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Staff Report

Operations – Water & Wastewater Services

Report To: **COW - Operations, Planning and Building Services**
Meeting Date: March 18, 2025
Report Number: OPS.25.017
Title: Happy Valley Reservoir Budget Increase
Prepared by: Allison Kershaw, Manager of Water & Wastewater Services

A. Recommendations

THAT Council receive Staff Report OPS.25.017, entitled "Happy Valley Reservoir Budget Increase";

AND THAT Council approve increasing the total project budget from the previously approved amount of $150,750 to $550,000 for the Happy Valley Reservoir Improvements.

B. Overview

This staff report is to request a budget increase for the required improvements to the Happy Valley Reservoir cells from $150,750 to $550,000.

C. Background

The drinking water system has (2) two 2500m^3 reservoirs located at 136 Happy Valley Road. A drinking water system best management practices recommend inspecting water reservoirs every 3 to 5 years. These inspections, completed by a submersible remotely operated vehicles, identified the need to undertake some necessary repairs.

D. Analysis

The Town has undertaken inspections of the Happy Valley Reservoirs in 2019 and again 2024. Both inspections identified the need to clean and repair the reservoirs. The internal inspections were completed using a remotely operated vehicle (ROV) which make it difficult to anticipate the severity of the cracks. The cleaning and repairs include removing the sediment accumulated in the tanks and placing the treatment in joints and cracks. The 2019 and the 2024 inspection reports can be found in Attachments 1 and 2.

The 2021 Annual Town Budget included $150,750 for the refurbishment of the Happy Valley Reservoirs. Due to staff availability, Water Staff were not able to complete the tender for completing the work. In 2023 Staff hired a consultant to assist with writing the tender

documents for refurbishment of the reservoirs. This work was tendered early in 2025, and the lowest compliant bid received was $476,225. Including a contingency and the consultant's fee, Staff are requesting a budget increase to a total of $550,000.

The proposed work is to be phased to accommodate water demand and completed during times of lower usage being either the period of April 1, 2025, to June 30, 2025, or September 1, 2025, to December 10, 2025.

E. Strategic Priorities

1. Communication and Engagement

We will enhance communications and engagement between Town Staff, Town residents and stakeholders

2. Organizational Excellence

We will continually seek out ways to improve the internal organization of Town Staff and the management of Town assets.

3. Community

We will protect and enhance the community feel and the character of the Town, while ensuring the responsible use of resources and restoration of nature.

4. Quality of Life

We will foster a high quality of life for full-time and part-time residents of all ages and stages, while welcoming visitors.

F. Environmental Impacts

Ensuring the drinking water is available and safe for the users. All potable water storage facilities should be routinely inspected and maintained at 3–5-year intervals. Preventative maintenance ensures that facilities reach their designed life cycle with minimal downtime and maintenance costs over the life of the asset.

G. Financial Impacts

This work is to be funded from the Water Asset Replacement reserves.

H. In Consultation With

Serena Wilgress, Manager of Purchasing & Risk Management

Michael Switzer, Deputy Treasurer / Manager of Accounting and Budgets

Rob Gilchrist, Water Supervisor

Meg Boyd, Water & Wastewater Compliance & Efficiency Coordinator

I. Public Engagement

The topic of this Staff Report has not been the subject of a Public Meeting and/or a Public Information Centre as neither a Public Meeting nor a Public Information Centre are required. However, any comments regarding this report should be submitted to Allison Kershaw, Manager of Water & Wastewater Services managerwww@thebluemountains.ca .

J. Attached

1. Attachment 1 – Happy Valley Reservoir Inspection Report, 2019
2. Attachment 2 – Visual Inspection of Happy Valley Reservoir, 2024

Respectfully submitted,

Allison Kershaw,
Manager of Water & Wastewater Services

Alan Pacheco
Director of Operations

For more information, please contact:
Allison Kershaw, Manager of Water & Wastewater Services
managerwww@thebluemountains.ca
519-599-3131 extension 226

Report Approval Details

Document Title:	OPS.25.017 Happy Valley Reservoir Budget Increase.docx
Attachments:	- Attachment 1 - Happy Valley Reservoir Inspection Report , 2019.pdf - Attachment 2 - Visual Inspection of Happy Valley Reservoir, 2024.pdf
Final Approval Date:	Mar 7, 2025

This report and all of its attachments were approved and signed as outlined below:

Allison Kershaw - Mar 7, 2025 - 11:49 AM

Alan Pacheco - Mar 7, 2025 - 11:56 AM

Attachment #1

LANDMARK
Elevating Expectations

Happy Valley Reservoir (North and South)
Remotely Operated Vehicle Inspection and Report
July 31, 2019

Landmark Municipal Services
3091 Harrison Court
Burlington, ON CAN L7M 0W4
905.319.7700 Phone
905.319.7706 Fax

www.teamlandmark.com

August 13th, 2019

Town of the Blue Mountains

26 Bridge Street East
P.O. Box 310
Thornbury, ON.
N0H 2P0

Att: **Mr. Scott Hill**

shill@thebluemountains.ca

Tel: 519-599-5287

Re: **LMS Job #LM19048**
Remotely Operated Vehicle Inspection & Report (ROV) – Happy Valley Reservoirs (North and South)

Mr. Hill,

An ROV underwater camera inspection was performed at the above-mentioned potable water storage facility on **July 31st, 2019**. Interior surfaces were inspected with a remotely operated vehicle (ROV).

The ROV unit and tether cable were disinfected in accordance with AWWA-C652-11 Method #2 guidelines (200ppm solution) prior to entry into the tank interior.

The cast-in-place reinforced concrete reservoirs were constructed in the early 1980's and are located at 136 Happy Valley Road, Blue Mountain, ON. There are two (2) Reservoir cells at this facility.

All potable water storage facilities should be routinely inspected and maintained at 3-5 year intervals. Preventative maintenance ensures that facilities reach their designed life cycle with minimal downtime and maintenance costs over the life of the asset.

Below grade concrete reservoirs are not subject to the same thermal movements that structures exposed directly to the weather are. Diagonal cracks are most often found near corners, while vertical cracks appear more frequently along the length of the structure. Generally, both types of cracks are not structural in nature – they're due to volumetric changes in length. These defects have the potential for leaks and contamination, which lead to water quality issues

With careful planning and preparation, routine inspections provide valuable information regarding the causes of deterioration and distress (if applicable). Once identified, the appropriate remedy can be applied thus extending the useful life of the structure and its appurtenances.

A thorough internal inspection of each reservoir including, but not limited to: hatches, ladders, and other appurtenances was performed by the Landmark Municipal Services (LMS) Inspection Crew.

The editing, rendering and reporting was completed by the writer – Dave Baker NACE Certified Coatings Inspector – Level 2, CIP #36124.

Table of Contents:

1) South Reservoir – Summary of Findings / Observations

The South reservoir has a diameter of approximately 70 feet and is approximately 30 feet deep. The reservoir is buried approximately two thirds its depth below grade. The top third of the tank and its roof are not covered with overburden.

A. Tank Environment

High humidity is present above the water line. Sediment levels measured from 2 – 4 cm of lightweight non-organic material along with some granular and other larger material (i.e. silt, flocking).

