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WILLISTON PARK
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May 31, 2018

Re: Syracuse Street Elevated Water Storage Tank

Please be advised that the cost estimates for the Syracuse Street Elevated Water Storage Tank will be updated at the June 4th meeting.

Thank you.

Inc. Village of Williston Park

INCORPORATED VILLAGE OF WILLISTON PARK
WATER DEPARTMENT

EVALUATION AND DESIGN REPORT
FOR THE SYRACUSE STREET ELEVATED WATER STORAGE TANK

Prepared by:

D&B ENGINEERS AND ARCHITECTS, P.C.
WOODBURY, NEW YORK

MAY 2018

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INC. VILLAGE OF WILLISTON PARK WATER DEPARTMENT
EVALUATION AND DESIGN REPORT
FOR THE SYRACUSE STREET ELEVATED WATER STORAGE TANK

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1.0 INTRODUCTION

The Incorporated Village of Williston Park (VWP or Village) owns and operates a water supply system which serves the residential and commercial customers within the boundaries of the Village. The VWP supplies water to an estimated population of 7,400 through 2,400 service connections. Water service is also provided on a wholesale to an estimated population of 2,500 in the neighboring Village of East Williston. (The Village of East Williston owns and maintains the distribution and metering infrastructure for the customers within the Village boundaries.)

This report evaluates options for both rehabilitation and replacement of the existing 500,000-gallon Syracuse Street elevated tank which was built in 1928. The existing exterior coatings on the tank are lead-containing and therefore must be abated. In addition, the tank is now 90 years of age and approaching the end of its useful life. This report presents information for rehabilitation and replacement alternatives with the objective of providing all the facts for the Village to decide which alternative best meets their needs.

2.0 BACKGROUND

2.1 General

The VWP obtains its water supply from three (3) water supply wells at two (2) plant sites located throughout its service area. A fourth well (Well No. 3) has been voluntarily removed from service due to elevated nitrate concentrations. The authorized capacities of each active well provide an aggregate total approved capacity of approximately 5.45 million gallons per day (mgd). **Table 2-1** summarizes the well capacities.

Table 2-1

INCORPORATED VILLAGE OF WILLISTON PARK WELL CAPACITIES

Well No.	Actual Capacity (mgd)
1	1.44
2	1.99
4	2.02
Total Capacity	5.45
Total Capacity (w/ Largest Well Out of Service)	3.43

The Village operates one elevated storage tank and one ground storage tank which provide a total storage capacity of 2.0 million gallons.

The Village maintains an interconnection with East Williston, as East Williston relies on the VWP as their sole source of water supply. The Village of East Williston cannot purchase water from any other adjoining water supplier.

The average day and maximum day demands for the VWP system for the past seven years are summarized in **Table 2-2** below.

Table 2-2

INCORPORATED VILLAGE OF WILLISTON PARK
HISTORICAL DEMANDS

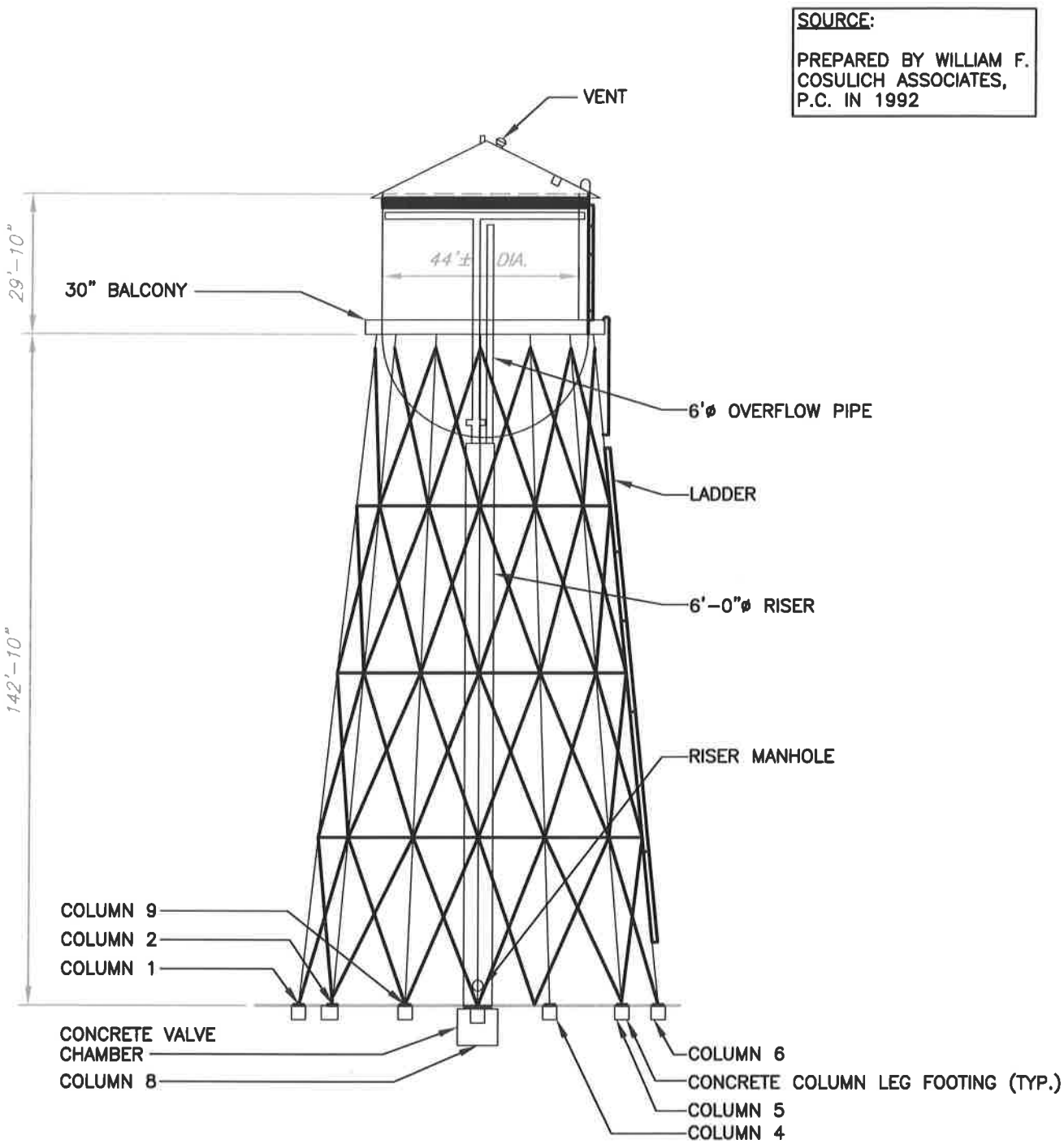
Year	Annual Pumpage	Average Day (mgd)	Max Day (mgd)
2011	417.5	1.14	2.67
2012	393.1	1.08	1.91
2013	430.7	1.18	2.36
2014	415.8	1.14	1.90
2015	449.0	1.23	2.16
2016	415.7	1.14	2.13
2017	407.4	1.12	1.94

Over the last seven years, the maximum day demand was 2.67 mgd (1,854 gallons per minute, or gpm).

2.2 Syracuse Street Tank

The Syracuse Street elevated water storage tank was constructed by the Pittsburgh-Des Moines Steel Company (PDM) in 1928. The tank is an elevated water storage tank with a capacity of 500,000 gallons. The tank is a riveted steel, multi-leg style tank, commonly known as a "witch's hat" style tank due to the roof configuration. **Figure 2-1** shows an elevation of the Syracuse Street Tank. Based on a survey performed by D&B in January of 2018, the ground elevation of the tank is 128.2 feet.

The Syracuse Street tank is approximately 44 feet in diameter with a height to the overflow of approximately 172.7 feet above grade, or an elevation of approximate 300.9 feet. All reported elevation measurements are in the National Geodetic Vertical Datum of 1929 (NGVD 29). The overall tank height is roughly 177.7 feet above grade, or an elevation of 305.9 feet. The existing tank level sensors are connected to the Village's Supervisory Control and Data Acquisition (SCADA) system, which records the tank level and is used to start and stop the supply wells.



D&B ENGINEERS AND ARCHITECTS, P.C.

INC. VILLAGE OF WILLISTON PARK
EVALUATION AND DESIGN REPORT FOR THE
SYRACUSE STREET ELEVATED WATER STORAGE TANK

EXISTING TANK ELEVATION VIEW

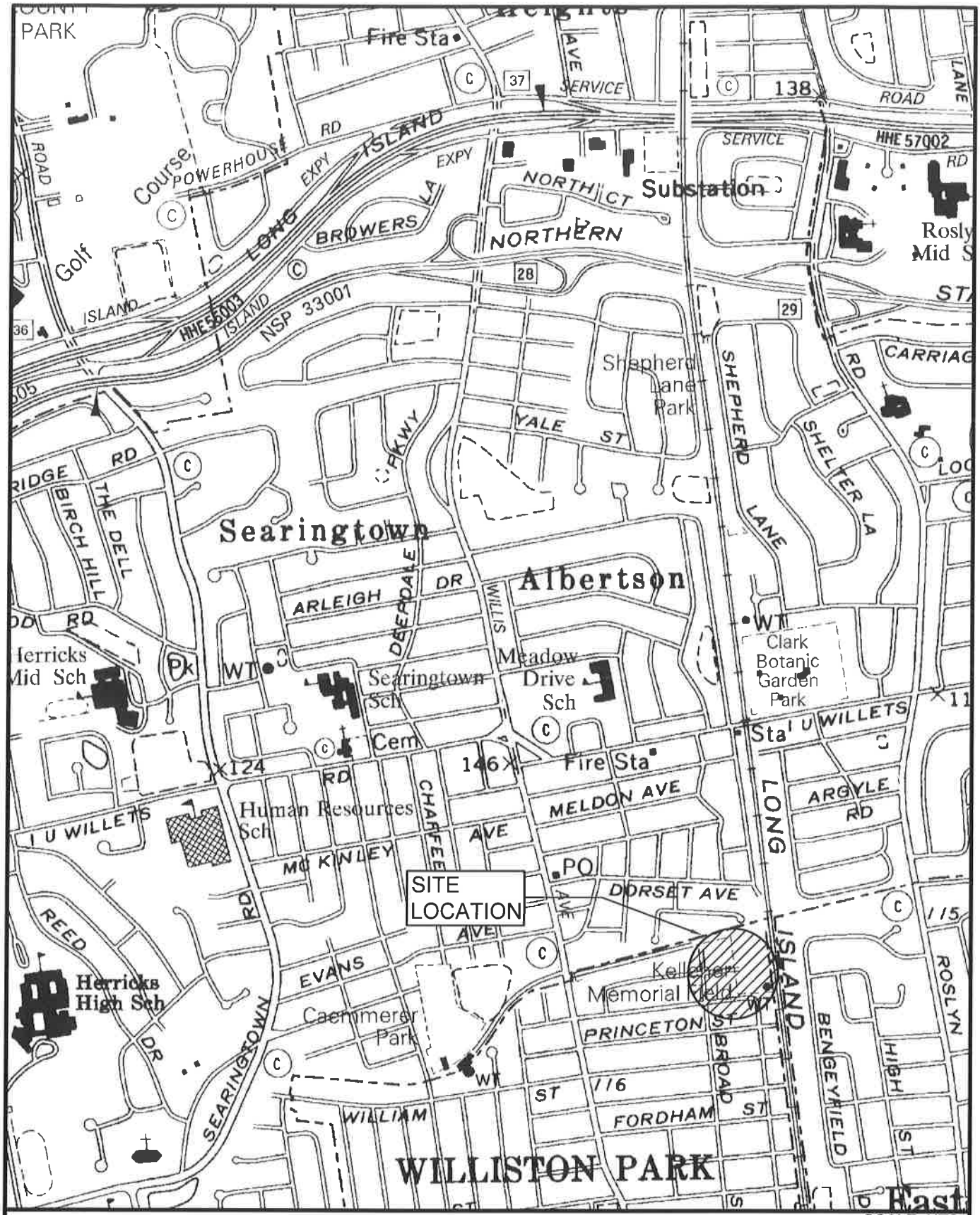
SCALE: NTS

FIGURE 2-1

F:\3867\Design Report\Figure 2-1.dwg, Layout1, 4/12/2018 2:12:06 PM, pconnell

2.3 Existing Site Description

The Syracuse Street tank is located on a site that is adjacent to a ball field, playground and residential homes, such that potential impacts must be considered during maintenance activities. The tank, however, is within an active Village maintenance area/yard, including two wells and associated treatment buildings, all of which must be considered when planning maintenance activities. **Figure 2-2** shows the location of the site.



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INC. VILLAGE OF WILLISTON PARK
EVALUATION AND DESIGN REPORT FOR THE
SYRACUSE STREET ELEVATED WATER STORAGE TANK

TANK LOCATION MAP

SCALE: NTS

FIGURE 2-2

F:\13867\Design Report\Figure 2-2.dwg, Layout1, 4/12/2018 1:39:37 PM, pconnell

3.0 ANALYSIS OF EXISTING TANK

3.1 Tank Condition

D&B Engineers and Architects, P.C. (D&B) completed a condition assessment evaluation of the Syracuse Street 500,000-gallon elevated water storage tank located in Williston Park, New York in October of 2014 and updated it in May of 2017. A copy of the Condition Assessment Report is included as **Appendix A**. Based on the inspection report, both the exterior and interior protective coatings are no longer providing effective corrosion barriers, which has resulted in evidence of aggressive corrosive activity on the tank. In this report, D&B recommended a rehabilitation project to address deficiencies identified during the inspection of the interior and exterior of the tank. This included miscellaneous repairs and a complete blasting and re-coating of both the tank interior and exterior. A scope for a rehabilitation project including a complete list of recommendations for interior and exterior repairs, surface preparation, and coating applications is included in Section 4.2 of this report.

