Map, Plan, and Report

FOR THE

Town of Boston
Wohlhueter Tank Improvements

Town of Boston
8500 Boston State Rd
Boston, NY 14025

February 2020

TABLE OF CONTENTS

FIGURES

APPENDICES

I. General

The Town of Boston's water system utilizes 3 existing water storage tanks in order to provide emergency water storage and maintain system pressure throughout the Town. In 2017, the tank located on Wohlhueter Rd was evaluated for potential safety and operational deficiencies. This report will outline the evaluation that was performed and identify improvements in order to ensure the Town provide safe and reliable potable water and fire flows to the members of its community.

II. Project Planning Area

A. Location

The Town of Boston is centrally located within Erie County. On Wohlhueter Road, located on the east side of the Town, is a 672,000 gallon standpipe tank constructed in 2004. A map showing the location of the Tank can be found in Figure 1.

Environmental Resources Present

The project area contained within the Town of Boston, completely on the site of the existing water storage tank. The improvements will take place within the Town owned parcel or easements that may be executed as part of the construction. Proper construction mitigation and restoration efforts will be implemented based on standard practices common to the industry. No adverse environmental impacts are expected.

B. Growth Areas and Population Trends

Based on the United States Census data, the Town of Boston's population in 2000 was 7,897 and in 2010 had grown to 8,023. The percent growth in these 10 years was approximately 1.6%. The estimated 2019 population is 8,126, a percentage growth of 1.3%. Based on this data, the Town can expect that the population should remain relatively steady, with some gradual growth.

III. Existing Facilities

A. Location Map

The Town of Boston is split into three water districts; the Wohlhueter Storage Tank is located within Water District No. 3. which covers the east side of the Town. Each of these Districts are served by the Erie County Water Authority (ECWA).

B. Condition of Facilities

Based on the population data for the Town, the demand in the area has remained relatively steady and therefore the priority has been on maintenance of the existing infrastructure. Many of the existing facilities are beginning to reach the end of their useful life or are in need of general maintenance to extend their life. The existing tank was constructed in 2004, and therefore should have significantly more time left in its useful life, as long as periodic maintenance is performed to protect the integrity of the steel materials.

The evaluation competed by Tank Industry Consultants (TIC) details the necessary upgrades to keep the existing Town tanks operating safely and efficiently. The deficiencies found are outlined in the section below. A copy of the report can be found Appendix A.

IV. Need For Project

A. Health and Safety

The Town, along with the water provider, the Erie County Water Authority (ECWA) are committed to provide safe and reliable potable water to the residents of Boston. In order to do this, it is important to keep up with maintenance in the water system. TIC was able to identify safety related deficiencies on the tank and suggested corrections and repairs take place within the next 2 years or so to maintain successful operation of the tank and overall system. The identified issues include:

- Valve vault ladder toe room did not meet required minimum
- Electrical receptables without ground fault interrupt circuits
- Uncovered junction box with exposed wiring in the valve vault
- Depth of the exterior shell ladder safety did not meet minimum
- Access opening to platform does not have self-closing gate

B. System O & M

In addition to the safety related issues that were identified in the evaluation, TIC was also able to report on operational deficiencies throughout the tank.

- Roof Manhole Cover not meeting AWWA D100
- Roof Manhole not locked
- Gaps located in roof vent flanges
- Roof vent flanges were bent in some locations

In addition to these operational problems that TIC found, it was also identified that the both the exterior and interior tank coating systems were in poor conditions. On the exterior of the tank, much of the coatings were found to be peeling away from the tank and showing signs of poor adhesion. On the interior surfaces, it was noted that much of the tank showed signs of corrosion in both the interior and upper rings, due to a lack of adhesion left by the coating system.

V. Alternatives Considered

A. Description

1. Alternative 1 – Null Alternative

This alternative proposes to "do nothing". The residents in the Town area would continue to receive water from the ECWA. The existing tank would continue to deteriorate, and the water supply would not be reliable or efficient to the residents. The useful life of the Wohlhueter tank would be diminished without continuing with the proper maintenance.

2. Alternative 2 – Wohlhueter Tank Painting & Repairs

This option includes painting both the interior and exterior surfaces, along with miscellaneous repairs that were identified as safety and operating deficiencies. Based on the evaluations performed on the tank, the full exterior would be blasted, primed and painted in order to apply the new protective coating. Based on the surro8udnig site, careful attention must be made to the painting methods in order to protect neighboring properties. This exterior coating would in turn extend the useful life of the tank.

The interior coating would be applied similarly, following blast cleaning of the tank, with the epoxy coating applied. The typical service life of the interior coating is approximately 12-15 years. Painting the interior surfaces of the tank would extend the useful life of the tank and ensure the proper safety and operation of the tank continue in the Town.

In addition to the coatings, the miscellaneous repairs described in the TIC tank evaluation should be addressed in order to bring the tank up to the proper AWWA operation and safety standards. This includes upgrades to the existing access hatches, ladder safety equipment and some electrical upgrades inside the existing valve vault.

The total estimate for this project is $900,000.

B. Design Criteria

The proposed tank improvement project for the Town will be designed in accordance with New York State Department of Health standards and will comply with the required AWWA standards for the operational and safety related tank repairs. The tank project will to the system will be designed to extend the useful life of the water system and to maintain safe and reliable potable water and the ability to provide required fire flows throughout the Town. The project will also be performed in accordance with ECWA standards.

C. Environmental Impacts

There are no anticipated environmental impacts to arise due to any of the alternatives. Construction will be performed within existing easements, and Town of Boston owned properties. Proper construction mitigation will be implemented in order to ensure neighboring sites and surrounding properties are not affected by the exterior coating methods.

D. Land Requirements

All of the tank work is contained within existing Town of Boston owned properties.

E. Construction Problems

There are no known or anticipated construction problems for the proposed designs.

VI. Recommended Alternative

The recommended alternative is Alternative 2. Based on the recommendations of the ECWA and TIC, and the desire of the Town to continue to provide safe and reliable water to the residents. The potential improvements to the Town's assets are imperative to the reduction of operational costs and uncertainties in the system, and also will provide a more dependable system.

A. Project Design

1. Water Supply, Treatment and Storage

   Water supply for the Town of Boston will continue to be provided from the same source via the ECWA. No changes will be made to the water treatment in this project. The town wide volume of storage will remain the same, but this project will extend the service life of the Wohlhueter Tank, which provides an overall volume of 672,000 gallons of water to the Town.

2. Pumping Stations

   No changes will be made to any pump stations in the Town's system as part of this project.

3. Distribution Layout

   No changes will be made to the Town's distribution system or residential services as part of this project.

B. Cost Estimate

The estimated capital cost for the project is $900,000 for the propose tank coating and improvements and is detailed in Appendix B.

VII. Grant Opportunities

The following is a summary of various grant opportunities available for water infrastructure projects.

Water Infrastructure Improvement Act (WIIA)

The NYSEFC has allotted money to be provided as grants in order to assist municipalities in the improvement of their drinking water or wastewater infrastructure. The grants are awarded up to a maximum amount of $3 million or 60% of the project costs for water quality improvements and are given directly to the approved applicant. The state allocated $275 million for projects during the 2018-2019 state fiscal year.

All municipalities within New York State are eligible for a WIIA grant. The evaluation of projects to allocate funding will consider factors such as the water quality improvement, reduction in risk to public health, financial needs of the community, readiness to advance construction, and the level of demonstrated community support. Application deadline is mid June, 2020.

Consolidated Funding Application

The United States Environmental Protection Agency (EPA) allocates funds to New York State through the Environmental Facilities Corporation (NYSEFC) for the Drinking Water State Revolving Fund (DWSRF). The DWSRF allocates funds to all communities, giving no priority to any project based on the size of the community. The program provides financing for needed drinking water infrastructure improvements including work on water treatment plants, distribution systems, and tanks.

For a project to be eligible for funding under the DWSRF, the project must include construction or upgrading a water treatment plant or some part of the distribution network including water main and storage tanks. Funds are not provided for the maintenance or operation of facilities.

The DWSRF provides several different types of assistance including zero interest short term loans and low interest long term loans. Grants (in the form of principal forgiveness) and subsidized loans may be available for communities that can demonstrate financial hardship based on median household income (MHI).

The subsidized loans can have interest rates as low as 0% and are typically financed over a 30-year period. In order to be eligible for the loan, the project must serve residential populations and must be environmentally significant as determined by the commissioner of the New York State Department of Environmental Conservation (NYSDEC).

The LCWSA should ensure that any project it undertakes meets the requirements of DWSRF. For example, the Town should ensure that the requirements for the Davis-Bacon Wage Rates and the Minority and Women in Business Enterprise/Equal Employment Opportunity (MWBE/EEO) requirements are met, even if financing for the project seems unlikely, in the event that funding becomes available in the immediate future.

USDA Rural Development

The USDA provides loans and grants to communities with no more than 10,000 people or to rural communities with no population limits. For the community to be eligible for these loans and/or grants it must:

- Be unable to commercially obtain a loan at reasonable rate/terms,
- Have the ability to repay the loan, and
- Maintain and operate the facilities; and the new facilities must be in compliance with all laws and standards.

The programs are administered on a national level by the Rural Utilities Service, a branch of the USDA, through state offices that distribute the funds to districts and municipalities. Funding is formulated based on rural population, poverty, and unemployment.

The program is implemented in order to provide rural communities with basic human amenities and to promote growth of these rural areas. The program allocates funds for installation, repair, maintenance, or expansion of current facilities.

Loan stipulations include the repayment of the loan within 40 years or by the end of the design life (the lesser of the two). Loans come directly from the USDA or are from commercial third-party lenders, in which case 90% is guaranteed by the USDA.

The USDA may award grants if the project is within a low to medium MHI range. Eligible projects must take place in a community where the population is not projected to decline below the designed project population. The grants are used to reduce costs to a reasonable level for the municipality and they can be used in conjunction with loans if the community is able to repay only part of the project cost.

The USDA also provides grants to fund nonprofit organizations that provide technical support and training to rural communities with regard to water and waste disposal. There are several organizations operating throughout the country with offices in each state.

CBDG (Community Block Development Grant) Water Planning Grant

The Office of Community Renewal, an office within the New York State Homes & Community Renewal (NYSHCR), administers the Community Development Block Grant (CDBG) program previously operated as the "Small Cities" program. The CDBG is a program designed to provide direct assistance to small, rural communities with low to moderate income in New York State. The funding, in the form of grants, is typically allocated to small communities with aging public infrastructure that requires updating or expansion.