Photo Reference #: 87 – 96

B. Cell Condition

The exterior concrete surfaces appear to be in good condition with no delamination, exposed wire mesh or reinforcement. There is some exposed aggregate and honey combing within the cell, likely the result of poor vibration technique during the placement, but this is relatively minor in severity.

The exterior side of the wall has many small cracks, as evidenced by efflorescence (calcium carbonate) that has been dissolved out of the concrete and been deposited. Cracks in concrete are normal, and usually represent relief of internal stresses during the curing process. Many times, these cracks are heterogeneously 'healed' by the calcium carbonate itself and do not represent water ingress or leaking. The roof to wall seal appears to be intact.

Photo Reference #: 20 – 59

The interior walls and center column appears to be in good condition, with no large or active cracks and with only moderate mineral staining. There seems to be deterioration of the Tape-Crete material between the wall and floor as well as on the vertical joints, with loose and delaminating slabs of the fine mortar that is embedded within the glass mesh; which is predominantly exposed. To what extent this seam treatment plays in the integrity of this joint is unknown, but this should be investigated further and repaired.

Photo Reference # 69, 70, 73, 78 – 94, 97 – 103

The ceiling appears to be in good condition, with only minor cracking and there are not spalled areas visible.

Photo Reference #: 104 – 111

C. Appurtenances

Venting

There are two (2) 14" diameter stainless steel gooseneck vents on this reservoir which have both coarse and fine screen installed as per the AWWA Ten States Standard. They are enclosed in an aluminum security cage.

Photo Reference #: 48 – 52

Hatches

There is one (1) 48" x 48" aluminum hatch on the roof which is in good condition. There is a locking hasp and padlock installed.

Photo Reference # 60 – 62

Ladders

There is a two-stage aluminum access ladder into the reservoir which is in good condition but does not meet code requirements being only 15" wide (code is 16"). An aluminum platform at the mid-point appears to be in good condition as well, although there is no kickplate installed. There is a cage around this ladder which qualifies as fall arrest according to the Occupational Health and Safety Act and Regulation for Industrial Establishments. All aluminum is mildly oxidized.

Photo Reference #: 62 – 67, 74 – 77

For security reasons there is no fixed access ladder from ground level to the reservoir roof.

Piping

The overflow piping within this reservoir is all stainless steel and appears to be in good condition

Photo Reference #: 70, 77, 101

2) North Reservoir – Summary of Findings / Observations

The North reservoir has a diameter of approximately 70 feet and is approximately 30 feet deep. The reservoir is buried approximately two thirds its depth below grade. The top third of the tank and its roof are not covered with overburden.

D. Tank Environment

High humidity is present above the water line. Sediment levels measured from 2 – 4 cm of lightweight non-organic material along with some granular and other larger material (i.e. silt, flocking).

Photo Reference #: 167 – 170

E. Cell Condition

The exterior concrete surfaces appear to be in good condition with no delamination, exposed wire mesh or reinforcement. There is some exposed aggregate and honey combing on the cell, likely the result of poor vibration technique during the placement, but this is relatively minor in severity.

The exterior side of the wall has many small cracks, as evidenced by efflorescence (calcium carbonate) that has been dissolved out of the concrete and been deposited. Cracks in concrete are normal, and usually represent relief of internal stresses during the curing process. Many times, these cracks are heterogeneously 'healed' by the calcium carbonate itself and do not represent water ingress or leaking. The roof to wall seal appears to be intact.

Photo Reference #: 112 – 136, 141 – 147

The interior wall surface and centre column appears to be in good condition, with no large or active cracks and with only moderate mineral staining.

Photo Reference #: 170 – 176

The ceiling appears to be in good condition, with only minor cracking and there are not spalled areas visible.

Photo Reference #: 184

F. Appurtenances

Venting

There are two (2) 14" diameter stainless steel gooseneck vents on this reservoir which have both coarse and fine screen installed as per the AWWA Ten States Standard. They are enclosed in an aluminum security cage.

Photo Reference #: 137 – 140

Hatches

There is one (1) 48" x 48" aluminum hatch on the roof which is in good condition. There is a locking hasp and padlock installed.

Photo Reference #: 148 – 150

Ladders

There is a two-stage aluminum access ladder into the reservoir which is in good condition and meets code requirements. An aluminum platform at the mid-point appears to be in good condition as well, although there is no kickplate installed. All aluminum is mildly oxidized.

Photo Reference #: 151 – 155

For security reasons there is no fixed access ladder from ground level to the reservoir roof.

Piping

Most of the pipes and fittings within the reservoir are at least moderately corroded, which is to be expected with carbon steel material. A substantial corrosion allowance is usually built in to allow for this, so it should not be considered a failure point at this time.

Photo Reference #: 156 – 166

Summary of Recommendations

The South reservoir should be drained and cleaned for further evaluation within the next 1 to 2 years. Once assessed, all seams should be repaired with modern materials to replace the failing Tape-Crete style joint treatment present and any active cracks should be chemically injected.

The North reservoir should be drained and cleaned for further evaluation within the next 2 to 4 years.

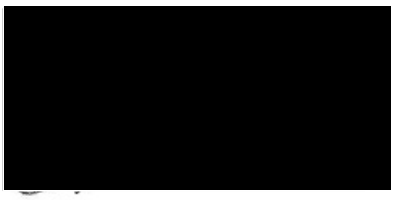
Happy Valley Reservoir

1. Clean and Disinfection – Price per Cell **$ 5,000**
2. Budget Allowance for Chemical Injection – Budget per Cell **$ 25,000**
   - Price assumes $5,000 per day x 5 days
   - Scaffold / access allowance per cell: $7,500
3. Budget pricing for joint treatment / repairs – Budget per Cell **$ 15,000**

Enclosed please find a photographic report of the ROV inspection along with videos of each cell.

Should you have any questions or comments regarding the content of this report, please contact us at 905-319-7700. We look forward to the opportunity of further interaction with The Town of Blue Mountains and thank you for your business.

Yours sincerely,
LANDMARK MUNICIPAL SERVICES



David Baker
NACE Certified Coating Inspector – Level 2, CIP No. 36124

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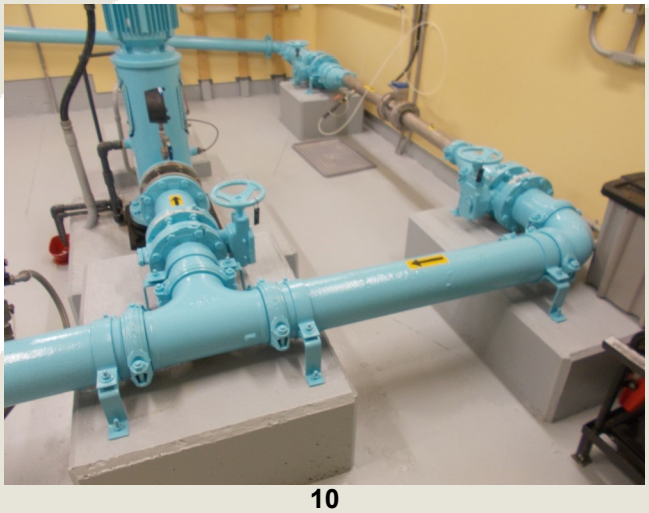