3.2 Tank Capacity Analysis

Calculated Tank Capacity

Utilizing information provided by the Village of Williston Park, calculations were performed to determine the required capacity and hydraulic grade for a potential new elevated water storage tank.

The New York State Department of Health Sanitary Code references the Recommended Standards for Water Works (10 States Standards) as it pertains to the design of water storage tanks and distribution systems. The 10 States Standards make the following recommendations for distribution system pressure:

> *"The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. The*

normal working pressure in the distribution system shall be at least 35 psi and should be approximately 60 to 80 psi and not less than 35 psi."

Since this analysis is focused on the most extreme design criteria (maximum day, peak hour, and fire flow), the standard requires that a minimum pressure of 20 psi always be maintained. The projected maximum day demands in the Village were developed based on the historical maximum day pumpages (2.67 mgd in 2011) observed in the service area. The Insurance Services Office (ISO) recommends fire flow be defined as an additional demand of 3,500 gpm for a duration of two hours. This amounts to a total of 420,000 gallons. That value was used for this analysis.

As indicated in **Table 2-1** above, the available flow with the largest well out of service is 3.43 mgd. This provides an excess capacity of 0.76 mgd on the maximum day.

It should be noted that the Village also owns a 1.5 MG ground water storage tank, located on William Street. This tank was constructed primarily to replace the capacity of Well No. 3 (which is not in service) and is located on the opposite edge of the Village's service area from the Syracuse Street elevated tank. The primary purpose of the ground storage tank is to provide additional capacity to support fire flows in that portion of the system. The William Street ground water storage tank is not used to support diurnal demands in the system, that purpose is served by the Village's elevated water storage tank. As such, the ground storage tank was not operated on the peak day in 2011, on which these calculations are being based.

Historical data provided by the Village indicates that the pressure has never fallen below 20 psi under any condition. However, there is no data available to verify that a minimum pressure of 20 psi has been maintained under a fire condition during the peak hour of the maximum day. Although the empirical data is not available, it stands to reason that the capacity of the proposed tank will not have a significant impact on this parameter because of the excess well capacity and the availability of the 1.5 MG William Street storage tank and booster pumps. Therefore, the most appropriate method for determining the required tank volume will be to

calculate the volume required to meet the demand under the worst-case condition (fire event on the peak hour of the maximum day).

Based on the circular charts provided by the Village for the historical peak day demand (July 22, 2011), the maximum and minimum tank levels were 164 feet above grade and 152.5 feet above grade, respectively. This amounts to a difference of approximately 11.6 feet of water. The existing tank has a radius of 22 feet, so the approximate volume of water per foot of sidewall depth is 11,374 gallons. Therefore, an approximate total water withdrawal from storage of 131,365 gallons occurred on the maximum day. When this value is added to the required fire flow volume of 420,000 gallons, the required tank volume is approximately 551,365 gallons. These detailed calculations are shown in **Table 3-1**

Table 3-1

REQUIRED TANK CAPACITY CALCULATIONS

Based on July 22, 2011 Usage	Max Tank Level (ft)	164.0
	Min Tank Level (ft)	152.5
	Difference (ft)	11.6
	Tank Volume Required (gallons)	**131,365**

Fire Flow (gallons) (3,500 gpm for 2 hours)	**420,000**

Total Volume Required (gallons)	**551,365**

The calculated volume is approximately 50,000 gallons larger than the existing tank volume. However, since the Village has another tank and booster station with a volume of 1.5 mg available at the William Street Station, it is not necessary to increase the volume of the elevated tank. Therefore, a capacity of 500,000 gallons is recommended for the new tank.

3.3 Tank Overflow Elevation

D&B performed a survey of the site in January of 2018. The existing elevation at grade at the base of the tank is 128.2 feet, in the NGVD 29 datum. The height to the overflow is estimated to be 172.7 feet above grade, though this will be verified during the detailed design phase. For optimum operation of the water system, the new Syracuse Street tank will be constructed at the same overflow elevation as the existing tank.

4.0 REHABILITATION AND REPLACEMENT ANALYSIS

4.1 Constraints

4.1.1 Schedule

The most significant constraint faced by the Village is the schedule of the project. Because this is the Village's only elevated storage tank, it serves as a critical component of the water supply system. The tank serves as a source of water pressure throughout the Village and is essential in enabling the Village to satisfy customer demands.

Depending on the project selected, the tank will either be demolished or removed from service. During this time, the Village will open an interconnection with a neighboring water supplier to use the pressure provided by the neighbor's elevated tank(s) to support the Village's system. This is not feasible during peak pumping season due to the high demands in both systems. Operating a neighboring water supplier's interconnection during periods of high demand will lead to frequent and significant variations in system pressure. Fluctuation of system pressure could lead to water main breaks, an inability to maintain necessary pressure during peak hour, and an inability to provide fire flow.

For these reasons, the Village cannot operate through its peak pumping season if the tank is out of service. As such, the tank repair or replacement work must take place during the low pumping season, in the period from Labor Day to Memorial Day. While coordinating with another water supplier may still present minor operational challenges, the issue is greatly mitigated by performing work during low demand months.

4.1.2 Site

Construction and/or repair work at the site will be difficult due to the location and other uses of the site. The tank is located on an existing Village Public Works Yard, immediately adjacent to a public baseball field and playground. In addition, the Village's sanitation trucks and

streetsweepers frequently enter and exit the site. Maintaining access to the various facilities on the site throughout the duration of the work is critical. The limited availability of space, the multiple uses of the nearby spaces, and the nature of surrounding properties must be considered when making a decision regarding the tank's future.

4.2 Interim Repair

The recent condition evaluation of the existing Syracuse Street tank by D&B on October of 2014 and follow-up inspection in May 2017 recommended that the structure undergo major rehabilitation or replacement. Persistent and extensive corrosion, if left unaddressed, could compromise the sanitary and structural integrity of the tank. Based on the report, both exterior and interior protective coatings are no longer providing an effective corrosion barrier to their respective substrates, which has resulted in evidence of aggressive corrosive activity and slight to moderate metal loss along various elements of the tank. The riveted construction style of this tank promotes corrosion and the intricate design at the legs and sway rods makes maintenance difficult and expensive. Based upon the above-mentioned defects, annual maintenance costs, and the age of the tank, an interim repair project is not recommended at this time.

4.3 Full Rehabilitation

If rehabilitation of the existing tank is selected, the following scope for a full rehabilitation project is recommended. These tasks are based on D&B's condition assessment performed in October of 2014 and a follow-up inspection performed in May of 2017:

1. Full exterior surface preparation and coating application
2. Full interior surface preparation and coating application
3. Miscellaneous roof repairs
4. Replacement of multiple vertical tank leg tension rods
5. Replacement of horizontal tank leg tension rods
6. Repairs to concrete foundation

7. New tank access hatch
8. New vandal guard
9. Modifications or replacement to balcony and handrail
10. Lead abatement
11. New riser grate
12. New exterior and interior ladders
13. New safety climb devices
14. Installation of tank hatch alarm
15. Modifications to tank piping vault
16. Relocation of overflow and installation of weir box

4.4 Replacement

4.4.1 General

If the replacement alternative is selected for the Syracuse Street tank, it is recommended that the replacement be constructed in approximately the same location as the existing tank on the Syracuse Street tank site for the following reasons:

- The Village already owns the property.
- In addition to the cost of obtaining new land, it would be difficult to obtain an alternate site because the supply area is already fully developed.
- The property is of a sufficient size to allow staging areas for contractors.
- Replacement of the existing tank in the same location minimizes the impact to the community compared to building a new facility in a new location.
- The distribution system is designed to accommodate a tank in this location, eliminating the need to construct new transmission piping to accommodate a new location.

There are several different tank styles available for potable water storage including different varieties of ground level tanks, standpipes, and elevated tanks. These alternatives are discussed below.

4.4.2 Ground Storage Tank and Booster Pumping Station

Ground level tanks are constructed at grade and are available in both concrete and steel. However, the low base elevation of the water typically requires a separate booster pumping station to meet the pressure requirements of the distribution system.

Although a ground storage tank can provide water storage without the need of an elevated tank, it has some potential drawbacks. A ground storage tank requires double pumping. Instead of water being pumped once from a well to an elevated tank and then draining by gravity, booster pumps must be used to transfer the water. This process requires large electric motors which increases energy use, having both a negative financial and environmental impact.

From an operation and maintenance perspective, a ground level storage tank and booster pumping station has the following disadvantages when compared to elevated water storage tanks:

- A booster pumping station requires frequent visits by the Operators each day.
- A booster pumping station must include standby power to ensure adequate flow and pressure in the event of a power outage. No power is required for an elevated water storage tank to provide flow and pressure.
- During the transfer of power from PSEG to generator, there will be a short period when a booster pumping station is not providing flow or pressure. This can result is significant pressure fluctuations in the distribution system, which could cause water main breaks.
- A booster pumping station would run most on maximum demand summer days, which would coincide with maximum electrical demand. During periods where electrical demand is high, and the electrical utilities are asking customers to conserve, this would increase the stress on the electrical grid. Further, the cost for power at these times is higher.

- Operation and maintenance costs are typically more expensive when compared to the elevated tank alternative.
- A larger area is required on the tire to accommodate both the tank and the booster station.

The only potential advantage to a ground level storage tank and booster pumping station is that it may be perceived by nearby residents as more aesthetically pleasing due to its lower height in comparison to an elevated tank.

Capital and operation and maintenance costs are discussed in further detail in Section 5.0. The cost estimate results indicate that the capital costs of a ground level tank and booster station are over 20% more expensive than constructing a new elevated tank. The operation and maintenance costs over the lifetime, however, are the most significant and make the ground storage tank and booster station prohibitively expensive. The ground storage tank and booster pumping station costs, in addition to the technical disadvantages, make this alternative undesirable.

4.4.3 Standpipe

A standpipe is a pillar style tank and is like a ground storage tank, although typically much taller. Therefore, for the reasons explained above in the discussion about ground storage tanks, a standpipe is not practical for this application.

4.4.4 Elevated Tank

Elevated water storage tanks are available in several styles including the following:

- Multi-legged
- Composite (concrete pedestal steel tank bowl)
- Fluted Column
- Pedestal spheroid (pedesphere)

A multi-legged style elevated water storage tank is not a desirable option due to the increased footprint on the site, because it is no longer a standard style in the industry, and the cost for maintenance is higher due to the larger surface area and more complicated geometry for painting. For these reasons, a multi-legged style elevated tank is not recommended.

At a capacity of 500,000 gallons, a composite concrete and steel pedestal style elevated water storage tank is likely to be slightly more expensive to build than the remaining two tank styles on the above list. However, this style has a lower cost for maintenance since only the bowl portion of the tank must be periodically painted. In addition to the initial capital expense, the major drawback for a composite tank is that the tank pedestal is larger than that of the pedestal spheroid. This would cause the line of sight around the tank base to be more obstructed. It's also worth noting that the tank is located on an active Village Public Works yard, immediately adjacent to a storage garage. A larger pedestal would make access to these garages more difficult. In addition, the composite tank style relies heavily on concrete placement for construction. The proposed tank replacement construction is likely going to take place in the winter. Extreme winter temperatures make it difficult to place concrete effectively, potentially compromising the construction schedule. For these reasons, it is not recommended that a composite tank be further considered for this project.

The pedestal spheroid and hydropillar style tanks both have enclosed interior spaces. Both tank styles are common in new construction. However, the hydropillar style tank, also called a fluted column, has a wide enclosed base. This can be an advantage for some utilities, as it can be used for storage space. However, for the Village, it is anticipated that the wide base, which impacts the line of sight and appearance to the community and access to the on-site garage, will be a negative aspect of its design. For this reason, it is not recommended that a hydropillar style tank be further considered.

It is recommended that the Village consider a pedestal spheroid style tank. This style tank will provide the water storage required while minimizing the visual impact from ground level. In addition, it is an efficient tank to maintain because it has a smaller surface area and limited sharp

edges and connection points which are costly components for rehabilitation. Another benefit of the pedestal spheroid tank is that it has a larger bowl diameter than the existing multi-legged tank. This allows it to maintain pressure in the system for a longer period, because the larger water surface area takes longer to draw down for the same demand. **Figure 4-1** shows an elevation view of the proposed tank style.

Tank Overflow Elevation

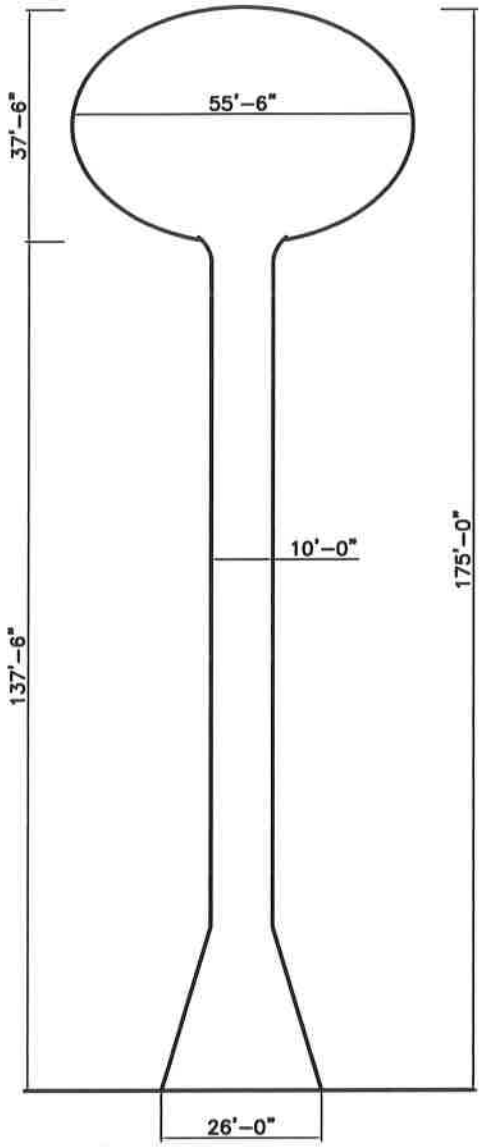
For optimum operation of the water system, the new tank should be constructed at a similar overflow elevation to the existing tank. This overall tank height is also considered to limit changing the visual appearance by building a tank which is higher than the existing tank. It should be noted that all modern style storage tanks require some freeboard between the overflow elevation and the top of the tank. It is estimated that the freeboard between the overflow elevation and the top of the tank will be approximately 5 feet. The overall height of a new tank, including a 42-inch handrail, is proposed to be 309.0 feet to match the height of the existing tank. (Again, these heights must be verified during design and construction.) This height does not include the added height of any antennas that may be installed on the roof of the tank.