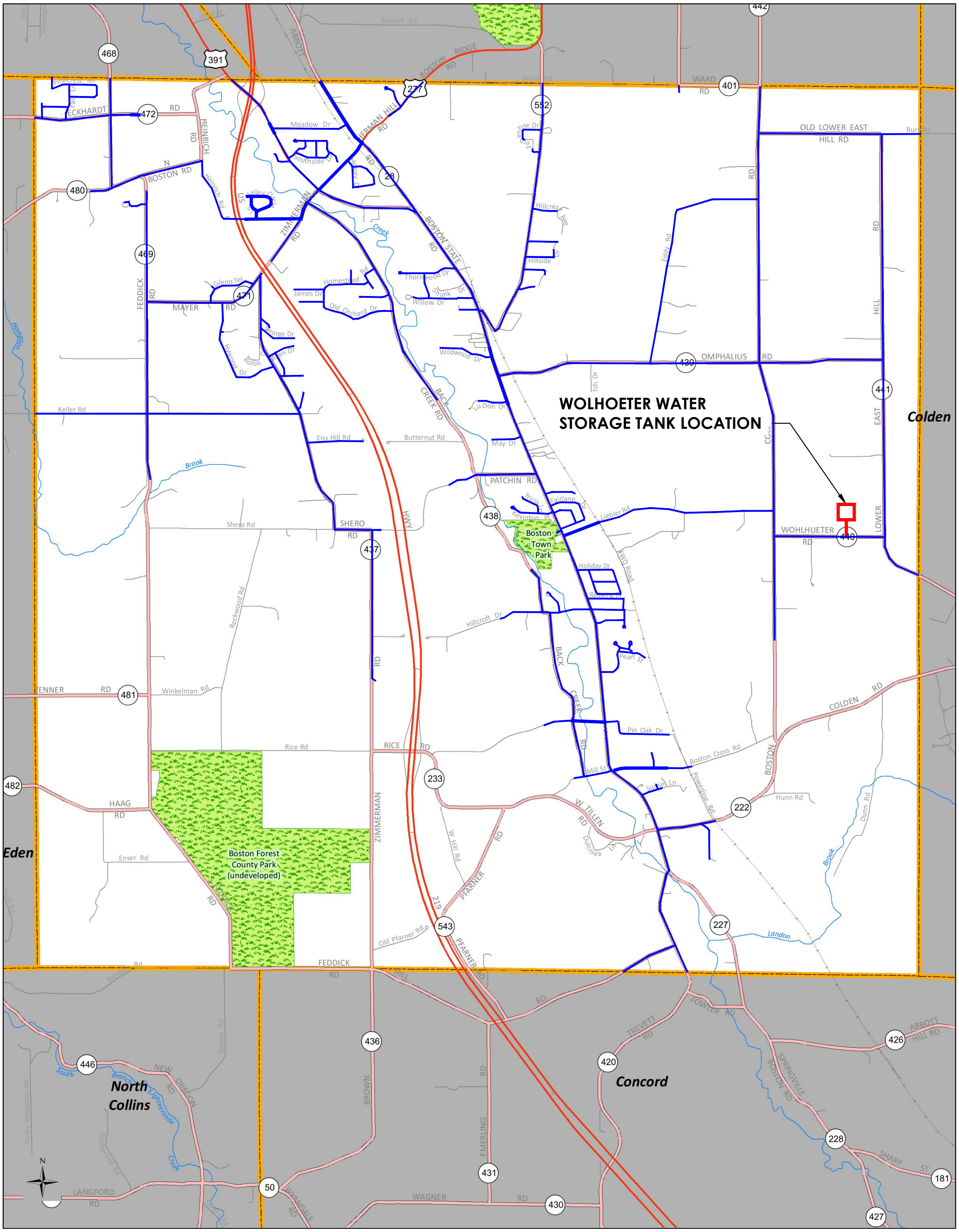
In order to be eligible, the community must demonstrate a need for upgrade or replacement to existing drinking water infrastructure or the requirement for construction of new potable water systems. Communities must also have a population below 50,000 people and demonstrate low to moderate income levels.

Through the CDBG program, municipalities are eligible to receive grants for up to $750,000 for water infrastructure projects that include upgrades and improvements to sources storage or distribution. For public infrastructure projects, 18% of the grant may be used towards delivery, administration and engineering costs. One application per year is accepted per project annually, but a municipality could conceivably be awarded multiple grants over multiple years for the same project by applying for different parts or phases of a project over those years.

VIII. Conclusions

The Town of Boston is committed to providing safe and reliable potable water supply and fire protection to the residents in the project area. This project will be instrumental in maintaining the existing water system and achieving that goal.

Figures



LOCATION OF
EXISTING WATERLINE

FIGURE #1

205 ST. PAUL STREET, SUITE 500
ROCHESTER, NEW YORK 14604
TEL (800) 274-9000
FAX (585) 232-5836

CPLteam.com

ARCHITECTURE ■ ENGINEERING ■ PLANNING

DATE:	2/19/2020
DRAWN:	BR
CHECKED:	DGI
SCALE:	N.T.S.
PROJ. #:	XXXX.XX

GENERAL LOCATION MAP

WOHLHEUTER TANK IMPROVEMENTS

BOSTON, NEW YORK

Plotted By: Dan Insinna
Date last plotted: 2/27/2020 3:18 PM
Date last accessed: 2/26/2020 4:00 PM
Drawing Name: P:\DInsinna\Boston Water\Figures\Boston Water.dwg
Referenced Drawings: None

Appendix A – Tank Industry Consultants Tank Evaluation

TANK INDUSTRY CONSULTANTS

EVALUATION OF THE

672,000 GALLON STEEL STANDPIPE

"WOHLHUETER TANK"
COLDEN, NEW YORK

FOR

ERIE COUNTY WATER AUTHORITY
BUFFALO, NEW YORK

October 25, 2017

16.081.L614.015

TIC
TANK
INDUSTRY
CONSULTANTS

7740 West New York Street
Indianapolis, Indiana 46214
317 / 271-3100 - Phone
317 / 271-3300 - FAX

Sacramento, California
916 / 717-3608

Plainfield, Illinois
815 / 556-8335

Pittsburgh, Pennsylvania
412 / 262-1586

El Paso, Texas
915 / 790-0790

Houston, Texas
281 / 367-3511

November 22, 2017

SUBJECT:

The subject of this report is the field evaluation of the 672,000 gallon steel standpipe in Colden, New York. The tank was owned by the Erie County Water Authority and was known as the "Wohlhueter Tank." The field evaluation was performed on October 25, 2017, by Gregory P. Cannon, NACE Coating Inspector Level 3 - Certified, Certificate No. 10339, and Jamie L. Stewart, NACE Coating Inspector Level 1 - Certified, Certificate No. 64809, of Tank Industry Consultants. The Owner's representative on the site at the time of the field evaluation was Steve Noyes. The tank was previously evaluated by Tank Industry Consultants under TIC No. L511.032 on September 26, 2012. The dome roof tank was of welded steel construction. According to information on the tank nameplate, the tank was erected in 2004 by CBI Constructors, Inc., under contract number 137422. The tank nameplate also stated the tank was 40 ft in diameter and had a nominal height of 71 ft 7 in. to top capacity level. According to information on the tank nameplate, the tank was designed using an alternative design basis which includes using higher allowable stresses and joint efficiencies.

OBJECTIVE:

The purpose of this washout and evaluation was to determine the condition of the tank interior, exterior, exposed foundation, and accessories. The purpose of this report is to present the findings of the evaluation and to make recommendations for recoating, repairing, corrosion protection, and maintenance. Budget estimates for the work, anticipated life of the coating and the structure, and the replacement cost of the tank are also included.

AUTHORIZATION:

This washout, evaluation, disinfection, and report were authorized in the PSA dated March 24, 2016 signed by Earl L. Jann, Chairman.

EXECUTIVE SUMMARY:

The interior and exterior coating systems appeared to be in poor condition. Tank Industry Consultants recommends that the interior surfaces of this tank should be recoated in 1 to 2 years. Tank Industry Consultants also believes that the exterior of the tank should be painted within the next 1 to 2 years from a corrosion standpoint. Due to the very poor adhesion of the existing exterior coating, topcoating does not appear to be an option.

ANSI/OSHA and Safety-Related Deficiencies: There were OSHA and safety-related deficiencies on this tank. These deficiencies included:

- the valve vault ladder toe room did not meet the required minimum (29 CFR 1910.23(d)(2)),
- one of the electrical receptacles in the valve vault was not equipped with ground fault interrupt circuits,
- an uncovered conduit junction box with exposed wiring was located in the valve vault,
- the depth of the exterior shell ladder safety cage did not precisely meet the required minimum, and
- the access opening to the platform was not equipped with a self-closing gate to deter personnel from inadvertently falling from the platform (29 CFR 1910.28(b)(3)(iv)).

If the Owner wishes to fully comply with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There were sanitary and operating deficiencies on this tank as well. These deficiencies included:

- the roof manhole cover overlap did not meet the required minimum (AWWA D100),
- the roof manhole was not locked, and
- gaps were located between the flanges for roof vent where a flange was bent.

These deficiencies should be corrected.

The safety-related, sanitary, and operating deficiencies listed above are not intended to be a complete list of deficiencies on this tank. The Owner should refer to the complete report text and accompanying photographs for a complete account of all observed deficiencies.

This evaluation and the reporting of the condition of this tank do not warrant the original structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes.

PHOTOGRAPHS:

Color photographs were taken of the visible portions of the foundation, the tank interior and exterior and are included as a part of this report. The significant photographs are keyed to the observations.

NOMENCLATURE:

The terms used in describing the various components of steel water tanks are unique to the industry. In fact, the terms vary from firm to firm and from person to person. In an attempt to define the terms used in this report, a sketch of the general type of tank covered is included at the end of the narrative portion of this report. Each horizontal row of steel plates on the tank is referred to as a "shell ring" or "ring." To aid in referencing the shell rings, the bottom ring is referred to as shell ring 1 and the top ring is

shell ring 9. **Warning: Some appurtenances on this tank may be referred to as erection or rigging attachments, lugs, or brackets. This does not mean that they are safe for rigging. Each attachment for each tank should be evaluated on an individual basis by a structural engineer or an experienced rigger before being used. These devices may have been intended for only the original erectors and painters to use with specialized equipment.**

ADHESION TESTS:

All adhesion tests performed during this evaluation were done in general accordance with ASTM D3359. The results are reported herein using the ASTM scale. The ASTM scale is a relative scale to rate adhesion from 0 to 5 with 5 being the best. A table of adhesion test results classification is included with this report following the sketch of the tank.