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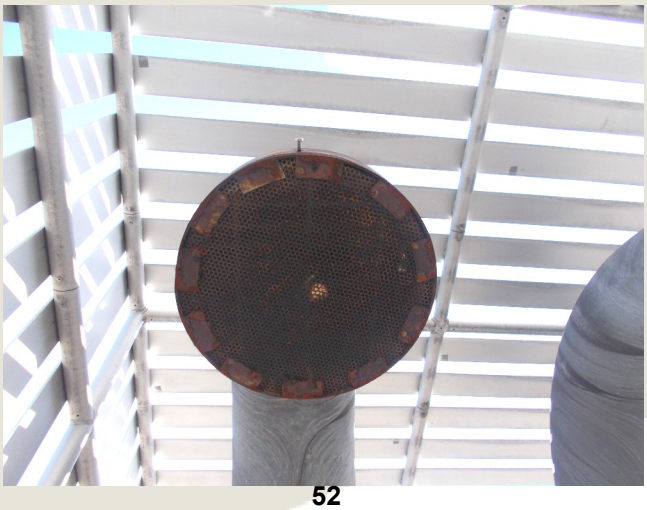

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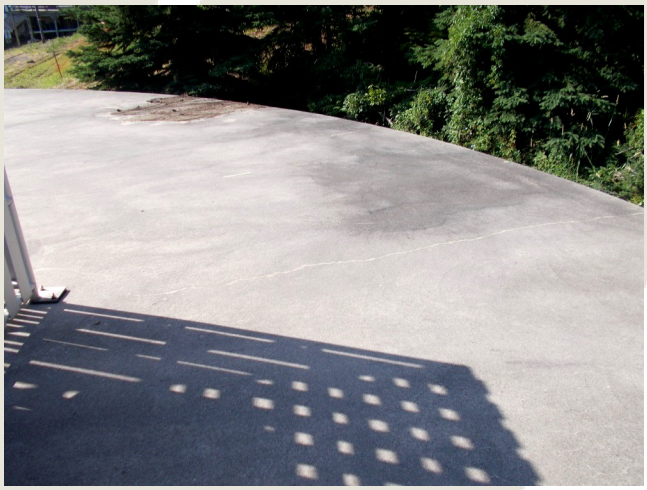

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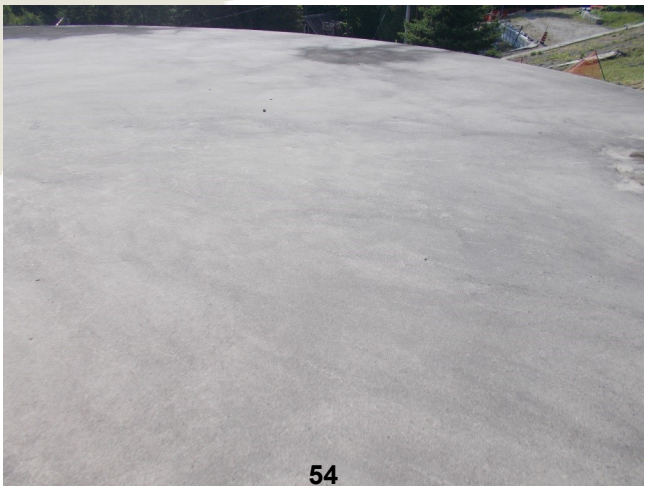

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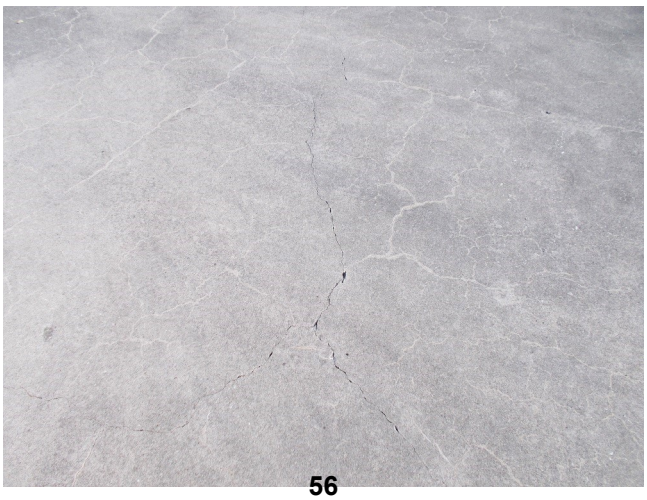

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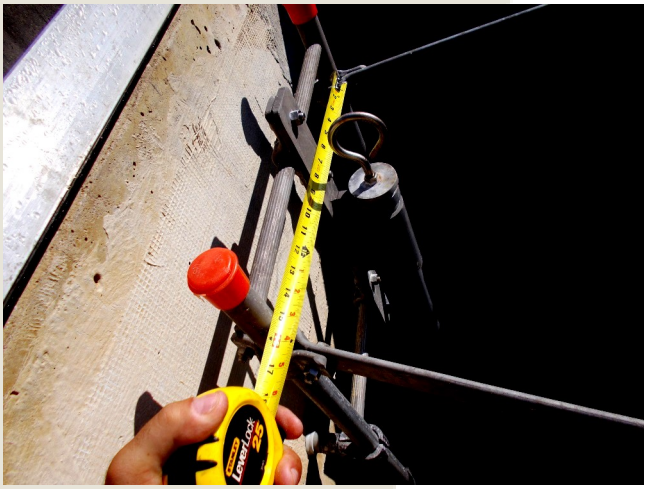

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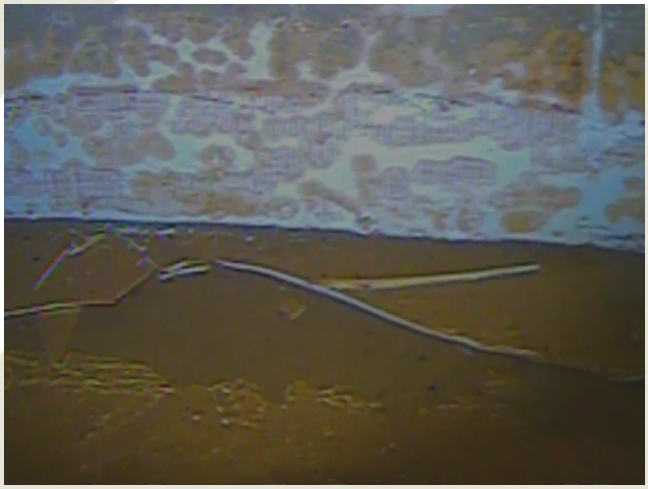

