WELL #6 GST

Comprehensive Inspection
For
The City of Pflugerville

500,000-gallon Ground Storage Tank
July 2020

HOT INSPECTION SERVICES

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PROJECT REPORT

TO: Brandon Pritchett	**DATE: 07/01/20**
Public Utilities Director	**REPORT NO: 2830-11**
15500 Sun Light Near Way #B	
City of Pflugerville	**CUSTOMER P.O. 12993**
Pflugerville, Texas 78660	
PROJECT: Comprehensive Tank Inspection	**LOCATION: Pflugerville, Texas**

1.0 INTRODUCTION:

The subject of this report is the evaluation of a 500,000-gallon ground storage tank known as Well #6 GST, located at 807 Point Run Dr., in Pflugerville, Texas. The Ground Storage Tank is welded steel construction with a knuckle rafter supported roof system and sits on a concrete ring beam foundation. The date of the original construction is shown on the name plate as 1988. The comprehensive evaluation and dimensional checks have been documented and are part of this report. The tank is operated by the City of Pflugerville and was made available for inspection during May and June of 2020. The tank was not in service at the time of inspection.

John H. Konzen, CWI, NDE Level III and NACE Certified Coating Inspector and Justin Konzen, NACE Level II Certified Coating Inspector of HOT Inspection Services Inc., performed the inspection and evaluation. The condition survey was conducted and generally follows the guidelines as described in Chapter 9 and Appendix C of the AWWA M42 Manual for Steel Water Storage Tanks. The inspection and evaluation meets and exceeds the requirements of the Texas Administration Code of TCEQ Chapter 290 subchapter D, Rule 290.46. The following report provides information that is valuable in the continued operation and maintenance of the tank.

The information contained herein is as accurate as could be obtained by HOT at the time of the inspection and from the history of the respective tank. No other assurance or warranty is expressed or implied. We assume no responsibility for any errors or omissions in this report, but will attempt to resolve concerns with the content of this report upon request. Any estimates or opinions with respect to tank rehabilitation provided by HOT in this report are based on HOT's experience and qualifications as a consultant and represent its best judgment as an experienced and qualified consultant familiar with the tank construction industry. Since we have no control over costs of labor, materials, equipment or services furnished by others or over competitive bidding or market conditions, it cannot guarantee that proposals, bids or actual project costs will not vary from any estimates or opinions of costs prepared by HOT.

The purpose of this evaluation was to determine the condition of the tank interior, exterior, exposed foundations and accessories and to make recommendations and cost estimates for recoating, repairing, corrosion protection and maintenance. Budget estimates for the work, anticipated life of the coating and the structure are included. The anticipated life of the coating and structure of the tank represents the remaining life with respect to any recommended maintenance repairs prior to the complete rehabilitation of the tank interior and or exterior. Budget estimates for the complete rehabilitation and required upgrades are

itemized for a thorough description of the cost associated with each task. A spreadsheet showing the CIP budget based on 2020 costs and the year recommended for complete rehabilitation of the interior and exterior is included.

2.0 SUMMARY:

2.1 **Exterior Surfaces** – The existing coating system is not known but is assumed to be an epoxy/urethane coating from the original construction. The coating is exhibiting moderate rust rash corrosion, coating delamination and chalking along the shell and on top of the roof as seen in the attached photos. The integrity of the exterior coating is aged and is in fair condition at the areas accessed during the inspection. The adhesion is less than acceptable for spot repairs and an effective overcoat application, therefore a complete coating removal should be considered before placing tank back into service.

2.2 **Interior surfaces** – The existing coating system is not known but is assumed to be an epoxy system from the original construction. The interior coating has failed and there is an excessive amount of corrosion on the tank plate surfaces and concerning amount of corrosion on the welds, roof penetrations, roof to shell support/rafter edges, and interfaces of the rafter to roof areas. The tank should not be placed back into service until it has been completely rehabilitated.