HEAVY METALS TESTS:

Samples of the exterior and interior coating systems were sent to a laboratory for inductively coupled plasma-atomic emission spectrometry analyses. The test results were as follows:

	Cadmium		Chromium		Lead	
	mg/kg	Percent	mg/kg	percent	mg/kg	Percent
Exterior	<0.4	<0.00004%	6.3	0.00063%	<1	<0.0001%
Interior	<0.4	<0.00004%	20	0.002%	<0.99	<0.000099%

Tank Industry Consultants performs this test only to determine if there is lead, cadmium, or chromium present in the coating samples. To limit damage to the existing coating, only small areas were tested. The small number of samples taken and the difficulty of retrieving all primer from the steel profile may cause the tests performed to not accurately represent the total coating system. Variations in thickness, types of coatings applied, and the interim cleaning and painting operations will also affect the actual readings. The reliability of the results is also dependent on the amount of primer included in the sample. Additional testing to determine the amount of leachable contaminants present in the spent cleaning debris will need to be performed following cleaning operations at the time of repainting. Results from the laboratory analysis are included following the adhesion tables.

ULTRASONIC THICKNESS MEASUREMENTS:

(all readings were taken through coating)

Roof:	
Cap:	0.215 in. to 0.216 in.
Finger:	0.207 in. to 0.209 in.
Shell:	
Ring #9:	0.277 in. to 0.281 in.
Ring #8:	0.267 in. to 0.273 in.
Ring #7:	0.273 in. to 0.275 in.
Ring #6:	0.265 in. to 0.269 in.
Ring #5:	0.260 in. to 0.265 in.
Ring #4:	0.324 in. to 0.327 in.
Ring #3:	0.346 in. to 0.349 in.
Ring #2:	0.344 in. to 0.348 in.
Ring #1:	0.346 in. to 0.349 in., bottom
Bottom Plate:	0.268 in. to 0.288 in.

OBSERVATIONS:

A. Foundation and Site

SITE:
- Size: approx. 110 ft x 160 ft
- Fence:
  - Type: chain link
  - Height: 6 ft
- Gates:
  - Number: 2
  - West Gate: 5 ft 6 in. wide
  - East Gate: 18 ft wide
  - Locked: yes

- Adjacent Structures:
  - Type: pump building, generator, and propane tank
  - Direction: south
  - Distance: approx. 40 ft

  - Type: residence
  - Direction: west
  - Distance: approx. 350 ft

Type: residence
Direction: south
Distance: approx. 1,000 ft

Adjacent Overhead Power Lines: none visible

FOUNDATION:
Type: concrete ringwall
Projection Above Grade:
North: 6 in. to 7 in.
South: 4 in. to 8 in.
East: 6 in. to 14 in.
West: 5 in. to 6 in.
Grout: approx. 1 in. to 2-5/8 in.
Sealant: polyurethane
Fiberboard: none visible

VALVE VAULT:
Location: beneath pump building
Size: approx. 9 ft x 11 ft x 10 ft 3 in.
Access: 30 in. square
Ladder:
Number of Rungs: 10
Width: 16 in.
Rung Size: 1-1/4 in. diameter
Side Rails: 2-1/2 in. x 3/8 in., aluminum flat bar
Rung Spacing: 12 in.
Toe Room: 5-1/2 in. minimum

1. **Site Location**: The tank was located off of Wohlhueter Road in Colden, New York. The site was located in an agricultural area although some residences were located to the west and south. No overhead power lines were visible near the site. (See photos 1-6)

2. **Site Conditions**: The tank site was covered with grass. The tank site was enclosed by a chain link fence which was equipped with two locked gates located on the west and east sides of the site. A pump building, hydrant, generator, and propane tank were located on the site south of the tank. (See photos 1-2)

3. **Foundation**: The concrete tank foundation appeared to be in fair condition as hairline cracks and areas of exposed aggregate were observed. The foundation had the AWWA recommended projection of 6 in. to 12 in. above grade. No coating was visible on the exposed concrete surfaces at the time of this field evaluation except for drips from the tank coating. A large rock had been placed on the foundation. (See photos 11-13)

4. **Grout and Sealant**: There was a pad of grout between the tank bottom plate and the concrete foundation. Cracks were noted in the grout. Most of the grout was not visible due to the presence of a flexible sealant located around it. The sealant was loose in areas, and vegetation was noted at an area along the grout-to-bottom plate interface. (See photos 13-15)

5. **Valve Vault: There were safety and OSHA deficiencies noted: (1) the 5-1/2 in. minimum toe room did not meet the required 7 in. minimum, (2) one of the electrical receptacles was not equipped with ground fault interrupt circuits, and (3) an uncovered conduit junction box with exposed wiring was located in the valve vault.** A valve vault was located beneath the pump building on the site. The vault access was equipped with an aluminum ladder. Minor spots of corrosion were observed on the piping in the valve vault at the time of the field evaluation. The vault was equipped with a sump and pump. Electrical equipment and four operational lights were located in the vault. A conduit junction in the vault was missing a cover. (See photos 7-10)

B. Exterior Surfaces

DESCRIPTION:

Construction: welded steel
Diameter: approx. 40 ft
Shell Height: approx. 72 ft 3 in.
Shell Rings: 9
Roof Type: dome

NAMEPLATE:

Horton Tank
AWWA D100 96 Sec. 14
Contract No. 137422 Year 2004
Nom. Diameter 40' Nom. Height 71'7" TCL Nom. Capacity 672,000 Gal.
Material A573-70 & A131-B Heat Treatment none
CBI Constructors, Inc.
Plainfield, Illinois

ANCHOR BOLTS:

Number: 20
Size: 2 in. diameter
Chairs:
Height: 27 in.
Width: 3-3/4 in. to 4 in. (i/s - i/s)
Top Plate Dimensions: 7 in. x 10 in. x 1-1/8 in., thick
Side Plate Dimensions: 2 in. to 7 in. x 25-7/8 in. x 1-1/8 in., thick

BOTTOM PLATE PROJECTION: 2 in. to 2-3/4 in.

SHELL MANHOLES:
- Number: 2
- Location: north and south sides of shell ring #1
- Type: flanged and bolted
- Size: 30 in. diameter
- Neck: 11 in. projection from shell x 3/4 in. thick
- Flange: 3-1/2 in. projection x 1-1/8 in. thick
- Bolts:
  - Number: 42
  - Size: 3/4 in. diameter x 4 in. long
- Cover Plate:
  - Size: 38-3/4 in. diameter x 1-1/8 in. thick
  - Hinged: yes, exterior

OVERFLOW PIPE:
- Size: 8 in. diameter
- Visible Air Break: yes, approx. 51 in.
- Protective Screen: 4 x 4 mesh
- Brackets:
  - Size: 6 in. x 1/4 in., flat bar x 14 in. long
  - Spacing: approx. 8 ft
- Drain Basin: 24 in. square x 35-1/2 in. deep

EXTERIOR LADDER:
- Number of Rungs: 69
- Distance From Ground to Lowest Rung: approx. 8 ft 5 in.
- Width: 16 in.
- Side Rails: 2-1/2 in. x 3/8 in., flat bar
- Rung Size: 3/4 in. square
- Spacing: 12 in. on center
- Toe Room: 7-1/4 in.
- Brackets:
  - Construction: welded
  - Size: 3 in. x 3/8 in., flat bar x 8-1/4 in. long
  - Spacing: approx. 8 ft
- Safe-Climbing Device: notched-tubular rail
- Safety Cage:
  - Depth: 26 in.
  - Width: 27-3/4 in.
  - Vertical Bars:
    - Size: 1-1/2 in. x 1/4 in., flat bar
    - Spacing: 9 in. to 9-1/2 in.
  - Horizontal Bars:
    - Size: 2 in. x 1/4 in., flat bar and 4 in. x 1/4 in., flat bar
    - Spacing: 4 ft

Vandal Deterrent:
Type: aluminum ladder gate
Size: 36 in. wide x 8 ft high
Locked: yes

PLATFORM:
Type: 1/4 in. thick diamond plate
Size: 3 ft x 6 ft
Handrail:
Height: 42 in.
Size: 2-1/2 in. x 2-1/2 in. x 1/4 in., angle
Uprights: 2-1/2 in. x 2-1/2 in. x 1/4 in., angle
Mid-Rail: 2-1/2 in. x 1/4 in., flat bar
Toe Bar:
Type: bent diamond plate
Height Above Platform: 4 in.
Access Opening:
Width: 28-1/2 in.
Self-Closing Gate: no

ROOF SAFETY RAILING:
Location: adjacent to roof's edge and manhole and around roof vent
Handrail:
Height: 42 in.
Size: 2-1/2 in. x 2-1/2 in. x 1/4 in., angle
Uprights: 2-1/2 in. x 2-1/2 in. x 1/4 in., angle
Mid-Rail: 2-1/2 in. x 1/4 in., flat bar and 2-1/2 in. x 2-1/2 in. x 1/4 in., angle
Toe Bar:
Type: 4 in. x 1/4 in., flat bar
Height Above Roof: 4 in.

STAIRS:
Type: 1/4 in. thick diamond plate
Size: 14 in. to 25 in.
Rise: 8-1/2 in.
Stringer: 12 in. x 1/4 in., flat bar
Handrail:
Height: 38-1/2 in. to 44-1/2 in.
Size: 2-1/2 in. x 2-1/2 in. x 1/4 in., angle
Uprights: 2-1/2 in. x 2-1/2 in. x 1/4 in., angle
Mid-Rail: 2-1/2 in. x 1/4 in., flat bar

ROOF OPENINGS:

Manhole:

Size: 24 in. diameter
Type: hinged
Curb: 6 in.
Overlap: 1-1/4 in.
Locked: no

Roof Vent:

Type: clog-resistant
Neck Height: 5-1/4 in. to 7-1/8 in.
Neck Diameter: 24 in.
Screen:
Orientation: horizontal
Size: 16 x 16 mesh
Cover: 56-1/2 in. diameter

EXTERIOR COATING AND METAL CONDITION:

	Coating Thickness		Approx. % Failure to		Adhesion	Metal Loss	
	Range	Typical	Underlying Coating	Rust		Typical	Deepest
Shell	7 mils to 22 mils	14.5 mils	Neg.	1%	1 S	Neg.	Neg.
Roof	7 mils to 21 mils	12 mils	Neg.	<1/2%	1 S	Neg.	Neg.

Key to Table

Adhesion 5 (very good)
4 (good)
3 (fair)
2 (poor)
1 (very poor)
0 (very poor)

T = Topcoat to Underlying Coating

S = Primer to Steel

Neg. = negligible

1. **Exterior Coating Condition**: The coating on the exterior of the tank appeared to be in poor condition on the two bottom shell rings with widespread peeled coating and corrosion. The exterior coating exhibited very poor adhesion to the steel.

