DIXON
ENGINEERING, INC.

Maintenance Inspection

250,000 Gallon Double Ellipse

Ontonagon, Michigan

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Inspection Performed: September 25, 2025
Reviewed by: Joseph T. Hoban, P.E.: November 15, 2025

CONCLUSIONS:

1. The exterior coating is an aluminum alkyd system. The coating is in fair to poor condition overall. Coating deterioration includes spot failures to the substrate with rust undercutting, topcoat delamination, rust bleedthrough, and erosion. There are numerous coating failures throughout.

2. The dry interior coating is an unknown system. The coating is in poor condition. Coating deterioration includes spot failures to the substrate with rust undercutting and topcoat delamination.

3. The wet interior coating is an unknown system. The coating is in poor condition overall. Below the high-water level coating deterioration includes spot failures to the substrate with rust undercutting, topcoat delamination, rust bleedthrough, blistering, and abrasion on the sidewall. Above the high-water level coating is deteriorating at the roof panels and open lap seams.

RECOMMENDATIONS (GENERAL):

Annually inspect the roof vent, hatches, and any other health or security items on the tank. The work could be performed by in-house personnel or contracted as part of a regular maintenance program.

Schedule regular cleanings and inspections of the tank by an independent third party once every five years as recommended by AWWA.

RECOMMENDATIONS (PRIORITY WORK TO MEET EGLE REQUIREMENTS):

EGLE may allow some of the required changes to be delayed until the next paint project. These items are listed as priority work since they are currently out of compliance.

1. Install a handrail on the roof to meet current EGLE requirements. Install a painter's railing on the roof around the new handrail. The estimated cost is $18,000.

2. Modify the overflow pipe discharge so it points downward to bring it into compliance with current EGLE requirements. Reinstall a flap gate or install a duck bill check valve at the discharge. The estimated cost is $5,000.

3. Immediately replace the screen at the overflow pipe discharge to meet current EGLE requirements for screen size. This would be a temporary repair until the overflow discharge can be modified to fully meet EGLE requirements. The work could be performed by in-house personnel.

4. Replace the roof vent with a pressure vacuum vent to meet current EGLE requirements. The estimated cost is $8,000.

5. Current EGLE requirements state that the ladder is to start 12 feet above the ground. Since the ladder is properly secured with a vandal guard it may be possible that acceptance may be granted for this non-compliance item.

6. Install a sample tap on the piping to meet current EGLE requirements. The estimated cost is $2,000.

RECOMMENDATIONS (WITH THE NEXT PAINT PROJECT):

Complete the recommended work in one to two years. The repairs and upgrades should be completed during the next major tank rehabilitation project when coating repairs are made.

1. Abrasive blast clean the exterior inside a dust tight containment system and repaint with a urethane system. The estimated cost is $350,000.

2. Abrasive blast clean the entire dry interior and repaint with an epoxy system. The estimated cost is $30,000.

3. Abrasive blast clean the entire wet interior and repaint with an epoxy system. The estimated cost is $140,000.

4. Caulk the roof lap seams after the wet interior is repainted. The estimated cost is $3,000.

5. Install clips and a pressure fitting for future installation of a submerged cathodic protection system. The estimated cost is $3,000.

6. Weld plates over the cathodic lift holes in the roof. The estimated cost is $11,000.

7. Install a sump pump in the pit. The work can be performed by in-house personnel.

8. Remove vegetation that is rubbing or encroaching on the tank so it will not interfere with containment. The work can be performed by in-house personnel or obtain a quote from a local landscaper.

9. Temporarily relocate or protect the power lines that would interfere with containment needed for exterior work. The work would need to be performed by the electric company.

10. Coat the foundations to help prevent further deterioration. The cost would be incidental to exterior painting.

11. Repair spalls on the concrete foundations. The estimated cost is $3,000.

12. Repair areas of missing or damaged grout between the steel baseplates and the concrete foundations. The cost would be incidental to the next painting project.

13. Install grounding for the tank. The estimated cost is $4,000.

14. Repair the damaged junction box on the roof so there are no exposed wires. The work can be performed by in-house personnel.

15. Drill drainage holes in the balcony walkway. The cost would be incidental to exterior painting.

16. Install a swing gate at the leg ladder opening in the balcony railing. The estimated cost is $3,000.

17. Remove all antennas and antenna cables prior to abrasive blast cleaning and repainting. The cost is assumed to be the responsibly of the antenna owners.

18. Tighten the loose sway rods. The estimated cost is $3,000.

19. Replace the wet interior roof hatch with a 30 inch diameter hatch to meet current EGLE requirements. The estimated cost is $4,000.

20. Install a handhold at the wet interior roof hatch. The handhold would assist the climber while entering and exiting the opening. The cost would be incidental to the next painting project.

21. Replace the sidewall/roof ladder with a vertical ladder and a step-off platform. The estimated cost is $16,000.

22. Install a dry interior ladder that is equipped with a fall prevention device. The estimated cost is $20,000.

23. Install a wet interior ladder that is equipped with a fall prevention device. The estimated cost is $11,000.

24. The expansion joint on the fill/draw pipe was covered with insulation and was not visible for inspection. The type of joint should be verified. If it is determined to be a glandular expansion joint, then replace it with a bellows type joint. The estimated cost is $15,000.

25. Remove the fill/draw pipe insulation, abrasive blast clean and repaint the pipe, and install new insulation with an aluminum jacket. The estimated cost is $15,000.

A DISCUSSION ON RESCUE AND RETRIEVAL OPERATIONS FROM ELEVATED STORAGE TANKS

Working on elevated water storage tanks is inherently dangerous. OSHA regulations give guidelines for climbing on elevated structures. Contractors and Engineers/Consultants are responsible for their own employees, but even with safety training and proper equipment, accidents can occur. Most rescue squads are local or neighboring fire departments, with some departments having more experience than others. Water storage tanks are designed to store water and are not suited for rescue or retrieval convenience. We recommend that you meet with your local rescue personnel and draft a rescue plan. A copy of the plan should be kept at the tank and with the rescue crew.

OSHA does not require 30 inch manways or hatches, but for rescue purposes 30 inch openings would allow enough room for a rescue basket with an injured person on it to pass through. Smaller openings may not be sufficient for retrieval.

