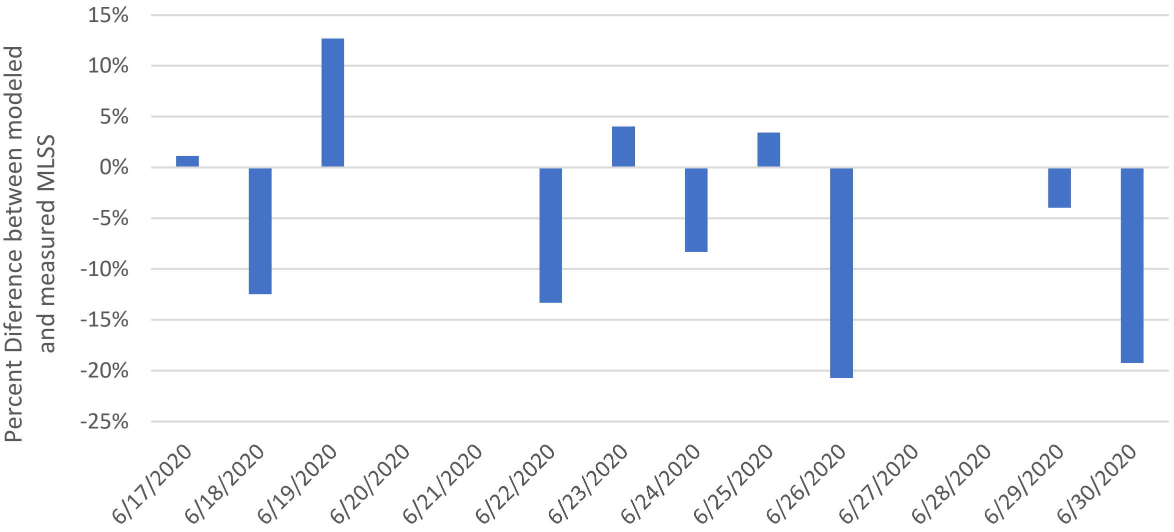


Figure 13b. BioWin-Predicted MLSS vs. Measured MLSS in Aeration Train No. 2 for Calibration Period

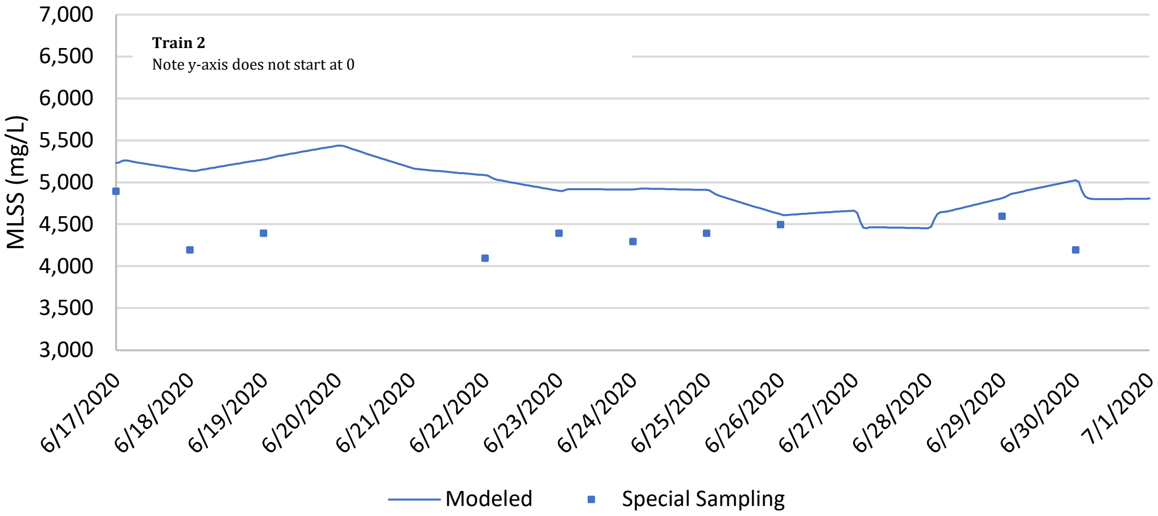


Figure 14b. Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 2
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

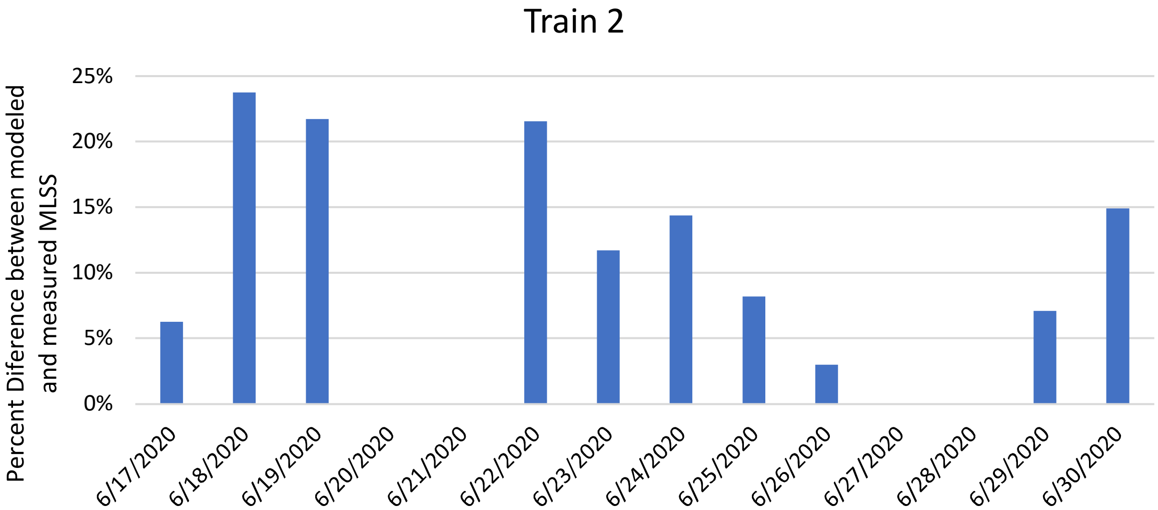


Figure 13c BioWin-Predicted MLSS vs. Measured MLSS in Aeration Train No. 3 for Calibration Period

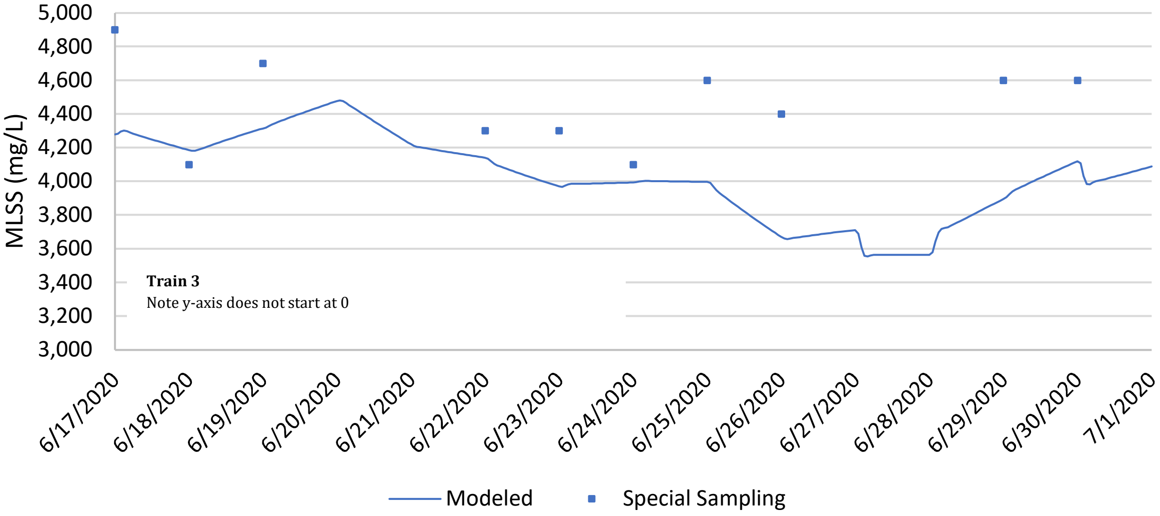


Figure 14c. Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 3
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

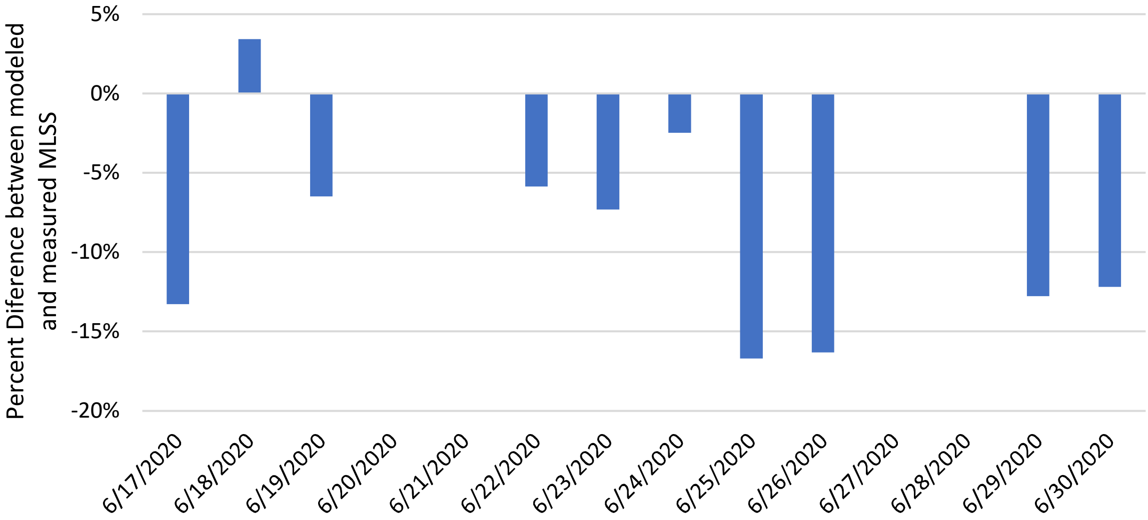


Figure 13d. Overall Average BioWin-Predicted MLSS vs. Measured MLSS in the three Aeration Trains for Calibration Period

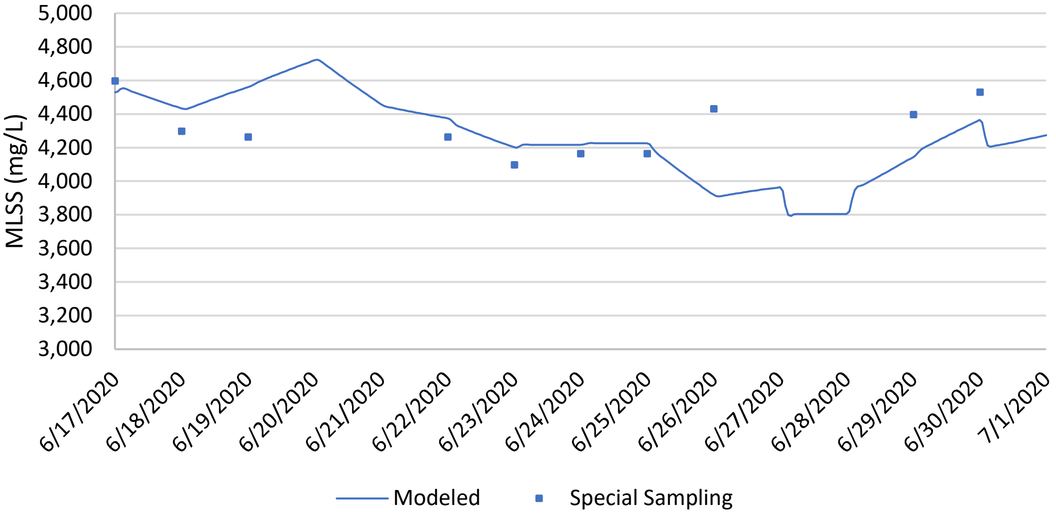
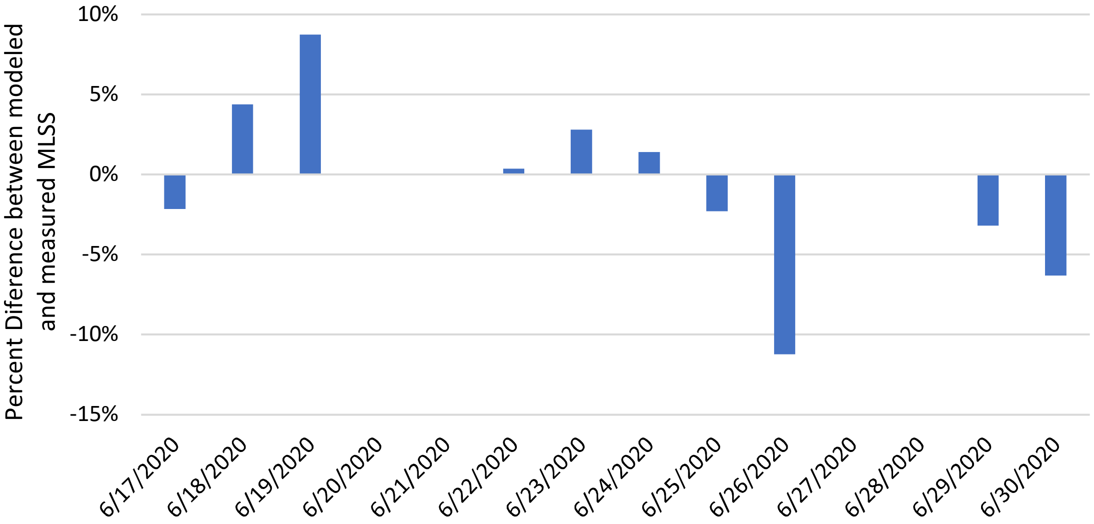


Figure 14d. Difference Between Overall Average BioWin-Predicted Value and Measured Values for the three Aeration Trains

Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value



MLSS:MLVSS

The average modeled and measured MLVSS:MLSS ratios in the aeration trains, and the percent differences between measured and modeled, are shown in **Table 15**. These values are within the IWA stop criteria (± 5%).

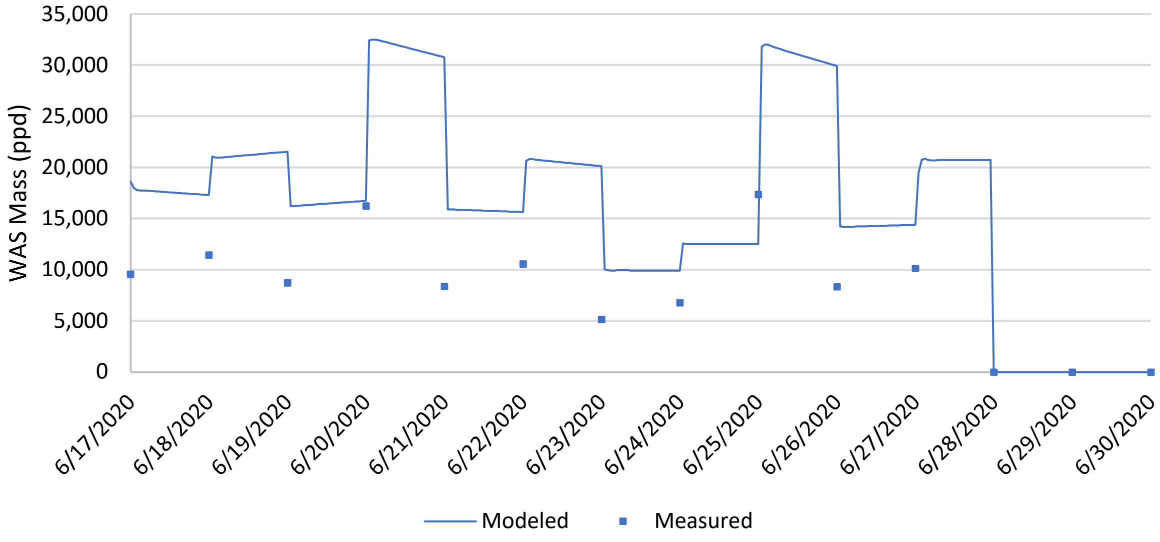
Table 15. BioWin-Modeled vs. Measured MLVSS:MLSS Ratio for Calibration Period, by Aeration Tank

Aeration Tank No.	Modeled Average MLVSS:MLSS Ratio for Calibration Month	Measured Average MLVSS:MLSS Ratio for Calibration Month	Percent Difference
1	0.809	0.828	-2.3%
2	0.797	0.845	-5.7%
3	0.806	0.843	-4.3%
Overall	0.804	0.839	-4.2%

WAS Mass

The average WAS mass predicted by BioWin for the calibration month was 15,016 lb/day vs. 8,073 lb/day average from daily plant data. This corresponds to a +69% relative difference, which exceeds the recommended IWA error range. Modeled vs. plant reported WAS mass is shown in **Figure 15**. Since WAS is wasted by plant staff opening a valve on the RAS header, reported WAS mass is approximated using visual inspection of the flow from this valve. Without WAS measurement, this discrepancy between model predicted WAS mass vs. plant reported WAS mass was anticipated.

Figure 15. BioWin-Predicted WAS Mass vs. Plant-Reported WAS Mass for Calibration Period



Solids Retention Time and Net Yield

The average SRT predicted by BioWin for the calibration period was 11.7 days vs. 22.1 days calculated from daily plant data. This corresponds to a -10.4 day difference which exceeds the recommended IWA error range (±1 day for SRT>5 days). Because SRT is calculated using WAS mass, this discrepancy is a direct result of the suspected validity of WAS approximated at the WWTP.

Effluent TSS

The absolute value of the difference between the average BioWin-predicted and average measured effluent TSS was 0.74 mg/L during the calibration period which is within the IWA stop criteria. Modeled and measured effluent TSS is shown **Figure 16**, while the daily differences (in mg/L) are shown in **Figure 17**. Three (of the 14) daily differences exceed 5 mg/L.

Figure 16. BioWin-Predicated Effluent TSS vs. Plant Data Secondary Effluent TSS for Calibration Period

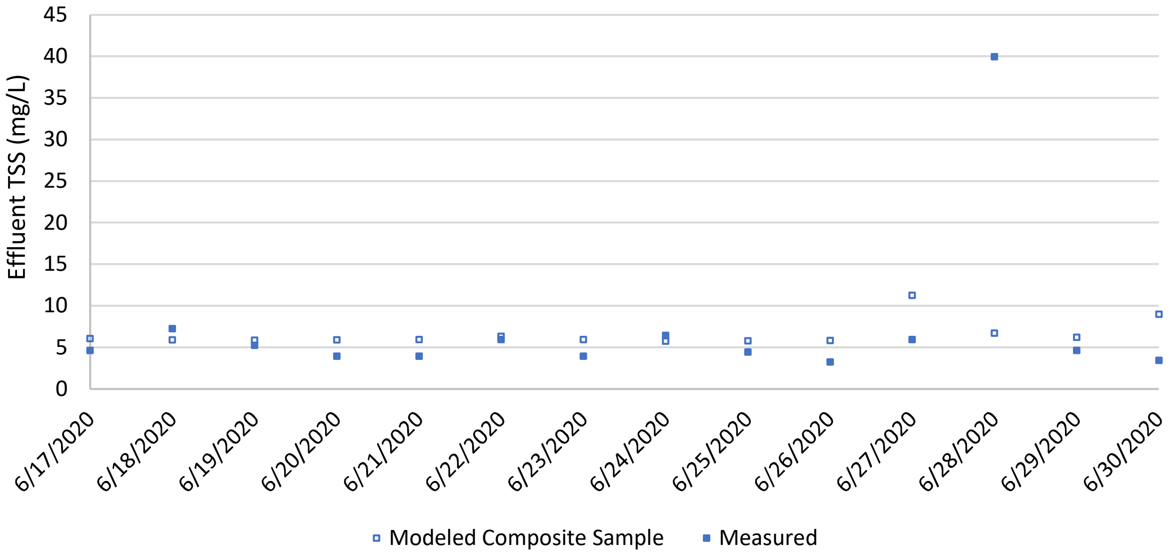
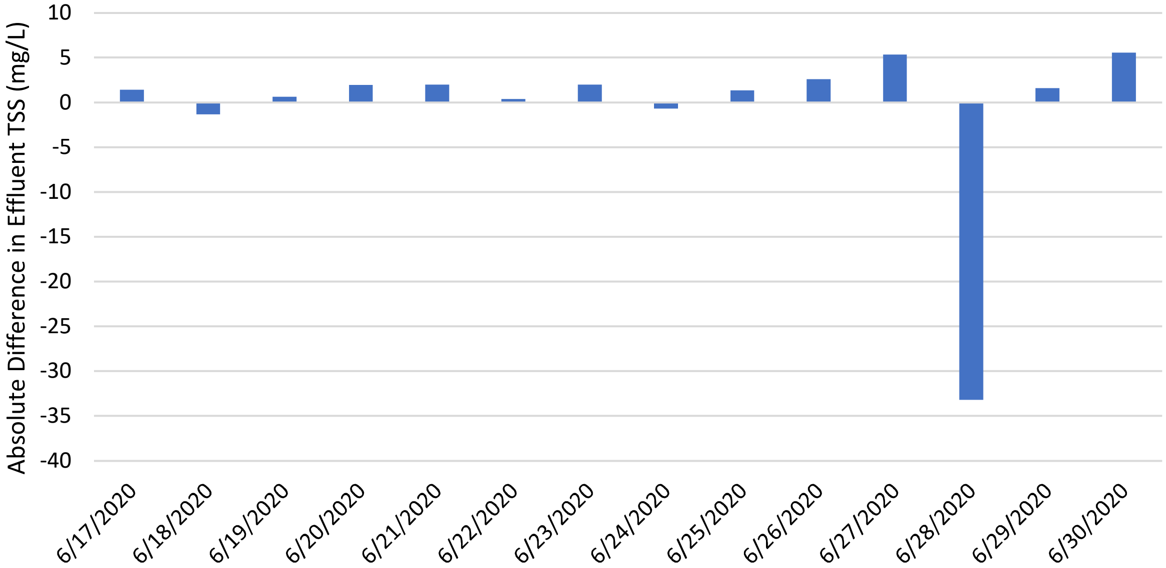


Figure 17. Difference Between BioWin-Predicted Effluent TSS and Plant Data Effluent TSS for Calibration Period



Effluent Ammonia

The absolute value of the difference between the average BioWin-predicted and average measured effluent ammonia-N was -1.55 mg/L during the calibration period which exceeds the IWA stop criteria (1 mg/L). Modeled and measured effluent ammonia-N is shown **Figure 18**, while the daily differences (in mg/L) are shown in **Figure 19**. All but three of the daily differences between modeled and measured are outside the IWA stop criteria.

Figure 18. BioWin-Predicted Effluent Ammonia-N vs. Plant Data Secondary Effluent Ammonia-N for Calibration Period

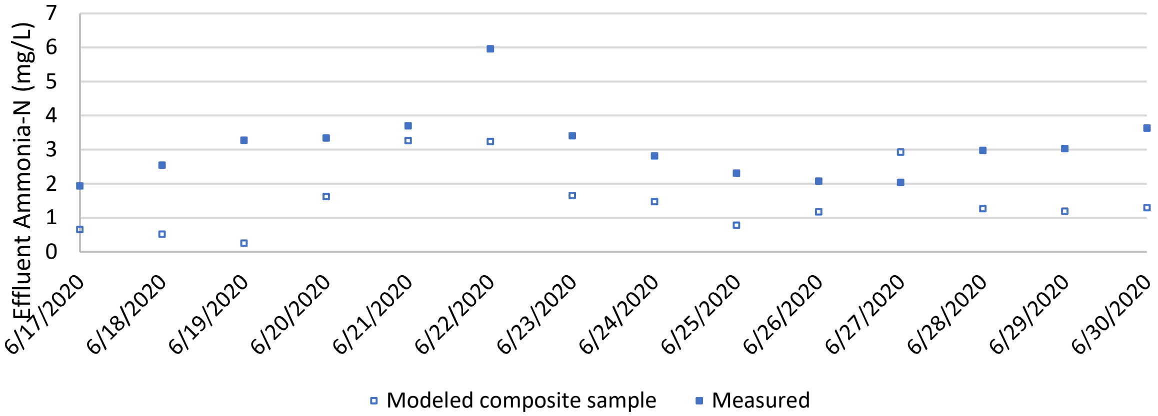
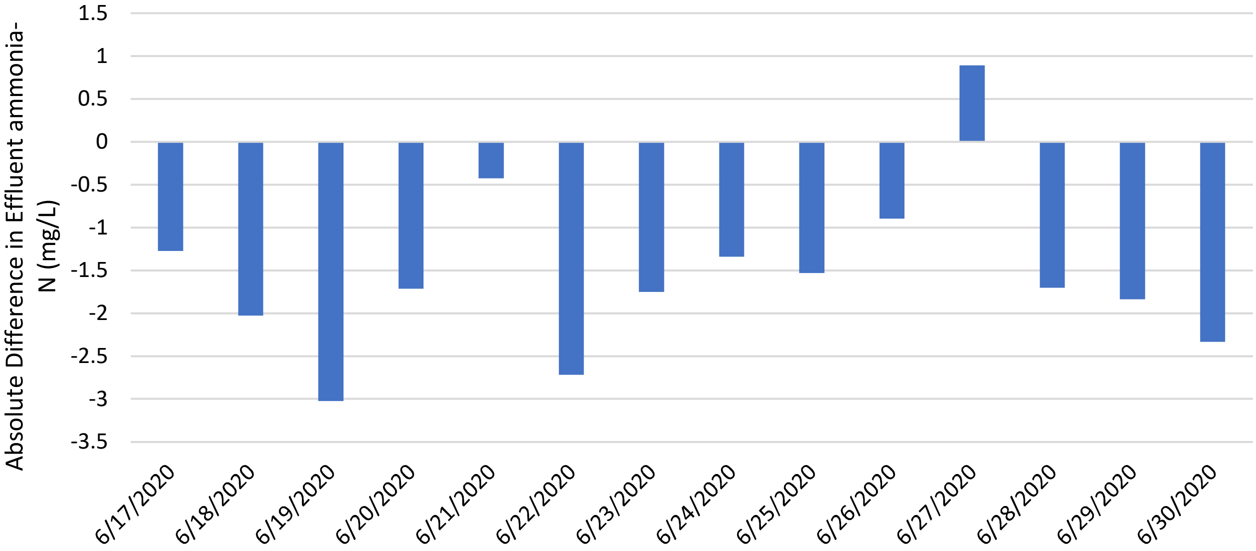


Figure 19. Difference Between BioWin-Predicted Effluent Ammonia-N and Secondary Effluent Ammonia-N for Calibration Period



Effluent Nitrate

The absolute value of the difference between the average BioWin-predicted and average measured effluent nitrate-N was -0.29 mg/L during the calibration period which is within the IWA stop criteria (1 mg/L). Modeled and measured effluent NOx-N is shown **Figure 20**, while the daily differences (in mg/L) are shown in **Figure 21**. Six (of 14) of the daily effluent nitrate values is outside the IWA stop criteria, however the WWTP's permitted annual total nitrogen waste load allocation is based an annual average results so the model capturing overall performance was deemed more important than daily variation.

Figure 20. BioWin-Predicted Effluent Nitrate-N vs. Plant Data Secondary Effluent Nitrate 2-N for Calibration Period

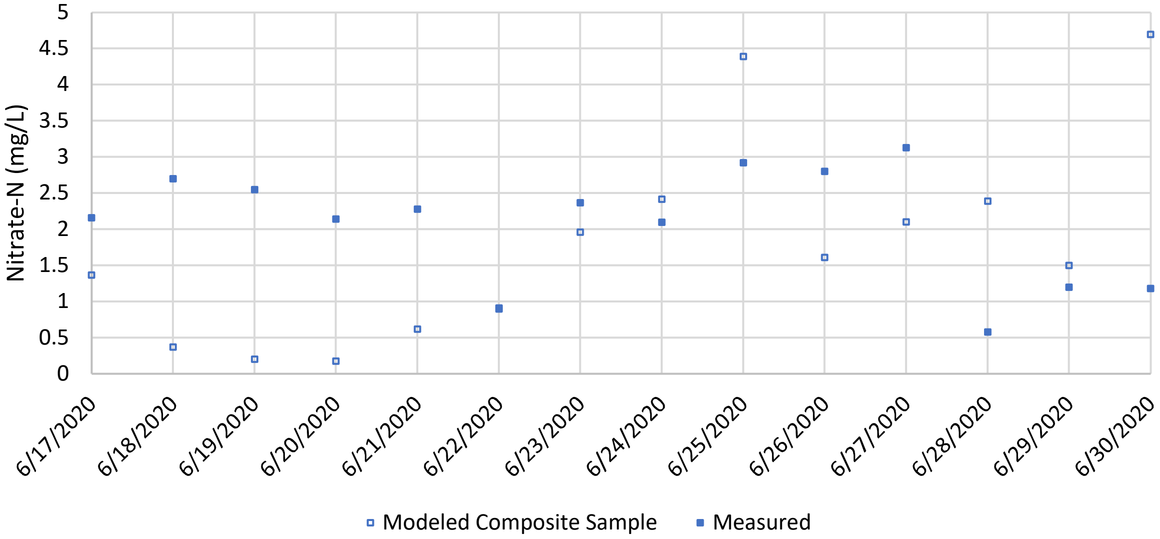
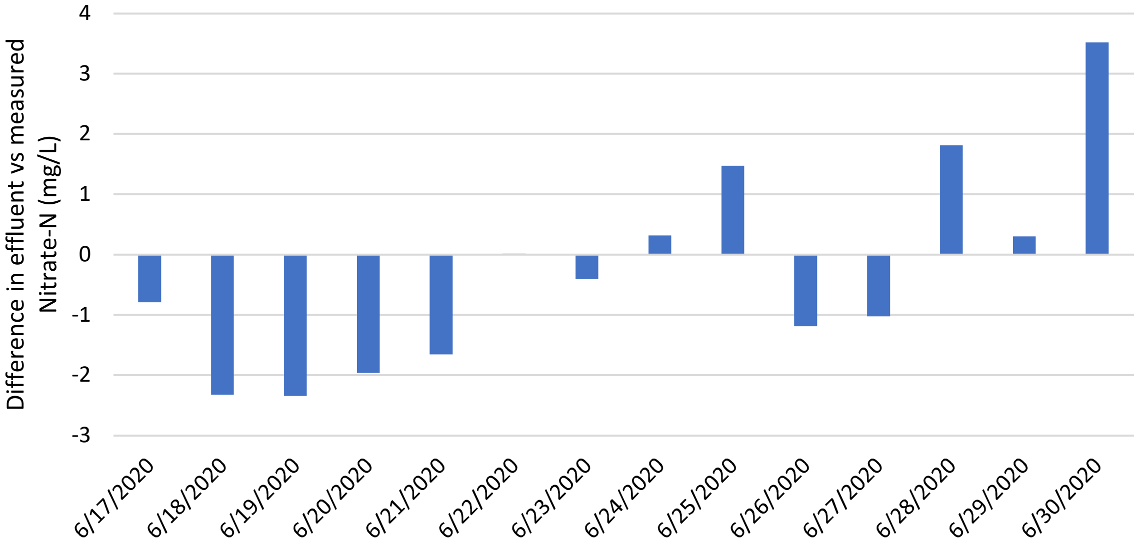


Figure 21. Difference Between BioWin-Predicted Effluent Nitrate-N and Secondary Effluent NOx-N for Calibration Period



Effluent Total Nitrogen

The absolute value of the difference between the average BioWin-predicted and average measured effluent Total nitrogen (TN) was -2.15 mg/L during the calibration period which exceeds the IWA stop criteria (1 mg/L). Modeled and measured effluent TN is shown **Figure 22**, while the daily differences (in mg/L) are shown in **Figure 23**. All but three of the daily differences between modeled and measured are outside the IWA stop criteria, however the permit is written an annual average basis so the model capturing overall performance was deemed more important than daily variation.

Figure 22. BioWin-Predicted Effluent Total-N vs. Plant Data Secondary Effluent Total Nitrogen for Calibration Period

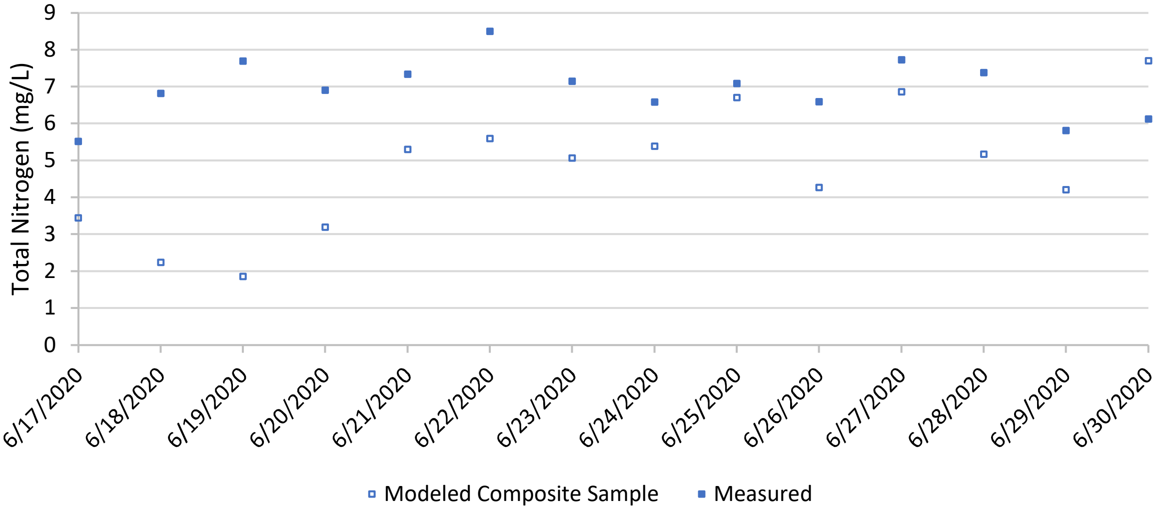
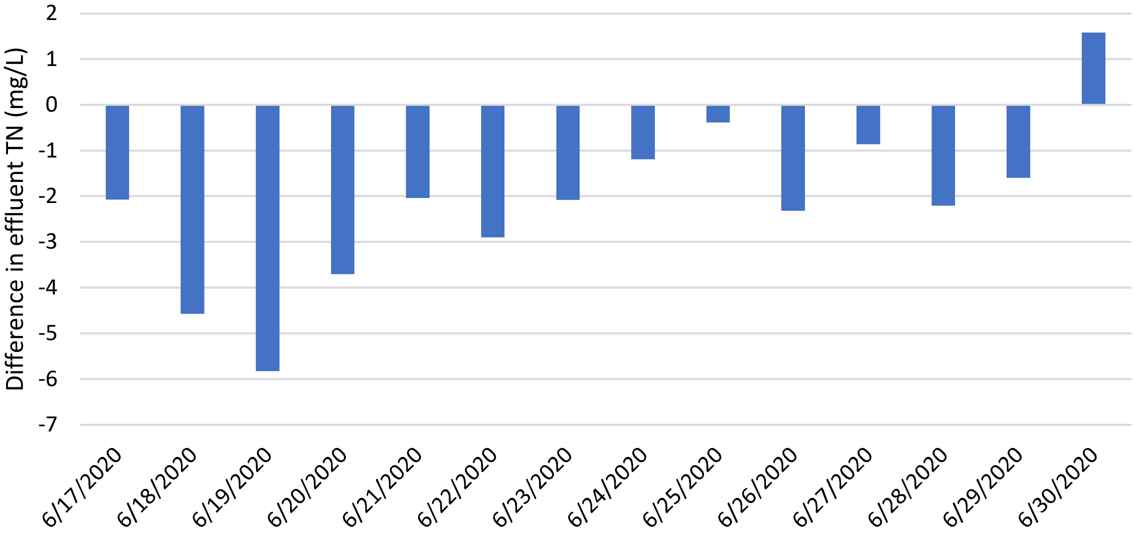


Figure 23. Difference Between BioWin-Predicted Effluent Total-N and Secondary Effluent Total Nitrogen for Calibration Period



6. Summary

Despite best modeling judgement and interpretation of plant data, stop criteria was not able to be achieved for WAS Mass Loading, SRT, effluent ammonia, nor effluent total nitrogen. Because WAS is wasted off of the RAS header by operating a valve, the WAS mass data is not considered to be accurate. As a function of WAS, SRT was not able to be predicted by the model to satisfy stop criteria. The model overpredicted nitrogen removal performance, particular nitrification performance. There are unknown nitrogenous transformations occurring at the WWTP. as summarized in **Table 16**.

Table 16. Summary of Calibration Results

Target Variable	Acceptable Error Range (±)	Actual Error	Stop Criteria Met?
MLSS Train 1	10%	-7.1%	Yes
MLVSS:MLSS Train 1	5%	-2.3%	Yes
MLSS Train 2	10%	12.5%	Yes
MLVSS:MLSS Train 2	5%	-5.7%	Yes
MLSS Train 3	10%	-9.7%	Yes
MLVSS:MLSS Train 3	5%	-4.3%	Yes
MLSS Average	10%	-1.3%	Yes
MLVSS:MLSS Average	5%	-4.2%	Yes
WAS Mass Load	5%	86.6%	No
SRT	1 day	-10.42 days	No
Effluent TSS	5 mg/L	-0.74 mg/L	Yes
Effluent NH_3-N	1.0 mg/L	-1.55 mg/L	No
Effluent Nitrate-N	1.0 mg/L	-0.29 mg/L	Yes
Effluent TN	1.0 mg/L	-2.15 mg/L	No

7. Validation

Despite the model not being calibrated to recommended IWA standards, the model was used to predict plant performance over a longer period of time. No additional changes to model kinetic or stoichiometric parameters were made during the validation process. Model predictions were compared with the observed values for calendar year 2019. Percent differences between modeled and measured values were calculated for both monthly and annual average values, with positive percent differences corresponding to days for which the modeled values are higher than the measured values and negative percent differences corresponding to days for which the modeled values are lower than the measured values.

MLSS

Figures 24a, **24b**, and **24c** show the percent difference between monthly average modeled and measured MLSS for each aeration train. **Figure 24d** shows the percent difference between monthly modeled and measured MLSS for the overall average of the three trains.

Figure 24a. Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 1
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

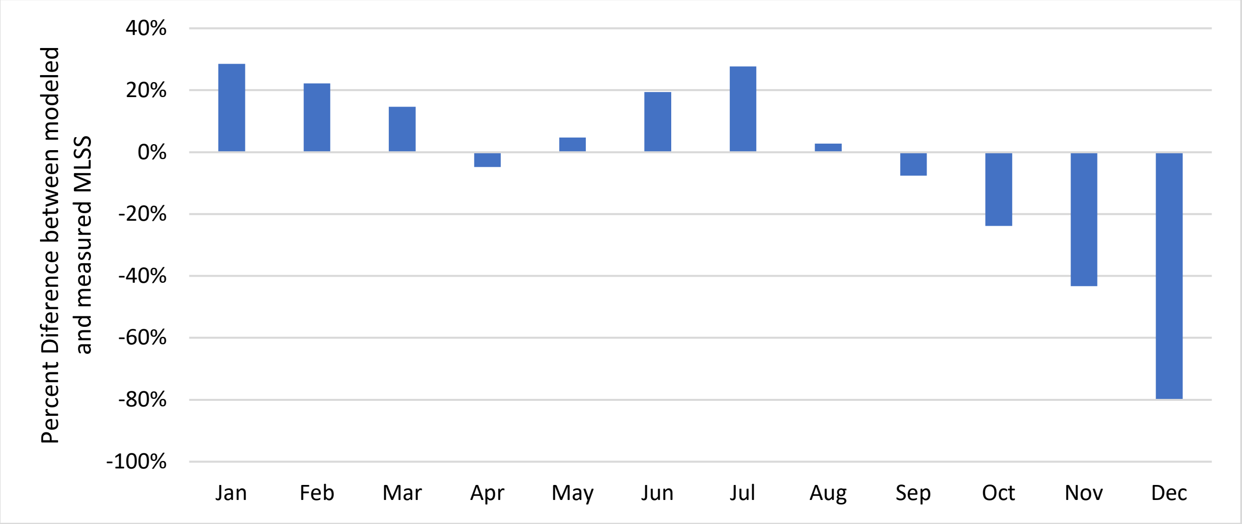


Figure 24b. Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 2
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

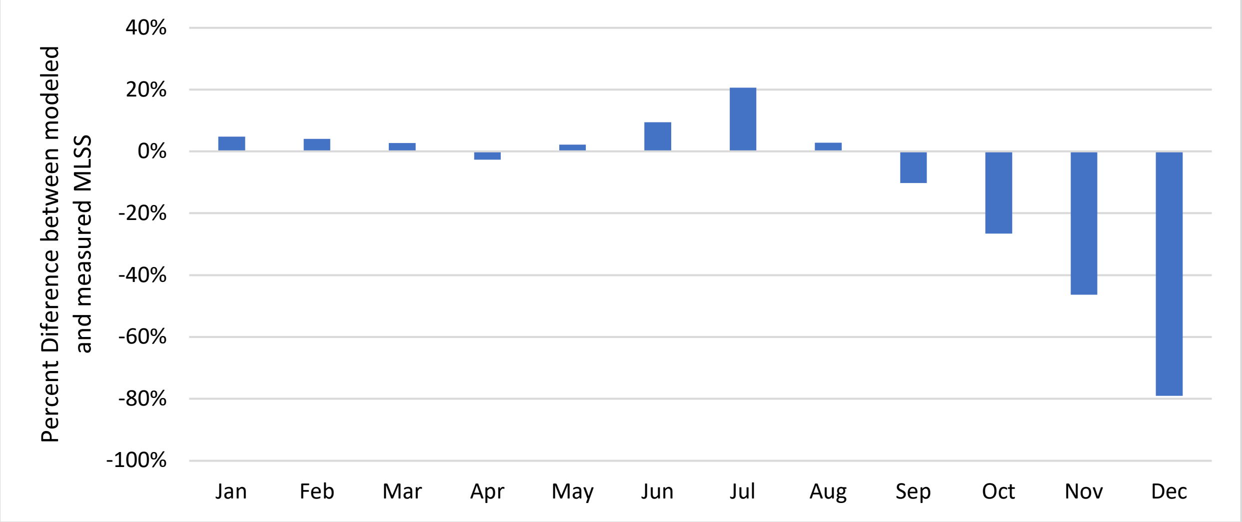


Figure 24c. Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 3
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

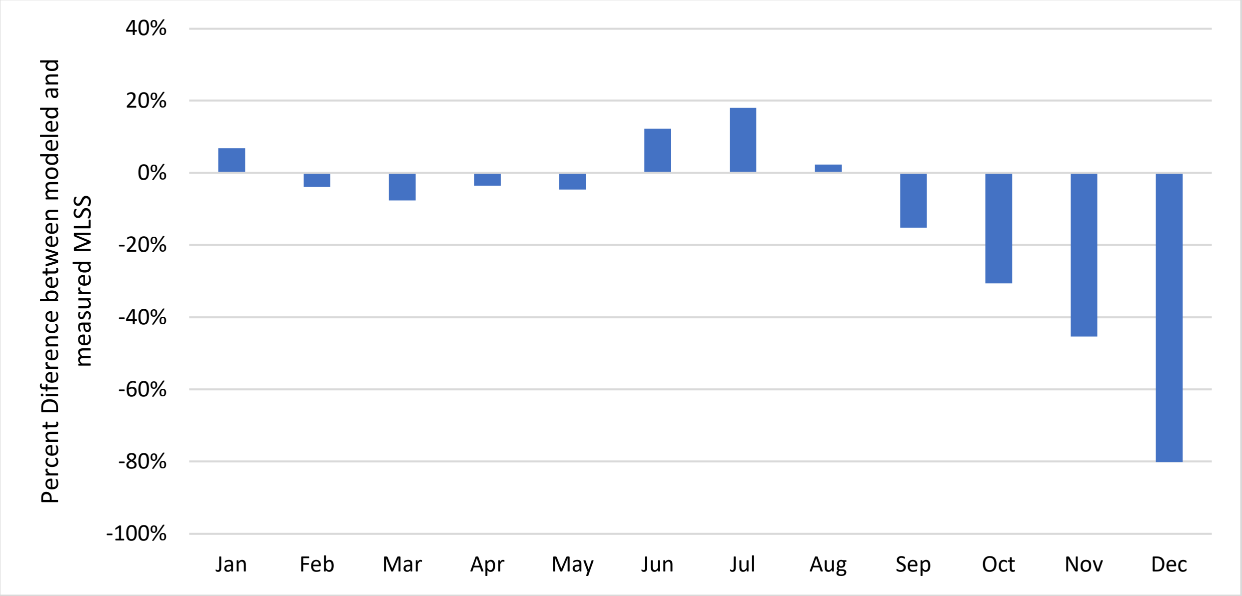
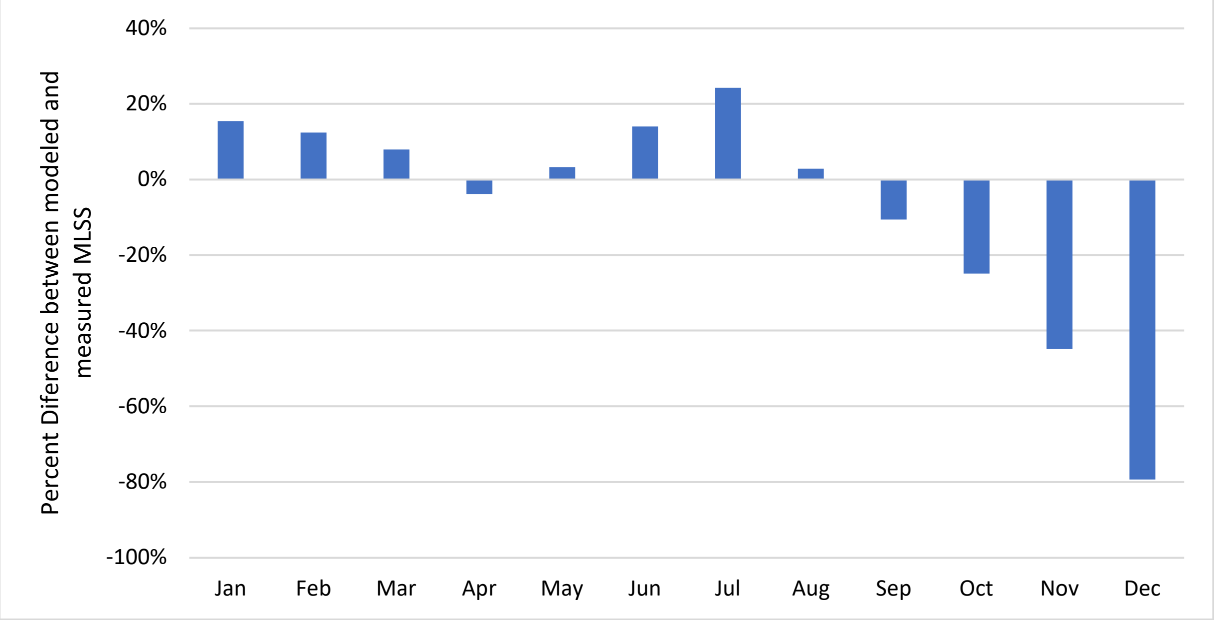


Figure 24d. Difference Between Overall Average BioWin-Predicted Value and Measured Values for the three Aeration Trains
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

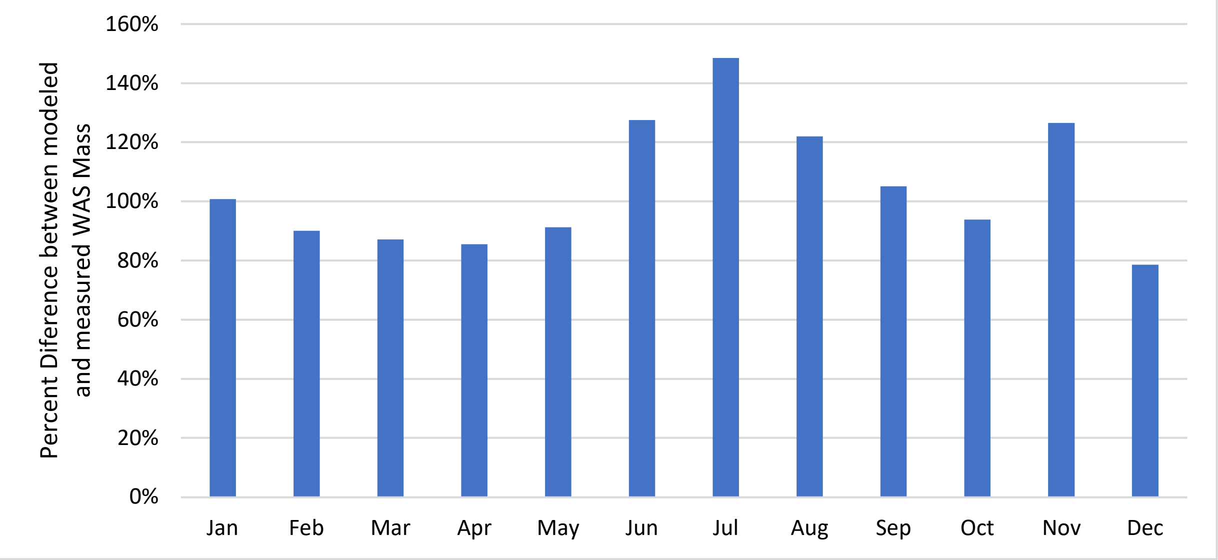


MLSS:MLVSS
MLVSS is not measured as part of normal operations and as such the validation of the MLVSS:MLSS ratio could not be performed.

WAS Mass

The average WAS mass predicted by BioWin for the validation year was 22,981lb/day (assuming wasting consistently over the 365-day validation period) vs. 11,419 lb/day average from MOR data. This corresponds to a +101% relative difference. The difference between monthly average modeled vs. measured WAS mass is shown in **Figure 25**. Consistent overestimation of the WAS load throughout the year indicates that current WAS monitoring practices are not understood, nor considered to be accurate.

Figure 25. BioWin-Predicted WAS Mass vs. Plant-Measured WAS Mass for Validation Period



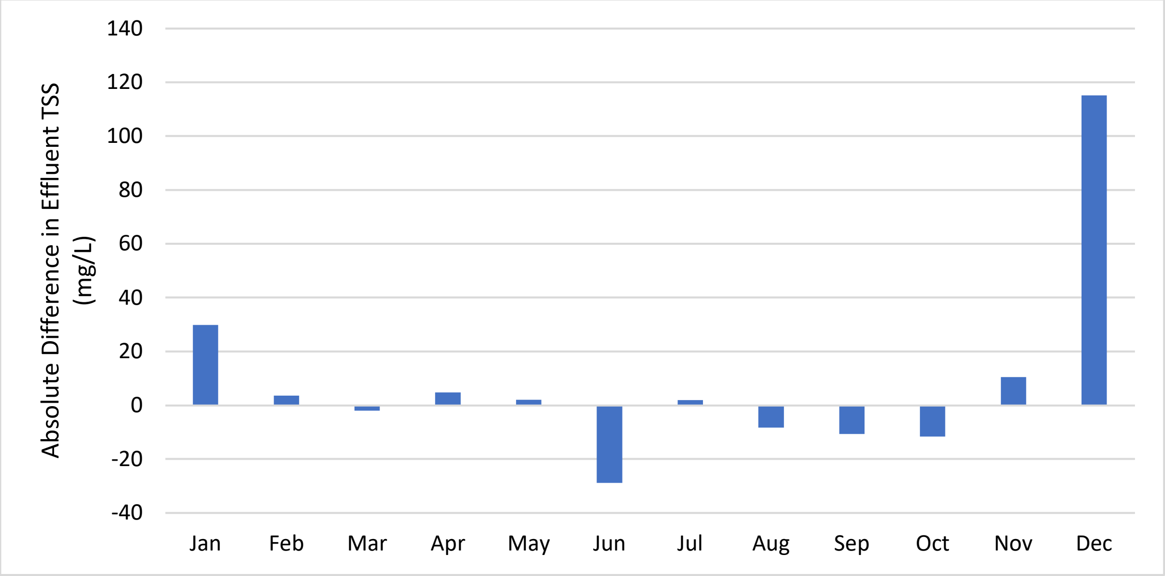
Solids Retention Time

The average SRT predicted by BioWin for the validation year was 7.2 days vs. 15.8 days calculated from daily plant data. This corresponds to a -8.6 day difference. This large difference in model predicted SRT is largely attributed to the difference of WAS production predicted by the model compared to the WWTP recorded WAS mass.

Effluent TSS

The absolute value of the difference between the average BioWin-predicted and average measured effluent TSS was 9.0 mg/L during the validation period. Monthly average modeled and measured effluent TSS is shown **Figure 26.** January, June, and December average values exceed 5 mg/L and are not within the IWA stop criteria.

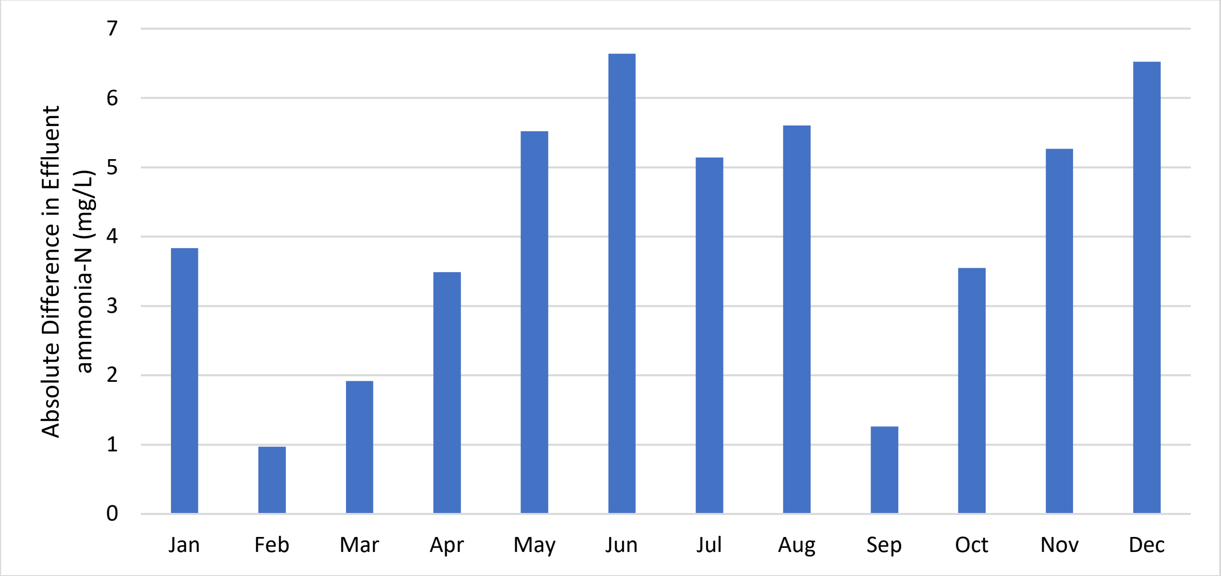
Figure 26. Difference Between BioWin-Predicted Effluent TSS and Plant Data Effluent TSS for Calibration Period



Effluent Ammonia

The absolute value of the difference between the average BioWin-predicted and average measured effluent ammonia-N was 4.2 mg/L during the validation year. Monthly differences (in mg/L) between the modeled and measured values are shown in **Figure 27**. Only one month is within the IWA stop criteria (1 mg/L). The model had overpredicted nitrification performance in the calibration period, but under-predicted nitrification performance during the longer validation period. This further shows that there are unknown nitrogenous transformations occurring within the WWTP's secondary process, likely due to DO volatility.

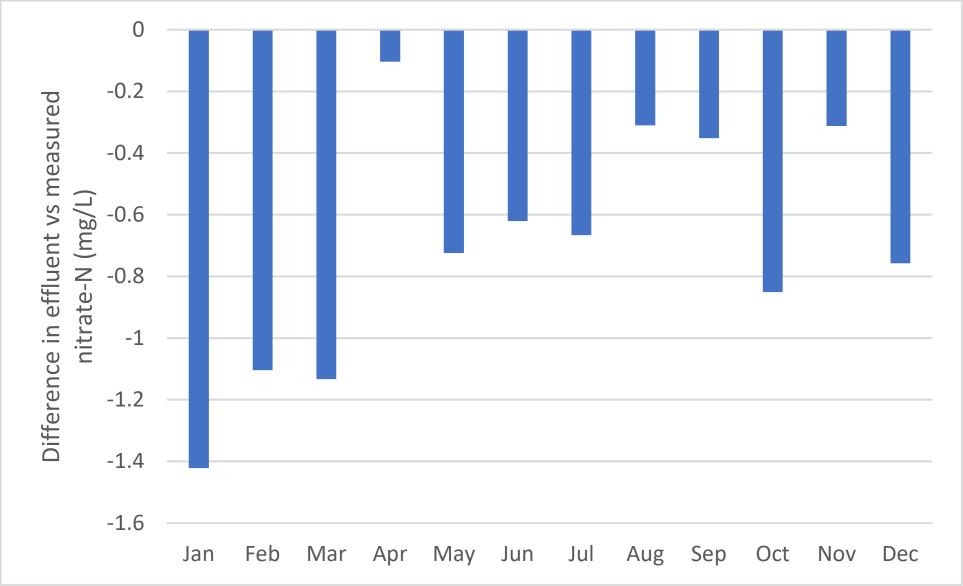
Figure 27. Difference Between BioWin-Predicted Effluent Ammonia-N and Effluent Ammonia-N for Calibration Period



Effluent Nitrate

The absolute value of the difference between the average BioWin-predicted and average measured effluent nitrate-N was -3.4 mg/L during the validation year. The difference between monthly average modeled and measured effluent nitrate-N is shown **Figure 28**. The model consistently over-predicted the extent of denitrification (lower effluent nitrate in the model than MOR data indicates).

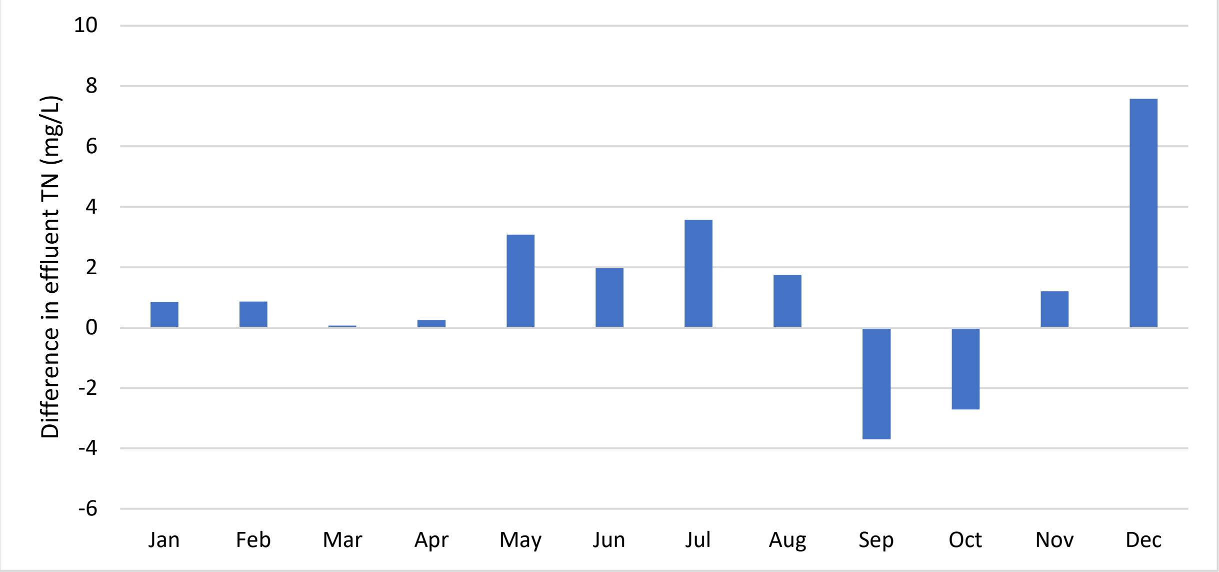
Figure 28. Difference Between BioWin-Predicted Effluent Nitrate-N and Effluent Nitrate-N for Calibration Period



Effluent Total Nitrogen

The absolute value of the difference between the average BioWin-predicted and average measured effluent Total-N was 1.26 mg/L during the validation year. The difference between monthly average modeled and measured effluent total-N is shown **Figure 29.** For nine months (January, February, April, May June, July, November and December) the model predicted higher effluent total nitrogen than reported in plant MOR data. Despite the inability for the model to predict the effluent nitrogen species, on an average basis the effluent total nitrogen was a better match to measured plant data.

Figure 29. Difference Between BioWin-Predicted Effluent Total-N and Effluent Total-N for Validation Year



Summary

As shown in **Table 17**, the model does not meet IWA stop criteria for every month. Therefore, the model wasn't able to be validated for the intended use. As Projects from this Facilities Plan move from planning stages into conceptual design and ultimately final design the model should be updated with new plant data and validated to new data to improve model accuracy.