2. **Bottom Plate**: The tank bottom plate extension appeared to be in nearly its original condition at the time of the field evaluation. Isolated spots of corrosion but no significant metal loss were observed along the edge of the bottom plate projection. (See photos 13-15)

3. **Anchor Bolts and Chairs**: The tank was equipped with 20 anchor bolts and chairs. Some spots of peeled coating and rust were observed on the anchor bolt washers, and rust staining was noted on some of the anchor bolts. (See photos 16-17)

4. **Shell Condition**: The contour of the tank shell appeared adequate as no significant irregularities were observed at the time of this field evaluation. The coating appeared to be in very poor condition as numerous areas of peeled coating and corrosion were noted, primarily on the two bottom shell rings. The coating exhibited very poor adhesion to the steel. A conduit extended up a set of brackets located adjacent to the ladder. A security light was mounted near the base of the shell. The

tank nameplate and a plate containing information about the roof vent were mounted on the shell. (See photos 18-24, 29, 32)

5. **Shell Manholes**: The tank was equipped with two flanged and bolted circular manholes located on the north and south sides of the tank. The shell plate around each of the manholes was equipped with a circular reinforcing plate. The shell manhole covers were equipped with hinged support arms located on the exterior of the tank. Corrosion was observed on the flanges and bolts. (See photos 20-22)

6. **Overflow Pipe**: The overflow pipe exited through the top shell ring and extended down the shell before discharging above a grate-covered drain basin. The discharge end was screened, and rust was observed on the flange for the screen. The pipe was equipped with welded steel brackets which appeared to be in their original structural condition at the time of this field evaluation. (See photos 25-28)

7. **Exterior Ladder: There was a safety and OSHA deficiency noted: the 26 in. depth of the ladder safety cage did not precisely meet the required 27 in. minimum.** The exterior ladder was welded to brackets which were welded to the shell. The ladder and brackets appeared to be in nearly their original structural condition at the time of this field evaluation. The ladder was equipped with a notched-tubular safe-climbing device and a safety cage which was constructed of welded flat bar members. Spots of corrosion were observed on the ladder safety cage, and a coaxial cable was clamped to the cage. The bottom of the ladder was equipped with a locked aluminum ladder gate-type vandal deterrent. The top bracket for the vandal deterrent was missing a bolt and was loose. No side plates were present along the ladder adjacent to the vandal deterrent. (See photos 19-31, 33)

8. **Platform: There was a safety-related and OSHA deficiency noted: the access opening to the platform was not equipped with a self-closing gate to deter personnel from inadvertently falling from the platform.** A platform was located at the top of the exterior ladder and adjacent to the roof access. The platform was constructed of a diamond plate floor, and corrosion and debris were observed on the topside of the platform floor. Rust staining was observed on the underside of the platform floor. The platform was equipped with a safety railing which was constructed from welded and bolted angle and flat bar members. Spots of corrosion were noted on the safety railing. A PVC pipe extended along the top of the platform safety railing to the roof manhole. (See photos 33-34, 36)

9. **Roof Safety Railings**: The roof was equipped with safety railings which extended along the edge of the roof adjacent to the roof manhole and around the roof vent at the center of the roof. The safety railings were constructed from welded angle and flat bar members. Spots of corrosion were noted on the safety railing members. An antenna was mounted on the safety railing adjacent to the roof vent, and a cable extended along the roof to the antenna. A lightning rod was attached to the antenna. A PVC pipe extended along the top of the safety railing located along the roof's edge to the roof manhole. (See photos 36, 42-45)

10. **Roof Condition**: The contour of the roof appeared adequate at the time of this evaluation. The roof coating appeared to be in fair to poor condition. Spots of peeled coating and rust were observed on the roof. The roof coating exhibited very poor adhesion to the steel. Two lugs were located on the roof cap on opposite sides of the roof vent. **It is the opinion of Tank Industry Consultants that the lugs should not be used for rigging purposes**. (See photos 37-39)

11. **Roof Stairs**: Stairs extended from the roof access to near the roof vent at the center of the roof. The stairs were equipped with safety railing which were constructed of welded angle and flat bar members. Minor rust and debris were observed on the stairs. A coaxial cable extended up the roof along the stairs. (See photos 36, 40-43)

12. **Roof Manhole: There were sanitary and AWWA deficiencies noted: (1) the cover overlap of 1-1/4 in. did not meet the required minimum of 2 in., and (2) the roof manhole was not locked.** The roof was equipped with one manhole which had a hinged cover. The roof manhole was not locked prior to and after this evaluation. A 3 in. diameter PVC pipe penetrated the roof manhole cover which prevented personnel from accessing the manhole at the time of the field evaluation. (See photos 35-36)

13. **Roof Vent: There was a sanitary deficiency noted: gaps were located between the flanges for roof vent where a flange was bent.** What appeared to be a clog-resistant vent was mounted to a flanged opening located in the approximate center of the roof. The aluminum vent appeared to be equipped with pallets which would facilitate ventilation during filling or draining of the tank. The proper operation or design of the pallets was not verified during this evaluation. Handles were located on the roof vent cover. **It is the opinion of Tank Industry Consultants that the handles should not be used for rigging purposes.** (See photos 46-47)

C. Interior Surfaces

TOP SHELL ANGLE:
Size: 3-1/2 in. x 3-1/2 in. x 1/4 in.
Orientation: leg out

INTERIOR LADDER: none

CATHODIC PROTECTION: none

OVERFLOW:
Inlet Type: weir box
Location: approx. 8 in. below the roof-to-shell connection

INTERIOR PIPING:
Inlet Pipe:
Size: 10 in. diameter
Projection: from floor to shell ring #4
Brackets:
Size: 3 in. x 3 in. x 3/8 in., angle
Construction: welded

Outlet Pipe:
Size: 10 in. diameter
Projection: 1/4 in. above floor
Mud Ring:
Size: 6 in. x 3/8 in., flat bar
Removable: yes

INTERIOR COATING AND METAL CONDITION:

	Coating Thickness		Approx. % Failure to		Adhesion	Metal Loss	
	Range	Typical	Primer	Rust		Typical	Deepest
Roof	-	-	Neg.	8%	-	Neg.	Neg.
Shell	15 mils to 25.5 mils	18 mils			3 S	<1/16 in.	<1/8 in.
Fluctuation Zone			Neg.	15%			
Intermediate Zone			Neg.	2%			
Sludge Zone			Neg.	<1%			
Floor	14 mils to 20 mils	15 mils	Neg.	<1/2%	2 S	Neg.	<1/16 in.

Key to Table

Adhesion 5 (very good)
4 (good)
3 (fair)
2 (poor)
1 (very poor)
0 (very poor)

T = Topcoat to Underlying Coating

S = Primer to Steel

Neg. = negligible

1. **Interior Coating Condition**: The coating on the interior surfaces of the tank appeared to be in poor condition with areas of corrosion noted on the interior roof and upper shell. The interior coating exhibited poor adhesion to the steel.

2. **Roof Condition**: The coating on the roof plates appeared to be in poor condition. Widespread rust staining was observed on the roof plates. (See photos 48-50)

3. **Shell Condition**: The coating on the shell interior appeared to be in poor condition with areas of corrosion noted. The largest area of corrosion noted measured approximately 3 ft wide x 10 ft tall. Coating failures and corrosion were worse in the upper shell. Metal loss measurements taken during this evaluation indicated a typical pit depth of less than 1/16 in., and the deepest pit found measured less than 1/8 in. deep. A top shell angle was located along the roof-to-shell connection. (See photos 51-58)

4. **Overflow Pipe**: The overflow pipe was equipped with a weir box inlet. The location of the overflow inlet was such that the top capacity level was below the shell-to-roof connection, and the weir box was located below the existing roof manhole. (See photos 48-49)

5. **Bottom Plate Condition**: The coating on the tank bottom appeared to be in fair overall condition. An approximately 5 ft square area on the interior floor below the roof manhole had rust particles and staining likely from debris from the pipe opening in the roof manhole. Rust was observed along the shell-to-floor weld seam. An approximately 6 in. diameter welded steel patch plate was located on the floor adjacent to the inlet pipe. Two lugs were located on the floor. **It is the opinion of**

Tank Industry Consultants that the lugs should not be used for rigging purposes. (See photos 58-61)

6. **Interior Piping**: The inlet pipe projected from the floor and extended to the approximate center of shell ring #4. The inlet pipe was equipped with welded angle brackets. The outlet pipe projected slightly above the floor and was equipped with a removable mud ring. (See photos 49, 62-64)

RECOMMENDATIONS:

A. Foundation and Site

1. **Site Maintenance**: The site should be maintained so that the top of the foundation projects a minimum of 6 in. to a maximum of 12 in. above grade and so that proper drainage away from the foundation occurs. Site maintenance should be performed with the mower discharge directed away from the base of the tank to prevent rock chips in the coating and the accumulation of debris on the foundation and within the anchor bolt chairs. Precautions should be taken when working around the propane tank on site.

2. **Tank and Site Security**: Water tanks have been defined by some courts under certain circumstances as attractive nuisances. As such, there may be a significant potential liability to the Owner for injury to persons on the tank and tank site, even if access is not authorized. Recent events have prompted the entire water industry to consider measures that inhibit intentional acts that could threaten the water supply. A review of the security requirements for the tank and site is recommended to confirm that the existing measures are consistent with the Owner's security requirements for their water system. Primary tank and site security should be focused on eliminating, preventing, and detecting unauthorized access to the tank. Such security measures might include routinely and periodically verifying all manholes and gates are locked, and all exterior ladders have suitable deterrents. Other security measures might include installing no-trespass signs, motion detectors, surveillance cameras, alarms on gates and tank manholes, and arranging more frequent site visits by law enforcement agencies.

3. **Foundation**: When the tank exterior is repainted, any unsound concrete should be chipped to sound material and the concrete should be brush-off blasted. Any deteriorated areas or voids found should have a bonding agent and a vinyl emollient modified concrete patching mortar applied to build up the surface to its original contour. The concrete should then be painted with a concrete sealer.

4. **Grout Maintenance**: All loose grout should be chipped away to solid material when the tank is empty. Any shim plates which can be easily removed should be taken out. Any voids in the grout should be filled with a nonshrinking, nonstaining, structural grout material. The grout should be placed as far back under the bottom plate as possible and squared off vertically with the edge of the bottom plate. Any gap between the steel bottom plate and the grout should be filled with a flexible sealant.

5. **Sealant Maintenance**: When the exterior repainting is performed, the existing sealant located between the bottom plate and the foundation should be removed and replaced with a flexible polyurethane sealant.

6. **Valve Vault**: If compliance with OSHA dimensional and safety standards is desired, the access ladder should be modified to allow adequate toe room. The piping and valves located in the valve vault should be cleaned and painted in accordance with the interior coating recommendations at the time of the tank cleaning and coating. The exterior concrete surfaces should be cleaned to the equivalent of a brush-off blast cleaning and painted with a concrete sealer. Freeze protection should be provided for on all control piping and static water lines. The electrical outlet should be equipped with ground fault interrupt circuits, and the missing cover for the conduit junction replaced.