4.4.5 Relocation of Existing Utilities

All piping and valves at the base of the tank will be replaced. The new facility would connect to the existing 16-inch and 10-inch water mains located on Stratford Avenue and Syracuse Street, respectively, located south of the tank.

4.4.6 Structural and Geotechnical

The new facility will be designed to satisfy all applicable New York State Building Code standards. Soil borings were collected in February of 2018 and the results indicate that a deep foundation system will not be required. The geotechnical report generated from the results of the subsurface investigation will be used during the detailed design phase to determine the exact foundation requirements.



D&B ENGINEERS AND ARCHITECTS, P.C.

INC. VILLAGE OF WILLISTON PARK
SYRACUSE STREET ELEVATED WATER
STORAGE TANK

500,000 GALLON PEDESTAL SPHEROID

SCALE: 1" = 30'

FIGURE 4-1

F:\3867\Design Report\Figure 4-1.dwg, Layout1, 4/17/2018 12:10:38 PM, pconnell

4.4.7 Permitting

In New York State, the environmental quality review process is established pursuant to the State Environmental Quality Review Act (SEQRA) and the implementing regulations of 6 NYCRR Part 617. The typical basic steps for satisfying SEQRA include the following:

- Designation of Lead Agency
- Classification of the project as Type I, Type II, or Unlisted
- Completion of an Environmental Assessment Form (long EAF with Visual Addendum if visual impacts are possible, but no other significant impacts are expected)
- Determination of significance (Positive Declaration if significant impacts are expected or Negative Declaration if no significant impacts are expected)

Under SEQRA, replacement of an existing structure would trigger a Type II action. Type II actions are defined by the State as actions, or classes of actions, which have been found categorically to not have significant adverse impacts on the environment. Type II actions must still comply with all relevant local laws and ordinances.

5.0 COST ESTIMATES

The purpose of this section is to provide the Village with budgetary construction cost estimates for both the full rehabilitation of the existing 500,000-gallon tank or the replacement of the existing tank with a new 500,000-gallon pedestal spheroid tank, for comparison of the two feasible alternatives. The estimates are based on the conceptual designs as presented in this report and budgetary prices provided by Caldwell Tanks, Inc. for the new tank style being considered.

Each cost estimate includes 10% for Contractor general requirements, 20% for Contractor overhead, profit, bonds, and insurance, and an additional 20% for estimating contingency. Engineering services are estimated at 15% of the construction cost to determine the total project cost.

Table 5-1 summarizes the capital costs for the major work tasks for the full rehabilitation project. **Table 5-2** summarizes the capital costs for the major work tasks for the replacement elevated tank project.

In addition to capital construction cost estimates for each alternative, the total annual costs, including operation and maintenance costs, were calculated to serve as a tool for the Village to decide for choosing an alternative. **Table 5-3** includes a comparison of both the capital construction costs and the total annual costs for each alternative.

Appendix B includes tables which contain the supporting calculations of total annual cost for each alternative. The tables present the cost for each initial project and the subsequent rehabilitation projects that are required periodically. For example, if the rehabilitation alternative is chosen now, a replacement project will be required in fifteen years as the tank will exceed its useful life. The tables also include other annual operation and maintenance costs.

Table 5-1

PROBABLE COST FOR
FULL REHABILITATION ALTERNATIVE

Item and Description	2018 Estimated Cost
Full Exterior Containment	$800,000
Exterior Blasting and Painting	$975,000
Interior Blasting and Painting	$600,000
Misc. Roof Repairs	$150,000
Vertical Tank Leg Tension Rods (25%)	$110,000
Horizontal Tank Leg Tension Rods (25%)	$60,000
Concrete Foundation Repairs	$10,000
New Access Hatch in New Location	$15,000
New Vandal Guard and Connection	$5,000
Balcony and Handrail Demolition	$20,000
Balcony and Handrail Replacement	$150,000
Lead Abatement	$60,000
Soil Sampling	$8,000
Lead-Containing Soil Disposal	$50,000
Air Monitoring	$17,000
New Riser Grate	$10,000
Exterior Ladder (Ground to Balcony, 143 ft)	$60,000
Interior Ladder (in new location)	$25,000
Safety Climb Devices	$10,000
Overflow Painting/Tideflex Valve	$5,000
Restoration of Staging Area	$3,000
Tank Hatch Alarm	$15,000
Aboveground Sampling Station and Piping Mods.	$5,000
Vault Repairs (new hatch and slab)	$20,000
Vault Upgrades (new ladder and valve)	$45,000
Relocate Overflow Pipe and Add Weir Box	$65,000
Subtotal	**$3,293,000**
Contingency at 10%	$329,000
Total Construction Cost	**$3,622,000**
Engineering and Inspection at 15%	$543,000
Total Project Cost (2018 Dollars)	**$4,166,000**

Table 5-2

PROBABLE COST FOR ELEVATED TANK REPLACEMENT ALTERNATIVE

Item and Description	2018 Estimated Cost
Demolition of Existing Tank and Footings	$250,000
Hazardous Material Disposal	$50,000
Tank Foundation	$400,000
0.5 MG Tank Design, Erection, Foundation, and Coating	$4,100,000
Containment	$400,000
Electrical	$100,000
Air Quality and Environmental Monitoring	$50,000
Yard Piping and Valves	$135,000
Chemical Injection Vault Modifications	$75,000
Site Restoration	$100,000
Instrumentation	$30,000
Subtotal	**$5,690,000**
Contingency @ 10%	$569,000
Total Construction Cost	**$6,259,000**
Engineering (Per 6/1/17 Proposal)	$642,500
Total Estimated Capital Cost (2018 Dollars)	**$6,901,500**

Table 5-3

ALTERNATIVE COST COMPARISON FOR 45 YEAR PERIOD

Description	Rehabilitation	New Tank
2018 Capital Cost	$4,166,000	$6,901,500
Annual Cost of 2018 Capital Cost	$173,020	$286,630
Annual O&M Cost	$794,954*	$371,410
Total Annual Cost	**$967,974**	**$658,040**

*Annual O&M cost for rehabilitation alternative includes the cost of building a new tank in 15 years.

6.0 PROJECT SCHEDULE

It should be noted that the project will require managing the distribution system to be able to provide sufficient flow and pressure to the Village's service area during the work. A critical component for providing the required flow and pressure during the work period will be to coordinate the outage with either the Albertson Water District or the Village of Mineola, both of which currently have emergency interconnections with the Village of Williston Park. In either case, there are operational concerns with maintaining pressure in both Williston Park and the interconnecting system during periods of high demand. For this reason, the construction of the new tank must be performed during non-peak demand conditions (September through May).

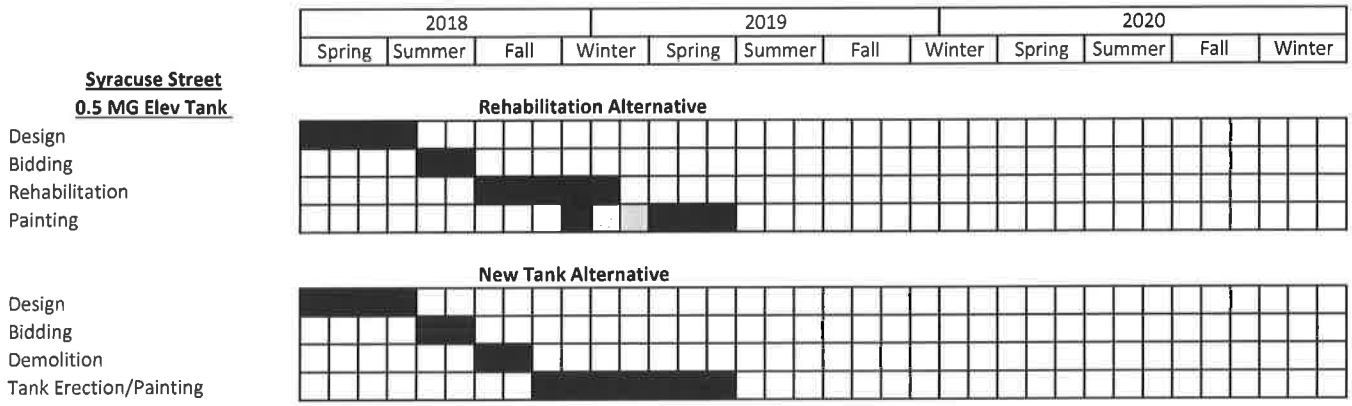
For the rehabilitation alternative, the Contractor can begin work in the fall of 2018 and complete the interior repairs, resurfacing, and recoating before the winter months require work to stop. With the interior complete, the tank can be returned to service for the winter months to provide fire protection during the period in which the Contractor is not working. In late winter, the Contractor can begin exterior repairs, resurfacing and recoating as soon as the weather allows. With this schedule, the entire project will be completed before the summer of 2019.

For the elevated replacement alternative, work will begin in the fall of 2018. The full eight-month period between September 2018 and April 2019 would be utilized, to the extent possible during winter months, to construct the new facility. Demolition and removal will begin in September 2018 as soon as the tank can be removed from service. An expedited construction schedule will be specified, requiring the installation of the new facility's foundation before the end of the Fall of 2018. Erection of the new facility will begin in the late fall of 2018 and will be completed in late winter. This will allow the start-up and coating process to begin in the Spring of 2019 and to be completed before the summer of 2019.

Figure 6-1 shows a graphical illustration of the above schedules.

Figure 6-1

Inc. Village of Williston Park Water Department
Syracuse Street 500,000 Gallon Elevated Water Storage Tank
Project Schedule for Rehabilitation and Replacement Alternatives



7.0 RECOMMENDATION

It is recommended that the Village proceed with the replacement of the existing Syracuse Street elevated tank with a new 500,000-gallon pedestal spheroid style elevated tank due to the following:

1. The existing 500,000-gallon multi-legged style elevated tank is approaching the end of its useful life.
2. If a replacement alternative is not chosen at this time, it is anticipated that replacement will be required in approximately 15-20 years when the tank requires its next rehabilitation.
3. The new elevated tank replacement alternative demonstrated a financial savings over the life cycle when compared to the full rehabilitation alternative.
4. A new 500,000-gallon pedestal spheroid style elevated tank can meet the Village's hydraulic needs and has the least visual impact when compared to other styles of elevated tanks.
5. A new 500,000-gallon spheroid style tank can be constructed during the winter months, which is critical to maintaining distribution system pressures.

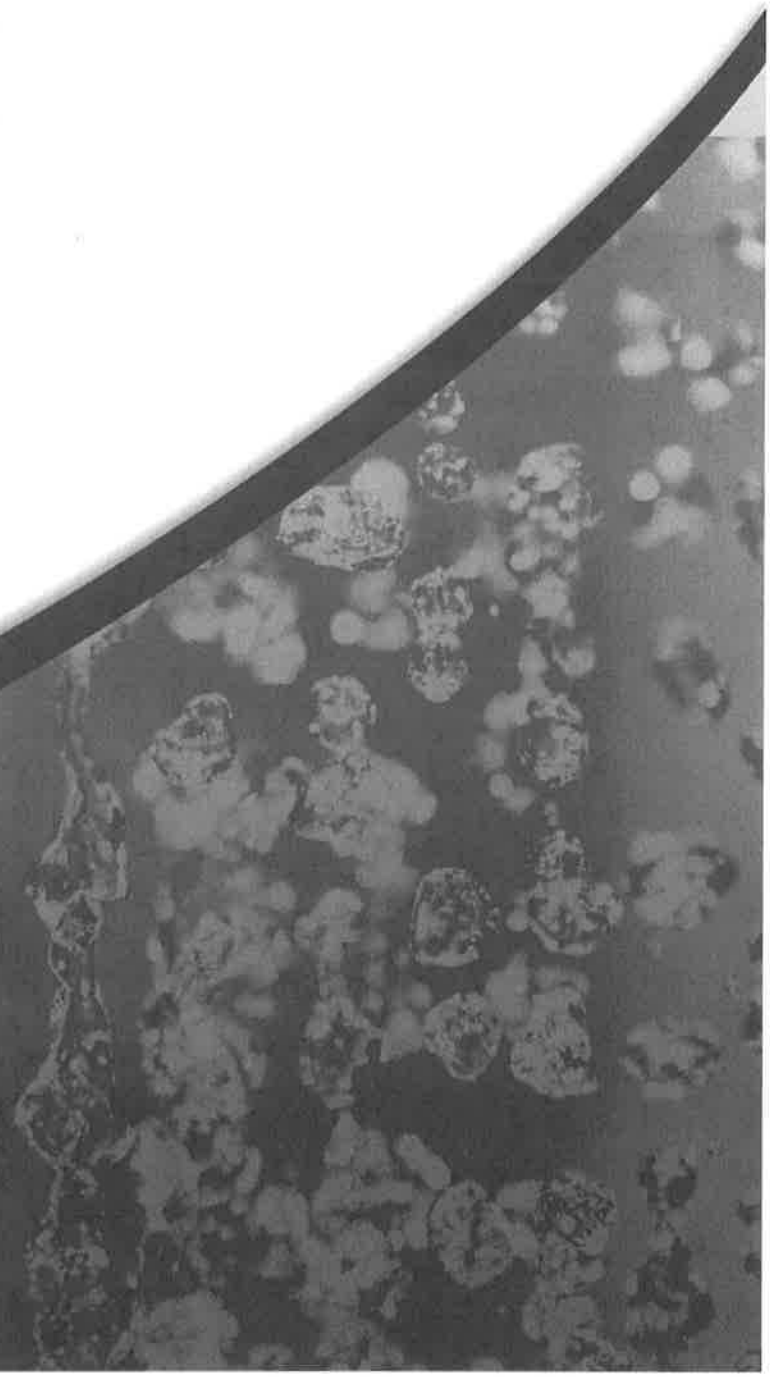
APPENDIX A

PRESENT CONDITION EVALUATION REPORT

Incorporated Village of Williston Park
Williston Park Water Department

Condition Assessment of Syracuse Street Elevated Storage Tank

October 8 & 9, 2014



Prepared By:

D&B ENGINEERS AND ARCHITECTS, P.C.