Table 17. Summary of Calibration Results

		Stop Criteria Met?							
Time	MLSS Train 1	MLSS Train 2	MLSS Train 3	MLSS Average	WAS Load	Effluent TSS	Effluent NH_3-N	Effluent Nitrate -N	Effluent TN
Stop Criteria (±)	10%	10%	10%	10%	5%	1 day	5 mg/L	1 mg/L	1 mg/L
Jan	No	**Yes**	**Yes**	No	No	No	No	No	**Yes**
Feb	No	**Yes**	**Yes**	No	No	**Yes**	**Yes**	No	**Yes**
Mar	No	**Yes**	**Yes**	**Yes**	No	**Yes**	No	No	**Yes**
Apr	Yes	**Yes**	**Yes**	**Yes**	No	**Yes**	No	No	**Yes**
May	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	No	No	No
Jun	No	**Yes**	No	No	No	No	No	No	No
Jul	No	No	No	No	No	**Yes**	No	No	No
Aug	**Yes**	**Yes**	**Yes**	**Yes**	No	No	No	No	No
Sep	**Yes**	No	No	No	No	No	No	No	No
Oct	No	No	No	No	No	No	No	No	No
Nov	No	No	No	No	No	No	No	No	No
Dec	No	No	No	No	No	No	No	No	No
Annual Average	**Yes**	No	No	**Yes**	No	No	No	No	No

8. Alternatives Modeled

To model future conditions, a dynamic daily dataset was required. This dataset was developed for the 25.8 mgd "Condition A" consisting of biological nutrient removal to annual average effluent mass loading of 1,041 lbs/day and the 30 mgd "Condition B" consisting of secondary treatment objectives (30 mg/L TSS and 30 mg/L BOD). A 1-year dynamic data set was developed for each of these Conditions as follows.

The historical daily influent generated as described above for the validation dataset was used to generate the projected future influent itinerary. Each day of historical loads was multiplied by the ratio of the projected future average load and historical average load (e.g. the BOD load on January 1 was multiplied by the ratio of the projected average BOD and historical average BOD load to estimate the future BOD load on January 1). This was done for each day in the 1-year itinerary and for each parameter of interest (BOD, TSS, and TKN).

The projected future daily loads were "capped" such that any projected load less than the design min day was set equal to the design min day and any projected load greater than maximum day was set equal to design maximum day. Subjectively determined "low" and "high" loads were then tweaked such that the statistics of the one-year projected data set matched design conditions. Flows and loads for “Condition A” are summarized in **Table 18a** and the projected itinerary is summarized in **Table 19a**. Flows and loads for “Condition B” are summarized in **Table 18b** and the projected itinerary is summarized in **Table 19b**.

Table 18a. Summary of Condition A Design Flow and Loads

Parameter	*Flow*	*BOD*	*TSS*	*TKN*
Minimum Day	17.10	13,000	13,000	2,700
Average Day	25.80	35,000	54,000	5,500
Maximum Month	34.60	52,000	103,000	7,800
Maximum Day	48.60	68,000	136,000	9,500

Table 19a. Summary of Condition A Dynamic Inventory Used for Alternatives Evaluation.

Parameter	*Flow*	*BOD*	*TSS*	*TKN*
Minimum Day	17.2	13,000	13,000	2,898
Average Day	25.7	34,364	53,461	5,346
Maximum Month	31.2	52,092	64,592	5,783
Maximum Day	48.6	68,000	136,000	9,500

Table 18b. Summary of Condition B Design Flow and Loads

Parameter	*Flow*	*BOD*	*TSS*	*TKN*
Minimum Day	19.9	15,000	14,000	3,200
Average Day	30.0	40,000	62,000	6,300
Maximum Month	40.2	60,000	118,000	9,000
Maximum Day	58.0	79,000	136,000	9,500

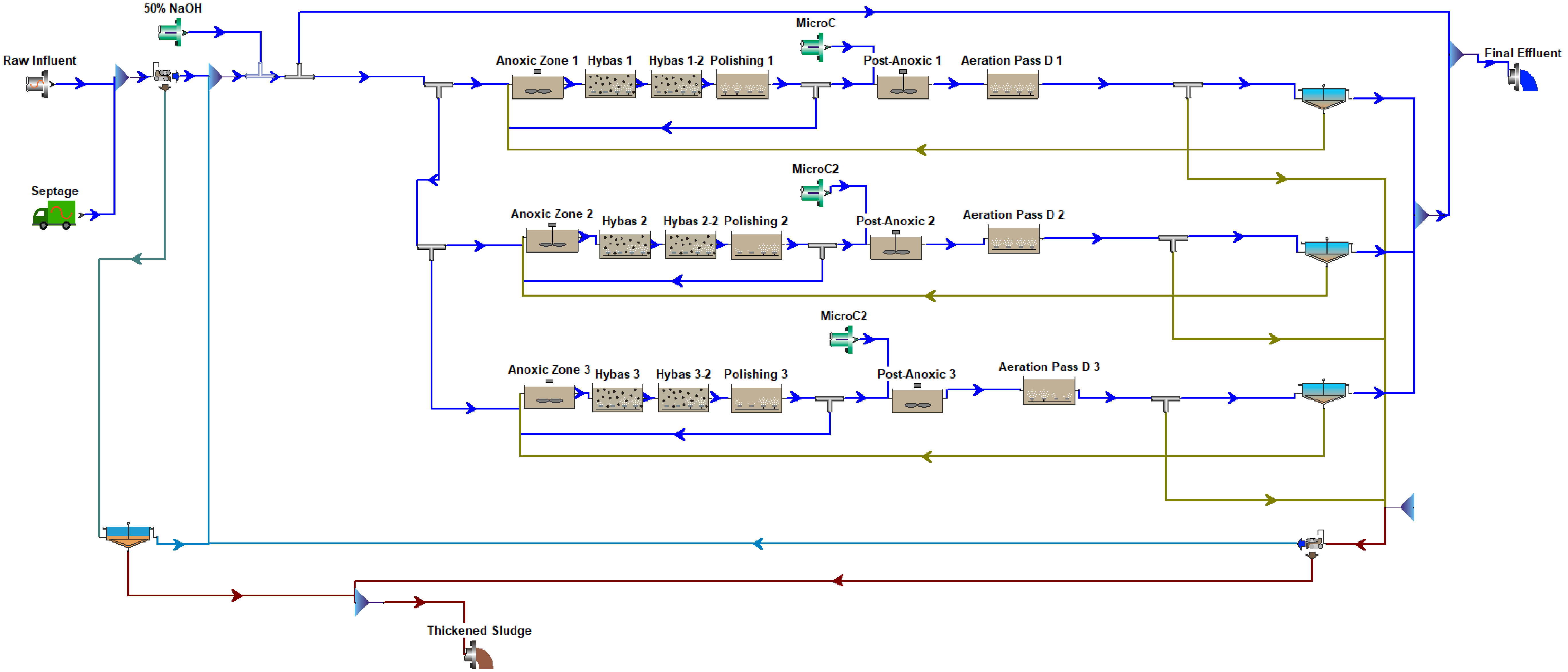
Table 19b. Summary of Condition B Dynamic Inventory Used for Alternatives Evaluation.

Parameter	*Flow*	*BOD*	*TSS*	*TKN*
Minimum Day	20.03	15,000	14,000	3,320
Average Day	29.89	43,862	60,943	6,098
Maximum Month	36.40	58,376	72,818	6,571
Maximum Day	58.00	79,000	136,000	9,500

The calibrated model was reconfigured as shown in **Figure 30**. The influent septage 2019 records was unchanged. Major differences include:

- Replacement of primary clarifiers with a 'Separator - Dewatering Unit' to represent new primary filtration. TSS capture was set at 85% with backwash equal to 12% of forward flow.
- Filter backwash/waste was sent to a new gravity thickener with capture set to 90%.
- Converting existing MLE to IFAS process, each train consisting of pre-anoxic zone, two IFAS zones in series, a polishing (aerated) zone, post-anoxic zone, followed by a reaeration zone.
- Media fill fraction in each IFAS zone was set to 50% and the media specific area was set to 243.83 ft^2/f^3 (to represent Kruger's AnoxKaldnes K5 media)
- A constant DO setpoint of 4 mg/L was input in each IFAS zone, and a constant DO setpoint of 2 mg/L was input for polishing and re-aeration reactor.
- Addition of a 'Influent - State Variable' element with the concentration of readily biodegradable COD equal to 1,040,000 mg/L set to a constant feed of 150 gallons/day to the post-anoxic reactor.
- Wasting from the aeration basin effluent (not final clarifier underflow) as this allows for less computationally intensive SRT control.
- Safety factory of 2.5 typically applied to suspended growth system washout aerobic SRT was reduced to 1.5 counting the suspended growth only. Because IFAS includes fixed film growth on the plastic media, slow-growing nitrifiers are maintained within the system, bound to the plastic media, longer than a conventional, suspended growth (only) activated sludge system.
- WAS sent to a new "Separator—Dewatering Unit' to represent a rotary drum thickener. TSS capture was set to 95%.
- Gravity thickener overflow and rotary drum thickener underflow sidestream was directed downstream of primary effluent, upstream of alkalinity addition.
- Revision of SVI to 150 mL/g (K=0.287)
- Internal recycle rate set to 200% of FF.
- RAS (clarifier underflow) revised to 50% of forward flow.
- Influent itinerary developed as described above

Figure 30. BioWin Model Configuration



Model Predictions: Condition A

Without supplemental carbon addition to the post-anoxic, the Condition A model predicts an MLSS that varies from a low of approximately 600 mg/L to a high of approximately 5,000 mg/L. Because the maximum MLSS exceeds the capacity of the secondary clarifiers (2,500 mg/L), a revision to the model was run that increased wasting from the system (WAS) and increased the DO setpoint within the aerated zones from 2.0 mg/L to 4.0 mg/L. Two models were run under these conditions with, and without supplemental carbon addition to the post-anoxic zones.

The modeled effluent total nitrogen for the two Condition A scenarios is presented in **Table 20.**

Table 20. Monthly Summary of Model Predicted Effluent Total Nitrogen Loads (and concentrations) for the Upgraded Recommended West Side WWTP Configuration at Design Year Flows and Loads

Month	Effluent TN, lbs/day (mg/L)	
	Condition A (25.8 mgd)	
	No Carbon addition	150 gallons/day Carbon Addition to Post-Anoxic Zone
January	632 (2.5)	544 (2.2)
February	528 (2.2)	483 (2.0)
March	475 (2.2)	397 (1.8)
April	557 (2.5)	421 (1.9)
May	582 (2.4)	531 (2.2)
June	703 (3.5)	438 (2.1)
July	1,212 (5.6)	829 (3.8)
August	1,493 (8.2)	983 (5.4)
September	2,002 (12.2)	1438 (8.8)
October	1,362 (7.3)	873 (4.7)
November	860 (4.5)	504 (2.6)
December	843 (3.2)	772 (3.0)
Annual Average	**938 (4.7)**	**664 (3.4)**

The annual average effluent TN loads with and without carbon addition are less than the permitted 1,041 lbs/day for each scenario. The greatest monthly average Condition A effluent TN without carbon addition was 12.2 mg/L, in September. This deviation of monthly effluent TN is attributed to a high effluent nitrate component, as shown in **Figure 31a**. Although the model predicts that endogenous decay in the post anoxic zone is sufficient to achieve the annual average effluent TN loading limit, supplemental carbon addition would be beneficial from July through November to drive denitrification and remove more effluent nitrate, to reduce overall effluent TN, as shown in **Figure 31b.** Modeled effluent TN in September with carbon addition was 8.7 mg/L. It is recommended that supplemental carbon storage and feed facilities are available to offset any process upset that could occur throughout the year to lower the annual average effluent TN load.

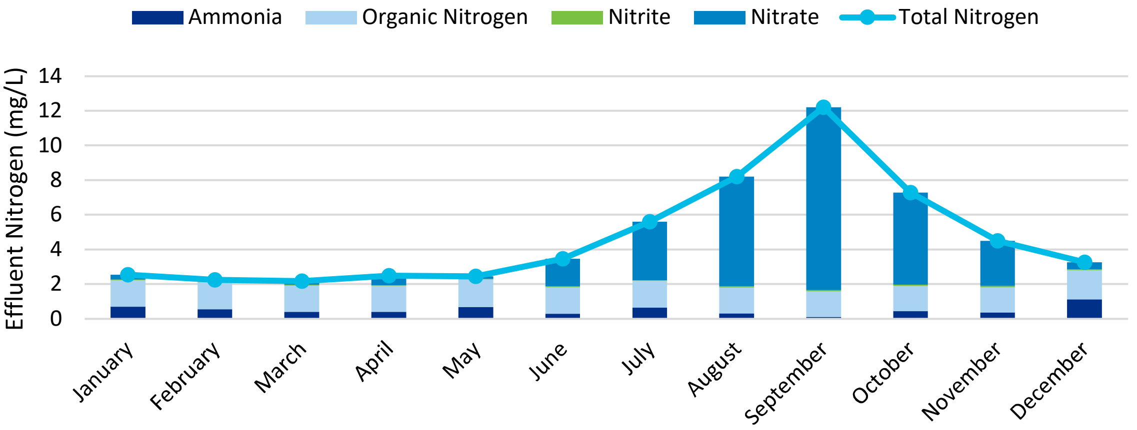


Figure 31a. Condition A (no carbon addition) Monthly Average Effluent Nitrogen Species

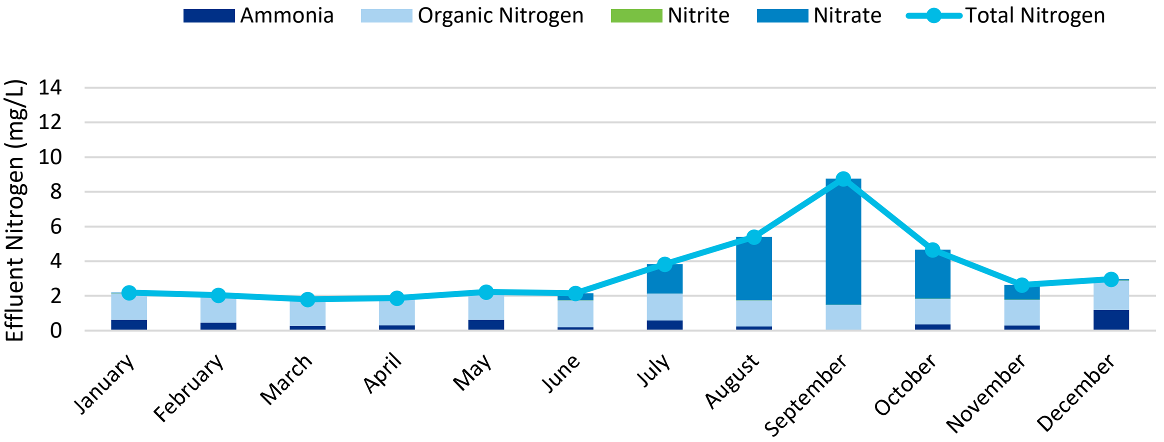


Figure 31b. Condition B (150 gallons/day carbon addition to post anoxic zone) Monthly Average Effluent Nitrogen Species

The modeled predicted monthly average, effluent TSS and BOD concentrations for Condition A scenarios is presented in **Table 21**.

Table 21. Monthly Summary of Model Predicted Effluent BOD and TSS concentrations the Upgraded West Side WWTP at Design Year Flows and Loads

Month	Condition A (25.8 mgd)			
	No Carbon addition		150 gallons/day Carbon Addition to Post-Anoxic Zone	
	BOD (mg/L)	TSS (mg/L)	BOD (mg/L)	TSS (mg/L)
January	16.5	11.9	20.9	11.9
February	11.1	10.6	14.4	10.7
March	8.4	9.7	11.6	9.8
April	12.4	10.7	17.3	10.7
May	16.9	11.5	21.5	11.6
June	8.5	9.0	12.9	9.0
July	12.2	10.2	16.7	10.3
August	5.2	7.0	7.7	7.0
September	3.3	5.7	5.1	5.7
October	9.1	8.4	12.5	8.4
November	7.5	7.8	12.0	7.8
December	22.7	13.8	28.1	13.9
Annual Average	**11.2**	**9.7**	**15.1**	**9.7**

As presented in **Table 21,** the model predicts less than 30 mg/L monthly average effluent BOD and TSS throughout the year under each condition. The difference in monthly average effluent BOD concentrations with and without carbon addition indicates that carbon addition should only be used when needed for nitrogen removal, because dosing carbon can increase effluent BOD.

The developed process model predicts a mixed liquor suspended solids ranging from a low of approximately 600 mg/L to a high of approximately 3,400 mg/L for Condition A (with or without carbon addition) and from a low of approximately 700 mg/L to a high of approximately 5,000 mg/L for Condition B. The maximum mixed liquor predicted for Conditions A and B exceeds the capacity of the secondary clarifiers (2,500 mg/L). Future modeling should use a BioWin controller to limit the high MLSS that are predicted to occur over short durations of time.

The periods of modeled low MLSS may be too low for effective settling as sludge that is too thin doesn’t flocculate as well as a thicker sludge. Generally, the minimum recommended MLSS is 1,200 mg/L although this value changes from plant to plant. Due to the West Side WWTP’s history of operating at very high MLSS, methods to enhance sludge settleability at model predicted very low MLSS should be considered in the design. This could be seasonal operation of the aeration tanks and taking tanks offline during period of low loading, decrease system wasting, bypass of some primary influent around the new primary filters to increase loading to the secondary system, or addition of polymer to enhance flocculation and aid settling.

Model Predictions: Condition B

The secondary process under Condition B flow and loading conditions is expected to achieve effluent BOD and TSS limits, as shown in **Table 23.**

Table 23. Monthly Summary of Model Predicted Effluent BOD and TSS concentrations the Upgraded West Side WWTP at Design Year Flows and Loads

Month	Condition B (30 mgd)	
	No Carbon addition	
	BOD (mg/L)	TSS (mg/L)
January	9.5	13.3
February	8.1	13.0
March	7.5	11.5
April	8.5	11.6
May	9.2	12.6
June	7.0	9.4
July	8.2	10.2
August	5.4	7.6
September	4.1	6.4
October	6.2	8.2
November	5.7	8.5
December	10.5	14.3
Annual Average	**7.5**	**10.5**

As shown in the table above, the process is not expected to exceed the monthly average effluent BOD and TSS limits (30 mg/L) for any of the months modeled in the 12-month simulation period.

9. Summary

As described above, the model of existing conditions was not able to be well-calibrated due to inherent uncertainties of plant operations and plant reported operational data (largely wasting strategies and reported waste sludge quantities). Because it was not well-calibrated, the model predictions were not well-validated. A model of the preferred West Side WWTP's treatment train was developed under the two flow and loading conditions and is predicted to successfully achieve conventional secondary treatment standards in addition to the average annual effluent total nitrogen mass loading limit. Before being applied to preliminary design of future improvements, it is recommended that additional data collection be collected, focused on:

- WAS flow and concentration.
    - WAS flow could be temporarily measured using an ultrasonic meter on the discharge.
- DO within each MLE zone.
- Septage characteristics.

Appendix L

East Side WWTP BioWin Modeling Report

Memorandum

To: *WPCA, Bridgeport CT*

From: *Eric Staunton, PE, PhD*

Date: *October 7, 2020*

Subject: *East Side WWTP BioWin Modeling Report for WPCA Facilities Planning*

A biological process model for the East Side Wastewater Treatment Plant (East Side WWTP) owned by the Bridgeport Water Pollution Control Authority is one of the tools being developed as part of the Facilities Plan project. The goal of the process modeling work is to generate a tool that can be used for evaluating how increased flow and load affect the East Side treatment processes, as well as support alternatives analysis and design of potential improvements if needed.

Wastewater process modeling represents the industry's best tool to understand the complex relationships between the chemical, physical, and biological processes that provide successful wastewater treatment. Modern wastewater process models track 175 critical processes that occur among 83 state variables that are intricately related. The numerical models developed to describe observed chemical, physical, and biological reactions continue to evolve as understanding of these processes improves. This project uses BioWin modeling software (Version 6.1.7.2226, EnviroSim Associates, Ltd.). This memorandum documents the results of the process model calibration and validation exercise, including the development of site-specific influent ratios and fractions, calibration and validation of the BioWin model, results from a sensitivity analysis exercise, and predictions of plant performance at design year flow and loading for the upgraded facility.

1. Wastewater Sampling

1.1 Routine Sampling

Six years (2013-2015 and 2017-2019) of Monthly Operating Reports (MORs) was provided to CDM Smith which included data regularly collected at the East Side WWTP as shown in **Table 1**.

Table 1: Typical Process Control Data Collected at the East Side Treatment Plant

Checked items are collected as part of on-going plant operation and optimization activities

Parameter	Influent	Primary Effluent	Final Effluent	Other
Flow	✓			Primary Sludge, Bypass
Settleable Solids			✓	
pH	✓	✓	✓	
Temperature	✓		✓	
Total Suspended Solids (TSS)	✓	✓	✓	Aeration Basin, RAS, Bypass
5-day Biochemical Oxygen Demand (BOD_5)	✓	✓	✓	Bypass
Turbidity			✓	
Alkalinity	✓	✓	✓	
Total Nitrogen	✓	✓	✓	
Total Kjeldahl Nitrogen	✓	✓	✓	
Ammonia-N	✓	✓	✓	
Nitrate	✓	✓	✓	
Nitrite	✓	✓	✓	
Dissolved Oxygen			✓	Aeration Basin
Total Orthophosphates	✓		✓	
Total Phosphorus	✓		✓	
Copper			✓	
Settled sludge index				Aeration Basin

1.2 Special Sampling

Fourteen days of special sampling were performed at the East Side WWTP between June 17, 2020 and June 30, 2020. This special sampling was conducted in addition to the Plant's routine monitoring. Details related to sample collection, preparation, and analysis, as well as sampling results for both the composite and grab samples, are presented below.

Composite samplers were installed on the raw influent, primary effluent (sampling location selected to exclude plant recycles), and secondary effluent (sampling location selected to exclude primary effluent bypass during wet weather). Sub-contractor (Eolas) staff collected composite samples from each sampling location and grab samples from the primary sludge, mixed liquor suspended solids, return activated sludge, gravity thickener overflow, and gravity belt thickener filtrate/washwater. All composite samples are hourly composite samples and were refrigerated until processing and analysis.

A summary of the composite and grab samples collected for analysis are provided in **Table 2** and **Table 3**, respectively.

Table 2. Summary of Parameters Analyzed for Composite Sample Locations

Parameter Number	Parameter Name	Number of Samples at Each Composite Sample Location		
		Influent	Primary Effluent	Secondary Effluent
1	TSS (mg/L)	14	14	14
2	VSS (mg/L)	14	14	14
3	COD, total (mg/L)	14	14	0
4	COD, 1.2-µm filtered (mg/L)	14	0	14
5	COD, filtered-flocculated (mg/L)	14	0	0
6	BOD, total (mg/L)	14	14	14
7	BOD, 1.2-µm filtered (mg/L)	14	0	0
8	TP, total (mg P/L)	14	0	0
9	Orthophosphate, filtered (mg P/L)	14	0	0
10	TKN (mg N/L)	14	14	14
11	NH_3-N (mg N/L)	14	0	14
12	Nitrate+nitrite (mg N/L)	0	0	14
13	Alkalinity (mg/L as $CaCO_3$)	14	0	0

Table 3. Summary of Parameters Analyzed for Grab Sample Locations

Parameter Number	Parameter Name (Units)	Number of Grab Samples at Each Location					
		Primary Sludge	Return Sludge[1]	Mixed Liquor[1]	Gravity Thickener Overflow	Gravity Belt Thickener Filtrate+ Washwater	Hauled Sludge
1	TSS (mg/L)	--	30	30	10	4	--
2	VSS (mg/L)	--	--	30	--	--	--
3	Total Solids (%)	10	--	--	--	--	10

[1] – One sample was collected from each basin (three basins) on weekdays during special sampling.

1.2 Sample Preparation and Analysis

All sample preparation and analysis were done by Phoenix Environmental Laboratories – an independent laboratory. After sample collection, both the composite and grab samples were analyzed as described by EPA methods except for filter/flocculated COD which was prepared as follows. Stock aluminum sulfate solution [$Al(SO_4)_3$-15 H_2O; stock at 50 g/L] was added to sample (10 mL stock to 1,000 mL sample). The sample was rapidly mixed at 200 rpm for 2 minutes and then slowly mixed at 5 rpm for 30 minutes to maximize flocculation. Mixing was turned off, and the flocculated sample was allowed to settle. Supernatant was withdrawn and filtered through a 1.2µm-glass fiber filter.

Sample analysis was performed in accordance with standard methods or EPA methods.

1.3 Sampling Results

The composite sample results are summarized in **Table 4**, while grab sample results are shown in **Table 5**.

Table 4. Summary of Results for Composite Samples

Parameter No.	Parameter Name	Influent			Primary Effluent			Secondary Effluent		
		Avg.	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*
1	TSS (mg/L)	180	78 to 380	104	92	60 to 180	37	4.45	3 to 9	2.20
2	VSS (mg/L)	160	66 to 310	84	85	56 to 150	28	4.14	3 to 9	1.99
3	COD, total (mg/L)	415	232 to 729	144	340	272 to 458	58	--	--	--
4	COD, 1.2-µm filtered (mg/L)	168	128 to 213	27	--	--	--	36.14	29 to 52	6.20
5	COD, filtered-flocculated (mg/L)	93	56 to 122	18	--	--	--	--	--	--
6	BOD, total (mg/L)	161	110 to 220	37	135	49 to 190	38	5.07	4 to 12	2.20
7	BOD, 1.2-µm filtered (mg/L)	68	26 to 93	18	--	--	--	--	--	--
8	TP, total (mg P/L)	3.7	2.7 to 4.6	0.5	--	--	--	--	--	--
9	Orthophosphate, filtered (mg P/L)	2.4	1.7 to 2.7	0.4	--	--	--	--	--	--
10	TKN (mg N/L)	34	26 to 52	6	30	26 to 39	3	7.92	3 to 14	3.50
11	NH_3-N (mg N/L)	22	16 to 26	3	--	--	--	6.27	1.79 to 11.3	3.40
12	Nitrate+nitrite (mg N/L)	--	--	--	--	--	--	0.70	0.02 to 1.46	0.50
13	Alkalinity (mg/L as $CaCO_3$)	146	115 to 165	12	--	--	--	--	--	--

Table 5a. Summary of Results for Grab Samples

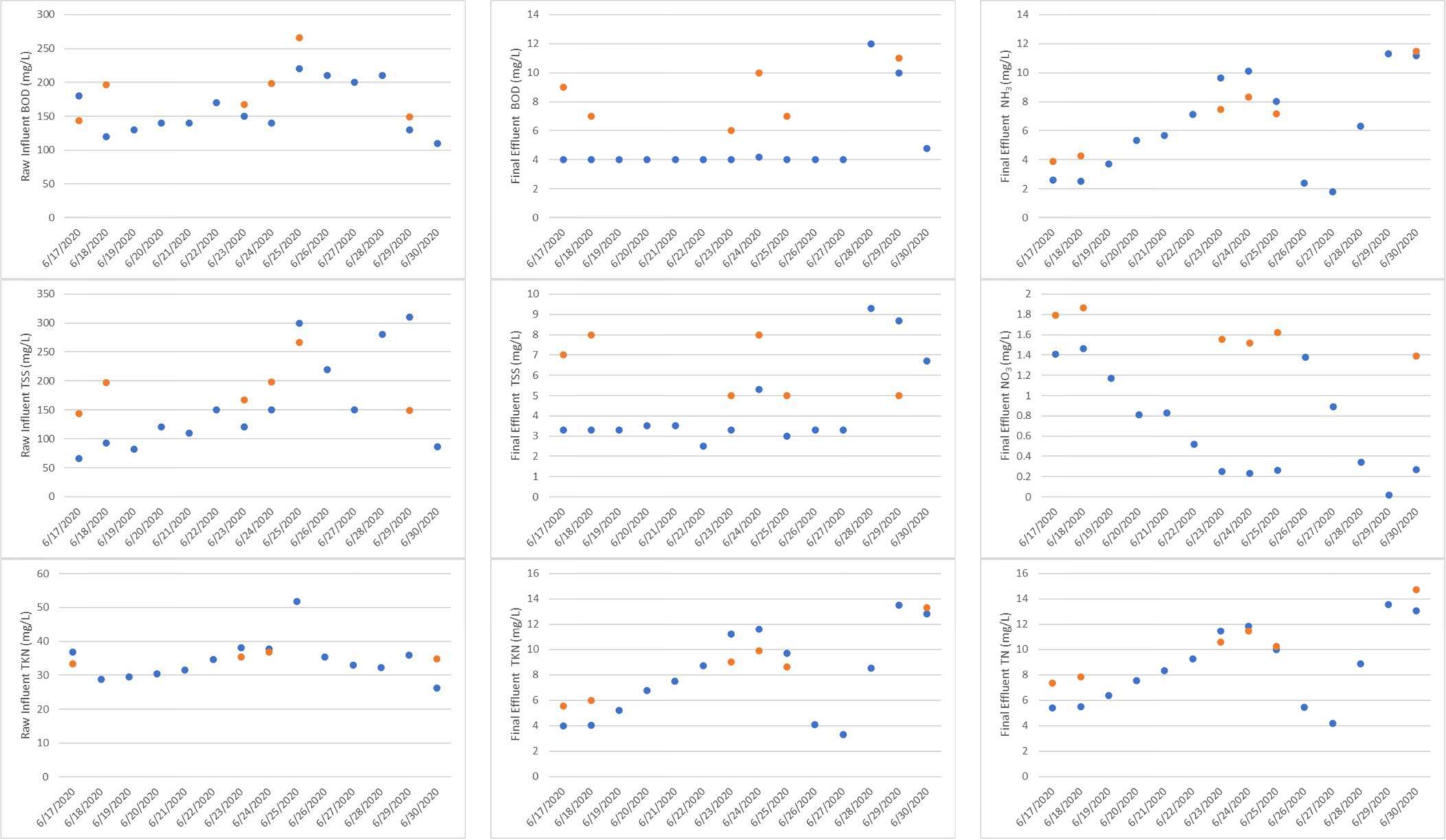
Parameter Number	Parameter Name	Primary Sludge			Return Sludge			Mixed Liquor		
		Avg.	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*
1	TSS (mg/L)	--	--	--	10707	7800 to 14000	1389	5240	4300 to 6400	506
2	VSS (mg/L)	--	--	--	--	--	--	4273	3500 to 5200	396
3	Total Solids (%)	0.18	0.08 to 0.28	0.06	--	--	--	--	--	--

Table 5b. Summary of Results for Grab Samples

Parameter Number	Parameter Name	Gravity Thickener Overflow			Gravity Belt Thickener Filtrate+ Washwater			Hauled Sludge		
		Avg.	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*	*Avg.*	*Range*	*Std. Dev.*
1	TSS (mg/L)	152	61 to 380	111	118.5	64 to 170	44	--	--	--
2	VSS (mg/L)	--	--	--	--	--	--	--	--	--
3	Total Solids (%)	--	--	--	--	--	--	6.362	1 to 10	2.42

Where both special sampling and normal operating data collected the same samples, the results between separate labs are in generally good agreement (**Figure 1**).

Figure 1. Comparison of Special Sampling (blue) and Plant Data (Orange)



2. Wastewater Characterization

The data collected as part of the intensive sampling provides critical information needed for model calibration. The ratios between various constituents in the influent establishes a reference for various process considerations. The development of site-specific influent COD, N and P fractions is needed to ensure that the model calculations are accurately capturing the character of the plant's wastewater influent.

2.1 General Ratios and Fractions

Ratios can be used to screen historical data and determine high or low outliers in individual parameter values. Ratios can also be helpful in correlating the data collected during periods of special sampling with historical data used during calibration and validation. Commonly considered domestic wastewater influent parameter ratios, along with typical values (compiled from Metcalf and Eddy 2014[1], WEF 2017[2], and CDM Smith experience), are shown in **Table 6**. Average ratios from the special sampling program and from six years of daily plant data (BOD:TSS, BOD:TKN, and NH_3:TKN values only; January 1, 2013 through December 31, 2015 and January 1, 2017 through December 31, 2019) are also presented in Table 6, and described below.

The **VSS:TSS** ratio indicates the proportion of influent solids that are organic. Inorganic suspended solids (ISS) are calculated by the difference between TSS and VSS. ISS is considered to be inert (that is, does not undergo biological transformation) and has a substantial impact on solids production within the facility. Typical VSS:TSS ratios in raw influent range from 0.75 to 0.85. The East Side WWTP's VSS:TSS influent ratio determined during special sampling averaged 0.90 ± 0.07. No historical data are available for VSS to allow for comparison. The plant influent has a higher fraction of volatile solids than typical, indicating a higher degree of biodegradability.

The **BOD:TSS** ratio indicates the solids content and quality of wastewater. Typical domestic wastewater has a wide range of BOD:TSS between 0.82 and 1.43. The East Side WWTP's influent ratios calculated from special sampling data was 1.09 ± 0.47 which is within typical wastewater ranges. This was lower, however, than the value calculated from the historical dataset. Historical BOD:TSS ratio was 1.4 ± 1.1. Due to variability in the system, the standard deviation between special sampling and historical data overlaps indicating no statistically significant difference.

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[1] Metcalf & Eddy | AECOM (2014) *Wastewater Engineering: Treatment and Resource Recovery.* McGraw-Hill Education. New York.

[2] WEF Manual of Practice 8, ASCE Manual and Report On Engineering Practice No.76 (2017) *Design of Municipal Wastewater Treatment Plants*, Sixth Edition. ASCE.

Table 6. Summary of Ratios for East Side WWTP's Influent

Ratio	Typical Raw Domestic Wastewater[1]	East Side Treatment Plant				
		Minimum	Maximum	Average	Standard Deviation	Number of Values
Special Sampling Program						
VSS:TSS	0.75 -0.85	0.74	0.99	**0.90**	0.07	14
BOD:TSS	0.82 -1.43	0.36	2.31	**1.07**	0.47	14
COD:BOD	1.8-2.2	1.58	3.47	**2.55**	0.48	14
fCOD:COD	0.3-0.5	0.19	0.75	**0.44**	0.13	13
ffCOD:COD	< 0.3	0.11	0.39	**0.25**	0.07	14
fBOD:BOD	~0.5	0.20	0.62	**0.44**	0.13	14
TP:BOD	0.02-0.05	0.02	0.03	**0.02**	0.00	14
Ortho-P:TP	~0.5	0.45	0.80	**0.64**	0.11	14
BOD:TKN	4.2 -7.1	3.62	6.50	**4.69**	0.90	0.65
NH3:TKN	0.5 – 0.8	0.50	0.76	**0.65**	0.08	14
Historical Plant Data						
BOD:TSS	0.82 -1.43	0.32	5.22	1.40	1.10	940
BOD:TKN	4.2 -7.1	1.56	9.32	4.57	2.52	459
NH3:TKN	0.5 – 0.8	0.42	0.79	0.63	0.12	346

Notes:

1. See text for information on sources for typical raw wastewater values.

The **COD:BOD** ratio is an indicator of the amount of the organic matter that is biodegradable. Typical domestic wastewater has a COD:BOD ratio of 1.8 to 2.2. The East Side WWTP influent had an average COD:BOD ratio of 2.55 ± 0.48 based on the special sampling. This is slightly higher than typical, indicating that possibly more biodegradation of organic matter is occurring in the collection system than for an average collection system, more inert organic solids are present, and/or major industrial users are present in the collection system discharging non-biodegradable COD. No historical data are available for COD to allow for comparison.

The **fCOD:COD** ratio indicates the fraction of total COD that passes through a filter, including both soluble and colloidal COD. As shown in **Figure 1** in Section 2.2.1 below, soluble COD can be biodegradable or unbiodegradable. Similarly, colloidal COD can be (slowly) biodegradable or unbiodegradable. Readily biodegradable soluble COD (discussed in the next section below) is more rapidly degraded in biological treatment. Typical fCOD:COD ratios in raw influent range from 0.3 to 0.5. The East Side WWTP's influent ratio determined during special sampling was 0.44 ± 0.13 which is within the expected range. No historical data are available for COD to allow for comparison.

The **ffCOD:COD** ratio indicates the fraction of total COD that is truly soluble (dissolved, not colloidal), including both biodegradable soluble and unbiodegradable soluble COD. It is necessarily lower than fCOD:COD. The East Side WWTP's influent ratio determined during special sampling was 0.25 ± 0.07. No historical data are available for COD to allow for comparison.

The **BOD:TKN ratio** is an indicator of how much carbon may be available for nitrogen removal. The more biodegradable carbon the greater the extent of denitrification that can occur in the biological process. Typical domestic wastewater has a BOD:TKN ratio of 4.2 to 7.1. The East Side WWTP's influent ratio determined during special sampling was 4.69 ± 0.90 which is on the low end of typical for municipal wastewater and shows that there may be a lack of carbon available for efficient denitrification. This was consistent with the value from historical plant data, 4.57 ± 2.52.

The **NH_3:TKN ratio** is the fraction of total Kjeldahl nitrogen present as filterable mineralized ammonia or the nitrogen that is readily available for biological metabolism (nitrogen uptake for the synthesis of proteins and DNA or nitrification). Typical domestic wastewater has an NH_3:TKN ratio of 0.5 to 0.8. The East Side WWTP's influent ratio determined during special sampling was 0.65 ± 0.08 is typical for municipal wastewater. This was consistent with the value from historical plant data, 0.63 ± 0.12.

Nitrification consumes 7.1 pounds of alkalinity as $CaCO_3$ per pound of ammonium nitrified. If the biological process also includes denitrification, then half of this alkalinity can be recovered. The **alkalinity:TKN** ratio is an indicator of supplemental alkalinity required to maintain neutral pH despite the acid production from nitrification. There is no typical value for this ratio as it depends upon potable water alkalinity, amount and type of infiltration (e.g. groundwater infiltration from an overall limestone matrix), and collection system operation (e.g. magnesium hydroxide addition for odor control). The East Side WWTP's influent ratio determined during special sampling was 4.32 ± 0.71. This was slightly lower than the value from historical plant data, 5.65 ± 1.57.

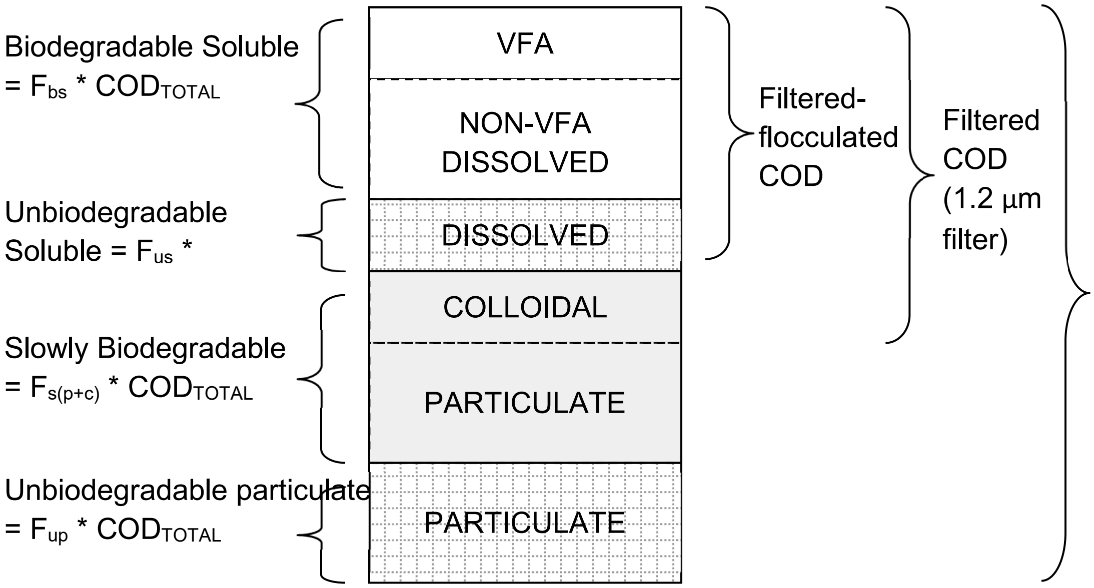
2.2 Fractions Needed for Modeling

The wastewater ratios provide an overview of the character of the East Side WWTP's wastewater. Closely related to the ratios, the wastewater fractions—specifically for COD and N—are important for model calibration because they determine the fate of parameters in the biological treatment process. Note that while concentrations of typical domestic wastewater may vary from day to day and month to month, parameter fractions are usually assumed to remain constant over time because the sources and types of contribution within a collection system are generally constant. These fractions are also considered to be constant within the process model.

2.2.1 COD Fractions

COD is the base unit of measurement of all carbonaceous components in biological process models and consists of both biodegradable and unbiodegradable portions. Biodegradable COD is further broken down into readily biodegradable (soluble) or slowly biodegradable (colloidal or particulate). Colloidal COD is COD that passes through a 1.2-µm filter but does not settle, while particulate COD is retained by a 1.2-µm filter and does typically settle. Unbiodegradable COD can either be soluble or particulate. **Figure 1** illustrates the breakdown of the various COD fractions.

Figure 1. COD Fractions



The fractions of each of these COD types are shown in **Table 8**, and are calculated as follows for BioWin input:

- **Unbiodegradable soluble COD fraction (F_{us})** = effluent filtered COD / influent total COD
- **Biodegradable soluble COD fraction (F_{bs})** = [Influent ffCOD – unbiodegradable influent soluble COD] / total influent COD = [Influent ffCOD – F_{us} x influent total COD] / total influent COD
- **Unbiodegradable particulate COD fraction (F_{up})** is estimated via iteration using the procedure outlined in WERF (2003)[3], equation 6.2.1, or with the BioWin influent specifier (described in Section 2.3)
- **Slowly biodegradable COD fraction, including colloidal and particulate ($F_{s(p+c)}$)** = 1 – F_{us} – F_{bs} - F_{up}

Table 7. Calculated COD Influent Fractions Used for BioWin Model Calibration

Fraction	Model Default Value	East Side WWTP
Unbiodegradable soluble (F_{us})	0.050	0.0870
Biodegradable soluble (F_{bs})	0.160	0.1373
Unbiodegradable particulate (F_{up})	0.130	0.1300
Slowly biodegradable COD (F_{xs})	0.660	0.6257
Particulate slowly biodegradable (F_{sp}) as fraction of slowly biodegradable	0.250	0.2886
Colloidal slowly biodegradable (F_{xsp}) as fraction of slowly biodegradable	0.750	0.7114

Note: 2% of influent COD is assumed to be present as heterotrophic microorganisms, per the default value assumed by EnviroSim. Therefore, $F_{us} + F_{bs} + F_{up} + F_{xs} = 0.98$.

The values of these COD fractions determine how much COD is degraded in the modeled biological process (biodegradable COD), how much is removed as inert particulate with the primary sludge and WAS (unbiodegradable particulate COD), and the amount that passes through the plant

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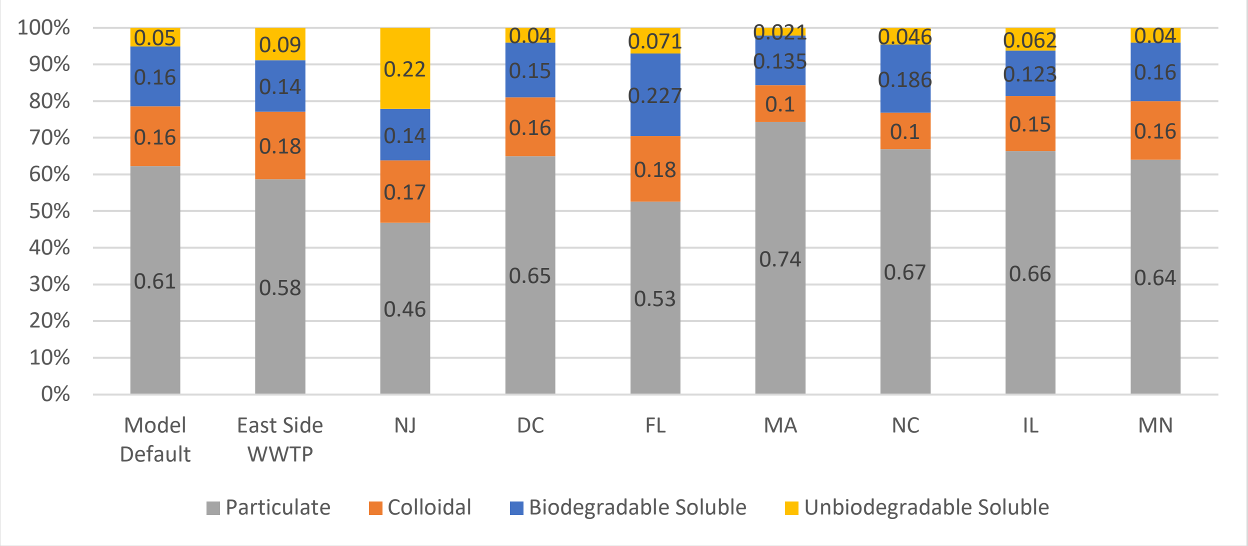
[3] WERF (Water Environment Research Foundation). 2003. *Methods for Wastewater Characterization in Activated Sludge Modeling.* WERF Report 99-WWF-03. WERF: Alexandria, VA and IWA: London.

(unbiodegradable soluble COD). For example, a treatment plant with a higher F_{us} will have higher filterable COD in its effluent, whereas a plant with higher F_{up} will have a higher solids yield.

Note that the COD fractions can also be presented as soluble (unbiodegradable and readily biodegradable), colloidal, and particulate fractions. **Figure 2** show the breakdown of COD into these fractions for the East Side WWTP, as measured by CDM Smith, and compares COD fractions to other facilities modeled by CDM Smith. The calculated biodegradable soluble COD fractions were within the expected range for municipal WPCF's (0.07 to 0.23, based on CDM Smith's sampling results at 10 other WRRFs and 0.12 to 0.25, based on BioWin default values). There is no typical colloidal COD fraction in wastewater, although BioWin uses 0.2 as the default value—which is close to the 0.18 calculated from the sampling.

Figure 2. Raw Wastewater COD Fractions for Selected Treatment Facilities. Each Datapoint Represents a Single Municipal Wastewate Treatment Plant.



2.2.2 Phosphorus Fractions

Although not included in the NPDES permit (#CT0101010) issued by the Connecticut Department of Energy and Environmental Protection (CT DEEP), phosphorus is an essential nutrient for biological growth and must be present in sufficient quantities. Influent phosphorus is collected weekly. Phosphorus species are divided into soluble and particulate components, each of which is further broken down into acid hydrolyzable, reactive, and organic components, for a total of six phosphorus fractions. The soluble non-reactive forms (including acid-hydrolyzable and organic) are not easily removed in biological and chemical treatment processes.

The following phosphorus fractions are used in BioWin:

- **F_{po4} =** soluble reactive phosphorus (assumed to be mostly orthophosphate) / total phosphorus
- **$F_{up,P}$ =** fraction of unbiodegradable particulate COD that is phosphorus, which is mostly particulate acid hydrolyzable phosphorus (polyphosphates) = assumed to be 0.022 g P/g COD

The values for the P fractions used is shown in **Table 8**. These fractions are based on the results of special sampling.

Table 8. Calculated Phosphorus Influent Fractions Needed for BioWin Model Calibration

Fraction	Model Default Value	East Side WWTP
Phosphate (F_{po4}) as fraction of total phosphorus	0.500	0.6290
Unbiodegradable particulate phosphorus (F_{upP}) as fraction of unbiodegradable particulate COD	0.022	0.022

2.2.3 Nitrogen Fractions

Nitrogen is also an essential nutrient for biological growth and as such is important for process modeling. Although there is no nitrogen limit in the East Side WWTP NPDES permit, the plant does have has an annual nitrogen discharge wasteload allocation established by the General Permit for Nitrogen Discharges, issued by CT DEEP. This permit establishes the WWTP's wasteload allocation at 362 pounds per day of Total Nitrogen (TN) on an annual average basis. Further, the BioWin model should accurately capture the potential for nitrification because the oxygen demand exerted by nitrification can impact overall WWTP oxygen requirements, airflow requirements, and blower size.

Influent TKN is measured 2x/week. Nitrogen species are divided into soluble and particulate components, as well as inorganic and organic types, defined as follows:

- Soluble inorganic nitrogen = ammonia + nitrite/nitrate
- Soluble organic nitrogen = filtered TKN – ammonia
- Particulate organic nitrogen = unfiltered TKN – filtered TKN
- Total nitrogen = unfiltered TKN + nitrite/nitrate

For the purposes of BioWin modeling, the following nitrogen fractions are calculated:

- F_{na} = fraction of TKN as ammonia = influent ammonia / influent TKN
- F_{nox} = fraction of particulate organic nitrogen = influent particulate TKN / influent TKN
- F_{nus} = fraction of soluble unbiodegradable TKN = effluent soluble TKN / influent TKN
- F_{upN} = fraction of unbiodegradable particulate COD that is N = assumed to be 0.5 g N/g COD

The values for each are provided in **Table 9**.

Table 9. Calculated Nitrogen Influent Fractions Used for BioWin Model Calibration

Fraction	Model Default Value	East Side WWTP
Ammonia (Fna) as fraction of TKN	0.660	0.6444
Particulate organic nitrogen (Fnox) as fraction of organic N	0.500	0.5000
Soluble unbiodegradable TKN (Fnus) as fraction of total TKN	0.020	0.0200
Unbiodegradable particulate nitrogen (FupN) as fraction of unbiodegradable particulate COD	0.07	0.070

2.3 BioWin Influent Specifiers

To calculate the East Side WWTP's influent wastewater fractions shown in Tables 7, 8 and 9, average parameter concentrations determined during the special sampling program were entered into a calculation tool (the "Raw Influent Specifier") provided by EnviroSim, the developers of BioWin. Note that EnviroSim uses the term "carbonaceous BOD" in the influent specifier input. However, these "carbonaceous BOD" values are based on uninhibited BOD5 measurements. Therefore, total BOD5 values from the special sampling were used as input to the Influent Specifiers.

The Influent Specifier calculation tool indicates how well the influent COD, VSS, TSS, and BOD parameter concentrations measured during the sampling program (**Figure 3**) agree with the influent COD parameters calculated from estimated fractions within the calculation tool (**Figure 4**). To use the influent specifier for developing COD fractions, the modeler modifies the following ratios and fractions (shown in blue under the "Adjust Fractions" tab), generally in this order:

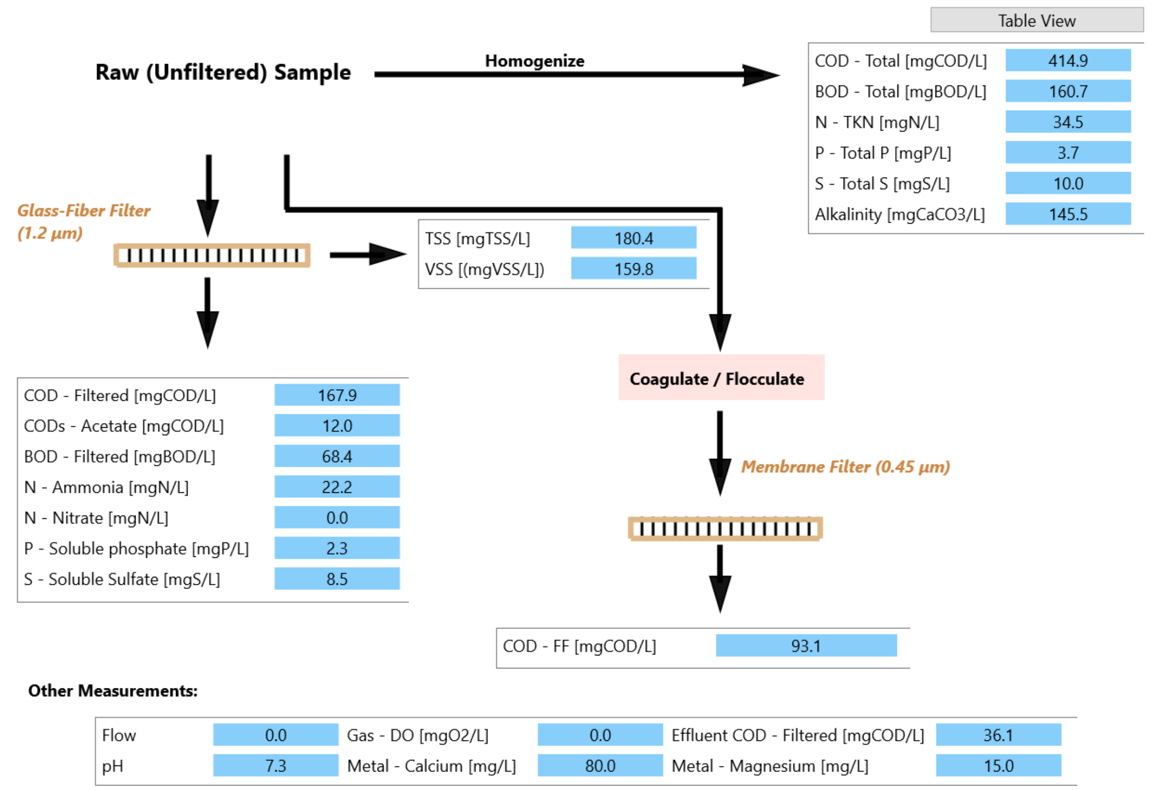
- Particulate Biodegradable COD:VSS ratio
- Particulate Inert COD:VSS ratio

- Cellulose COD:VSS ratio
- $F_{up,cellulose}$
- F_{up}
- $F_{biomass}$
- k1 for X_{sc}
- k2 for X_{sp}

These are adjusted through an iterative process until there is agreement between the measured and calculated values. BioWin defines the level of agreement in their calculation tool as “match status”. Based on the special sampling, every calculated parameter achieved a match status of “Excellent” so that the difference between estimated and measured values were consistently <10%.

The only parameters that were modified to achieve the match status shown in Figure 4 were k1 for X_{sc} and k2 for X_{sp} which are both rate constants used in the calculations to convert COD to BOD. The rate constants are used to convert slowly biodegradable colloidal COD and slowly biodegradable particulate COD respectively. For a COD/BOD ratio less than or equal to 2.1, these values are typically 0.5. For a COD/BOD ratio greater than 2.4 these values are typically 0.3. For a COD/BOD ratio between 2.1 and 2.4 these rate constants are typically 0.4. The COD/BOD ratio for the East Side WWTP is 2.55 so a rate constant of 0.3 was used. These rate constants do not have to be the same value.

Figure 3. Input Measurements Tab from Influent Specifier



COD - Total [mgCOD/L]	414.9
BOD - Total [mgBOD/L]	160.7
N - TKN [mgN/L]	34.5
P - Total P [mgP/L]	3.7
S - Total S [mgS/L]	10.0
Alkalinity [mgCaCO3/L]	145.5

TSS [mgTSS/L]	180.4
VSS [(mgVSS/L])	159.8

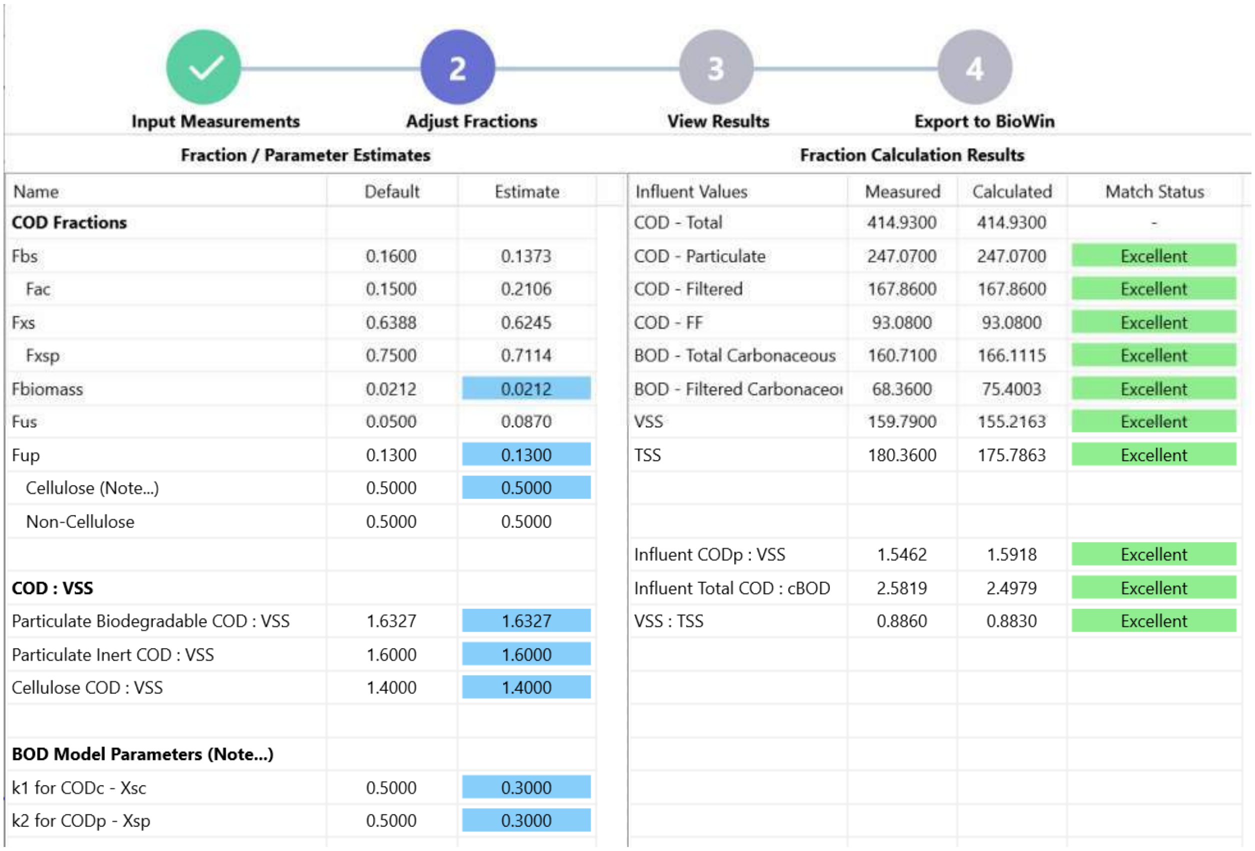
COD - Filtered [mgCOD/L]	167.9
CODs - Acetate [mgCOD/L]	12.0
BOD - Filtered [mgBOD/L]	68.4
N - Ammonia [mgN/L]	22.2
N - Nitrate [mgN/L]	0.0
P - Soluble phosphate [mgP/L]	2.3
S - Soluble Sulfate [mgS/L]	8.5

COD - FF [mgCOD/L]	93.1

Other Measurements:

Flow	0.0	Gas - DO [mgO2/L]	0.0	Effluent COD - Filtered [mgCOD/L]	36.1
pH	7.3	Metal - Calcium [mg/L]	80.0	Metal - Magnesium [mg/L]	15.0

Figure 4. “Estimate COD Fractions” Tab from Influent Specifier



Fraction / Parameter Estimates

Name	Default	Estimate
COD Fractions		
Fbs	0.1600	0.1373
Fac	0.1500	0.2106
Fxs	0.6388	0.6245
Fxsp	0.7500	0.7114
Fbiomass	0.0212	0.0212
Fus	0.0500	0.0870
Fup	0.1300	0.1300
Cellulose (Note...)	0.5000	0.5000
Non-Cellulose	0.5000	0.5000
COD : VSS		
Particulate Biodegradable COD : VSS	1.6327	1.6327
Particulate Inert COD : VSS	1.6000	1.6000
Cellulose COD : VSS	1.4000	1.4000
BOD Model Parameters (Note...)		
k1 for CODc - Xsc	0.5000	0.3000
k2 for CODp - Xsp	0.5000	0.3000

Fraction Calculation Results

Influent Values	Measured	Calculated	Match Status
COD - Total	414.9300	414.9300	-
COD - Particulate	247.0700	247.0700	Excellent
COD - Filtered	167.8600	167.8600	Excellent
COD - FF	93.0800	93.0800	Excellent
BOD - Total Carbonaceous	160.7100	166.1115	Excellent
BOD - Filtered Carbonaceo	68.3600	75.4003	Excellent
VSS	159.7900	155.2163	Excellent
TSS	180.3600	175.7863	Excellent
Influent CODp : VSS	1.5462	1.5918	Excellent
Influent Total COD : cBOD	2.5819	2.4979	Excellent
VSS : TSS	0.8860	0.8830	Excellent

2.4 Uncertainty in Influent Fractions

As explained in Section 1 above, there is variability inherent in the measured TSS, VSS, COD, BOD and TKN values used as input into the influent specifier. This variability derives from true day-to-day variation for each parameter, but also from any error introduced by sampling or analytical techniques. Both types of variability are reflected in the variation in daily values measured for each of the fourteen days of special sampling.