B. Exterior Surfaces

1. **Life of the Exterior Coating**: The exterior coating system appeared to be in poor condition with numerous areas of peeled coating and corrosion. Tank Industry Consultants believes that the exterior of the tank should be painted within the next 1 to 2 years from a corrosion standpoint. Due to the very poor adhesion of the existing exterior coating, topcoating does not appear to be an option.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the exterior of the tank, samples of the exterior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Cleaning**: When the exterior is to be cleaned, all varieties of containment should be investigated. Containment of the wind-blown debris and paint droplets may be required due to the proximity of residences.

4. **Recommended Coating System**:

a. **Complete Cleaning and Repainting**: The optimum long-life coating system presently available for this site is an epoxy-polyurethane coating system. Properly formulated and applied polyurethanes have good resistance to condensation, mildew, and chipping. The polyurethanes also have excellent color and gloss retention and the longest expected service life of any of the common exterior tank coatings. The typical life of a properly applied epoxy-polyurethane coating system is approximately 15 to 20 years. These coatings are also presently manufactured to meet current VOC requirements.

b. **Coating Application**: The entire tank exterior should be cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning and have an epoxy-primed, epoxy intermediate and polyurethane finish coating system applied. However, care must be taken during the application of this particular coating system because this coating does have poor dry-fall characteristics, and potential damage to the surrounding property must be taken into consideration. The polyurethane coatings also require close monitoring of temperature and humidity during application.

5. **Effective Service Life**: Tank Industry Consultants defines the life of a coating as the amount of time before repainting becomes necessary due to coating failure and corrosion. During the coating life the Owner should expect the coating to lose its gloss, start to chalk, show signs of weathering, and possibly some rust staining. Future touch-up may be required on isolated coating

failures. If aesthetics are a concern, the Owner may have to topcoat the repainted tank prior to the end of the expected service life. However, future topcoating would be less expensive than complete cleaning and recoating and could delay the next complete cleaning and repainting for many years.

6. **Other Systems**: With air emission volatile organic compounds (VOC) restrictions being put in place around the nation, alternative coating systems may become available which would be viable options for this tank. The Owner should review the available systems prior to preparing specifications for the recoating project.

7. **Coating Curing**: It would be more economical to paint the tank exterior at the same time the interior is painted, since the tank must be drained while the exterior is painted, and the applied coatings cure. This will also reduce mobilization and observation costs.

8. **Rehabilitation Schedule**: To obtain the lowest possible prices for the work outlined in the recommendations, the Owner should have the specifications prepared and the work bid in the spring, with the work scheduled to start in early summer (if possible).

9. **High Strength Steel:** Any welding and modifications made to the tank should take into account that the shell was constructed with high-strength steel.

10. **Grinding and Bracket Removal**: Any unused brackets or erection lugs should be removed prior to the exterior repainting. Any weld burrs, weld spatter, or erection scars should be ground off to provide a smooth surface for the application of the coating.

11. **Nameplate and Vent Information Plate**: The tank nameplate and vent information plate should be removed for the cleaning and coating of the tank. Both of the plates should be cleaned and reattached to the tank using new brackets.

12. **Electrical Apparatus**: All unused electrical conduit, antennas, fixtures, and cabinets should be removed from the tank and tank site. All required equipment should be repaired and maintained in accordance with the National Electric Code (NEC).

13. **Existing Shell Manholes**: At the time of recoating and repairs, the gaskets for the shell manholes should be replaced, and the bolts should be replaced with galvanized bolts.

14. **Overflow Pipe**: The discharge end of the overflow pipe should be equipped with a new screened, counter-weighted flap gate or elastomeric check valve to prevent the ingress of small animals and insects into the tank.

15. **Exterior Ladder**: The safety cage is not required on ladders with safe-climbing devices. To reduce cleaning and painting costs and future maintenance costs, because the depth of the ladder safety cage was not compliant, and because OSHA is phasing out the use of the safety cages in lieu of the installation of safe-climbing devices, Tank Industry Consultants recommends that the safety cage be removed. At the time of the exterior repainting, the safe-climbing device should be cleaned and protected from the application of the exterior coating. The conduit and coaxial cable should be relocated away from the ladder.

16. **Vandal Deterrent**: The missing bolt for the bracket should be replaced and the existing vandal deterrent secured. The addition of side plates on both sides of the ladder at the existing vandal deterrent would offer the Owner further protection from unauthorized access to the ladder and tank.

17. **Platform**: The platform access opening should be equipped with a self-closing gate.

18. **Clog-Resistant Vent**: The bent flange at the vent attachment should be repaired, and any gap between flanges sealed with a gasket. The existing clog-resistant vent should be regularly evaluated to verify proper operation of the vent pallets.

19. **Roof Manhole**: The existing roof manhole dimensions did not comply with current AWWA standards. Therefore, the roof manhole should be modified to include a 2 in. overlapping cover. The roof manhole should be locked. The cover for the existing roof manhole above the overflow weir box could not be opened due to the PVC pipe attached to the cover. As such a second roof manhole available for access is recommended.

C. Interior Surfaces

1. **Life of the Interior Coating**: The interior coating system appeared to be in poor condition. Tank Industry Consultants recommends that the interior surfaces of this tank should be recoated in 1 to 2 years. It is recommended that when the interior is completely cleaned and repainted, an epoxy coating system should be used.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the interior of the tank, samples of the interior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Recommended Interior Coating System**:

a. **Epoxy Coating System**: The optimum long-life coating system presently available for the interior of water tanks is an epoxy coating system. An ultra-high solids epoxy system is recommended for the interior of this tank. This coating system should meet the certification criteria of ANSI/NSF 61 and state department of health regulations.

b. **Coating Application**: When the interior is to be repainted, the entire tank interior should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied.

c. **Service Life**: The typical life of a properly formulated and applied epoxy coating system is approximately 12 to 15 years in immersion service. Tank Industry Consultants defines the life of a coating as the expected service life before repainting becomes necessary due to coating failure and corrosion. The Owner could extend the service life of the coating by installing, properly maintaining and operating a cathodic protection system to help protect the steel surfaces in areas which have experienced coating failure.

4. **Cathodic Protection**: When the tank is rehabilitated the brackets and fittings should be installed for the future installation of a cathodic protection system.

a. **Type**: When the cathodic protection system is installed, an ice-resistant cathodic protection system which features long-life anodes, automatic potential and current control should be specified.

b. **Scheduling**: After the interior is completely cleaned and recoated, the cathodic protection system should not be energized until after the First Anniversary Evaluation. The Owner should conduct washouts and evaluations approximately every 3 years to monitor the need for cathodic protection. As the interior coating begins to show signs of failure, the cathodic protection system should be energized to aid in minimizing corrosion below the top capacity level.

c. **Maintenance**: Cathodic protection, if used and maintained properly, will control active corrosion below the water level and extend the useful life of a coating system. It should be noted that maintenance as recommended by the cathodic protection manufacturer is required for the cathodic protection system to work properly. Without proper monitoring, the cathodic protection system may operate too high and cause the coating to blister, or the system may operate too low and not adequately protect the exposed steel surfaces.

5. **Pit Welding and Pit Filling**: After initial cleaning, all significant pitting which is found should be welded, and all pitting with rough edges that would make the pitting difficult to coat properly should be filled with a solventless epoxy seam sealer.

6. **Rough Edges**: All unused brackets should be removed from the interior and exterior surfaces at the time of the next recoating. Any weld burrs, spatter, scars or rough edges in the steel should be ground smooth to provide a better surface for coating.

ECONOMIC FACTORS:

Item	Cost	Life in Years
Replacement of tank with a new one	$1,000,000[1]	75+

The following is a complete list of repairs and estimated costs for their respective recommendations found in the RECOMMENDATION section of this report.

Item	Sanitary & Safety	Scheduled Maintenance Repairs
Clean and Paint Exterior:		
SP 6, Complete Clean, Epoxy/Polyurethane System		$ 250,000
Containment		100,000
Clean and Paint Interior:		
SP 10, Epoxy System		300,000
Cathodic Protection System		15,000
Miscellaneous Chipping and Grinding		2,000
Pit Repair		2,000
Foundation Repair		2,000
Grout and Sealant Repair		2,000
Overflow Elastomeric Check Valve	$ 4,000	
Vandal Deterrent Side Plates	2,000	
Remove Exterior Ladder Safety Cage	2,000	
Self-Closing Gate for Platform Access	1,000	
Existing Roof Manhole Modifications	2,000	
Additional Roof Manhole	6,000	
Contingency Items	5,000	10,000

Estimates are believed to be a high average of bids that would be received in 2018.

[1] The replacement estimate includes costs associated with new tank fabrication and erection, foundation, painting, and engineering. The budget estimate given does not include costs associated with tank demolition, site acquisition, and distribution interruptions.

The following economic factors include only those work items that the Engineer believes to be the minimum to properly maintain this tank from an operational standpoint. Other items related to safety and risk management should be evaluated by the Owner.

Item	Cost
Clean and Paint Exterior:	
SP 6, Complete Clean, Epoxy/Polyurethane System	$ 250,000
Containment	100,000
Clean and Paint Interior:	
SP 10, Epoxy System	300,000
Cathodic Protection System	15,000
Miscellaneous Chipping and Grinding	2,000
Pit Repair	2,000
Foundation Repair	2,000
Grout and Sealant Repair	2,000
Overflow Elastomeric Check Valve	4,000
Vandal Deterrent Side Plates	2,000
Remove Exterior Ladder Safety Cage	2,000
Self-Closing Gate for Platform Access	1,000
Existing Roof Manhole Modifications	2,000
Additional Roof Manhole	6,000
Contingency Items	15,000
Total of Engineer's Recommendations	**$ 705,000**

Tank Industry Consultants has no control over the cost of labor, materials, or equipment, or over the contractors' methods of determining prices, or over competitive bidding, or the market conditions. Opinions of probable cost, as provided for herein, are to be made on the basis of our experience and qualifications and represent our best judgment as design professionals familiar with the design, maintenance, and construction of concrete and steel plate structures. However, Tank Industry Consultants cannot and does not guarantee that proposals, bids, or the construction cost will not vary from opinions of probable cost prepared for the Owner.

Due to the numerous potential scopes of work which exist, the Owner should obtain an updated budget estimate once the final scope of work has been determined. This would enable the Owner to accurately budget monies for additional mobilization costs and damaged coating rehabilitation costs.

Engineering and resident observation costs are not included in the Total of the Engineer's Recommendations because these fees are dependent upon the scope of work to be performed. Tank Industry Consultants performs all facets of the engineering services which would be required for this project. Estimated fees for engineering and resident observation will be furnished upon request.