0849 - Condition Assessment Cover.indd (12/31/14)

WILLISTON PARK WATER DEPARTMENT
SYRACUSE STREET 0.5 MILLION GALLON
ELEVATED STORAGE TANK CONDITION ASSESSMENT

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WILLISTON PARK WATER DEPARTMENT
SYRACUSE STREET 0.5 MILLION GALLON
ELEVATED STORAGE TANK CONDITION ASSESSMENT

D&B ENGINEERS AND ARCHITECTS, P.C.
WOODBURY, NEW YORK

OCTOBER 8 & 9, 2014

♦0849\KK12111401(R01)

TANK DATA

TANK NAME:	Syracuse Street 0.5 Million Gallon Elevated Storage Tank
DATE:	October 8 and 9, 2014
PREPARED FOR:	Williston Park Water Department Mr. Keith Bunnell, Superintendent
TANK LOCATION:	
Street:	Syracuse Street
City:	Williston Park
State:	New York
TANK SIZE:	
Diameter:	40'-0"
Capacity:	0.5 Million Gallons
Height to Overflow:	175'-0"
CONSTRUCTION:	
Type of Structure:	Riveted Elevated
Number of Column:	Ten (10) Boxed Lattice
Type of Bottom:	Ellipsoidal
Type of Roof:	Cone
Type of Foundation:	Concrete Pad
Roof Manway:	(1) 24" x 24" Square Access Opening
DATE CONSTRUCTED:	1928
BY:	PDM
CONTRACT No.	N/A
DATE LAST INSPECTED:	2008

Inspected by:

Christopher W. Francis
NACE Coating Inspector-Level 2 Certified
No. 20736

Michael Rispoli
Field Engineer

1.0 INTRODUCTION AND BACKGROUND

D&B Engineers and Architects, P.C. (D&B) has completed the condition assessment evaluation of the Syracuse Street 0.5 million gallon elevated water storage tank located in Williston Park, New York. The purpose of the evaluation was to assess the structural and sanitary condition of the tank in order to determine if a planned rehabilitation of the structure will be necessary.

This report includes field observations and photographs recorded during the inspection of October 8 and 9, 2014, as well as evaluations and recommendations.

The tank is a steel riveted plate elevated structure with a conical roof, ellipsoidal belly, and ten (10) opposing "C" channel boxed lattice legs. The foundation at each leg was a visible concrete pad. There was nameplate data available on the tank to determine its age. The tank was built in 1928 by PDM. The tank was drained to allow an interior inspection, but was not cleaned of any sediment.

The tank has coatings on the exterior as well as the interior. A cursory review of the coatings indicates a Noxyde System on the exterior and an Epoxy System on the interior. Both interior and exterior coatings are in suitable condition to provide protection to the structure's steel. The interior of the tank shows significant dust and sediment staining on the tank walls and floor, while the roof and non-welded surfaces are exhibiting coating failure.

The exterior of the tank shows significant coating breakdown at weld seams, plate joints and at rivets. The exterior also has widespread localized coating failures on the shell walls, walkways and handrails, but has no issue with adhesion.

Paint samples were not taken at the time of inspection as it is known that undercoats are lead bearing and any rehabilitation to the exterior coatings will require air monitoring, containment and disposal of the hazardous material.

2.0 OBSERVATIONS

2.1 Site Location and Condition

The Syracuse Street tank is located on a site that is adjacent to a ball field, playground and neighbors, such that potential impacts must be considered during maintenance activities. The tank, however, is within an active Village maintenance area/yard, including a pump station, well house and treatment building, all of which must be considered when planning maintenance activities. The site is level and is located in a residential area.

2.2 Tank Exterior

2.2.1 Exterior Surfaces

The overall exterior is generally in fair to good condition. Less than 30% of the exterior roof and 20% of the shell shows coating degradation. There is little to no visible metal loss.

The exterior coating is providing adequate protection and has not completely broken down. The areas of failure on the roof appear to be primarily degradation due to UV radiation. The paint is showing undercoats and cracking on the surface. The other 5% of the roof surface has localized blistered paint, pitting and rust due to water between the steel and coating film at locations of adjoining surfaces (rivets, ladder, shell, plates, etc). This is a very typical occurrence when low film builds are encountered with a Noxyde paint system.

The sidewall shell above the walkway/balcony has a very intact coating and is providing sound protection to the underlying steel. The shell is exhibiting localized areas of blistered and delaminated coating resulting in exposure of steel and accumulation of rust pockets. There is some rust staining on the sidewall from riveted plate overlap but no metal loss. Peeling paint and curled coatings were also observed at the areas of weld attachments to the tank. Low film buildup on leading edges are typically the cause of scattered failures and rust.

The coatings on the walkway surfaces, balcony rail and connection pieces are in fair to poor condition and exhibiting widespread failure among the top of the deck and at the handrail. Large areas of heavy rust and rust staining were observed along the riveted and bolted connection of rail to deck plate, and at deck plate to shell wall transition.

The area under the balcony and the tank bowl section are exhibiting the same or similar conditions as the sidewall shell discussed previously. The underside of the balcony deck plates are not showing any of the corrosion issues that are present on the top of the plate. Minor rust staining was observed at the drain holes and a significant degree of algae accumulation was noted at the transition to the tank bowl. Approximately 30% of the bowl shell surface has concentrated rust pockets and coating pin holes showing coating delamination and staining. No significant metal loss observed and no corrosion issues on riveted seams.

The coatings on the riser sections are in good to very good condition with exception of a few scattered areas of large blisters where it is evident that moisture is trapped between the coating and the underlying steel structure. A couple of these blisters have fractured exhibiting draining water, paint curling and heavy rust accumulation. There was a large amount of abrasion damage to the center riser at grade limiting the effectiveness of the existing coating.

The leg sections of the exterior tank are in a good to very good condition with approximately 10% to 15% of the areas exhibiting corrosion issues with coating delamination and rust accumulation. The areas which are heavily influenced by this breakdown are at the riveted belts, adjoined plate seams and within the lattice bars. There is also evidence of under-film corrosion along scattered areas such as at spider rods, bracing rods and horizontal struts.

The coatings along the remaining surfaces of the tank and attachments were also exhibiting varying degrees of degradation and rust and will be further detailed in this report.

Dry film thickness was recorded on the exterior at the roof, handrail and shell wall using a Positector 6000 gauge.

Roof Shell Plate Coating
High of 45.6 mils
Low of 13.0 mils
Average of 24.48 mils for 30 locations

Handrail and Connections Coating
High of 31.1 mils
Low of 11.8 mils
Average of 21.04 mils for 15 locations

Tank Body Shell Coating
High of 53.0 mils
Low of 12.1 mils
Average of 32.64 mils for 40 locations

2.2.2 Exterior Container Soundness

The structure did not exhibit any areas of severe bumps or dents, or discontinuities in the circumference. The roof retains an overall conical shape. There were no visible leaks noted in the vessel. There were three (3) locations on the roof observed that showed evidence of previous repairs. The welded plates and repair coating appear to be providing suitable protection. The tank bowl and belly sections exhibit no determinable metal loss at plate overlap or on rivet heads.

2.2.3 Exterior Access

There is an exterior ladder present on this tank to gain access to the balcony level and two exterior ladders on the tank shell that provide access to the roof. There are safety climb rail devices installed on all three exterior ladders, but these were not used during the inspection due to their defective condition. The access from grade to the leg ladder has a vandal guard attached to the tank deterring the use of the lattice bars as a means of accessing the ladder and is in serious need of replacement. The existing leg ladder also has a caged hatch at its beginning that was bypassed by the use of a bucket truck.

The termination of this ladder to the balcony needs to be redesigned in order to allow for personnel to safely enter the balcony. The safety rail is in the way of safe egress and the ladder

does not terminate at a safe landing platform as per OSHA requirements for entering the balcony. Access to balcony was achieved by climbing over the balcony handrail.

The handrails installed at the balcony were a cross braced rail type and do not comply with current OSHA requirements.

2.2.4 Roof Opening

There is one 24" x 24" roof access hatch with 2" overhang and 6" lip, which is not properly sized for the tank and not consistent with good design practice. The hatch cover is hinged and allows to be locked in place. The hatch lid opens 90° from the tank center which is a good design. There were no handrails or platforms on the roof, making transition access difficult and dangerous.

2.2.5 Vents

There is one double pallet design vent which appears to be properly sized for the vessel in the middle/center of the roof to prevent pressurization and vacuum conditions. There are also four vented/screened 6" x 12" openings in the sidewall of the tank under the roof overhang. Though this is typical for a tank of this type and age, it is not consistent with good sanitary design.

2.3 Tank Interior

2.3.1 Interior Surfaces

The overall interior appears to be in good to very good condition with minor rust staining noted throughout. Less than 10% of the interior walls of the side shell and belly are showing signs of advanced coating breakdown. There were large accumulations of sediment that should be removed. There were no signs of lost rivets or missing metal at the joint overlaps. The roof structure was noted to show more advanced delamination with some areas (approximately 30%) of rust staining and possible metal loss.

The largest area of coating failure observed was at the top face of the top rafters and at the roof support structure.

The coating along the roof to shell rim are in an advanced stage of failure resulting in medium to heavy grade rust. There were some areas of stratified rust formations that would suggest a potential for localized metal loss.

The shell sections, as noted earlier, are in very good condition and are providing protective properties to the existing steel. There was no evidence of corrosion under the sediment when the sediment was removed by hand. The only exception was in the vicinity of the ladder. The interior ladder was not adhered well to the shell at multiple locations on the bowl and exhibited rust and corrosive breakdown at the former weld contact points.

The riser was observed from the bottom of the shell bowl but was not entered. From this vantage point, the interior coating showed localized spotting of corrosive activity and rust staining. The last two upper rings of the riser did not show significant delamination nor widespread silt accumulation.

Dry film thickness was recorded on the interior at the shell belly bowl section using a Positector 6000 gauge:

Coating Thickness
- High of 57.5 mils
- Low of 14.5 mils
- Average of 23.01 mils for 40 locations

2.3.2 <u>Interior Ladder</u>

There is one interior ladder installed within this structure. It is not OSHA compliant for clearance to wall and rung type. The ladder is in poor condition. It does have a safety climb

device installed, but was in a failing condition. It was not used during the inspection of the interior. At many connection points, it was not adhered to the structure.

2.3.3 Overflow and Fill Pipe

The overflow pipe is a coated steel 8-inch diameter pipe that runs up the center riser from the bottom of bowl to approximately 48' plus a 2' flared extension piece. The overflow line is supported by four securing rods (spider) connected to the tank wall. The rods are exhibiting coating delamination and rust staining and potential metal loss. Two of the four rods are attached to the overflow pipe. The coating on the overflow appears to be well adhered though some cracking and blistering was observed.

The fill pipe consists of a 12" diameter pipe, routed alongside the overflow, that terminates 10' from the top of the riser. The fill pipe has a similar coating as the interior shell that appears to be protecting for useful life and is well adhered to the surface.

2.3.4 Riser Grate

The riser has a metallic grate with access hinge gate over the 6' wide column. The gate is made up of 2" x 5/16" bars with 10" openings. It was unclear if this was previously coated, but larger accumulations of stratified rust deposits were observed yet no accountable metal loss was noted.

3.0 EVALUATION OF EXISTING CONDITIONS

3.1 Exterior Evaluation

The exterior shell coating on the tank is in generally good to fair condition. There are areas of localized delamination noted on the exterior. There were no areas of severe exposed metal loss noted that endangered the exterior structure. The integrity of the exterior appeared to be sound. No graffiti was found on the tank. No other signs of vandalism were found. The entire exterior of the tank was evaluated for visible signs of leakage. No evidence of visible leakage was noted.

The roof showed signs of advanced delamination in coating from UV rays in limited areas as well as some existing repairs made previously to the shell.

There are three permanently fixed exterior ladders installed on this tank structure, which are in need of repair/rehabilitation to bring to full OSHA compliance.

The tank has one vent on the center of the roof and four opening vents on the sidewalls. The center vent consists of a 30" diameter, vacuum/pressure frost proof, pallet vent on a 16"ϕ diameter opening. The vent appears to be properly sized for the maximum flow event in the tank and will likely not cause a pressurization or a vacuum condition should the maximum flow event occur.