To use the influent specifier, a single value (e.g., influent TSS) needs to be entered into the spreadsheet. For the purposes of this model, the *average* of all daily values from the special sampling (e.g., 180.4 mg/L for influent TSS) were used. Because the average of all measured values was used as influent specifier input, the parameter ratios for the values used in the influent specifier are slightly different than the average of the individual ratios presented in Table 6. For example, taking the average of the fourteen daily VSS:TSS ratio values yields 0.90 (as shown in Table 6). However, the ratio between the overall average VSS (159.8 mg/L) and the overall average

TSS (180.4 mg/L) is 0.89. The differences between ratios calculated from the average of daily ratio values vs. the ratios calculated from the overall average values are not significant, as highlighted in **Table 10**. Therefore, using the average of the daily values as influent specifier inputs appears to be reasonable.

Nevertheless, the variability highlighted by the differences in the daily data points to the importance of performing a sensitivity analysis of the predicted wastewater fractions to changes in average TSS, VSS, COD, BOD and TP values used in the influent specifier. This sensitivity analysis is presented in Section 7 below.

Table 10. Ratios Calculated from Average Daily Ratio Values vs. Overall Averages of Parameter Values

Ratio	East Side WWTP	
	Calculated from Daily Ratios	Calculated from Parameter Averages
VSS:TSS	0.9 ± 0.07	0.89 ± 0.7
TSS:BOD	1.09 ± 0.47	0.89 ± 0.68
COD:BOD	2.55 ± 0.48	2.58 ± 1.06
fCOD:COD	0.44 ± 0.13	0.4 ± 0.17
ffCOD:COD	0.25 ± 0.07	0.22 ± 0.1
fBOD:BOD	0.44 ± 0.13	0.43 ± 0.15
TP:BOD	0.024 ± 0.004	0.023 ± 0.006
Ortho-P:TP	0.64 ± 0.11	0.63 ± 0.13
BOD:TKN	4.69 ± 0.9	4.67 ± 1.36
NH3:TKN	0.65 ± 0.08	0.64 ± 0.14
Alk:TKN	4.32 ± 0.5	4.22 ± 0.48

3. Modeling Assumptions and Limitations

The ability of any model to accurately represent reality depends on the quality of the inputs. Measuring conditions at a wastewater treatment plant is arguably the weakest component of modeling. There is uncertainty inherent to sampling and analysis, which suggests that models might not always reflect actual conditions at a plant. This is often the case, despite the best efforts of the modelers. Explanations for such discrepancies can often be deduced, which improves understanding of the plant. Good and reliable agreement between model results and plant data is only possible if the data is verified and vetted by identifying inconsistencies and quantifying uncertainty in sample collection at the plant and sample analyses in the lab. Obtaining good agreement between model results and plant data was the goal of the calibration exercise for this project, but it is likely that some discrepancies will exist even after calibration is completed.

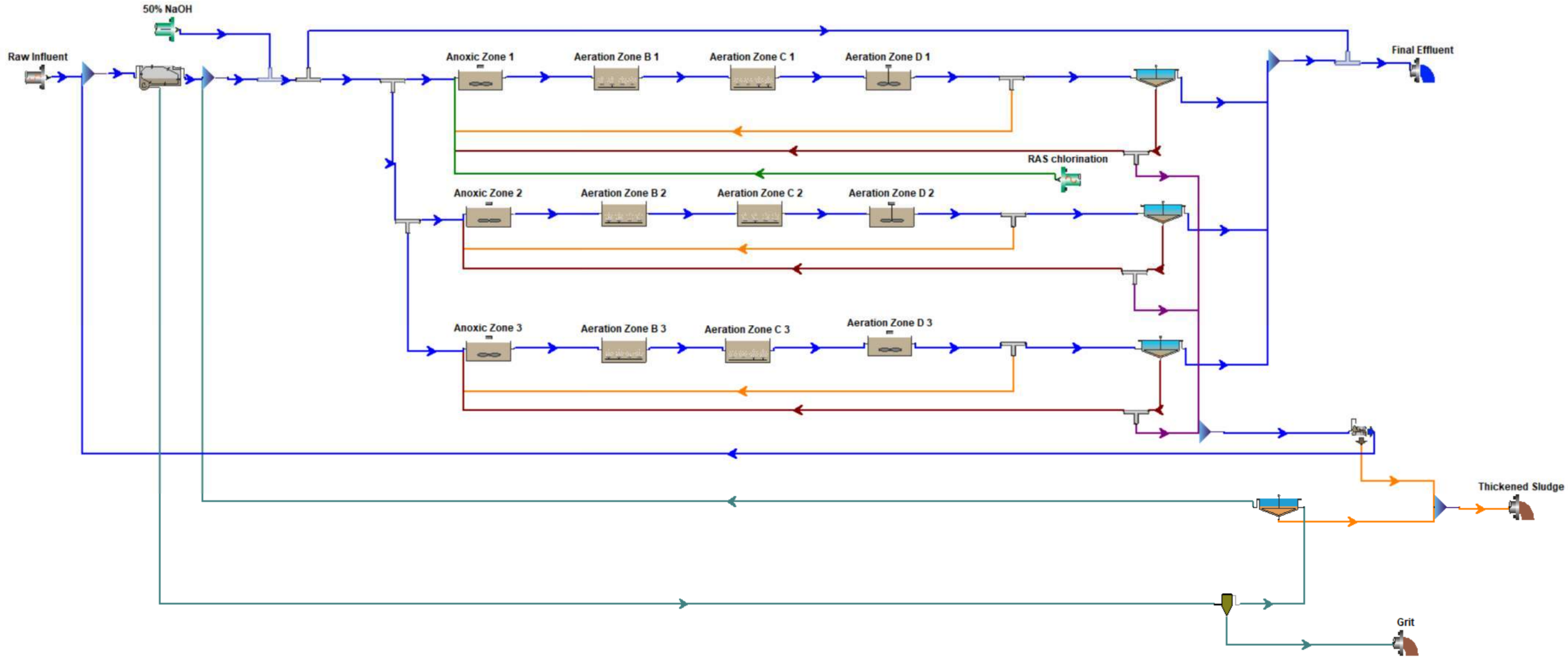
4. Model Set Up

Both the liquid and solids unit processes were modeled, as shown in **Figure 5**, with all sidestreams from solids processing returned to the appropriate locations within the East Side WWTP. The configured model was then calibrated and validated, as discussed in Sections 5 and 6, respectively. A key aspect of the model set up, calibration and validation exercises was the identification of appropriate influent datasets for each.

The calibration period used corresponded with the period of special sampling (June 17, 2020 through June 30, 2020). This dataset was used as it was the most complete including daily samples for many parameters as opposed to data collected just 1-3 times per week as is done as part of routine plant operations. Additionally, more parameters were analyzed (e.g. COD, fCOD, etc) during this period than historically and plant recycles were well defined (e.g. gravity thickener overflow recycle to head of aeration rather than plant headworks). Data was supplemented with MOR data as needed to provide model inputs and calibration parameters that were not recorded as part of special sampling (e.g. influent flow, DO in the aeration basin, WAS generated, etc). Where both special sampling and MORs analyzed the same parameter (e.g. effluent ammonia) there was generally good agreement between the duplicate measurements. Calibrating the model required adjusting the 'P in biomass' fraction from Biowin default of 0.022 mg P/mgCOD to 0.015 mg P/mgCOD to clear nutrient limitation errors, and adjusting the dissolved oxygen switching function of autotrophs from the Biowin default of 0.25 mg/L to 0.5 mg/L. The switching function was modified to partially inhibit nitrifying bacteria (as observed by high effluent ammonia during the calibration period despite seemingly optimum conditions for nitrification) while keeping kinetic parameters within a typical range. The switching function should be measured prior to use of the model in detailed design as it is very unusual for modifying kinetic parameters from default. The modified value is still within the typical range as determined in Activated Sludge Model 1.

Due to the unusual need to modify biokinetics in the calibration and atypical plant performance during calibration (i.e. effluent ammonia in the single digit mg/L despite seemingly optimum conditions for nitrification), an extended validation was selected. The validation period was one year of plant MOR data; 2019 was selected since this year had the coldest winter of the data sets available with the associated adverse impact of cold weather on nitrification. No special sampling data was available for the validation period so only plant MOR data was used. To develop the influent itinerary for the validation, the COD:BOD ratio from special sampling was used to convert measured BOD to COD for use in the COD input. The VSS:TSS ratio was used to estimate ISS from measured TSS.

Figure 5. BioWin Model Configuration



For days that did not include a measured BOD concentration, flow was used to predict the BOD load based on the linear regression of flow on BOD load from the measured values (**Figure 6**).

The regressed BOD load was used along with a liner regression on the TSS:BOD ratio (**Figure 7**) to determine a TSS:BOD ratio for days when TSS was not measured. The regressed TSS:BOD ratio was multiplied by the BOD load to estimate the influent TSS load.

The regressed BOD load was used along with a nonliner regression on the TKN:BOD ratio (**Figure 8**) to determine a TKN:BOD ratio for days when TKN was not measured. The regressed TKN:BOD ratio was multiplied by the BOD load to estimate the influent TKN load.

Phosphorus and sulfur were assumed constant since there is no permit limit for these constituents.

Figure 6. Regression of BOD load on flow.

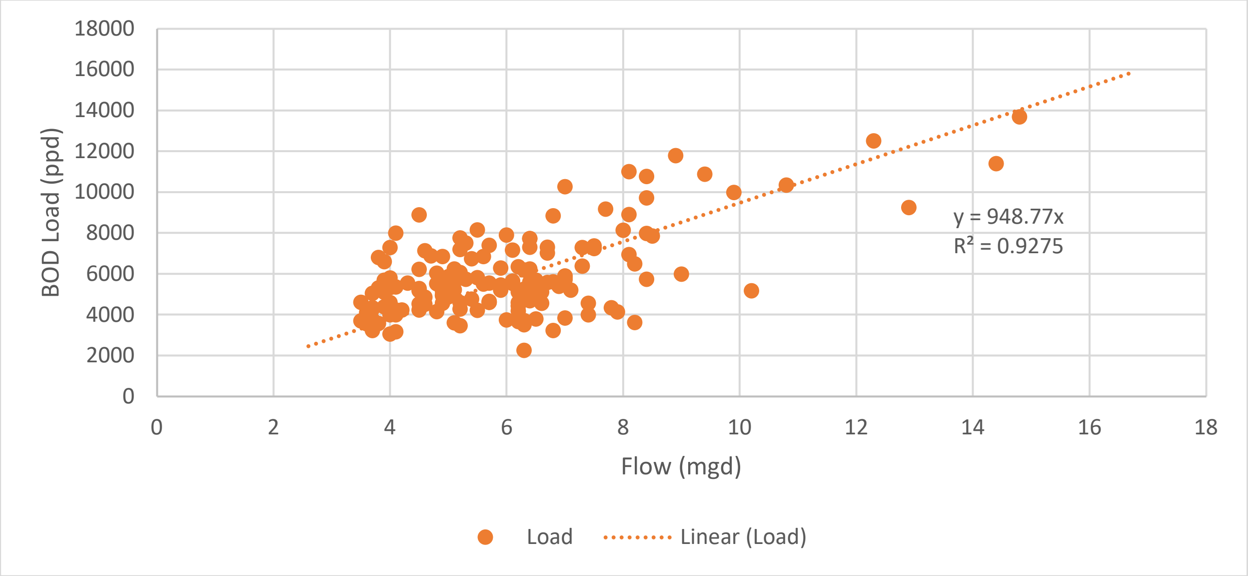


Figure 7. Regression of influent TSS:BOD ratio on BOD load

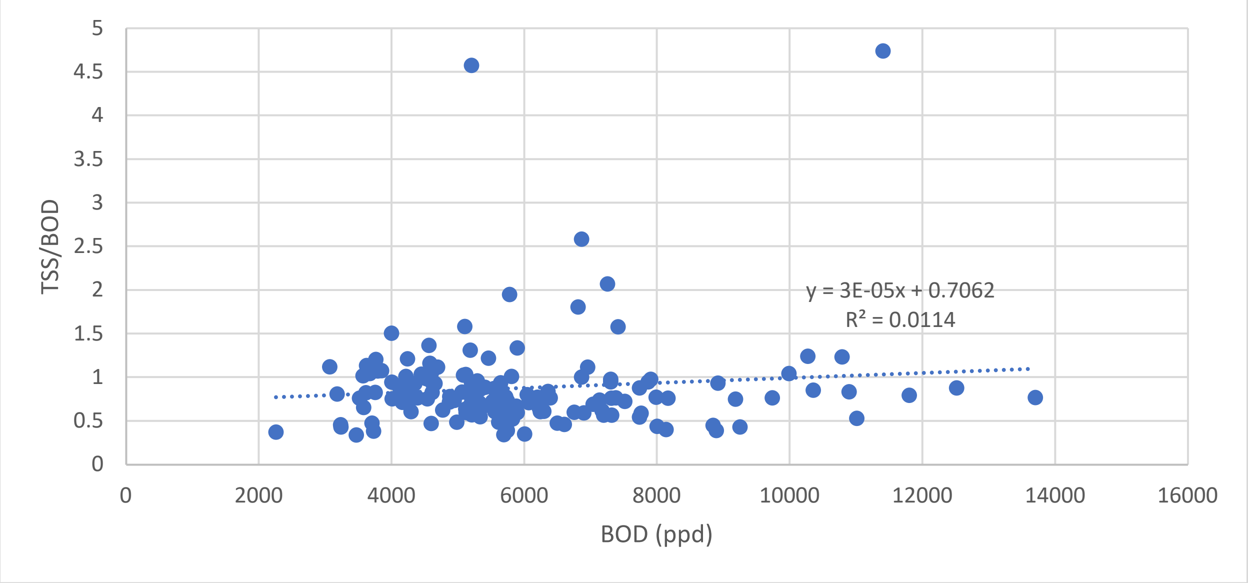
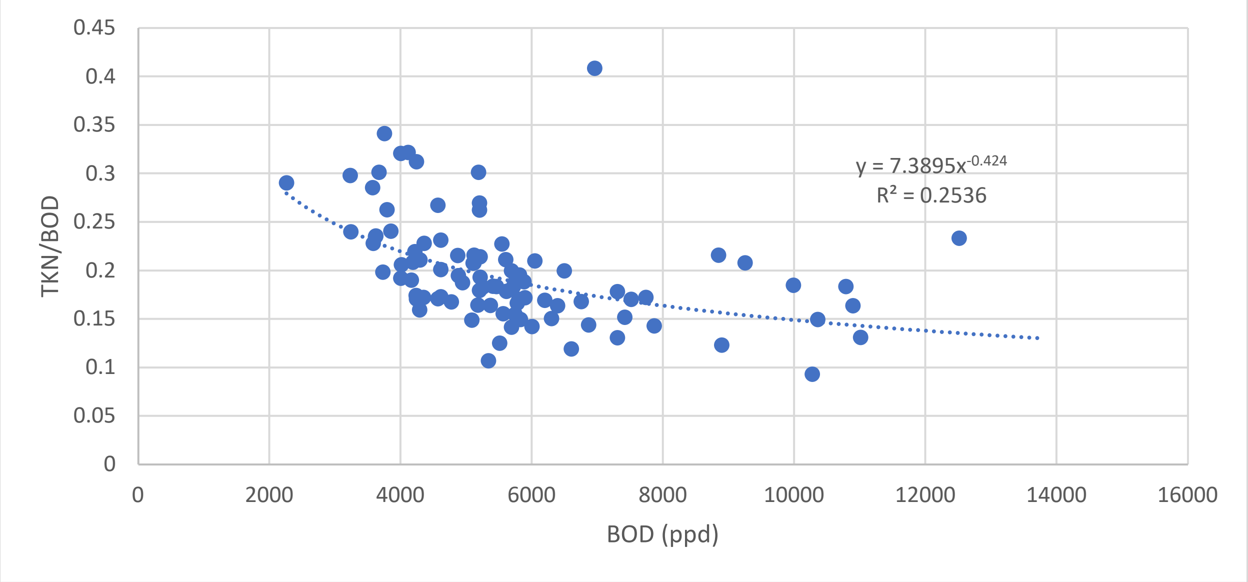


Figure 8. Regression of influent TKN:BOD ratio on BOD load



Influent

The influent model used is the COD influent element which requires the following inputs:

- Total COD
- TKN
- TP
- Total Sulfur[4]
- Nitrate
- pH
- Alkalinity
- ISS
- Calcium
- Magnesium
- Dissolved Oxygen

For the calibration period, the itinerary for the “Raw Influent” was established based on plant reported influent flow and special sampling results. The inputs needed for the COD influent element are directly measured during special sampling or are calculated from directly measured values (e.g. ISS is calculated from measured VSS and TSS). The exception is calcium and magnesium, which are counterions that undergo transformations during biological phosphorus removal, which is not a goal of this project and as such were not measured.

For the validation period, Total COD in the Raw Influent element was based on BOD as estimated via the method described above and the COD:BOD ratio determined from special sampling. Other parameters were as reported in plant MOR data or the method described above if not measured.

BioWin uses the directly-entered data, combined with COD fractions, to calculate parameters that are not entered directly, such as BOD, NH_3-N, and ortho-P.

Primary Clarification

One 'Ideal primary settling tank' element was used to model the two primary settling tanks in service. Percent TSS removals were entered based on a calculated mass balance determined as follows:

Flow balance
Primary effluent flow was the sum of raw influent flow from the MOR with estimated filtrate and washwater flow from the gravity belt thickeners with primary sludge flow subtracted. Filtrate flow was determined based on the WAS load and RAS concentration reported in the MOR; washwater flow assumed a 2.0m GBT uses 20 gpm/m of washwater with a 6-hr operating day. Primary sludge flow assumed two primary sludge pumps in service (one pump per clarifier) with a design flow of 200 gpm and without variable frequency drives (VFDs) operated continuously.

Solids Mass balance
The mass balance used the flows as determined above with the concentration determined from special sampling. In general, the mass balance around the primary settling tanks did not close mostly due to the high concentration (and as such load) associated with the primary sludge. Sludge samples, especially grit laden primary sludge samples such as those collected at East Side WWTP, are notoriously inaccurate due to diurnal variability and large amount of grit in sample lines. Since primary effluent solids are lighter material, it is easier to suspend in channels with mixing and less prone to sampling error, primary effluent was assumed to be correct and was used in the model development.

Primary performance
The calculated capture is 48.4% during the calibration period. The calibration period reported primary capture is low for municipal wastewater treatment plants but is biased by two exceptionally low values: 9.2% removal on the first day of special sampling and 2.4% on the third day of special sampling. Removing these two outliers results in an average capture of 55.6% which is typical for municipal wastewater treatment plants with no chemical addition. The reason for the low capture on these two days is unknown.

Dynamic percent TSS removals were input the primary clarifier model element, based on the daily percent TSS removal. **Figure 9a** shows modeled (solid line) vs. measured (points) primary effluent TSS and VSS calibration simulation. **Figure 9b** shows the same for BOD and COD.

Figure 9a. BioWin-Predicted vs. Measured Primary Effluent TSS and VSS for the Calibration Period

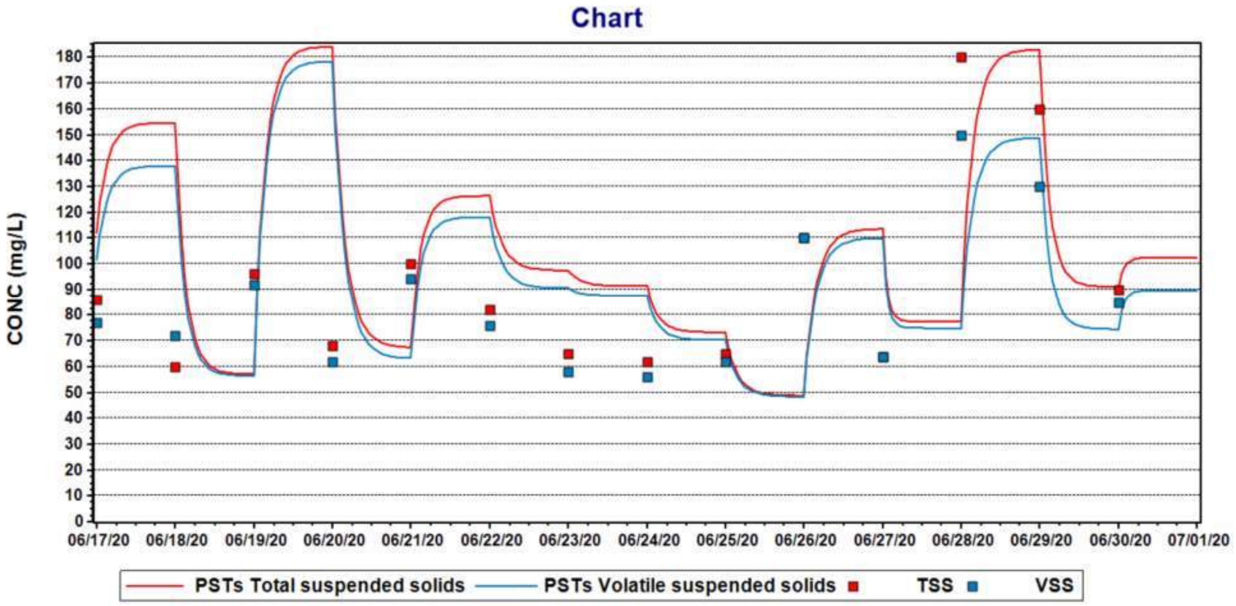
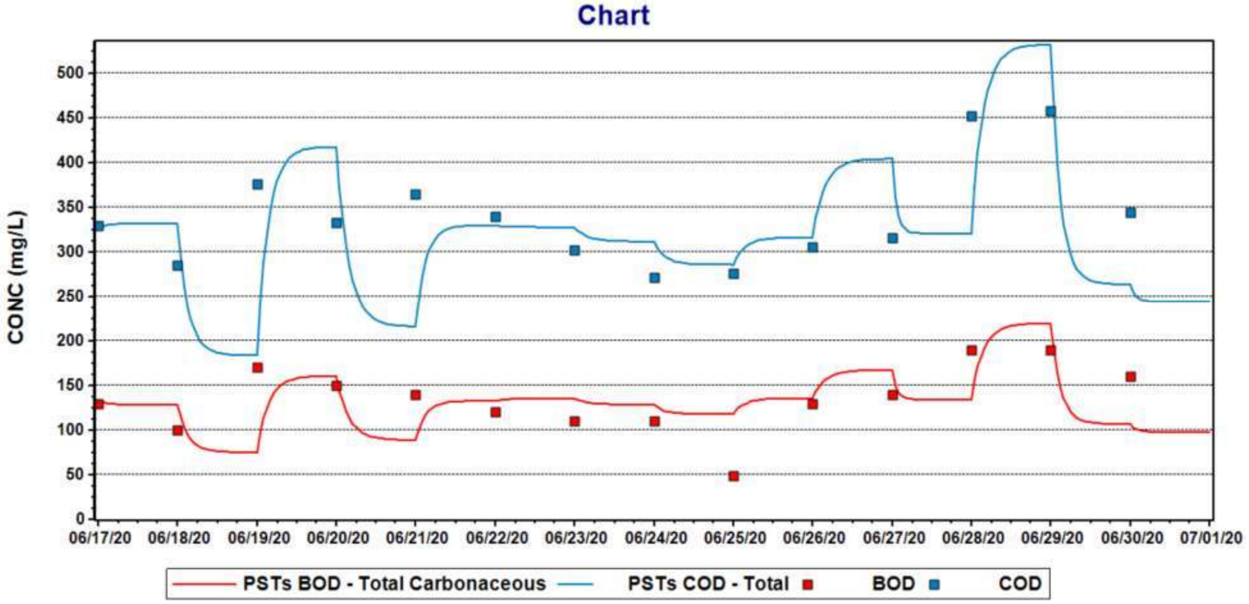


Figure 9b. BioWin-Predicted vs. Measured Primary Effluent COD and BOD for the Calibration Period



For the validation period, average TSS removal in the primaries is 50% which includes some days with negative values. On days that primary quality was not measured or was negative, the average removal was used.

Aeration

There are a total of six aeration tanks with one pair of tanks dedicated to a pair of rectangular final clarifiers that each have dedicated return activated sludge lines. There is no cross connection between the pairs of aeration tanks and final clarifiers, interconnecting channels, nor piping. Each pair of aeration tanks functions as a separate activated sludge system and as such was modeled independently.

Although not evaluated for this project, this will allow the model to be used in the future to assess the impact of flow split on overall plant performance. A series of 'Bioreactor' elements were used to model the four individual zones for the aeration trains, with a total of 2.16 million gallons (MG) of tank volume in operation. The dimensions were updated from the record drawings. Each train was modeled as four zones. The input for each bioreactor was specified by the "Area and depth" method with values as shown in **Table 11**.

Table 11. Geometry Used in the Bioreactor Models

Bioreactor	# Tanks in service	Area (SF)	Depth (ft)	Width (ft)
Zone A	2	1,720	13.8	40
Zone B	2	1,720	13.8	40
Zone C	2	1,720	13.8	40
Zone D	2	1,720	13.8	40

The "Splitter" element was used to for the bypass flow and to split simulated primary effluent between the modeled tanks in service. On days which had plant bypass, the 'rate in side' of this splitter was set to a non-zero value based on reported bypass flow in the MOR. For the flow split to trains 2 and 3, the 'Ratio [S/M]' method was used with constant value of 2 (i.e. two times the flow going tanks 2 and 3 than going to tank 1). For the flow split to train 3, the 'Ratio [S/M]' method was used with constant value of 1 (i.e. equal flow going tanks 2 and 3). In this way, equal flow split was modeled. These ratios can be adjusted once a hydraulic model is complete.

There is no online data acquisition for dissolved oxygen (DO). DO is recorded along the length of the aeration tank multiple times per day and a daily 'High' and 'Low' value are recorded for plant MORs. There was relatively high effluent ammonia during the model calibration period which is surprising given the seemingly optimum conditions for nitrification. These conditions include:

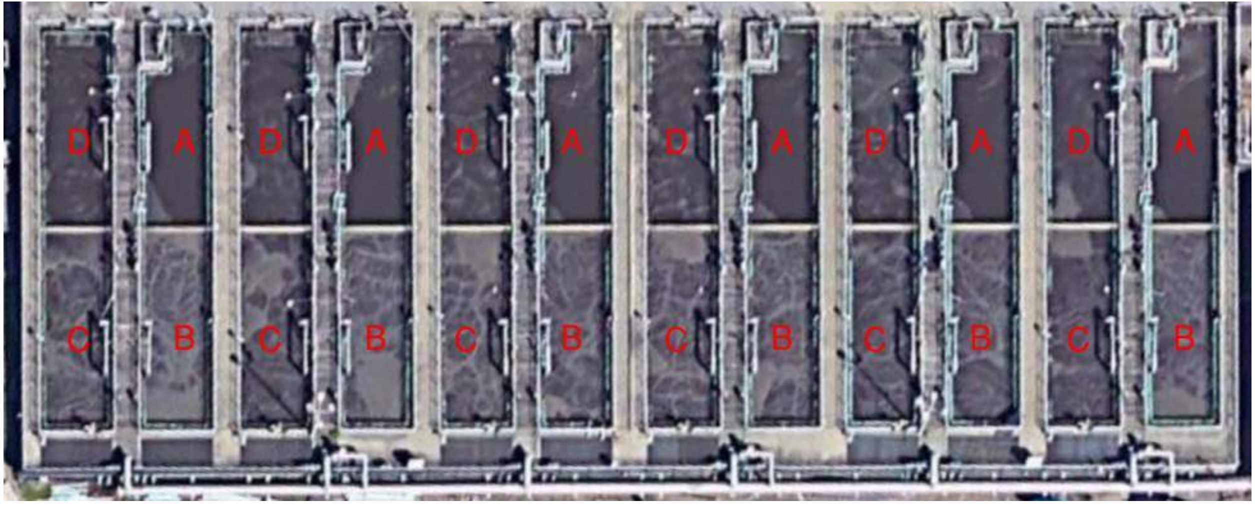
- Warm temperatures
- Sufficiently long SRT
- Neutral pH

- Lack of inhibition
- High dissolved oxygen

The East Side WWTP generally has all these conditions with the exception of high DO. During the calibration period, the reported 'Low' DO varied from a low of 0.09 mg/L to a high of 0.44 mg/L; the 'High' DO varied from a low of 0.47 mg/L to a high of 3.02 mg/L. Although the theoretical fraction of maximum specific growth rate of nitrifying bacteria increases slightly from a DO of 2.0 to 4.0 mg/L, experience shows there has not been a noticeable difference in effluent ammonia when the DO is greater than 2 mg/L and this value is often targeted to ensure complete nitrification.

The tanks are configured in a modified Ludzack Ettinger (MLE) configuration with Zone A unaerated with an anoxic mixer to promote denitrification and total nitrogen removal. Based on an aerial view of the East Side WWTP (**Figure 10**), there is minimal surface agitation of Zone D implying minimal aeration of this Zone. As such this zone was modeled as unaerated. Zones B and C were modeled using the 'Low' DO reported on the MOR as this best predicted effluent ammonia and total nitrogen as discussed in more detail below.

Figure 10. Surface turbulence of East Side WWTP aeration tanks.



Secondary Clarification

The secondary clarifiers were modeled using a single 'Model clarifier' element for each bioreactor train. Total area in the model clarifier was set equal to the total area of the secondary clarifiers in service, and side water depth = 10.25ft. The Modified Vesilind model was selected, and the settling parameters were based on the correlations in Daigger and Roper (1985)[5] as follows:

- Maximum Vesilind settling velocity (V_0) = 0.427 ft/min
- Vesilind hindered zone settling parameter (K) = 0.148 + 0.0021 * SVI (mL/g)

The SVI varies slightly for each of the six aeration tanks. Since the aeration tanks were modeled in pairs, the SVI used was the average of the two aeration tanks feeding the model clarifiers. The exception is the SVI on 6/23/2020 in aeration tank #5 which was reported to be 7 mL/g. This value was revised to 70 mL/g based on surrounding data. The SVI for the three aeration tanks was 77.1 mL/g, 66.6 mL/g, and 72.2 mL/g for modeled aeration trains 1, 2, and 3 respectively. This corresponds to K values of 0.287, 0.270, and 0.279 respectively.

Biowin only allows a single value of K to be entered for each model clarifier, which can impact the ability of the model to predict MLSS and RAS suspended solids. The SVI used in each model clarifier corresponds to the average SVI for the entire calibration period (77.1 mL/g, 66.6 mL/g, and 72.2 mL/g for clarifiers 1, 2 and 3 respectively) or the entire validation period (SVI = 80.9 mL/g, 68.8 mL/g, and 82.9 mL/g for modeled clarifiers 1, 2 and 3 respectively).

The SVI for the calibration was relatively consistent for the entire two-week period (**Figure 11a**). Note, however, that the validation SVI was variable as shown in **Figure 11b**. Therefore, the settling model in BioWin should be expected to overestimate settling performance at the beginning of the calibration period which will also impact the WAS sludge load.

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[5] Daigger G.T. and R.E. Roper, Jr. 1985. The Relationship between SVI and Activated Sludge Settling Characteristics. *Journal (Water Pollution Control Federation)* Vol. 57, No. 8, WPCF Conference Preview Issue, pp. 859-866

Figure 11a. SVI for the calibration period.

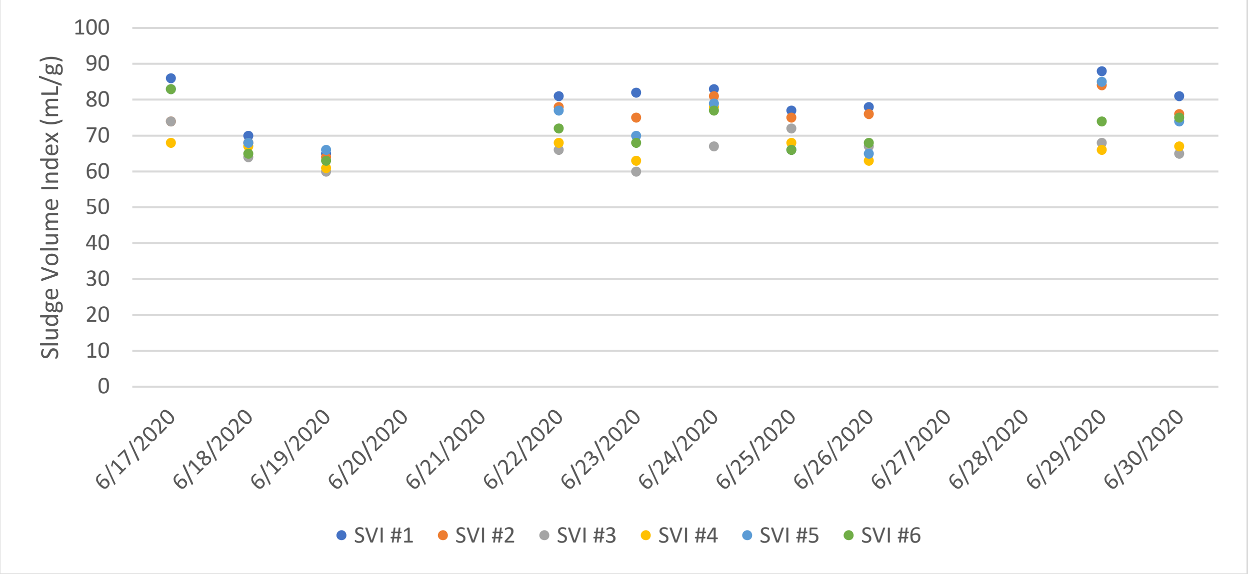
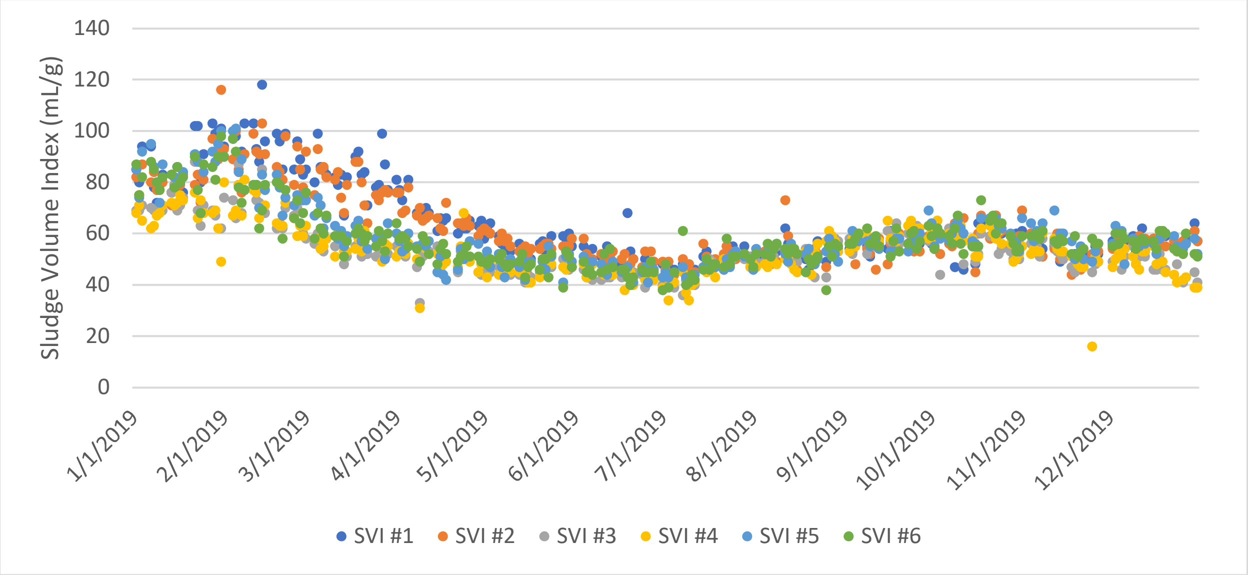


Figure 11b. SVI for the validation period.



Return activated sludge flow is reported as a percent which was assumed to be percent of forward flow. WAS flow is not reported, only the WAS load is included in the MORs. WAS flow was estimated from WAS load and RAS concentration. The secondary clarifier underflow rate was set equal to the daily estimated dynamic RAS and WAS flows.

Solids Processing

Primary sludge is degritted and prior to thickening in gravity thickeners. WAS is thickened separately using a gravity belt thickener (GBT). These unit processes are described in more detail below.

Grit Removal
The grit removal system was modeled using a 'Separator – Cyclone (ISS) element' with 50% ISS removal and an underflow fraction of 0.002.

Primary Thickening
The gravity thickeners were modeled with a single 'Clarifier - Ideal' element. The total area of the gravity thickeners was equal to three 30-ft diameter gravity thickeners in operation during the calibration period. Capture of the modeled gravity thickeners was 85%. Thickened primary sludge is blended with thickened WAS (discussed below) before being sent to a sludge element.

WAS Thickening
The Gravity Belt Thickener (GBT) was modeled using a 'Separator – Dewatering Unit' element assuming 95% capture. The underflow fraction of the GBT was set to 0.2 which would result in thickening the sludge by a factor of 5 (from nominally 1% to 5%). Capture of the modeled GBT was 95%. Thickened WAS is blended with thickened primary sludge (discussed above) before being sent to a sludge element.

Chemical Addition

Due to the acid produced as a side product, nitrification results in a net pH decrease. To maintain neutral pH in the reactor and optimum conditions for nitrification, 50% sodium hydroxide is added downstream of the primary clarifiers. Chemical addition was modeled using the 'Influent – State variable' element with flow of 150 gpd and 'Other Cations (strong bases) equal to 19,100 meq/L.

RAS is also chlorinated using 50 gpd of 12.5% NaOCl to prevent the growth of filamentous organisms and operational challenges associated with foam accumulation. A second 'Influent – State variable' element was used to represent the addition of chlorine and ensure that chlorine could not be adversely impacting plant performance. A typical dose is 1-10 lb of Cl_2/1000 lbs of MLVSS. Based on modeling results, actual chlorine dose is 0.6-0.75 lb of Cl_2/1000 lbs of MLVSS. Chlorine addition used the 'User defined – UD1' state variable equal to 125,000 mg/L. UD1 is a variable not used by the default process model included in Biowin and is included to provide the modeler flexibility in use of the modeling software.

5. Model Calibration

As discussed above, June 17, 2020 through June 30, 2020 was selected for the calibration period to overlap the period of special sampling. Dynamic model results were compared with special sampling data from the calibration period and percent differences between modeled and measured values were calculated for both daily values and average values. Note that positive percent differences corresponding to days for which the modeled values are higher than the measured values and negative percent differences corresponding to days for which the modeled values are lower than the measured values. The goal of the calibration was to achieve the stop criteria shown in **Table 12**, which were selected from Table 6.5 in Rieger *et al*. (2012)[6] and correspond to values suitable for the following applications of the calibrated East Side WWTP model:

- Assessing overall oxygen transfer requirements,
- Considering various process configurations for nitrogen removal; and

Table 12. Calibration Stop Criteria Used for Calibration

Target Variable	Acceptable Error Range (±)
MLSS	10%
MLVSS:MLSS	5%
WAS Mass Load	5%
SRT	1 day
Effluent TSS	5 mg/L
Effluent NH_3-N	1.0 mg/L
Effluent NO_x-N	1.0 mg/L
Effluent TN	1.0 mg/L

The stop criteria presented in Table 12 are based on monthly average values. Special sampling was only performed for a two-week period and as such the average of this two-week period was used to establish stop criteria instead of the average of an entire month. It is generally more challenging to predict plant performance over shorter time periods so this approach is considered conservative.

MLSS

Modeled vs. measured MLSS for the three modeled trains are shown in **Figures 12a**, **12b**, and **12c**, respectively. **Figure 12d** shows the modeled vs measured MLSS for the overall average of the three trains. **Figures 13a**, **13b**, and **13c** show the corresponding percent difference between daily modeled and measured MLSS for each aeration train. **Figure 13d** shows the corresponding percent difference between daily modeled and measured MLSS for the overall average of the three trains. Note that the daily differences exceeded ± 10% on two (out of 14) days for Train 1, one day for

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[6] Rieger, L., S. Gillot, G. Langergraber, T. Ohtsuki, A. Shaw, I. Takács and S. Winkler. 2013. *Guidelines for Using Activated Sludge Models.* Scientific and Technical Report No. 22. IWA Publishing. New York, NY.

Train 2, and three days for Train 3. Based on the average of all three trains, the daily difference never exceeded +/-10%.

Some of the daily differences between measured and modeled values may be due to MLSS samples being taken once per day for each train in service. The model, on the other hand, reports MLSS in 15-minute increments during the simulation and so is more variable. Additionally, the model is configured such that the flow and load is constant throughout a 24-hr period however the physical plant receives constantly varying flow and load. Both these discrepancies between modeled and physical plant performance explain some level of discrepancy even with a calibrated model.

The relative percent difference between modeled and measured average MLSS for the entire calibration period was:

- Train 1: -3.5%
- Train 2: 5.2%
- Train 3: -7.5%
- Overall Average: 2.1%

These values are consistent with the IWA stop criteria (±10%).

Figure 12a BioWin-Predicted MLSS vs. Measured MLSS in Aeration Train No. 1 for Calibration Period

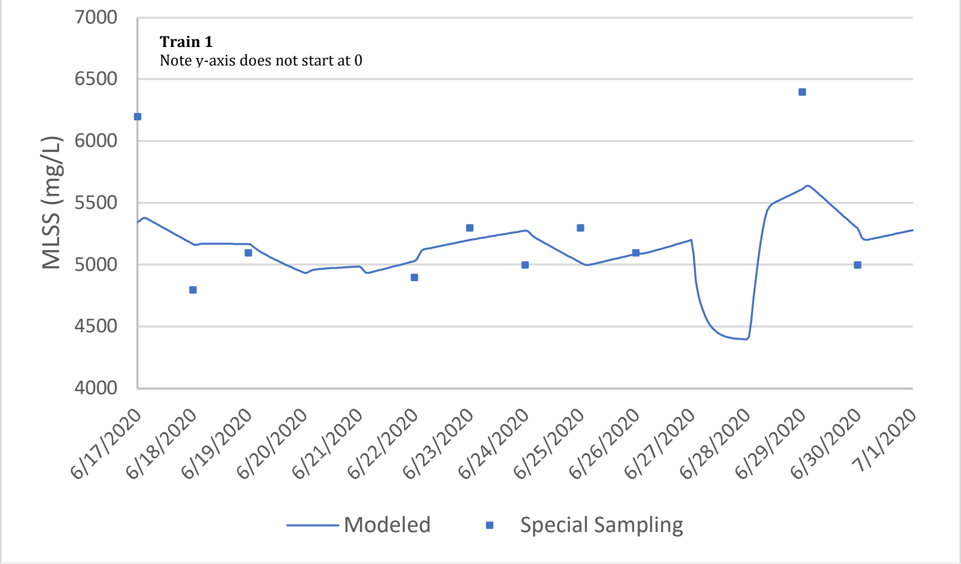


Figure 13a Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 1

Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

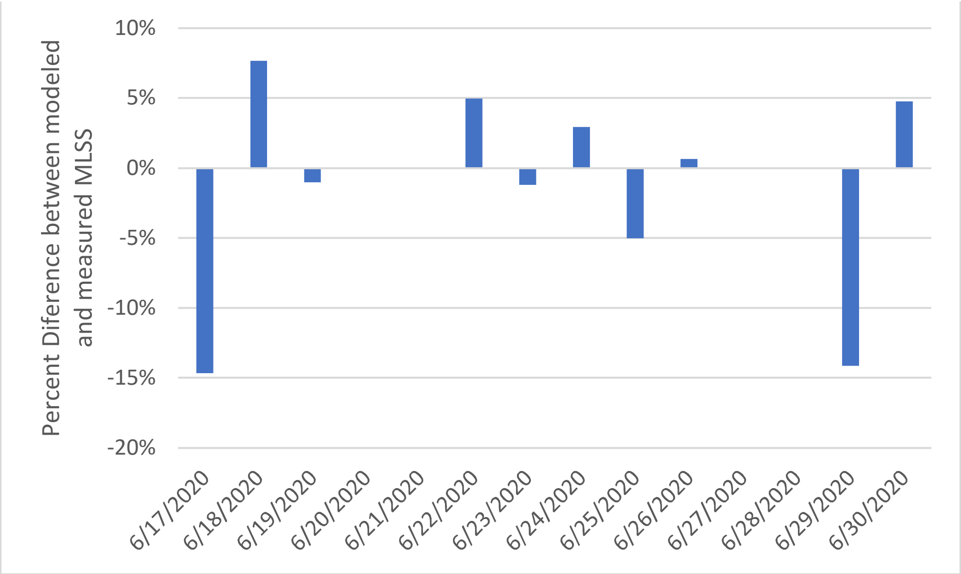


Figure 12b BioWin-Predicted MLSS vs. Measured MLSS in Aeration Train No. 2 for Calibration Period

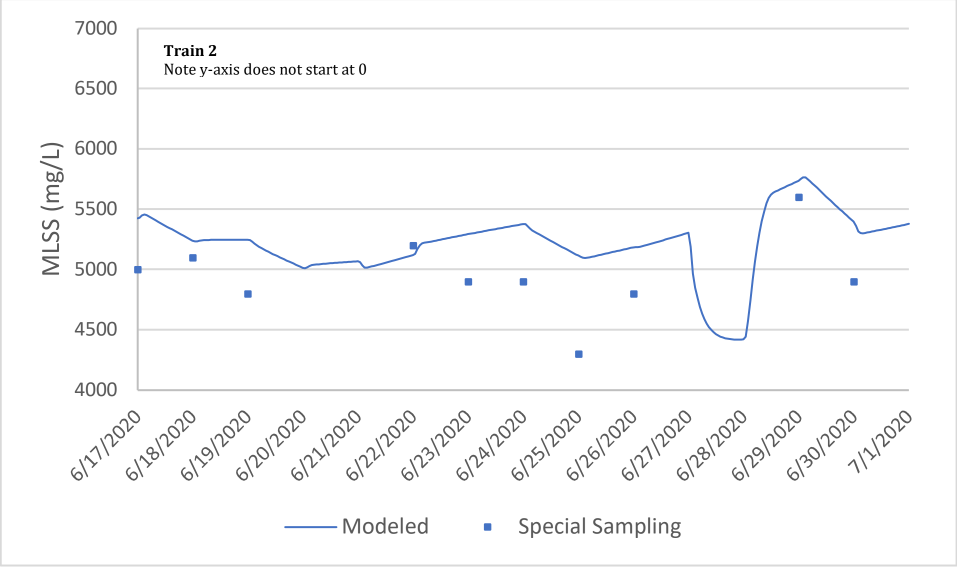


Figure 13b Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 2
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

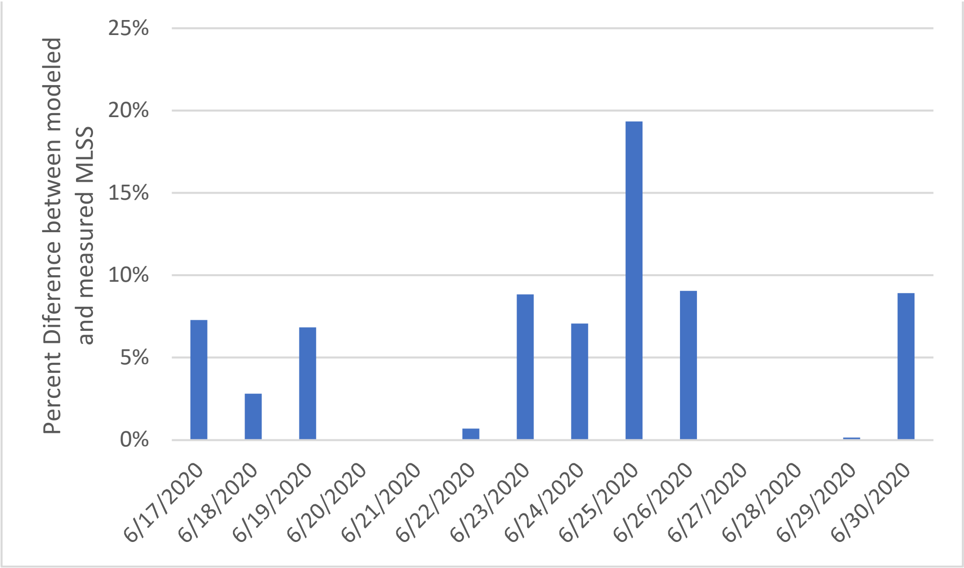


Figure 12c BioWin-Predicted MLSS vs. Measured MLSS in Aeration Train No. 3 for Calibration Period

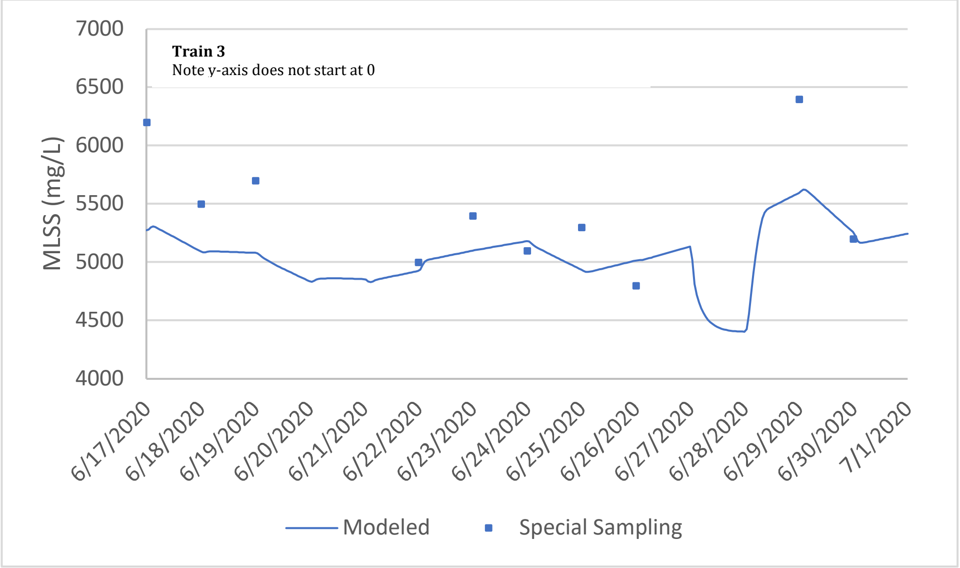


Figure 13c Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 3
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

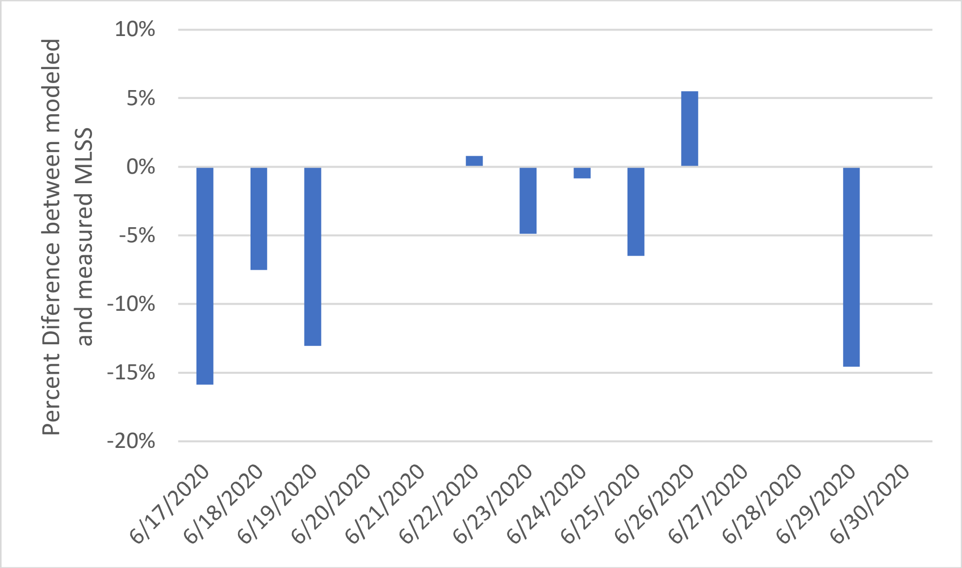


Figure 12d Overall Average BioWin-Predicted MLSS vs. Measured MLSS in the three Aeration Trains for Calibration Period

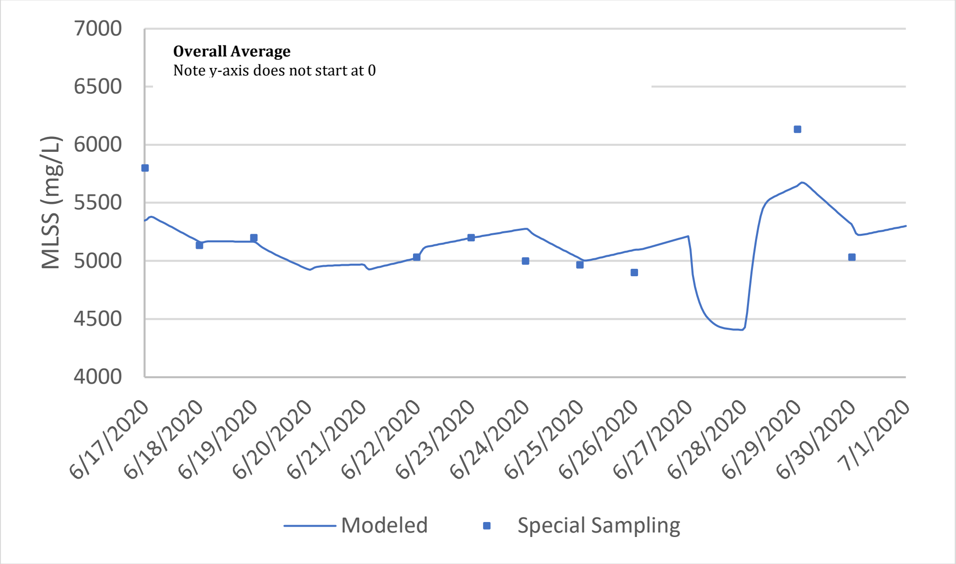
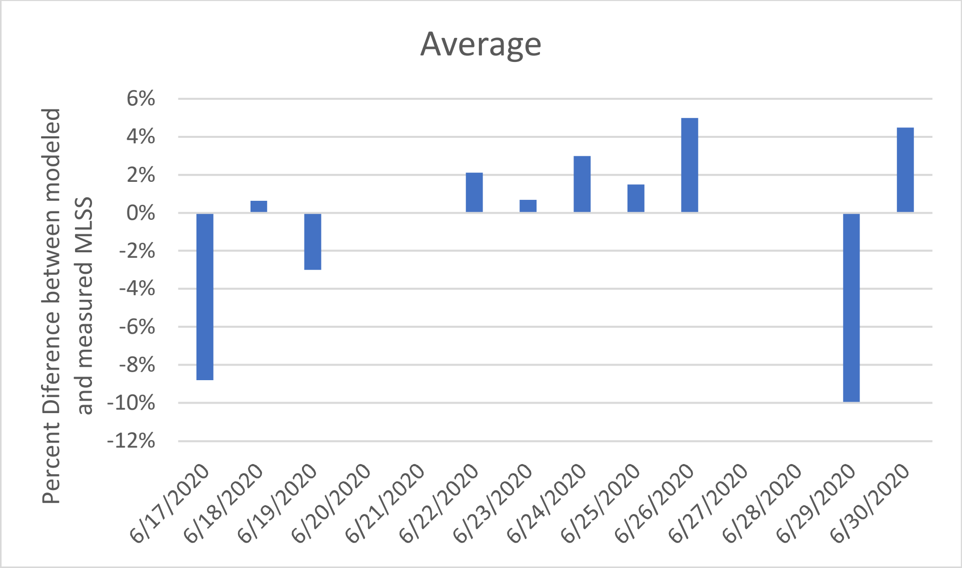


Figure 13d Difference Between Overall Average BioWin-Predicted Value and Measured Values for the three Aeration Trains

Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value



MLSS:MLVSS

The average modeled and measured MLVSS:MLSS ratios in the aeration trains, and the percent differences between measured and modeled, are shown in **Table 13**. These values are within the IWA stop criteria (± 5%).

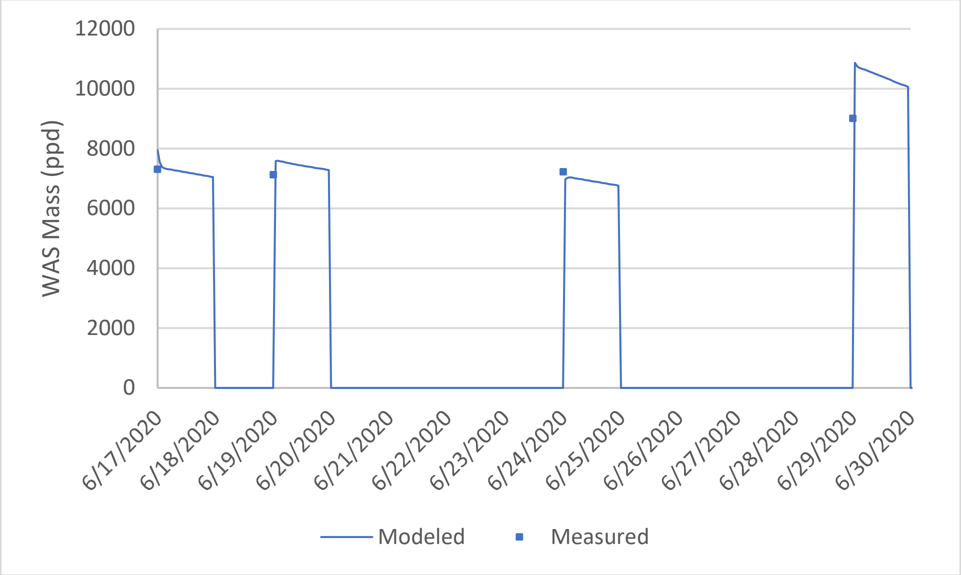
Table 13. BioWin-Modeled vs. Measured MLVSS:MLSS Ratio for Calibration Period, by aeration train

Aeration Train No.	Modeled Average MLVSS:MLSS Ratio for Calibration Month	Measured Average MLVSS:MLSS Ratio for Calibration Month	Percent Difference
1	0.805	0.820	-1.8%
2	0.818	0.816	0.2%
3	0.814	0.812	0.2%
Overall	0.812	0.816	-0.4%

WAS Mass

The average WAS mass predicted by BioWin for the calibration period was 2,205 lb/day (assuming wasting consistently over the 14-day calibration period) vs. 2,191 lb/day average from MOR data. This corresponds to a -0.4% relative difference, which is within the recommended IWA error range. Modeled vs. measured WAS mass is shown in **Figure 14**.

Figure 14. BioWin-Predicted WAS Mass vs. Plant-Measured WAS Mass for Calibration Period



Solids Retention Time

The average SRT predicted by BioWin for the calibration period was 20.9 days vs. 21.5 days calculated from daily plant data. This corresponds to a -0.59 day difference and so is within the recommended IWA error range (±1 day for SRT>5 days).

Effluent TSS

The absolute value of the difference between the average BioWin-predicted and average measured effluent TSS was 1.34 mg/L during the calibration period which is within the IWA stop criteria. Modeled and measured effluent TSS is shown **Figure 15**, while the daily differences (in mg/L) are shown in **Figure 16**. Two (of the 14) daily differences exceed 5 mg/L.