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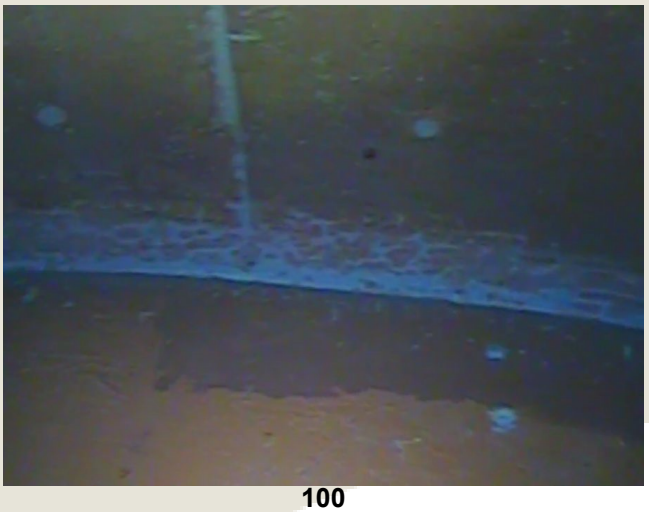

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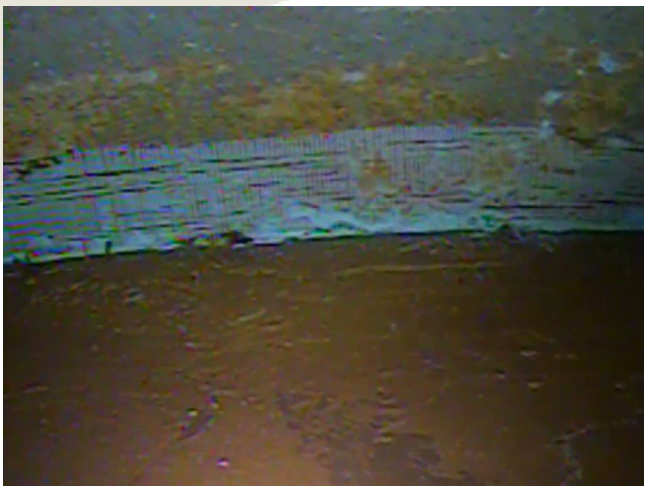

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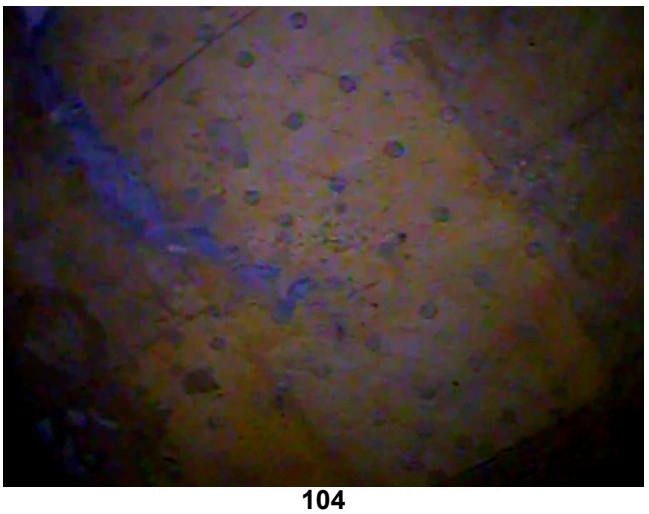

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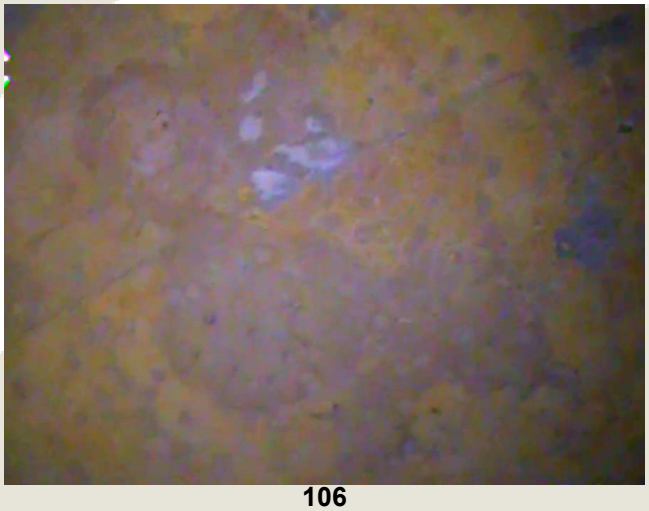

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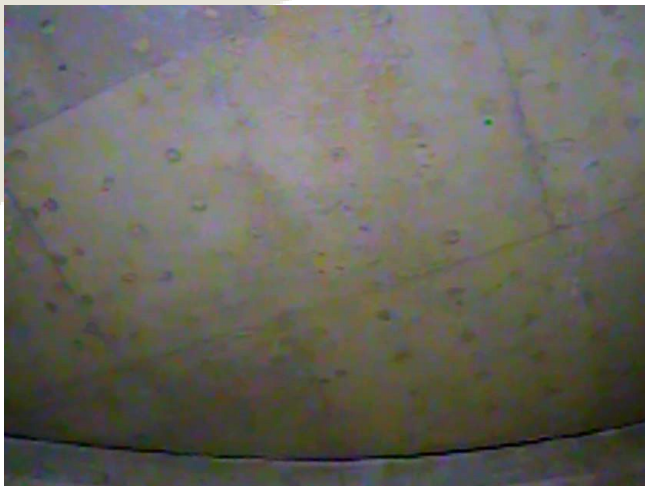

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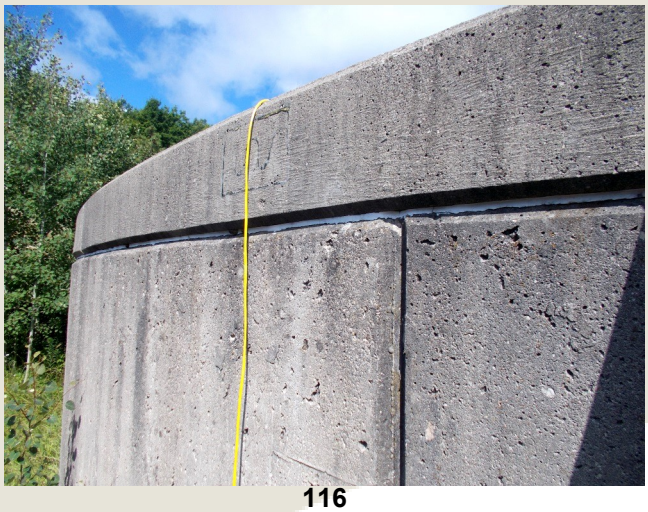

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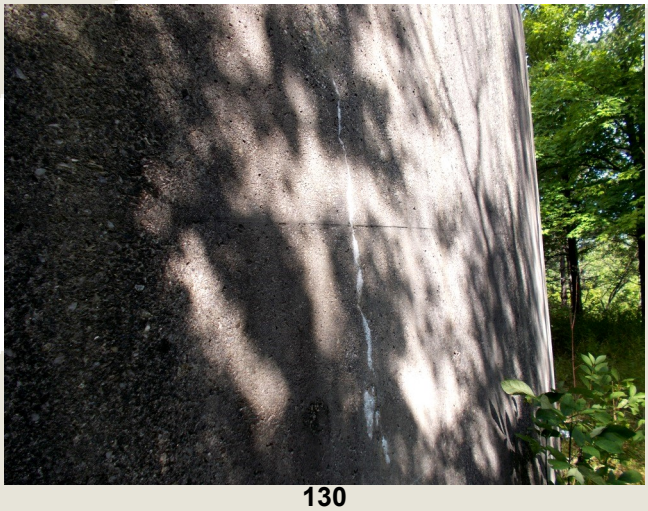