Rescue personnel would gain access to the injured person using the existing ladders while attached to fall prevention devices. If possible, the basket would be lowered through the riser and out the opening in the bottom. If needed, the rescue crew would work from the roof inside a handrail. A tripod would be used to attach a winch to the basket. If the basket cannot fit through the riser, then it would need to be raised to the roof.

From the roof it is possible to lower the basket over the side to ground level, but that would require a large winch and increased loading on the attachment point. On a rainy, windy, or snowy day, the objective would be to get rescue personnel off the roof as soon as possible, so lowering through the dry interior is preferred. A helicopter rescue would need to be performed if it is not possible to lower the rescue basket down the dry interior.

Upgrades intended to make a rescue easier are included in this report. Dixon recommends 30 inch manways or hatches where possible, and fall prevention devices on all ladders.

COST SUMMARY:

Exterior repaint with containment	$350,000
Dry interior repaint	30,000
Wet interior repaint	140,000
Caulk roof lap seams	3,000
Cathodic clips and pressure fitting	3,000
Weld cathodic covers	11,000
Foundation spall repair	3,000
Grounding	4,000
Balcony swing gate	3,000
Roof handrail and painter's railing	18,000
Tighten sway rods	3,000
Overflow pipe discharge modification	5,000
30 inch wet interior roof hatch	4,000
Pressure vacuum roof vent	8,000
Roof platform	16,000
Dry interior ladder	20,000
Wet interior ladder	11,000
Sample tap	2,000
Expansion joint	15,000
Fill/Draw pipe insulation	15,000
Sub Total	$664,000
Engineering and Contingencies	$100,000
Total	$764,000

Notes: Exterior coating is primarily for aesthetics and can be delayed as long as desired since the next paint job cannot be an overcoat. While the appearance will deteriorate the structural integrity should not be impacted.

Exterior repainting will require temporary removal and relocation of the antennas and cables. This cost is not included in these estimates and is assumed to be the responsibility of the antenna owners. Cost is also not included for coordinating with the antenna carriers or for any redesign work needed for antenna mounting or cable routing.

Safety improvements other than the roof handrail are optional and can be delayed. The best price for safety improvements would be obtained by including them with the next painting project.

INSPECTION:

On September 25, 2025, Dixon Engineering Inc. performed a maintenance inspection on the 250,000 gallon double ellipse elevated water storage tank owned by the Village of Ontonagon, Michigan. Purposes of the inspection were to evaluate the interior and exterior coating's performance and life expectancy, assess the condition of metal surfaces and appurtenances, review safety and health aspects, and make budgetary recommendations for continued maintenance of the tank. The inspection was performed from existing ladders and platforms. No special rigging and no disassembly of any items was conducted by the inspector. All recommendations with budgeting estimates for repairs are incorporated in this report.

The inspection was performed by Josh Grover and Michael Sedlmayer, Engineering Technicians.

The wet interior inspection was completed with a remotely operated vehicle (ROV). Video of the inspection and still photos are included with this report. No cleaning was performed in the wet interior during the ROV inspection.

Note that testing paint samples for heavy metals is intended to determine the possibility that heavy metal dust may be created during a maintenance project. current OSHA requirements are limited to air and blood testing which cannot be determined until dust generating work is performed during such a project. New coatings are required to have no more than 0.009% lead content according to federal regulations. Federal regulations in the past determined that for residential conditions, 0.06% was the limit for lead content in a newly applied coating. Any coating sample testing equal or higher for lead may require special consideration during coating removal. We have continued to use this rule of thumb for lead on industrial work since we are working with existing coating removal and disposal. Based on past projects we have used the amount of 0.01% as a limit for chromium. Coatings that test below these limits for lead (0.06%) and chromium (0.01%) are unlikely to trigger worker safety or environmental concerns.

GENERAL INFORMATION:

The original construction date is unknown. The tank has a height to low-water level of 101 feet.

CONDITIONS AND RECOMMENDATIONS:

EXTERIOR COATING CONDITIONS:

It is not known when the exterior was last painted. The coating applied was an aluminum alkyd system. The coating is in fair to poor condition overall. The coating is beginning to chalk and fade and there is loss of gloss. Surfaces have faded due to exposure to ultraviolet light which is a normal occurrence for an exterior coating system.

The riser, leg, and bowl coating are in fair condition with a few failures. Primary methods of deterioration are spot failures to the substrate with rust undercutting, delaminated topcoat, and erosion.

The coating on the balcony, sidewall, and roof is in poor condition with extensive failures. Primary methods of deterioration are spot failures to the substrate with rust undercutting, rust bleedthrough, delaminated topcoat, and erosion.

Coating samples were taken during the inspection and tested for heavy metals. The coating tested at 20 percent lead by weight and 1.1 percent chromium by weight. Special considerations will be needed during maintenance to avoid contamination of workers and prevent the generation of hazardous waste.

EXTERIOR COATING RECOMMENDATIONS:

Budget for total exterior coating removal and repainting in approximately one to two years. Fading will continue and more coating failures will occur decreasing the tank's aesthetic appearance. Total removal is recommended because the coating failures are extensive and it is not practical to attempt to spot repair all failed areas.

Remove the existing coating by dry abrasive blast cleaning the steel to a commercial (SSPC-SP6) condition and apply a urethane system. All blast work would be performed inside a dust tight containment system using negative air pressure.

Since the existing coating contains heavy metals, during abrasive blast cleaning procedures the waste generated may be considered hazardous waste and groundwater leachable. In addition, the airborne particulate of spent abrasive and heavy metal bearing coating may be considered a threat to public health, not only to workers, but also to pedestrians, houses, and business owners in the immediate vicinity. Special provisions in project specifications will be necessary to address hazardous waste, worker safety, and environmental concerns. We recommend the exterior, wet, and dry interior be completed at the same time because the wet and dry interior also has a heavy metal bearing coating. There would be some economy-of-scale to remove all heavy metal bearing coating at the same time.

The coating system would consist of a full prime coat on the bare metal, a full coat of epoxy, and followed by two full coats of urethane. The urethane system offers excellent abrasion resistance with high gloss and sheen retention. The life expectancy of this system is fifteen years. The system can be overcoated in fifteen years, and a second time approximately fifteen years after the first overcoat, extending the total life of the coating to approximately forty-five years before total removal would be necessary. The tank would be removed from service during the coating project. This is necessary to reduce condensation on the tank's surface. Urethane coatings have a minimum temperature requirement for application and are sensitive to moisture during the curing process. If moisture is present during the curing process, the appearance will become cloudy with little or no gloss. The estimated cost is $350,000.