Figure 15. BioWin-Predicted Effluent TSS vs. Plant Data Effluent TSS for Calibration Period

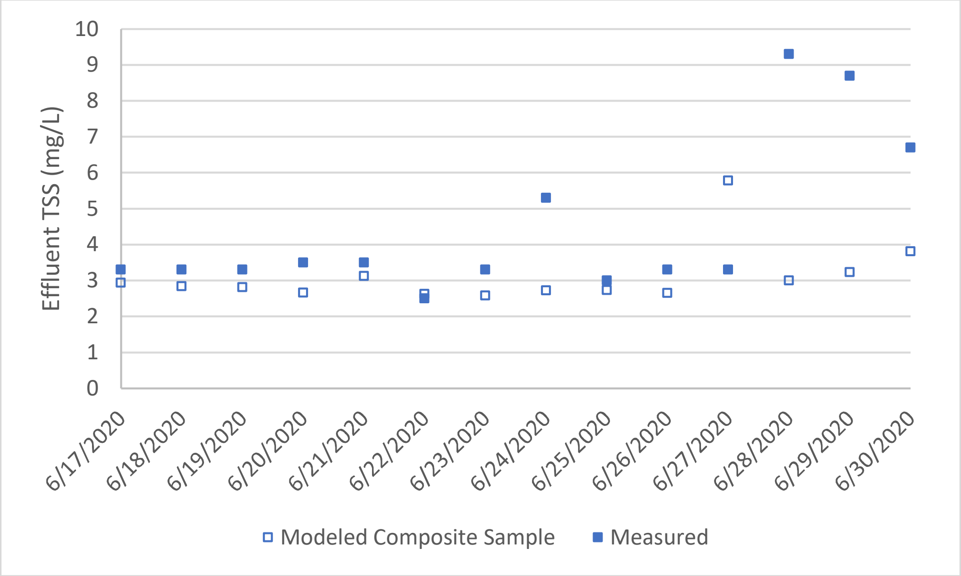
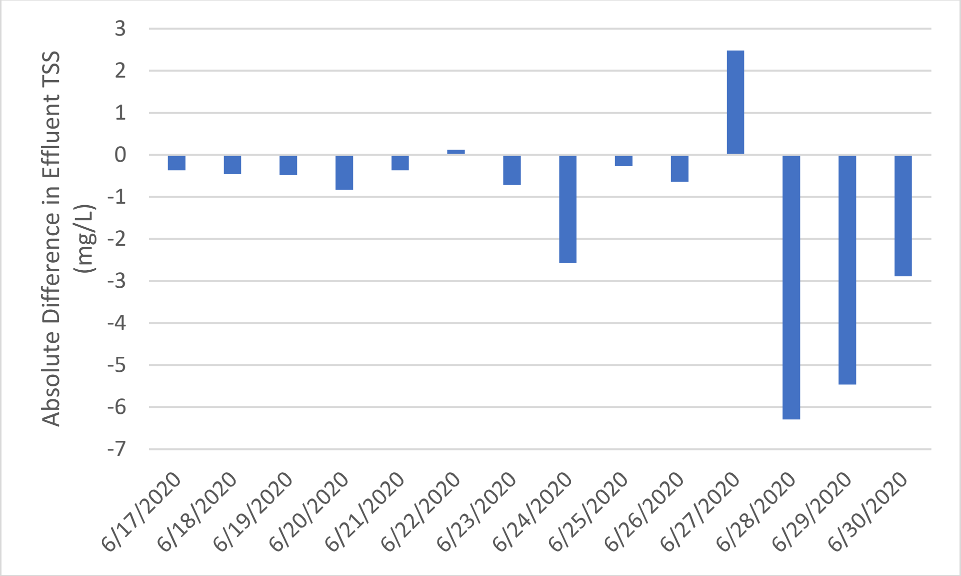


Figure 16. Difference Between BioWin-Predicted Effluent TSS and Plant Data Effluent TSS for Calibration Period



Effluent Ammonia

The absolute value of the difference between the average BioWin-predicted and average measured effluent ammonia-N was 0.25 mg/L during the calibration period which is within the IWA stop criteria (1 mg/L). Modeled and measured effluent ammonia-N is shown **Figure 17**, while the daily differences (in mg/L) are shown in **Figure 18**. All but two of the daily differences between modeled and measured are outside the IWA stop criteria, however the total nitrogen wasteload allocation is written an annual average basis so the model capturing overall performance was deemed more important than ensuring the model captured the daily variation. As shown in the sensitivity analysis in Section 7 the assumed DO in Zones B, C, and D and the DO Switching function for ammonia oxidizing bacteria has a significant impact on the model predicted effluent ammonia-N.

Figure 17. BioWin-Predicted Effluent Ammonia-N vs. Plant Data Secondary Effluent Ammonia-N for Calibration Period

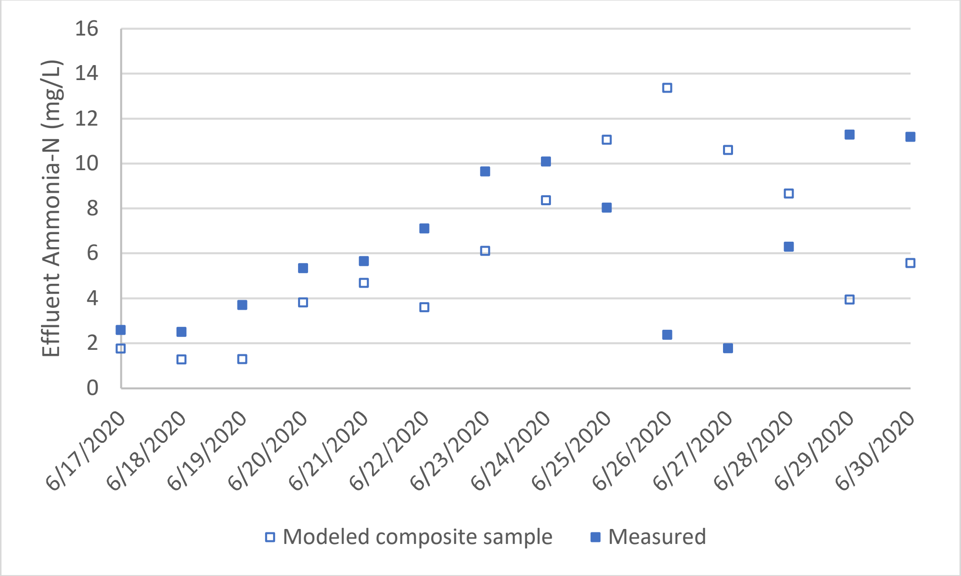
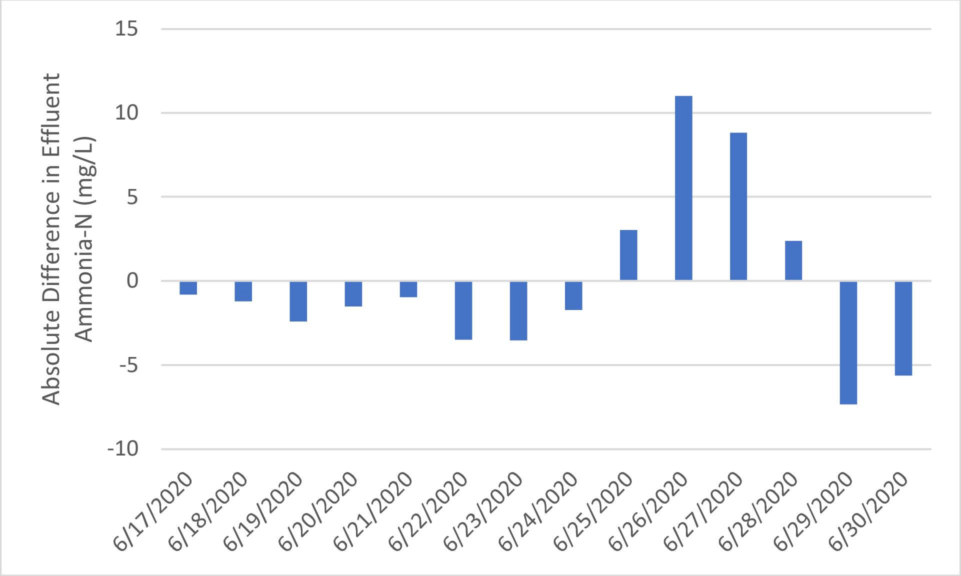


Figure 18. Difference Between BioWin-Predicted Effluent Ammonia-N and Secondary Effluent Ammonia-N for Calibration Period



Effluent Nitrate

The absolute value of the difference between the average BioWin-predicted and average measured effluent nitrate-N was 0.2 mg/L during the calibration period which is within the IWA stop criteria

(1 mg/L). Modeled and measured effluent nitrate-N is shown **Figure 19**, while the daily differences (in mg/L) are shown in **Figure 20**. Only one (of 14) of the daily effluent nitrate values is outside the IWA stop criteria.

Figure 19. BioWin-Predicted Effluent Nitrate-N vs. Plant Data Secondary Effluent Nitrate-N for Calibration Period

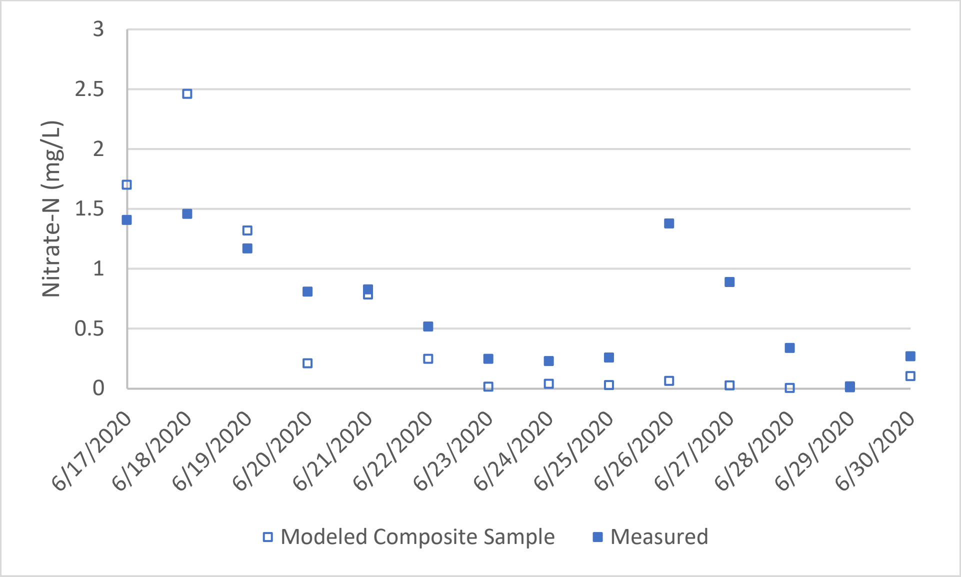
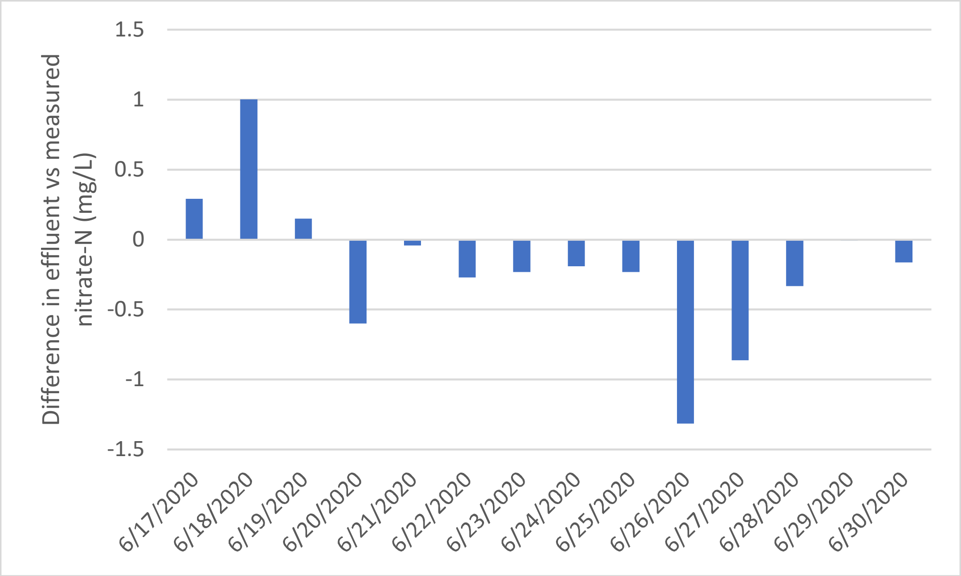


Figure 20. Difference Between BioWin-Predicted Effluent Nitrate-N and Secondary Effluent Nitrate-N for Calibration Period



Effluent Total Nitrogen

The absolute value of the difference between the average BioWin-predicted and average measured effluent Total-N was 0.89 mg/L during the calibration period which is within the IWA stop criteria (1 mg/L). Modeled and measured effluent ammonia-N is shown **Figure 21**, while the daily differences (in mg/L) are shown in **Figure 22**. All but three of the daily differences between modeled and measured are outside the IWA stop criteria, however the wasteload allocation has an annual average basis so the model capturing overall performance was deemed more important than ensuring the model captured the daily variation.

Figure 21. BioWin-Predicted Effluent Total-N vs. Plant Data Secondary Effluent Total-N for Calibration Period

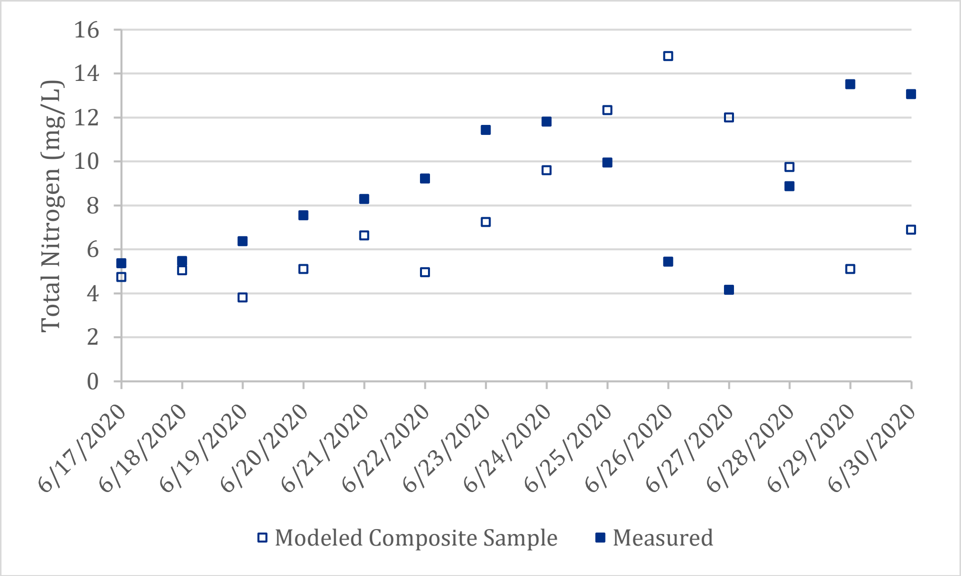
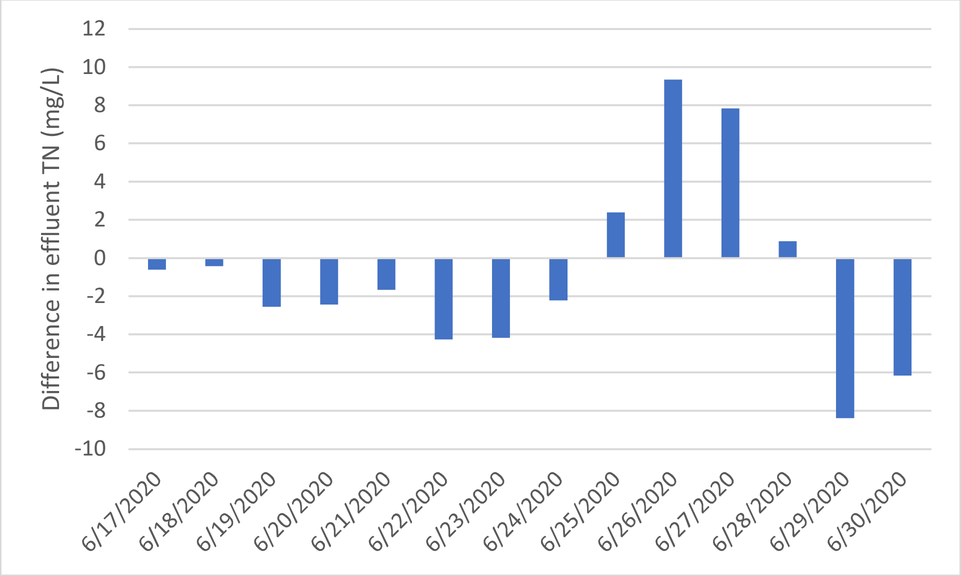


Figure 22. Difference Between BioWin-Predicted Effluent Total-N and Secondary Effluent Total-N for Calibration Period



Summary

Although some of the daily variation is outside IWA stop criteria, the average of the modeling period is within stop criteria for all model parameters as summarized in **Table 14**,

Table 14. Summary of Calibration Results

Target Variable	Acceptable Error Range (±)	Actual Error	Stop Criteria Met?
MLSS Train 1	10%	-3.5%	Yes
MLVSS:MLSS Train 1	5%	-1.8%	Yes
MLSS Train 2	10%	5.2%	Yes
MLVSS:MLSS Train 2	5%	0.2%	Yes
MLSS Train 3	10%	-7.5%	Yes
MLVSS:MLSS Train 3	5%	0.2%	Yes
MLSS Average	10%	-2.1%	Yes
MLVSS:MLSS Average	5%	-0.4%	Yes
WAS Mass Load	5%	0.6%	Yes
SRT	1 day	-0.59 day	Yes
Effluent TSS	5 mg/L	-1.34 mg/L	Yes
Effluent NH_3-N	1.0 mg/L	-0.25 mg/L	Yes
Effluent NO_x-N	1.0 mg/L	-0.20 mg/L	Yes
Effluent TN	1.0 mg/L	-0.89 mg/L	Yes

6. Validation

The calibrated model described above was validated for application to facilities planning and upgrades required for improved nutrient removal by using a full year of historical plant data to ensure typical performance could be captured by the process model. No changes to model kinetic or stoichiometric parameters were made during the validation process. Rather, model predictions were compared with the observed values for calendar year 2019. Percent differences between modeled and measured values were calculated for both monthly and annual average values, with positive percent differences corresponding to days for which the modeled values are higher than the measured values and negative percent differences corresponding to days for which the modeled values are lower than the measured values.

MLSS

Figures 23a, **23b**, and **23c** show the percent difference between monthly average modeled and measured MLSS for each aeration train. **Figure 23d** shows the percent difference between monthly modeled and measured MLSS for the overall average of the three trains.

Figure 23a Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 1

Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

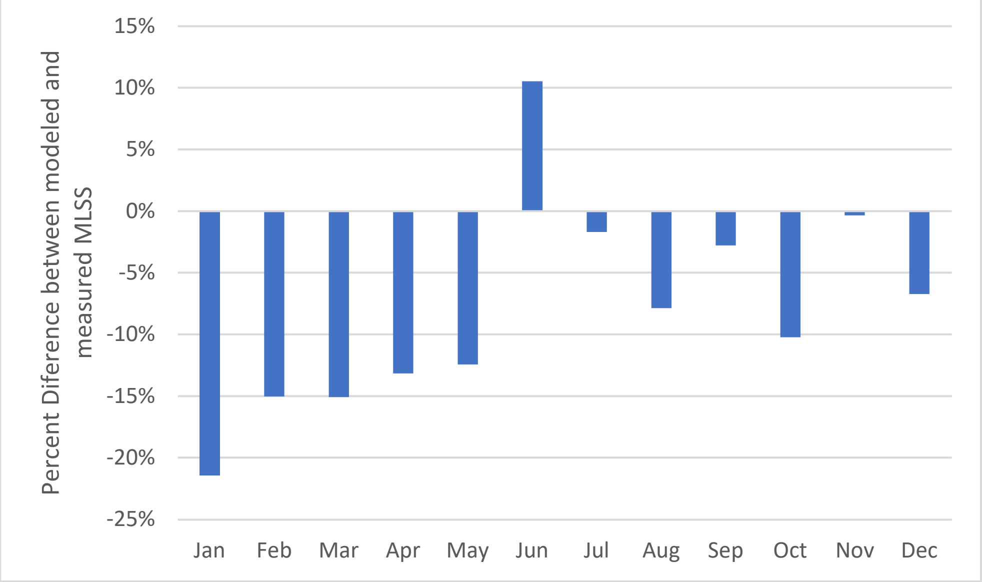


Figure 23b Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 2
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

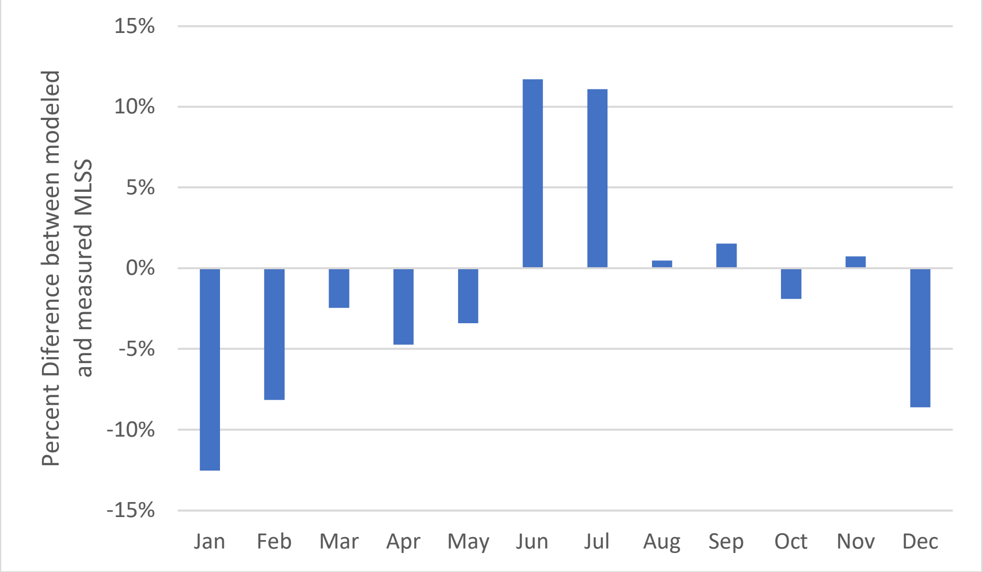


Figure 23c Difference Between BioWin-Predicted Value and Measured Values for Aeration Train No. 3
Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value

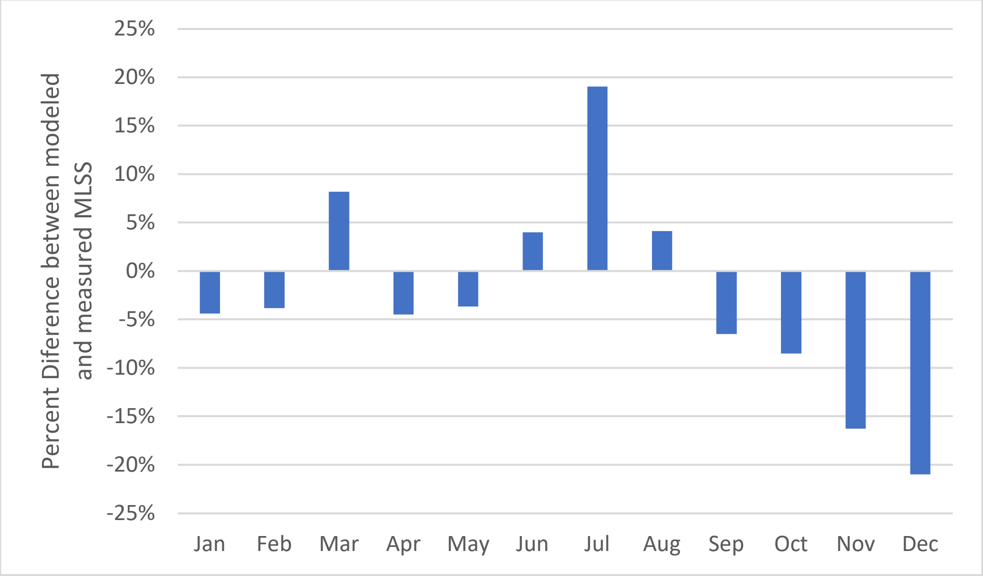
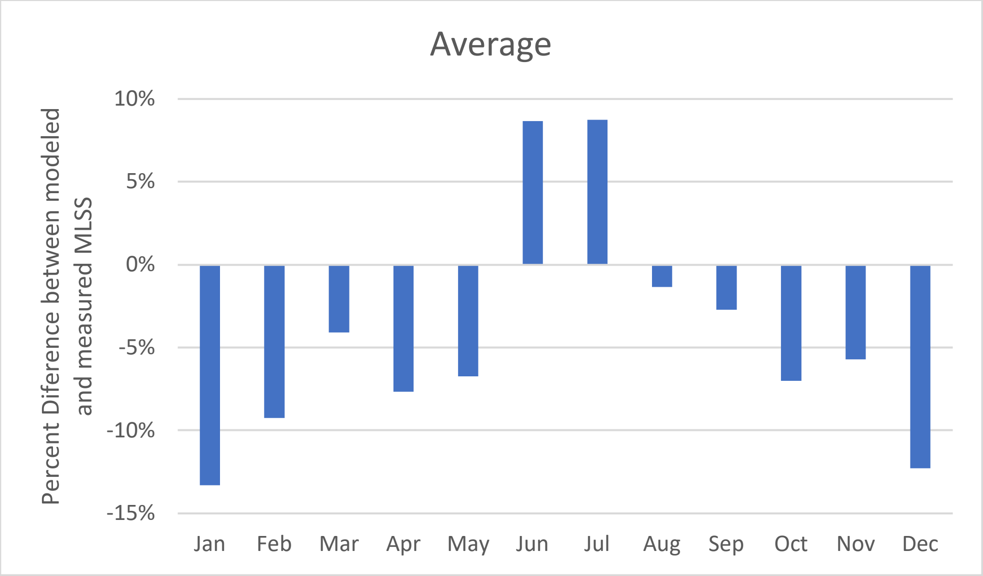


Figure 23d Difference Between Overall Average BioWin-Predicted Value and Measured Values for the three Aeration Trains

Notes: A positive difference corresponds to days for which the modeled value is higher than the measured value



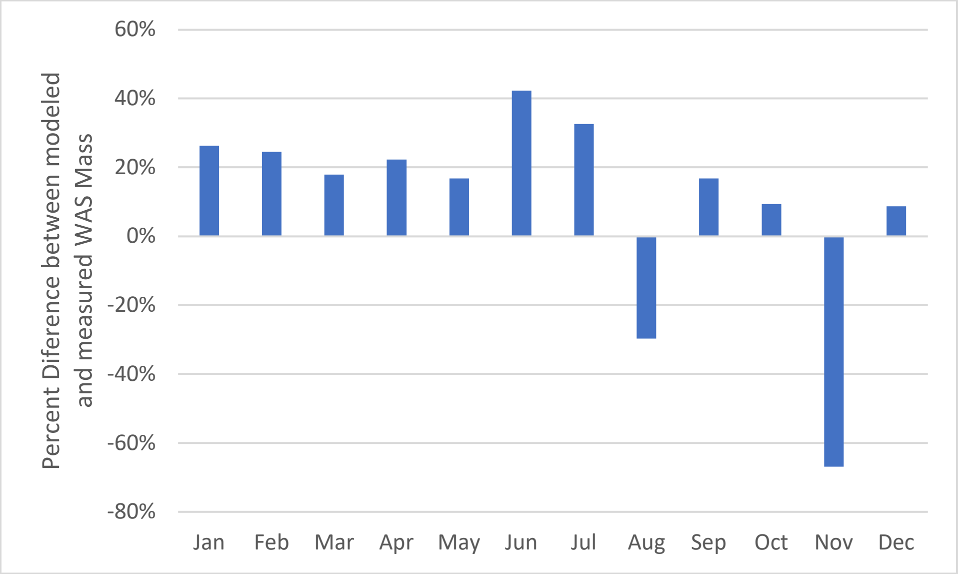
MLSS:MLVSS

MLVSS is not measured as part of normal operations and as such the validation of the MLVSS:MLSS ratio could not be performed.

WAS Mass

The average WAS mass predicted by BioWin for the validation year was 1,874 lb/day (assuming wasting consistently over the 365-day validation period) vs. 1,942 lb/day average from MOR data. This corresponds to a -3.5% relative difference. Monthly average modeled vs. measured WAS mass is shown in **Figure 24**. Overestimation of the WAS load in the first half of the year is due to overestimation of RAS suspended solids during the first half of the validation period. The SVI during this period was significantly higher than annual average but Biowin only allows a single SVI value to be used.

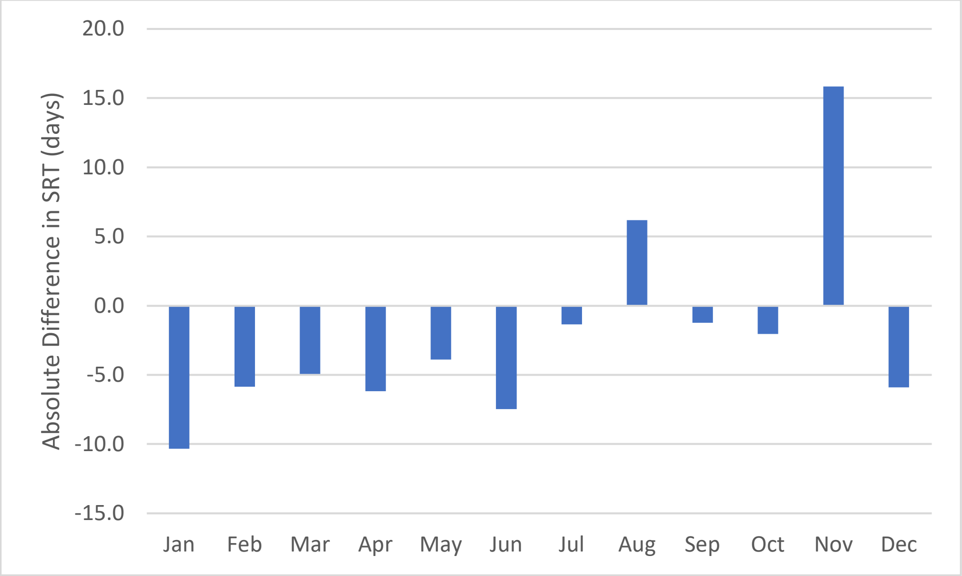
Figure 24. BioWin-Predicted WAS Mass vs. Plant-Measured WAS Mass for Validation Period



Solids Retention Time

The average SRT predicted by BioWin for the validation year was 23.3 days vs. 23.5 days calculated from daily plant data. This corresponds to a -0.2 day difference. Monthly average modeled vs. measured WAS mass is shown in **Figure 24**. Mismatch between WAS load and MLSS as described above leads to an overall poor agreement between modeled and measured SRT.

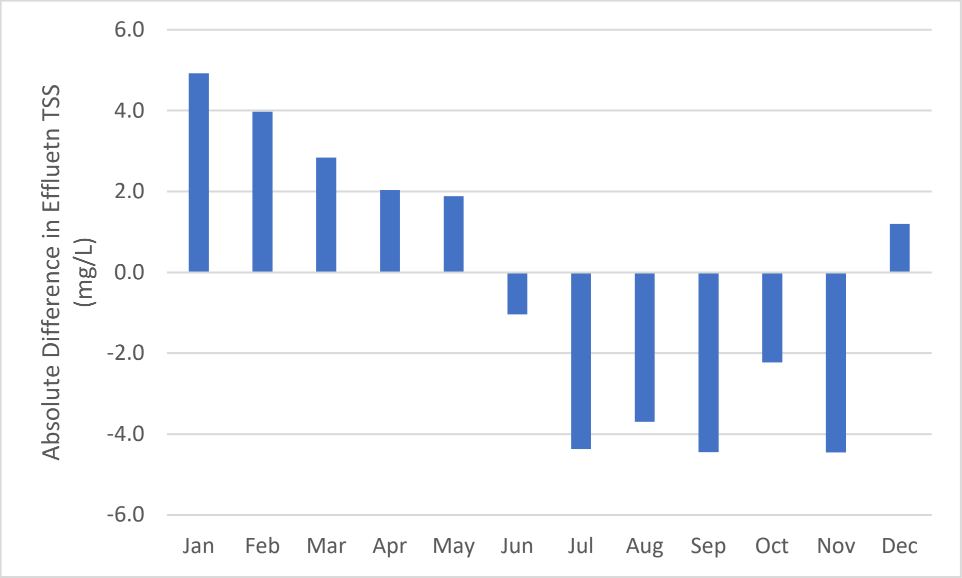
Figure 25. BioWin-Predicted SRT vs. Plant-Measured SRT for Validation Period



Effluent TSS

The absolute value of the difference between the average BioWin-predicted and average measured effluent TSS was 0.46 mg/L during the validation period. Monthly average modeled and measured effluent TSS is shown **Figure 26.** None of the monthly average values exceed 5 mg/L and are within the IWA stop criteria.

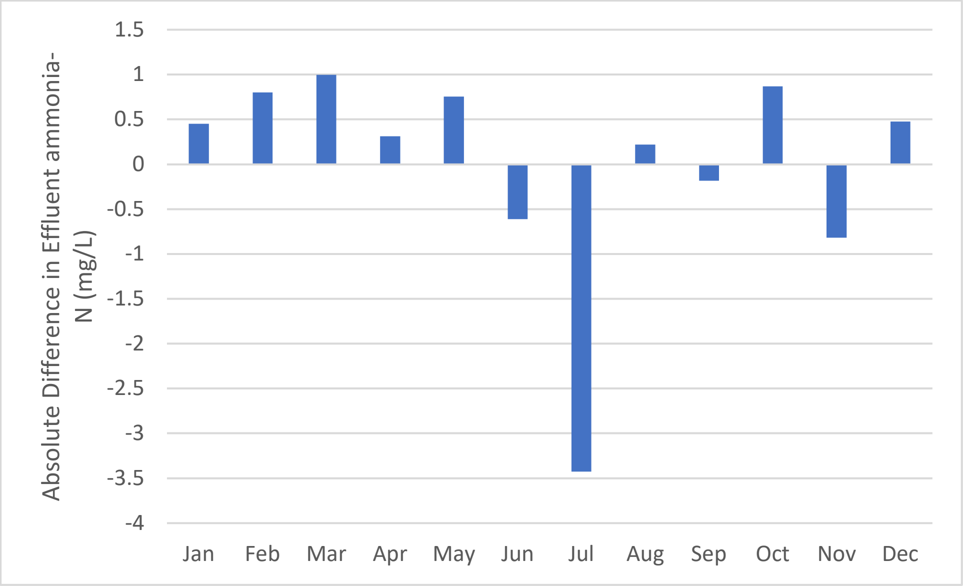
Figure 26. Difference Between BioWin-Predicted Effluent TSS and Plant Data Effluent TSS for Calibration Period



Effluent Ammonia

The absolute value of the difference between the average BioWin-predicted and average measured effluent ammonia-N was 0.03 mg/L during the validation year. Monthly differences (in mg/L) between the modeled and measured values are shown in **Figure 27**. One month is outside the IWA stop criteria (1 mg/L), however the total nitrogen wasteload allocation is written an annual average basis so the model capturing overall annual performance was deemed acceptable. In July during the validation period the plant reported difficulty in achieving full nitrification (as shown by high effluent ammonia in MOR data) which is unusual in warm temperatures.

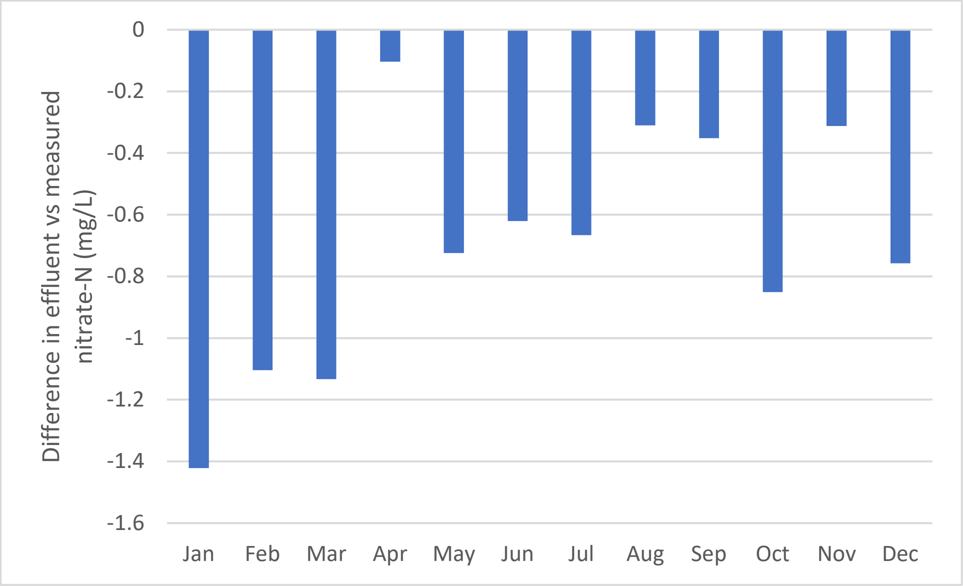
Figure 27. Difference Between BioWin-Predicted Effluent Ammonia-N and Effluent Ammonia-N for Calibration Period



Effluent Nitrate

The absolute value of the difference between the average BioWin-predicted and average measured effluent nitrate-N was 0.7 mg/L during the validation year. The difference between monthly average modeled and measured effluent nitrate-N is shown **Figure 28**. During cooler months (January -March) the model tended to over-predict the extent of denitrification (lower effluent nitrate in the model than MOR data indicate).

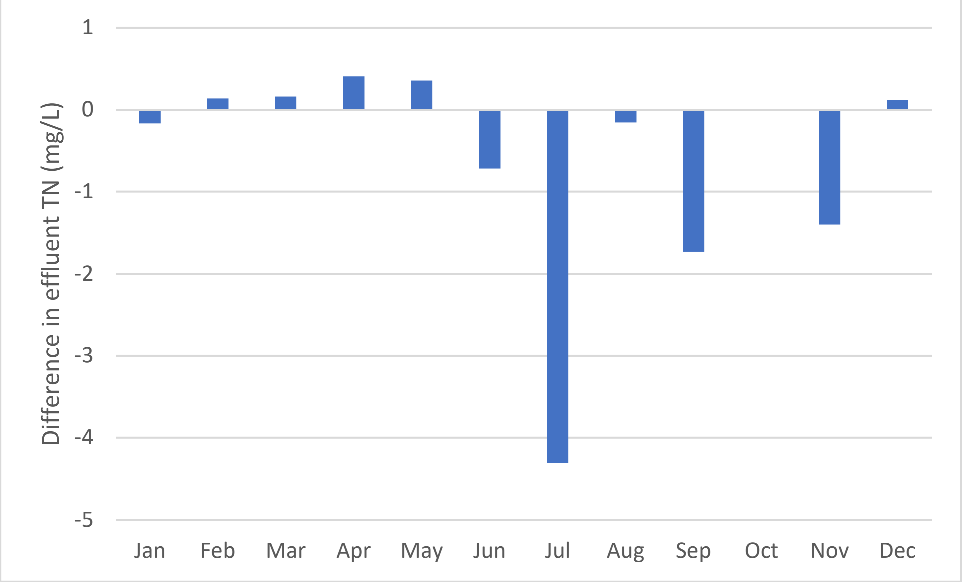
Figure 28. Difference Between BioWin-Predicted Effluent Nitrate-N and Effluent Nitrate-N for Calibration Period



Effluent Total Nitrogen

The absolute value of the difference between the average BioWin-predicted and average measured effluent Total-N was 0.65 mg/L during the validation year. The difference between monthly average modeled and measured effluent ammonia-N is shown **Figure 29.** For three month (Jul, Sep, and Nov) the model predicted lower effluent total nitrogen than reported in plant MOR data. The discrepancy in July is due to the mismatch between modeled and measured effluent ammonia which is as previously stated is unknown. The reason for the mismatch of the other months is unknown.

Figure 29. Difference Between BioWin-Predicted Effluent Total-N and Effluent Total-N for Validation Year



Summary

As shown in **Table 15**, the model does not meet IWA stop criteria for every month but does meet the stop criteria for the annual average. Therefore, the model is considered validated for the intended use. As projects from this Facilities Plan move from planning stages into conceptual design and ultimately final design the model should be updated with new plant data and validated to new data to improve model accuracy.

Table 15. Summary of Calibration Results

			Stop Criteria Met?							
Time	**MLSS Train 1**	**MLSS Train 2**	**MLSS Train 3**	**MLSS Average**	**WAS Load**	**SRT**	**Effluent TSS**	**Effluent NH_3-N**	**Effluent Nitrate -N**	**Effluent TN**
Stop Criteria (±)	10%	10%	10%	10%	5%	1 day	5 mg/L	1 mg/L	1 mg/L	1 mg/L
Jan	No	No	**Yes**	No	No	No	**Yes**	**Yes**	No	**Yes**
Feb	No	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	No	**Yes**
Mar	No	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	No	**Yes**
Apr	No	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**
May	No	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**
Jun	No	No	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**
Jul	**Yes**	No	No	**Yes**	No	No	**Yes**	No	**Yes**	No
Aug	**Yes**	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**
Sep	**Yes**	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	No
Oct	No	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**
Nov	**Yes**	**Yes**	No	**Yes**	No	No	**Yes**	**Yes**	**Yes**	No
Dec	**Yes**	**Yes**	No	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**
Annual Average	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

7. Sensitivity Analysis

To assess the sensitivity of the model predictions to changes in model parameter values, a sensitivity analysis was performed for the following parameters:

- COD Influent F_{bs}
- COD Influent F_{up}
- COD Influent F_{xsp}
- COD Influent F_{na}
- COD Influent F_{nus}
- COD Influent F_{nox}
- COD Influent F_{upN}
- Stoichiometric Common Parameter for Particulate Inert COD:VSS Ratio
- Stoichiometric Common Parameter for Particulate Substrate COD:VSS Ratio
- DO in aeration basins

In addition to the model parameters listed above, the model sensitivity of the ammonia oxidizer DO switching function and the DO concentration in the last zone was also assessed.

To perform the sensitivity analysis, a baseline steady state simulation was run using the calibrated model file without changing any parameter values used during the calibration. The model parameters listed above were then changed one at a time to +10% of the value used in the calibrated model, and a steady state simulation was rerun. The percent change in model predictions were then recorded for the following:

- Overall average MLSS in Zone D
- Overall average MLVSS:MLSS in Zone D
- WAS mass
- Secondary effluent TSS
- Secondary effluent Ammonia-N
- Secondary effluent Nitrate-N
- Secondary effluent Total-N
- Overall Oxygen Transfer Requirements

The exception to this +10% change is the Kinetic Parameter for Ammonia oxidizing DO half saturation switching function (which was set to the default value of 0.25) and the last zone DO concentration sensitivity (which was set equal to the same concentrations used in the other aerobic zones).

The results of the sensitivity analysis are provided in **Table 16**. The table shows the percent change in the predicted value for a +10% change in the parameter (or, in the case of DO, for setting DO in the Zone D equal to DO in the other zones). For example, increasing the biodegradable soluble COD fraction (F_{bs}) in the influent from 0.1373 to 0.1510 (+10% increase) results in an increase in steady state model-predicted secondary effluent TN of 0.48% (from 4.19 mg/L to 4.21 mg/L). Note that any variable differences < 0.1% are excluded from the table for simplicity.

As illustrated in Table 16, MLSS and WAS mass are most sensitivity to the Zone D DO concentration. Secondary effluent TN is most sensitive to the DO, Zone D DO, and the AOB DO switching function. Secondary effluent ammonia and secondary effluent nitrate are also very sensitive to these inputs. For example, a 10% increase in the DO concentration, predicted a secondary effluent nitrate increase from 0.14 mg/L to 0.26 mg/L.

Table 16. Summary of Sensitivity Analysis Results for Calibrated Model

Values in table are percent difference in predicted variable values (in columns) for a 10% increase in the model parameter listed (in rows), except for the AOB DO Switching function which was set to Biowin default and the DO in Zone D which was changed to match the DO in the remaining Zones. Any variable differences less than 0.1% are excluded from the table for simplicity.

		Model-Predicted Variable							
		MLSS (mg/L)	**MLVSS: MLSS**	**WAS Mass (lb/d)**	**Secondary Effluent TSS (mg/L)**	**Secondary Effluent Ammonia-N (mg/L)**	**Secondary Effluent Nitrate-N (mg/L)**	**Secondary Effluent Total-N (mg/L)**	**Oxygen Transfer Requirements (lb/hr)**
	Baseline Value	***5,348***	***0.803***	***2,438***	***3.11***	***2.72***	***0.14***	***4.19***	***7,732***
Parameters Changed for Sensitivity Analysis	Influent F_{bs}	0.67%		0.70%		-0.37%		0.48%	0.81%
	Influent F_{up}	1.58%	0.52%	1.60%		-0.37%	7.14%	0.48%	-1.16%
	Influent F_{ac}			0.11%		-0.37%			-0.14%
	Influent F_{xsp}	-2.21%	-0.27%	-2.19%	-0.32%		28.57%	1.91%	-2.28%
	Influent Fna	-0.19%		-0.18%		2.57%	7.14%	2.39%	0.30%
	Influent Fnos					-0.37%	-7.14%	1.43%	-0.04%
	Influent Fnox	0.10%		0.12%			-7.14%	-0.24%	-0.15%
	Influent FupN					-0.37%	-7.14%	-0.24%	-0.11%
	Inert COD:VSS	-1.18%	-0.28%	-1.19%					
	Substrate COD:VSS	-0.10%							
	DO	-1.10%	-0.14%	-1.11%		-30.88%	85.71%	-16.23%	0.50%
	AOB DO Switch	-1.09%	-0.13%	-1.07%		-73.16%	28.57%	-44.39%	1.33%
	Zone D DO	-8.68%	-0.18%	-8.67%	-0.96%	-96.32%	1000.00%	-44.63%	4.65%

Note, some of the model outputs appear quite sensitive to input parameters because the model is predicting a small baseline value and a small change appears to be a large percent. For example, secondary effluent ammonia-N appears to be very sensitive to input parameters however, the baseline value is only 2.72 mg/L. A change of 0.01 mg/L is a 0.37% change in the baseline and is above the cutoff of 0.1% for inclusion in Table 16.

8. Alternatives Modeled

Two loading scenarios were evaluated:

- **<u>Condition A: BNR + Conventional Treatment</u>**: the secondary system will be designed to achieve effluent NPDES limits (e.g. BOD_5 and TSS) in addition to the effluent TN load (362 lbs/day) under all flow and load conditions associated with the WWTP's projected 6.4 design capacity.

- **Condition B: Conventional Treatment:** the secondary system will be designed to achieve effluent NPDES limits (e.g. BOD_5 and TSS) under all flow and load conditions associated with the WWTP's permitted flow capacity of 10 mgd. The secondary system may not be able to achieve the effluent nitrogen permit limits under all these flow and load conditions.

To model future conditions, a dynamic daily dataset was required. A 1-year dynamic data set was developed for each of these Conditions as follows.

The historical daily influent generated as described above for the validation dataset was used to generate the projected future influent itinerary. Each day of historical loads was multiplied by the ratio of the projected future average load and historical average load (e.g. the BOD load on January 1 was multiplied by the ratio of the projected average BOD and historical average BOD load to estimate the future BOD load on January 1). This was done for each day in the 1-year itinerary and for each parameter of interest (BOD, TSS, and TKN).

The projected future daily loads were "capped" such that any projected load less than the design min day was set equal to the design min day and any projected load greater than maximum day was set equal to design maximum day. Subjectively determined "low" and "high" loads were then tweaked such that the statistics of the one-year projected data set matched design conditions. Flows and loads for "Condition A" are summarized in **Table 17a** and the projected itinerary is summarized in **Table 18a**. Flows and loads for "Condition B" are summarized in **Table 17b** and the projected itinerary is summarized in **Table 18b**.

Table 17a. Summary of Condition A Design Flow and Loads

Parameter	*Flow*	*BOD*	*TSS*	*TKN*
Minimum Day	3.3	3,000	2,300	800
Average Day	6.4	6,400	6,900	1,300
Maximum Month	9.3	8,700	13,000	1,900
Maximum Day	14.3	12,000	14,000	2,500

Table 18a. Summary of Condition A Dynamic Inventory Used for Alternatives Evaluation.

Parameter	*Flow*	*BOD*	*TSS*	*TKN*
Minimum Day	3.3	3,000	2,300	800
Average Day	6.4	6,385	6,906	1,326
Maximum Month	9.3	8,769	9,562	1,908
Maximum Day	14.3	12,000	14,000	2,500

Table 17b. Summary of Condition B Design Flow and Loads

Parameter	*Flow*	*BOD*	*TSS*	*TKN*
Minimum Day	3.3	4,800	3,600	1,300
Average Day	10.0	10,000	11,000	2,100
Maximum Month	14.6	14,000	20,000	2,900
Maximum Day	22.3	19,000	22,000	3,900

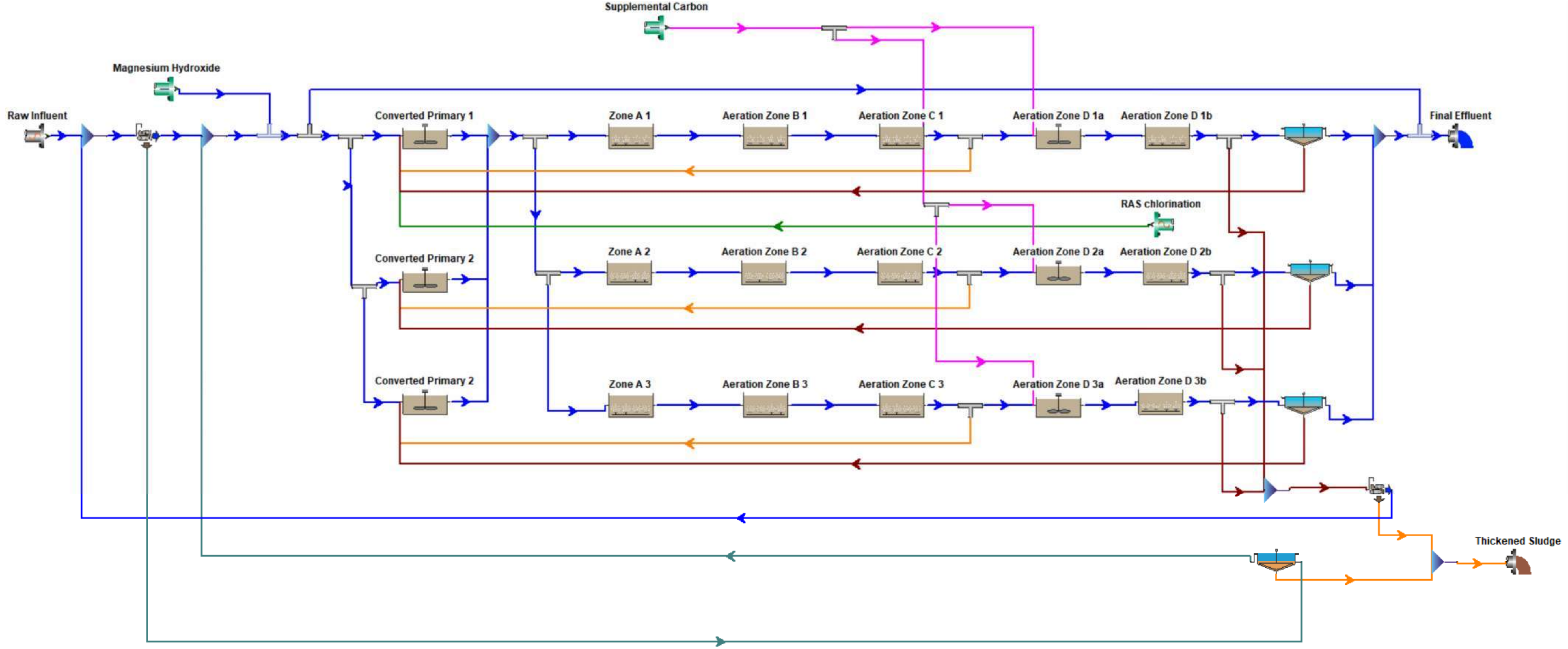
Table 18b. Summary of Condition B Dynamic Inventory Used for Alternatives Evaluation.

Parameter	*Flow*	*BOD*	*TSS*	*TKN*
Minimum Day	3.3	4,800	3,600	1,300
Average Day	10.2	10,088	11,609	2,123
Maximum Month	14.0	13,311	13,715	2,872
Maximum Day	22.3	19,000	22,000	3,900

The calibrated model was reconfigured as shown in **Figure 29**. Major differences include:

- Replacement of primary clarifiers with a ‘Separator - Dewatering Unit’ to represent new primary filtration. TSS capture was set at 85% with back wash equal to 12% of forward flow.
- Addition of new pre-anoxic tanks with configuration equal to the existing primary clarifiers.
- Splitting of Zone D in the aeration basin into a post-anoxic and reaeration zone.
- Addition of a ‘Influent - State Variable’ element with the concentration of readily biodegradable COD equal to 1,040,000 mg/L. Flow was controlled using the Biowin controller to maintain 1 mg/L nitrite+nitrate-N in the post anoxic effluent (Condition A only).
- Wasting from the aeration basin effluent (not final clarifier underflow) as this allows for less computationally intensive SRT control.
- Revision of SVI to 150 mL/g (K=0.287)
- Increase internal recycle to 8.5 MGD (two pumps per train at 2,963 gpm/pump).
- RAS (clarifier underflow) revised to 50% of forward flow.
- Influent itinerary developed as described above

Figure 29. BioWin Model Configuration



Model Predictions: Condition A

Without supplemental carbon addition to the post-anoxic, the Condition A model predicts an MLSS that varies from a low of approximately 600 mg/L to a high of approximately 2,300 mg/L. The modeled MLSS may be too low for effective settling as sludge that is too thin doesn't flocculate as well as a thicker sludge. Generally, the minimum recommended MLSS is 1,200 mg/L although this value changes from plant to plant. Due to the East Side WWTP's history of operating at very high MLSS, methods to enhance sludge settleability at model predicted very low MLSS should be considered in the design. This could be seasonal operation of the aeration tanks and taking tanks offline during period of low loading, or bypass of some primary influent around the new primary filters to increase loading to the secondary system. There may be other methods to enhance secondary clarifier performance which can be evaluated during detailed design.

Annual average effluent TN of 5.18 mg N/L which is equivalent to 276 ppd of TN at the design flow of 6.4 mgd. This is below the permitted load of 362 ppd. Without the post-anoxic, annual average effluent TN is 7.4 mg/L or 395 ppd. The post-anoxic zone is necessary to meet the total nitrogen limit can likely be met by endogenous decay. Supplemental carbon is likely not required to meet the permitted discharge, however this feed system will likely be included in the design as a contingency.

The carbon addition model to maintain a post anoxic effluent nitrate of 1 mg/L predicts that an annual average of 50 gpd supplemental carbon would be required with a 24-hr rolling average maximum of 320 gpd. Sizing and design of this feed system can occur as part of conceptual or preliminary design.

Model Predictions: Condition B

For Condition B design criteria the model predicts an MLSS that varies from a low of approximately 600 mg/L to a high of approximately 3,100 mg/L. Annual average effluent TN of 7.8 mg N/L, but conventional secondary treatment objectives (30 mg/L BOD and TSS) are met.

9. Summary

As described above, the calibrated and validated process model developed for the East Side WWTP can be used for evaluating how variations in flow and loading affect the treatment processes, as well as in support alternatives analysis. Before being applied to design of future improvements, however, additional data collection is recommended to better define the long-term average COD:BOD and BOD:TKN ratio for the influent wastewater.

Appendix M

Plant Staffing Charts

CHAPTER 8

CHARTS: 24/7 PLANT

The charts on the following pages apply to publicly and privately owned wastewater treatment facilities where operators are present seven days a week, 24 hours a day. To arrive at the numbers on the charts, the daily hour estimates for a task were multiplied by 365 to determine annual hours.

CHART 1 (24/7 Plant)
BASIC AND ADVANCED OPERATIONS AND PROCESSES

	Flow						
Process	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**	**Total Hours for Plant**
Preliminary Treatment	182.5	182.5	365	730	1095	1460	1460
Primary Clarification (mult. by # of units)	182.5	182.5	182.5	365	365	365 11	4015
Activated Sludge	730	1460	2190	2190-2920	2920-3650	8760	
Activated Sludge w/BNR	1095	2190	2920	3285-4380	4380-8760	10220	10220
Rotating Biological Contactor	365	547.5-1095	1095-2190	2190	X	X	
Sequencing Batch Reactor (per tank)	365	365	365	365	365	365	
Extended Aeration (w/o primary)	912.5	1825	2920	X	X	X	
Extended Aeration w/BNR	1277.5	2555	3650	X	X	X	
Pure Oxygen Facility	X	X	X	2920-3650	3650	6570	
Pure Oxygen Facility w/BNR	X	X	X	3650-5475	5475	8760	
Trickling Filter	365	365	730	1095	1460	2920	
Oxidation Ditch (w/o primary)	912.5	1825	2920	X	X	X	
Oxidation Ditch w/BNR	1277.5	2555	3650	X	X	X	
Aeration Lagoon	547.5	547.5	547.5	X	X	X	
Stabilization Pond	365	365	365	X	X	X	
Innovative Alternative Technologies	730	1095	X	X	X	X	
Nitrification	91.25	91.25	182.5	182.5	365	730	
Denitrification	91.25	91.25	182.5	182.5	365	730	
Phosphorus Removal (Biological)	91.25	91.25	182.5	182.5	365	730	

Continued on page 48

CHART 1 (24/7 Plant) *continued*

BASIC AND ADVANCED OPERATIONS AND PROCESSES

	Flow						
Process	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**	**Total Hours for Plant**
Phosphorus Removal (Chemical/Physical)	91.25	182.5	365	730	1095	1460	
Membrane Processes	91.25	91.25	182.5	182.5	365	365	
Cloth Filtration	91.25	91.25	182.5	182.5	182.5	182.5	
Granular Media Filters (Carbon, sand, anthracite, garnet)	182.5	365	365	547.5	547.5	1095	
Water Reuse	91.25	91.25	182.5	182.5	182.5	182.5	
Plant Reuse Water	36.5	36.5	36.5	54.75	91.25	91.25	
Chlorination	182.5	182.5	365	365	365	365	
Dechlorination	182.5	182.5	365	365	365	365	
Ultraviolet Disinfection	182.5	182.5	365	365	365	365	365
Wet Odor Control (mult. by # of systems)	182.5	182.5	365	365	365	365	
Dry Odor Control (mult. by # of systems)	91.25	91.25	182.5	182.5	182.5	182.5 3	548
Septage Handling	182.5	182.5	365	365	365	365	365
TOTAL							16973

- Activated Sludge process includes RAS and WAS pumping.
- Secondary Clarification has been built into basic operations processes.