3.0 DESCRIPTION OF WELL #6 GROUND STORAGE TANK

Name of Tank: Well #6 GST
Date: 07/01/20
Constructed: 1988 by Holloway Co., Inc.
Tank Type: Ground Storage Tank
Type of Construction: Steel Welded
Type of Coatings: Exterior – Epoxy/Urethane
Interior – Epoxy
Type of Foundation: Concrete Ring Beam
Capacity: 500,000-gallons
Dimensions: 44' Ø x 44' High (6 shell rings)
Interior Surface Area: Approx. 9,440 sq./ft.
Exterior Surface Area: Approx. 7,921 sq./ft.
Tank Component Thicknesses/Sizes:
Shell Courses 1-2 = 7/16"
Shell Courses 3 = 3/8"
Shell Courses 4-6 = 5/16"
Roof = 3/16"
Floor = 1/4"
Roof Support System:
Rafters = (24) C6x8.2 structural channel
Center Column = 8"∅ sch. 40 pipe w/ base plate re-pad
Rafter Support at Center = 36"∅ 1" plate w/gusset supports to center column
Rafter Support at Shell = 6" x ¼" F.B. welded to shell and rafters
Overflow: 12"∅ w/top fill weir box and flap plate closure 26" above ground level
Roof Access Hatch: (1) 24"x24" C.S w/hinged hatch cover
Roof Vent: (1) 12"∅ C.S
Ladder Description: Exterior ladder w/cage
Interior ladder
Level Indicator: Floating Target Gauge
Cathodic Protection System: N/A
Exterior Coating Thickness: 8 mils
Exterior Coating Adhesion Rating: 2A
Interior Coating Thickness: Minimal
Interior Coating Adhesion Rating: 1A
Security Fence: Yes. Chain Link.

Note: ***The description above was obtained from field measurement taken during the inspection and represents a general description of the tank components and appurtenances. Plate thickness measurements were obtained from ultrasonic thickness testing using a calibrated Positector UTG.***

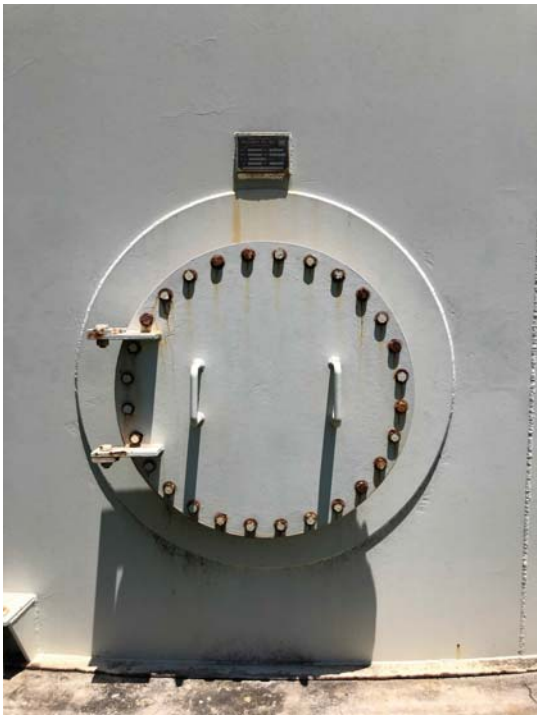
4.0 INSPECTION RESULTS:

4.1 Exterior

A. **<u>Foundation:</u>** The tank foundation consists of a concrete ring beam. The majority of the foundation appeared to be in good overall condition with small width cracking in several locations. The floor extension plate to ring beam foundation has no protection along the edge and has failed to seal the interface. ***See photos below.***

B. **<u>Exterior Coating Condition</u>:** The exterior coating system on the shell and roof is in poor condition. The shell protective coating has oxidized and chalked from the UV sunlight and weather. There is mildew and growth spores covering much of the knuckle with the roof exhibiting total coating failure as seen in the photos. Brittleness, cracking and top coat delamination was observed at areas, indicating that the coating has reached its overall protective life. ***TCEQ Rule 290.43 (c) (8) requires coatings be maintained in strict accordance with current AWWA Standards. See photos below.***