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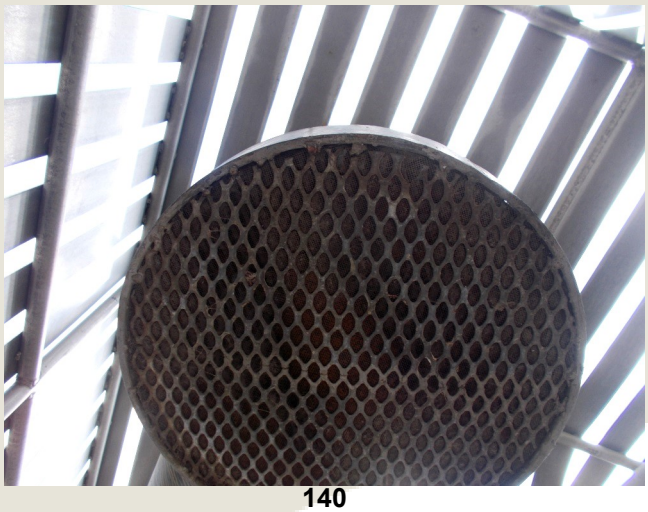

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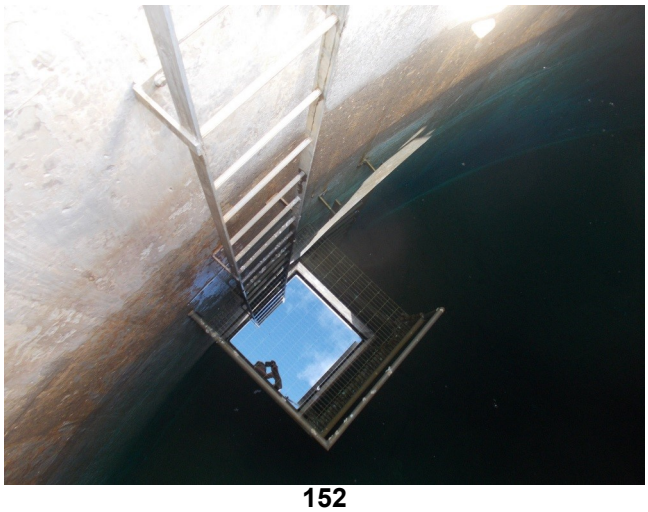

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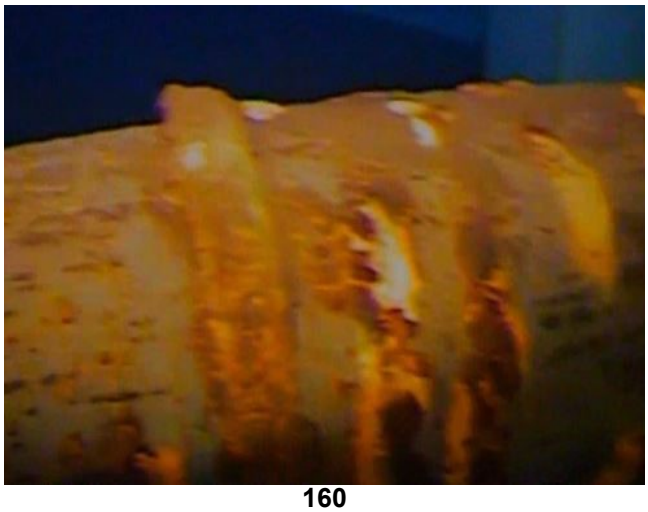

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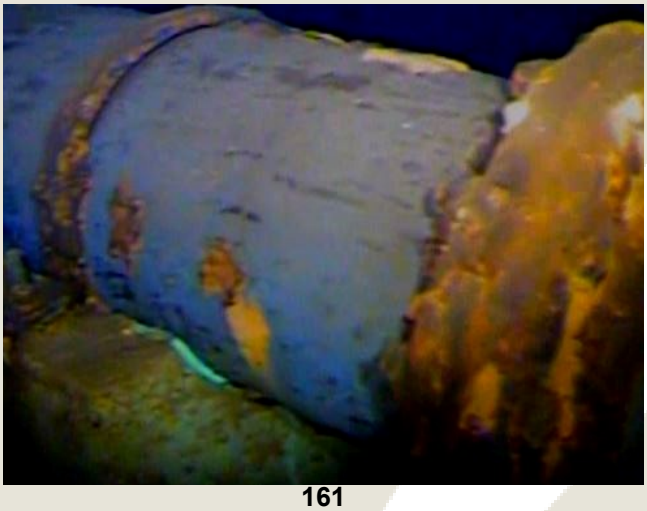

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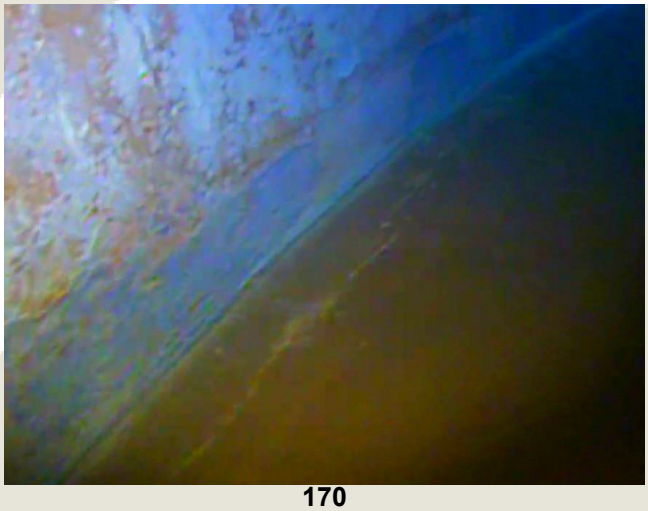

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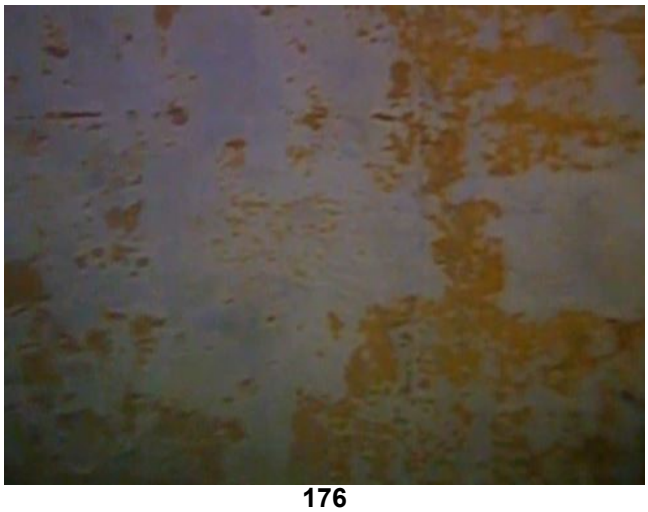