CLOSURE:

Brief Summation: Erie County Water Authority owns a 672,000 gallon standpipe in Colden, New York which appeared to be in generally good condition. Proper maintenance after completing the recommendations herein would include periodic washouts and evaluations approximately every 3 to 5 years in accordance with AWWA recommendations, and the installation and proper maintenance of a new ice-resistant cathodic protection system with long-life anodes.

Contractor Selection: The work should be performed by a competent bonded contractor, chosen from competitive bids taken on complete and concise specifications. The coatings used should be furnished by an experienced water tank coating manufacturer, supplying the field service required for application of technical coatings.

Standards for Repairs and Coatings: All work done and coatings applied should be applied in accordance with NACE, ANSI/NSF Standard 61, the manufacturer's recommendation, AWWA D100 and AWWA D102 (latest revisions), and the SSPC: The Society for Protective Coatings.

Observation of Work: Observation of the work in progress by experienced personnel will offer additional assurance of quality protective coating application. Observations can be performed on a continuous basis or spot (critical phase) basis. The actual cost of observation may be less using spot as opposed to full-time resident observation; however, with spot observation it is often necessary for work to be redone to comply with the specifications. This somewhat lowers the quality of the finished product, lengthens the job, and is frequently a cause of conflict between the contractor, Owner, and field technician. Resident full-time observation minimizes the amount of "rework" required.

Anniversary and Maintenance Evaluations: An anniversary evaluation should be conducted prior to the end of the one year bonded guarantee. Washouts and coating, structural, sanitary, safety, and corrosion evaluations should be conducted not less than every three years.

Time Frame: If the work is not performed within the next 12 months, the structure should be reevaluated prior to the preparation of specifications and solicitation of bids.

Specifications and Bidding Documents: The recommendations in this report are not intended to be specifications on which a contractor can bid. Complete bidding documents must include general and special conditions, detailed technical specifications, and other information necessary for the competitive bidding process. To properly protect the interests of the Owner, Contractor, and Engineer; the initial evaluation, the technical specifications, legal portions of the contract documents, and the observation should be performed by the same firm or with close coordination of all parties involved.

Limitations of Evaluation: It is believed that the conditions reported herein reflect the condition of the tank as observed on the date of the evaluation, using reasonable care in making the observations, and safety in gaining access to the tank. Should latent defects be discovered during the cleaning of the structure, they should be brought to the attention of the Owner and the Engineer.

Seismic and Wind Loadings: This tank is located in a region of low seismic activity. This evaluation and the reporting of the condition of this tank do not warrant the structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes. It is possible the tank was erected in compliance with pre-existing industry standards which have since been replaced by more restrictive standards.

Hazardous Materials in Coatings: It should be taken into consideration that Federal, State, and local environmental agencies have placed stricter controls on the removal of lead-based and other heavy-metal based coatings from steel structures by the use of conventional abrasive blasting techniques. The paint and blast residue may be considered to be hazardous waste depending on the concentration of lead or other particles in residue.

Please contact Tank Industry Consultants if you have any questions or comments.

Respectfully submitted,

Tank Industry Consultants

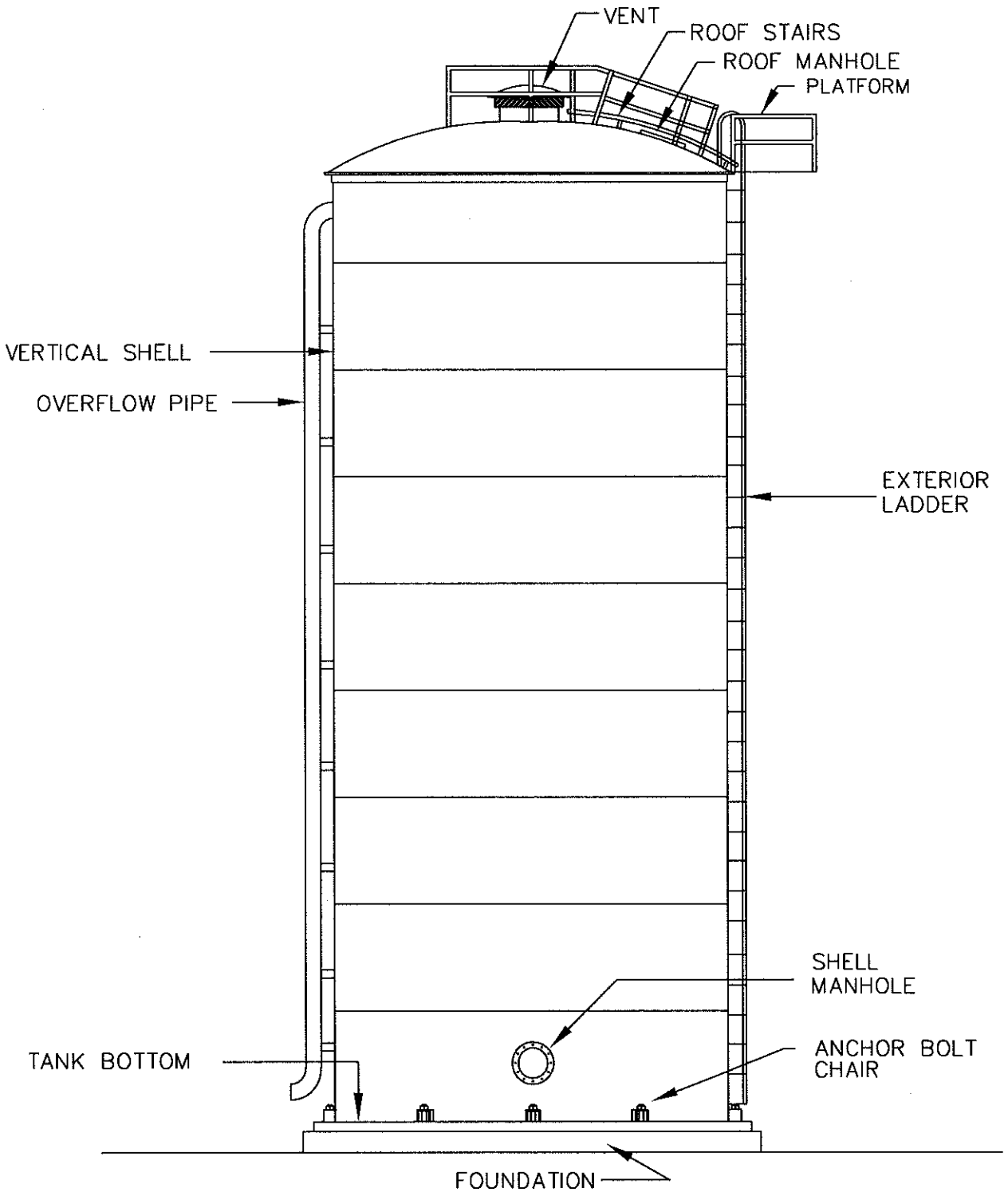
Patrick J. Brown, P.E.
Project Engineer

Gregory R. "Chip" Stein, P.E.
Managing Principal

STATE OF NEW YORK
GREGORY R. STEIN
LICENSED PROFESSIONAL ENGINEER

It is a violation of Education Law Article 145 for any person, unless he is acting under the direction of a licensed PE, to alter an item in any way.

STANDPIPE



NOMENCLATURE

Classification of Adhesion Test Results

Method A – X Cut Tape Test Approx. 1.5 in. long cuts at 30 deg. to 45 deg. apart.	Surface	Classification
No peeling or removal.		5
Trace peeling or removal along incisions.		4
Jagged removal along incisions up to 1/16 in. (1.6mm) on either side.		3
Jagged removal along most of incisions up to 1/8 in. (3.2mm) on either side.		2
Removal from most of the area of the X under the tape.		1
Removal beyond the area of the X.		0

Method B – Lattice Cut Tape Test Six parallel cuts at 2mm apart.	Surface	Classification
The edges of the cuts are completely smooth; none of the squares of the lattice are detached.	No Failure	5
Small flakes of the coating are detached at intersections; less than 5% of the lattice is affected.		4
Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5% to 15% of the lattice.		3
The coating has flaked along the edges and on parts of the squares. The area affected is 15% to 35% of the lattice.		2
The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35% to 65% of the lattice.		1
Flaking and detachment worse than grade 1.		0

ASTM 3359 Standard Test Methods for Measuring Adhesion by Tape Test

Tank Industry Consultants

7740 West New York Street
Indianapolis, Indiana 46214

Telephone – 317/271–3100
FAX – 317/271–3300

EMSL Analytical, Inc.
6340 CastlePlace Dr., Indianapolis, IN 46250
Phone: (317) 803-2997 Fax: (317) 803-3047 Email: indianapolislab@emsl.com

Attn: **Bruce Hobbs**
Tank Industry Consultants
7740 West New York Street
Indianapolis, IN 46214
Phone: (317) 271-3100
Fax: (317) 271-3300

11/9/2017

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 11/3/2017. The results are tabulated on the attached data pages for the following client designated project:

16.081.L614.015

The reference number for these samples is EMSL Order #161721005. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (317) 803-2997.

Approved By:

Doug Wiegand, Laboratory Manager

ACCREDITED

Chemical Testing
2845.25

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. This report may not be reproducted except in full and without written approval by EMSL Analytical, Inc. A2LA accredited chemical testing laboratory for Metals in Solids and Liquids by Inductively Coupled Plasma (ICP). As well as Mercury by Cold Vapor Atomic Absorption (CVAA).