DRY INTERIOR COATING CONDITIONS:

The dry interior on this tank is defined as the non-water contact surfaces consisting of the riser. It is not known when the dry interior was last painted. The coating is an unknown system.

The coating is in poor condition overall. Primary methods of deterioration are spot failures to the substrate with rust undercutting and delaminated topcoat.

Coating samples were taken during the inspection and tested for heavy metals. The coating tested at 0.0023 percent lead by weight and below the reporting limit for chromium. These are trace levels that should not generate a hazardous waste during future abrasive blast cleaning.

DRY INTERIOR COATING RECOMMENDATIONS:

Abrasive blast clean the entire dry interior to a commercial (SSPC-SP6) condition and apply an epoxy system. The existing coating is in poor condition and has deteriorated to the point where complete removal and repainting is necessary. The work should be performed with an exterior/wet interior painting project. The estimated cost is $30,000.

WET INTERIOR COATING CONDITIONS:

It is not known when the wet interior was last painted. The coating applied was an unknown system.

The roof coating is in poor condition with numerous failures. Primary methods of deterioration are spot failures to the substrate with rust undercutting and rust bleedthrough.

The sidewall coating is in poor condition with numerous failures. Primary methods of deterioration are spot failures to the substrate with rust undercutting, delaminated topcoat, rust bleedthrough, blisters, and abrasion.

The bowl was covered with sediment that limited the amount of surface visible with the ROV.

The surfaces below the normal operating water level are covered with mineral staining which does not affect the integrity of the coating system.

Coating samples were taken during the inspection and tested for heavy metals. The coating tested at 9.3 percent lead by weight and 0.0025 percent chromium by weight. Special considerations will be needed during maintenance to avoid contamination of workers and prevent generation of hazardous waste.

WET INTERIOR COATING RECOMMENDATIONS:

Budget to repaint the wet interior in one to two years. Abrasive blast clean the entire wet interior to a near-white metal (SSPC-SP10) condition. Wet interior coating systems must be approved for potable water storage tanks contingent upon meeting requirements of NSF/ANSI 61.

Apply a three-coat epoxy system to the prepared surfaces. Epoxy coating systems are recommended in most applications because they have good adhesion and abrasion resistant qualities. The estimated cost is $140,000.

Caulk the roof lap seams after the wet interior is repainted. The caulk will fill the open seams and help prevent corrosion. The estimated cost is $3,000.

CATHODIC PROTECTION CONDITIONS:

There is no cathodic protection system in the wet interior. There are bolted covers on the roof over the access holes for the abandoned roof mounted cathodic protection system. These covers are kept in place with a single bolt. These covers tend to shift creating an opening in the roof. The covers were found to be properly aligned.

CATHODIC PROTECTION RECOMMENDATIONS:

Install cathodic clips and a pressure fitting for future installation of floating type cathodic protection system. The estimated cost is $3,000.

Weld plates over the cathodic lift holes in the roof. The estimated cost is $11,000.

PIT PIPING CONDITIONS:

There is a pit adjacent to the tank that contains piping. The pit has a metal plate covering the top of the pit. The pit was filled with water and the piping was not visible for inspection.

PIT PIPING RECOMMENDATIONS:

Install a sump pump in the pit. The work can be performed by in-house personnel.

SITE CONDITIONS:

Tree branches and vegetation are rubbing and encroaching on the tank. The trees and vegetation would interfere with a containment system. Power lines are attached to the tank and would interfere with a containment system.

SITE RECOMMENDATIONS:

Remove vegetation that is rubbing or encroaching on the tank so it will not interfere with containment. The work can be performed by in-house personnel or obtain a quote from a local landscaper.

Temporarily relocate or protect the power lines that would interfere with containment needed for exterior work. The work would need to be performed by the electric company.

FOUNDATION AND ANCHOR BOLT CONDITIONS:

The exposed concrete foundations are in good to poor condition. There is extensive deterioration with some spalls on the leg foundations. The spalls are significant enough to create a structural problem. The foundations are not coated.

There are anchor bolts evenly spaced around the riser and anchor bolts on each leg. The anchor bolts are in good condition with no deterioration.

FOUNDATION AND ANCHOR BOLT RECOMMENDATIONS:

Coat the foundations to help prevent further deterioration. The cost would be incidental to exterior painting.

Repair spalls on the concrete foundation. Remove all loose and spalled concrete back to sound material by saw cutting then chipping. Replace the damaged concrete with a cementitious patching system. This work should be completed without loading from the tank proper. The estimated cost is $3,000.

GROUT CONDITIONS:

The grout between the steel baseplates and the concrete foundations is in good to fair condition with approximately 2 total lineal feet missing at the legs.

GROUT RECOMMENDATIONS:

The purpose of the grout is to evenly distribute the load onto the foundation and to prevent water from getting between the foundation and the tank. Repair areas of missing or damaged grout between the steel baseplate and the concrete foundation. The cost would be incidental to exterior painting.

GROUNDING CONDITIONS:

There are no grounding wires visible on the tank.

GROUNDING RECOMMENDATIONS:

Install grounding for the tank. The estimated cost is $4,000.

ELECTRIC COMPONENT CONDITIONS:

There is exposed electrical wiring at a damaged junction box on the roof.

ELECTRIC COMPONENT RECOMMENDATIONS:

Repair the damaged junction box on the roof so there are no exposed wires. The work can be performed by in-house personnel.

BALCONY CONDITIONS:

The exterior balcony is a walkway with a railing that surrounds the sidewall. The balcony is in good condition overall. The balcony is 30 inches wide with a 36 inch high handrail. The handrail consists of diagonal angles and a 3 inch kick plate at the balcony floor. The balcony railing does not conform to current OSHA requirements. The railing height is undersized.

The balcony does not contain enough drainage holes and there is evidence of water ponding on the walkway.

There is an opening in the balcony railing at the leg ladder. There is no swing gate at the leg ladder opening in the balcony railing.

BALCONY RECOMMENDATIONS:

Disclaimer:
OSHA currently requires railings to be 42 inches tall with a 4 inch kickplate. Unless we feel balconies are unsafe, it is our opinion that if the balconies were built to code at the time of construction including the railing height and style, they do not require replacement. Codes can change regularly making compliance expensive and impractical. However, it is our responsibility to inform you of this possible deficiency.