CHART 2 (24/7 Plant)
MAINTENANCE

	Flow							
Activity	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**	**Multiply by**	**Total Hours for Plant**
Manually Cleaned Screens	91.25	91.25	91.25	91.25	182.5	365	# of screens	
Mechanically Cleaned Screens	91.25	91.25	91.25	365	1095	1460	# of screens	
Mechanically Cleaned Screens with grinders/ washer/compactors	91.25	182.5	365	730	1460	1825 10	# of screens	18250
Comminutors/ Macerators	91.25	91.25	91.25	182.5	273.75	365	# of units	
Aerated Grit Chambers	36.5	36.5	91.25	182.5	273.75	365	# of chambers	
Vortex Grit Removal	36.5	36.5	91.25	182.5	273.75	365 5	# of units	1825
Gravity Grit Removal	36.5	36.5	54.75	73	91.25	182.5	# of units	
Additional Process Tanks	36.5	36.5	36.5	36.5	36.5	36.5	# of tanks	
Chemical Addition (varying dependent upon degree of treatment)	36.5	36.5	36.5	36.5-109.5	109.5-219	292	# of chemicals added for processes	292
Circular Clarifiers	91.25	91.25	182.5	182.5	273.75	365	# of clarifiers	
Chain and Flight Clarifiers	91.25	91.25	182.5	182.5	273.75	365 3	# of clarifiers	1095
Traveling Bridge Clarifiers	X	X	X	X	273.75	365	# of clarifiers	
Squircle Clarifiers	91.25	91.25	182.5	182.5	273.75	365	# of clarifiers	
Pumps	100	100	250	500	750	1500	X	1500
Rotating Biological Contactor	54.75	54.75	91.25	91.25	X	X	# of trains	
Trickling Filters	54.75	54.75	54.75	91.25	146	182.5	# of TFs	
Sequencing Batch Reactor	54.75	54.75	54.75	91.25	146	182.5	# of tanks	
Mechanical Mixers	36.5	36.5	36.5	36.5	54.75	73	# of mixers	
Aeration Blowers	73	73	73	73	109.5	146 5	# of blowers	730
Membrane Bioreactor	36.5	36.5	36.5	73	109.5	146	# of cartridges	

Continued on page 50

CHART 2 (24/7 Plant) *continued*

MAINTENANCE

	Flow							
Activity	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**	**Multiply by**	**Total Hours for Plant**
Subsurface Disposal System	36.5	36.5	36.5	36.5	109.5	146	# of systems	
Groundwater Discharge	36.5	36.5	36.5	36.5	54.75	73	X	
Aerobic Digestion	36.5	36.5	36.5	36.5	54.75	73	# of digesters	
Anaerobic Digestion	X	73	73	109.5	219	365	# of digesters	
Gravity Thickening	36.5	36.5	36.5	36.5	109.5	146 2	# of basins	292
Gravity Belt Thickening	54.75	54.75	54.75	91.25	146	182.5	# of belts	183
Belt Press	54.75	54.75	54.75	91.25	146	182.5	# of presses	
Mechanical Dewatering (Plate Frame and Centrifuges)	54.75	54.75	54.75	91.25	146	182.5	# of units	
Dissolved Air Floatation	X	36.5	36.5	36.5	109.5	146	# of units	
Chlorination (gas)	36.5	36.5	36.5	73	109.5	146	X	
Chlorination (liq.)	73	73	73	109.5	164.25	219	X	
Dechlorination (gas)	36.5	36.5	36.5	73	109.5	146	X	
Dechlorination (liq.)	73	73	73	109.5	164.25	219	X	
Ultraviolet	36.5	36.5	36.5	54.75	91.25	109.5	# of racks	3942
Biofilter	182.5	182.5	182.5	182.5	182.5	182.5 36	# of units	
Activated Carbon	182.5	182.5	182.5	273.75	273.75	365 3	# of units	1095
Wet Scrubbers	X	X	X	54.75	91.25	109.5	# of units	
Microscreens	36.5	36.5	36.5	54.75	91.25	109.5	# of screens	
Pure Oxygen	X	X	X	73	109.5	146	# of units	
Final Sand Filters	73	73	73	73	109.5	219	# of units	
Probes/ Instrumentation/ Calibration	36.5	36.5	36.5	36.5	36.5	36.5	# of probes in-line	
TOTAL								29204

CHART 3 (24/7 Plant)
LABORATORY OPERATIONS

	How often are tests run?				
Test Required by Permit	**Testing Time (hrs.)**	**Tested Weekly X 52**	**Tested Monthly X 12**	**Tested Quarterly X 4**	**Annual Hours**
Acidity	0.75				
Alkalinity, total	0.75	2			78
Biochemical Oxygen Demand (BOD)	2.5	3			390
Chemical Oxygen Demand (COD)	2.5				
Chloride	0.5				
Chlorine, Total Residual	0.25				
Coliform, Total, Fecal, E.Coli	1.0	3			156
Dissolved Oxygen (DO)	0.25	5			65
Hydrogen Ion (pH)	0.25	5			65
Metals	3.0	1			156
Toxicity	2.0		1		24
Ammonia	2.0	3			312
Total Nitrogen	2.0	3			312
Oil and Grease	3.0				
Total and Dissolved Phosphorus	2.0	1			104
Solids, Total, Dissolved, and Suspended	3.0	3			468
Specific Conductance	0.25				
Sulfate	1.0				
Surfactants	1.0				
Temperature	0.25	5			65
Total Organic Carbon (TOC)	0.25				
Turbidity	0.25				
Bacteriological Enterococci	1.0	3			156
Lab QA/QC Program	1.0				
Process Control Testing	3.0				
Sampling for Contracted Lab Services	0.25				
Sampling for Monitoring Groundwater Wells	0.5				
TOTAL					2351

CHART 4 (24/7 Plant)
BIOSOLIDS/SLUDGE HANDLING

	Flow					
Process	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**
Belt Press	365	1095	2190	2920	2920	2920/shift
Plate & Frame Press	365	547.5	1095	2920	2920	2920
Gravity Thickening	91.25	91.25	182.5	182.5	365	365
Gravity Belt Thickening	91.25	91.25	182.5	182.5	365	730
Rotary Press	91.25	91.25	182.5	182.5	365	730
Dissolved Air Floatation	X	182.5	182.5	365	365	365
Alkaline Stabilization	91.25	91.25	91.25	91.25	91.25	91.25
Aerobic Digestion	182.5	182.5	182.5	365	547.5	730
Anaerobic Digestion	91.25	91.25	182.5	547.5	912.5	1460
Centrifuges	365	365	1095	2920	2920	2920
Composting	365	730-1095	1460	2920	2920	2920/shift
Incineration	X	X	X	X	8760	8760
Air Drying – Sand Beds	182.5	182.5	X	X	X	X
Land Application	91.25	182.5	182.5	X	X	X
Transported Off-Site for Disposal	91.25	365	1460	2920	2920	2920
Static Dewatering	365	365	X	X	X	X
TOTAL						4015

CHART 5 (24/7 Plant)
YARDWORK

	Size of Plant			
Work Done	**Small**	**Average**	**Large**	**Total Hours for Plant**
Janitorial/Custodial Staff	100	200	400	400
Snow Removal	60	120	400	400
Mowing	100	120	400	
Vehicle Maintenance (per vehicle)	25	25	25	
Facility Painting	60	80	160	
Rust Removal	60	80	160	
TOTAL				800

CHART 6 (24/7 Plant)
AUTOMATION/SCADA

Type of Automation	Yes	No
Automated attendant or Interactive voice recognition (IVR) equipment		X
Automated Meter Reading (AMR), Touchpad meters or other automated metering technology		X
Automatic call director (ACD)		X
Billing system		X
Computerized facilities management (FM) system	X	
Computerized preventative maintenance		X
Computerized recordkeeping		X
E-mail	X	
Geographical information system (GIS)	X	
Integrated purchasing and inventory		X
Internet website	X	
Laboratory information management system (LIMS)		X
Local area network (LAN)	X	
Supervisory control and data acquisition (SCADA)	X	
Telemetry	X	
Utility customer information system (CIS) package		X

CHART 7 (24/7 Plant)

CONSIDERATIONS FOR ADDITIONAL PLANT STAFFING

• Management responsibilities (i.e., human resources, budgeting, outreach, training, town/city meetings, scheduling, etc.) and responsibility for clerical duties (i.e., billing, reports, correspondence, phones, time sheets, mailings, etc.)	X
• Plant staff responsible for collection system operation and maintenance, pump station inspections, and/or combined sewer overflows	X
• Plant operators responsible for snow plowing, road/sidewalk repair, or other municipal project	
• Plant staff involved in generating additional energy	
• Plant receives an extra high septage and/or grease load (higher than designed organic and grease loadings) or plant takes in sludge from other treatment plants	
• Plant is producing a Class A Biosolid product	
• Plant operators responsible for operating generators and emergency power	
• Plant responsible for industrial pre-treatment program	
• Plant staff responsible for plant upgrades and large projects done both on-site and off-site (i.e., collection systems, manholes, etc.)	
• Plant operators responsible for machining parts on-site	
• Age of plant and equipment (over 15 years of age)	X

All management and collections system staff to be excluded from this assessment.

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THE NORTHEAST GUIDE FOR ESTIMATING STAFFING AT PUBLICLY AND PRIVATELY OWNED WASTEWATER TREATMENT PLANTS (24/7 Plant)

Plant Name: West Side WWTP

Design Flow: 30 mgd **Actual Flow:** 22.1 mgd

FINAL ESTIMATES

Chart #	**Annual Hours**
1 – Basic and Advanced Operations and Processes	16973
2 – Maintenance	29204
3 – Laboratory Operations	2351
4 – Biosolids/Sludge Handling	4015
5 – Yardwork	800
Estimated Operation and Maintenance Hours	53343
Estimated Operation and Maintenance Staff	36
Estimated Additional Staff from Chart 7	0
Total Staffing Estimate	36

- Divide the total of Annual Hours by 1500 hours per year to get the Estimated Operation and Maintenance Staff needed to operate the plant. This assumes 5-day work week; 29 days of vacation, sick leave, holidays; and 6.5 hours per day of productive work.

Note: The estimate from Charts 1-5 will not be the final amount of staff necessary to run the facility. Please review Chart 7 for additional staffing needs.

Chart 6 – Automation/SCADA (List all “yes” answers from Chart 6.)

Chart 7 – Considerations for Additional Plant Staffing (List all “yes” answers from Chart 7.)
Attach supporting information to justify additional staffing needs from Chart 7.

All management and collections system staff to be excluded from this assessment as they are accounted for separately in contract operator agreement.

CHAPTER 8

CHARTS: 24/7 PLANT

The charts on the following pages apply to publicly and privately owned wastewater treatment facilities where operators are present seven days a week, 24 hours a day. To arrive at the numbers on the charts, the daily hour estimates for a task were multiplied by 365 to determine annual hours.

CHART 1 (24/7 Plant)
BASIC AND ADVANCED OPERATIONS AND PROCESSES

	Flow						
Process	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**	**Total Hours for Plant**
Preliminary Treatment	182.5	182.5	365	730	1095	1460	1095
Primary Clarification (mult. by # of units)	182.5	182.5	182.5	365	365 5	365	1825
Activated Sludge	730	1460	2190	2190-2920	2920-3650	8760	
Activated Sludge w/BNR	1095	2190	2920	3285-4380	4380-8760	10220	4380
Rotating Biological Contactor	365	547.5-1095	1095-2190	2190	X	X	
Sequencing Batch Reactor (per tank)	365	365	365	365	365	365	
Extended Aeration (w/o primary)	912.5	1825	2920	X	X	X	
Extended Aeration w/BNR	1277.5	2555	3650	X	X	X	
Pure Oxygen Facility	X	X	X	2920-3650	3650	6570	
Pure Oxygen Facility w/BNR	X	X	X	3650-5475	5475	8760	
Trickling Filter	365	365	730	1095	1460	2920	
Oxidation Ditch (w/o primary)	912.5	1825	2920	X	X	X	
Oxidation Ditch w/BNR	1277.5	2555	3650	X	X	X	
Aeration Lagoon	547.5	547.5	547.5	X	X	X	
Stabilization Pond	365	365	365	X	X	X	
Innovative Alternative Technologies	730	1095	X	X	X	X	
Nitrification	91.25	91.25	182.5	182.5	365	730	
Denitrification	91.25	91.25	182.5	182.5	365	730	
Phosphorus Removal (Biological)	91.25	91.25	182.5	182.5	365	730	

Continued on page 48

CHART 1 (24/7 Plant) *continued*
BASIC AND ADVANCED OPERATIONS AND PROCESSES

	Flow						
Process	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**	**Total Hours for Plant**
Phosphorus Removal (Chemical/Physical)	91.25	182.5	365	730	1095	1460	
Membrane Processes	91.25	91.25	182.5	182.5	365	365	
Cloth Filtration	91.25	91.25	182.5	182.5	182.5	182.5	
Granular Media Filters (Carbon, sand, anthracite, garnet)	182.5	365	365	547.5	547.5	1095	
Water Reuse	91.25	91.25	182.5	182.5	182.5	182.5	
Plant Reuse Water	36.5	36.5	36.5	54.75	91.25	91.25	
Chlorination	182.5	182.5	365	365	365	365	
Dechlorination	182.5	182.5	365	365	365	365	
Ultraviolet Disinfection	182.5	182.5	365	365	365	365	365
Wet Odor Control (mult. by # of systems)	182.5	182.5	365	365	365	365	
Dry Odor Control (mult. by # of systems)	91.25	91.25	182.5	182.5	182.5 3	182.5	548
Septage Handling	182.5	182.5	365	365	365	365	
TOTAL							8213

- Activated Sludge process includes RAS and WAS pumping.
- Secondary Clarification has been built into basic operations processes.

CHART 2 (24/7 Plant)
MAINTENANCE

	Flow							
Activity	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**	**Multiply by**	**Total Hours for Plant**
Manually Cleaned Screens	91.25	91.25	91.25	91.25	182.5	365	# of screens	
Mechanically Cleaned Screens	91.25	91.25	91.25	365	1095	1460	# of screens	
Mechanically Cleaned Screens with grinders/ washer/compactors	91.25	182.5	365	730	1460 6	1825	# of screens	8760
Comminutors/ Macerators	91.25	91.25	91.25	182.5	273.75	365	# of units	
Aerated Grit Chambers	36.5	36.5	91.25	182.5	273.75	365	# of chambers	
Vortex Grit Removal	36.5	36.5	91.25	182.5	273.75 2	365	# of units	548
Gravity Grit Removal	36.5	36.5	54.75	73	91.25	182.5	# of units	
Additional Process Tanks	36.5	36.5	36.5	36.5	36.5	36.5	# of tanks	
Chemical Addition (varying dependent upon degree of treatment)	36.5	36.5	36.5	36.5-109.5	109.5-219	292	# of chemicals added for processes	110
Circular Clarifiers	91.25	91.25	182.5	182.5	273.75	365	# of clarifiers	
Chain and Flight Clarifiers	91.25	91.25	182.5	182.5	273.75 3	365	# of clarifiers	821
Traveling Bridge Clarifiers	X	X	X	X	273.75	365	# of clarifiers	
Squircle Clarifiers	91.25	91.25	182.5	182.5	273.75	365	# of clarifiers	
Pumps	100	100	250	500	750	1500	X	750
Rotating Biological Contactor	54.75	54.75	91.25	91.25	X	X	# of trains	
Trickling Filters	54.75	54.75	54.75	91.25	146	182.5	# of TFs	
Sequencing Batch Reactor	54.75	54.75	54.75	91.25	146	182.5	# of tanks	
Mechanical Mixers	36.5	36.5	36.5	36.5	54.75	73	# of mixers	
Aeration Blowers	73	73	73	73	109.5 4	146	# of blowers	438
Membrane Bioreactor	36.5	36.5	36.5	73	109.5	146	# of cartridges	

Continued on page 50

CHART 2 (24/7 Plant) *continued*

MAINTENANCE

	Flow							
Activity	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**	**Multiply by**	**Total Hours for Plant**
Subsurface Disposal System	36.5	36.5	36.5	36.5	109.5	146	# of systems	
Groundwater Discharge	36.5	36.5	36.5	36.5	54.75	73	X	
Aerobic Digestion	36.5	36.5	36.5	36.5	54.75	73	# of digesters	
Anaerobic Digestion	X	73	73	109.5	219	365	# of digesters	
Gravity Thickening	36.5	36.5	36.5	36.5	109.5 2	146	# of basins	219
Gravity Belt Thickening	54.75	54.75	54.75	91.25	146	182.5	# of belts	146
Belt Press	54.75	54.75	54.75	91.25	146	182.5	# of presses	
Mechanical Dewatering (Plate Frame and Centrifuges)	54.75	54.75	54.75	91.25	146	182.5	# of units	
Dissolved Air Floatation	X	36.5	36.5	36.5	109.5	146	# of units	
Chlorination (gas)	36.5	36.5	36.5	73	109.5	146	X	
Chlorination (liq.)	73	73	73	109.5	164.25	219	X	
Dechlorination (gas)	36.5	36.5	36.5	73	109.5	146	X	
Dechlorination (liq.)	73	73	73	109.5	164.25	219	X	
Ultraviolet	36.5	36.5	36.5	54.75	91.25	109.5	# of racks	2190
Biofilter	182.5	182.5	182.5	182.5	182.5 24	182.5	# of units	
Activated Carbon	182.5	182.5	182.5	273.75	273.75 3	365	# of units	821
Wet Scrubbers	X	X	X	54.75	91.25	109.5	# of units	
Microscreens	36.5	36.5	36.5	54.75	91.25	109.5	# of screens	
Pure Oxygen	X	X	X	73	109.5	146	# of units	
Final Sand Filters	73	73	73	73	109.5	219	# of units	
Probes/ Instrumentation/ Calibration	36.5	36.5	36.5	36.5	36.5	36.5	# of probes in-line	
TOTAL								14803

CHART 3 (24/7 Plant)
LABORATORY OPERATIONS

	How often are tests run?				
Test Required by Permit	**Testing Time (hrs.)**	**Tested Weekly X 52**	**Tested Monthly X 12**	**Tested Quarterly X 4**	**Annual Hours**
Acidity	0.75				
Alkalinity, total	0.75	2			78
Biochemical Oxygen Demand (BOD)	2.5	3			390
Chemical Oxygen Demand (COD)	2.5				
Chloride	0.5				
Chlorine, Total Residual	0.25				
Coliform, Total, Fecal, E.Coli	1.0	3			156
Dissolved Oxygen (DO)	0.25	5			65
Hydrogen Ion (pH)	0.25	5			65
Metals	3.0	1			156
Toxicity	2.0		1		24
Ammonia	2.0	3			312
Total Nitrogen	2.0	3			312
Oil and Grease	3.0				
Total and Dissolved Phosphorus	2.0	1			104
Solids, Total, Dissolved, and Suspended	3.0	3			468
Specific Conductance	0.25				
Sulfate	1.0				
Surfactants	1.0				
Temperature	0.25	5			65
Total Organic Carbon (TOC)	0.25				
Turbidity	0.25				
Bacteriological Enterococci	1.0	3			156
Lab QA/QC Program	1.0				
Process Control Testing	3.0				
Sampling for Contracted Lab Services	0.25				
Sampling for Monitoring Groundwater Wells	0.5				
TOTAL					2351

CHART 4 (24/7 Plant)
BIOSOLIDS/SLUDGE HANDLING

	Flow					
Process	**0.25-0.5 mgd**	**0.5-1.0 mgd**	**1.0-5.0 mgd**	**5.0-10.0 mgd**	**10.0-20.0 mgd**	**>20 mgd**
Belt Press	365	1095	2190	2920	2920	2920/shift
Plate & Frame Press	365	547.5	1095	2920	2920	2920
Gravity Thickening	91.25	91.25	182.5	182.5	365	365
Gravity Belt Thickening	91.25	91.25	182.5	182.5	365	730
Rotary Press	91.25	91.25	182.5	182.5	365	730
Dissolved Air Floatation	X	182.5	182.5	365	365	365
Alkaline Stabilization	91.25	91.25	91.25	91.25	91.25	91.25
Aerobic Digestion	182.5	182.5	182.5	365	547.5	730
Anaerobic Digestion	91.25	91.25	182.5	547.5	912.5	1460
Centrifuges	365	365	1095	2920	2920	2920
Composting	365	730-1095	1460	2920	2920	2920/shift
Incineration	X	X	X	X	8760	8760
Air Drying – Sand Beds	182.5	182.5	X	X	X	X
Land Application	91.25	182.5	182.5	X	X	X
Transported Off-Site for Disposal	91.25	365	1460	2920	2920	2920
Static Dewatering	365	365	X	X	X	X
TOTAL						3650

CHART 5 (24/7 Plant)
YARDWORK

	Size of Plant			
Work Done	**Small**	**Average**	**Large**	**Total Hours for Plant**
Janitorial/Custodial Staff	100	200	400	200
Snow Removal	60	120	400	120
Mowing	100	120	400	
Vehicle Maintenance (per vehicle)	25	25	25	
Facility Painting	60	80	160	
Rust Removal	60	80	160	
TOTAL				320

CHART 6 (24/7 Plant)
AUTOMATION/SCADA

Type of Automation	Yes	No
Automated attendant or Interactive voice recognition (IVR) equipment		X
Automated Meter Reading (AMR), Touchpad meters or other automated metering technology		X
Automatic call director (ACD)		X
Billing system		X
Computerized facilities management (FM) system	X	
Computerized preventative maintenance		X
Computerized recordkeeping		X
E-mail	X	
Geographical information system (GIS)	X	
Integrated purchasing and inventory		X
Internet website	X	
Laboratory information management system (LIMS)		X
Local area network (LAN)	X	
Supervisory control and data acquisition (SCADA)	X	
Telemetry	X	
Utility customer information system (CIS) package		X

CHART 7 (24/7 Plant)
CONSIDERATIONS FOR ADDITIONAL PLANT STAFFING

• Management responsibilities (i.e., human resources, budgeting, outreach, training, town/city meetings, scheduling, etc.) and responsibility for clerical duties (i.e., billing, reports, correspondence, phones, time sheets, mailings, etc.)	X
• Plant staff responsible for collection system operation and maintenance, pump station inspections, and/or combined sewer overflows	X
• Plant operators responsible for snow plowing, road/sidewalk repair, or other municipal project	
• Plant staff involved in generating additional energy	
• Plant receives an extra high septage and/or grease load (higher than designed organic and grease loadings) or plant takes in sludge from other treatment plants	
• Plant is producing a Class A Biosolid product	
• Plant operators responsible for operating generators and emergency power	
• Plant responsible for industrial pre-treatment program	
• Plant staff responsible for plant upgrades and large projects done both on-site and off-site (i.e., collection systems, manholes, etc.)	
• Plant operators responsible for machining parts on-site	
• Age of plant and equipment (over 15 years of age)	X

All management and collections system staff to be excluded from this assessment.

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THE NORTHEAST GUIDE FOR ESTIMATING STAFFING AT PUBLICLY AND PRIVATELY OWNED WASTEWATER TREATMENT PLANTS (24/7 Plant)

Plant Name: East Side WWTP

Design Flow: 10 mgd **Actual Flow:** 5.7 mgd

FINAL ESTIMATES	
Chart #	**Annual Hours**
1 – Basic and Advanced Operations and Processes	8213
2 – Maintenance	14803
3 – Laboratory Operations	2351
4 – Biosolids/Sludge Handling	3650
5 – Yardwork	320
Estimated Operation and Maintenance Hours	29337
Estimated Operation and Maintenance Staff	20
Estimated Additional Staff from Chart 7	0
Total Staffing Estimate	20

- Divide the total of Annual Hours by 1500 hours per year to get the Estimated Operation and Maintenance Staff needed to operate the plant. This assumes 5-day work week; 29 days of vacation, sick leave, holidays; and 6.5 hours per day of productive work.

Note: The estimate from Charts 1-5 will not be the final amount of staff necessary to run the facility. Please review Chart 7 for additional staffing needs.

Chart 6 – Automation/SCADA (List all "yes" answers from Chart 6.)

Chart 7 – Considerations for Additional Plant Staffing (List all "yes" answers from Chart 7.)
Attach supporting information to justify additional staffing needs from Chart 7.

All management and collections system staff to be excluded from this assessment as they are accounted for separately in contract operator agreement.

Appendix N

Energy Efficiency Study

TECHNICAL MEMORANDUM

To: CDM Smith

From: JKMuir, LLC

Subject: City of Bridgeport Facilities Planning
East Side and West Side WWTPs
Energy Efficiency Opportunities & Funding Sources

Date: July 2020

EXECUTIVE SUMMARY

This memorandum provides an overview of the energy usage of the Bridgeport East Side and West Side Wastewater Treatment Plants (WWTPs). The East Side WWTP is located at 695 Seaview Avenue and the West Side WWTP is located at 205 Bostwick Avenue. An energy balance for each facility is presented which estimates the energy usage that can be attributed to each unit process in the facilities. Using the energy balance, unit processes where significant gains could be achieved in energy efficiency were identified. Finally, information about the energy efficiency incentive program through the local electric utility is also provided. These programs can be utilized to offset the capital cost of installing efficient process system and building systems, and it is anticipated that portions of the proposed plant upgrades will be eligible for funding.

The objectives of the technical memorandum include the following:

- Review past energy consumption at each WWTP and identify areas where significant gains could be achieved in energy efficiency through the selection of functionally equivalent, yet different equipment.
- Perform an energy evaluation of the plants by collecting readily available energy usage and equipment data and develop an energy balance and energy efficiency recommendations.
- Provide guidance for Energy Conscious Design Considerations for all aspects of a typical WWTP with considerations for pumping, aeration, lighting, standby power, HVAC, electrical distribution equipment, automation, and disinfection.
- Provide a summary of available energy incentive programs with a description of eligibility criteria, application procedures, and funding potential.
- Provide copies of blank application forms for available incentive programs along with a narrative describing the general application process.

ENERGY USAGE SUMMARY

The energy usage summary shown below provides an overview of annual electrical usage (kWh), as well as annual electric costs based on billing information provided by facility staff from July 2017 to January 2020. The data for an average 12-month period is summarized below.

Table 1. Energy Usage and Cost Summary

Location	Average Monthly Usage (kWh)	Average Monthly Cost ($)	Annual Energy Usage (kWh)	Annual Cost ($)	Unit Cost ($/kWh)
East Side WWTP	440,352	$58,697	5,284,219	$704,361	$0.133
West Side WWTP	832,594	$117,484	9,991,123	$1,409,809	$0.141

Note:

1. Energy usage and cost data from July 2017 to January 2020 billing data provided by facility staff.

The East and West Side WWTPs monthly electrical usage from July 2017 to January 2020 are presented in the figure below.

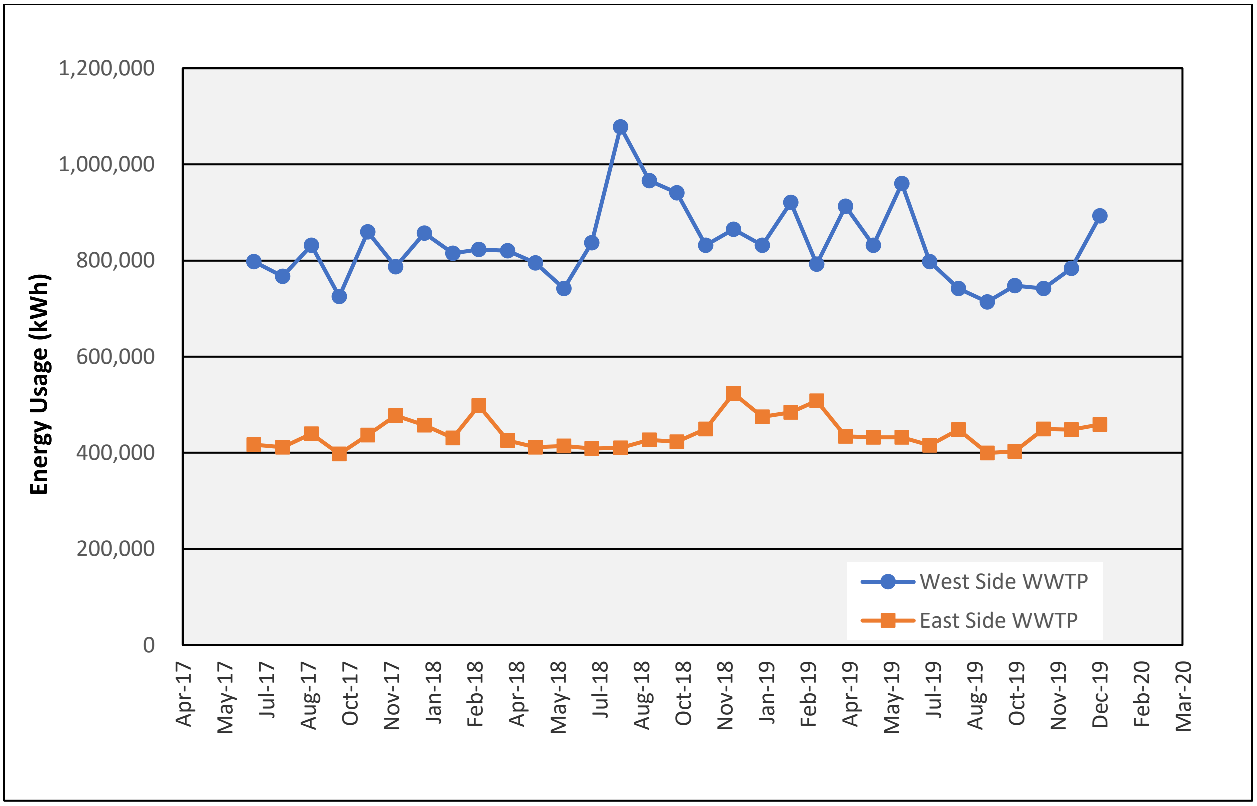

Figure 1. Historic Energy Usage

Rate Structure

The East Side and West Side facilities are billed for electricity by two companies: UI and Constellation. The charges from UI are associated with the electric grid infrastructure used to deliver the electricity from the energy generation facility to the treatment plants. The charges from Constellation are associated with the generation of electricity and are based on the amount of electricity the treatment plants use on a monthly basis.

The East Side and West Side facilities are billed under UI's Large Power Time-of-Day (LPT) rate for delivery and transmission costs related to electric grid infrastructure. The current billing structure consists of a flat fee of $345.49 for the distribution service, summer and winter transmission rates of $10.24/kW and $8.20/kW respectively based on on-peak kW usage, and a distribution demand rate of $11.35 also based on the on-peak kW and excess off and shoulder peak kW. Based on the current UI rate schedule, the peak period is between 10 AM and 6 PM during weekdays. The on-peak demand is defined as the greatest demand registered during the on-peak hours of the month, but not less than 80% of the preceding months of June through September. Off-peak usage is between 11 PM to 7 AM weekdays and all weekend hours. Shoulder usage is between 7 AM to 10 AM weekdays and 6 PM to 11PM weekdays. Under this rate structure summer months are considered June through September and winter months are considered January to May and October to December.

The City of Bridgeport has a third-party contract with Constellation Energy for energy supply. The contract lasts 36-months; it started in December 2017 and ends in December 2020. Under the contract the energy generation rate for various municipal buildings including the East Side and West Side WWTPs is $0.0805 per kWh.

Based on the on and off-peak demand rate structure, operations at the facilities that can be feasibly completed before 10 AM or initiated after 6 PM may result in demand charge savings. A comparison of the monthly cost breakdown for the UI rate shows the WWTPs can expect monthly savings by shifting the kW demand to the off-peak and shoulder times, particularly during the months of June through September. The facility would see savings if the off-peak usage does not result in a demand higher than the on-peak values. Please note it may not be feasible to move some high demand activities to off-peak hours, such as pumping and aeration demands.

Wastewater Energy Use Benchmark

The figure below shows the energy usage per million gallons treated for the Bridgeport East and West WWTPs compared to other municipal WWTPs primarily in Connecticut, Massachusetts, and Rhode Island that JKMuir has worked with previously. The figure demonstrates how the energy usage of Bridgeport WWTPs compares to plants with similar flowrates.

East Side WWTP Energy Use Benchmark

Based on facility monthly operating reports from January 1, 2019 to December 31, 2019 the East Side WWTP treats an average of 5.9 million gallons per day (MGD), and a calculated total of approximately 2,171 million gallons a year. Based on the electrical energy usage presented above, the plant consumes approximately 2,154 kWh per million gallons treated.

West Side WWTP Energy Use Benchmark

Based on facility monthly operating reports from January 1, 2019 to December 31, 2019 the West Side WWTP treats an average of 24.9 million gallons per day (MGD), and a calculated total of approximately 9,075 million gallons a year. Based on the electrical energy usage presented above, the plant consumes approximately 1,099 kWh per million gallons treated.

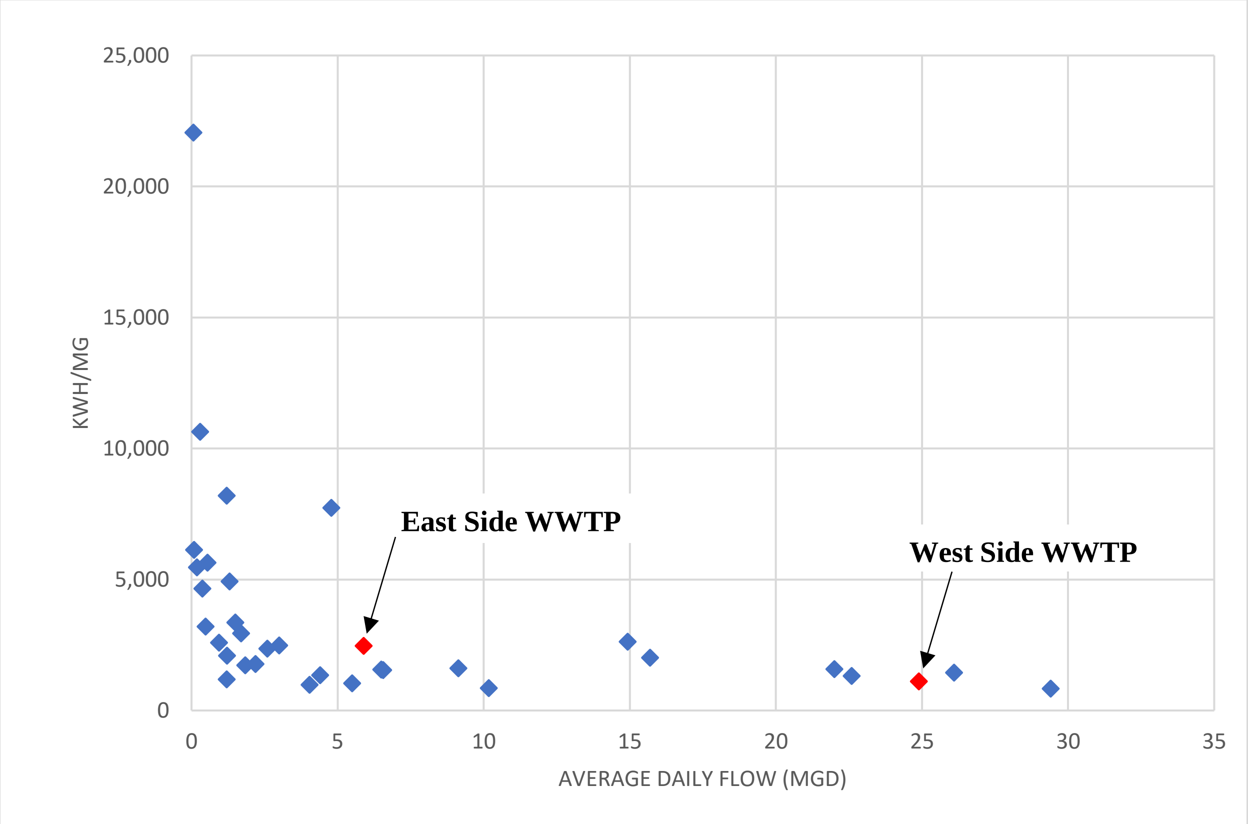

Figure 2. East & West Side WWTP Wastewater Benchmark

The figure above demonstrates that the Bridgeport East WWTP consumes slightly more energy compared to other plants with similar flowrates (around 6 MGD) and the Bridgeport West plant consumes a similar amount of energy compared to other plants with similar flowrates (around 25 MGD).

ENERGY BALANCE

An energy balance was developed in order to determine how power is utilized through the facilities and which unit processes draw the most significant amounts of power. The energy balance includes a comprehensive list of unit process equipment and the installed horsepower. The annual energy usage (kWh) is calculated for each process by using an estimated loading and typical hours of operation. The tables showing the detailed electrical energy end usage reconciliation are provided in Appendix A and B for the East Side and West Side WWTPs, respectively. A summary of the breakdown of electrical energy usage attributed to the major processes systems at each facility is shown in the figures below.

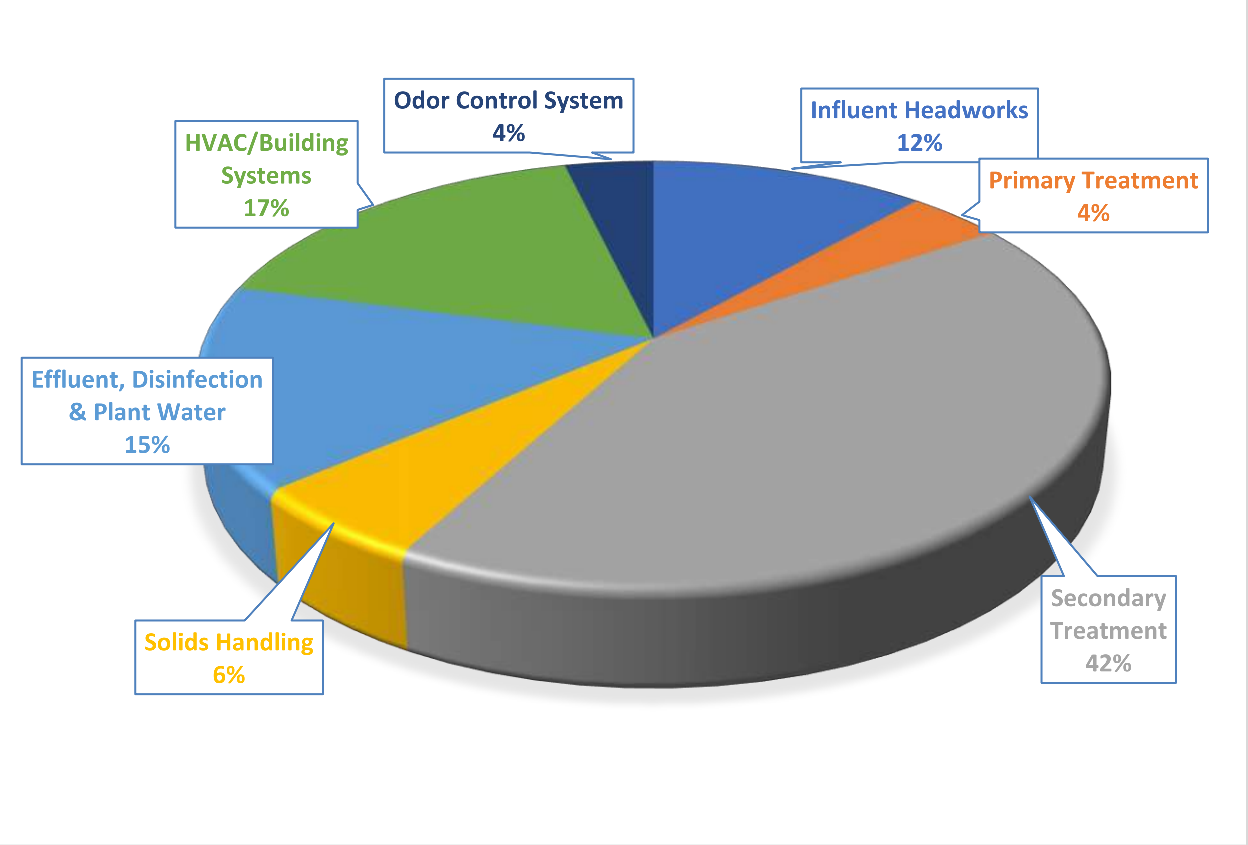

Figure 3. East Side WWTP Energy Balance

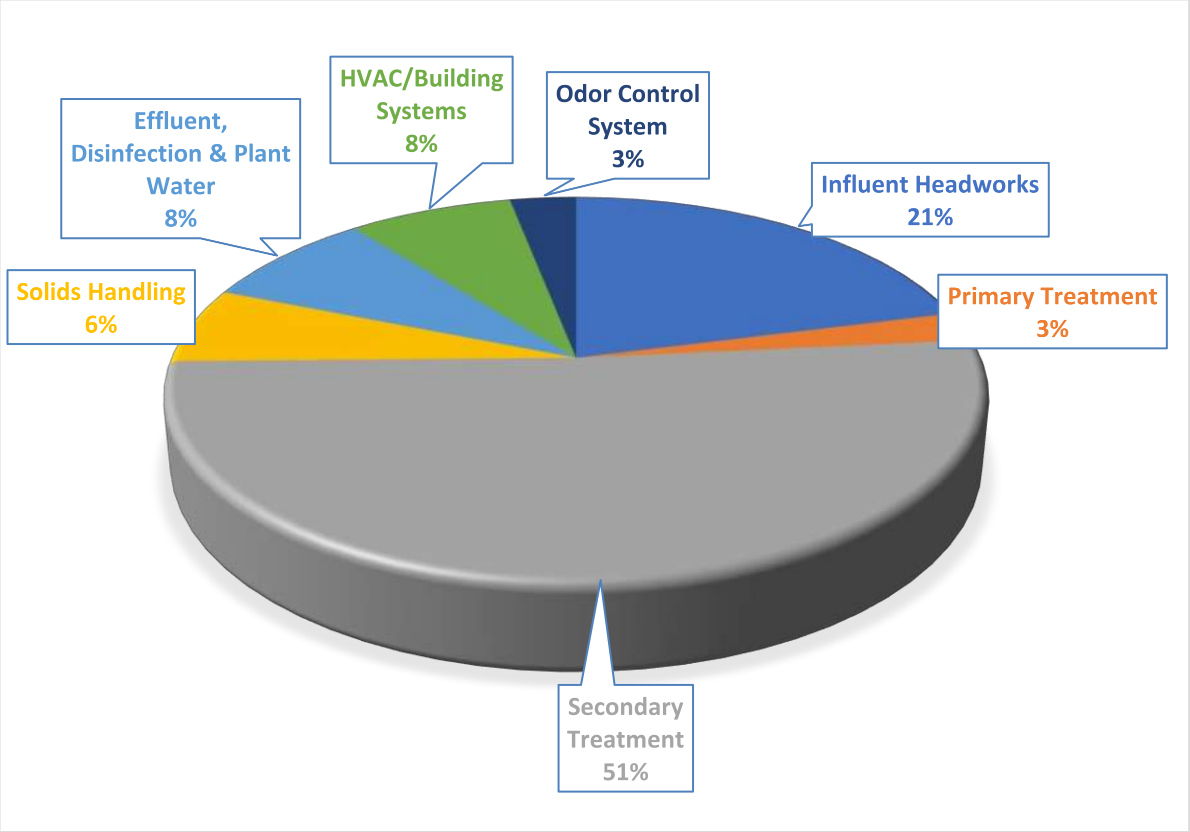

Figure 4. West Side WWTP Energy Balance

As is typically found in the energy consumption of wastewater facilities, the secondary treatment system, which includes the aeration system, is responsible for approximately half of the total facility energy usage at both facilities. For the East Side WWTP, the secondary treatment system is the highest energy consuming portion, at approximately 42% of the facility's energy usage. For the West Side WWTP, the secondary treatment is the highest energy consuming portion, at approximately 51% of the facility's total energy usage.

The reference materials used to develop the energy balance are a combination of the last major upgrade drawings, operations & maintenance (O&M) manuals, and other reports and documents listed below.

- *East Side WWTP Rehab Contract No. 2*, Volumes 1-4. (August 1995). Completed by Kasper Group, Inc. and Hazen and Sawyer.
- *West Side WWTP Rehab Contract No. 1*, Volumes 1-3. (August 1992). Completed by Kasper Associates, Inc. and Hazen and Sawyer.
- *Operations & Maintenance Manual: Eastside Wastewater Treatment Plant*, Parts 1-4. (April 2002). Completed by Kasper Group Inc.
- *Operations & Maintenance Manual: Westside Wastewater Treatment Plant*, Parts 1-4. (May 1999). Completed by Kasper Group, Inc. and Aqua-Terre Systems Manuals, Inc.

- *City of Bridgeport – East Side Wastewater Treatment Plant*. (May 2014). Completed by JKMuir, LLC and The United Illuminating Company (UI).
- *City of Bridgeport – West Side Wastewater Treatment Plant.* (May 2014). Completed by JKMuir, LLC and The United Illuminating Company (UI).

The most recent set of plans available for the East Side and West Side WWTPs were the plans from the 1995 and 1992 upgrades, respectively. These plans were used to develop a list of equipment for the energy balances. Additional information was supplemented by the O&M manuals. The East Side WWTP Operations & Maintenance Manual was developed 2 years after the major plant upgrade drawings. The West Side WWTP Operations & Maintenance Manual was developed 10 years after the last major plant upgrade drawings. Therefore, the information contained in the O&M manuals was assumed to supersede the drawings and was used where applicable. Information from the O&M manuals included the equipment horsepower and typical operation. In addition, the information was supplemented with anecdotal information obtained from the operations staff.

In addition, JKMuir previously performed energy audits of the East Side and West Side Bridgeport WWTP facilities in 2014. Reports were developed for each facility in conjunction with The United Illuminating Company (UI). The reports summarized the field measurements taken using portable equipment, typical operation data provided by operators, and recommended energy conservation measures. The field measured power draw and typical operation information from the energy audits were also used in developing the energy balance.

The remaining outstanding information was estimated based on typical wastewater treatment facility equipment operations. The load was estimated to be 80-90% for the remaining constant speed equipment and 60% for the remaining equipment operated on a VFD.

In order to verify whether the energy balance is a reasonable estimation, a comparison between the energy balance total energy usage (kWh) and the total billed electric usage (kWh) was conducted. The total billed electric usage is based on Table 1 annual energy usage (kWh) from July 2017 to January 2020.

The information collected in the energy balance provides an indication of which unit process equipment utilizes the most energy, identifying the greatest opportunities for energy and cost savings, and where consideration can be given during the design for optimizing energy usage.

OVERVIEW OF ENERGY CONCIOUS DESIGN CONSIDERATIONS FOR WWTPS

The following section is an overview of process and non-process energy conscious design recommendations to consider during the design stage of a major WWTP upgrade. Specific design recommendations are outlined in the subsequent section.

Aeration

As shown in the energy balance figures above, secondary treatment accounts for approximately half of the total plant energy usage at both facilities. The energy intensive aeration system is responsible for the majority of the secondary treatment systems energy usage; and represents the most significant opportunity for energy savings measures. Energy savings can be achieved by minimizing the air flow requirements of the system through instrumentation and controls that optimize the oxygen concentration in the basins based on the actual treatment needs. The blowers that supply the required air to the system can then be selected and sized to maximize mechanical efficiency.

Blower and Blower System Efficiency

The selection of blowers for the upgrade should be considered for efficiency across the expected airflow range, which can be expected to vary significantly based on seasonal and diurnal flow and load fluctuation. The quantity and size of the blowers should be optimized to provide for efficient operation over the complete range of flows. This can be achieved by installing various sized blowers with design points determined based on historic and anticipated flow conditions. For example, a smaller jockey blower sized to operate with a high efficiency at typical plant flowrates can be installed in addition to larger blowers that are sized to meet the demands of higher flow and load conditions.

Aeration Controls

Currently the aeration systems at the East and West plants are controlled based on manual DO readings taken a few times per day, using portable meters. It is common for aeration tanks without real time DO monitors to be over-aerated. Automated control of the aeration system can significantly reduce the required airflow and energy usage. This can be achieved through an automated control system based on real time dissolved oxygen (DO) readings and dedicated drop-leg air flow control at multiple locations in the aerated zones. The airflow requirements can be further reduced by monitoring the nitrogen levels and trimming the DO setpoints based on nitrogen loading conditions. Aperture valves for airflow control can reduce the pressure loss through the air piping and allow for more precise control over a wider range of airflows compared to typical butterfly valves.

Pump System Recommendations

After aeration, the combined load of the plant-wide pumps are likely the next largest energy consumer. Replacing or rebuilding the largest pumps with the greatest number of operating hours would restore the pumps back to manufacturer’s conditions and would result in energy savings. When selecting new pumps, the quantity and size should be optimized to provide for efficient operation over the complete range of expected flows. When operating multiple pumps, operating on VFDs that modulate pump speed based on system demand can help to reduce energy usage.

Added controls to pumping systems such as minimum speed setpoints, pump sequencing and pump optimization can also increase energy efficiency. Operating the pumps close to the best efficiency point and within their preferred operating range as often as possible would maximize efficiency and reduce energy usage. Other controls that can be programmed include increasing wetwell level setpoints during dry weather to reduce the head on the pumps and therefore reduce the energy usage. Another energy conscious consideration is to reduce head loss through piping but considering opportunities for low head loss valves and fittings.

Mixing

Mixing systems throughout the various systems, channels, and tanks at the plant can appear to have low Hp, but the number of mixers combined with the continuous run hours results in significant annual energy usage. The technology available for mixing systems has dramatically improved with newer units drawing as little as ¼ of the power of older mixer styles. Replacing the submersible mixers in the anoxic zones of the aeration tanks with newer mixer technology would likely result in significant energy savings.

The East Side and West Side WWTPs have coarse bubble mixing systems in the screenings tanks and the primary tanks. Replacing the coarse bubble mixing systems with newer mechanical mixing systems may provide an opportunity for energy savings. If the coarse bubble mixing systems are not replaced during the next upgrade, it may be feasible to install VFDs on the blowers to reduce their operating speed, and adjust airflow based on the channel flow conditions to meet adequate mixing requirements.

Plant Water/Effluent Water Systems

Plant water systems can effectively reduce the volume of city water that is required at the facility but can also utilize a significant amount of energy. When considering opportunities to optimize these systems it may be feasible to provide pressure controls, as well as pump replacement/rebuild options to increase hydraulic efficiency. Where and how the plant effluent water is utilized throughout the plant can also provide an opportunity for usage reduction.

Installing a pressure control system on the effluent water pump systems at the East Side and West Side WWTPs would allow the systems to better modulate and reduce the operating pressure of the pumps. The system would have the ability to respond based on flow and pressure needs depending on the effluent water requirements. The existing system speed can be controlled manually but the system typically operates at full speed. Automating the control system will allow for improved operation and system optimization. Multiple size pumps are often appropriate options for plant water systems in order to efficiently meet the variable flow demand.

Odor Control

Odor control systems can be an area for substantial savings and can be candidates for VFD installation associated with fans. Where feasible, the VFDs allow for turndown of the fans, while complying with ventilation rates in the National Fire Protection Association (NFPA) 820 guidelines. These standards allow the minimum number air changes to be reduced for certain building areas during unoccupied hours or based on outside air temperature. This also can provide significant reductions in the heating requirements of these spaces during the cold weather months, creating further cost savings. Reduction in air changes per hour and flow through the odor control system for the purposes of reducing energy usage can be carefully controlled to ensure adequate odor management at the plant.

HVAC

While hazardous gases associated with wastewater facilities can necessitate significant ventilation requirements, air changes can be minimized to reduce electrical and heating loads, while continuing to provide code compliant ventilation and protect staff health and safety. Ventilation criteria should be based on NFPA 820. For most space classifications the required air changes per hour are lower for cooler temperatures and when the space is unoccupied.

It is recommended that premium efficiency HVAC equipment be specified in accordance with the latest edition of American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) standards and International Energy Conservation Code (IECC) standards. Efficient gas fired or hot water heating units should be specified where possible. Using high efficiency infrared heaters or gas unit heaters is recommended instead of electric unit heaters. If unit heaters are installed, timers or temperature controls are recommended to prevent heaters operating unnecessarily for extended periods of time or while the space is unoccupied.

Lighting

Installing LED lighting and skylights or clerestory windows for daylight harvesting where possible can decrease the energy usage of facility lighting. EnergizeCT recommends installing light fixtures that are listed on the DLC qualified or Energy Star certified products lists to ensure the lighting fixtures are reliable and meet high efficiency standards. Another way to decrease energy usage of lighting is to install lighting control systems, which can include occupancy sensors, photocell sensors, schedules, and high-end trimming features. The lighting control system can be programmed to dim or turn off lights and reduce the overall plants energy demand during demand response events.

Electric Demand Charges

A growing portion of electric bills for industrial facilities is associated with demand charges. There can be opportunities to both monitor and reduce demand in order to control these charges. A demand monitoring system that tracks and trends the power draw at the overall plant level, the motor control centers (MCC) and for individual equipment and unit processes gives operators and plant personnel insight into which equipment and systems are responsible for high power draw and high electric demand peaks. Manual and automatic modification to the operation of equipment when the plant is reaching a demand peak can be implemented to avoid higher demand charges. In addition, plant personnel have the opportunity to shift the operation of some equipment to off-peak or shoulder peak hours when demand charges are lower.

A number of wastewater facilities have successfully utilized the New England demand response programs that are offered by local electric utilities and ISO New England to create a revenue stream. Programs also offer customers incentives for utilizing batteries to discharge stored energy during on-peak hours and reduce the daily electric demand being drawn from the grid during peak hours. Wastewater facilities can also receive incentives for reducing their electric demand peaks during "demand events" by curtailing their load or switching to onsite generation. These programs can be considered during the design phase of the plant upgrades in order to incorporate monitoring, instrumentation, and controls that would allow for participation and revenue stream generation.

FACILITY DESCRIPTIONS & SPECIFIC ENERGY CONSCIOUS DESIGN RECOMMENDATIONS

The following is an overview of the existing equipment and operation of each unit process at the East Side and West Side WWTPs and specific energy conscious design recommendations for each process system.

Influent Headworks

Existing Systems

The East Side WWTP consists of one (1) main bar screen and compactor and one (1) bypass bar screen and compactor. In addition, there are four (4) influent pumps, one (1) agitator/wetwell drain pump and two (2) screen channel blowers. One bar screen and compactor are operated at a time. The influent pumps operate on variable frequency drives (VFDs) and operate to maintain a wetwell level. One (1) pump is typically in service however, during wet weather, three (3) or four (4) pumps operate. The screen blowers provide mixing air to a coarse bubble system in the screen building channel. Normally one (1) blower will operate at a time.

The West WWTP consists of one (1) two-speed main screen and compactor and one (1) bypass screen and compactor. In addition, there are four (4) influent pumps operated on VFDs, one (1) agitator/wetwell drain pump, three (3) ring flush pumps, and two (2) screen channel blowers. One screen and compactor are operated at a time. The influent pumps operate on VFDs and operate to maintain a wetwell level. Typically, one (1) pump operates continuously. During wet weather, two (2) or three (3) pumps operate simultaneously with one pump at full speed while a second unit ramps up and down to maintain the wet well level. The ring flush pumps draw water from the effluent water supply and provide water to the rings of the influent pumps to keep the rings free of grit. The ring flush pumps are no longer used. Typically, one (1) to two (2) pumps operate at a time. The screen blowers provide mixing air to a coarse bubble system in the screen building channel. Normally one (1) blower will operate at a time.

Design Considerations

The equipment responsible for the greatest energy use in the influent headworks systems at the East Side Plant and the West Side Plant are the influent pumps and the channel blowers. This equipment has an opportunity for energy savings during the upgrade and the projects may qualify for energy efficiency grant funding. The following are recommendations to consider that would likely result in reduced energy usage.

- Influent Pumps
    - Select pumps that have high hydraulic efficiencies over the range of typical flow conditions.
    - Install a jockey pump sized for low flow conditions which would prevent the operation of large pumps at reduced speeds and lower efficiencies.

    - Install VFDs on the pumps and consider programming the control system to operate the pumps close to the best efficiency point or within the preferred operating range (POR) when possible. Perform an energy intensity analysis of the pump system to determine the most favorable sequence of operation based on the kWhs per million gallons pumped over the anticipated flow range.
    - Install low head check valves to reduce the head requirement for the pumps.
    - Consider adding a control sequence that raises the wetwell level setpoint under dry weather conditions to reduce the head requirement and energy usage of the pumping systems. The wetwell level setpoint can be automatically decreased during wet weather/high flow events if necessary.
- Screen Channel Blowers
    - Install a mechanical mixer in the screen channel in place of the coarse bubble mixing system to keep solids suspended.
    - If the blowers are not replaced, install VFDs on the blowers and modulate the airflow of the existing channel blowers based on mixing demands.
    - Allow for intermittent operation of the blowers to reduce operating hours.

Primary Treatment

Existing Systems

The East Side WWTP primary treatment system consists of three (3) primary sedimentation tanks, with three (3) longitudinal collector drives and three (3) cross collector drives, five (5) primary sludge pumps, two (2) primary skimming tank pumps, and two (2) channel air blowers. Two (2) primary tanks, two (2) primary sludge pumps, and one (1) channel air blower are normally in service at a time. The skimming pumps no longer operate.

The West Side WWTP primary treatment system consists of three (3) primary sedimentation tanks, with three (3) longitudinal collector drives, three (3) cross collector drives, five (5) primary sludge pumps, and (2) primary channel blowers. Two (2) primary tanks, two (2) primary sludge pumps, and one (1) channel air blower are normally in service at a time.

Design Considerations

The equipment responsible for the greatest energy usage in the primary treatment process system at the East Side and West Side WWTPs includes the primary sludge pumps and the channel air blowers. This equipment has the greatest opportunity for energy savings during the upgrade and the projects may qualify for energy efficiency grant funding. The following are recommendations to consider during the upgrade that would likely result in reduced energy usage.

- Primary Sludge Pumps
    - Select a pump type that reliably accommodates primary sludge and associated settled material, while also considering hydraulic efficiency.

    - Install VFDs on the pumps to minimize flow.
    - Implement controls that allow for intermittent pump operation and pump/tank sequencing.
- Primary Tank Channel Blowers
    - Install a mechanical mixer in the channel in place of the coarse bubble mixing system to keep solids suspended.
    - If the blowers are not replaced, install VFDs on the blowers and modulate the airflow of the existing channel blowers based on mixing demands.
    - Allow for intermittent blower operation to reduce operating hours.
- Primary Tank Sludge Collectors
    - Install premium efficiency motors on the sludge collector drives.

Secondary Treatment

Existing Systems

The East Side WWTP secondary treatment system consists of six (6) aeration tanks and three (3) final settling tanks (FSTs). The aeration tanks have four (4) zones each (A through D). Zone A is maintained anoxic, while zones B through D are aerated. Submersible mixers maintain the mixed liquor in suspension in the anoxic zones; and zones A through D are equipped with a fine bubble diffusers. There are six (6) submersible anoxic mixers in the aeration tanks. In addition, there are three (3) 200 hp multi-stage centrifugal blowers that provide air to the process. Typically, one (1) blower operates, while two (2) run in the summer months. The guide vane angle position is manually set based on the air requirements as there is no automated control of the air supply. There are six (6) internal recycle pumps, located in zone D of each aeration tank. The pumps operate on a VFD at a reduced speed of approximately 25 hz. The three (3) final settling tanks (FSTs) each have one (1) drive for a long sludge collector and one (1) drive for a cross sludge collector. In addition, the FSTs have two skimming pumps and one skimming pit mixer. The skimming pumps and mixer no longer operate. There is a total of six (6) return activated sludge (RAS) pumps, two for each FST.

The West Side WWTP secondary treatment system consists of six (6) aeration tanks and three (3) FSTs. The aeration tanks have four (4) zones each (A through D). Zone A is maintained anoxic, while zones B through D are aerated. Submersible mixers are installed in the anoxic zones and zones A through D are equipped with a fine bubble diffusers. There are twelve (12) submersible anoxic mixers in the aeration tanks. In addition, there are three (3) 600 hp process air blowers that provide air to the aeration tanks. Typically (2) blowers operate with the inlet guide valve opening set to 75%. During the summer months the guide vane position is set to 90 to 95% open. The air supply is adjusted manually based on dissolved oxygen (DO) readings that are take twice per shift from each of the aeration basins using a portable meter. There are six (6) internal recycle pumps located in zone D of each aeration tank. The pumps operator on a VFD at a reduced speed of approximately 30 hz. The internal return rate is set and typically not adjusted based on influent flow. The three (3) FSTs each have two (2) longitudinal collector drives and one (1) cross collector drives. In addition, the FSTs have two (2) scum pumps. The scum pumps no longer operate.

Design Considerations

A large percentage of a wastewater treatment plants energy usage can typically be attributed to the secondary treatment system and more specifically the aeration system. The aeration system at most wastewater plants is responsible for 40%-60% of the total plant energy consumption. This is the case for both the East Side and West Side WWTP. The secondary treatment systems at the East Side WWTP consumes approximately 42% of the total plants energy while the West Side WWTP consumes approximately 51% of the total plants energy. The following is a list of upgrades that would result in energy savings.

- Blowers
    - Select efficient blowers with wide turndown capabilities. Blower alternatives can be compared based on efficiency and energy intensity at multiple conditions that represent the diurnal and seasonal variations determined through process modeling.
    - Install a jockey blower sized for low and average airflow conditions if larger blowers have limited turndown or are less efficient at lower airflows.
    - Construction specifications can include minimum efficiencies and require guaranteed kW draw under various airflow and atmospheric conditions to create manufacturer accountability and ensure savings.
- Control System
    - Minimize overaeration and optimize the process through automatic DO control, including DO probes, airflow meters, and control valves at multiple points/droplegs within each train or tank.
    - Incorporate automatic nitrogen trimming control with ammonium probes, where feasible to further reduce the required airflow of the systems.
    - Select modulating aperture valves for airflow control to reduce pressure loss through air piping and to allow for control of airflows over a wider range compared to typical butterfly valves. Equipment costs versus savings may need to be evaluated do determine feasibility.
- Mixers
    - Evaluate mixer technology options based on life cycle costing, which can include replacement costs as well as operating cost. Newer technology mixers can be higher cost but operate at substantially reduced Hp per mixed unit of volume.
    - Operate the mixers on a VFD and reduce the speed to meet the minimum mixing requirement of the anoxic zones. Intermittent operation could also be considered to reduce operating hours.
- Internal recycle pumps

    - Optimize energy usage through VFD operation and automated speed control based on influent flow or other treatment related parameters.
- Final Settling Tank Sludge Collectors
    - Install premium efficiency motors on the sludge collector drives.

Solids Handling

Existing Systems

At both facilities the primary sludge, scum and WAS is mixed and then diluted by effluent water in the mixed sludge wetwell. The mixed sludge pumps transfer the mixed sludge to the gravity thickeners. The gravity thickeners thicken the sludge to 4-5% solids. Once the sludge is thickened the thickened sludge grinders and pumps transport the sludge to the sludge holding tanks. The sludge is typically hauled to New Haven WPCF for incineration.

The East Side WWTP solids handling system consists of three (3) grit classifiers, three (3) waste activated sludge (WAS) pumps, three (3) mixed sludge pumps, three (3) gravity thickeners, two (2) thickener pumps, two (2) thickened sludge grinders, and six (6) return activated sludge (RAS) pumps. Typically, one (1) WAS pump operates intermittently at full speed to transfer waste sludge to the mixed sludge wetwell. The sludge in the mixed sludge wetwell is mixed with primary sludge and diluted with effluent water and then pumped by the mixed sludge pumps to the gravity thickeners. The thickened sludge is pumped from the gravity thickeners to the sludge storage tanks by the thickened sludge pumps. One mixed sludge pump operates at a time typically on a continuous basis. Normally, two gravity thickeners are in service and one is in standby. The RAS pumps operate on VFDs and typically (3) pumps operate continuously. Although the pumps are on VFDs the speed of the pumps is not adjusted based on the incoming flow. The pumps therefore operate at a fixed speed and are not flow paced.

The West Side WWTP solids handling system consists of three (3) grit classifiers, two (2) WAS pumps, two (2) gravity thickeners, two (2) sludge pumps, one (1) sludge storage emergency pump, six (6) RAS pumps operated on VFDs, and two (2) scum pumps. The WAS pumps are not currently used. The head provided by the RAS pumps is used to pump the waste sludge. The scum pumps no longer operate. The sludge in the mixed sludge wetwell is mixed with primary sludge and diluted with effluent water. The mixed sludge then flows by gravity to the gravity thickeners through a pipe that runs from the Degritter Building. The mixed sludge pumps no longer operate. Typically, one gravity thickener is in service at a time. The RAS pumps operate on VFDs and typically (3) pumps operate continuously. The return rate is typically adjusted manually to 50% of the influent flow. Although the pumps are on VFDs the speed of the pumps is not adjusted based on the incoming flow. The RAS pumps therefore operate at a fixed speed and are not flow paced.