C. **<u>Shell Manway:</u>** The shell 24"∅ manway has a flanged bolted plate cover on a hinge with a reinforcing pad around the tank shell penetration. The cover is with gasket and leak tight showing signs of deterioration and corrosion on the bolts. ***TCEQ Rule 290.43 (c) (10) requires a 30"∅ access in the lower ring of a GST. See photo below.***



D. **<u>Overflow Pipe:</u>** The 12"∅ overflow pipe exits through the top of the shell ring and extends straight down the shell and exits out above the tank perimeter foundation which it discharges through a plate flap closure 26" above the splash vault. The gap between the pipe and plate flap closure has been reduced with a silicone caulking that is considered a temporary adjustment. ***TCEQ Rule 290.43 (c) (3) requires all covers fit tightly with no gap over 1/16". See photo below.***

E. **<u>Water Level Indicator</u>:** The tank is fitted with a floating target gauge with level increments on the target and a pressure foot gauge. The level gauge and pressure gauge are not operable. ***TCEQ Rule 290.43 (c) (4) that states all tanks have a level indicator at the tank site. See Photos below.***

F. **<u>Exterior Ladder</u>:** The ladder is 16" wide with 3/4"∅ rungs spaced every 12" on center with 10" of standoff for toe room. The ladder is equipped with a cage but no safety climb or vandal deterrent at the bottom of the ladder. The ladder does not meet **ANSI/OSHA** Standards. ***See photo below.***

G. **<u>Roof Hatch</u>:** The roof access hatch is welded steel (24"x24") with a hinged lid and locking hasp with no lock. The hatch neck and hinges are corroded and deteriorated. The access hatch does not have a hold-open device to safely hold the lid open. ***TCEQ Rule 290.43 (c) (2) requires the primary roof access opening to be 30" diameter and remain locked. See photos below.***

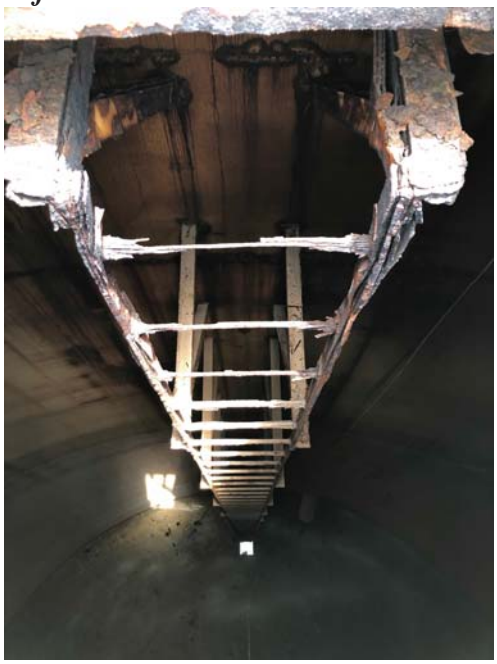
H. **<u>Roof Vent:</u>** The roof vent is 12"∅ steel construction and welded directly to the roof. The vent has deteriorated and broken from the roof at the neck. ***TCEQ Rule 290.43 (c) (1) require vents to be designed and installed in strict accordance with AWWA Standards. See photos below.***

4.2 Interior

A. **<u>Interior Coating Condition</u>:** The coating on the interior surfaces of the tank is in poor condition. The coating has failed and allowed corrosion to deteriorate the shell, roof support system, ladder and other appurtenances inside the tank. ***TCEQ Rule 290.43 (c) (8) requires coatings be maintained in strict accordance with current AWWA Standards.***