3.2 Interior Evaluation

The tank interior coating is in good to very good condition with limited delamination areas mostly observed at the roof structure. The roof has a conical shape with 20 independent support joists attached to two main rafters supporting the shell sidewalls.

The interior sidewalls and bowl exhibited minor isolated areas of corrosive activity. Rust staining and silt accumulation was observed throughout the surface, but not affecting coating delamination.

The interior ladder does not meet OSHA regulations for fixed ladders. The ladder does not have a functioning safe climbing device. The rungs are round rods that are not slip resistant. The ladder is not structurally sound or well attached to the structure and a full replacement of the ladder is warranted.

The interior has a 12" diameter fill pipe and an 8" diameter overflow line, which terminates approximately 1'-6" from the roof transition. The fill pipe and overflow line are immersion service coated steel that are undergoing minor corrosion issues.

3.3 Structural Evaluation

The overall assessment of this tank with respect to structural integrity is good. The steel bowl appears to be well intact. The exterior roof had some areas of chipped, pitted or flaked coating and potential rusted metal. Past repairs of the exterior roof were observed with the repair work in good condition.

The tank support structure (legs, horizontal struts, cabling/rods) all showed minor degradation and localized pitting and metal loss, which indicate a weathered coating but in good condition.

3.4 Safety Evaluation

There are handrails on the tank at the balcony level to provide additional safety for personnel accessing the tank. There are no handrails above the roof level, which is typical for this type of tank. The balcony rail is not OSHA compliant and should have a three-rail handrail system installed at a minimum height of 42 inches. The handrail should be equipped with a mid-

rail. The ladder area should have a means of egress such as a landing platform. The method of climbing on to and off ladder is unsafe at this tank.

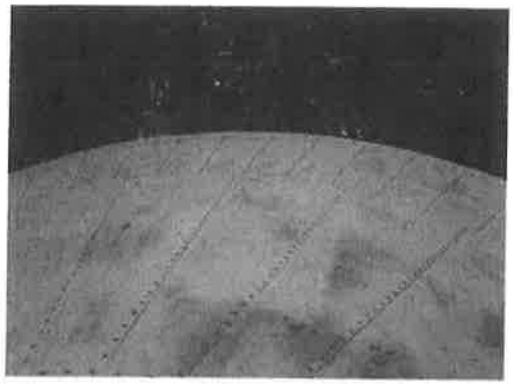
3.5 Sanitary Evaluation

The tank is a sound container with no evidence of sanitary issues. There were incidences of daylight at the roof sidewall transition that can be investigated further and repaired. The four sidewall screened vents should have some form of rain/wind protection and a tighter mesh screen to prohibit insects.

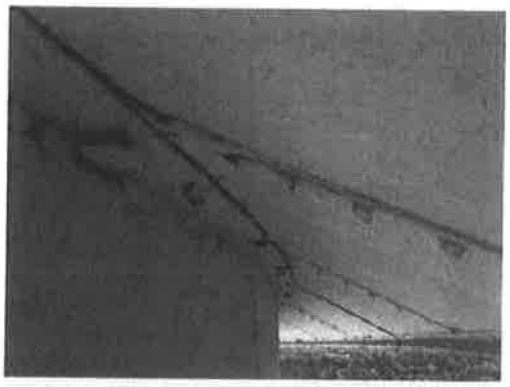
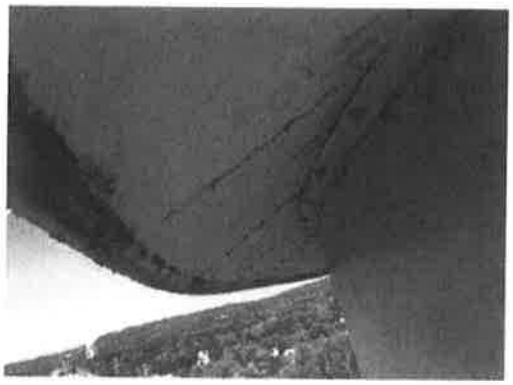
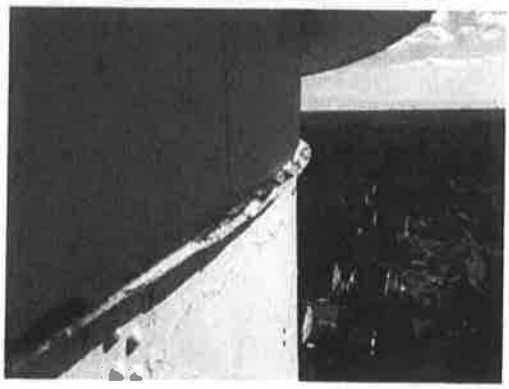
3.6 Security Evaluation

The site is typically manned during normal working hours. The perimeter is secured with a locked fence that would require penetration of the fence fabric to gain entry to the site. The tank is elevated and is not easily accessible once the perimeter fencing is penetrated due to the vandal guard and ladder gate cage. The tank has one hatch opening on the roof that is sufficiently locked. The old style of lattice legs do present an attractive means of climbing the tank, but the site is manned during working hours and fitted with security cameras during non-manned hours.

Inspection Photos – Exterior Surfaces

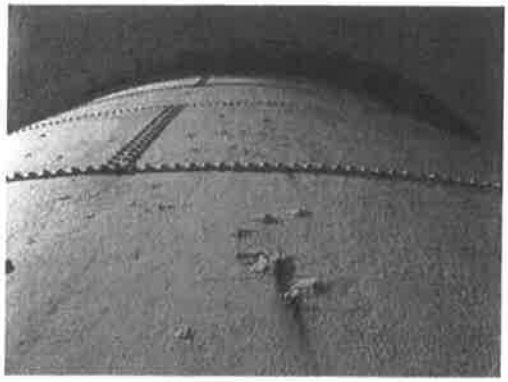
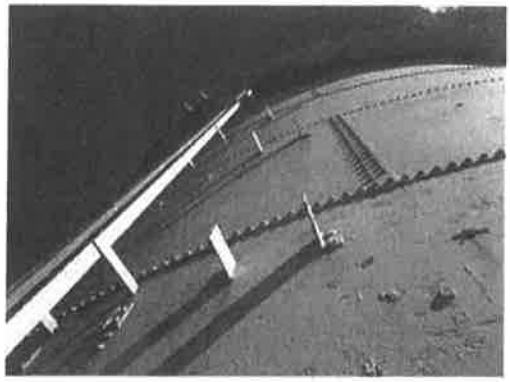
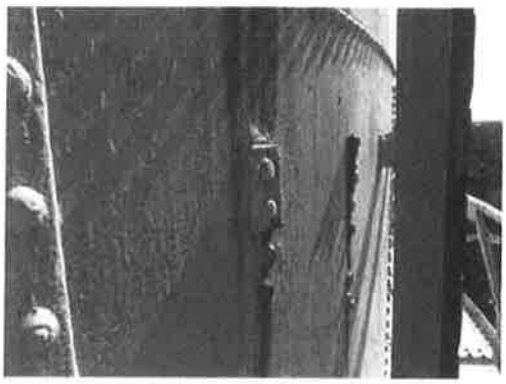


Roof plates showing signs of UV radiation degradation, slight rust accumulation and coating wear.

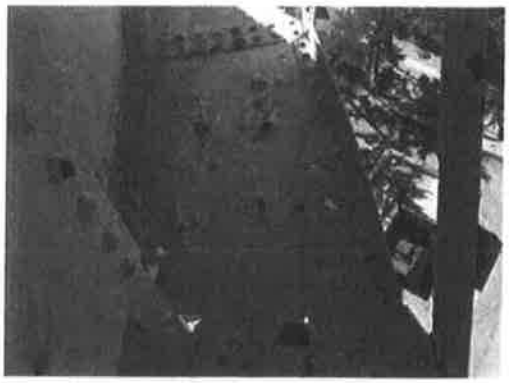
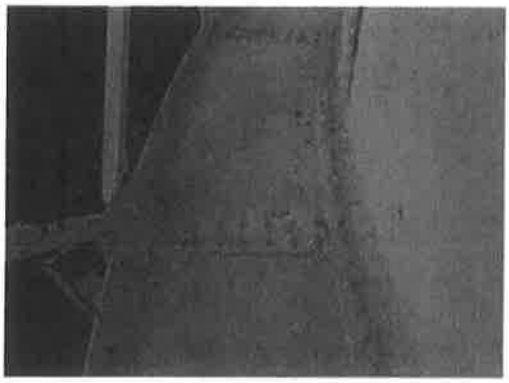
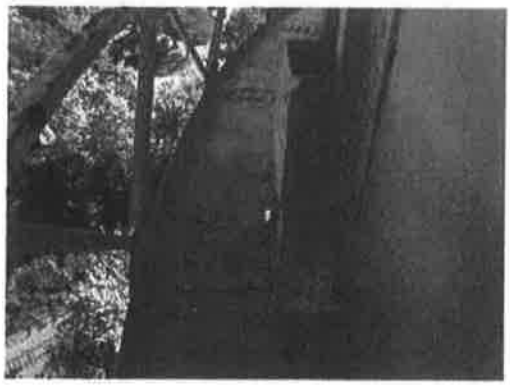




Under Roof surface exhibiting advanced corrosion at seam lines and staining from leading edges.

Inspection Photos – Exterior Surfaces

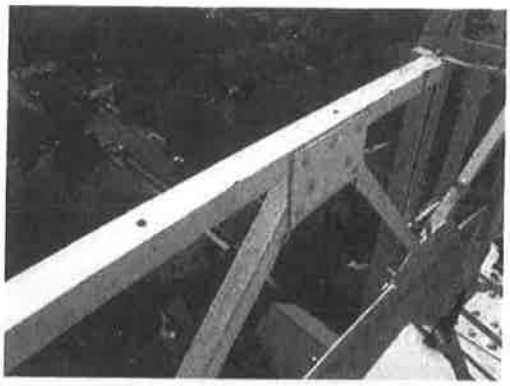




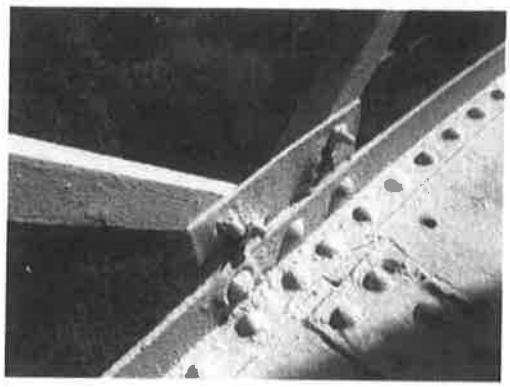
Sidewall shell section showing advanced degree of localized pitting, rust staining from welded attachments as well as one area of trapped water between steel and coating creating a bubble.

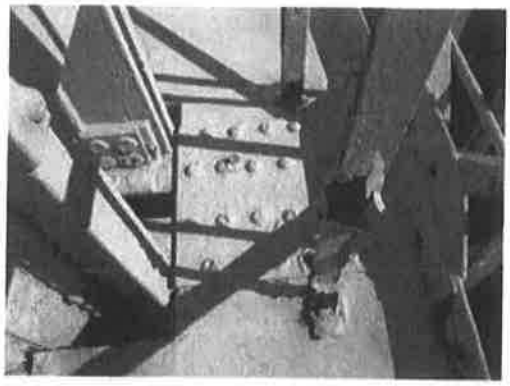
Balcony walkway surface showing large scale rust pockets causing peeled and chipped coating, Advanced corrosive activity at some riveted plates.

Inspection Photos – Exterior Surfaces



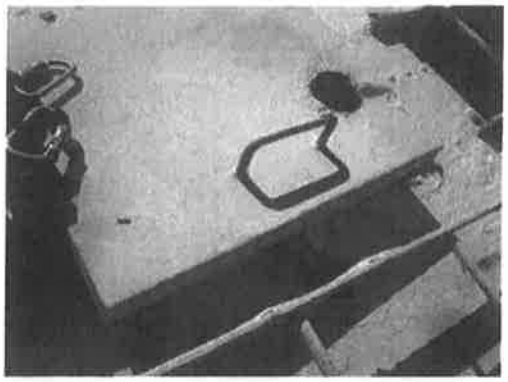


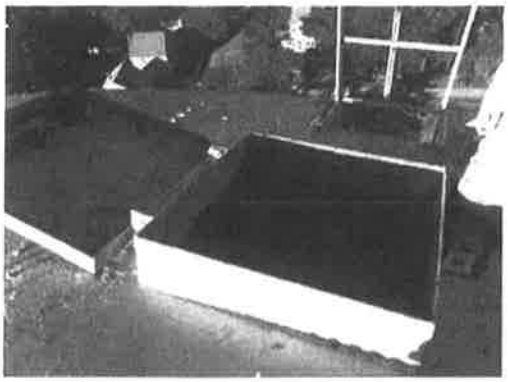
Handrail section in need of repair showing more advanced signs of coating degradation at bolted and rivets connections.

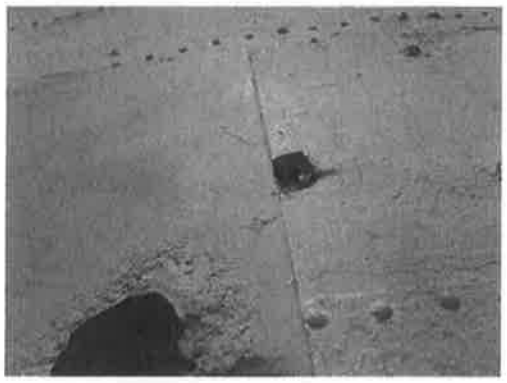


Exterior ladder to balcony exhibiting rust deposits and coating delamination with slight metal loss.