Drill drainage holes in the balcony walkway. The cost would be incidental to exterior painting.

Install a swing gate at the leg ladder opening in the balcony railing. The estimated cost is $3,000.

ROOF HANDRAIL, PAINTER'S RAILING, AND ROOF RIGGING CONDITIONS:

The tank does not have a roof handrail or a painter's railing.

There are roof rigging couplings for fall prevention lines and staging lines during wet interior coating work. The rigging couplings are in good condition.

ROOF HANDRAIL, PAINTER'S RAILING, AND ROOF RIGGING RECOMMENDATIONS:

Install an OSHA compliant railing on the roof to meet current EGLE requirements. The railing would allow tie off locations during routine vent screen inspections and would provide a safe work area for retrieval personnel performing a roof extraction. Install a painter's railing outside the railing. The estimated cost is $18,000.

ANTENNA CONDITIONS:

There are five antennas and miscellaneous antenna equipment attached to balcony railing. The antenna cable routing is in good condition and does not interfere with climbing or tank operations.

ANTENNA RECOMMENDATIONS:

Remove all antennas and antenna cables prior to abrasive blast cleaning and repainting. The cost is assumed to be the responsibly of the antenna owners.

SWAY ROD AND BOWL SAFETY CONDITIONS:

There are sway rods and struts that connect between the legs. The rods are intended to keep the legs aligned and are equipped with turnbuckles for adjusting tension. The sway rods and struts are in good condition. Because of the inaccessibility of the upper sway rods the tension could not be determined at every bay. However, based on the accessible bay at ground level it appears that some of the rods are not in proper tension as designed.

There are riser tie rods that extend from each leg to the riser. The rods are bolted to a welded angle on the riser. The rods help keep the legs and riser in alignment. The riser tie rods are in good condition.

There are rigging couplings under the bowl for fall prevention line attachments during exterior coating. The rigging couplings appear to be in good condition.

SWAY ROD AND BOWL SAFETY RECOMMENDATIONS:

Tighten the loose sway rods. The upper sway rod bays were not inspected for tightness, the actual number of loose rods will need to be determined during the next rehabilitation project once the contractor rigs the tank. The estimated cost is $3,000.

OVERFLOW PIPE CONDITIONS:

The overflow pipe exits the upper sidewall, extends along the sidewall through the balcony, and down along a leg to ground level. The overflow pipe discharge is horizontal.

The discharge end of the overflow pipe is screened. The screen is in good condition but is oversized. The end of the pipe is equipped with a solid flap gate that is in good condition. The pipe discharges to a concrete splash pad. The air gap meets the required 12 to 24 inches. The discharge area is in good condition.

OVERFLOW PIPE RECOMMENDATIONS:

Modify the overflow pipe discharge so it points downward to bring it into compliance with current EGLE requirements. Reinstall a flap gate or install a duck bill check valve at the discharge. The estimated cost is $5,000.

Replace the screen at the overflow pipe discharge to meet current EGLE requirements for screen size. This would be a temporary repair until the overflow discharge can be modified to fully meet EGLE requirements. The work could be performed by in-house personnel.

HATCH AND MANWAY CONDITIONS:

There is a 24 inch diameter roof hatch to the wet interior that is in good condition. The hinged cover is in good condition. There is no handhold next to the hatch to aid the climber while entering and exiting the opening. The hatch was secured with a pin. The hatch neck curb height meets the minimum height requirement of 4 inches. The hatch cover lip meets the minimum height requirement of 2 inches. There is a gasket on the hatch that is in good condition.

There is a service door in the riser that is in good condition. The door operated properly during the inspection.

HATCH AND MANWAY RECOMMENDATIONS:

Replace the wet interior roof access hatch with a new 30 inch diameter hatch to meet current EGLE requirements. Average rescue baskets will not pass through the existing hatch. The estimated cost is $4,000.

Install a handhold at the wet interior roof hatch. The handhold would assist the climber while entering and exiting the opening. The cost would be incidental to the next painting project.

VENT CONDITIONS:

The roof vent is a flow-through design that is in fair condition. The screen is damaged resulting in holes that are large enough to allow birds or insects to enter the wet interior, though there was no evidence of entry.

VENT RECOMMENDATIONS:

Replace the roof vent with a screened pressure vacuum vent to meet current EGLE requirements. The new vent would have a movable plate that would allow air to flow in and out of the tank even if the screens become plugged or frosted over. The vent would have a rain shield to prevent rainwater from entering the storage tank during high winds. The estimated cost is $8,000.

LADDER CONDITIONS:

The exterior leg ladder starts 9 feet above the ground and extends up to the balcony. The ladder does not meet current OSHA size requirements. The leg ladder is equipped with a rail-type fall prevention device that is in good condition. There is a vandal guard on the leg ladder that is in good condition.

There is a revolving sidewall/roof ladder that follows the curve of the roof to the center near the vent. The ladder is in good condition. The ladder does not meet current OSHA size requirements. The ladder is equipped with a rail-type fall prevention device that is misaligned and the glide cannot pass. The revolving ladder attaches around the vent pipe in the center of the roof and the connection point is in good condition.

There is no ladder in the dry interior.

There is no ladder in the wet interior.

LADDER RECOMMENDATIONS:

Disclaimer:
Unless DIXON feels ladders are unsafe, it is our opinion that if they were built to code at the time of construction, they do not require replacement. The code changed three times in the late 80's and early 90's and it seems excessive to replace ladders each time. However, it is our responsibility to inform you of this possible deficiency.

Replace the revolving roof/sidewall ladder with a vertical sidewall ladder that runs up to a step-off platform. The platform would have a handrail that would extend around the roof hatch. The step-off platform and railing will provide a safer working area at the roof hatch. The estimated cost is $16,000.

Current EGLE requirements state that the ladder is to start 12 feet above the ground. Since the ladder is properly secured with a vandal guard it may be possible that acceptance may be granted for this non-compliance item.

Install a dry interior ladder that is equipped with a fall prevention device. The estimated cost is $20,000.

Install a wet interior ladder that is equipped with a fall prevention device. The estimated cost is $11,000.

FILL/DRAW PIPE CONDITIONS:

The majority fill/draw pipe was not visible for inspection.

There is no sample tap on the piping in the riser. There is a threaded coupling on the piping for future attachment of a chemical feed line.

FILL/DRAW RECOMMENDATIONS:

Install a sample tap on the piping to meet current EGLE requirements. The estimated cost is $2,000.