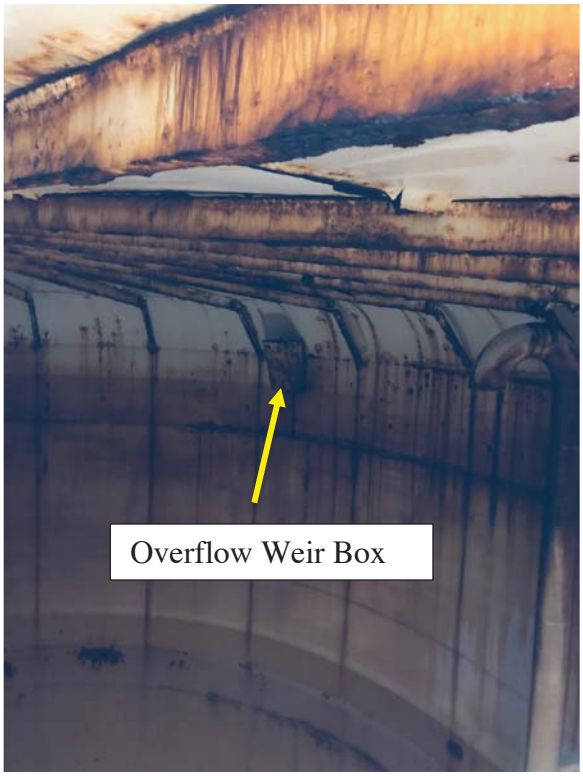
B. **<u>Roof and Support System</u>**: There is severe seam, interface and edge corrosion throughout. The roof is not seal welded together at lap seams or at the top shell angle. Corrosion is actively aggressive and has deteriorated the roof and support system to degree of structural concern for the integrity of the roof. ***See photos below.***

C. **<u>Interior Shell Ladder</u>**: The interior ladder is attached to the shell and is not safe to climb due to the coating failure and total deterioration from the corrosion that has occurred on the interior. ***Deficiencies to ANSI/OSHA. See Photo Below:***



D. **<u>Water Level Indicator</u>:** The float has been damaged and is broken from the guide cables that operate the float.. ***See Photo Below***.

E. **<u>Overflow Pipe and Weir Box</u>:** The 12"∅ overflow pipe is located on the exterior and enters the top of the shell. The weir box is tapered from the 3' square top opening to approximately 12" at the bottom where it connects to the overflow pipe at the shell. There is excessive corrosion around the top edge and inside of the overflow. and no concerns with the integrity of the weir. ***See photo below.***



F. **<u>Floor and Sediment Level:</u>** The coating on the interior floor appeared to be in poor condition with some lap weld seam corrosion. The sediment level depth was undetermined but covered approximately 40% of the floor. ***See Photo Below:***

4.3 Coating Adhesion Test

A. **<u>Interior and Exterior</u>:** An adhesion test was conducted in accordance with ASTM D3359 Standard for measuring the adhesion rating of the current interior exterior coating system. This is a vital test to determine the options available for rehabilitating the coating system. Over-coating a tank requires adhesion ratings of 3 or greater on a scale of 0-5. The results are reported in the tank description table using the ASTM scale. The ASTM scale is a relative scale to rate adhesion from 0 to 5 with 5 being the best. Both the interior and exterior were at or below 1A-2A.
5 (very good) - 4 (good) - 3 (fair) - 2 (poor) - 1 (very poor) - 0 (unacceptable and failing)

5.0 DEFICIENCIES:

TCEQ, AWWA, OSHA and Safety-Related Deficiencies. There were deficiencies and concerns with this tank. They included:

- The interior and exterior coating system has reached its full potential for providing protection as required to prevent excessive corrosion and subsequent metal loss. ***TCEQ Rule 290.43 (c) (8). Coatings of all clear wells, ground storage tanks, standpipes and elevated tanks shall be maintained in strict accordance with current AWWA Standards.***
- The shell manway is not the required 30"∅. ***TCEQ Rule 290.43 (c) (10) requires a 30"∅ access in the lower ring of a GST.***
- The overflow flap closure is caulked with a temporary sealant. ***TCEQ Rule 290.43 (c) (3) requires all covers fit tightly with no gap over 1/16".***