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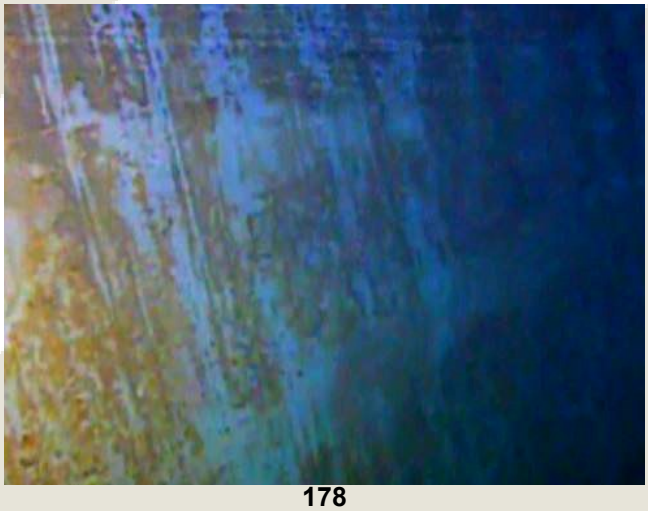

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LANDMARK
Elevating Expectations

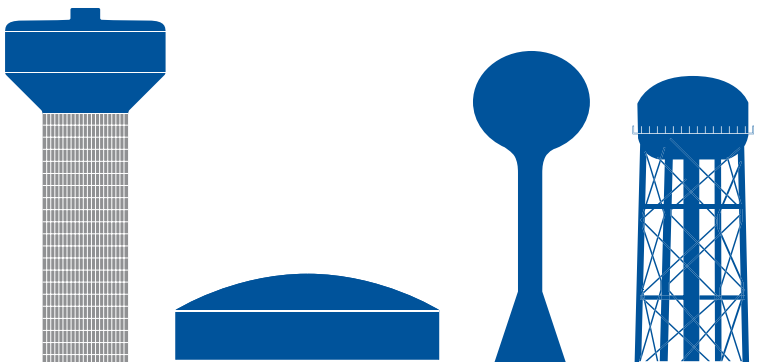
Municipal Services

Storage Tank Maintenance

Extend Service Life

Single Source Responsibility

Expert Inspection, Maintenance And Repairs
For All Types Of Water Storage Tanks



Expert inspection, maintenance, and repairs for all types of water storage tanks

- Safe, efficient, issue-free operation of your water storage infrastructure
- Full compliance with all applicable regulations across Canada

Landmark Municipal Services (LMS) brings more than 30 years of insight and innovation in water storage to owners and operators of tanks and systems of all types. Our complete range of services and packages provide predictability, continuity and flexibility for this essential function of municipal governments.

Inspections

Regular, scheduled inspections are critical for long-term efficiency. LMS conducts various types of inspections, all with comprehensive reports detailing repairs performed or recommended and upgrade requirements, with photo documentation and related cost estimates.

CIR: **Clean, Inspect & Report:** AWWA (American Water Works Association) recommends that water storage tanks be washed out and inspected on a minimum three-year cycle.

SIR: **Safety Inspection & Report:** A thorough interior and exterior review of structure and operations for compliance with applicable government regulations.

ROV: **Remotely Operated Vehicle:** ROV inspections eliminate the inconvenience and expense of taking your tank out of service. LMS provides real-time, in-water evaluations with a remotely operated vehicle.

LMS inspections provide a complete review of all critical factors:

- Site works
- Foundations
- Support structure
- Ladders/landings
- Accessories
- Valves and piping
- Metal conditions
- Exterior coatings
- Interior linings
- Antenna and communications equipment
- Safety and rescue equipment

Safety Upgrades and Training

LMS can provide safe access and rescue systems that meet or exceed the requirements of the Occupational Health & Safety Act for “vessel entry and rescue” as well as “fall arrest.”



Tank Modifications

Skilled LMS professionals provide practical, proven and fully engineered modifications for all types of storage tanks, leveraging experience as one of the leading tank builders in North America. Our vertical integration adds design, fabrication and coatings expertise when needed, with single source management and responsibility.



Coatings and Linings

LMS services include all surface preparation and recoating of all interior and exterior areas. Options range from spot preparation to total blast cleaning with full containment for environmental protection. All lining materials applied to interior surfaces are ANSI and NSF 61 approved.



Safety is the Key




Inspections:

- Clean, Inspect & Report (CIR)
- Safety Inspection & Report (SIR)
- Remotely Operated Vehicle (ROV)

Safety:

- Confined space
- Fall arrest
- Training

Maintenance:

- Tank Asset Management Program (TAMP)
- Annual programs
- Coatings/linings

Lightning Protection:

- Design
- Installation
- Inspection

Antenna and Communications Systems

- Design
- Structural fabrication & installation
- Inspection

Demolition

- Partial
- Total

Modifications

- Engineering
- Tank hydrodynamic mixing systems
- Site works
- Balconies/handrails
- Manholes
- Hatches
- Venting and vacuum relief
- Welding and fabrication
- Electrical/instrumentation
- Heat trace
- Insulation and cladding
- Security systems

Landmark delivers consistent, high quality results.

Contact us today to discuss the best solution for your next project.

LANDMARK
Elevating Expectations

Landmark Municipal Services • 3091 Harrison Court
Burlington, ON L7M 0W4 • 905.319.7700 Phone
www.teamlandmark.com • info@teamlandmark.com

Landmark Coatings

Specialty Mobile Operations

Uncompromising commitment to safety. World class technical skill. Go-anywhere mobility. Landmark delivers factory applied quality to your site.

LANDMARK
Elevating Expectations

Developed and refined throughout 25 years of storage tank coatings and lining work, Landmark's specialty crews work wherever you need them…on projects that we design, fabricate and build, or on existing infrastructure requiring repair and recoating. The Society for Protective Coatings (SSPC) has recognized our technical skills and processes with their prestigious QP-1 certification, so you can rely on thoroughly tested multi-craft services on the most demanding jobs, with the added benefits of uncompromising safety and nationwide mobility.

We work in a wide range of applications for the private sector, the military and municipal authorities:

- Industrial facilities
- Terminals
- Petrochemical plants
- Water and wastewater
- Oil and gas exploration and production
- Aircraft fueling facilities
- Lead abatement

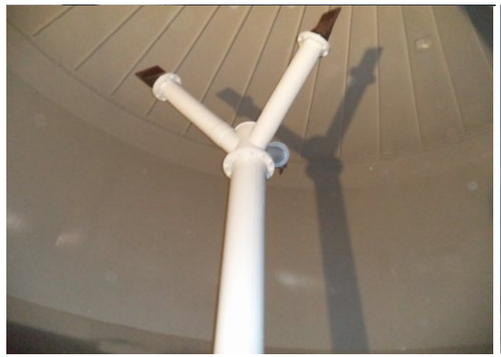
Safety

Safety is the Key

Landmark's uncompromising commitment to safety protects people, property and the environment. We apply equally rigorous standards for all locations, require ongoing training and testing for all crews, and utilize site evaluations, Hazard Identification and Risk Assessments (HIRA) and root cause analysis to continually drive performance improvement. Landmark employs the best available safeguards for the job, such as advanced, self-contained respiratory equipment on many applications. And we stay at the forefront of best practices and efficient reporting with our membership in ISNetworld. Core values and comprehensive safety and health programs, along with SSPC C-3 accreditation for de-leading steel structures, safeguards against environmental impact.