EXPANSION JOINT CONDITIONS:

The fill/draw pipe appears to be equipped with an expansion joint located in the bottom of the riser. The expansion joint is covered with insulation and is not accessible for inspection.

EXPANSION JOINT RECOMMENDATIONS:

A glandular style of expansion joint can seize if corrosion forming at the joint stops the joint from moving as designed. If the expansion joint seizes it cannot take up the longitudinal movement of the fill/draw pipe and the tank bottom will flex to compensate for this movement. With enough flexing, the weld at the tank bottom could crack and cause a leak. The type of joint should be verified. If it is determined to be a glandular expansion joint, then replace it with a bellows type joint. The estimated cost is $15,000.

INSULATION CONDITIONS:

The visible portion of the fill/draw pipe is covered with rigid foam insulation. The insulation is covered with a paper cover. The insulation and cover are in poor condition.

INSULATION RECOMMENDATIONS:

Remove the fill/draw pipe insulation, abrasive blast clean and repaint the pipe, and install new insulation with an aluminum jacket. The estimated cost is $15,000.

WET INTERIOR METAL CONDITIONS:

The steel tank is in good condition overall. No pitting was observed at the coating failures on the sidewall.

The interior roof is supported by radial stiffeners that are in good condition with moderate corrosion in the crevices and on top of the flanges.

There is a horizontal stiffener located at the upper sidewall. The stiffener is in good condition.

ANALYTICAL LABORATORY REPORT

Tuesday, October 14, 2025

CUSTOMER: Dixon Engineering
4811 S. 76th St. Ste 109
Greenfield, WI 53220

DATE RECEIVED: Friday, September 26, 2025
PO/PROJECT #: MI025KSM-6726
SUBMITTAL #: 2025-10-01-005

LAB NUMBER: AD33046

Sampled By: Josh Grover
Job Location: Ontonagon, MI 250,000 Double Ellipse 22-66-01-03
Sample Identification: exterior leg

Date Sampled: 9/25/25
Sample Description: paint chips

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)
Analysis Method: EPA 6010D-M (ICP-AES Method for Determination of Metals)
Date Analyzed: Monday, October 13, 2025

ELEMENT	RESULT (by dry weight)	REPORTING LIMIT (RL)
Chromium	**1.1 %**	0.0013 %
Lead	**20 %**	0.0013 %

LAB NUMBER: AD33047

Sampled By: Josh Grover
Job Location: Ontonagon, MI 250,000 Double Ellipse 22-66-01-03
Sample Identification: wet interior roof

Date Sampled: 9/25/25
Sample Description: paint chips

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)
Analysis Method: EPA 6010D-M (ICP-AES Method for Determination of Metals)
Date Analyzed: Monday, October 13, 2025

ELEMENT	RESULT (by dry weight)	REPORTING LIMIT (RL)
Chromium	**0.0025 %**	0.0013 %
Lead	**9.3 %**	0.0013 %

LAB NUMBER: AD33048

Sampled By: Josh Grover
Job Location: Ontonagon, MI 250,000 Double Ellipse 22-66-01-03
Sample Identification: dry interior riser

Date Sampled: 9/25/25
Sample Description: paint chips

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)
Analysis Method: EPA 6010D-M (ICP-AES Method for Determination of Metals)
Date Analyzed: Monday, October 13, 2025

ELEMENT	RESULT (by dry weight)	REPORTING LIMIT (RL)
Chromium	**< RL**	0.0013 %
Lead	**0.0023 %**	0.0013 %

DIXON ENGINEERING, INC.

STEEL TANK FIELD INSPECTION REPORT

LEGGED TANK

DATE: **September 25, 2025**

OWNER: **Village of Ontonagon**
CLIENT CODE: **22-66-01-03**
LOCATION: Address: **92 Maple Street**
City: **White Pine**
State: **Michigan**
TANK SIZE: Capacity: **250,000 gallons**
Tank diameter: **42 feet (measured)**
Bottom (LWL): **101 feet (measured)**
Sidewall height from the balcony to top of wall: **14 feet**
CONSTRUCTION: **Welded**
Type: **Double ellipse**
YEAR CONSTRUCTED: **Unknown**
MANUFACTURER: **Unknown**
CONTRACT NUMBER: **Unknown**
USE: **Potable water and fire protection**

COATING HISTORY	EXTERIOR	WET INTERIOR	DRY INTERIOR
YEAR COATED	**Unknown**	**Unknown**	**Unknown**
CONTRACTOR	**Unknown**	**Unknown**	**Unknown**
SYSTEM	**Aluminum Alkyd**	**Unknown**	**Unknown**
SURFACE PREPARATION	**Unknown**	**Unknown**	**Unknown**
MANUFACTURER	**Unknown**	**Unknown**	**Unknown**
HEAVY METAL COATING SAMPLES	**Yes**	**Yes**	**Yes**
HEAVY METAL BEARING	**Yes 20% lead 1.1% chromium**	**Yes 9.3% lead 0.0025% chromium**	**Yes 0.0023% lead**

PERSONNEL: ROV/Drone operator **Josh Grover**, Crew member **Michael Sedlmayer**
METHOD OF INSPECTION: **ROV**

SITE CONDITIONS

Fenced: **No**
Site large enough for contractor's equipment: **Yes**
Control building: **No**
Antenna control site: **No**
Power lines within 50 feet: **Yes (estimated distance 30 feet)**
    Are power lines attached to the structure: **Yes**
    Would power lines interfere with containment: **Yes**
Site drainage: **Away from the tank**
Indications of underground leakage: **No**
Vegetation, tree, etc. encroachment: **Yes**
    Rubbing on the tank: **Yes**
    Would there be interference with future containment: **Yes**

EXPOSED PIPING

Location: **Adjacent to the tank (in a pit)**
Condition of structure: **Good**
    Structure is: **Wet**
    Sump pump present: **No**
    Drain line present: **No**
Cover condition: **Good**
    Locked: **No**
Piping comments: **The pit is full of water**

FOUNDATION

Riser:

Foundation exposed: **Yes**
Exposed height: **0-1 inches**
Exposed foundation condition: **Good**
Damage or deterioration: **No**
Foundation coated: **No**
Type of baseplate gap filler: **Grout**
    Condition: **Good**
        Amount missing: **0 feet**
Undermining of foundation: **No**

Legs:

Foundations exposed: **Yes**
Exposed height: **0-7 inches**
Exposed foundation condition: **Good to poor**
Damage or deterioration: **Yes**

FOUNDATION

Type of damage: **Spalls**
Severity: **Moderate**
Total spall area: **6 square feet (6 square feet need repair)**
Foundation coated: **No**
Type of baseplate gap filler: **Grout**
Condition: **Fair**
Amount missing: **2 feet**
Undermining of foundation: **No**
Leg foundation comments: **One entire foundation is spalled**

EXTERIOR COATING

Legs:

Number: **6**
Type: **Tubular**
Dimensions: **20 inches**
Topcoat condition: **Fair**
Previous coat/system condition: **Fair**
Describe coating: **Fading, delaminating, spot coating failures to substrate**
Dry film thickness: **3-6 mils**
Metal condition: **Good**
Leg comments: **There are approximately fifty spot coating failures on the lower legs and baseplates, several random throughout that are up to ½ inch diameter**

Riser:

Type: **Dry**
Diameter: **6 feet**
Topcoat condition: **Fair**
Previous coat/system condition: **Fair**
Describe coating: **Fading, spot coating failures to substrate, erosion**
Mildew growth: **No**
Dry film thickness: **5-8 mils**
Metal condition: **Good**
Bottom shell steel thickness: **0.320 inch**
Riser comments: **There are approximately thirty spot coating failures with five up to 2 inch diameter and the rest are ¾ inch diameter or less**

Bowl:

Topcoat condition: **Fair**
Previous coat/system condition: **Fair**

EXTERIOR COATING

Describe coating: **Fading, delaminating, spot coating failures to substrate, rust undercutting**
Mildew growth: **No**
Metal condition: **Good**

Sidewall:

Lettering: **No**
Logo: **No**
Topcoat condition: **Poor**
Previous coat/system condition: **Poor**
Describe coating: **Fading, delaminating, spot coating failures to substrate, rust undercutting, erosion, rust bleedthrough**
Dry film thickness: **4-7 mils**
Metal condition: **Good**
Sidewall comments: **There are extensive coating failures**

Roof:

Topcoat condition: **Poor**
Previous coat/system condition: **Poor**
Describe coating: **Fading, delaminating, spot coating failures to substrate, rust undercutting, erosion, rust bleedthrough**
Dry film thickness: **8-15 mils**
Metal condition: **Good**
Roof comments: **There are extensive coating failures**

EXTERIOR APPURTENANCES

Riser Door:

Size: **30 x 60 inches**
Cover attachment: **Hinged**
Metal condition: **Good**

Anchor Bolts:

Number of bolts per leg: **2**
Diameter: **1 ¾ inches**
Metal condition: **Good**
Number of riser bolts: **4**
Diameter: **1 inch**
Metal condition: **Good**

EXTERIOR APPURTENANCES

Grounding (for the tank not equipment):

N/A

Overflow Pipe:

Diameter: **6 inches**
Metal condition: **Good**
Discharge orientation: **Horizontal**
Screen condition: **Good**
Percent of screen open: **100**
Mesh size: **4**
Flap gate at the discharge: **Yes**
Type: **Solid**
Condition: **Good**
Air gap: **Yes**
Lowest part of discharge to the ground distance: **20 inches**
Height to elbow: **28 inches**
Overflow discharges to: **Concrete splash pad**
Condition: **Good**

Sample Tap:

N/A

Threaded Coupling (for chemical feed on the piping):

Location: **In the dry riser**
Condition: **Good**

Leg Ladder:

Height to start of ladder: **9 feet**
Toe clearance: **7 inches or greater**
Width of rungs: **Less than 16 inches**
Thickness of rungs: **⅝ inch**
Shape of rungs: **Round**
Metal condition: **Good**
Fall prevention device: **Yes**
Type: **Rail**
Function properly: **Yes**
Cage: **Yes**
Diameter: **24 inches**
Vandal guard: **Yes**
Condition: **Good**

EXTERIOR APPURTENANCES

Step off platform: **No**
Ladder comments: **The cage is only on the bottom 5 feet above the vandal guard**

Struts and Rods:

Number of bays: **3**
Sway rod metal condition: **Good**
Loose rods: **Yes**
Number of loose rods: **6**
Strut metal condition: **Good**
Riser tie rod metal condition: **Good**
Connection to riser: **Welded angle**

Bowl Rigging Couplings:

Number: **3**

Balcony:

Balcony width: **30 inches**
Railing height: **36 inches**
Midrail style: **Diagonals**
Kickplate height: **3 inches**
Vertical post type: **Angle**
Size: **2 x 2 inches**
Top rail type: **Angle**
Size: **2 x 2.5 inches**
Opening for ladder access: **Yes**
Location: **Handrail**
Size: **16 inches**
Handhold at opening: **Yes**
Opening security: **None**
Coating condition: **Poor**
Describe coating: **Fading, delaminating, spot coating failures to substrate, rust undercutting, erosion, rust bleedthrough**
Metal condition: **Good**
Evidence of water ponding: **Yes**
Balcony comments: **There are extensive coating failures**

Antennas:

Balcony number: **5**
Attached to: **Railing**

EXTERIOR APPURTENANCES

Cable runs: **Along the balcony railing**

Antenna or cable interference: **No**

Sidewall/Roof Ladder:

Design: **Revolving**
Metal condition: **Good**
Toe clearance: **7 inches or greater**
Width of rungs: **Less than 16 inches**
Thickness of rungs: **⅝ inch**
Shape of rungs: **Round**
Fall prevention device: **Yes**
Type: **Rail**
Function properly: **No, rail is misaligned**
Cage: **No**

Step-off Platform:

N/A

Roof Handrail:

N/A

Painter's Railing:

N/A

Roof Rigging Points:

Number: **32**
Couplings covered: **Yes**
Covered with: **Plugs**
Metal condition: **Good**

Removable Cathodic Covers:

Number: **22**
Metal condition: **Good**
Aligned: **Yes**

Wet Interior Roof Hatch:

Neck size: **24 inches**
Shape: **Round**
Handhold at opening: **No**
Curb height: **7 inches**

EXTERIOR APPURTENANCES

Cover overlap: **2 inches**
Gasket on cover/neck curb: **Yes**
Hatch security: **Pin**
Metal condition: **Good**

Bolted Ventilation Hatch:

N/A

Roof Vent:

Distance from center of the tank (to outer edge): **14 feet**
Type: **Flow-through**
Neck diameter: **16 inches**
Vertical screen condition: **Poor**
Mesh size: **4**
Rain shield: **Yes**
Height of the lowest opening above the roof: **7 inches**
Metal condition: **Good**

Aviation Lights:

N/A

Electric Conduit:

Electrical conduit condition: **Good**
Exposed wiring: **Yes**
Location: **Near the wet hatch**

DRY INTERIOR COATING

Riser:

Diameter: **6 feet**
Coating condition: **Poor**
Describe coating: **Delaminating, spot coating failures to substrate, rust undercutting**
Dry film thickness: **4-8 mils**
Metal condition: **Good**
Floor material: **Steel**
Coating condition: **Poor**
Riser comments: **Drop ceiling 5 feet up with no ladder. The bottom area is heated**

WET INTERIOR COATING

Roof:

Topcoat condition: **Poor**
Primer coating condition: **Poor**
Describe coating: **Spot coating failures to substrate, rust undercutting, rust bleedthrough**
Metal condition: **Good**
Lap seams: **Open**
Condition of lap seams: **Fair**

Sidewall:

Topcoat condition: **Poor**
Primer coating condition: **Poor**
Describe coating: **Spot coating failures to substrate, rust bleedthrough, blisters, erosion/abrasion**
Mineral deposits: **Moderate**
Metal condition: **Good**
Active pitting: **No**
Previous pitting: **No**

Tank Bottom:

Completely covered in sediment, not inspected with the ROV

WET INTERIOR APPURTENANCES

Ladder:

N/A, there are remnants of an old damage ladder

Cathodic Protection:

N/A
Clips: **No**
Pressure fitting: **No**

Roof Stiffeners:

Radial:
Number: **12**
Dimensions: **3 x 5 inches**
Shape: **Angle**
Connections: **Bolted, welded**
Ring Stiffener:
Number: **1**
Shape: **Angle**

WET INTERIOR APPURTENANCES

Connections: **Bolted, welded**
Coating condition: **Poor**
Metal condition: **Good**

Sidewall Stiffeners:

Horizontal number: **1**
Location: **Top of the sidewall**
Vertical stiffeners: **Yes**
Coating condition: **Poor**
Metal condition: **Good**

Overflow Pipe Inlet:

Type: **Weir box**
Metal condition: **Good**
Overflow pipe inlet comments: **The weir box is external**

Fill/Draw Pipe (could not inspect with ROV):

Fill/draw pipe comments: **The water was too cloudy, could not see to inspect**

Mixer:

N/A

Field Inspection Report is prepared from the contractor's viewpoint. It contains information the contractor needs to prepare his bid for any repair or recoating. The engineer uses it to prepare the engineering report. Cost estimates are more accurate if the contractor's problems can be anticipated. While prepared from the contractor's viewpoint, the only intended beneficiary is the owner. These reports are completed with diligence, but the accuracy is not guaranteed. The contractor is still advised to visit the site.

250,000 gallon double ellipse elevated water storage tank located in White pine, Michigan and owned by the Village of Ontonagon, Michigan.

1) Tree branches and vegetation are rubbing and encroaching on the tank.

2) Same.

3) The concrete riser foundation is in good condition with no significant deterioration.

4) The grout between the steel riser baseplate and concrete foundation is intact.

5) The riser anchor bolts are in good condition.

6) There are a few coating failures on the riser.

7) Same.

8) The riser coating is in fair condition overall.

9) The riser tie rods are in good condition.

10) The concrete leg foundations are in fair to poor condition with moderate deterioration.

11) Same.

12) There is missing grout between the steel leg baseplates and concrete foundations.

13) The leg anchor bolts are in good condition.

14) There are a few coating failures on the legs.

15) Same.

16) Same.

17) Same.

18) Same.

19) The leg coating is in fair condition overall.

20) Same.

21) There are coating failures on the struts.

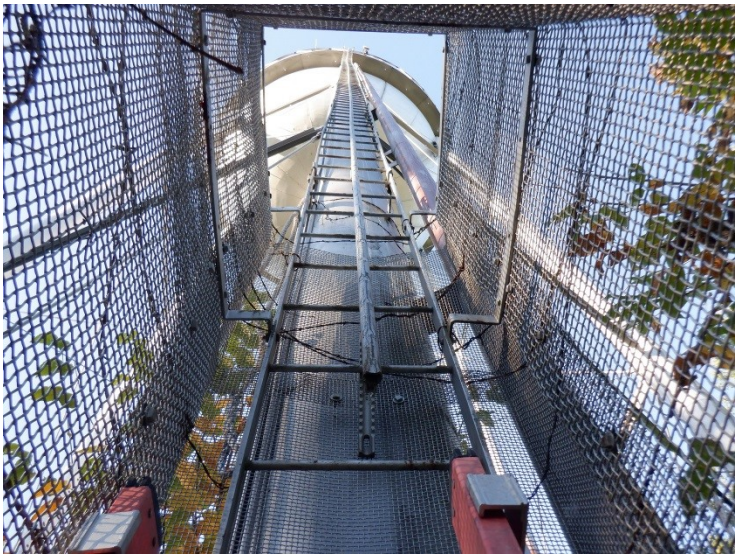
22) The sway rods are in good condition.

23) The overflow pipe discharges to a concrete splash pad.

24) The solid flap gate at the overflow pipe discharge operated properly.

25) The screen at the overflow pipe discharge is intact but oversized.

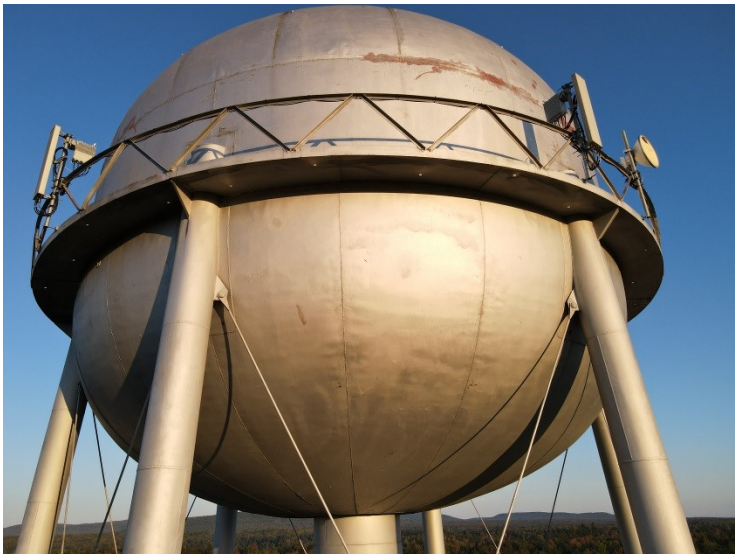
26) The vandal guard on the leg ladder is in good condition.