- The water level indicator is not functioning. ***TCEQ Rule 290.43 (c) (4) that states all tanks have a level indicator at the tank site***.
- The exterior ladder is not fitted with a safety climb device or a vandal deterrent door and is not ***ANSI/OSHA*** compliant.
- The roof access hatch is not in compliance***. TCEQ Rule 290.43 (c) (20 requires the primary roof access opening to be 30" diameter***
- The roof vent is not in compliance. ***TCEQ 290.43 (c) (1). Require vents to be designed in strict accordance with AWWA Standards.***
- The interior access ladder has deteriorated and is unsafe and compliant with ***ANSI/OSHA***.
- The interior roof support system has deteriorated from the corrosion and is unsafe to walk on the roof or place the tank back into service.
- Sediment levels on the floor of the tank exceed the sanitary standards for Potable Water Storage.

6.0 RECOMMENDATIONS:

6.1 **Exterior**: HOT defines the life of an exterior coating as the amount of time before repainting becomes necessary due to coating failure and corrosion. During the exterior coating's life, the owner should expect the coating to lose its gloss, start to chalk, show signs of weathering, mildew and possibly some rust staining. The typical life of a properly applied exterior coating system is approximately 15-20 years. Due to the age of the coating, chalking and brittleness it is recommended that a complete exterior coating rehabilitation be performed. A zinc/epoxy/urethane system is recommended for the exterior of this tank. This coating system should meet the AWWA D102 recommendations. The typical life of this properly formulated and applied coating system is approximately 18-25 years.

6.2 **Interior**: HOT defines the life of an interior coating as the amount of time before repainting becomes necessary due to coating failure and corrosion. During the coating life the owner should expect some rust staining due to interface corrosion, some checking, a few small holidays and minor blistering due to entrapment. The optimum long-life coating system presently available is a Zinc-epoxy coating system. A zinc and two-coat or single hi-build epoxy system is recommended for the interior of this tank. This coating system should meet the certification criteria of ANSI/NSF 61 and TCEQ regulations. The typical life of this properly formulated and applied coating system is approximately 15-20 years. Due to the age of the coating and brittleness, it is recommended that the interior be rehabilitated.

6.3 **Recommendation List:** The recommended scope of work listed below applies to the Well # 6 GST for proper modification and rehabilitation to bring the tank into a serviceable condition in accordance with TCEQ, AWWA, ANSI/OSHA and Industry Standards. The budget and bidding process will have an effect on the project's end result. A set of specifications that has a detailed scope of work and itemizes the repair and modifications well enough to properly bring the tank into compliance is an essential requirement for a successful project. It is recommended that any surrounding instruments and equipment be protected during the project. Industry standards with recommended practices and procedures should be referenced in the specification as to give the contractor a quality standard for accomplishing the scope of work.

1. Make any necessary interior/exterior welding repair, corrosion related repairs and general repairs to the tank and foundation. This includes: Repairing concrete foundation cracks and voids by cleaning and filling cracks with flexible concrete patching mortar. Repairing any holes in the floor and shell after initial interior abrasive blasting that unveils any metal loss or pitting by weld overlay, applying 100% solids epoxy surfacing compound. Grinding all sharp edges, weld splatter, arc strikes, uneven weld profiles, and any other defects that do not provide adequate anchor profile and causes a lack of coating adhesion. The resident inspector and engineer should identify any repairs necessary. All welding conducted on this project is to be conducted by a welder certified to ASME Section IX or AWS D1.1 (tests as described in AWS B2.1) code shall conduct all welding on this tank.

2. Demo and replace the roof and roof support system with a self-supporting dome roof. The roof will include a new OSHA approved access ladder for the interior and exterior, 24 ∅vent, 30"x30" roof hatch, flanged roof nozzles and overflow weir box. The contractor shall field verify measurements, access to the tank site and design the roof and accessories to AWWA D100. A set of drawings shall be provided and sealed by a P.E. in the State of Texas.

3. Remove the existing 12"∅ overflow plate flap closure and install a new clow flap valve closure. A bolt on flange type or weld on is acceptable. Maintain all air gap dimensions from current ground level.