Skill

Landmark's technical capabilities start with specification assistance, based on in-depth knowledge of industry suppliers and their latest products, and insights from our own operations. Our crews are fully equipped to perform surface preparation and coatings work on virtually any type of steel structure, utilizing a broad array of coatings including polyurethanes, 100% solids and fiberglass reinforced systems. Our crews perform all coatings work in accordance with the Landmark Quality Assurance Manual for Surface Preparation and Coating. They are trained to implement all of the required process controls and conduct workmanship inspections to meet or exceed all applicable standards and client expectations.



Routine quality evaluations include but are not limited to:

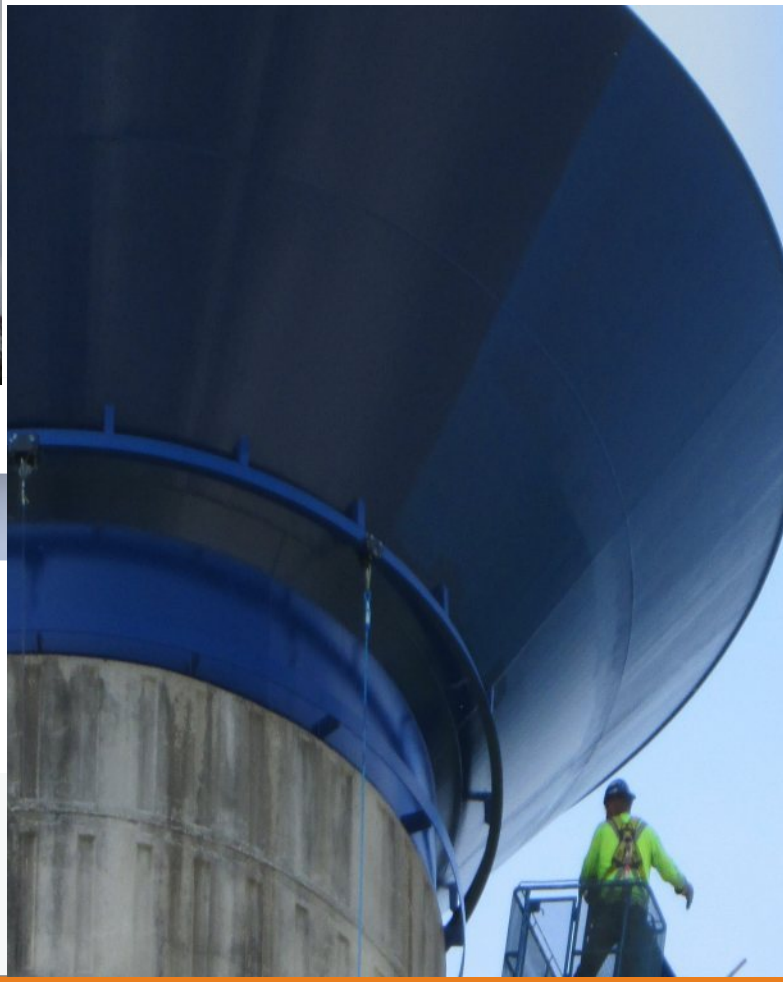
- Measurement of environmental conditions
- Verification of surface cleanliness prior to coating or lining
- Wet and dry film thickness measurement
- Holiday testing (low or high voltage, depending on lining thickness)

Daily logs track all inspection activity, and are available upon request.

Specialized equipment enables Landmark to manage dehumidification on work in enclosed spaces such as tank lining and recoating, and to protect the environment with blast media recycling and a full or partial containment on exterior surface preparation and coating. In addition, site specific plans for environmental monitoring, hazardous material management, and disposal of wastes are developed for all tank rehabilitations where existng coatings contain toxic metals. And for high-profile projects with community impact, Landmark has perfected the art of translating even the most intricate graphics to the public stage with precise reproduction. The utilization of dust collection systems ensures complete extraction of dusts for not only a cleaner surface prior to paint application, but as well as containment of dusts generated. This provides necessary air exchanges for confined space work.

Mobility

Landmark capabilities are completely mobile for deployment nationwide or beyond, without limitations. Specially outfitted trailers move containerized equipment to the project site, and then serve as mobile command centers for the crews. All required assets are at hand, coordinated with local supply lines as appropriate.



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HAPPY VALLEY RESERVOIR (NORTH & SOUTH) - ROV INSPECTION AND REPORT: JULY 31, 2019

Authorized Inspection Services Inc.
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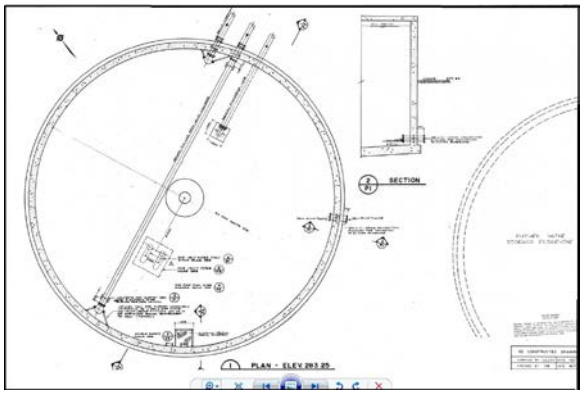
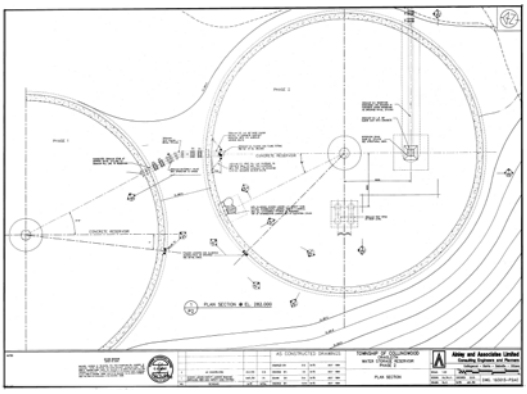
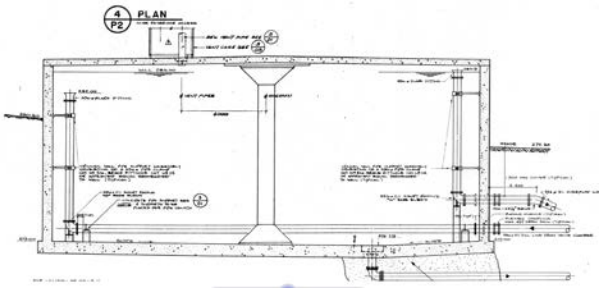
Visual Inspection of the Accessible Internal & External Areas of the Happy Valley Potable Water Reservoirs