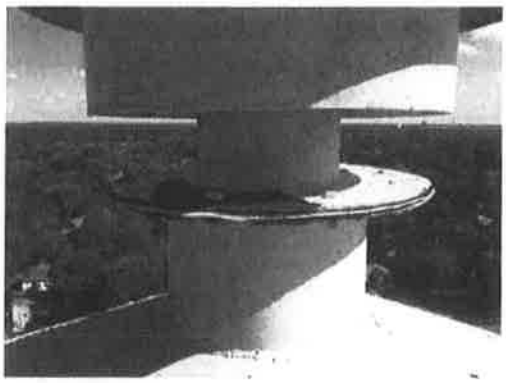
Inspection Photos – Exterior Surfaces

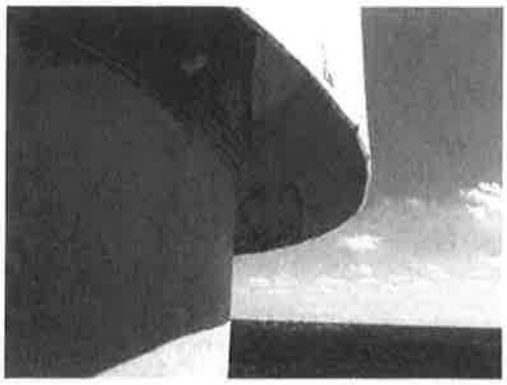


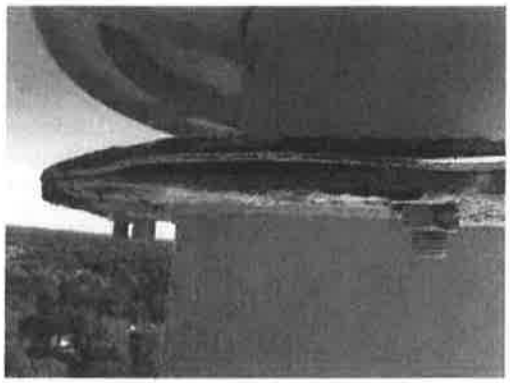




Access Roof Hatch in need of restoration for OSHA requirements and breakdown of coating at corrosion point. Curled coating at interior hatch.

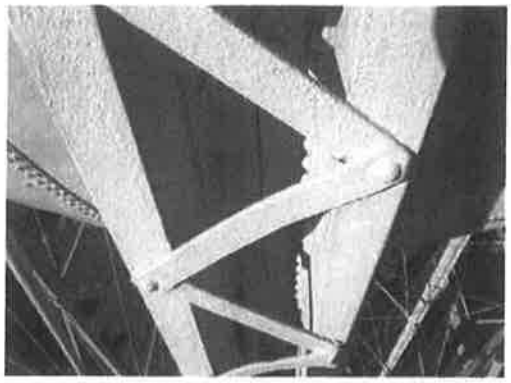
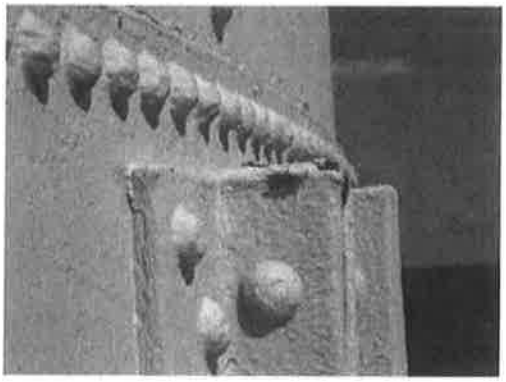
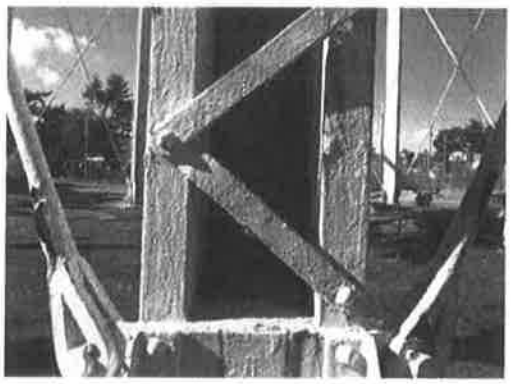




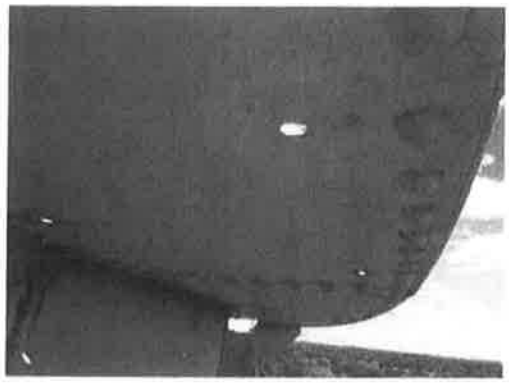


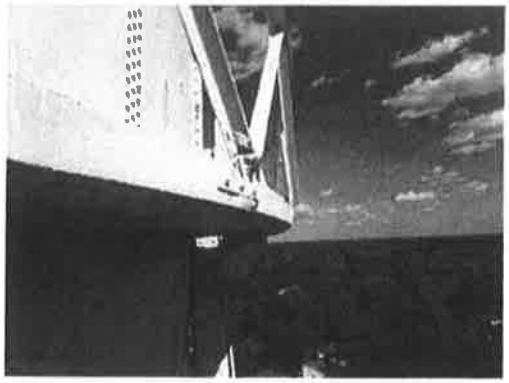
Tank Vent in need of replacement, with severe coating loss and rust accumulation at collar and shroud.

Inspection Photos – Exterior Surfaces

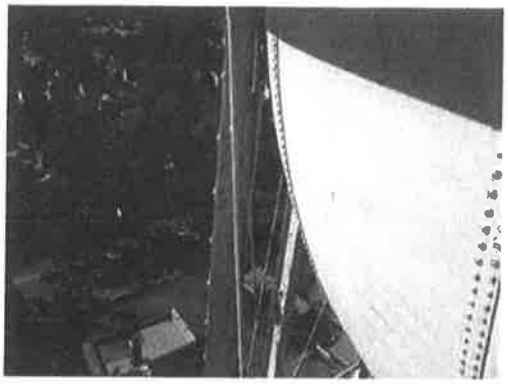
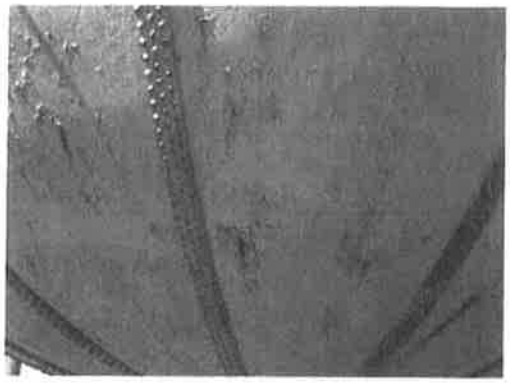
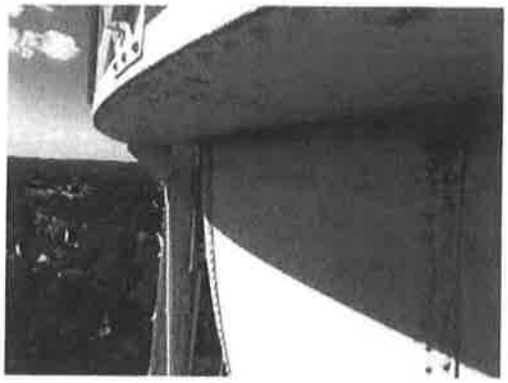
Tank Leg showing typical rust staining at penetration and plate overlap connections with minor amounts of coating loss in localized areas.



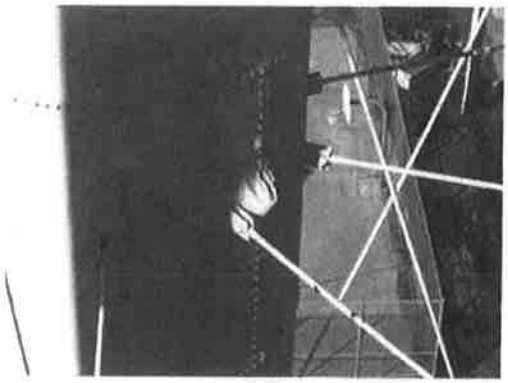
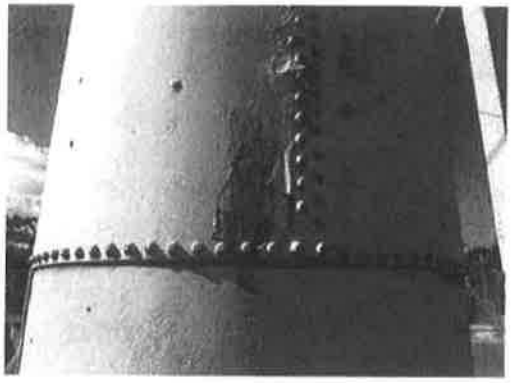
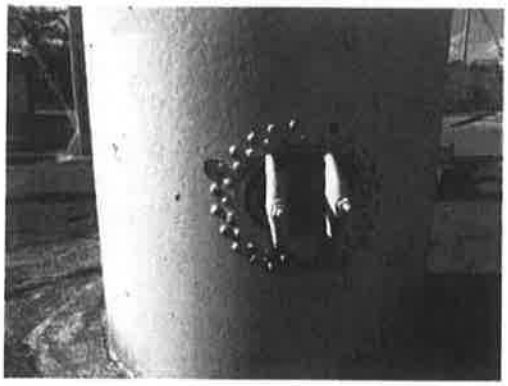


Under walkway Balcony showed heavy coating applied with algae and debris observed but no corrosion.

Inspection Photos – Exterior Surfaces

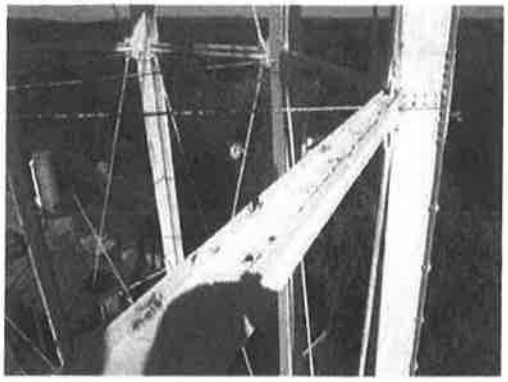
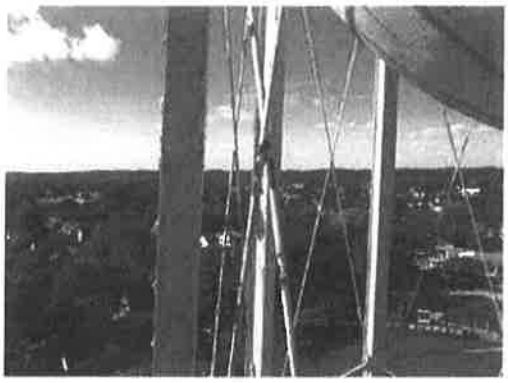
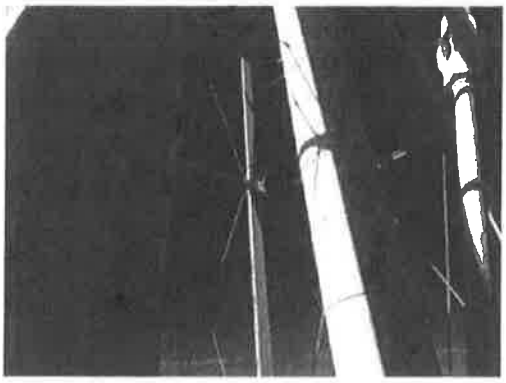
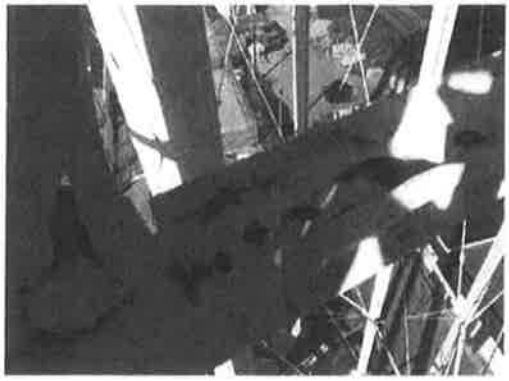




Shell belly section observed similar conditions of side wall with localized pitting, and rust staining from peeled coating at corrosion points.

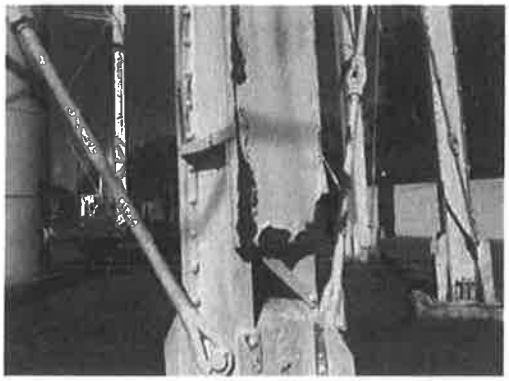
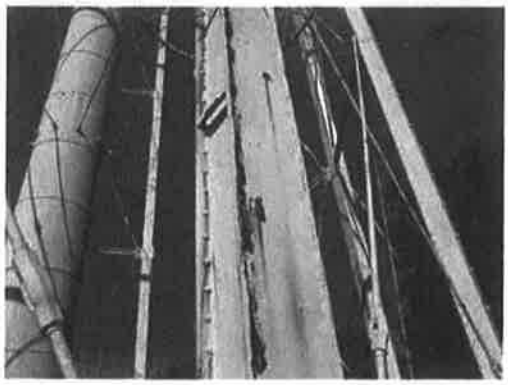




Tank Riser sections showed the most water trapped between coating and underlying steel in form of in tact and burst coating bubbles.