Design Considerations

The solids handling equipment responsible for the most energy usage at the East Side and West Side WWTPs include the RAS Pumps, mixed sludge pumps and thickener pumps at the East Side WWTP. These pumping systems have the greatest opportunity for energy savings during the upgrade and the projects may qualify for energy efficiency grant funding. The following are recommendations to consider during the upgrade that would likely result in reduced energy usage.

- RAS Pumps
    - Select pumps that have high hydraulic efficiencies over the range of typical flow conditions. While RAS pumps may be sized for maximum conditions consider the operating point of the pumps under typical and average conditions and specify a minimum efficiency.
    - Consider adding an automatic control sequence to operate the RAS pumps based on a percentage of the influent flow.
- Gravity Thickener Mechanisms
    - Install premium efficiency motors on the gravity thickener mechanisms.

Effluent, Disinfection, & Plant Water

Existing Systems

The East Side WWTP effluent, disinfection and plant water system consists of three (3) effluent water pumps, three (3) high pressure effluent water pumps, one (1) effluent wash water booster pump, three (3) service water pumps, one (1) flush water pump, and chemical feed pumps. The effluent water pumps provide chlorinated effluent from the chlorine contact tanks to the plant-wide piping loop for various plant services including sludge thickeners, odor control wet scrubber system, chemical make-up system and spray water. The effluent water pumps are operated on a VFD and one pump continuously operates at a time. The three high pressure effluent water pumps are designed to raise the water pressure of the effluent water from 40 psi to 75 psi for use with the chlorine injectors. A maximum of two (2) pumps operate at a time and the third pump is on standby. The effluent wash water booster pump receives water from the effluent water system and discharges water to the hose bibs for washing operations throughout the plant when needed. The service water pump system consists of one skid mounted pumping system with a break tank. Typically, one pump operates continuously while the second pump operates as a lag pump and the third pump operates at a standby. The flush water pump supports the primary sludge pumps and draws water by drawing water from the effluent water system and discharges to the primary sludge pump discharge lines to flush the cyclone separates and suction lines back to the primary tanks. The chemical feeds pumps are used to meter chemical to the chlorine contact tanks.

The West Side WWTP sludge handling system consists of three (3) effluent water pumps, three (3) high pressure effluent water pumps, one (1) flushing water booster pump, two (2) service water pumps, three (3) strainer backwash pumps, and one (1) multistage blower. The effluent water pumps provide chlorinated effluent from the chlorine contact tanks for plant water uses such as the chemical make-up systems, aeration spray system, and wash water. The effluent water pumps are operated on VFDs however the speed is typically not adjusted. Typically, one pump in continuously in service. The high-pressure effluent pumps raise the effluent water pressure from 12 psig to 70 psig for use with the chlorine injectors. Typically, one (1) or two (2) of the high-pressure effluent water pumps are online. The flushing water booster pump draws water from the effluent water system and discharges the water to the primary sludge pump discharge lines and flush the cyclone separates and suction lines back to the primary tanks. The service water pump system consists of one skid mounting pumping system with a break tank and is rated at 72 psi. The service water pumps provide water to various systems throughout the plant such as seal water to various pumps, make-up water for the odor control system, flushing water to various points throughout the plant and other miscellaneous uses. The chlorine contact multistage blower is operated continuously to provide mixing, and prevent short circuiting, of the chlorine contact tanks.

Design Considerations

The effluent, disinfection, and plant water system equipment responsible for the most energy usage at the East Side and West Side WWTPs include the effluent water pumps and the flushing water booster pump. The following are recommendations to consider during the upgrade that would likely result in reduced energy usage.

- Effluent Water Pumps
    - Add an automatic pressure control system that adjusts the speed of the pumps based on the pressure in the effluent water system. The system can also be used to automatically operate a smaller, jockey pump under low flow requirements to improve overall system efficiency.
    - Consider reducing the system operating pressure or allowing for multiple operating pressures depending on plant conditions and time of day.
- Flushing Water Booster Pumps
    - Install a VFD and automatic control system to vary the flow and discharge pressure based on system demands.

HVAC & Building Systems

Existing Systems

HVAC, heating ventilation and air conditioning, is a critical part of the facility and protects the health and safety of the staff. Heating and ventilation must comply with building code regulations.

The East Side WWTP HVAC system consists of five (5) air handling units (AHUs), five (5) rooftop units (RTUs), thirty three (33) fans, one (1) water heater, six (6) hot water recirculation pumps, twelve (12) sump pumps, and two (2) drain pumps.

The West Side WWTP HVAC system consists of six (6) hot water circulation pumps, nine (9) AHUs, twenty-seven (27) exhaust fans, eight (8) supply fans, three (3) boilers, eight (8) sump pit pumps, and a monorail.

In addition, the building systems also include interior and exterior lighting throughout the plant.

Design Considerations

- Minimize air changes based on HVAC code to reduce the electrical and heating loads, while continuing to provide code compliant ventilation, and comfortable working conditions while specific areas are occupied.
- Install VFDs on hot water recirculation pumps and add a control sequence to automatically adjust the speed of these pumps based on the outside temperature and actual heating load requirements.
- Install high efficiency boilers and hot water heaters.
- Install timers or schedules to automatically turndown or shut off unit heaters and HVAC equipment when not in use (overnight hours, winter hours, weekends etc).
- Replace electric unit heaters with natural gas unit heaters or high efficiency infrared heaters, where feasible.

Odor Control Systems

Existing Systems

The East Side WWTP has two (2) scrubber odor control systems that are currently operational. One scrubber system serves the Screen Building a consists of one (1) scrubber fan and (2) scrubber recirculation pumps. The second scrubber system services the Sludge Degritter Building and consists of one (1) scrubber fan and (2) recirculation pumps. two (2) scrubber fans and four (4) recirculation pumps.

The West Side WWTP has three (3) scrubber odor control systems that are currently operational. The first scrubber odor control system services the Screen Building and consists of one (1) scrubber fan and two (2) scrubber recirculation pumps. The second system serves the Bypass/Screen Pump Station and contains two (2) odor control pans and two (2) recirculation pumps. The third system serves the Sludge Degritter Building and contains one (1) scrubber fan and two (2) scrubber recirculation pumps.

Design Considerations

- Install VFDs on all odor control fans to allow for operating speed reduction.
- Add an automatic control sequence to reduce the air changes per hour during the winter months and unoccupied hours based on the NPFA 820 regulations for each space type.

ENERGY EFFICIENCY FUNDING

Electric Utility – United Illuminating (UI)

The EnergizeCT is a rate payer funded program that provides financial incentives for the installation of energy efficient equipment and systems, and is administered through the local utility, United Illuminating (UI). The grant funding available includes prescriptive rebates for specific lighting and HVAC improvements. In addition, UI offers financial assistance through the Custom Incentive program, which provides funding for any project that can be shown to provide energy savings and meets the program's technical requirements. Through the program's grants, funding can be provided for up to 40% of the total project cost and 75% of the incremental project costs. Projects eligible for this funding include building system upgrades, pumping equipment upgrades, treatment system equipment and controls, and equipment replacement, as well as instrumentation and SCADA system improvements. Similar wastewater treatment facility upgrade projects in Connecticut and within UI territory have received significant funding through these programs and it is anticipated that portions of the proposed equipment and system improvements at both the East and West side plants will be eligible. In order to qualify for the funding, the application documentation must be submitted to UI prior to initiating construction. Typically, the applications are completed during the design phase of the project as equipment selection and sizing is finalized.

As part of the design effort, it is recommended that eligible portions of each design contract be submitted to the EnergizeCT programs.

The required documentation can be obtained through the EnergizeCT website and is typically updated annually. Many of the process improvements and large equipment replacements that will be included in the design of the upgrades to the East and West side plants are expected to be eligible for funding through the custom measure program. The current application document is provided in Appendix C. In addition to the requested information about the project and facility, the application is expected to include detailed descriptions of the proposed equipment and process improvements, equipment data sheets, and calculations documenting the anticipated energy savings associated with each unit process.

For the prescriptive program, the lighting information required will include quantity of fixtures, model number, lamp type and wattage. As part of the design of lighting systems the Design Lights Consortium database can be referenced, which provides information on fixtures that are eligible through the efficiency programs.

Incentives for HVAC equipment and controls are also provided through prescriptive programs. In order to be eligible equipment must meet minimum efficiency standards outlined in the applications. It is recommended that the contract documents reference these minimum efficiencies to ensure funding eligibility, and that the specifications require the contractor to submit the AHRI certificates, which are required with the energy efficiency applications.

The intention of the programs is to incentivize Connecticut industrial customers to install more efficient equipment by offsetting the higher, incremental cost of advanced technologies and controls. Under the custom program the incentive is determined based on either a dollar amount per annual kWh saved ($/kWh) or based on a percentage of the project cost. Under the current program guidelines, there are higher incentive levels for “comprehensive upgrades” that include energy efficiency improvements to multiple end uses, such as projects that include lighting, HVAC, and process equipment. An overview of the EnergizeCT incentives offered in 2020 is presented in Appendix D.

The modifications to the facilities will provide an opportunity for energy efficiency, cost savings, and grant funding. Specifically, the replacement of existing pumps, pump selection, instrumentation and controls, aeration equipment and controls, as well as the building HVAC and lighting systems, can be selected and specified to optimize energy usage and maximize funding opportunities through the EnergizeCT programs. By incorporating both process system improvements, as well as building system efficiency upgrades into the design, the project may be eligible for the comprehensive program which can increases the level of funding available for the plant upgrades.

Incentive Application Process

The first step to participate in the Energize CT program is to fill out an application which includes customer information and an overview of the energy saving project. A recent application is presented in Appendix C. The application may change periodically. The Energize CT website (energizect.com) contains information about the program and the latest version of the application. The next step is to provide detailed information about the equipment included in the application and estimated energy savings estimates. After the application and information about the project is submitted UI performs a review. Once the applications are approved a Letter of Agreement (LOA) is issued with an estimate of the incentive dollar amount. Following the installation of the equipment, an in-person inspection of the equipment may be required to verify the information provided in the application. After the inspection and verification process is complete the LOA must be signed by the WWTP and UI representative. The incentive check is then issued to the WWTP.

APPENDIX A

East Side WWTP Energy Balance

Facility: **East Side, Bridgeport, CT**
Electric Energy Balance

Equipment Description		Hp	Estimated Load	Estimated kW	Annual Estimated hours	kWhs	Notes
Influent Headworks							
Main Bar Screen		5.0	0.90	3.36	1,460	4,901	10 minutes every hour
Bypass Bar Screen		5.0	0.90	3.36	24	81	
Main Bar Screen Compactor		3.0	0.90	2.01	1,460	2,941	
Bypass Bar Screen Compactor		3.0	0.90	2.01	24	48	
Influent Pump No. 1	VFD	125.0	0.43	40.40	3,206	129,522	1 dry-weather, 3-4 wet-weather, kW based on 2014 field reading, decrease loading to 43% based on set speed
Influent Pump No. 2	VFD	125.0	0.43	40.40	3,206	129,522	
Influent Pump No. 3	VFD	125.0	0.43	40.40	3,206	129,522	
Influent Pump No. 4	VFD	125.0	0.43	40.40	3,206	129,522	
Agitator/Wetwell Drain Pump		10.0	0.80	5.97	730	4,357	
Screen Channel Blower No. 1		15.0	0.80	8.95	4,380	39,210	1 on-line
Screen Channel Blower No. 2		15.0	0.80	8.95	4,380	39,210	
				61		**608,837**	
Primary Treatment							
Primary Sludge Pump No. 1		15.0	0.59	6.60	3,942	26,017	2 on-line at constant speed, kW based on 2014 field readings
Primary Sludge Pump No. 2		15.0	0.71	7.90	3,942	31,142	
Primary Sludge Pump No. 3		15.0	0.71	7.90	3,942	31,142	
Primary Sludge Pump No. 4		15.0	0.82	9.20	3,942	36,266	
Primary Sludge Pump No. 5		15.0	0.71	7.90	3,942	31,142	
Primary Tank No. 1 Longitudinal Sludge Collector Drive		0.75	0.90	0.50	1,947	980	2 tanks on-line
Primary Tank No. 1 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Primary Tank No. 2 Longitudinal Sludge Collector Drive		0.75	0.90	0.50	1,947	980	
Primary Tank No. 2 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Primary Tank No. 3 Longitudinal Sludge Collector Drive		0.75	0.90	0.50	1,947	980	
Primary Tank No. 3 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Primary Skimming Tank Subcant Pump No. 1		5.0	0.90	3.36	0	0	No longer operate
Primary Skimming Tank Subcant Pump No. 2		5.0	0.90	3.36	0	0	
Primary Tank Channel Blower No. 1		10.0	0.80	5.97	4,380	26,140	1 on-line
Primary Tank Channel Blower No. 2		10.0	0.80	5.97	4,380	26,140	
				22		**212,890**	
Secondary Treatment							
Submersible Anoxic Mixer No. 1		5.0	0.80	2.98	8,760	26,140	
Submersible Anoxic Mixer No. 2		5.0	0.80	2.98	8,760	26,140	
Submersible Anoxic Mixer No. 3		5.0	0.80	2.98	8,760	26,140	
Submersible Anoxic Mixer No. 4		5.0	0.80	2.98	8,760	26,140	
Submersible Anoxic Mixer No. 5		5.0	0.80	2.98	8,760	26,140	
Submersible Anoxic Mixer No. 6		5.0	0.80	2.98	8,760	26,140	
Aeration Blower No. 1		200.0	1.00	157.20	4,216	662,755	2 in summer, 1 remaining months, kW based on 2014 field reading
Aeration Blower No. 2		200.0	1.00	157.20	4,216	662,755	
Aeration Blower No. 3		200.0	1.00	157.20	4,216	662,755	
Blower Valves and Appurtenances		8.0	0.80	4.77	3,896	18,601	
Internal Recycle Pump No. 1	VFD	3.6	0.50	1.34	8,760	11,763	6 on-line and set to 25 hz, decrease loading to 50%
Internal Recycle Pump No. 2	VFD	3.6	0.50	1.34	8,760	11,763	
Internal Recycle Pump No. 3	VFD	3.6	0.50	1.34	8,760	11,763	
Internal Recycle Pump No. 4	VFD	3.6	0.50	1.34	8,760	11,763	
Internal Recycle Pump No. 5	VFD	3.6	0.50	1.34	8,760	11,763	
Internal Recycle Pump No. 6	VFD	3.6	0.50	1.34	8,760	11,763	
Final Tank No. 1 Longitudinal Sludge Collector Drive		0.75	0.90	0.50	1,947	980	
Final Tank No. 1 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Final Tank No. 2 Longitudinal Sludge Collector Drive		0.75	0.90	0.50	1,947	980	
Final Tank No. 2 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Final Tank No. 3 Longitudinal Sludge Collector Drive		0.75	0.90	0.50	1,947	980	
Final Tank No. 3 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Final Settling Tanks Skimmings Pump No. 1		7.5	0.80	4.48	0	0	No longer operate
Final Settling Tanks Skimmings Pump No. 2		7.5	0.80	4.48	0	0	
Skimmings Pit Mixer		5.0	0.90	3.36	0	0	No longer operates
				355		**2,239,184**	
Solids Handling							
Grit Classifier No. 1		1.0	0.90	0.67	5,840	3,921	2 on-line
Grit Classifier No. 2		1.0	0.90	0.67	5,840	3,921	
Grit Classifier No. 3		1.0	0.90	0.67	5,840	3,921	
WAS Pump No. 1		3.0	0.80	1.79	2,920	5,228	1 on-line intermittently at full speed
WAS Pump No. 2		3.0	0.80	1.79	2,920	5,228	
WAS Pump No. 3		3.0	0.80	1.79	2,920	5,228	
Mixed Sludge Pump No. 1		20.0	0.80	11.94	2,920	34,853	1 continuously on-line
Mixed Sludge Pump No. 2		20.0	0.80	11.94	2,920	34,853	
Mixed Sludge Pump No. 3		20.0	0.80	11.94	2,920	34,853	
Gravity Thickener No. 1		1.0	0.90	0.67	5,840	3,921	2 on-line and 1 standby
Gravity Thickener No. 2		1.0	0.90	0.67	5,840	3,921	
Gravity Thickener No. 3		2.0	0.90	1.34	5,840	7,842	
Thickener Pump No. 1		10.0	0.80	5.97	4,380	26,140	
Thickener Pump No. 2		10.0	0.80	5.97	4,380	26,140	
Thickened Sludge Grinder No. 1		3.0	0.90	2.01	4,380	8,822	
Thickened Sludge Grinder No. 2		3.0	0.90	2.01	4,380	8,822	
RAS Pump No. 1	VFD	30.0	0.15	3.30	4,380	14,454	kW based on 2014 field reading, 3 continuously on-line, decrease loading to 15% based on fixed speed
RAS Pump No. 2	VFD	30.0	0.15	3.30	4,380	14,454	
RAS Pump No. 3	VFD	30.0	0.15	3.30	4,380	14,454	
RAS Pump No. 4	VFD	30.0	0.15	3.30	4,380	14,454	
RAS Pump No. 5	VFD	30.0	0.15	3.30	4,380	14,454	
RAS Pump No. 6	VFD	30.0	0.15	3.30	4,380	14,454	
				34		**304,338**	
Effluent, Disinfection & Plant Water							
Effluent Water Pump No. 1	VFD	125.0	0.39	36.80	3,942	145,066	1 continuously on-line, kW based on 2014 field reading
Effluent Water Pump No. 2	VFD	125.0	0.39	36.80	3,942	145,066	
Effluent Water Pump No. 3	VFD	125.0	0.39	36.80	3,942	145,066	
High Pressure Effluent Water Pump No. 1		15.00	0.80	8.95	3,796	33,982	2 on-line
High Pressure Effluent Water Pump No. 2		15.00	0.80	8.95	3,796	33,982	

High Pressure Effluent Water Pump No. 3	15.00	0.80	8.95	3,796	33,982	1-2 on-line
Effluent Wash Water Booster Pump	15.00	0.80	8.95	1,825	16,337	5 hours/day
Service Water Pump No. 1	25.00	0.80	9.60	3,635	34,900	kW based on 2014 field reading
Service Water Pump No. 2	25.00	0.80	9.60	3,635	34,900	
Service Water Pump No. 3	25.00	0.80	9.60	3,635	34,900	1 on-line continuously, 1 lag, 1 standby
Flush Water Pump	20.00	0.80	16.00	8,760	140,160	
Chemical Feed Pumps	2.7	0.90	1.83	8,760	15,998	
			82		**814,337**	
HVAC/Building Systems						
(5) AHUs	36.0	0.80	21.48	3,205	68,849	
(7) RTUs	55.5	0.80	33.12	3,205	106,143	
(29) Exhaust Fans	60.5	0.80	36.11	3,205	115,705	
(3) Supply Fans	30.0	0.80	17.90	3,205	57,375	
Water Heater	7.5	0.80	4.48	3,205	14,344	
(6) Hot Water Recirculation Pumps	90.0	0.80	53.71	3,205	172,124	
(12) Sump Pumps	53.5	0.80	31.93	3,205	102,318	
(2) Drain Pumps	30.0	0.80	17.90	497	8,898	
Indoor & Outdoor Lighting			20.00	4,381	87,620	
Misc			20.00	8,760	175,200	
			239		**908,576**	
Odor Control System						
Scrubber Fan No. 1	20.0	0.80	11.94	8,760	104,559	
Scrubber Fan No. 2	7.5	0.80	4.48	8,760	39,210	
Recirculation Pump No. 1	5.0	0.80	2.98	4,380	13,070	
Recirculation Pump No. 2	5.0	0.80	2.98	4,380	13,070	
Recirculation Pump No. 3	5.0	0.80	2.98	4,380	13,070	
Recirculation Pump No. 4	5.0	0.80	2.98	4,380	13,070	
			22		**196,049**	

Plant System	**Baseline Annual kWh**	**% of Total**	**Average kW**
Influent Headworks	608,837	12%	61
Primary Treatment	212,890	4%	22
Secondary Treatment	2,239,184	42%	355
Solids Handling	304,338	6%	34
Effluent, Disinfection & Plant Water	814,337	15%	82
HVAC/Building Systems	908,576	17%	239
Odor Control System	196,049	4%	22
Annual Total	**5,284,210**	**100%**	**815**
Annual Electric Use July 2017 to January 2020	**5,284,219**		
Average Annual Electric Costs July 2017 to Jan. 2020	**$704,361**		
Unit Cost	**$0.13**		

APPENDIX B

West Side WWTP Energy Balance

Facility: **West Side, Bridgeport, CT**

Electric Energy Balance

Equipment Description		Hp	Estimated Load	Estimated kW	Annual Estimated hours	kWhs	Notes
Influent Headworks							
2 Speed Main Screen		7.5	0.90	5.04	1,460	7,352	10 minutes every hour
Bypass Screen		7.5	0.90	5.04	24	121	
2 Speed Main Screen Compactor		3.0	0.90	2.01	1,460	2,941	
Bypass Screen Compactor		3.0	0.90	2.01	24	48	
Influent Pump No. 1	VFD	400.0	0.77	229.20	2,190	501,948	1 on-line continuously, kW based on 2014 field readings
Influent Pump No. 2	VFD	400.0	0.77	229.20	2,190	501,948	
Influent Pump No. 3	VFD	400.0	0.77	229.20	2,190	501,948	
Influent Pump No. 4	VFD	400.0	0.77	229.20	2,190	501,948	
Ring Flush Pump No. 1		7.50	0.80	4.48	0	0	No longer operate
Ring Flush Pump No. 2		7.50	0.80	4.48	0	0	
Ring Flush Pump No. 3		7.50	0.80	4.48	0	0	
Agitator/Wetwell Drain Pump		10.00	0.80	5.97	730	4,357	
Screen Channel Blower No. 1		15.0	0.80	8.95	4,380	39,210	1 on-line
Screen Channel Blower No. 2		15.0	0.80	8.95	4,380	39,210	
				251		**2,101,030**	
Primary Treatment							
Primary Sludge Pump No. 1		15.0	0.80	8.95	3,504	31,368	2 on-line continously
Primary Sludge Pump No. 2		15.0	0.80	8.95	3,504	31,368	
Primary Sludge Pump No. 3		15.0	0.80	8.95	3,504	31,368	
Primary Sludge Pump No. 4		15.0	0.80	8.95	3,504	31,368	
Primary Sludge Pump No. 5		15.0	0.80	8.95	3,504	31,368	
Primary Tank No. 1 Longitudinal Sludge Collector Drive		1.0	0.90	0.67	1,947	1,307	8 hours/day, 2 on-line
Primary Tank No. 1 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Primary Tank No. 2 Longitudinal Sludge Collector Drive		1.0	0.90	0.67	1,947	1,307	
Primary Tank No. 2 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Primary Tank No. 3 Longitudinal Sludge Collector Drive		1.0	0.90	0.67	1,947	1,307	
Primary Tank No. 3 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Primary Tank Channel Blower No. 1		15.0	0.80	8.95	4,380	39,210	1 on-line
Primary Tank Channel Blower No. 2		15.0	0.80	8.95	4,380	39,210	
				29		**241,140**	
Secondary Treatment							
Submersible Anoxic Mixer No. 1		7.5	0.80	4.50	8,760	39,420	kW based on 2014 field readings
Submersible Anoxic Mixer No. 2		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 3		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 4		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 5		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 6		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 7		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 8		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 9		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 10		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 11		7.5	0.80	4.50	8,760	39,420	
Submersible Anoxic Mixer No. 12		7.5	0.80	4.50	8,760	39,420	
Aeration Blower No. 1		600.0	0.84	377.00	3,791	1,429,110	2 on-line, kW based on 2014 field reading
Aeration Blower No. 2		600.0	0.84	377.00	3,791	1,429,110	
Aeration Blower No. 3		600.0	0.84	377.00	3,791	1,429,110	
Blower Valves and Appurtenances		16.0	0.80	9.55	5,840	55,765	
Internal Recycle Pump No. 1	VFD	15.0	0.50	5.60	8,760	49,012	
Internal Recycle Pump No. 2	VFD	15.0	0.50	5.60	8,760	49,012	
Internal Recycle Pump No. 3	VFD	15.0	0.50	5.60	8,760	49,012	
Internal Recycle Pump No. 4	VFD	15.0	0.50	5.60	8,760	49,012	
Internal Recycle Pump No. 5	VFD	15.0	0.50	5.60	8,760	49,012	
Internal Recycle Pump No. 6	VFD	15.0	0.50	5.60	8,760	49,012	
Final Tank No. 1 Longitudinal Sludge Collector Drive 1		1.0	0.90	0.67	1,947	1,307	
Final Tank No. 1 Longitudinal Sludge Collector Drive 2		1.0	0.90	0.67	1,947	1,307	
Final Tank No. 1 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Final Tank No. 2 Longitudinal Sludge Collector Drive 1		1.0	0.90	0.67	1,947	1,307	
Final Tank No. 2 Longitudinal Sludge Collector Drive 2		1.0	0.90	0.67	1,947	1,307	
Final Tank No. 2 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Final Tank No. 3 Longitudinal Sludge Collector Drive 1		1.0	0.90	0.67	1,947	1,307	
Final Tank No. 3 Longitudinal Sludge Collector Drive 2		1.0	0.90	0.67	1,947	1,307	
Final Tank No. 3 Cross Sludge Collector Drive		0.5	0.90	0.34	1,947	653	
Scum Pump No. 1		3.0	0.80	1.79	0	0	No longer operate
Scum Pump No. 2		3.0	0.80	1.79	0	0	
				856		**5,120,012**	
Solids Handling							
Grit Classifier No. 1		1.0	0.90	0.67	4,380	2,941	
Grit Classifier No. 2		1.0	0.90	0.67	4,380	2,941	
Grit Classifier No. 3		1.0	0.90	0.67	4,380	2,941	
WAS Pump No. 1		2.0	0.80	1.19	0	0	No longer operate
WAS Pump No. 2		2.0	0.80	1.19	0	0	
Mixed Sludge Pump No. 1		15.0	0.80	8.95	0	0	No longer operate
Mixed Sludge Pump No. 2		15.0	0.80	8.95	0	0	
Mixed Sludge Pump No. 3		15.0	0.80	8.95	0	0	
Gravity Thickener Mechanism No. 1		3.0	0.90	2.01	4,380	8,822	
Gravity Thickener Mechanism No. 2		3.0	0.90	2.01	4,380	8,822	
RAS Pump No. 1	VFD	75.0	0.56	31.30	4,380	137,094	3 on-line continuously, kW based on 2014 field readings
RAS Pump No. 2	VFD	75.0	0.56	31.30	4,380	137,094	
RAS Pump No. 3	VFD	75.0	0.24	13.70	4,380	60,006	
RAS Pump No. 4	VFD	75.0	0.24	13.70	4,380	60,006	

RAS Pump No. 5	VFD	75.0	0.44	24.40	4,380	106,872	
RAS Pump No. 6	VFD	75.0	0.44	24.40	4,380	106,872	
				80		**634,411**	
Effluent, Disinfection & Plant Water							
Effluent Water Pump No. 1	VFD	75.0	0.83	46.30	2,920	135,196	1 on-line continuously. Speed is typically not adjusted using the VFD. Loading adjusted to 83%
Effluent Water Pump No. 2	VFD	75.0	0.83	46.30	2,920	135,196	
Effluent Water Pump No. 3	VFD	75.0	0.83	46.30	2,920	135,196	
High Pressure Effluent Water Pump No. 1		15.0	0.80	8.95	2,920	26,140	1-2 on-line
High Pressure Effluent Water Pump No. 2		15.0	0.80	8.95	2,920	26,140	
High Pressure Effluent Water Pump No. 3		15.0	0.80	8.95	2,920	26,140	
Flushing Water Booster Pump		25.00	0.80	14.92	8,760	130,699	1 on-line continuously
Service Water Pump No. 1		7.50	0.70	3.90	4,380	17,082	kW based on 2014 field readings
Service Water Pump No. 2		7.50	0.48	2.70	4,380	11,826	
Chlorine Contact Tank Multistage Blower		30.0	0.80	20.10	8,760	176,076	kW based on 2014 field readings
				94		**819,691**	
HVAC/Building Systems							
(9) AHUs		98.0	0.80	58.49	3,101	181,360	
(27) Exhaust Fans		123.0	0.80	73.41	3,101	227,625	
(8) Supply Fans		71.0	0.80	42.37	3,101	131,393	
(3) Boilers		8.8	0.80	5.22	3,101	16,193	
(6) Hot Water Recirculation Pumps		90.0	0.80	53.71	3,101	166,555	
(8) Sump Pumps		45.0	0.80	26.86	200	5,371	
Monorail		4.0	0.80	2.39	200	477	
Indoor & Outdoor Lighting				10.00	3,079	30,791	
Misc				3.00	3,079	9,237	
				246		**769,002**	
Odor Control System							
Scrubber Supply Fan No. 1		10.0	0.87	6.49	8,760	56,852	kW based on 2014 field readings
Scrubber Supply Fan No. 2		10.0	0.87	6.49	8,760	56,852	
Scrubber Supply Fan No. 3		10.0	0.87	6.49	8,760	56,852	
Scrubber Supply Fan No. 4		10.0	0.87	6.49	8,760	56,852	
Recirculation Pumps No. 1		5.0	0.80	2.98	4,380	13,070	
Recirculation Pumps No. 2		5.0	0.80	2.98	4,380	13,070	
Recirculation Pumps No. 3		5.0	0.80	2.98	4,380	13,070	
Recirculation Pumps No. 4		5.0	0.80	2.98	4,380	13,070	
Recirculation Pumps No. 5		5.0	0.80	2.98	4,380	13,070	
Recirculation Pumps No. 6		5.0	0.80	2.98	4,380	13,070	
				35		**305,829**	

Plant System	**Baseline Annual kWh**	**% of Total**	**Average kW**
Influent Headworks	2,101,030	21%	251
Primary Treatment	241,140	2%	29
Secondary Treatment	5,120,012	51%	856
Solids Handling	634,411	6%	80
Effluent, Disinfection & Plant Water	819,691	8%	94
HVAC/Building Systems	769,002	8%	246
Odor Control System	305,829	3%	35
Annual Total	**9,991,114**	**100%**	**1,591**
Annual Electric Use July 2017 to January 2020	**9,991,123**		
Total Electric Costs July 2017 to January 2020	**$1,409,809**		
Unit Cost	**$0.14**		

APPENDIX C

UI Energy Efficiency Incentive Application

ENERGY EFFICIENCY INCENTIVE APPLICATION
FOR COMMERCIAL & INDUSTRIAL CUSTOMERS

Valid for all Eversource ("Eversource"), United Illuminating ("UI"), Connecticut Natural Gas Corporation ("CNG") or The Southern Connecticut Gas Company ("SCG") commercial & industrial customers ("Participant"). **INSTRUCTIONS:** Please fill out this Application completely, truthfully and accurately and mail it to:

Eversource
Energy Efficiency
C&I Custom Measure Application
P.O. Box 270
Hartford, CT 06141-0270
email: commercial@eversource.com

OR

The United Illuminating Company
Conservation & Load Management
C&I Custom Measure Application
180 Marsh Hill Road, Mailstop AD-2A
Orange, CT 06477
e-mail: business.save.energy@uinet.com Fax: 203-499-2800

CALL **877-WISE-USE**
WITH QUESTIONS

Include the following documentation with your completed and signed application: ☐ Specification sheets ☐ W-9 (payee) ☐ Engineering analysis

Participant Information

Company Name (please print)
Contact Name
Mailing Address
City
State
Zip
Telephone
Email Address
Facility Electric Utility (check one)
☐ Eversource ☐ UI
Electric Account Number (as stated on bill)
Facility Gas Company (check one)
☐ Eversource ☐ CNG ☐ SCG
Gas Account Number (as stated on bill)

Facility Name (please print)
Contact Name
Mailing Address
City
State
Zip
Telephone
Email Address
Facility Type *(select one):*
Other
Project Square Footage
Facility Type *(if "Other"):*

Contractor Information

Company Name
Contact
Mailing Address
City
State
Zip
Telephone
Email Address

Payment Method (PAYEE MUST SUBMIT A W-9 FORM)

Payment To
☐ Customer ☐ Vendor/Installer
Payee Tax ID # (REQUIRED)
Check Payable To
Payee Company Type:
☐ Incorporated ☐ Not Incorporated ☐ Exempt

Proposed Equipment Specification (Facility Detail)

Building, Room, And Equipment Identification (Installation Site):

Description of project:

This project will be: ☐ New facility ☐ Addition to existing facility ☐ Replacement of existing equipment ☐ New equipment ☐ Major renovation

Expected completion date: ______

Is existing equipment operational? ☐ Yes ☐ No ☐ N/A

Expected start date (if known): ______

Estimated project costs: ______

Participant Acknowledgement

By signing this form below, I certify that all statements made in this application are correct to the best of my knowledge and that I have read and agree to the Terms and Conditions on the back of this form. I understand the utilities reserve the right to approve or disapprove of any application or proposed energy efficiency measures. I also understand if the project qualifies for incentive payments from the Connecticut Energy Efficiency Fund, the utilities will issue a Letter of Authorization or a Letter of Agreement.

Participant Name (please print)
Participant Title
Signature of Participant Official
Date

TERMS AND CONDITIONS

1. The Connecticut Light and Power Company, and/or Yankee Gas Service Company, both doing business as Eversource Energy ("Eversource") and The United Illuminating Company ("UI"), The Southern Connecticut Gas Company ("SCG") and Connecticut Natural Gas Corporation ("CNG") (collectively referred to herein as the "Utilities") manage the Connecticut Energy Efficiency Fund ("EEF"). To be eligible to receive an incentive payment from EEF, the Participant must obtain conditional approval from the Utilities prior to the purchase or installation of any Energy Efficiency Measures ("EEMs" or "measures"). The Utilities reserve the right to approve or disapprove of any application or proposed EEMs. If the project qualifies for incentive payments from EEF, Utilities will issue a Letter of Authorization or a Letter of Agreement (both referred to as an "LOA"). The Participant will have no right to receive, and Utilities will have no obligation to pay, incentives for any EEMs that have not been approved in writing in advance by the Utilities. Further, the Utilities are not obligated to pay incentives for projects which were pre-approved but are determined to not comply with program requirements after installation is complete. Incentives are not guaranteed until the Utilities verify that the EEMs have been installed and operating in accordance with the approved energy analysis report and/or any Exhibit(s) to the LOA, and the Participant has submitted any additional documentation regarding the EEMs requested by the Utilities.
2. To be eligible for an incentive payment, the Participant shall install EEMs and comply with the requirements listed in the LOA and verify the EEMs perform in their intended manner. The Participant shall design and install each and all EEMs identified in the LOA. Participant must provide itemized invoices relating to all EEMs, including the model, quantity and cost for each EEMs, and shall identify any applicable discounts or incentives. The Participant shall obtain all necessary permits and comply with all applicable laws, ordinances, building codes, and regulations of all appropriate governing authorities. Moreover, the Participant shall be responsible for any infraction or violation thereof, and any expense or damage resulting therefrom. The Participant receiving incentives shall be responsible for any tax liability associated with incentive payments. The Participant is not obligated to install any of the EEMs referred to in the LOA, and at any time may decide to forego the incentive payments for one or more measures. The Utilities shall issue a Form 1099 to all Participants who receive more than $600.00 of incentives per year.
3. To be eligible for an incentive payment, the project must be inspected by the Utilities and verified to be installed and operating in accordance with the approved energy analysis report and/or LOA by the agreed upon completion date. The Participant shall notify the Utilities in sufficient time and allow the Utilities reasonable access to the facility to conduct such inspections and shall supply the Utilities with copies of any requested documents necessary to verify that the project complies with the LOA requirements.
4. Incentive payments from the EEF to the Participant are based on the EEMs actually installed by the Participant, which are specified in and in compliance with the LOA. The Utilities will provide the Participant (or its designee) with the actual incentive payment based on the Utilities' review and approval of final installed costs after installation of all measures. The Utilities are solely responsible for determining the final incentive amount and reserves the right to withhold the incentive payment until it has verified actual cost(s) of the measures or performance specifications of installed EEMs.
5. Participant acknowledges and agrees that (a) neither Utilities nor any of its employees, agents, representatives or consultants are responsible for assuring the design, analysis, engineering, and/or installation of any or all of the individual EEMs is proper or complies with any particular laws, codes, or industry standards, including, without limitation, current standards published or otherwise recognized as applicable to the technology, and (b) Utilities do not represent, warrant or guarantee the product or services of any particular vendor, manufacturer, contractor or subcontractor.
6. Only electricity retail distribution customers of the Utilities and/or firm gas customers of the Utilities, at time of inspection, are eligible to receive incentives and become Participants in any of the EEF energy conservation programs. In addition, Participants who receive service for the subject facility noted in the LOA via Utilities' distribution equipment are eligible for incentives.
7. The Utilities do not represent, warrant, or guarantee the safety of any EEMs or that the installation of any EEMs will result in any level of energy savings will occur at the level projected in the energy analysis report and/or the Exhibits or will result in any measurable energy related benefit. Factors that are impossible to predict, such as changes in facility use, equipment additions or modifications, cutbacks, or weather changes, etc., all of which may impact the Participant's future electric energy or natural gas use and savings. Utilities' scope of review for purposes of the LOA is limited to determining if the EEMs have met the program requirements. The Utilities do not include any kind of safety or performance review of the equipment installed or serviced in connection with the LOA or any planned or installed EEMs.
8. The Utilities reserve the right to perform, at EEF's expense, and within two years of incentive payment, a confidential project evaluation, under actual operating conditions, to help determine the actual energy savings. The Participant shall provide information as necessary to facilitate this evaluation.
9. The Participant hereby acknowledges and assigns to its participating electric utility, either Eversource or UI (as the case may be), any and all payments, benefits and/or credits in connection with the Forward Capacity Market or any currently existing or successor or replacement markets, (including, but not limited to, any and all "LICAP", "ICAP", transitional credits or payments or any and all other capacity-related credits, payments and/or benefits for which Participant is eligible) and that are associated with or applicable to Participant's participation in connection with the program that is the subject of the LOA. Participant hereby assigns to either Eversource or UI (as the case may be) all of its right, title and interest in and to any and all such capacity payments, credits and/or benefits and shall take any and all action, including executing and delivering any and all documents and/or instruments, as requested by either Eversource or UI (as the case may be) to evidence the same. Forward Capacity Market means the market for procuring capacity pursuant to ISO-NE Tariff, FERC Electric Tariff No. 3, Section III, Market Rule 1, Section 13, any modifications to the Forward Capacity Market, or any successor or replacement market/capacity procurement process.
10. If the Participant requests in writing additional time to complete the EEMs at least (5) five business days prior to the project's estimated completion date as stated in the LOA, Utilities may grant an extension, but reserve the right to re-evaluate any program incentives or modify the EEF Energy Conservation Program Standard Terms and Conditions in effect at the time of the request.
11. Utilities may, by written notice, terminate the LOA for convenience, in whole or in part. In this event, Utilities shall pay, from the EEF, the unit or pro rata price for the performed and accepted portion of the project, and a reasonable amount, not otherwise recoverable from other sources, for the unperformed or unaccepted portion of the project, provided that the total compensation does not exceed the total amount in the LOA. No allowance will be made for anticipated profits. Utilities and the EEF shall not be liable for any consequential or incidental damages for termination under this Article.
12. These Standard Terms and Conditions are applicable only to the facilities described in the LOA and not to any future additions or alterations to the Participant's facility that may be serviced by Utilities.
13. The Participant shall defend, indemnify and hold harmless Utilities, their directors, officers, employees, agents, affiliated companies, and representatives, against and from any and all loss, claims, actions, or suits, including cost and reasonable attorneys' fees, arising from the Participant's participation in Utilities' Energy Efficiency Services. Utilities shall not be liable to Participant for any damages in contract or tort or otherwise including negligence caused by any activities related to Participant's participation in Utilities' Energy Efficiency Services, including without limitation the actions or omissions of any design professional or any employee, agent, contractor, subcontractor or consultant retained by Utilities. Utilities' liability under the LOA shall be limited to paying the incentives specified for the EEMs, but only as and if such incentives become payable to Participant and only to the extent that such incentives are not subject to repayment as provided in the LOA. In no case shall Utilities be liable to Participant for any special, indirect, consequential, incidental, punitive or exemplary damages of any kind including but not limited to loss of use, lost profits, out of pocket expenses by statute, tort or contract, in equity under any indemnity provision or otherwise.
14. These Standard Terms and Conditions are binding on the heirs, successors and assigns of the Participant and Utilities. The LOA shall not be assigned by either party without prior written consent of the other.
15. The LOA shall be administered and interpreted under the laws of the State of Connecticut. If any part is found to be in conflict with applicable laws, such part shall be inoperative, null and void insofar as it is in conflict with said laws, but the remainder of the terms and conditions shall continue in full force and effect.
16. The Participant understands that all funding for this program derives from the EEF and funded by the customers of the Utilities. The Utilities are not responsible for any costs or damages incurred by the Participant if funding for this program or the EEF is reduced or eliminated by the State of Connecticut, the Department of Energy and Environmental Protection or the Connecticut Public Utilities Regulatory Authority.
17. The parties shall endeavor to resolve any dispute arising out of or relating to the LOA by mediation before the alternative dispute resolution staff of the Public Utilities Regulatory Authority. If a resolution cannot be reached in that forum, the parties agree resolve their dispute by the CPR Mediation Procedure then currently in effect. Unless the parties agree otherwise, the mediator will be selected from the CPR Panels of Distinguished Neutrals. Any controversy or claim arising out of or relating to the LOA, including the breach, termination or validity thereof, which remains unresolved 45 days after the appointment of a mediator, shall be finally resolved by confidential, final and binding arbitration in accordance with the CPR Institute for Dispute Resolution Rules for Non-Administered Arbitration then currently in effect, by a sole arbitrator. The arbitration shall be governed by the Federal Arbitration Act, 9 U.S.C. §§ 1-16, and judgment upon the award rendered by the arbitrator may be entered by any court having jurisdiction thereof. The place of arbitration shall be Hartford, Connecticut, or such other location mutually agreed to by the parties. The arbitration must be commenced within two years of the conduct or action giving rise to the dispute.

APPENDIX D

2020 Energize CT Incentive Summary

2020 NEW CONSTRUCTION & MAJOR RENOVATIONS

Project Caps and Incentive Levels For Eversource, United Illuminating (UI), Connecticut Natural Gas Corporation (CNG) and The Southern Connecticut Natural Gas Company (SGC) - Electric and Natural Gas Savings Projects. To be eligible to receive an incentive payment, the participant must obtain conditional approval from the Utilities prior to the purchase or installation of any energy efficiency measures.

Effective 1/1/20

Cumulative Cap per Federal Tax ID	$500,000
PATH 1: WHOLE BUILDING PERFORMANCE & ZERO ENERGY MODELING PROGRAM	
(Projects at least 30,000 square feet and in Pre-Design, Schematic Design, Design Development or Net Zero projects)	
OWNER'S INCENTIVES	
Path to Zero Energy (35% Better Than Code)	$10,000
% better than code (based on modeled source BTU savings)	Increased Savings ≥30% = $3 / sf ≥25% - <30% = $2.25 / sf ≥20% - <25% = $1.25 / sf ≥15% - <20% = $0.75 / sf ≥10% - <15% = $0.50 / sf
Enhanced Commissioning[1]	10% of total EEM incentive (capped at $15,000)
LEED Zero, LEED Silver and above (2 EAC1 credits required), Passive House, and/or IFLI Living Building Challenge Petal (Energy Petal required)	$10,000
ENERGY MODELING FIRM INCENTIVES	
Energy Modeling	$20,000 SD or earlier $15,000 at Design Development
ARCHITECT FIRM INCENTIVES	
Designed for Efficiency (15% Better Than Code)	Lesser of: $0.07 / kWh + $0.34 / ccf (annual savings), $0.20 / sqft (capped at $15,000)
Design Charrette (kick-off meeting)	$2,500
PATH 2: PRESCRIPTIVE PROGRAM	
MULTI END USE INCENTIVE (project includes a minimum of 3 end uses)[2]	$0.10 / kWh and/or $1.00 / ccf (capped at $20,000)
LIGHTING	
HIGH PERFORMANCE LIGHTING	
LED Fixtures with Networked Lighting Controls System[3]	Greater of: $0.65 / kWh OR $1,000 / summer peak kW (Capped at 65% of the incremental cost)
SUSTAINABLE OFFICE DESIGN[4,5]	$1 / sf of project floor area, (7,500-200,000 SF)
LIGHTING DESIGNER INCENTIVE[4]	20% of the project incentive (up to $15,000)
PRESCRIPTIVE LED LIGHTING	project gross lighted square foot
Lighting Power Density % better than code (Interior)	Increased Savings 40% = $0.50 / sf 35% = $0.4375 / sf 30% = $0.375 / sf 25% = $0.3125 / sf 20% = $0.25 / sf 15% = $0.1875 / sf 10% = $0.125 / sf
Fixture Caps (applicable for projects ≥30,000 sf)	$30 to $150 / fixture depending on type
EXTERIOR LIGHTING	See Data Collection Form available at: EnergizeCT.com/EnergyConsciousBlueprint

CUSTOM MEASURES	
CUSTOM - NEW CONSTRUCTION: NON-WHOLE BUILDING PERFORMANCE (the lesser of)	
Incremental Cost	95%
Measure Cap (greater of)	$0.40 / kWh OR $1,000 / summer peak kW $6 / CCF
CUSTOM - EQUIPMENT: NEW OR REPLACEMENT (the lesser of)	
Incremental Cost	75%
Measure Cap	$0.40 / kWh OR $1,000 / summer peak kW $6 / CCF
PRESCRIPTIVE MEASURES AND EQUIPMENT	
System upgrades above code: Unitary / split / heat pumps, Energy Recovery Units, Natural Gas, Controls, VRF/VRV, VFDs	See Data Collection Form available at: EnergizeCT.com/EnergyConsciousBlueprint
REBATED MEASURES AND EQUIPMENT	
EnergizeCT.com/your-business/commercial-and-industrial-online-rebates	

1. Two LEED Enhanced Commissioning points must be achieved to be eligible for this incentive or net zero certification.
2. End use is defined as Gas or Electric, impacting Heating; Cooling; Lighting; Process; Domestic Water Heating; Refrigeration; Motors and Drives
3. 80% of project load must utilize a networked lighting control system, as defined by DLC, with all controlled LED fixtures wirelessly accessible to initialize, configure, and commission. Individual fixture addressability and luminaire level lighting control (LLLC) and compliance with LLLC capabilities as outlined by DLC is optional. Must include and demonstrate a minimum of one control strategy per fixture and two different control strategies at the project level (e.g. occupancy, daylighting, task tuning/high end trim). System must be capable of energy monitoring and demand response, as defined by DLC. Customer must also provide control narrative for the system and six months of energy monitoring data, and it must be fully commissioned with reporting and demonstrated demand response capability.
4. Lighting projects with networked lighting control systems or Sustainable Office Design projects may also take advantage of an additional Lighting Designer incentive to assist with lighting design work. The Lighting Designer bonus incentive equals 20% of the total incentive, up to $15,000. Only lighting designers who have obtained LC, CLEP, CLD certifications or are current members of IALD are eligible. The lighting designer must design, engineer, or install, and not profit solely from the sale of the lighting.
5. Five program requirements - (1) Building area between 7,500 SF - 200,000 SF; (2) Open Office Component: ≥40 percent; (3) Partition Heights: ≤48 inches; (4) Lighting Power Density: ≤ 0.6 watts/sf (5) Control Density: ≤250 sf/control point.

EnergizeCT.com/EnergyConsciousBlueprint

Incentive caps and qualification criteria are subject to change at any time. Availability of funding is not guaranteed and the Utilities are not responsible for any costs or damages incurred by the Participant if funding for this program is reduced or eliminated. Retainage may be applied to any project if final payment is contingent on delivery of performance results or information. Utilities shall have final determination of eligible incentives and energy savings. A Letter of Agreement/Authorization detailing available incentives and energy savings for each proposed measure must be signed by Utilities Management before any equipment is ordered to be eligible for incentives.

IECC 2015 is the baseline energy code.

All references to kWh and ccf savings shall refer to annual savings.

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CNG SCG UI

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EXISTING BUILDINGS

TIERED PROJECT INITIATIVE

	GREATER OF		PLUS	Not to exceed	
	per kWh	**per kW**	**per CCF**	**PROJECT CAP**	**PROJECT QUALIFICATION**
TOTAL COMPREHENSIVE INCENTIVE					
Three or more End Uses	$0.65	$1000/ summer peak	$6	65% of Installed Cost	**No one end use can exceed 90% of the project's value based on annual savings and each qualifying end use must contribute at least 3%** • If lighting is one End Use, must be at a minimum Enhanced Performance Lighting • At least 25% of the savings must be from retrofit measures
MULTI END USE OR EMS					
Minimum two End Uses	$0.50	$1000/ summer peak	$5	50% of Installed Cost	**No one end use can exceed 90% of the project's value based on annual savings and each qualifying end use must contribute at least 3%** • At least 25% of the savings must be from retrofit measures • If lighting is one End Use, must be at a minimum Enhanced Performance Lighting • A control system that only controls lighting is not an EMS. A control device/system that just establishes the space temperature is not an EMS
SINGLE NON LIGHTING END USE					
Minimum one non-lighting End Use	$0.40	$1000	$4	40% of Installed Cost	• Project must impact at least one non-lighting End Use • If lighting is the only measure, - DO NOT USE - refer to below "Lighting Measures" table
End use is defined as Gas or Electric, impacting Heating; Cooling; Lighting; Process; Domestic Water Heating; Refrigeration; Motors and Drives					

LIGHTING MEASURES

	GREATER OF		PLUS	Not to exceed	
	per kWh	**per kW**	**per CCF**	**PROJECT CAP**	**PROJECT QUALIFICATION**
HIGH PERFORMANCE LIGHTING					
LED Fixtures with Networked Lighting Controls System	$0.65	$1000/ summer peak	NA	65% of Installed Cost	80% of project load must utilize a networked lighting control system, as defined by DLC. System must be capable of energy monitoring and demand response, as defined by DLC. Customer must also provide control narrative for the system, and it must be fully commissioned with reporting and demonstrated demand response capability.
ENHANCED PERFORMANCE LIGHTING					
LED Lighting with Luminaire Level Lighting Controls or Wirelessly Accessible Controls	$0.45	$1000/ summer peak	NA	45% of Installed Cost	80% of project load must be controlled LED fixtures[1], with all controlled LED fixtures wirelessly accessible to initialize, configure, and commission. Individual fixture addressability and luminaire level lighting control (LLLC) and compliance with LLLC capabilities as outlined by DLC is optional. Must include and demonstrate a minimum of one control strategy per fixture and two different control strategies at the project level (e.g. occupancy, daylighting, task tuning/high end trim).
STANDARD LIGHTING					
	$0.25	$1000/ summer peak	NA	25% of Installed Cost	Prescriptive unit incentives use rebate form where applicable. **For Express Lighting Rebate refer to Lighting Rebate Form.** EnergizeCT.com/your-business/solutions-list/Express-Service-Lighting-Rebate. **NOTE:** Type C retrofit LED full kits or type C lamps with external drivers are the only (tube) product options that qualify for this incentive.

RETROFIT MEASURES	EXISTING BUILDING RETROFIT
Cumulative Cap per Federal Tax ID	$500,000
Municipal Finance Cap (total per municipality) - Eversource	$500,000
Municipal Finance Cap (total per municipality) - UI	$250,000

Project Caps and Incentive Levels For Eversource CT and United Illuminating (UI) - Effective 1/1/20

EnergizeCT.com/your-business/solutions-list/Energy-Opportunities

Incentive caps and qualification criteria are subject to change at any time. Availability of funding is not guaranteed and the Utilities are not responsible for any costs or damages incurred by the Participant if funding for this program is reduced or eliminated. Retainage may be applied to any project if final payment is contingent on delivery of performance results or information. Utilities shall have final determination of eligible incentives and energy savings. A Letter of Agreement/ Authorization detailing available incentives and energy savings for each proposed measure must be signed by Utilities Management before any equipment is ordered to be eligible for incentives.

IECC 2015 is the baseline energy code. All references to kWh and CCF savings shall refer to annual gross savings.

[1] All LED fixtures must be DesignLights Consortium® (DLC) or ENERGY STAR® qualified. The lists of qualifying products can be found at www.designlights.org and www.energystar.gov, respectively.

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Program Overview

Business Sustainability Challenge
Tackle common business issues like utility costs, waste, and employee engagement in the context of sustainability and energy efficiency. Become competitive and resilient by following recommended action steps that are accessible, achievable, and profitable.

Commercial Clothes Washer Rebate
Make your laundry facility work for your bottom line. Purchase an energy-saving ENERGY STAR® model for your next commercial clothes washer and earn a $200 rebate for each qualifying machine. And, get high performance with every load!

Cool Choice Rebate
Save electricity and cut energy costs in your business by installing qualifying high-efficiency air conditioning and heat pump systems. Rebates help to offset the costs.

Energy Opportunities
With today's energy costs, delaying to upgrade old inefficient equipment can actually cost you money. Invest in energy-efficient equipment now to reduce operating costs and improve productivity, ease-of-use, comfort and even aesthetics.

Low-Interest Loans for Commercial & Industrial Customers
Make energy savings pay off with low-interest financing for qualified energy-efficient improvements. Coupled with incentives, it can make your project a reality so you can start saving sooner.

Natural Gas Water Heating Rebate
With efficiencies of up to 85 percent or more, installing high-efficiency natural gas water heating equipment is a smart way for businesses to save gas and cut energy costs. Rebates let you enjoy the energy-saving benefits without paying a premium price.

Process Reengineering for Increased Manufacturing Efficiency
Make your manufacturing operations more productive with "lean manufacturing" training. You'll learn techniques to streamline product flow, eliminate or reduce waste, improve production efficiency, minimize environmental impact and reduce energy consumption.

Small Business Energy Advantage
A utility-authorized contractor performs a no-cost, no-obligation energy assessment (audit) of your facility and then manages the installation of the energy-saving improvements. This one-stop service, combined with our incentives and zero-interest, on-bill payment plans, allows you to get started right away.

C&LM Financing-Small Businesses & Municipalities
Loans make it easier for small businesses and municipalities to invest in energy-efficient improvements. Repayment terms up to four years and an on-bill payment option make it even easier!

Commercial Kitchen Equipment Rebate
Put energy savings on the front burner with rebates on energy-saving ENERGY STAR® commercial kitchen equipment. You'll reduce energy costs, improve performance, and because many energy-saving options produce less heat, you might also reduce your cooling costs.

DEEP-Sponsored Granted Financial Incentives & Low-Interest Loans
Reduce operating costs with a combined heat and power system. Financial incentives and low-interest loans, sponsored by the Connecticut Department of Energy and Environmental Protection (DEEP), can make it a cost-effective investment. Capital grants of $200 per kilowatt are available for qualifying projects of one megawatt or less in Eversource or United Illuminating's service territory. To qualify, a project must reduce energy costs by an amount equal to or greater than the project's installation cost within 10 years of its installation.

Express Service and Instant Lighting Rebates
It is easy for businesses to save electricity and cut energy costs by installing high-efficiency lighting. Now with paper and instant rebates, you can enjoy all the energy-saving benefits without paying a premium price. What a bright idea!

Natural Gas Heating Equipment Rebate
A smart way for businesses to save gas and cut energy costs is by installing high-efficiency natural gas heating equipment. With efficiencies of up to 98 percent, they are the most efficient heating equipment available.

Programs for Municipal Utility Customers
Business customers of Connecticut's municipal utilities can also benefit from smart energy options. To learn more about available programs, please contact your utility using the information below.

Commercial Multifamily Properties
Reduce energy and operating costs and make the multifamily property you own or manage more comfortable and environmentally friendly with the Multifamily Initiative.

Energy Conscious Blueprint
Maximize your new facility's energy performance by planning for efficiency from the beginning. Utility energy experts help to identify and integrate energy-saving opportunities into your plans early.

Green Buildings Tax Credit Program
Connecticut is offering a new incentive to build or renovate commercial buildings to meet or exceed U.S. Green Building Council's Leadership in Environmental and Energy Design (LEED) Gold Standard. The Green Buildings Tax Credit makes it more cost-effective for builders and developers to invest in energy-efficient construction that supports our clean energy future.

Natural Gas Infrared Heater Rebate
Large structures, such as warehouses and loading docks, can reduce the heat needed to maintain comfortable temperatures by 15 percent with low-intensity natural gas infrared heaters. Feel the heat and see the savings with rebates!

Operations and Maintenance
Improve your facility's electrical and thermal efficiency through operational changes and repairs rather than capital investments.

Retro-Commissioning
A pre-qualified retro-commissioning engineering firm evaluates how your mechanical equipment, lighting and related controls operate and function together. Suggested improvements are supported with sustainable energy management strategies.

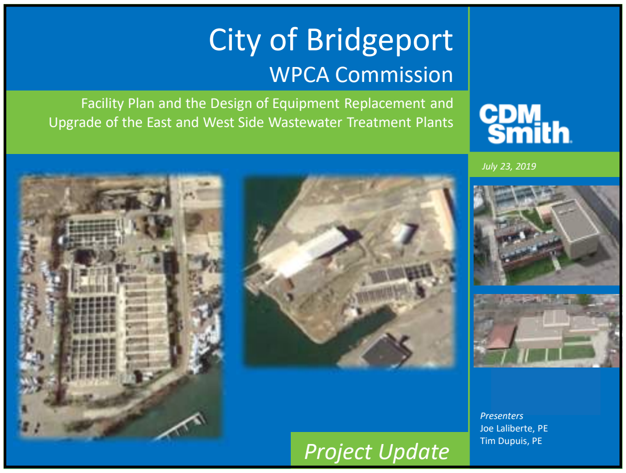
EMS Systems
We are often able to incentivize the costs associated with putting in EMS strategies not previously existing or required by code.