EMSL Analytical, Inc.
6340 CastlePlace Dr., Indianapolis, IN 46250
Phone/Fax: (317) 803-2997 / (317) 803-3047
http://www.EMSL.com indianapolislab@emsl.com

EMSL Order:	161721005
CustomerID:	TICO62
CustomerPO:	
ProjectID:	

Attn: **Bruce Hobbs**
Tank Industry Consultants
7740 West New York Street
Indianapolis, IN 46214

Phone:	(317) 271-3100
Fax:	(317) 271-3300
Received:	11/03/17 11:40 AM
Collected:	10/25/2017

Project: **16.081.L614.015**

Analytical Results

Client Sample Description 1
Ext Shell — ***Collected:*** 10/25/2017 — ***Lab ID:*** *161721005-0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
3050B/6010C	Cadmium	ND	0.40	mg/Kg	11/8/2017	AF	11/8/2017	WF
3050B/6010C	Chromium	6.3	1.0	mg/Kg	11/8/2017	AF	11/8/2017	WF
3050B/6010C	Lead	ND	1.0	mg/Kg	11/8/2017	AF	11/8/2017	WF

Client Sample Description 2
Int Shell — ***Collected:*** 10/25/2017 — ***Lab ID:*** *161721005-0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
3050B/6010C	Cadmium	ND	0.40	mg/Kg	11/8/2017	AF	11/8/2017	WF
3050B/6010C	Chromium	20	0.99	mg/Kg	11/8/2017	AF	11/8/2017	WF
3050B/6010C	Lead	ND	0.99	mg/Kg	11/8/2017	AF	11/8/2017	WF

Definitions:
ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit (Analytical)

1. Tank. Note coating failures and rust on lower shell.

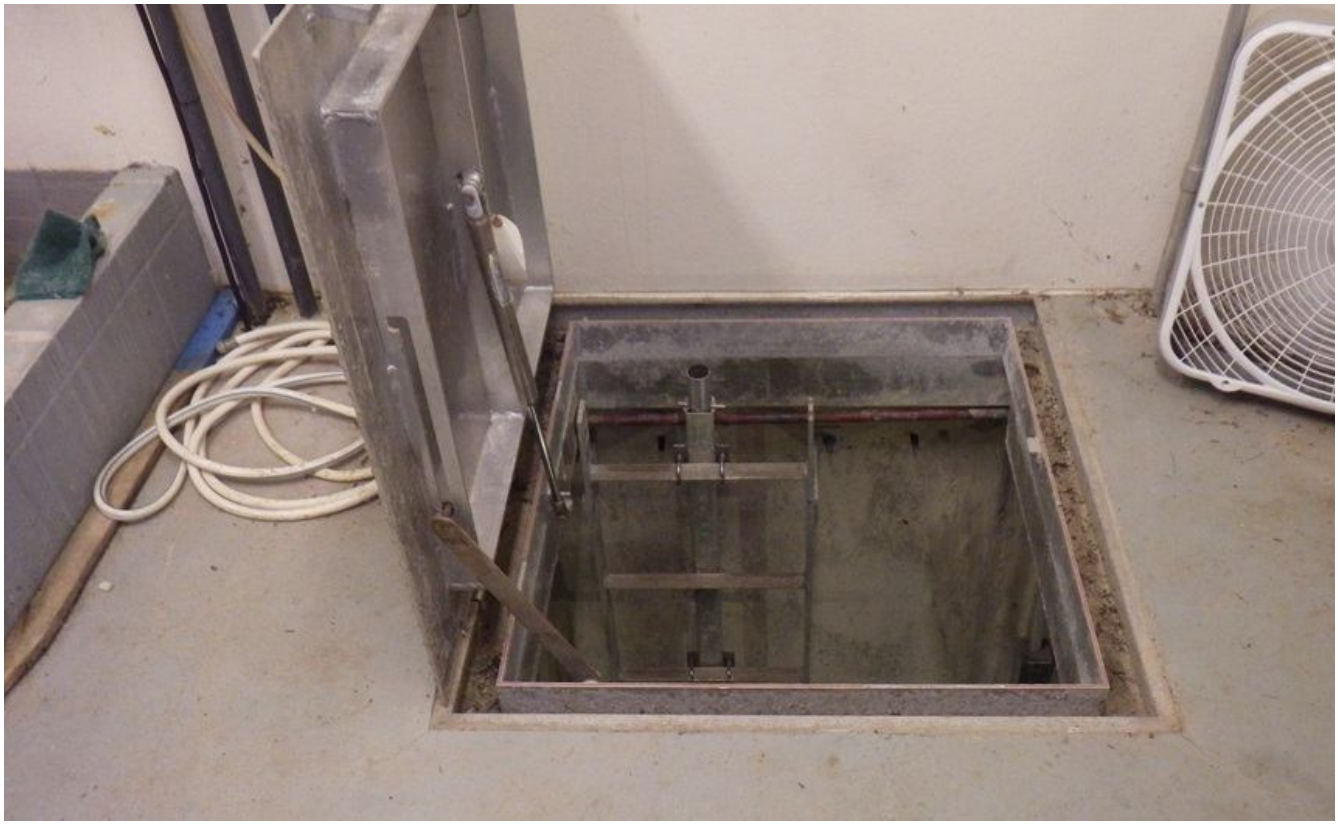
2. Site access.

3. Surrounding area.

4. Surrounding area.

5. Surrounding area.

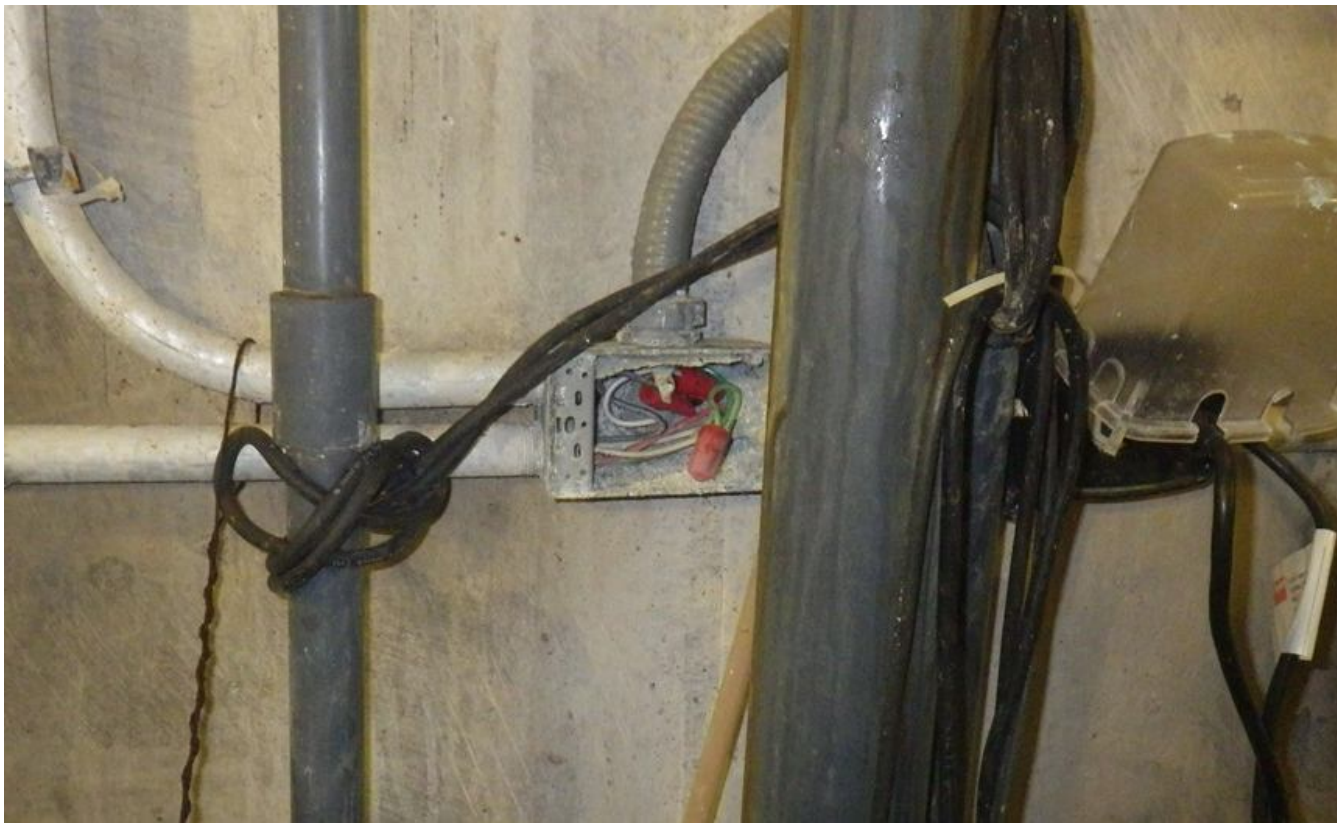
6. Surrounding area.



7. Valve vault access inside building on site.

8. Valve vault access ladder.

9. Piping and valves in vault.



10. Conduit junction with missing cover.

11. Crack in tank foundation.

12. Tank foundation.

13. Tank foundation.

14. Peeled sealant along grout and bottom plate.

15. Vegetation at bottom plate.

16. Anchor bolt and chair.

17. Anchor bolt and chair.

18. Vent information plate on shell under ladder.

19. Tank nameplate.

20. Shell manhole and tank nameplate.

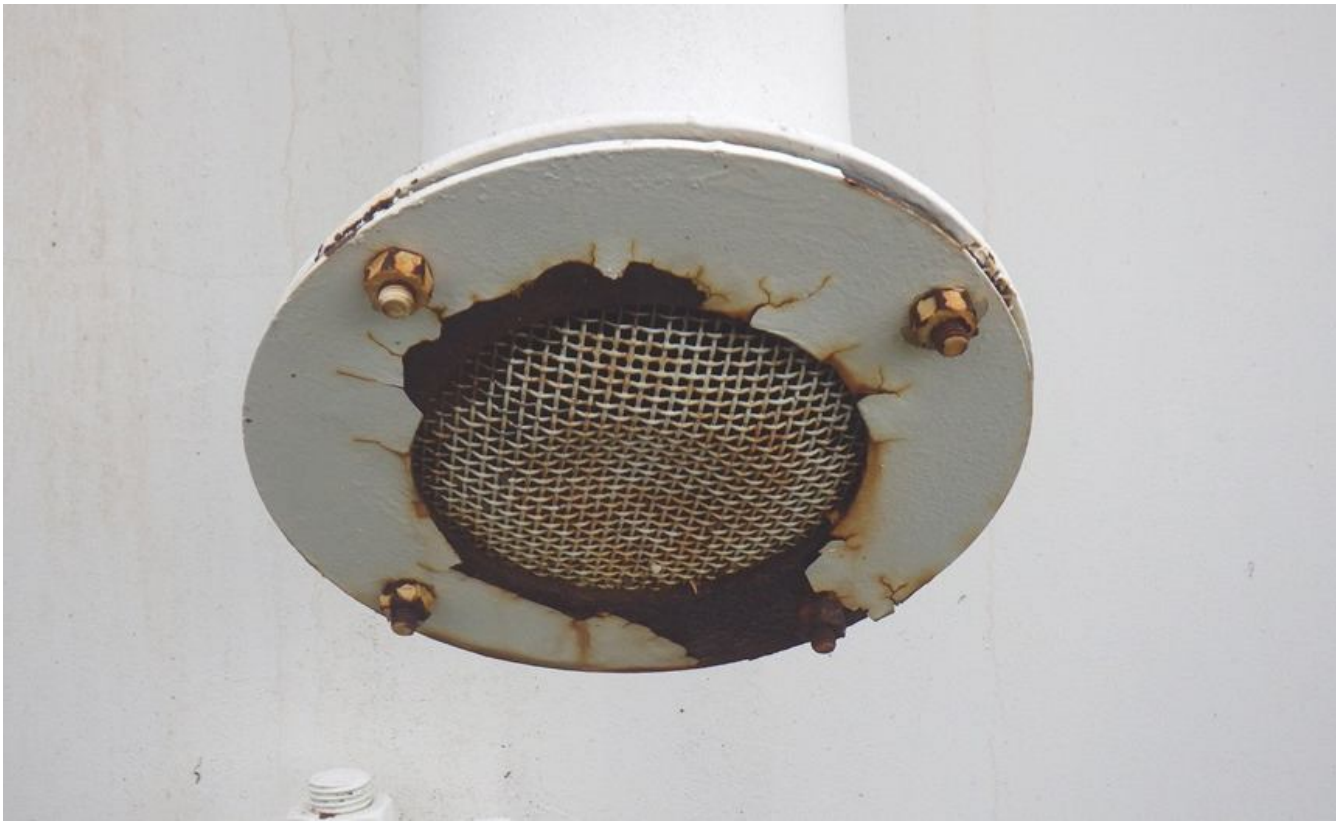
21. Shell manhole.