Inspection Photos – Exterior Surfaces

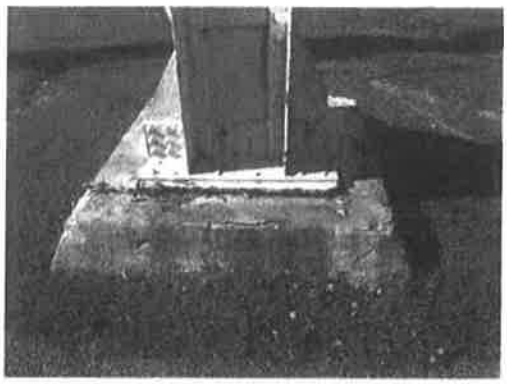





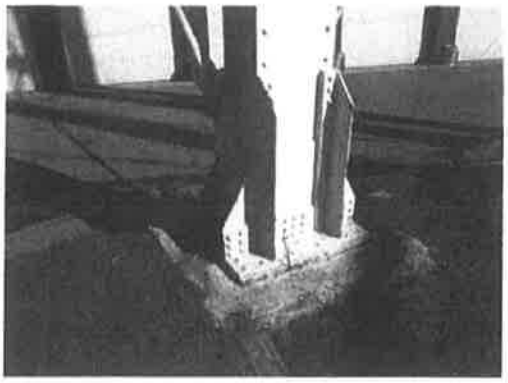
Horizontal Struts, Spider roads, and Cross Bracing all showed signs of coating wear, rust staining and slight metal loss. Thin build of coating was prevalent on cross braces & spider rods.

Vandal Guard and Ladder Cage were in a serious state of corrosion and should be replaced.

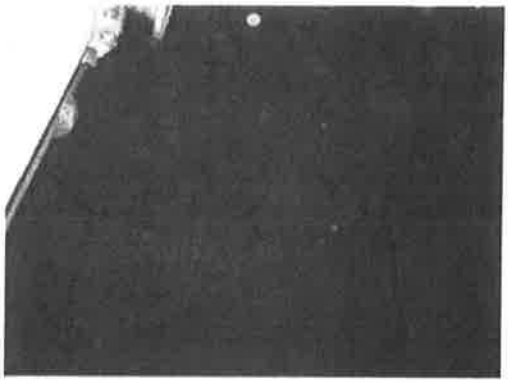
Inspection Photos – Exterior Surfaces



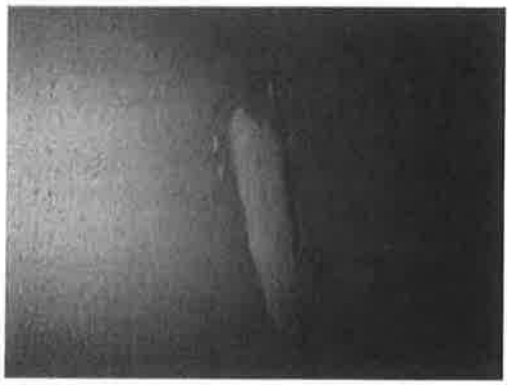


Concrete Foundations appeared to be in sound condition with no major cracking or sections missing.

Inspection Photos – Interior Surfaces

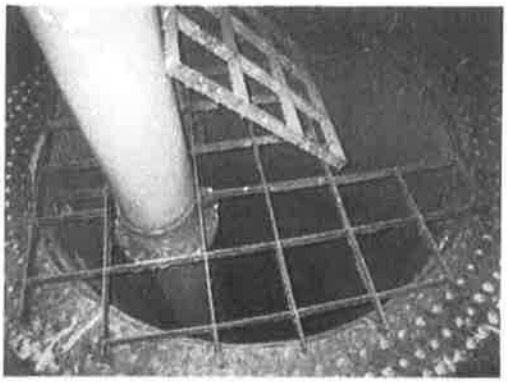


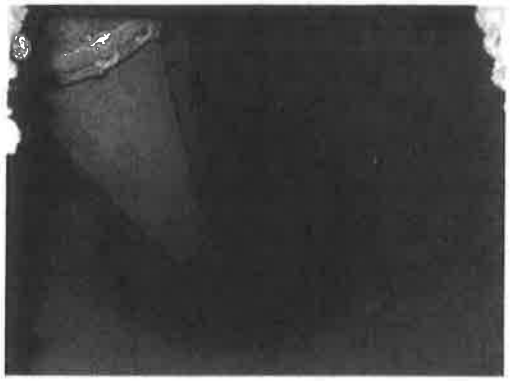
Shell wall plate exhibited a heavy buildup of silt and sediment but were well intact with no coating loss and no steel degradation.



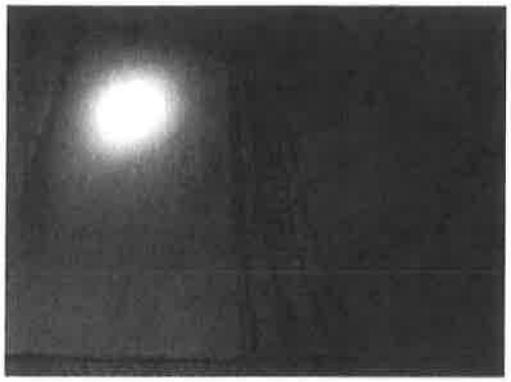
Weld lines on Plates throughout the interior expressed a slight amount corrosive activity with some rust staining.

Inspection Photos – Interior Surfaces



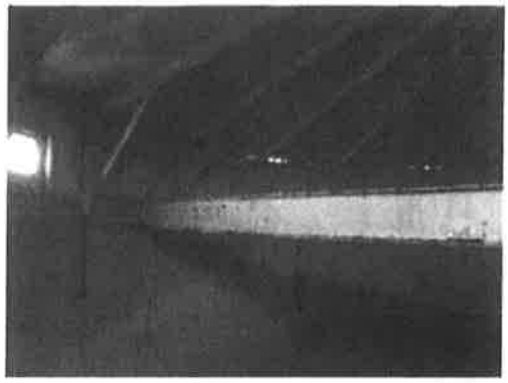
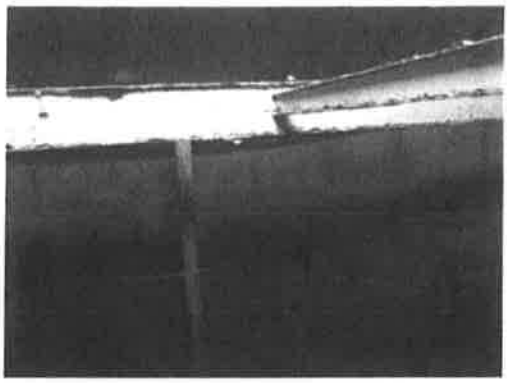


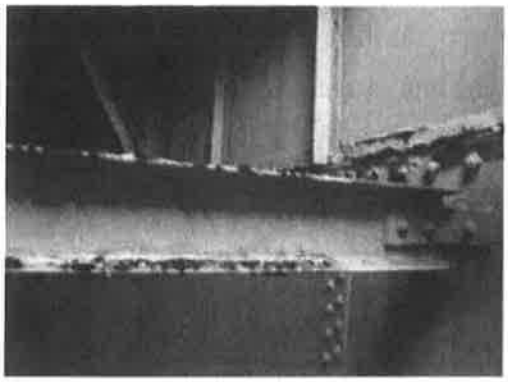
Riser grate showed advanced corrosion issues yet metal loss was not noted. Overflow and Fill pipe exhibited little coating loss but stratified rust on the bolts was observed.



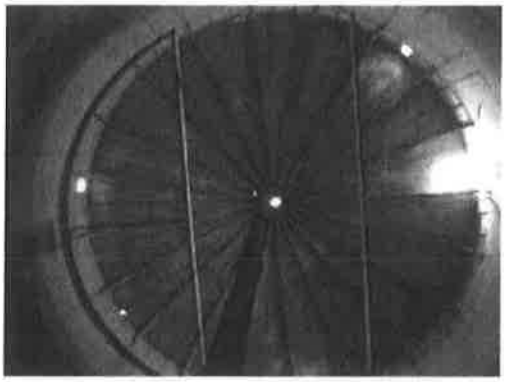
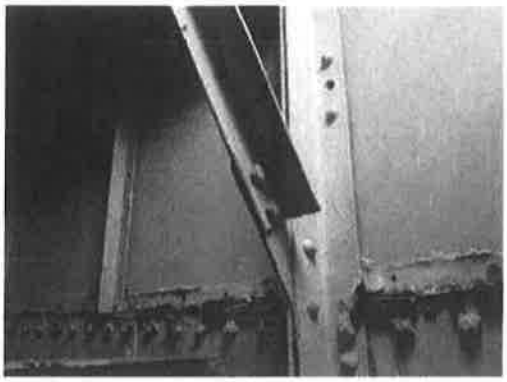
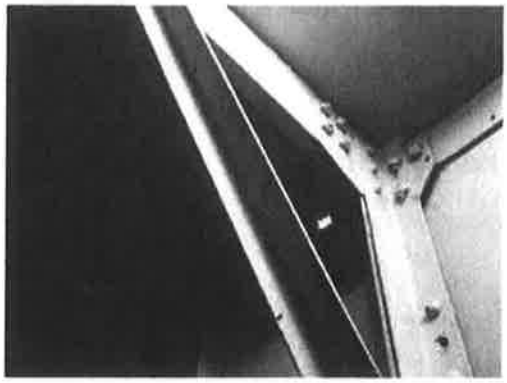
Interior ladder was not well adhered to side wall shell and condition of safety climb is poor. Corrosive action at broken welds from ladder attachments.

Inspection Photos – Interior Surfaces



Roof Rafters showed advanced coating delamination, chipped paint, rust buildup and staining. The rafters are suffering from metal loss at these points, but the condition of the steel is still very good.

Roof joists did not have the same degree of delamination as the rafters and the coating appeared tightly adhered.

4.0 REPAIR EVALUATION

4.1 Site Location and Condition

No repairs necessary.

4.2 Foundation

The concrete at each of the legs and riser do not need any significant repairs but a suitable bonding agent and concrete patch can be applied at the chipped sections and cracks.

4.3 Exterior Condition

The exterior sidewalls are in fair to good condition but do require coating rehabilitation to provide protection of the steel. The tank should receive a full abrasive blast and new three part coating system within the next 1 to 2 years to protect the existing steel. The Noxyde and underlying paint system should be completely removed.

4.4 Exterior Overflow Pipe

No repairs necessary as the overflow runs with the riser.

4.5 Handrails and Platforms

The balcony should have a three-rail handrail system installed at a minimum height of 42 inches. The handrail should be equipped with an OSHA-compliant mid-rail and a toe plate. A safe access platform to allow for movement of personnel from a ladder onto the balcony shall be installed. The existing balcony support structure can be modified to provide this platform.

4.6 Roof Access

The existing 24-inch square access hatch should be replaced or rehabilitated to a 30" minimum opening. The style of hatch can remain as is, as it is of good design.

4.7 Vent

Complete replacement of the existing vent with a non-corrosive type (aluminum or galvanized metal) double pallet type shall be performed. The four sidewall exterior vents should be fitted with a tighter mesh screen and a wind/rain vent hood.

4.8 Ladders

The existing three exterior ladders and one interior ladder all need some form of rehabilitation to bring to full OSHA compliance. The exterior balcony ladder needs to be modified to allow for a platform. The exterior roof ladder needs to be reworked to fix the deflection in the side rails and attachment points to the tank. The interior ladder should be replaced.

4.9 Interior Condition

The interior surface shell and belly section does not need to be abrasive blasted and recoated due to the excellent adhesion properties of the existing interior Epoxy coating. This coating under similar conditions can last for another 5 to 7 years before expressing signs of degradation. The new ladder attachment points, the riser grate, and overflow and fill pipe should be spot brush blasted (SSPC-SP7) and coated to maintain overall coating condition.

The rafters, roof joists and connections to the existing sidewall should be blasted to a near white blast (SSPC-SP10) and coated with a comparable 100% solids Epoxy coating for immersion service.

There are also two of four cable rods that are no longer supporting the overflow pipe and these will need to be replaced if and when any repairs are performed on the tank.

5.0 RECOMMENDATIONS

Based on the observations evaluations made during this inspection, the tank is a good candidate for rehabilitation. Replacement of this tank with a new tank is not required. It should be noted that because of the construction details of the existing tank, some minor corrosion and staining will likely occur at overlapping plates and sharp edges shortly after a new coating is applied. While this does not present a significant concern with respect to protection of the steel, it can be aesthetically undesirable.

If the tank is left as is, a full rehabilitation will be required in approximately 1 to 2 years. As an alternative, the Village could perform an Interim Repair Project in 2015 which would extend the time before a full rehabilitation is required to 4 to 7 years.

The scope of the Interim Repair Project and Full Rehabilitation Project will be as follows:

Interim Repair Project

- Concrete Foundation Spot Repairs
- Exterior Spot Coating Repairs
- New Cable Safety Climb Devices for Exterior Ladders
- New Vent
- New Vandal Guard and Cage Connection
- Interior Spot Coating Repairs
- Interior Ladder with Cable Safety Climb Device
- Two Cable Rods for Overflow Pipe Support

Full Rehabilitation Project

- Concrete Foundation Spot Repairs
- Full Exterior Coating Removal and Replacement

- Revised Platform at Balcony and Ladder Connection
- Handrail Modifications
- New Cable Safety Climb Devices for Exterior Ladders
- New Vent
- New Access Hatch
- New Vandal Guard and Cage Connection
- Full Interior Coating Removal and Replacement at Rafter, Roof Joists and Connections to the Sidewall
- Interior Spot Coating Repairs on Shell
- New Riser Grate
- Interior Ladder with Cable Safety Climb Device
- Four Cable Rods for Overflow Pipe Support

6.0 BUDGETARY COST ESTIMATES

The cost estimates for the Interim Repair Project and Full Rehabilitation Project are based on the following assumptions:

- All costs are based on 2015 dollars.
- All costs include the Contractor's overhead and profit of 15 percent.
- A 20 percent contingency is added to all costs
- Engineering is estimated at 20 percent of the construction costs.