27) The leg ladder is in good condition. The ladder is equipped with a fall prevention device.

28) The bowl coating is in fair condition with a few failures.

29) Same.



30) Same.

31) Same.

32) Same.

33) There is not a swing gate across the leg ladder opening in the balcony railing.

34) There is evidence of water ponding on the balcony.

35) There are numerous coating failures on the balcony.

36) The sidewall coating is in poor condition with numerous failures.

37) Same.

38) Same.

39) Same.

40) Same.

41) Same.

42) Same.

43) The sidewall/roof ladder is in good condition.

44) Same.

45) The fall prevention device on the sidewall/roof ladder is misaligned and the glide cannot pass.

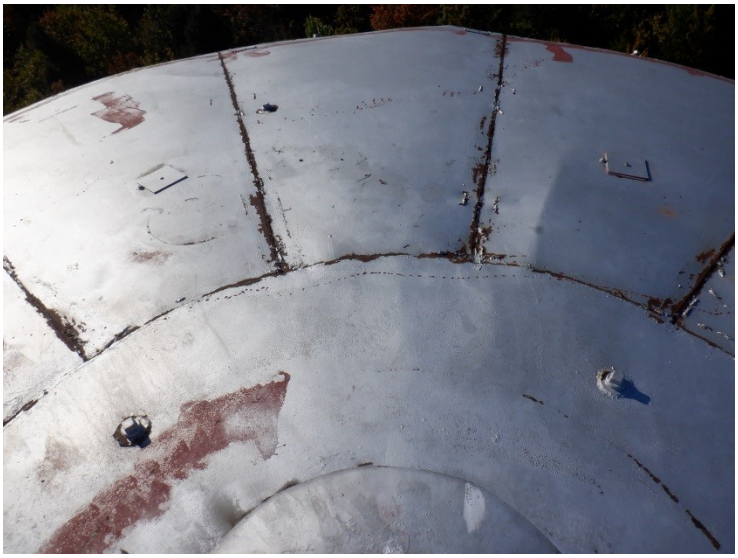
46) There is a gasket on the wet interior roof hatch.

47) There is exposed wiring at a damaged junction box on the roof.

48) The roof coating is in poor condition with numerous failures.

49) Same.

50) Same.



51) Same.

52) Same.

53) Same.

54) The cathodic lift holes on the roof were found to be properly aligned.

55) The roof rigging couplings are properly capped.

56) The roof vent is in fair condition.

57) The roof vent screen is damaged.

58) The service door in the riser operated properly. There is no ladder in the dry interior riser.

59) The expansion joint on the bottom of the fill/draw pipe in the riser is covered with insulation and not accessible for inspection.

60) The dry riser coating is in poor condition with numerous failures.

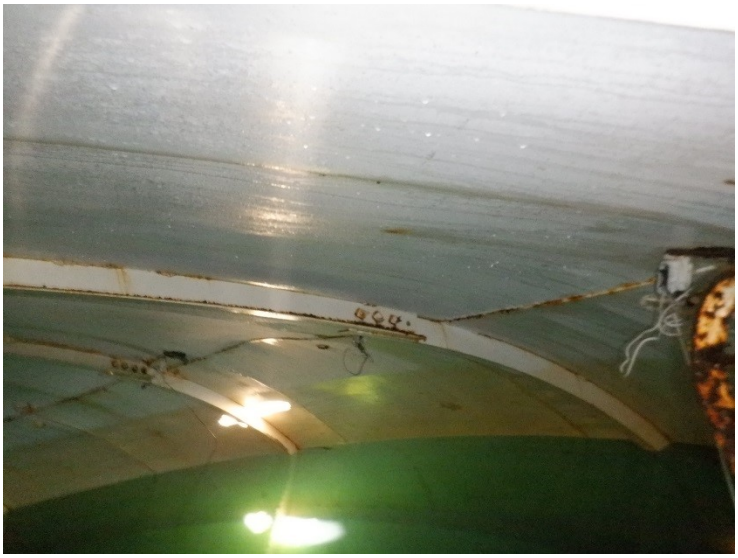
61) There are remnants of an old damaged wet interior ladder.

62) The wet interior roof coating is in poor condition with numerous failures.

63) Same.

64) Same.

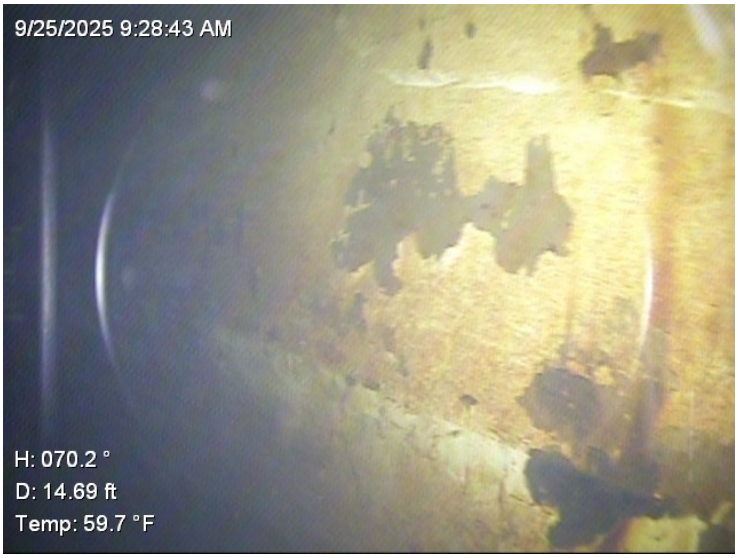
65) Same.



66) Same.

67) The wet interior sidewall coating is in poor condition with extensive failures.

68) Same.



69) Same.

70) Same.

71) The sidewall stiffener is in good condition.

72) The bowl is covered with sediment that limited the amount of surface visible with the ROV.

73) Same.

74) The metal plate over the pit is in good condition.

75) The pit was filled with water and the piping was not visible for inspection.