22. Shell manhole and light fixture. Note coating failures and rust on shell.

23. Light fixture. Note coating failures and rust on shell.

24. Coating failures and rust on shell.

25. Overflow pipe discharge above drain basin.



26. Screen at discharge end of overflow pipe. Note rust on flange.

27. Overflow pipe.

28. Overflow pipe.

29. Conduit and coaxial cable adjacent to shell ladder.

30. Shell ladder with vandal deterrent.

31. Unattached bracket for shell ladder vandal deterrent.

32. Conduit at top of shell.

33. Shell ladder access to platform.

34. Platform at roof.

35. Pipe attached to hinged roof manhole cover.

36. Roof safety railing, platform, stairs, and pipe attached to hinged roof manhole cover.

37. Exterior roof.

38. Coating failures and rust on exterior roof.

39. Lug on roof.

40. Roof stairs.

41. Stairs to roof vent.

42. Stairs, railing, roof vent, and antenna.

43. Coaxial cable along roof stairs.

44. Antenna near center of roof.

45. Rust on roof safety railing.

46. Roof vent.

47. Roof vent pallet.

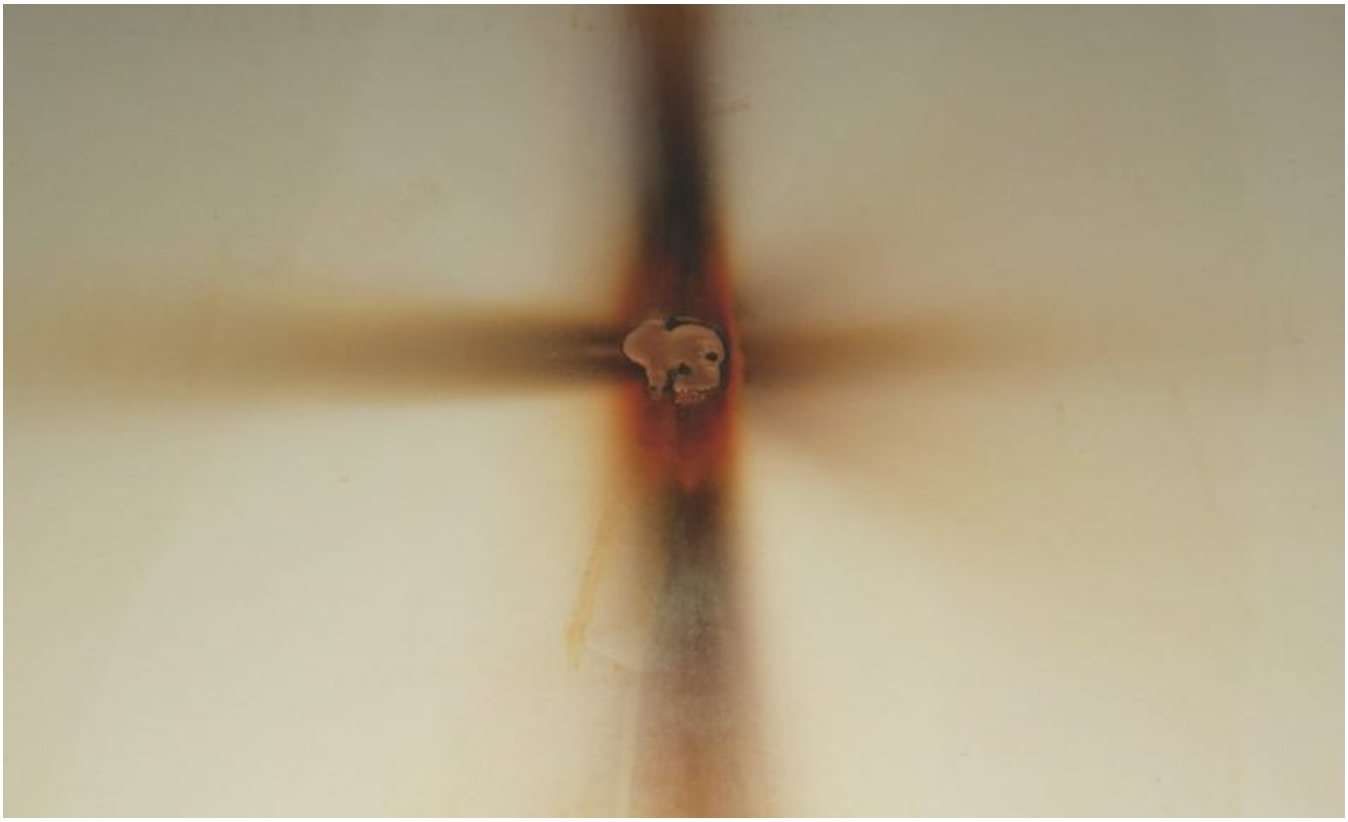
48. Interior roof and shell. Note corrosion.

49. Interior roof, shell, and inlet pipe. Note corrosion.

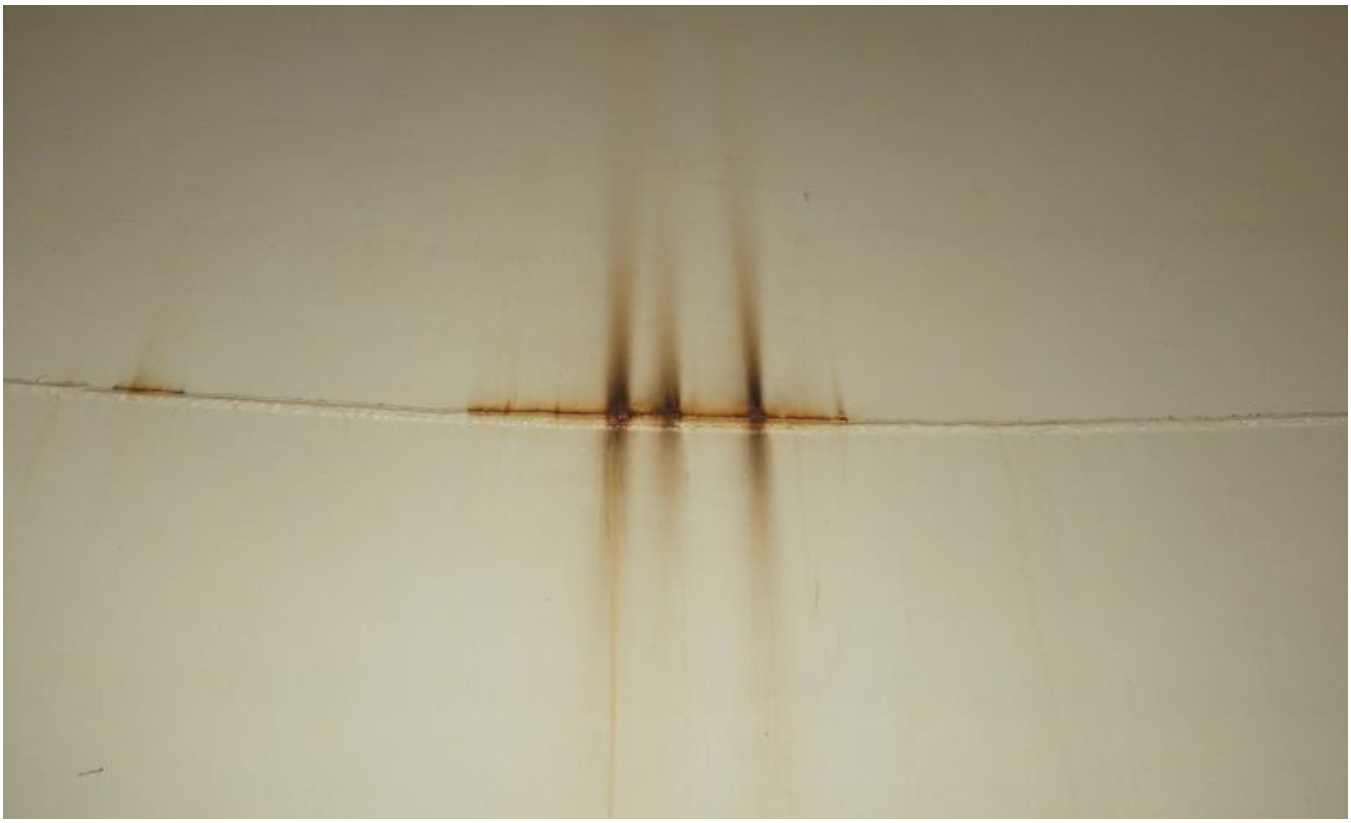
50. Overflow weir box below roof manhole.

51. Corrosion on interior shell.

52. Corrosion on interior shell.



53. Corrosion on interior shell.



54. Corrosion along interior shell weld seam.

55. Corrosion on interior shell.

56. Corrosion on interior shell.

57. Shell manhole.

58. Interior shell and floor.

59. Interior floor.

60. Interior floor.

61. Lug on interior floor.

62. Inlet pipe adjacent to shell manhole.

63. Inlet pipe at floor.

64. Outlet pipe with removable mud ring.

Appendix B – Costs Estimates

TOWN OF BOSTON
Wohlheuter Tank Improvements
2/24/2020

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED TOTAL
1	Mobilization (2% of Construction Costs)	LS	1	$ 13,786.00	$ 13,786.00
2	Exterior Painting	SF	9,100	$ 38.00	$ 345,800.00
3	Interior Painting	SF	9,100	$ 35.00	$ 318,500.00
4	Safety and Operational Deficiency Repairs	LS	1	$ 25,000.00	$ 25,000.00

Subtotal =	**$**	**703,086.00**
Contingency (8%) =	$	56,246.88
Legal, Engineering, Administration (20%) =	$	140,617.20
Total Estimated Capital Cost=	**$**	**900,000.00**