SYRACUSE STREET TANK INTERIM REPAIRS

Item and Description	Estimated Cost
1. Concrete Foundation Spot Repairs	$5,000
2. Exterior Spot Coating	$200,000
3. New Cable Safety Climb Device for Exterior Ladders	$4,000
4. New Vent	$6,000
5. New Vandal Guard and Cage Connection	$15,000
6. Interior Spot Coating	$150,000
7. Interior Ladder with Cable Safety Climb Device	$25,000
8. Two Cable Rods for Overflow Pipe Support	$2,000
Subtotal	$407,000
Contingency at 20%	$81,400
Total Construction Cost	$488,400
Engineering at 20%	$97,680
Total Project Cost	**$586,000**

SYRACUSE STREET TANK REHABILITATION REPAIRS

Item and Description	Estimated Cost
1. Concrete Foundation Spot Repairs	$5,000
2. Full Exterior Coating Removal and Replacement	$950,000
3. Revised Platform at Balcony and Ladder Connection	$50,000
4. New Cable Safety Climb Device for Exterior Ladders	$4,000
5. New Vent	$6,000
6. New Access Hatch	$12,000
7. New Vandal Guard and Cage Connection	$15,000
8. Full Interior Coating Removal and Replacement at Rafter Roof Joists and Connections to Sidewalls	$450,000
9. Interior Spot Coating Repairs on Shell	$150,000
10. Handrail Modification	$40,000
11. New Riser Grate	$10,000
12. Interior Ladder with Cable Safety Climb Device	$25,000
13. New Cable Rods for Overflow	$4,000
Subtotal	$1,721,000
Contingency at 20%	$344,200
Total Construction Cost	$2,065,200
Engineering at 20%	$413,040
Total Project Cost	**$2,478,240**

As a means of comparison, we have provided a cost breakdown for replacing the existing tank with a new 500,000 gallon Spheroid tank.

SYRACUSE STREET NEW SPHERIOD TANK

Item and Description	Estimated Cost
1. Demolition	$200,000.00
2. Excavation	$50,000.00
3. Tank Design, Erection and Painting as Quoted by CB&I**	$2,500,000.00
4. Containment	$200,000.00
5. Yard Piping	$50,000.00
6. Valves	$15,000.00
7. Electrical	$80,000.00
8. Instrumentation	$20,000.00
Subtotal	$3,115,000.00
Contingency at 20%	$623,000.00
Escalation to Mid-Point of Const. (3%/yr for 1.5 yrs)	$3,907,465.34
Engineering at 20%	$781,493.07
Total Project Cost	**$4,689,000.00**

** CB&I Price quote from December 2014. Useful life of tank (before rehabilitation required) estimated to be 20 plus years.

APPENDIX B

ANNUAL COST CALCULATIONS FOR PROJECT ALTERNATIVES

Annual Cost for Rehabilitation Alternative

Inflation =	3.2%
Bond Rate =	2.75%
Duration =	40

Annual O&M Costs	
Generator Maintenance =	NA
Power =	NA
Fuel =	NA
Operators =	$ 9,681
Total =	$ 9,681

			Periodic Maintenance Costs				Annual O&M Costs			
Year		Project Description	2018 Cost	Escalated Cost	PV	Annual Cost	Escalated Cost	PV	Annual Cost	Total Annual Cost
1	2019			$ -	$ -	$ -	$ 9,990	$ 9,723	$ 9,990	$ 9,990
2	2020			$ -	$ -	$ -	$ 10,310	$ 9,766	$ 5,085	$ 5,085
3	2021			$ -	$ -	$ -	$ 10,640	$ 9,808	$ 3,451	$ 3,451
4	2022			$ -	$ -	$ -	$ 10,981	$ 9,851	$ 2,634	$ 2,634
5	2023			$ -	$ -	$ -	$ 11,332	$ 9,895	$ 2,145	$ 2,145
6	2024			$ -	$ -	$ -	$ 11,695	$ 9,938	$ 1,819	$ 1,819
7	2025			$ -	$ -	$ -	$ 12,069	$ 9,981	$ 1,587	$ 1,587
8	2026			$ -	$ -	$ -	$ 12,455	$ 10,025	$ 1,413	$ 1,413
9	2027			$ -	$ -	$ -	$ 12,854	$ 10,069	$ 1,278	$ 1,278
10	2028			$ -	$ -	$ -	$ 13,265	$ 10,113	$ 1,170	$ 1,170
11	2029			$ -	$ -	$ -	$ 13,689	$ 10,157	$ 1,083	$ 1,083
12	2030			$ -	$ -	$ -	$ 14,127	$ 10,202	$ 1,010	$ 1,010
13	2031			$ -	$ -	$ -	$ 14,580	$ 10,247	$ 948	$ 948
14	2032			$ -	$ -	$ -	$ 15,046	$ 10,291	$ 896	$ 896
15	2033	New Tank	$ 6,901,500	$ 11,069,779	$ 7,369,050	$ 606,172	$ 15,528	$ 10,337	$ 850	$ 607,022
16	2034			$ -	$ -	$ -	$ 16,024	$ 10,382	$ 811	$ 811
17	2035			$ -	$ -	$ -	$ 16,537	$ 10,427	$ 776	$ 776
18	2036			$ -	$ -	$ -	$ 17,066	$ 10,473	$ 745	$ 745
19	2037			$ -	$ -	$ -	$ 17,613	$ 10,519	$ 718	$ 718
20	2038			$ -	$ -	$ -	$ 18,176	$ 10,565	$ 694	$ 694
21	2039			$ -	$ -	$ -	$ 18,758	$ 10,611	$ 672	$ 672
22	2040			$ -	$ -	$ -	$ 19,358	$ 10,658	$ 652	$ 652
23	2041			$ -	$ -	$ -	$ 19,977	$ 10,704	$ 634	$ 634
24	2042			$ -	$ -	$ -	$ 20,617	$ 10,751	$ 618	$ 618
25	2043			$ -	$ -	$ -	$ 21,276	$ 10,798	$ 603	$ 603
26	2044			$ -	$ -	$ -	$ 21,957	$ 10,846	$ 589	$ 589
27	2045			$ -	$ -	$ -	$ 22,660	$ 10,893	$ 577	$ 577
28	2046			$ -	$ -	$ -	$ 23,385	$ 10,941	$ 565	$ 565
29	2047			$ -	$ -	$ -	$ 24,133	$ 10,989	$ 555	$ 555
30	2048			$ -	$ -	$ -	$ 24,906	$ 11,037	$ 545	$ 545
31	2049			$ -	$ -	$ -	$ 25,703	$ 11,085	$ 536	$ 536
32	2050			$ -	$ -	$ -	$ 26,525	$ 11,134	$ 528	$ 528
33	2051			$ -	$ -	$ -	$ 27,374	$ 11,182	$ 520	$ 520
34	2052			$ -	$ -	$ -	$ 28,250	$ 11,231	$ 513	$ 513
35	2053	Tank Rehabilitation/Painting	$ 2,652,000	$ 7,986,618	$ 3,090,287	$ 138,619	$ 29,154	$ 11,281	$ 506	$ 139,125
36	2054			$ -	$ -	$ -	$ 30,087	$ 11,330	$ 500	$ 500
37	2055			$ -	$ -	$ -	$ 31,050	$ 11,380	$ 494	$ 494
38	2056			$ -	$ -	$ -	$ 32,043	$ 11,429	$ 489	$ 489
39	2057			$ -	$ -	$ -	$ 33,069	$ 11,480	$ 484	$ 484
40	2058			$ -	$ -	$ -	$ 34,127	$ 11,530	$ 479	$ 479
					$ 10,459,337	$ 744,791		$ 424,059	$ 50,163	$ 794,954

2018 Capital Cost =	$ 4,166,000
Annual Cost (40 yrs) =	$173,020
Total Annual Cost =	**$967,974**

Annual Cost for New Tank Alternative

Inflation =	3.2%
Bond Rate =	2.75%
Duration =	40

Annual O&M Costs	
Generator Maintenance =	NA
Power =	NA
Fuel =	NA
Operators =	$ 9,681
Total =	$ 9,681

				Periodic Maintenance Costs				Annual O&M Costs			
Year		Project Description	2018 Cost	Escalated Cost	PV	Annual Cost	Escalated Cost	PV	Annual Cost	Total Annual Cost
1	2019			$ -	$ -	$ -	$ 9,990	$ 9,723	$ 9,990	$ 9,990
2	2020			$ -	$ -	$ -	$ 10,310	$ 9,766	$ 5,085	$ 5,085
3	2021			$ -	$ -	$ -	$ 10,640	$ 9,808	$ 3,451	$ 3,451
4	2022			$ -	$ -	$ -	$ 10,981	$ 9,851	$ 2,634	$ 2,634
5	2023			$ -	$ -	$ -	$ 11,332	$ 9,895	$ 2,145	$ 2,145
6	2024			$ -	$ -	$ -	$ 11,695	$ 9,938	$ 1,819	$ 1,819
7	2025			$ -	$ -	$ -	$ 12,069	$ 9,981	$ 1,587	$ 1,587
8	2026			$ -	$ -	$ -	$ 12,455	$ 10,025	$ 1,413	$ 1,413
9	2027			$ -	$ -	$ -	$ 12,854	$ 10,069	$ 1,278	$ 1,278
10	2028			$ -	$ -	$ -	$ 13,265	$ 10,113	$ 1,170	$ 1,170
11	2029			$ -	$ -	$ -	$ 13,689	$ 10,157	$ 1,083	$ 1,083
12	2030			$ -	$ -	$ -	$ 14,127	$ 10,202	$ 1,010	$ 1,010
13	2031			$ -	$ -	$ -	$ 14,580	$ 10,247	$ 948	$ 948
14	2032			$ -	$ -	$ -	$ 15,046	$ 10,291	$ 896	$ 896
15	2033			$ -	$ -	$ -	$ 15,528	$ 10,337	$ 850	$ 850
16	2034			$ -	$ -	$ -	$ 16,024	$ 10,382	$ 811	$ 811
17	2035			$ -	$ -	$ -	$ 16,537	$ 10,427	$ 776	$ 776
18	2036			$ -	$ -	$ -	$ 17,066	$ 10,473	$ 745	$ 745
19	2037			$ -	$ -	$ -	$ 17,613	$ 10,519	$ 718	$ 718
20	2038	Tank Rehabilitation/Painting	$ 2,652,000	$ 4,979,291	$ 2,894,215	$ 190,068	$ 18,176	$ 10,565	$ 694	$ 190,762
21	2039			$ -	$ -	$ -	$ 18,758	$ 10,611	$ 672	$ 672
22	2040			$ -	$ -	$ -	$ 19,358	$ 10,658	$ 652	$ 652
23	2041			$ -	$ -	$ -	$ 19,977	$ 10,704	$ 634	$ 634
24	2042			$ -	$ -	$ -	$ 20,617	$ 10,751	$ 618	$ 618
25	2043			$ -	$ -	$ -	$ 21,276	$ 10,798	$ 603	$ 603
26	2044			$ -	$ -	$ -	$ 21,957	$ 10,846	$ 589	$ 589
27	2045			$ -	$ -	$ -	$ 22,660	$ 10,893	$ 577	$ 577
28	2046			$ -	$ -	$ -	$ 23,385	$ 10,941	$ 565	$ 565
29	2047			$ -	$ -	$ -	$ 24,133	$ 10,989	$ 555	$ 555
30	2048			$ -	$ -	$ -	$ 24,906	$ 11,037	$ 545	$ 545
31	2049			$ -	$ -	$ -	$ 25,703	$ 11,085	$ 536	$ 536
32	2050			$ -	$ -	$ -	$ 26,525	$ 11,134	$ 528	$ 528
33	2051			$ -	$ -	$ -	$ 27,374	$ 11,182	$ 520	$ 520
34	2052			$ -	$ -	$ -	$ 28,250	$ 11,231	$ 513	$ 513
35	2053			$ -	$ -	$ -	$ 29,154	$ 11,281	$ 506	$ 506
36	2054			$ -	$ -	$ -	$ 30,087	$ 11,330	$ 500	$ 500
37	2055			$ -	$ -	$ -	$ 31,050	$ 11,380	$ 494	$ 494
38	2056			$ -	$ -	$ -	$ 32,043	$ 11,429	$ 489	$ 489
39	2057			$ -	$ -	$ -	$ 33,069	$ 11,480	$ 484	$ 484
40	2058	Tank Rehabilitation/Painting	$ 2,652,000	$ 9,348,919	$ 3,158,553	$ 131,179	$ 34,127	$ 11,530	$ 479	$ 131,658
					$ 6,052,769	$ 321,248		$ 424,059	$ 50,163	$ 371,410

2018 Capital Cost =	$ 6,901,500
Annual Cost (40 yrs) =	$286,630
Total Annual Cost =	**$658,040**

F:_WaterSupply\2017 Bellevue Park ESP Rehab\Cost Estimate\2018 PV Cost Estimates.xlsx

Alternative Cost Comparison for 40 Year Period		
Description	**Rehabilitation**	**New Tank**
2018 Capital Cost	$ 4,166,000	$ 6,901,500
Annual Cost of 2018 Capital Cost	$173,000	$287,000
Annual O&M Cost	$795,000	$371,000
Total Annual Cost	**$968,000**	**$658,000**