4. Install an AWWA approved 30"∅ shell manway with a davit arm.

5. Apply an industrial coating system using trained and qualified coating applicators. The Tnemec Coating System is recommended utilizing the coatings available from Tnemec. Clean the exterior surfaces to a SSPC-SP 6, Commercial Blast Cleaning and apply a Zinc/Epoxy/Urethane system. Clean the interior surfaces to a SSPC-SP 10, Near White Blast Cleaning and apply a Zinc/2-Coat Epoxy system. ***(A detailed coating specification shall be written under a separate cover upon review and discussion of this report. The system above may be changed depending on the existing coating system results and the time of year the tank will be rehabilitated).***

6. Provide a dust collector and dehumidification unit to control the interior environment while abrasive blasting and coatings application.

7. Provide a containment system to the exterior of the tank to protect the facility and surrounding property. The containment system shall be specified in the contract bid documents and technical specifications.

8. Seal caulk all interior penetrations, laps and other unsealed connections that cannot be protected from the moisture or corrosive environment.

9. Provide a knowledgeable and qualified welding/coating inspector to monitor all aspects of the scope of work to assure the customer that all industry standards, specifications and good workmanship practices are being followed.

10. The facility pump buildings, vaults, valves, vault electrical, insulated piping and modifications to the level transducer and sample port are not part of the comprehensive tank assessment but are being recommended to be addressed prior to the contract

specifications and final work scope development. There is insulation on the inlet and outlet piping should be removed, the piping blasted and coated and then re-insulated. The addition of a pressure foot level gauge and or a digital read-out on the level transducer to be located on the control cabinet and electrical safety issues inside the valve vaults should be considered. A contingency is being provided in the budget cost below for these tasks.

7.0 BUDGET COST:

EXTERIOR (based on 7,921 sq./ft. @ $12.00/sq./ft.)	
Clean & Paint Exterior	$ 95,052
SP-6 Clean, apply zinc/epoxy/urethane system	
INTERIOR (based on 9,440 sq./ft. @ 9.00/sq./ft.)	
Clean and Paint Interior	$ 84,960
SP-10 Clean, apply zinc/2-coat epoxy system	
LINE BID ITEMS	
Corrosion related and general repairs/grinding pit filler (item 1)	$ 10,000
Roof support system demo and replacement (item 2)	$210,000
Overflow flap valve replacement (item 3)	$ 2,500
Shell manway upgrade (item 4)	$ 7,500
Dehumidification and dust collection (item 6)	$ 20,000
Containment System for the exterior rehabilitation phase (item 7)	$ 50,000
Caulking of lap seams/crevices @ 60 tubes of (item 8)	$ 4,500
Inspection Services (item 9)	$ 42,000
Contingency Items @ 10% of $484,512	$ 48,450

Total Cost to Budget should be $574,962. *This does not include the cost for Engineering Services to write the bid documents/specifications and administrate the project. The contractor should consider the accessibility to this project by means of assuring overhead electrical lines are not obstructing to the containment and site work.*

8.0 CONCLUSION OF OBSERVATION:

The intent of this report is to convey the condition of the tank and make reasonable recommendations and cost estimates to the owner on rehabilitating the tank. The cost associated with a total rehabilitation will be substantial and should be considered sensitive to the time of bidding as it relates to our economy.

The recommendations and budget have been offered by HOT Inspection Services as a plan to consider before placing the tank into service. The CIP budget should be approved with a contingency as indicated for the economy and any local, state or federal regulations that may affect the pricing.

In conclusion to the inspection and evaluation of the above referenced tank, it is the opinion of HOT Inspection Services that the recommended repairs be conducted to maintain the integrity of the water storage tank. HOT Inspection Services, Inc., assumes no responsibility for losses of any kind due to our interpretation of the quality of the material submitted. All data and information will be held strictly confidential.

HOT Inspection Services, Inc.

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AWS Certified Welding Inspector #85040251
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