Strategies to Consider
- Optimal Start Stop
- Dual Enthalpy Economizer
- CO_2 or Demand Controls Ventilation
- Hot Water Reset
- Chilled Water Reset
- Condenser Water Reset
- Static Pressure Reset
- Discharge Temperature Reset

Appendix O

Meeting Presentation Slides

Presentation to WPCA Board
July 2019



City of Bridgeport

WPCA Commission

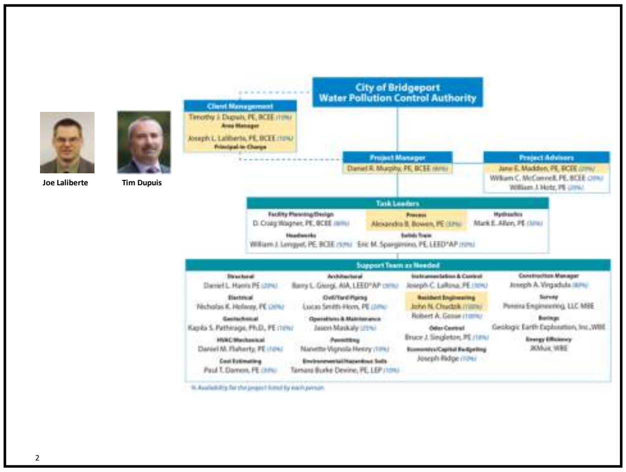
Facility Plan and the Design of Equipment Replacement and Upgrade of the East and West Side Wastewater Treatment Plants

CDM Smith

July 23, 2019

Presenters
Joe Laliberte, PE
Tim Dupuis, PE

Project Update



Joe Laliberte

Tim Dupuis

City of Bridgeport
Water Pollution Control Authority

Client Management
Timothy J. Dupuis, PE, BCEE (10%)
Area Manager
Joseph L. Laliberte, PE, BCEE (10%)
Principal-in-Charge

Project Manager
Daniel R. Murphy, PE, BCEE (80%)

Project Advisors
Jane E. Madden, PE, BCEE (20%)
William C. McConnell, PE, BCEE (20%)
William J. Hotz, PE (20%)

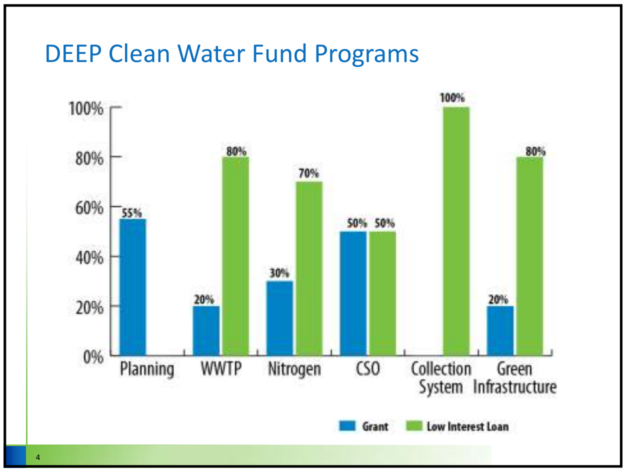
Task Leaders
Facility Planning/Design D. Craig Wagner, PE, BCEE (80%)
Process Alexandra B. Bowen, PE (50%)
Hydraulics Mark E. Allen, PE (50%)
Headworks William J. Lengyel, PE, BCEE (10%)
Solids Train Eric M. Spargimino, PE, LEED®AP (10%)

Support Team as Needed
Structural Daniel L. Harris PE (20%)
Electrical Nicholas K. Holway, PE (20%)
Geotechnical Kapila S. Pathirage, Ph.D., PE (10%)
HVAC/Mechanical Daniel M. Flaherty, PE (10%)
Cost Estimating Paul T. Damon, PE (30%)
Architectural Barry L. Giorgi, AIA, LEED®AP (30%)
Civil/Yard Piping Lucas Smith-Horn, PE (20%)
Operations & Maintenance Jason Maskaly (25%)
Permitting Nanette Vignola Henry (10%)
Environmental/Hazardous Soils Tamara Burke Devine, PE, LEP (10%)
Instrumentation & Control Joseph C. LaRosa, PE (10%)
Resident Engineering John N. Chudzik (100%)
Robert A. Gosse (100%)
Odor Control Bruce J. Singleton, PE (10%)
Economics/Capital Budgeting Joseph Ridge (10%)
Construction Manager Joseph A. Vingadula (80%)
Survey Pereira Engineering, LLC MBE
Borings Geologic Earth Exploration, Inc.,WBE
Energy Efficiency JKMuir, WBE

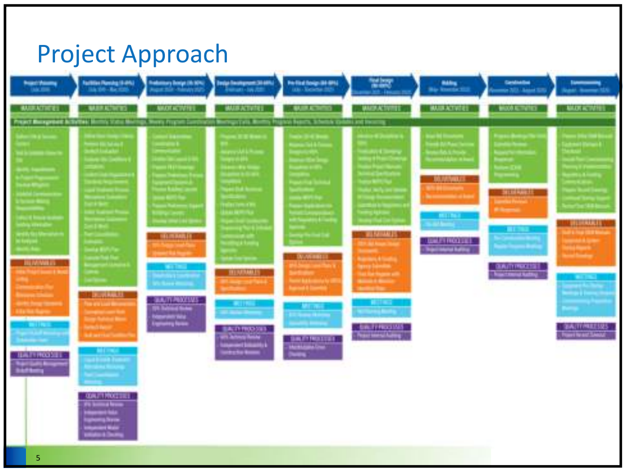
% Availability for the project listed by each person

Facility Plan will Focus on these Key Topics

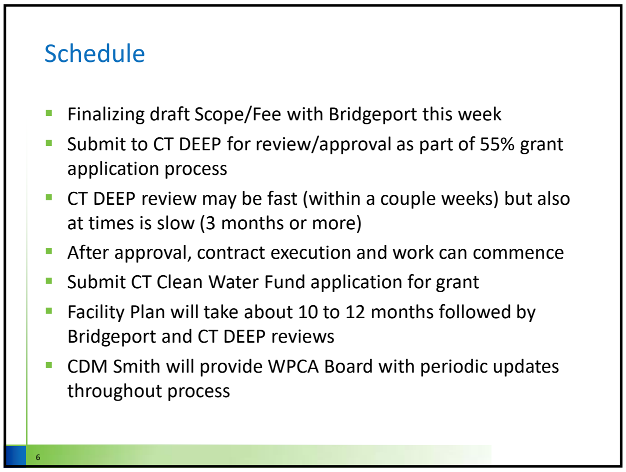
- Address Issues with Grit, Grease, and Rags
- Maintenance of Plant Operations during Construction
- Optimization
- Flow Expansion/Optimal Plant Expansion Capacity
- Nitrogen Reduction
- Improved Solids Processing



DEEP Clean Water Fund Programs

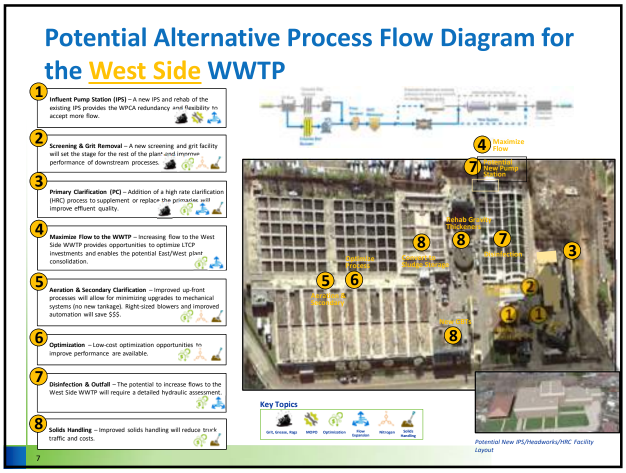


Project Approach



Schedule

- Finalizing draft Scope/Fee with Bridgeport this week
- Submit to CT DEEP for review/approval as part of 55% grant application process
- CT DEEP review may be fast (within a couple weeks) but also at times is slow (3 months or more)
- After approval, contract execution and work can commence
- Submit CT Clean Water Fund application for grant
- Facility Plan will take about 10 to 12 months followed by Bridgeport and CT DEEP reviews
- CDM Smith will provide WPCA Board with periodic updates throughout process



Potential Alternative Process Flow Diagram for the West Side WWTP

① **Influent Pump Station (IPS)** – A new IPS and rehab of the existing IPS provides the WPCA redundancy and flexibility to accept more flow.

② **Screening & Grit Removal** – A new screening and grit facility will set the stage for the rest of the plant and improve performance of downstream processes.

③ **Primary Clarification (PC)** – Addition of a high rate clarification (HRC) process to supplement or replace the primaries will improve effluent quality.

④ **Maximize Flow to the WWTP** – Increasing flow to the West Side WWTP provides opportunities to optimize LTCP investments and enables the potential East/West plant consolidation.

⑤ **Aeration & Secondary Clarification** – Improved up-front processes will allow for minimizing upgrades to mechanical systems (no new tankage). Right-sized blowers and improved automation will save $$$.

⑥ **Optimization** – Low-cost optimization opportunities to improve performance are available.

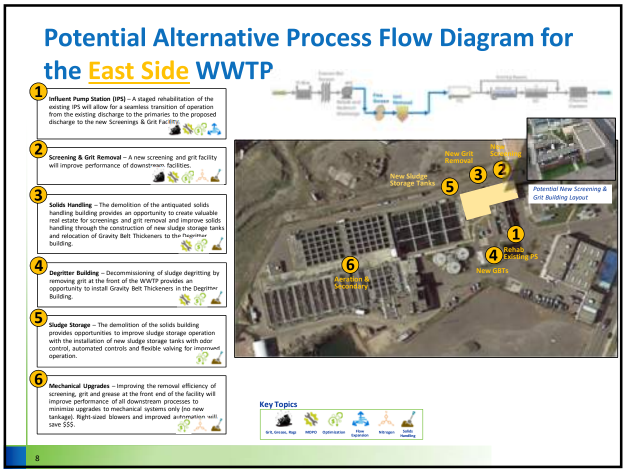
⑦ **Disinfection & Outfall** – The potential to increase flows to the West Side WWTP will require a detailed hydraulic assessment.

⑧ **Solids Handling** – Improved solids handling will reduce truck traffic and costs.

Key Topics

Grit, Grease, Rags · MOPO · Optimization · Flow Expansion · Nitrogen · Solids Handling

Potential New IPS/Headworks/HRC Facility Layout



Potential Alternative Process Flow Diagram for the East Side WWTP

① **Influent Pump Station (IPS)** – A staged rehabilitation of the existing IPS will allow for a seamless transition of operation from the existing discharge to the primaries to the proposed discharge to the new Screenings & Grit Facility.

② **Screening & Grit Removal** – A new screening and grit facility will improve performance of downstream facilities.

③ **Solids Handling** – The demolition of the antiquated solids handling building provides an opportunity to create valuable real estate for screenings and grit removal and improve solids handling through the construction of new sludge storage tanks and relocation of Gravity Belt Thickeners to the Degritter building.

④ **Degritter Building** – Decommissioning of sludge degritting by removing grit at the front of the WWTP provides an opportunity to install Gravity Belt Thickeners in the Degritter Building.

⑤ **Sludge Storage** – The demolition of the solids building provides opportunities to improve sludge storage operation with the installation of new sludge storage tanks with odor control, automated controls and flexible valving for improved operation.

⑥ **Mechanical Upgrades** – Improving the removal efficiency of screening, grit and grease at the front end of the facility will improve performance of all downstream processes to minimize upgrades to mechanical systems only (no new tankage). Right-sized blowers and improved automation will save $$$.

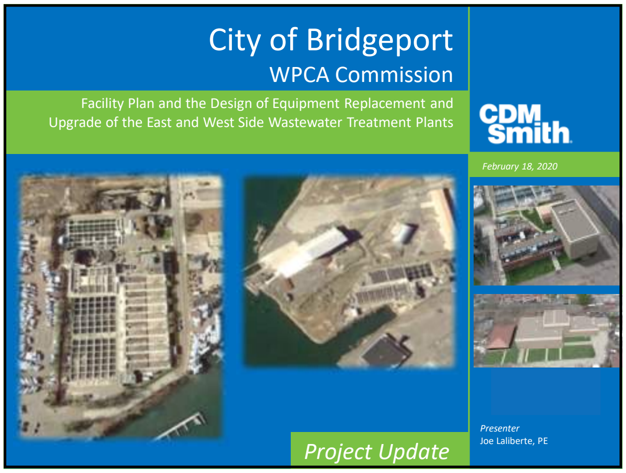
Potential New Screening & Grit Building Layout

Key Topics

Grit, Grease, Rags · MOPO · Optimization · Flow Expansion · Nitrogen · Solids Handling

Presentation to WPCA Board
February 2020

CDM Smith



City of Bridgeport

WPCA Commission

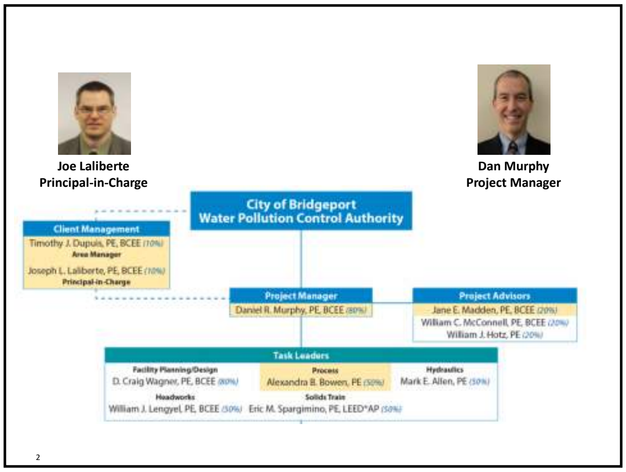
Facility Plan and the Design of Equipment Replacement and Upgrade of the East and West Side Wastewater Treatment Plants

CDM Smith

February 18, 2020

Presenter
Joe Laliberte, PE

Project Update

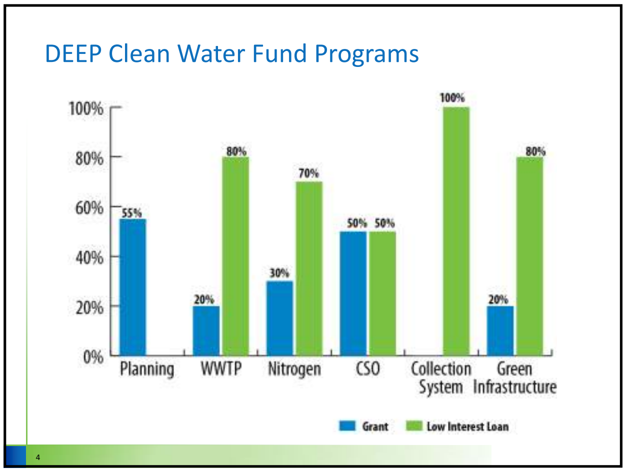


Joe Laliberte
Principal-in-Charge

Dan Murphy
Project Manager

Facilities Plan will Focus on these Key Topics

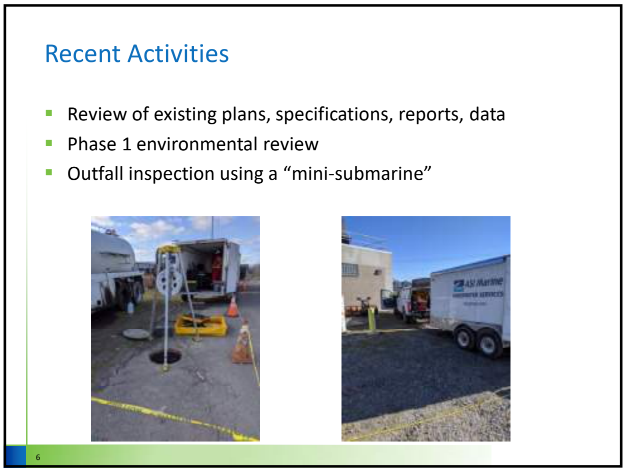
- Address Issues with Grit, Grease, and Rags
- Maintenance of Plant Operations during Construction
- Optimization
- Flow Expansion/Optimal Plant Expansion Capacity
- Nitrogen Reduction
- Improved Solids Processing



DEEP Clean Water Fund Programs

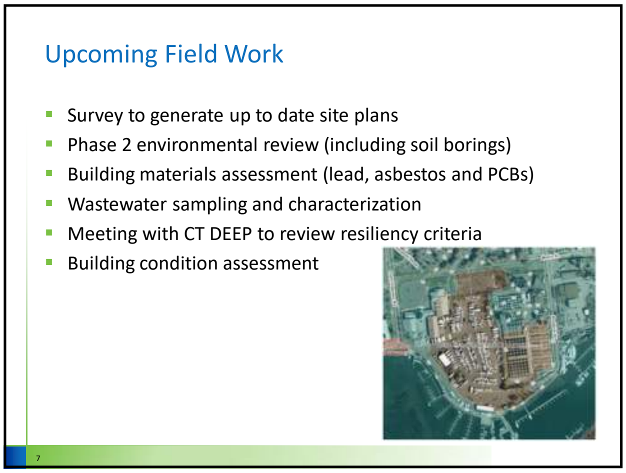
Facilities Plan Overview

- Funded through DEEP CWF Planning Grant
- Thorough evaluation of both plants and collection system
- Scope includes 18 tasks
- Approved by DEEP and started November 2019
- Final completion date November 2020



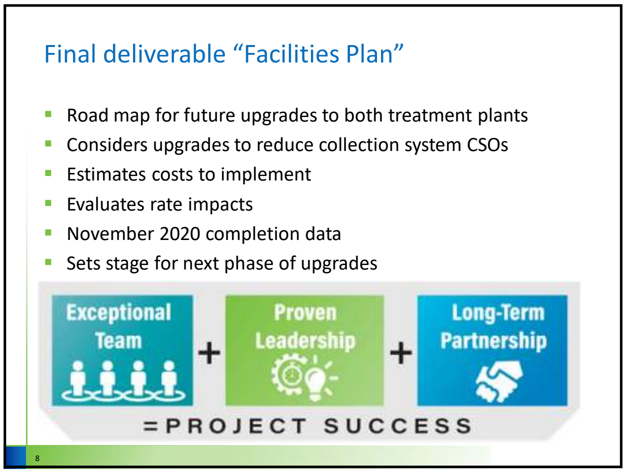
Recent Activities

- Review of existing plans, specifications, reports, data
- Phase 1 environmental review
- Outfall inspection using a “mini-submarine”



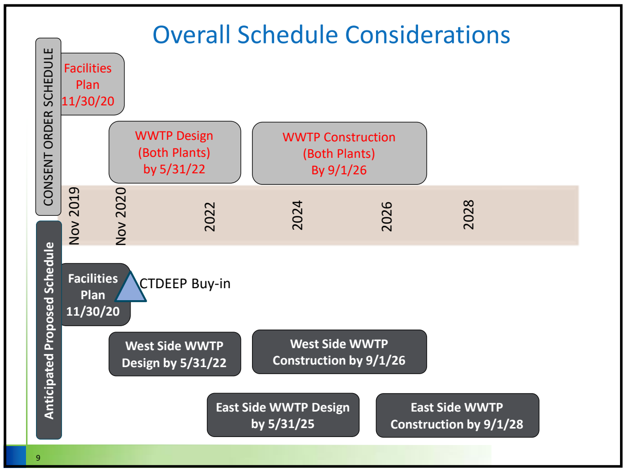
Upcoming Field Work

- Survey to generate up to date site plans
- Phase 2 environmental review (including soil borings)
- Building materials assessment (lead, asbestos and PCBs)
- Wastewater sampling and characterization
- Meeting with CT DEEP to review resiliency criteria
- Building condition assessment



Final deliverable “Facilities Plan”

- Road map for future upgrades to both treatment plants
- Considers upgrades to reduce collection system CSOs
- Estimates costs to implement
- Evaluates rate impacts
- November 2020 completion data
- Sets stage for next phase of upgrades



Overall Schedule Considerations

CONSENT ORDER SCHEDULE

Facilities Plan 11/30/20

WWTP Design (Both Plants) by 5/31/22

WWTP Construction (Both Plants) By 9/1/26

Anticipated Proposed Schedule

Facilities Plan 11/30/20

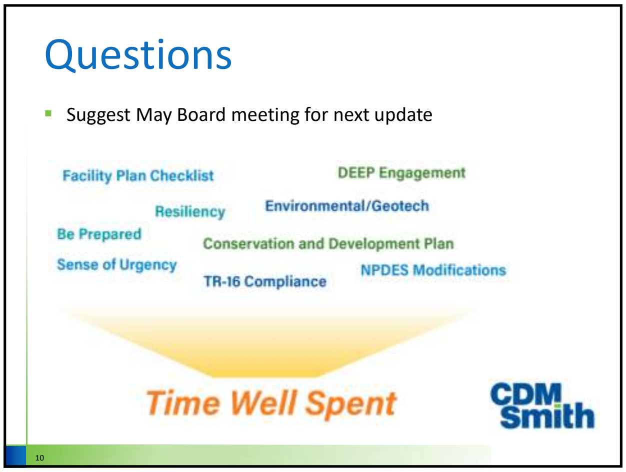
CTDEEP Buy-in

West Side WWTP Design by 5/31/22

West Side WWTP Construction by 9/1/26

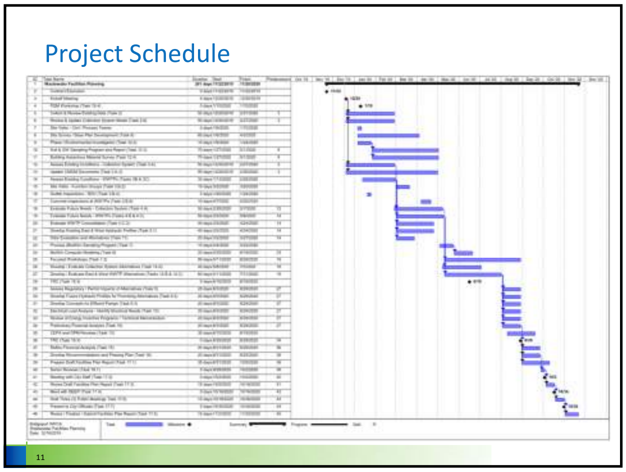
East Side WWTP Design by 5/31/25

East Side WWTP Construction by 9/1/28



Questions

- Suggest May Board meeting for next update



Project Schedule

Presentation to WPCA Board
August 2020

City of Bridgeport
Water Pollution Control Authority (WPCA)

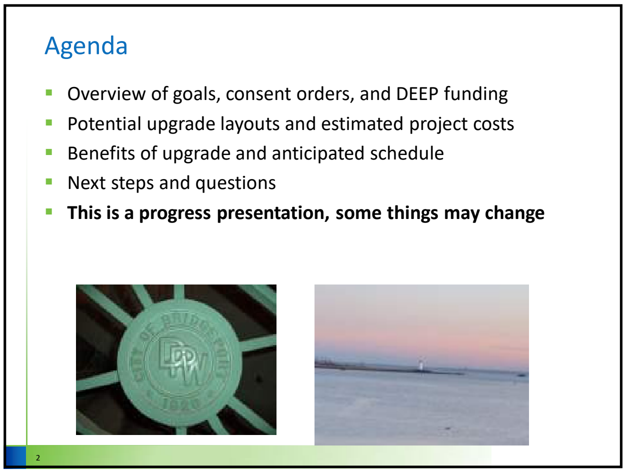
Facility Plan Preliminary Analysis and Recommendations
East and West Side Wastewater Treatment Plants

CDM Smith

August 18, 2020

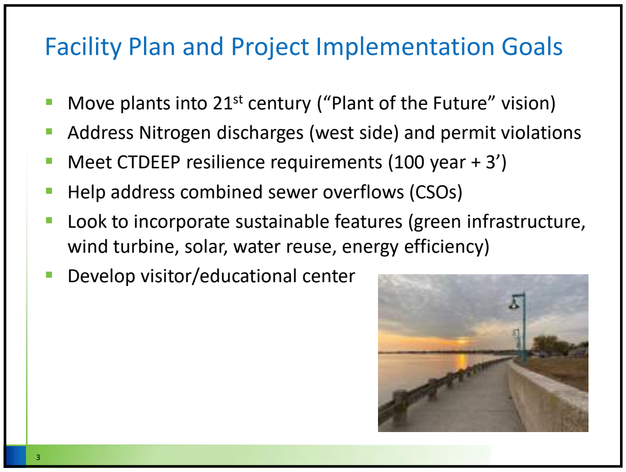
WPCA Board
Project Update

Presenters
Lauren Mappa, PE
Joe Laliberte, PE
Dan Murphy, PE



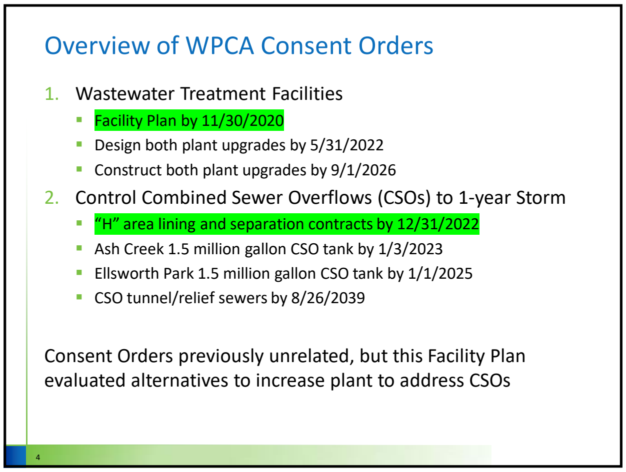
Agenda

- Overview of goals, consent orders, and DEEP funding
- Potential upgrade layouts and estimated project costs
- Benefits of upgrade and anticipated schedule
- Next steps and questions
- **This is a progress presentation, some things may change**



Facility Plan and Project Implementation Goals

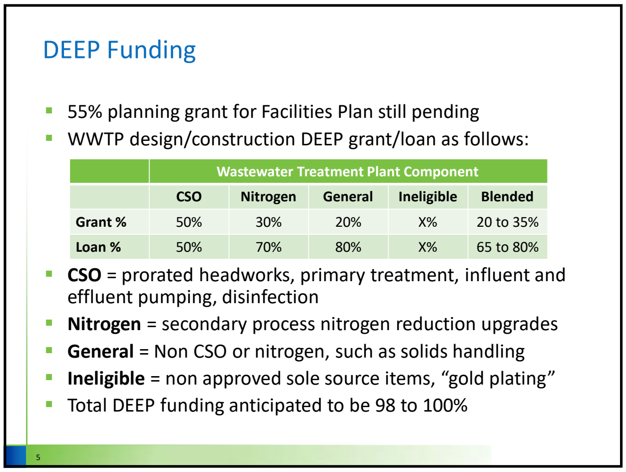
- Move plants into 21st century ("Plant of the Future" vision)
- Address Nitrogen discharges (west side) and permit violations
- Meet CTDEEP resilience requirements (100 year + 3')
- Help address combined sewer overflows (CSOs)
- Look to incorporate sustainable features (green infrastructure, wind turbine, solar, water reuse, energy efficiency)
- Develop visitor/educational center



Overview of WPCA Consent Orders

1. Wastewater Treatment Facilities
    - Facility Plan by 11/30/2020
    - Design both plant upgrades by 5/31/2022
    - Construct both plant upgrades by 9/1/2026
2. Control Combined Sewer Overflows (CSOs) to 1-year Storm
    - "H" area lining and separation contracts by 12/31/2022
    - Ash Creek 1.5 million gallon CSO tank by 1/3/2023
    - Ellsworth Park 1.5 million gallon CSO tank by 1/1/2025
    - CSO tunnel/relief sewers by 8/26/2039

Consent Orders previously unrelated, but this Facility Plan evaluated alternatives to increase plant to address CSOs

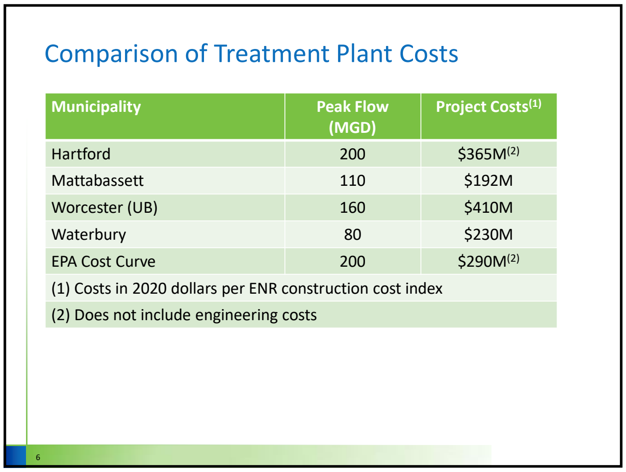


DEEP Funding

- 55% planning grant for Facilities Plan still pending
- WWTP design/construction DEEP grant/loan as follows:

	Wastewater Treatment Plant Component				
	CSO	**Nitrogen**	**General**	**Ineligible**	**Blended**
Grant %	50%	30%	20%	X%	20 to 35%
Loan %	50%	70%	80%	X%	65 to 80%

- **CSO** = prorated headworks, primary treatment, influent and effluent pumping, disinfection
- **Nitrogen** = secondary process nitrogen reduction upgrades
- **General** = Non CSO or nitrogen, such as solids handling
- **Ineligible** = non approved sole source items, "gold plating"
- Total DEEP funding anticipated to be 98 to 100%



Comparison of Treatment Plant Costs

Municipality	Peak Flow (MGD)	Project Costs[1]
Hartford	200	$365M[2]
Mattabassett	110	$192M
Worcester (UB)	160	$410M
Waterbury	80	$230M
EPA Cost Curve	200	$290M[2]
(1) Costs in 2020 dollars per ENR construction cost index		
(2) Does not include engineering costs		

Move West Side Plant into 21st Century

- Wet Weather flow capacity – 90 to 200 MGD
- Estimated Project Costs 90MGD = $265M, Bridgeport share = $205M
- Estimated Project Costs 200MGD = $325M, Bridgeport share = $210M

*All costs are preliminary, in 2020 dollars, & need escalation to construction midpoint

West Side CSO Scenarios

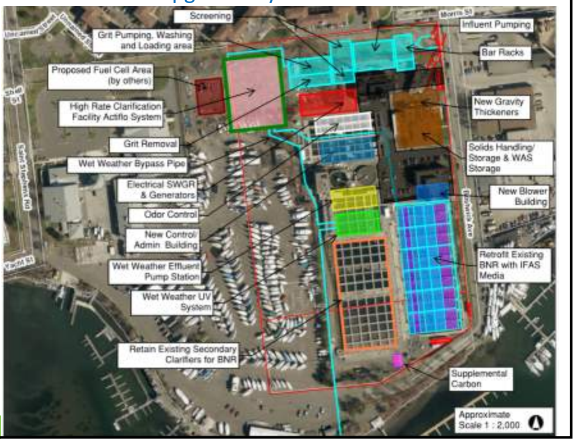
West Side Scenario 1 (Maintain WPCF at 90 MGD, Control Entire 1-Year Storm)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 90 MGD WPCF Upgrade (Dual-Use Primary Filters & IFAS)	$	265,000,000
Cost to Control 1-Year Storm (44.2 Mgal)	$	496,000,000
West Scenario 1 Total	**$**	**761,000,000**

West Scenario 2 (WPCF to 200 MGD, Control Remaining CSO)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 200 MGD WPCF Upgrade (Dual-Use Primary Filters & IFAS)	$	325,000,000
Collection System Improvements to Convey 200 MGD	$	57,000,000
Cost to Remove Remaining CSO (19 Mgal) in 1-Year Storm	$	213,000,000
West Scenario 2 Total	**$**	**595,000,000**
Cost Difference (200 MGD-90 MGD)	$	(166,000,000)

Existing West Side Plant Site and Surrounding City Land

Potential 90 MGD Upgrade Layout – within Current Fence Line

Potential 200 MGD Upgrade Layout – Need Additional Land



Existing West Side Plant Site – Need Additional Land

Move East Side Plant into 21st Century

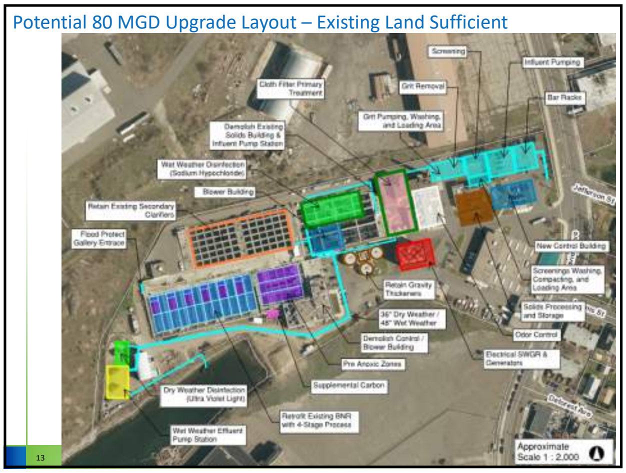
- Wet Weather flow capacity – 40 to 80 MGD
- Estimated Project Costs 40MGD = $150M, Bridgeport share = $115M
- Estimated Project Costs 80MGD = $175M, Bridgeport share = $115M

*All costs are preliminary, in 2020 dollars, & need escalation to construction midpoint

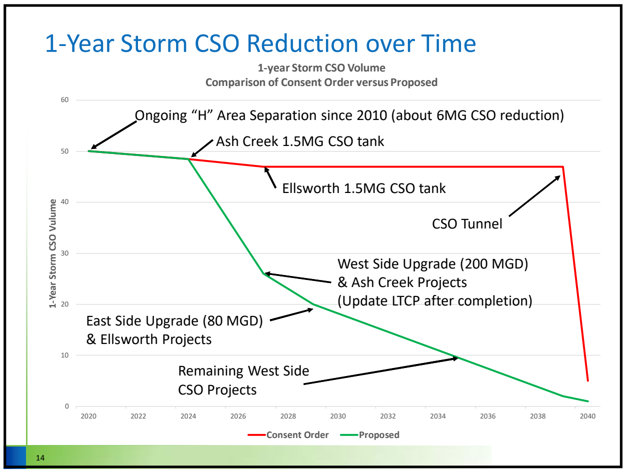
East Side CSO Scenarios

East Side Scenario 1 (WPCF to 40 MGD, Control Entire 1-Year Storm)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 40 MGD WPCF Upgrade (Dual-Use Primary Filters & 4-Stage)	$	150,000,000
Cost to Control 1-Year Storm (4.2 Mgal)	$	47,000,000
East Scenario 1 Total	**$**	**197,000,000**

East Side Scenario 2 (WPCF to 80 MGD, Control Remaining CSO)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 80 MGD WPCF Upgrade (Dual-Use Primary Filters & 4-Stage)	$	175,000,000
Collection System Improvements to Convey 80 MGD	$	11,000,000
Cost to Remove Remaining CSO (1 Mgal) in 1-Year Storm	$	11,000,000
East Scenario 2 Total	**$**	**197,000,000**
Cost Difference (80 MGD-40 MGD)	$	-

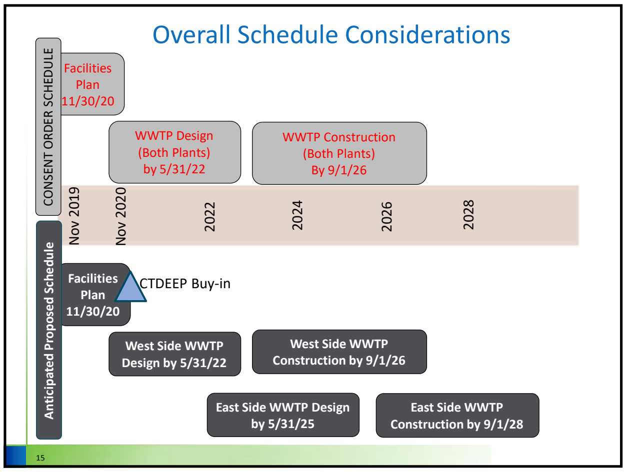


Potential 80 MGD Upgrade Layout – Existing Land Sufficient



1-Year Storm CSO Reduction over Time

1-year Storm CSO Volume
Comparison of Consent Order versus Proposed



Overall Schedule Considerations

Next Steps

- Requires decision on additional land availability
- Update affordability analysis
- Draft Facilities Plan report for CTDEEP submission (by 11/20)
- Draft/finalize West Side Plant Scope and Budget with intent to commence design mid-November

Presentation to WPCA Board
November 2020

CDM Smith

Water Pollution Control Authority (WPCA)
City of Bridgeport

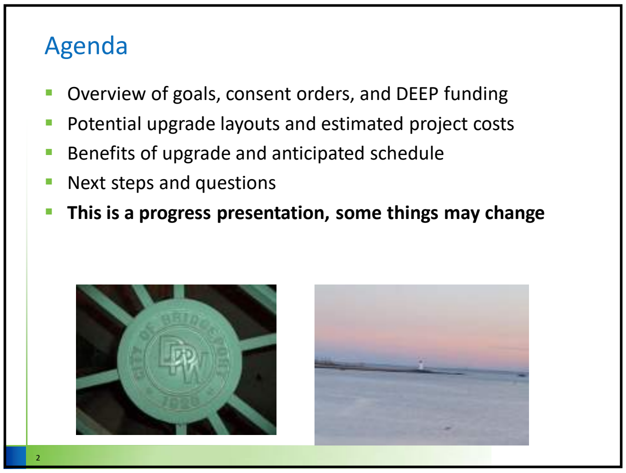
Facility Plan Preliminary Analysis and Recommendations
East and West Side Wastewater Treatment Plants

CDM Smith

November 17, 2020

WPCA Board Project Update

Presenters
Lauren Mappa, PE
Joe Laliberte, PE
Dan Murphy, PE



Agenda

- Overview of goals, consent orders, and DEEP funding
- Potential upgrade layouts and estimated project costs
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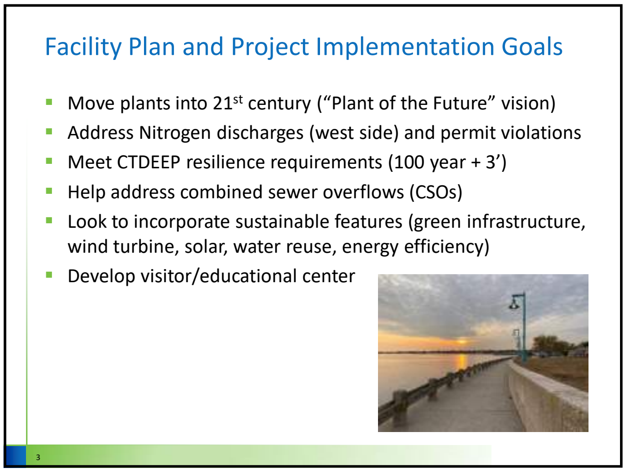
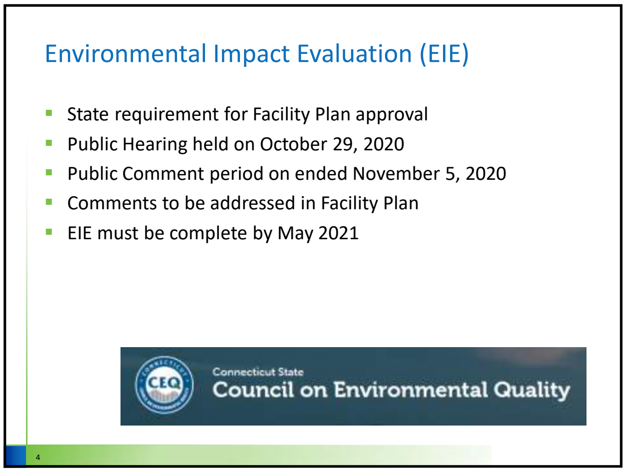


Facility Plan and Project Implementation Goals

- Move plants into 21st century (“Plant of the Future” vision)
- Address Nitrogen discharges (west side) and permit violations
- Meet CTDEEP resilience requirements (100 year + 3’)
- Help address combined sewer overflows (CSOs)
- Look to incorporate sustainable features (green infrastructure, wind turbine, solar, water reuse, energy efficiency)
- Develop visitor/educational center



Environmental Impact Evaluation (EIE)

- State requirement for Facility Plan approval
- Public Hearing held on October 29, 2020
- Public Comment period on ended November 5, 2020
- Comments to be addressed in Facility Plan
- EIE must be complete by May 2021

Connecticut State
Council on Environmental Quality

Existing West Side Plant Site and Surrounding City Land

West Side Recommended 200 MGD Layout - $395,000,000

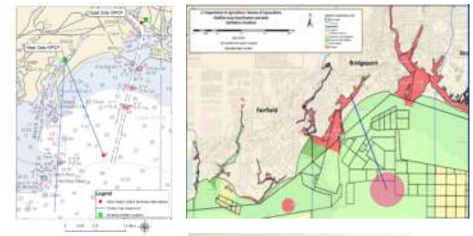
Existing West Side Plant Site – Need Additional Land

Outfall Considerations

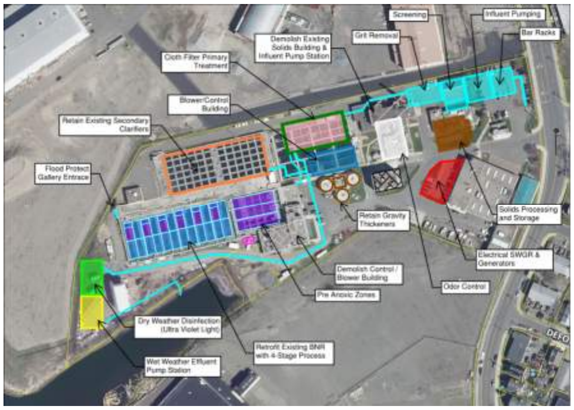
- 72-inch diameter pipe constructed in 1948
- Size and condition adequate for upgraded plant
- Pipe lining to renew pipe considered
- Extending outfall is a major undertaking

Extended Outfall

- Options considered for deep water discharge
- 2-mile-long extension to outer harbor
- Offshore shellfish claim impacts
- Extensive permitting process will delay project
- Order of magnitude cost $200M
- Recommendation – Future project, maintain existing pipe at this time



Recommended East Side 80 MGD Layout – $215,000,000

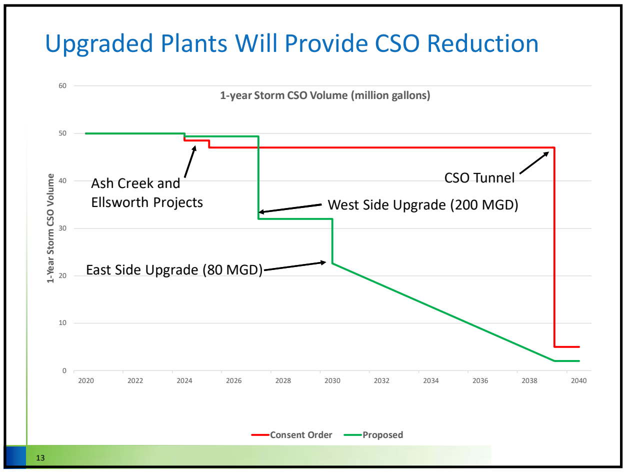


Outfall Considerations

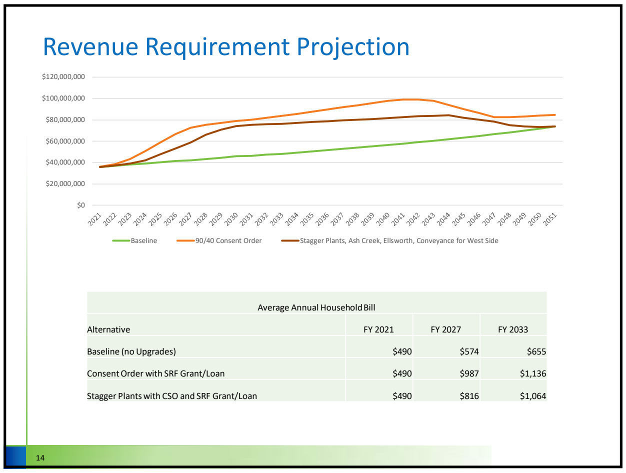
- 60-inch diameter pipe constructed in 1950s and 1969
- Size and condition adequate for upgraded plant
- Pipe lining to renew pipe considered
- Extending outfall has marginal benefits

Extended Outfall

- Options considered for harbor discharge
- 350-foot-long extension to harbor edge near channel
- Extensive permitting process will delay project
- Order of magnitude cost $2M
- Recommendation – maintain existing pipe at this time



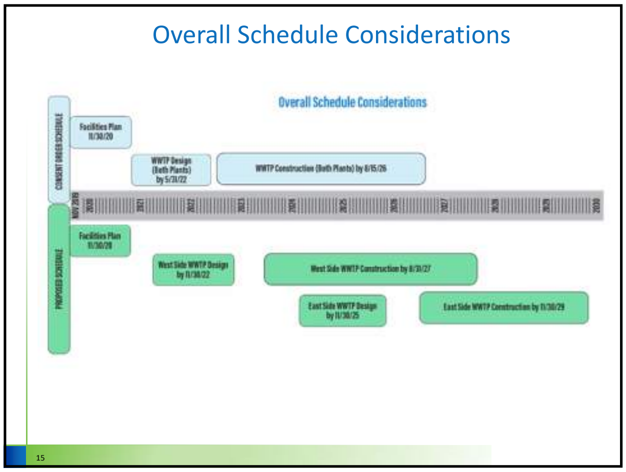
Upgraded Plants Will Provide CSO Reduction



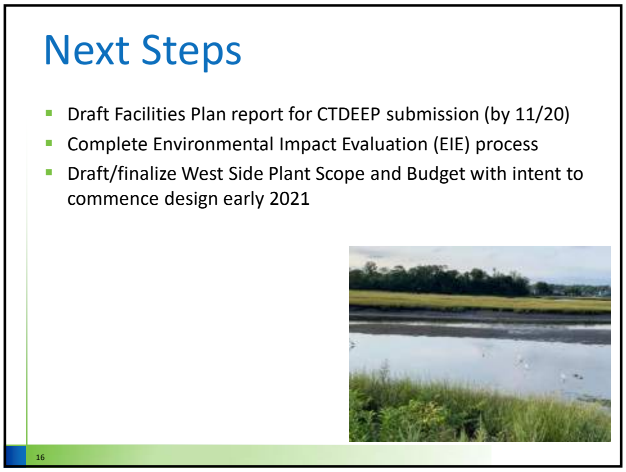
Revenue Requirement Projection

Average Annual Household Bill

Alternative	FY 2021	FY 2027	FY 2033
Baseline (no Upgrades)	$490	$574	$655
Consent Order with SRF Grant/Loan	$490	$987	$1,136
Stagger Plants with CSO and SRF Grant/Loan	$490	$816	$1,064



Overall Schedule Considerations



Next Steps

- Draft Facilities Plan report for CTDEEP submission (by 11/20)
- Complete Environmental Impact Evaluation (EIE) process
- Draft/finalize West Side Plant Scope and Budget with intent to commence design early 2021

Presentation to CT DEEP
August 2020

City of Bridgeport
Water Pollution Control Authority (WPCA)

Facility Plan Preliminary Analysis and Recommendations
East and West Side Wastewater Treatment Plants

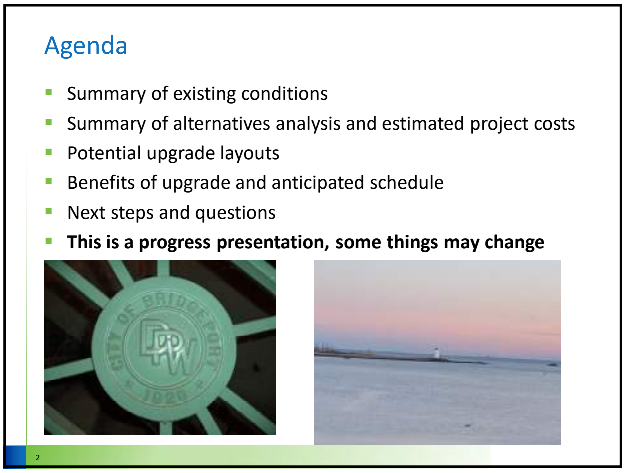
CDM Smith

August, 2020

CT DEEP

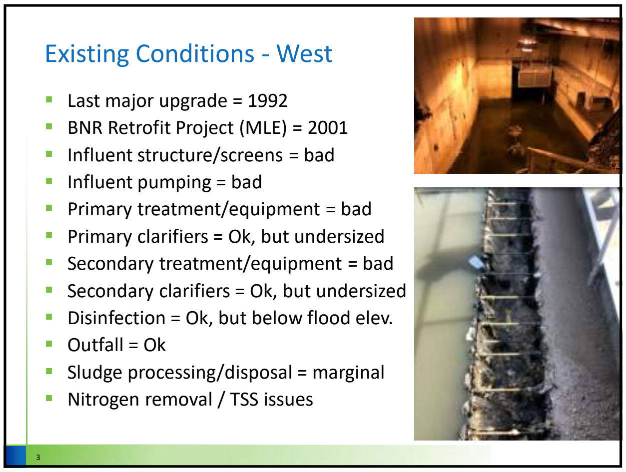
Project Update

Presenters
Lauren Mappa, PE
Joe Laliberte, PE
Dan Murphy, PE



Agenda

- Summary of existing conditions
- Summary of alternatives analysis and estimated project costs
- Potential upgrade layouts
- Benefits of upgrade and anticipated schedule
- Next steps and questions
- **This is a progress presentation, some things may change**



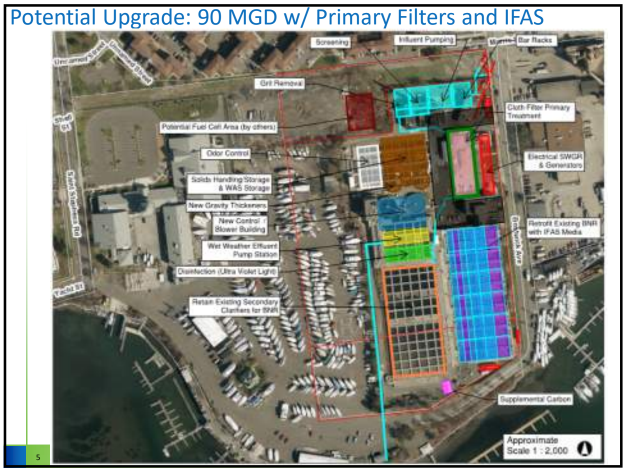
Existing Conditions - West

- Last major upgrade = 1992
- BNR Retrofit Project (MLE) = 2001
- Influent structure/screens = bad
- Influent pumping = bad
- Primary treatment/equipment = bad
- Primary clarifiers = Ok, but undersized
- Secondary treatment/equipment = bad
- Secondary clarifiers = Ok, but undersized
- Disinfection = Ok, but below flood elev.
- Outfall = Ok
- Sludge processing/disposal = marginal
- Nitrogen removal / TSS issues

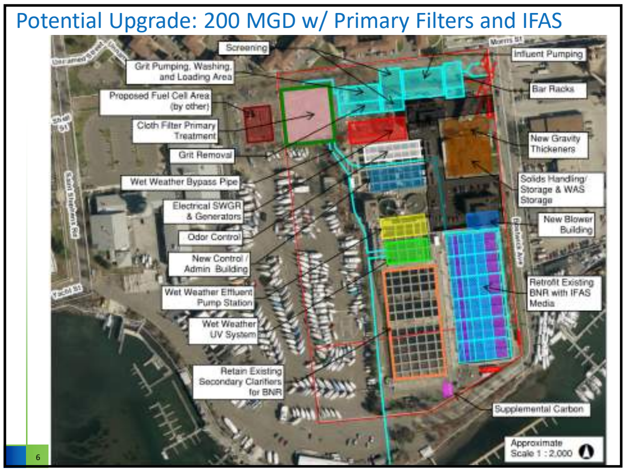
Alternative Analysis – West

- Preliminary – screening, grit removal and pumping required
- Primary – traditional tanks, Actiflo, filters, CEPT, hybrid
- Secondary – traditional, MBR, IFAS
- Disinfection – Chlorine, UV, hybrid
- Wet Weather capacity – 90, 140, 180, 200 mgd
- Sludge handling/disposal – upgrade thickening systems

- Estimated Project Costs - $265M to $360M



Potential Upgrade: 90 MGD w/ Primary Filters and IFAS



Potential Upgrade: 200 MGD w/ Primary Filters and IFAS

Existing Conditions - East

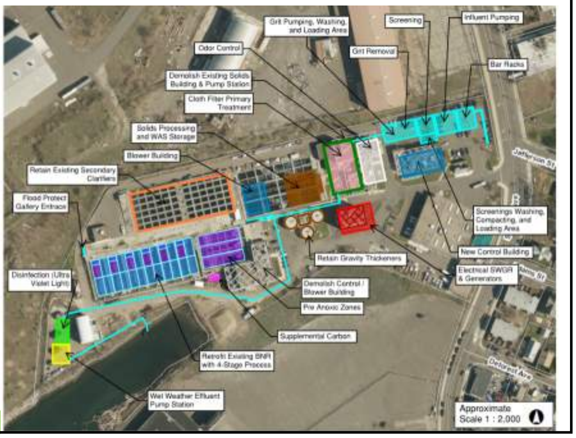
- Last major upgrade = 1995
- BNR Retrofit Project (MLE) = 2001
- Influent structure/screens = bad
- Influent pumping = bad
- Primary treatment/equipment = bad
- Primary clarifiers = Ok, but undersized
- Secondary treatment/equipment = bad
- Secondary clarifiers = Ok
- Disinfection = Ok, but below flood elev.
- Outfall = Ok
- Sludge processing/disposal = marginal

Alternatives Analysis - East

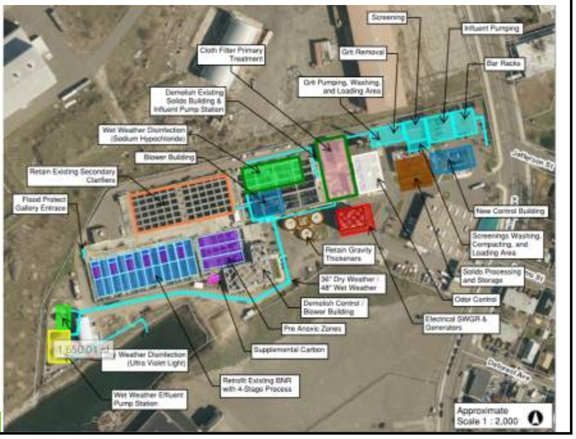
- Preliminary – screening, grit removal and pumping required
- Primary – traditional tanks, Actiflo, filters, CEPT, hybrid
- Secondary – traditional, MBR, IFAS
- Disinfection – Chlorine, UV, hybrid
- Wet Weather capacity – 40, 80 mgd
- Sludge handling/disposal – Upgrade thickening systems

- Estimated Project Costs - $140M to $210M

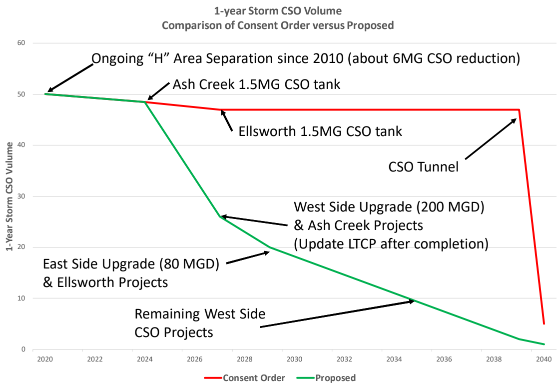
Potential Upgrade: 40 MGD w/ Primary Filters and 4-Stage BNR



Potential Upgrade: 80 MGD w/ Primary Filters and 4-stage BNR



1-Year Storm CSO Reduction over Time



Ongoing "H" Area Separation since 2010 (about 6MG CSO reduction)

Ash Creek 1.5MG CSO tank

Ellsworth 1.5MG CSO tank

CSO Tunnel

West Side Upgrade (200 MGD)
& Ash Creek Projects
(Update LTCP after completion)

East Side Upgrade (80 MGD)
& Ellsworth Projects

Remaining West Side
CSO Projects

1-Year Storm CSO Reduction Cost Comparison

West Side CSO Scenarios

West Side Scenario 1 (Maintain WPCF at 90 MGD, Control Entire 1-Year Storm)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 90 MGD WPCF Upgrade (Dual-Use Primary Filters & IFAS)	$	265,000,000
Cost to Control 1-Year Storm (44.2 Mgal)	$	496,000,000
West Scenario 1 Total	**$**	**761,000,000**

West Scenario 2 (WPCF to 200 MGD, Control Remaining CSO)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 200 MGD WPCF Upgrade (Dual-Use Primary Filters & IFAS)	$	325,000,000
Collection System Improvements to Convey 200 MGD	$	57,000,000
Cost to Remove Remaining CSO (19 Mgal) in 1-Year Storm	$	213,000,000
West Scenario 2 Total	**$**	**595,000,000**

Cost Difference (200 MGD-90 MGD) $ (166,000,000)

East Side CSO Scenarios

East Side Scenario 1 (WPCF to 40 MGD, Control Entire 1-Year Storm)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 40 MGD WPCF Upgrade (Dual-Use CEPT & IFAS)	$	137,000,000
Cost to Control 1-Year Storm (4.2 Mgal)	$	47,000,000
East Scenario 1 Total	**$**	**184,000,000**

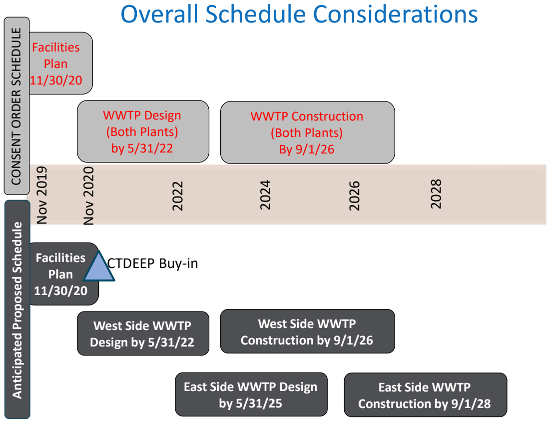
East Side Scenario 2 (WPCF to 80 MGD, Control Remaining CSO)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 80 MGD WPCF Upgrade (Dual-Use Primary Filters & 4-Stage)	$	176,000,000
Collection System Improvements to Convey 80 MGD	$	11,000,000
Cost to Remove Remaining CSO (1 Mgal) in 1-Year Storm	$	11,000,000
East Scenario 2 Total	**$**	**198,000,000**

Cost Difference (80 MGD-40 MGD) $ 14,000,000

Facility Plan and Project Implementation Goals

- Move plants into 21st century ("Plant of the Future" vision)
- Address Nitrogen discharges (west side)
- Address TSS violations
- Meet CTDEEP resilience requirements (100 year + 3')
- More than 50% CSO reduction with increase treatment capacity faster than current LTCP/Consent Order while saving ~$200M
- Look to incorporate sustainable features (green infrastructure, wind turbine, solar, water reuse, energy efficiency)
- Develop visitor/educational center

Overall Schedule Considerations



CONSENT ORDER SCHEDULE

Facilities Plan 11/30/20

WWTP Design (Both Plants) by 5/31/22

WWTP Construction (Both Plants) By 9/1/26

Nov 2019

Nov 2020

2022

2024

2026

2028

Anticipated Proposed Schedule

Facilities Plan 11/30/20

CTDEEP Buy-in

West Side WWTP Design by 5/31/22

West Side WWTP Construction by 9/1/26

East Side WWTP Design by 5/31/25

East Side WWTP Construction by 9/1/28

Funding Considerations

- Update on CTDEEP Planning Grant for Facilities Plan?
- Splitting up plants helps CTDEEP from funding standpoint
- Potential stimulus funding?
- CSO/BNR/Plant upgrade – 50%/30%/20% CWF grant
- Design – commence fall 2020
- Construction – commence summer 2022
- Possible CTDEEP loan/grant funding in place for design prior to construction?

Next Steps

- Presenting to WPCA Board (August 18th)
- Update affordability analysis
- Draft Facilities Plan report for CTDEEP submission (by 11/20)
- Draft/finalize West Side Plant Scope and Budget with intent to commence design mid-November

- CTDEEP start EIE process?

Presentation to City Finance Committee
August 2020

CDM Smith

City of Bridgeport
Water Pollution Control Authority (WPCA)

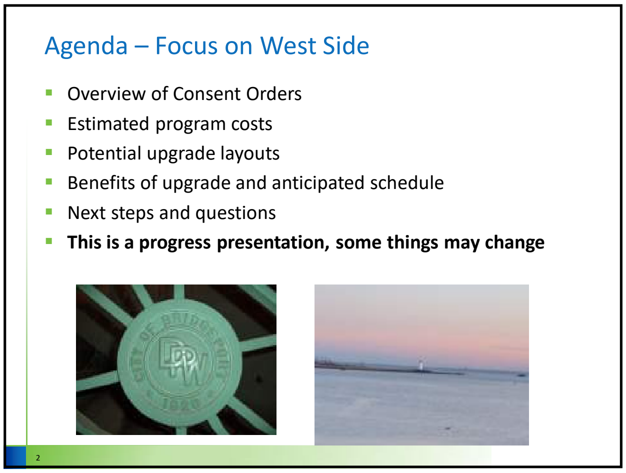
Facility Plan Preliminary Analysis and Recommendations
East and West Side Wastewater Treatment Plants

CDM Smith

August 12, 2020

City Finance
Project Update

Presenters
Lauren Mappa, PE
Joe Laliberte, PE
Dan Murphy, PE



Agenda – Focus on West Side

- Overview of Consent Orders
- Estimated program costs
- Potential upgrade layouts
- Benefits of upgrade and anticipated schedule
- Next steps and questions
- **This is a progress presentation, some things may change**

Overview of WPCA Consent Orders

- Wastewater Treatment Facilities
  - Facility Plan by 11/30/2020
  - Design both plant upgrades by 5/31/2022
  - Construct both plant upgrades by 9/1/2026
- Control Combined Sewer Overflows (CSOs) to 1-year Storm
  - "H" area lining and separation contracts by 12/31/2022
  - Ash Creek 1.5 million gallon CSO tank by 1/3/2023
  - Ellsworth Park 1.5 million gallon CSO tank by 1/1/2025
  - CSO tunnel/relief sewers by 8/26/2039
- Consent Orders previously unrelated, but this Facility Plan evaluated alternatives to increase plant to address CSOs

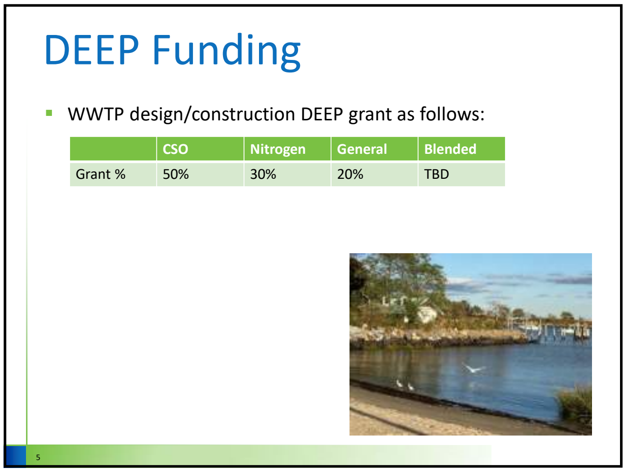
1-Year Storm CSO Reduction Cost Comparison

West Side CSO Scenarios

West Side Scenario 1 (Maintain WPCF at 90 MGD, Control Entire 1-Year Storm)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 90 MGD WPCF Upgrade (Dual-Use Primary Filters & IFAS)	$	265,000,000
Cost to Control 1-Year Storm (44.2 Mgal)	$	496,000,000
West Scenario 1 Total	**$**	**761,000,000**

West Scenario 2 (WPCF to 200 MGD, Control Remaining CSO)	Bridgeport 2010 LTCP Program Cost ($2020, M)	
Cost of 200 MGD WPCF Upgrade (Dual-Use Primary Filters & IFAS)	$	325,000,000
Collection System Improvements to Convey 200 MGD	$	57,000,000
Cost to Remove Remaining CSO (19 Mgal) in 1-Year Storm	$	213,000,000
West Scenario 2 Total	**$**	**595,000,000**
Cost Difference (200 MGD-90 MGD)	$	(166,000,000)

*Cost for CSO Control escalated from 2010 LTCP



DEEP Funding

- WWTP design/construction DEEP grant as follows:

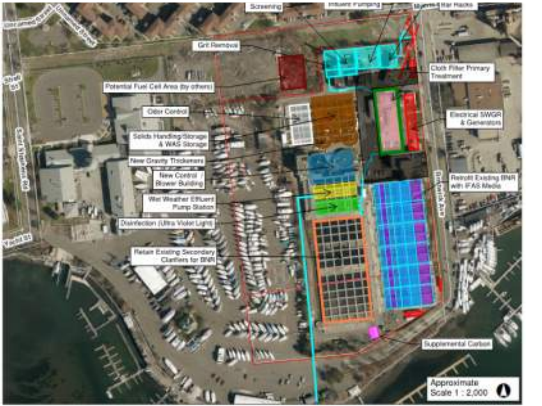
	CSO	Nitrogen	General	Blended
Grant %	50%	30%	20%	TBD

Existing West Side Plant Aerial

Comparison of Treatment Plant Site Sizes

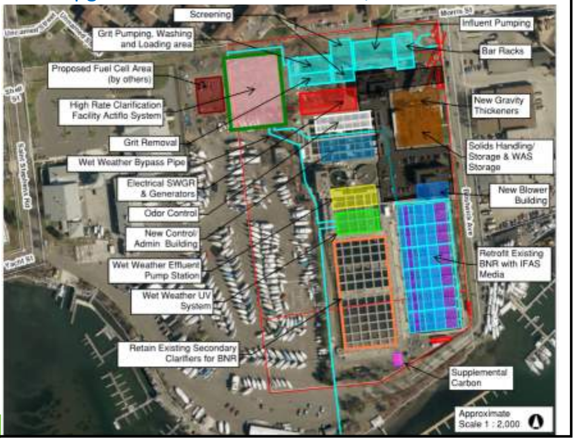
Municipality	Site Size (acres)	Average Day (MGD)	Peak Secondary (MGD)	Peak Wet Weather (MGD)
Hartford	49.8	70	120	200
Providence (FP)	24.5	65	77	200
New Haven	23	40	60	100
Mattabassett	~24	35	55	110
Worcester (UB)	47	34	120	160
Bridgeport (west)	**8.5**	30	58	90
Waterbury	21.8	25	50	80
Providence (BP)	36.2	24	46	116
Stamford	23.5	24	54	68
Norwalk	12.3	18	30	90
Bridgeport (east)	**8.8**	10	24	40
Norwich	12	8.5	17	17

Potential Upgrade: 90 MGD w/ Primary Filters and IFAS
Estimate Project Cost = $265M, Bridgeport Share = $205M

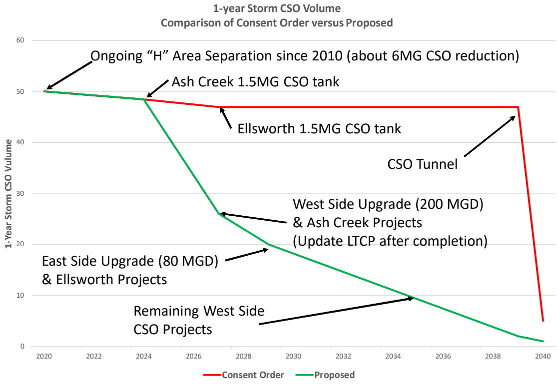


Potential Upgrade: 200 MGD w/ Primary Filters and IFAS
Estimated Project Costs = $325M, Bridgeport Share = $210M

Potential Upgrade Alternate: 200 MGD w/ HRC and IFAS



1-Year Storm CSO Reduction over Time



Ongoing “H” Area Separation since 2010 (about 6MG CSO reduction)

Ash Creek 1.5MG CSO tank

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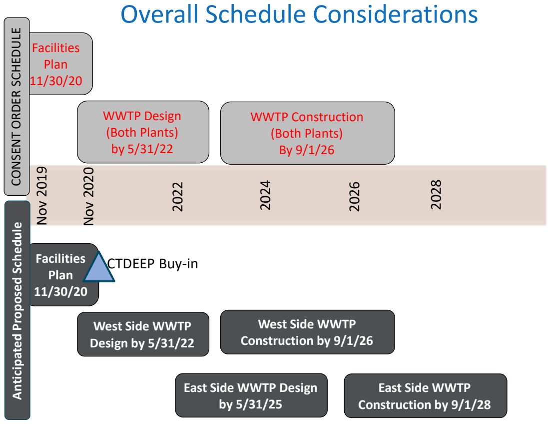
CSO Tunnel

West Side Upgrade (200 MGD)
& Ash Creek Projects
(Update LTCP after completion)

East Side Upgrade (80 MGD)
& Ellsworth Projects

Remaining West Side
CSO Projects

Overall Schedule Considerations



Facilities Plan 11/30/20

WWTP Design (Both Plants) by 5/31/22

WWTP Construction (Both Plants) By 9/1/26

Facilities Plan 11/30/20

CTDEEP Buy-in

West Side WWTP Design by 5/31/22

West Side WWTP Construction by 9/1/26

East Side WWTP Design by 5/31/25

East Side WWTP Construction by 9/1/28

Next Steps

- Requires decision on additional land availability
- Draft Facilities Plan report for CTDEEP submission (by 11/20)
- Draft/finalize West Side Plant Scope and Budget with intent to commence design mid-November

Public Scoping Meeting CT DEEP
October 28, 2020

Water Pollution Control Authority (WPCA)
City of Bridgeport

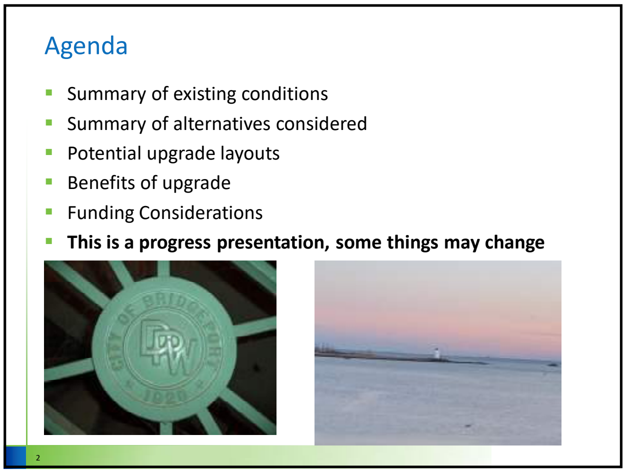
Facility Plan Preliminary Analysis and Recommendations
West Side and East Side Wastewater Treatment Plants

CDM Smith

October 28, 2020

Public Scoping Meeting

Presenters
Lauren Mappa, PE
Joe Laliberte, PE
Dan Murphy, PE



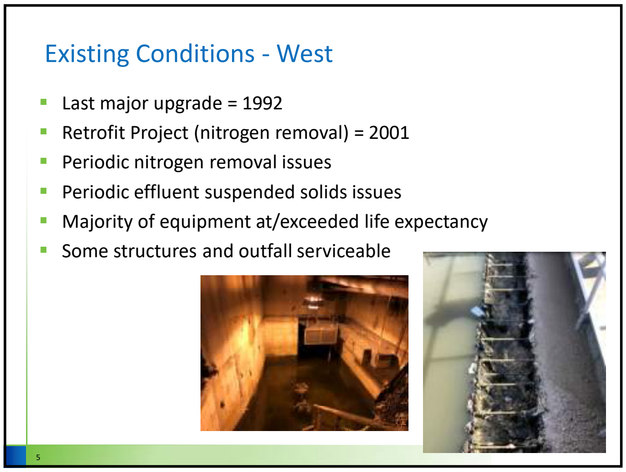
Agenda

- Summary of existing conditions
- Summary of alternatives considered
- Potential upgrade layouts
- Benefits of upgrade
- Funding Considerations
- **This is a progress presentation, some things may change**

Facility Plan and Project Implementation Goals

- Move plants into 21st century ("Plant of the Future" vision)
- Address Nitrogen discharges (west side) and permit violations
- Meet CTDEEP resilience requirements (100 year + 3')
- Help address combined sewer overflows (CSOs)

Existing Conditions - West



Existing Conditions - West

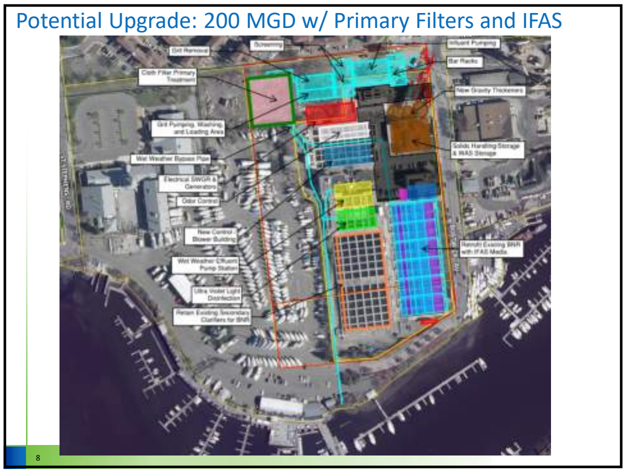
- Last major upgrade = 1992
- Retrofit Project (nitrogen removal) = 2001
- Periodic nitrogen removal issues
- Periodic effluent suspended solids issues
- Majority of equipment at/exceeded life expectancy
- Some structures and outfall serviceable

Alternative Analysis – West

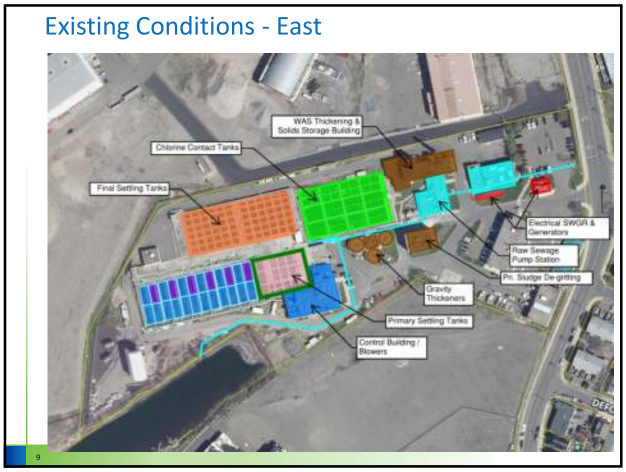
- Preliminary – screening, grit removal and pumping required
- Primary – traditional tanks, Actiflo, filters, CEPT, hybrid
- Secondary – traditional, MBR, IFAS
- Disinfection – Chlorine, UV, hybrid
- Wet Weather capacity – 90 versus 200 mgd
- Sludge handling/disposal – upgrade thickening systems

List of Acronyms:
CEPT – chemically enhanced primary treatment
MBR – membrane bioreactor
IFAS – integrated fixed film activated sludge
UV – ultraviolet light
mgd – million gallons per day

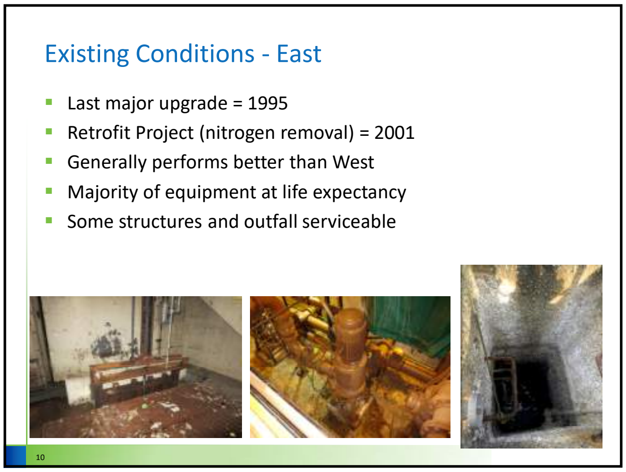
Potential Upgrade: 90 MGD w/ Primary Filters and IFAS



Potential Upgrade: 200 MGD w/ Primary Filters and IFAS

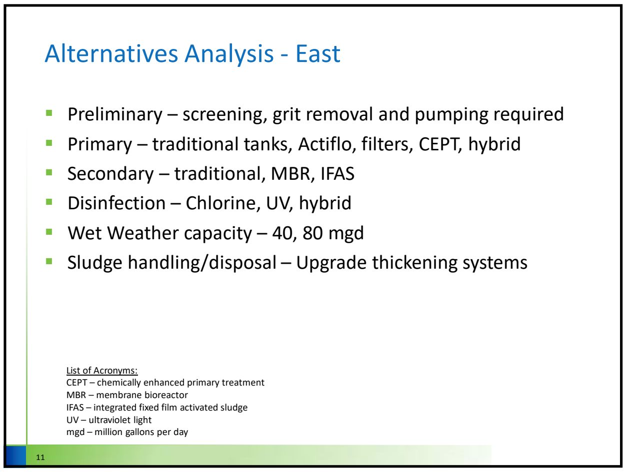


Existing Conditions - East



Existing Conditions - East

- Last major upgrade = 1995
- Retrofit Project (nitrogen removal) = 2001
- Generally performs better than West
- Majority of equipment at life expectancy
- Some structures and outfall serviceable



Alternatives Analysis - East

- Preliminary – screening, grit removal and pumping required
- Primary – traditional tanks, Actiflo, filters, CEPT, hybrid
- Secondary – traditional, MBR, IFAS
- Disinfection – Chlorine, UV, hybrid
- Wet Weather capacity – 40, 80 mgd
- Sludge handling/disposal – Upgrade thickening systems

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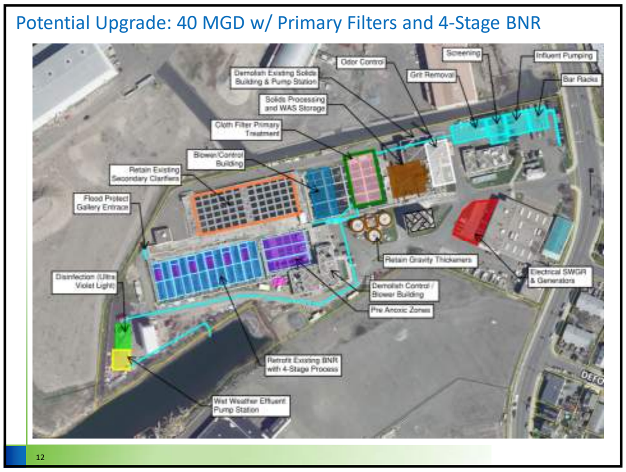
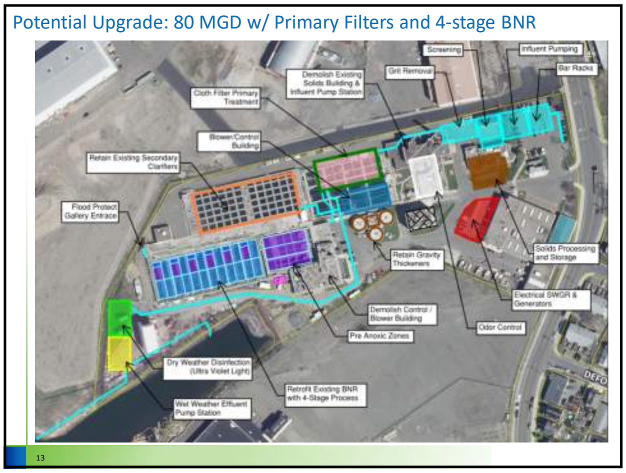
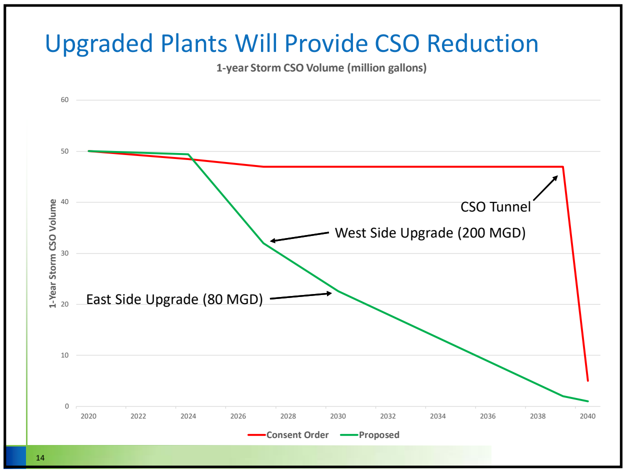


Potential Upgrade: 40 MGD w/ Primary Filters and 4-Stage BNR



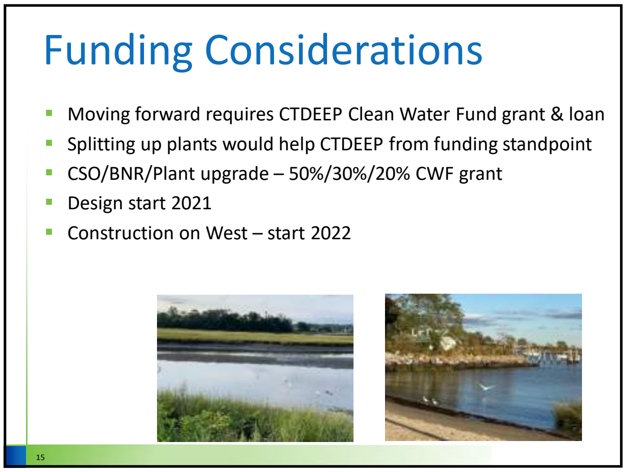
Potential Upgrade: 80 MGD w/ Primary Filters and 4-stage BNR

13



Upgraded Plants Will Provide CSO Reduction

14



Funding Considerations

- Moving forward requires CTDEEP Clean Water Fund grant & loan
- Splitting up plants would help CTDEEP from funding standpoint
- CSO/BNR/Plant upgrade – 50%/30%/20% CWF grant
- Design start 2021
- Construction on West – start 2022

15

CDM Smith

Memorandum

Date: November 17, 2020

Subject: Scoping Meeting Public Comments and Responses

The Water Pollution Control Authority (WPCA), City of Bridgeport has submitted its Wastewater Treatment Facilities Plan in accordance with Administrative Order WRMU19001. CDM Smith was retained as a consultant to complete this Facilities Plan. As part of the requirements of the Connecticut Environmental Policy Act (CEPA), a virtual public scoping meeting was scheduled by CT DEEP and advertised to the public. This public information session was held on October 29, 2020. CDM Smith presented the recommended plans for upgrading both the East Side and West Side WWTPs.

Public comments on the presentation and the project were accepted through November 5, 2020. The questions and comments received as part of this public participation progress are included herein. Many of these questions and comments have been abbreviated, but the substance of the public comment has not been altered. CDM Smith and the WPCA have provided corresponding responses in italics. Written comments, presentation slides, along with a transcript of the public meeting are attached to this memorandum.

Public Comment 1 (Submitted via Email): From Bill Lucey, Long Island Soundkeeper, Save the Sound:

A. "I am interested if there has ever been an effects analysis completed examining cumulative impacts from permitted sewage outfalls as part of the issuance of a NPDES permit."

   Response to 1A:

   DEEP will respond to this question through the EIE process.

B. "Understanding that there are certain allowances within "Zones of Influence", what is the responsibility of the permit holder when discharging into an impaired water body? More specifically what is the course of action when the impairment encompasses both the ZOI as well as the rest of the waterbody in cases where the waterbody is an enclosed harbor or bay?"

   Response to 1B:

   DEEP will respond to this question through the EIE process.

C. "Has there ever been **mitigation** required during a permitting or CEPA process for chronic inputs of nutrients and solids from a permitted discharge when these activities are identified as the primary source of the impairment?"

Response to 1C:

DEEP will respond to this question through the EIE process.

D. "Physical and chemical impacts include interruption of diurnal DO cycling, chronic hypoxia associated with high BOD and conversion of pre-discharge benthic sediments to post-discharge sediments characterized by high carbon concentrations and fine particle loading."

"Biological impacts include reduction in biomass and diversity of aquatic species and fish kills."

"Finally, understanding that in CT SLR is taken into consideration when upgrading facilities with state funds, are the effects of warming waters on chemical processes within the zone of influence (ZOI) and the impaired waterbody also considered?"

Response to 1D:

DEEP will respond to this question through the EIE process.

- **Public Comment 2 (Submitted via Email):** From Kevin Blagys, Bridgeport Resident, Business Owner of KB Dive Services, and Coordinator of the Black Rock Harbor Study

A. "Kevin Blagys, Bridgeport Resident, business owner of KB Dive Services and Coordinator of the Black Rock Harbor Study. I attended the Zoom meeting and asked 2 questions regarding the CSO tunnel and plans for moving the outfall pipe."

"Having just played the video presentation again, and studied the questions and Answers, here are my thoughts as a resident who works on the water, and has been studying Black Rock Harbor since 2019."

"The 14-minute zoom presentation by Dan and Joe of CDM Smith was the first time seeing the actual expansion plans of the East and West treatment plants."

"It seems that a project of this scale is being rushed through without appropriate time for public Comment. Black Rock harbor just completed its 2nd year, monitoring the harbor for the Unified Water Study (UWS) (monitoring program through Save the Sound). Prior to 2019 Black Rock was not included in the Long Island Sound Report published by Save the Sound."

Response to 2A:

The WPCA's Administrative Order with CT DEEP required the submittal of this Facilities Plan by November 30, 2020. Over the last 12 months CDM Smith has been working diligently with the WPCA to assess both treatment plants and develop a long-term vision of the capital needs of the facilities to improve the performance and reliability of the treatment facilities over the 30-year planning period. The plan is also designed to dovetail with the recommendations in the CSO Long Term Control Plan (LTCP) and provide a holistic view of the collection and treatment systems to result in the most cost-

effective, timely solutions to improve water quality in the receiving waters. Numerous meetings have been conducted with the WPCA Board to keep them abreast of the project; these meetings are open to the public. Moving forward additional public meetings will be conducted with the WPCA Board, the public and the neighborhoods to ensure stakeholders are engaged in the solution. The recommended plan developed takes advantage of existing infrastructure and results in improved water quality in the receiving waters in a cost-effective and timely fashion.

The milestone dates included in the Administrative Order, that the WPCA is required to comply with, contribute to the seemingly rushed schedule. That said, as you understand, the treatment plants are in desperate need of upgrade so the sooner that this can be accomplished the better for Black Rock Harbor.

B. "With the community seeking answers to the water quality in the harbor, a group of resident volunteers and students from the Aquaculture school began monitoring Black Rock Harbor for 5 months From May thru Oct. We go out on a boat before sunrise and sample 6 locations in the harbor 2 times per month."

"The 2019 Results for our sampling show Black Rock Harbor with an overall grade of D. Consisting of 5 parts:

1) Dissolved oxygen – F

2) Macrophyte (seaweed) D

3) Chlorophyll a (plankton) D

4) Oxygen Saturation B

5) Water clarity A

The results of our 2020 sampling will not be available till 2021."

"My business is KB Dive Service, maintaining boats underwater and marine services. I have been diving in Black Rock harbor since 2006 when I started the business. I dive regularly in the harbor from April thru November. Being on the front lines of actually diving in the harbor has made me aware of how stressed Black rock harbor is as a direct result of the Westside Treatment plant. It is because of the state of the harbor that I got involved in studying it, in an effort to save it. And I am not alone. The participation in the UWS water study was led by the Ash Creek Conservation Assoc, and funded through local Business leader: Santa Fuel."

"The Community and businesses are invested in cleaning up the harbor...

"Having reviewed the proposal: The improvements in treatment of the Westside plant and expansion are welcome for the 90mg/d. However, expanding the plant, doubling it...to 200mg/d are not welcome without relocating the Outfall pipe from in the harbor to outside the harbor. (As was originally planned, and as Fairfield does)"

"Reduction of CSOs seems to be the main focus of this plan, and the problem isn't the CSO's....it's what Comes out of the Outfall pipe."

"Black Rock harbor has been on the front line of what comes out of the treatment plant, and the harbor is basically fertilized by the nitrogen, and that reduces the oxygen in the water which has been stressing plant, animals."

"If the plant is going to expand to 200 mg/d then relocating the outfall pipe under Seaside park into the sound would be recommended. Relocating the Pipe was also addressed by CT rep Steve Stafstrom."

Response to 2B:

We appreciate your commitment to the environment and your efforts in sample collection and documentation of the water quality conditions in Black Rock Harbor. This will not only provide baseline water quality conditions, but will also help to assess the positive impacts resulting from an upgraded treatment facility.

It is clear, as documented in the Facilities Plan, that the West Side Wastewater Treatment Plant suffers from aging, undersized and inadequate treatment processes which directly and indirectly impact the ability of the treatment facility to meet permit limits. The Wastewater Facilities Plan has developed a plan to remedy the situation through the design and construction of a state-of-the-art treatment facility that will dramatically improve the efficiency, effectiveness and reliability of the treatment processes while reducing the pollutant load to the receiving waters.

We agree that Black Rock Harbor is stressed, and that the cause of much of the stress is due to the effluent from the West Side WWTP discharge. Stressors also include the four combined sewer overflows discharging to Black Rock Harbor, as well as non-point source due to urban runoff, stormwater discharges and landfill leachate from the Seaside Landfill. The prime focus of this Facilities Plan was to address the upgrade to the treatment facilities to improve effluent quality. Concurrently, we assessed the system holistically to identify the most cost-effective solutions that integrate CSO control with treatment plant upgrades to simplify operations and avoid sunk costs.

With the treatment plant upgrade we expect that the annual total nitrogen mass loading of 1,041 lb/day will be consistently achieved, which was not the case in the three years between 2017 and 2019. In fact, process modeling shows an expected annual total nitrogen load of 938 lb/day in the design year 2050, 10 percent less than permitted. In addition, under average conditions, it is expected that the 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) discharged will be consistently below 10 mg/L.

Currently, during storm events, the existing treatment plant is incapable of accepting more than 80 mgd for treatment (due to the current pumping and treatment capacity) at the West Side plant. Influent flow, up to 58 mgd, receives secondary treatment and disinfection. Influent flow greater than 58 mgd, receives primary treatment and *disinfection prior to discharge to Black Rock Harbor. Combined sewer flow (sanitary sewer flow and storm water) beyond the current capacity of the WWTP is discharged through combined sewer overflow (CSO) outfalls with no treatment. There are four such combined sewer overflows tributary to Black Rock Harbor. During a 1-year, 24-hour storm event it is estimated that 44.4 MG of CSO from the West Side service area is discharged to receiving waters.*

Increasing the West Side WWTP's wet weather capacity to provide preliminary treatment, primary treatment and disinfection for flows up to 200 mgd will reduce the volume of untreated CSO that is discharged by over 50 percent on the West Side during a 1-year, 24-hour storm event. Given the new, expanded preliminary treatment, primary filtration system and UV disinfection systems proposed, the primary effluent bypassed during high flow events is expected to achieve superior removal efficiencies, further improving the effluent quality of the discharge.

It is important to understand the expected frequency of these peak flows. Based on the collection system modeling, under existing conditions (2017-2019), influent flow is expected to be greater than 90 mgd only 10 percent of the time (36 days per year). Influent flow is expected to be greater than 120 mgd only 5 percent of the time (18 days per year). Again, based on 2017-2019 conditions, the peak flow that was conveyed to the West Side plant over the three-year period modeled was 186 mgd. We elected to increase the peak flow capacity to 200 mgd, since with some collection system improvements, more flow could be conveyed to the plant and further reduce CSOs to Black Rock Harbor.

Refer to Comment Response 2D and 3B for a discussion of a new outfall pipe.

C. As a "rate payer" to the WPCA for its service, I disagree with the comment that "We can only pay so much"

"This project is looking for funding from the Clean Water Act, and but residents should not be held responsible for plan.... The Clean Water Act is Responsible."

Response to 2C:

CT DEEP's Clean Water Fund (CWF) provides grants and loans for these types of projects. Grants typically provide 50% funding for CSO projects, 30% for biological nitrogen removal (BNR) components, and 20% for general WWTP upgrade projects, with the balance eligible for a low interest loan. The possibility of obtaining grant percentages higher than these values would need to be addressed by DEEP.

D. "Also commented was: what's the priority? All 3 are a priority, CSO, Plant and Outfall."

Response to 2D:

The project priority is to develop a cost-effective plan to holistically address water quality issues across Bridgeport – this is accomplished through CSO reduction and *improving the performance and reliability of the two WWTPs. Cost-effectiveness is the critical component to the plan. By increasing the treatment plant capacity at both plants, we found we were able to significantly reduce CSOs sooner for less money, than previously recommended in the CSO LTCP. The cost-effectiveness of a new outfall was also assessed. The analysis revealed an estimated cost of a new outfall discharging about 11,000 ft offshore would cost on the order of $200 million, whereas the benefit of the extended outfall, especially with improved effluent quality from the West Side plant was not immediately apparent. It is recommended that the water quality in Black Rock Harbor continue to be assessed subsequent to the proposed wastewater treatment plant improvements. If at that time, water quality in Black Rock Harbor is not showing signs of improvement, the WPCA could re-evaluate outfall relocation.*

E. "I hope that the EIE plan under consideration shows that Black Rock Harbor has been directly affected over the years by the Current plant, and if the plant is going to increase its size, then now is the time to relieve the harbor and relocate the outfall pipe."

Response to 2E:

As presented in the response to Comment 2B, the age and condition of the existing West Side WWTP has impacted its performance and there is no question that the facility needs to be upgraded to improve the effluent quality discharged. The increase in capacity of the West Side WWTP, however, is not expected to increase the loading to Black Rock Harbor. On the contrary, the increased capacity is expected to significantly decrease the volume of combined sewer overflows discharged untreated into the Harbor sooner than would be accomplished under the CSO LTCP.

Although relocation of the effluent outfall could be considered in the future, we are confident that the investment in the treatment plant and collection system infrastructure will result in measurable improvements to Black Rock Harbor. Therefore, it is recommended that the relocation of the outfall be deferred until additional water quality data can be collected to justify or refute the need.

Public Comment 3 (Submitted via Chat during Public Meeting): From Kevin Blagys, Bridgeport Resident, Business Owner of KB Dive Services, and Coordinator of the Black Rock Harbor Study

A. "Please explain the CSO tunnel and reduction of CSOs....in Black Rock we have 4 CSOs, will they be reduced with the CSO tunnel?"

Response to 3A:

The CSO tunnel was recommended in the WPCA's 2011 LTCP. The 2011 LTCP recommended a schedule of collection system projects that achieved a 1-year level of CSO control by the year 2039 as required in the WPCA's CSO consent order. The 1-year control is defined as no CSO discharges during the 1-year, 24-hour storm. The CSO tunnel was proposed to be constructed toward the end of the LTCP schedule (2039).

Upon completion of the LTCP projects, all CSOs on the West Side (including Black Rock Harbor) would not be expected to overflow in rain events smaller than the 1-year, 24-hour level. Several CSOs on the East Side would remain active upon implementation of the LTCP projects.

You are correct, there are 4 CSOs that currently discharge to Black Rock Harbor (ARBOR, WORD, ANTH and SEAB). Under our proposed plan to increase the capacity of the West Side WWTP ANTH, WORD, and SEAB will be controlled under the 1-year, 24-hour storm event. Discharges from ARBOR will be reduced by approximately 60 percent during the 1-year event. Because of the complex nature of the collection system hydraulics, it is proposed that additional collection system metering, modeling and calibration be conducted subsequent to the proposed improvements to determine what more, if anything, needs to be done to control the remaining CSO.

B. "Follow up....Will the Main outflow pipe be addressed? Is extending the pipe under seaside park an option? Today 10/29 at 4pm the main outflow was clearly in Bypass event."

Response to 3B:

The West Side WWTP currently discharges through a 72-inch pipe at the headwall along the north side of Cedar Creek in Black Rock Harbor near the Captain's Cove Seaport restaurant and marina across from the Seaside Landfill. Options for the West Side Plant outfall evaluated in the Facilities Plan included:

- *No Action, maintaining the existing outfall as is*
- *Inspect, clean and rehabilitate existing outfall as necessary (note that an inspection was performed as a part of the planning process and the outfall was deemed to be in good condition)*
- *Move outfall offshore to about 28-ft deep water (MLW) west of the terminus of the dredged channel*
- *Move outfall further offshore to about 50-ft deep water (MLW) south of Penfield Reef.*

The location south of Penfield Reef was eliminated from consideration because the mixing at the site near the dredged channel was judged to be sufficient to not warrant the higher cost of an outfall to the south of Penfield Reef location. Planning level cost for cleaning and rehabilitating the existing outfall is estimated at $100,000 to $150,000. Planning level estimate for an extended to location near the terminus of the dredged channel is in the range of $200 million. Due to the improved effluent quality from the new West Side plant, ability to meet the requirements of the plant's NPDES permit, potential impacts to shellfish lease holders, cost, required permitting, and construction risks associated with the extended outfall, it is recommended that a new outfall pipe be *deferred until the water quality conditions in the harbor can be assessed after the new treatment facility is operating.*

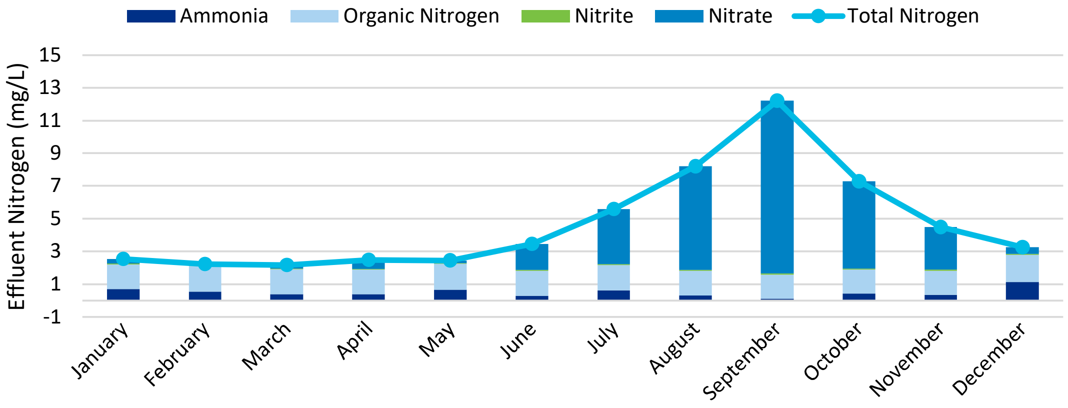
Public Comment 4 (Submitted via Email): From Peter D. Spain, MPH, Bridgeport Resident:

A. "If the proposed improvements are made, what is the expected change in the average nitrogen ppm to Cedar Creek and Black Rock Harbor -- on or around the first day of each month of the year?"

Response to 4A:

The existing West Side WWTP has not met the annual total nitrogen mass loading limit of 1,041 lbs/day over the last three years (2017-2019), ranging from an annual average load of 1,277 to 1,761 lbs/day. During this period the annual effluent Total Nitrogen (TN) concentration ranged from 8.5 to 10.6 mg/L (ppm). The proposed treatment plant improvements incorporating a four-stage nitrogen removal process with integrated fixed film activated sludge (IFAS) will increase the plant's capacity to achieve total nitrogen limits under all flow and load conditions and under all influent temperatures with an estimated annual average TN loading of 938 lbs/day (4.7 mg/L) in the design year (2050). Expected monthly TN from the West Side discharge is presented in the Figure 1 below. If supplemental carbon is added to the treatment process the annual load could be reduced to 664 lbs/day (3.4 mg/L). Understand, the results below are based on process modeling which is often conservative. Actual results could be even more favorable when the new treatment facility is put into operation.

Figure 1 - Projected Monthly Total Nitrogen Discharges from the West Side WWTP



B. "If the proposed improvements are made, what will be the maximum number of gallons a day that the Bridgeport WPCA can process at the West Side Plant? How much will this improvement and increased capacity cost?"

Response to 4B:

With a plant peak capacity of 200 mgd, the Bridgeport WPCA will be able to process 58 million gallons per day through primary and secondary treatment, and an additional 142 million gallons per day through the wet weather treatment system (preliminary treatment, primary treatment, and disinfection). The cost of the West Side WWTP upgrade and expansion, including engineering and contingencies, escalated to the midpoint of construction is $383 million. The cost of the West Side WWTP upgrade with a 90 mgd peak flow capacity is $297 million. There is an economy of scale realized with the increased plant capacity (that is, the 90 mgd facility equates to $3.3/gallon treated versus $1.9/gallon treated for the 200 mgd facility). The $86 million differential between the two, plus the some anticipated collection system modifications (estimated between $20 and $60 million) result in a 50 percent reduction of CSOs in the West Side service area in a 1-year, 24-hour storm event, and the complete control 7 of the 19 CSOs in the service area (WORD, RAILS, TIC, CEM/MAPE, DEW, and SEAB), including two of the four CSOs that discharge into Black Rock Harbor. This cost differential can be compared against the estimated cost included in the CSO LTCP of $496 million (2020 dollars) to control all 19 CSOs in the West Side service area. It is our hope that subsequent to the construction and operation of the expanded and upgraded treatment facility additional collection system metering and modeling could be conducted to result in limited additional work, at a reduced cost, to control the remaining CSOs.

C. “Any thought to integrating the management of the plant and the environmental monitoring of the harbor with the adjacent Aquaculture Regional Magnet School?”

Response to 4C:

Yes. We believe that there could be significant synergy between the treatment facility on the West Side and the Aquaculture school. The proposed layout of the new administration, laboratory and control building faces the Aquaculture School to provide a welcoming connection between the two. The WPCA administration will be moved from the East Side to the West Side and it is anticipated that a new visitor/educational center will be incorporated into the lobby of the new control building to highlight the benefits of and need for wastewater treatment. The upgraded West Side WWTP will be a “plant of the future” with vastly improved treatment processes that can be highlighted and provide educational opportunities for individuals of all levels. There would appear to be value for both parties in a partnership with the aquaculture school.

D. “In line with, but adding to, point raised by State Rep Stafstrom during the Q&A: Has the draft proposed upgrade plan for the West Side plant to ”potential 200[million gallons per day]” capacity (see the slides) been evaluated for its potential adverse impacts, in terms of noise and air pollution and daily/nightly nuisance, from the perspective of the next-door residents in the PT Barnum Apartments complex? If not, when will this evaluation take place, how long will it take, and how many public meetings will it include? How will members of the community know about this/these meeting(s)?”

Response to 4D:

The West Side WWTP site is extremely space limited. When evaluating site layouts for varying treatment plant capacities our designers were cognizant of the proximity of the adjacent apartment complex and considered how best to minimize impacts to the abutters, while also enabling the construction of the new treatment facility while maintaining operation of the existing facility. It is proposed that the new treatment plant headworks (influent pumping, screening and grit removal) be constructed on the northern portion of the site adjacent to the public housing complex.

The buildings proposed to abut the PT Barnum Apartments would be completely contained. Building openings facing the apartments will be limited to mitigate fugitive odors and noise. New odor control units will be provided to further reduce the impact of odors, and HVAC and other noise generating equipment will be designed to contain noise. In addition, landscaping along the northern property line will soften the visual impact of the new facility. The WPCA and our consultant welcome further discussions with the neighborhood to refine and improve the design to further mitigate impacts. As the design develops 3D tools can be used to portray the new facilities from different vantage points at public meetings. CDM Smith and the WPCA conducted a site visit with State Representative Stafstrom and City Council member Scott Burns on November 12, 2020 to visit the location and further discuss the potential concerns.

E. "In line with, but adding to, point raised by State Rep Stafstrom during the Q&A: Does the plan include a way to extend the large pipe that now spills out, and for decades has spilled out, from the West Side plant into the harbor (just below the office building at Captain's Cove) and to run the pipe out of the harbor and into the Sound for significantly greater flushing/dilution of the plant's outflows? Like Fairfield's and other towns'. What would be the time and money required to do this?"

Response to 4E:

Please see the response to public comment 2D and 3B regarding the effluent outfall.

Public Comment 5 (Submitted via Chat during Public Meeting): From Peter D. Spain, MPH, Bridgeport Resident:

A. "For West Side plant upgrade: What will be expected life expectancy of this, if it is online around 2026?"

Response to 5A:

In general, for planning purposes, the life of new structures (buildings and concrete tankage) are expected to be 50 to 100 years, process equipment is expected to be 20 to 30 years, and electrical systems and instrumentation and controls are expected to have a 15 to 20 year life. The design of the new facilities have considered expected sea level rise and all critical structures and equipment will be designed to protect against the 100-year flood elevation plus 3-feet.

Public Comment 6 (Submitted via Email): From Peter D. Spain, MPH, Bridgeport Resident:

A. "Thank you for the WPCA's presentation and public Q&A last night on the facility planning update for the two wastewater treatment plants in Bridgeport.

"It was good that the Zoom meeting could be resumed and completed."

"I would like to be sure that people in the community – especially those who either (A) prematurely left the Zoom meeting due to prurient piracy (AKA Zoom blitzing), or (B) could not attend the meeting but are interested – can access the excellent slides that CDM Smith presented last night."

Response to 6A:

The WPCA appreciates and acknowledges the feedback. The slides from the public meeting are included as an attachment to this memorandum. In addition, the entire report including an Executive Summary will be made available on the WPCA and CT DEEP websites.

Public Comment 7 (Submitted via Email): From Roger Reynolds, Senior Legal Counsel, Save the Sound

A. "We are writing to comment upon the Scoping for City of Bridgeport Facilities Planning for East Side and West Side Wastewater Treatment Plants. Save the Sound strongly urges a strong Environmental Impact Evaluation in full compliance with the Connecticut Environmental Policy Act ("CEPA") that will fully and comprehensively address the environmental problems of ongoing water quality impairments in Black Rock harbor due to nitrogen discharges and combined sewer overflows. We request that the following significant environmental impacts be studied in substantial detail: (1) the impact of the continuing nitrogen discharge onto Black Rock Harbor, (2) requiring monitoring of the harbor system going forward to fully understand the environmental impacts and necessary actions, (3) a full evaluation of alternatives to address the negative impacts from the discharge including additional nitrogen treatment and relocation of the discharge pipe, (4) a full analysis of whether, and to what extent, the upgrades can shorten the amount of time to implement the Long Term Control Plan for combined sewer overflows,(5) whether and to what extent there is opportunity to capture combined sewer overflows above and beyond the proposed 280 MGD, (6) whether the upgrades will violate a DEEP Consent Order, and (7) whether and to what extent the Consent Order non-compliance will impact the environment."

"Finally, we would note that the responses to these and other comments should be addressed BEFORE DEEP receives and/or approves any facilities plan or moves forward with it under the Consent Order. If that did not occur, this would be a cynical and meaningless exercise, and frustrate the letter and spirit of CEPA as well as the public's ability to understand and to influence these plans."

Response to 7A:

Please see the WPCA's responses to the above concerns as outlined in Public Comments 7B through 7E.

B. "The City of Bridgeport should address the impact of the continuing nitrogen impact on Black Rock Harbor including long term monitoring of the system and a full evaluation of alternatives to address the activity causing or contributing to such impairment."

"Under CEPA, C.G.S. Sec. 22a-1b, for an action significantly impacting the environment, an Environmental Impact Evaluation must provide a "detailed written evaluation of its environmental impact" and alternatives to avoid or mitigate environmental impacts. Thus, under law, the various environmental impacts, as detailed below, and alternatives to address them must be thoroughly studied."

"Black Rock Harbor is a severely polluted and impaired water body according to the 2020 Integrated Water Quality Report issued by DEEP pursuant to the federal Clean Water Act. It does not support aquatic life, recreation or shell fishing. Causes of these impairments include the nitrogen discharge from the pipe as well as combined sewer overflows, each of which are impacted by this project. According to a 2016 study of embayment's across Connecticut, approximately 95% of the nitrogen impairment for Black Rock Harbor can be directly attributed to the sewage treatment plants. (Vaudrey, J. M., Yarish, C., Kim, J. K., Pickerel, C., Brousseau, L., Eddings, J., & Sautkulis, M. (2016). Comparative analysis and model development for determining the susceptibility to eutrophication of Long Island Sound embayment's. Connecticut Sea Grant Final Project Report, 38.)"

"Under the Clean Water Act and Connecticut law, it is illegal to maintain a discharge that causes or contributes to a violation of water quality standards. The Environmental Impact Evaluation must document (1) whether and to what extent the water quality is impaired, (2) whether and to what extent the discharge from the plant and the combined sewer overflows are causing and contributing to this impairment and (3) the measures available to address these impairments."

"To do this effectively, DEEP should require a period of long-term monitoring of the harbor. Because this project is explicitly designed to address this impairment, it should include long term modeling of such impairment and its causes to fully understand the dynamics of the waterbody and how it should be addressed."

"The second thing that needs to be addressed is the evaluation of alternatives that would address this impairment. With respect to the aquatic life and dissolved oxygen impairments, the nitrogen discharge from the sewage treatment plant should be fully addressed. The two most obvious alternatives would be (1) the additional treatment of nitrogen from the pipe and (2) the relocation of the pipe such that it is not discharging into the inner harbor. The analyses should include whether and to what extent each of these would address the impairment and any other measures that might be necessary or feasible."

Response to 7B:

DEEP will respond to this question through the EIE process.

C. **"The City of Bridgeport should more fully document what alternatives are available to speed up the implementation of the Long-Term Control Plan and how those alternatives will impact water quality in Bridgeport"**

"Combined sewer overflows from the West and East side plants are also causing and contributing to the impairments and impeding recreation and shell fishing. On page 14 of the PowerPoint presented at the scoping meeting, entitled, "Upgraded Plants Will Provide CSO Reduction" there is a chart indicating that the facilities plan may lead to a more gradual reduction in CSOs over time, rather than a sudden reduction once a tunnel is constructed in 2040. This chart is unclear and confusing on many levels. First, it is unclear why the assumed level of CSO capture, 280 MGD, would not accelerate the time in which the CSOs are reduced to the level of the one-year storm. In both scenarios, it would not be until 2040 until the CSOs were reduced this substantially. Accelerating the time to eliminate these CSOs would have a huge environmental impact and thus, under law, must be studied as an alternative. Moreover, it is not clear from a logical basis why, if a final tank will no longer have to be constructed, the time frame to reduce the CSOs would not be substantially shortened. This should be fully explored including all of the environmental benefits that such an acceleration in time frame would entail."

"While the City stated, in the scoping meeting, that it did not feel that it had to address this because this project was not necessarily designed to decrease combined sewer overflows, such reduction is clearly a major environmental consequence of this action. Indeed, the ability to address CSOs and the extent to which they will be addressed take up several pages of the presentation. A full analysis of this issue must include the various alternatives to use this extra storage to accelerate the time schedule to complete the CSO reductions."

"Second, if the west side upgrades won't be completed until 2026 and the East Side upgrades not until 2030, it is unclear why it shows a gradual decrease until that time, instead of a sudden drop once those projects are completed."

"Finally, it is unclear how the 200 and 80 MGD storage capacities were reached. The EIE should set out other alternatives, such as having even more capacity for CSOs, along with their feasibility and environmental benefits."

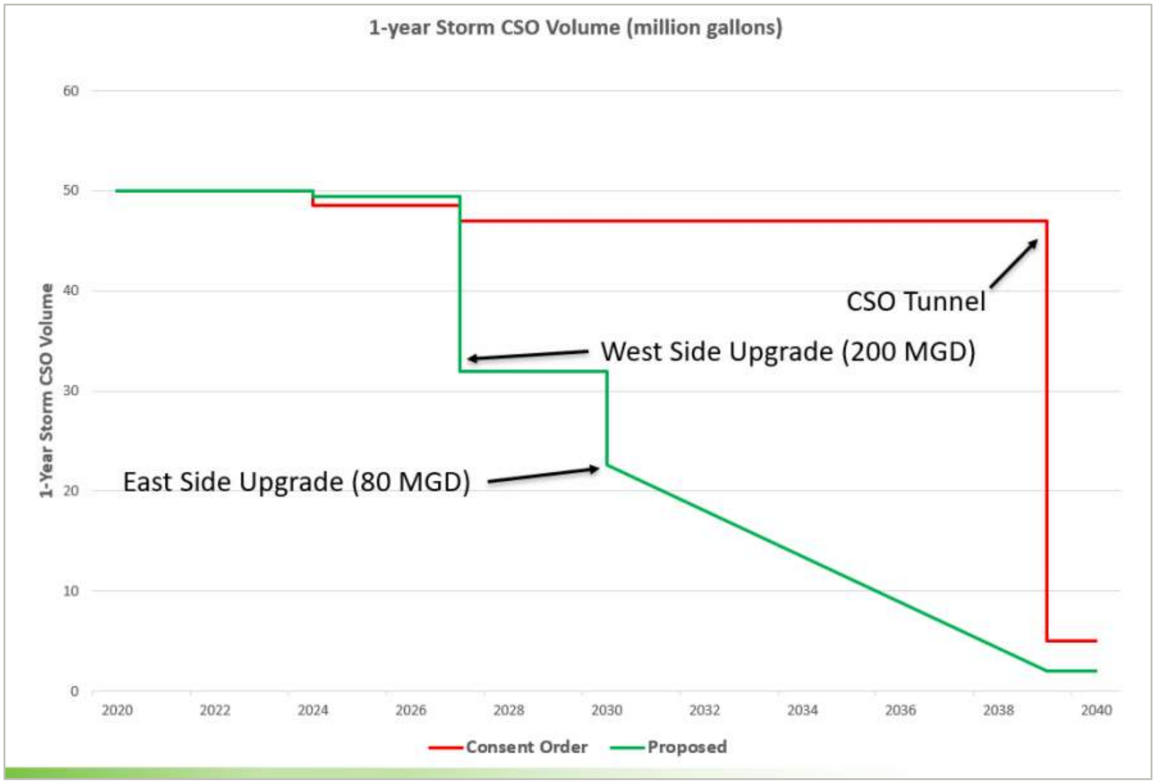
Response to 7C:

The WPCA contracted with CDM Smith to prepare the Wastewater Treatment Plant Facilities Plan as required by the Administrative Order. The goal of the facilities plan was to assess both treatment plants and develop a long-term vision of the capital needs of the facilities to improve the performance and reliability of the treatment facilities over the 30-year planning period. The plan was also designed to dovetail with the recommendations in the CSO Long Term Control Plan (LTCP) and provide a holistic view of the collection and treatment systems to result in the most cost-effective, timely *solutions to improve water quality in the receiving waters. Early in the planning process CDM Smith recognized that the Bridgeport collection system had the capability of conveying much more flow to the treatment facilities than the treatment facilities can currently accept. In addition, surprisingly, the CSO Long Term Control Plan (prepared by others) did not assess increasing the capacity of the two plants as a means of controlling CSOs nor did it consider the cost to upgrade the plants. As a part of the wastewater treatment facilities plan, CDM Smith then assessed, through collection system modeling, the impact of increased plant capacity on CSO reduction. This assessment, as documented in the Facilities Plan, revealed that increasing the plant capacity had a profound impact on the reduction of CSOs (over 50 percent) and could be implemented, cost-effectively, as part of the treatment plant upgrades, to reduce CSOs in a more timely fashion.*

The WPCA agrees that the graph originally presented in the public meeting did not accurately represent the benefits of increasing the plant capacity. A revised version of this graph is included below. The full CSO benefit of the increased plant size will not be seen until the WWTP construction is completed, at which point the WWTP can treat a larger peak flow, and thus reduce the volume of CSO in the 1-year, 24-hour design storm. After the completion of the East Side WWTP upgrade, more than half of the CSO volume is eliminated during the 1-year storm.

The WPCA is under a CSO consent order to abate all CSOs to 1-year level of control by 2039. The gradual decrease from completion of the East Side WWTP until 2039 represents the removal of the remaining CSO volume in the system to reach the 1-year control level as defined in the order. This decline would not be provided by the WWTPs but instead would need to be achieved through collection system improvements, such as sewer separation or other methods, that have yet to be fully defined or scheduled. Because of the complexity of the combined sewer collection system, we recommend additional metering and modeling subsequent to the construction of the expanded treatment facilities to better understand how to best control the remaining CSOs.

In assessing treatment plant capacities, the wastewater Facilities Plan assessed peak flow capacities of 80, 90, 140, 180 and 200 mgd at the West Side Plant and 35, 40, 60 and 80 mgd at the East Side plant. The recommended 200 and 80 mgd peak flow capacities of the two plants, represented the most cost-effective capacities to enable the reduction of CSOs. These values were reached through hydraulic modeling to determine the flow that could reach the WWTPs and the commensurate reduction of CSOs. Currently the West and East Side WWTPs can pump and treat a maximum of approximately 80 and 35 mgd, respectively. However, the collection system can deliver 200 and 80 mgd to the plant during larger storms. Today, flow to the two plants is restricted by partially closing the influent gates to avoid either flooding of the influent pumping. When the influent gates are partially closed, the collection system backs up, ultimately resulting in CSO discharges.



Updated Chart from Slide 14 of the Public Meeting Slides

D. "The EIE must address whether and to what extent the facilities plan complies with orders issued by DEEP and, if not, what impact such non-compliance will have on the environment."

"A consent order entered by DEEP on March 1, 2019 required the West and East side plants to be fully upgraded no later than 2739 days after the date of the order which occurs in late 2016. This was to address the discharge and the impairment to Black Rock Harbor and Long Island Sound. Yet the scoping power point, with no explanation, puts the completion date of the East Side plant at 2030. The EIE must explain whether and to what extent this complies with the Consent Order and, if not (as it appears), what the impact of that non-compliance will be, and the alternatives available to remedy this."

Response to 7D:

The Administrative Ordered schedule for the wastewater treatment plants is summarized in the table below:

Date	Action
On or before November 30, 2020	Submit Facilities Planning Report
On or before May 31, 2022	Submit 100% design plans and specifications for WWTP upgrades
No later than August 2023	Commence construction of remedial actions
No later than August 2026	Complete construction of remedial actions

The Facilities Planning Report has been submitted in accordance with the schedule. Based on the information presented in this Facilities Plan, the WPCA requests a modification to the design and construction project schedule to accommodate the significant amount of work that is necessary to mitigate current issues at both plants and the significant impacts on sewer use rates to the citizens of Bridgeport.

First, it is proposed that the design and construction of the two facilities occur sequentially, versus concurrently as presented in the Administrative Order. All previous projects, whether large or small, conducted for the WPCA occurred sequentially to enable the limited resources at the WPCA to provide adequate and timely input and review of the design documents and construction issues, and to better manage the costs incurred by the WPCA. It is proposed that the construction at the West Side Plant commence first, followed by the construction at the East Side Plant.

Second, because of current difficulties securing SRF funding for design, it appears that the design start will be delayed. Previously, a December 2020 start date was anticipated.

Lastly, the Administrative Order proposed a three-year (36 month) construction duration. Given the complexity of the improvements, especially regarding maintenance of plant operations during construction and the need to get certain systems up and running before others can be decommissioned and demolished to make room for new facilities, a minimum 42-month construction schedule, and more likely at least 48 months will be necessary.

Based on these factors, a revised schedule is proposed. As presented, the West Side WWTP upgrade and expansion will be completed one year after the original construction date presented in the Administrative Order. The East Side WWTP will be completed by the end of 2029. Achieving these milestones will require SRF funding in addition to timely reviews and approvals of submittals by the CT DEEP.

E. **“These and other comments should be considered and addressed BEFORE DEEP approves the proposed facilities plan”**
“This should be obvious, but before approving any facilities plan that would have a significant impact on the outstanding DEEP consent order or the Long Term Control Plan, DEEP and/or the City of Bridgeport should address these and other comments received through the scoping process. Otherwise, this would be a meaningless and cynical exercise, violating both the spirit and the letter of the Connecticut Environmental Policy Act.”

Response to 7E:

The WPCA agrees with this sentiment. Addressing concerns of customers and the public is a priority. We believe that this Facilities Plan recommends improvements at each WWTP that will provide great environmental benefit for years to come, while also being mindful of our rate payers and what is affordable at this time.

Public Comment 8 (Submitted via Email): From Suzanne Murray, Bridgeport Resident:

A. “I am writing to you to express my support to upgrade plans for the West End Treatment Plant as soon as possible. Damage done by excess nitrogen and the fecal bacterial pollution is obvious as our health and our water quality are put at risk every day. Further, it contributes to Cumulative ecological damage that must not be ignored.”

“The good news: It is a SOLVABLE problem. We must eliminate all CSOs as part of our overall resiliency planning to adapt to the imminent changes that global warming brings. Doing this NOW is the right step for our water and earth neighborhoods and for our planet.”

Response to 8A:

The WPCA appreciates and acknowledges the feedback.

Public Comment 9 (Submitted via Email): From Tim Kendzia:

A. “I read about the scoping notice for facilities planning for Bridgeport’s wastewater treatment plants.”

“I’m very interested in staying updated on this and other coastal infrastructure projects in the state. I have two comments and a question on this project.”

“I think that an anaerobic digester should be considered for this project, especially if consolidation is being proposed. I am not the most well versed in the capacity requirements, but I think generally an anaerobic digester needs a large population base to contribute several millions of gallons per day to be efficient. Bridgeport, being the largest municipality in the state, ought to meet the sizing requirements for an anaerobic digester. The benefits of anaerobic digestion can include odor control, a reduction in nutrient effluent, and biogas production. Biogas can be used directly to power generators onsite, or it can be converted into hydrogen gas and usable in fuel cell applications. Surely the WWTP has some form of on-site generation in the case of emergencies, but with a biogas generator it can reduce its use of fossil fuels and increase the projects ability to function during storm events."

Response to 9A:

Anaerobic digestion was evaluated as part of the facilities planning process. It was not included in the recommended improvements due to the space limitations at the West Side WWTP site and added cost and operability of the system. The most pressing needs at this time are water quality improvements, so at this time the primary focus is the liquid treatment train. It is recommended that the facility continue to truck thickened sludges off-site for disposal.

B. "The second comment is in regard to preserving and enhancing natural infrastructure along the coast. The project must be consistent with the Connecticut Coastal Management Act which calls for ""feasible, less environmentally damaging alternatives" to flood and erosion control structures. Among the alternatives is to consider moving the infrastructure further landward. As both the plants are located adjacent to the coast, they both will be at heightened risk of flooding via storm surge. Flooding the WWTPs would be an extreme risk to public health and the environment. To mitigate the risk, these facilities either can be surrounded by protective infrastructure (potentially nature-based such as living shorelines, or the facilities can be relocated further inland. I propose that for the scoping of this project that relocation is given serious consideration as an alternative."

"My question is related to sea-level rise forecasting. I am curious what the planning horizon is for this project and to what height sea level rise is being planned for."

Response to 9B:

Due to both the treatment plants' proximity to the Long Island Sound, tidal flooding occurs at the plant sites during intense storms and hurricanes. Tidal flooding is typically the result of several factors such as tidal fluctuation, intense rainfall (which cannot drain from the sites when tides are high) and wind driven coastal storm surge. With the current threat of sea level rise, TR-16 design guidelines were revised in 2016 to incorporate significant modifications to flood protection and resiliency. This includes requiring existing treatment plants that are planned for upgrade or expansion be improved to the maximum extent possible to meet the following flood protection criteria:

> *Provide for uninterrupted operation of all units during conditions of a 100-year (1% annual chance) flood, and*
>
> *Be placed above or protected against the structural, process and electrical equipment damage that might occur in an event that results in a water elevation above the 100-year (1% annual chance) flood.*
>
>> *Critical equipment should be protected against damage up to a water surface elevation that is 3 feet above the 100-year flood elevation*

> *Non-critical equipment should be protected against damage up to a water surface elevation that is 2 feet above the 100-year flood elevation*

The planning horizon for these projects was 30 years. The above criteria were the planning basis for this Facilities Plan and will be adhered to in the final design of these facilities.

Public Comment 10 (Submitted via Email): From Brad Burns-Howard, Bridgeport Resident:

A. “Does the plan include a way to extend the large pipe that now spills out, and for decades has spilled out, from the West Side plant into the harbor (just below the office building at Captain's Cove) and to run the pipe out of the harbor and into the Sound for significantly greater flushing/dilution of the plant’s outflows? Like Fairfield’s and other towns’.”

“The answer last night: No. The consultant engineer suggested that the costs for that pipeline would be hard to cover in addition to the costs for the planned major overhaul to the two plants.”

“These “costs for that pipeline” should be specifically identified in relation to the costs of the existing plans and publicized to Bridgeport residents, as well as Fairfield County and Connecticut residents who are adversely affected by poor quality water as a result of effluent discharges into Long Island Sound.”

“With the additional costs identified, residents and voters will be able to bring educated public opinion to bear on city, county and state officials and force them to FIND THE MONEY!”

Response to 10A:

Please refer to responses to Comment 2C, 2D and 3B.

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