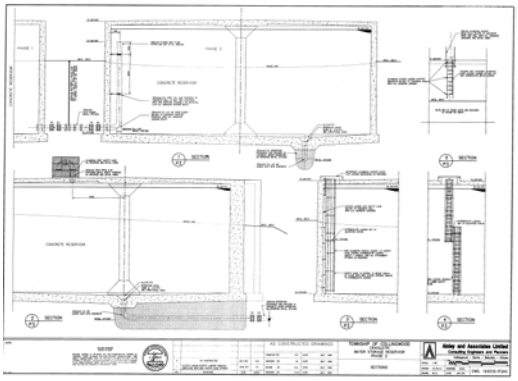
North Reservoir Cell – plan view



South Reservoir Cell – plan view



North Reservoir Cell – profile view



South Reservoir Cell – profile view

Client Rep : Rob Gilchrist, Water Supervisor, Water and Waste Water Services

Project : 2024-17-Q-OPS, Inspection of the Two (2) Happy Valley Reservoirs

Method : Disinfected, Submersible Video ROV for Internal, Underwater Areas

Location : 136 Happy Valley Road, The Blue Mountains, ON L9Y 0N9

Date : October 24, 2024

AIS Job No. : 20241009-TBM-01

Prepared by: Paul Keenan, Sr. Inspector

TABLE OF CONTENTS

1.0 Introduction:

At the request of The Town of the Blue Mountains, Water & Waste Water Services, internal video inspection of the two (2) circular concrete reservoirs, in accessible areas, was performed, using a submersible ROV with onboard lighting and high-resolution camera. The main purpose of the inspections was to obtain an overall condition assessment, including any need for cleaning. Inspection of accessible external areas of the reservoirs was also performed and results will be assessed, as much as practical, with recommendations and conclusions provided, as far as can be confidently reported.

2.0 Equipment:

Submersible, DeepTrekker, video ROV with high-resolution colour camera and lighting.

3.0 Conclusions:

3.1 South Reservoir – 1st reservoir surveyed

3.1.1 As seen in the North Reservoir; typical brown sediment found across most areas of the floor less than 1" thick
3.1.2 Internal lining and protective coatings on the vertical wall joints are generally in good condition. Parging around the outer floor is flaked off in many areas.
3.1.3 The roof support column is in good condition.
3.1.4 Internal ladder structures appear intact and the ladders have protective safety cages for persons climbing the ladders, which are in good condition.
3.1.5 External cracks visible at random locations, deposit buildups and failed joint grouting, seen in various areas, were identified and photographed.

3.2 North Reservoir – 2nd reservoir surveyed

3.2.1 There is a thin layer of typical brown sediment across most areas of the floor, less than 1" thick but no evidence of large bits of concrete debris which would indicate deterioration of the walls or underside of the reservoir roof.
3.2.2 Internal lining and protective coatings on the vertical wall joints and around the lower wall to floor interface are generally in good condition except flaking of parging was seen around the outer edges of the floor.
3.2.3 The roof support column is in good condition.
3.2.4 Internal ladder structures appear intact, scale bits seen on floor below ladder. No fall arrest system is seen on the ladders so entry and egress will require continuous fall-protection for persons when using the ladder to do up and down.
3.2.5 External cracks, deposit buildups and failed joint grouting, seen in various areas, was identified and photographed.

3.3 Pumphouse and site equipment

3.3.1 Piping, valves and other equipment were externally, visually viewed and photographed inside the site pumphouse with no obvious anomalies or severe corrosion seen in the accessible areas viewed. Access to valve chambers is not practical.

4.0 Recommendations:

4.1 Compliance & Efficiency Coordinator and Water Supervisor, Water & Waste Water Services, Town of the Blue Mountains, to review this inspection report and video footage.
4.2 Plan to dewater and enter each of the two reservoirs and perform cleaning as well as more detailed inspections of the metal parts, thickness of piping, bolting corrosion including removal of scale and failed coating to better assess condition of these metal components.
4.3 Internal surfaces should be cleaned using a gentle-action detergent made by Moesslein Wassertechnik and **NO high-pressure spray to be used on any concrete surfaces.**
4.4 If and when the reservoir cells are entered for cleaning, maintenance or repairs, take the opportunity to test the integrity of the upper roof to wall joint seals, method to be discussed.
4.5 Remove external calcium and other deposits seen at random areas of the reservoir and at joints and monitor periodically to see if these areas have active leakage or increasing size.
4.6 Conduct phone or video conference meetings to fully discuss objectives of further actions.

5.0 Inspection/Discussion:

The South Reservoir was chosen to be internally, underwater video inspected first. The roof hatch cover was unlocked and opened to allow internal access for the submersible ROV. The ROV and associated submersible umbilical cable was sprayed, using a mixture of sodium hypochlorite supplied by Water & Wastewater Services, prior to the vehicle being lowered down through the square, roof access hatchway to the water surface. Recording, lighting and maneuverability functions were tested prior to beginning the internal inspection.

The North Reservoir was ROV inspected immediately after the South Reservoir in the same manner as the South Reservoir.

A repair procedure example, relevant to from our preferred consultant, Aquashield–Umengan Construction, is attached to this inspection report. Further discussions with The Town of the Blue Mountains are required to give accurate quotations for the repairs which are deemed to be required. The roof topside proposed repairs of the “spider-cracking” on the South Reservoir will be addressed and further discussed with The Town of the Blue Mountains.

5.1 **South Reservoir – details, explanations with comments of the inspection video**:

Highlights of the video below with a general location of the ROV and a brief comment next to each; Clock Time, in the table below, can be seen on the inspection video in upper left of display:

Clock Time	Comments
File 01	Labeled 2024-10-24_10-29-28_HV South Res
10:29:30	Beginning below roof hatch, testing lights, recording functions
10:29:35	View up at top of ladder structure, cage, sliding post appear in good condition
10:30:05	View up at roof to wall joint adjacent to hatchway
10:30:30	Moving ROV generally to right of ladder along water surface, good views of upper wall
10:32:00	Views down a section of wall. (@ 10:32:30 wide views of the ladder cage and structure)
10:33:00	Continue moving to right of ladder, views up at the roof to wall joint
10:33:25	Views down joint (@ 10:34:15 bottom of joint reached)
10:35:25	Good view of floor to wall joint, flaked off parging layer around outer floor edge
10:35:30	Sediment cleared using ROV motors to view bare area of flaked off parging layer
10:36:30	Continue moving right from manway along the floor to wall areas
10:37:15	Begin viewing up wall sections
10:38:00	Continue moving in same direction around outer floor area
10:40:15	View up a wall joint with protective coating, generally in good condition
10:40:30	Continue moving around outer floor to wall area
10:43:50	Good view straight down of floor to wall joint
10:44:15	Moving up wall joint
10:44:45	View of wall joint at roof
10:45:05	Good view of roof to wall joint
10:45:30	Begin pulling ROV back looking up; good views of underside of roof
10:48:30	Views up at the two roof vents
10:50:50	(end recording of File 01)
File 02	Labeled 2024-10-24_10-56-27_HV South Res
10:56:27	Starts recording
10:59:30	Begin moving ROV to the left of the ladder, views of the top funnel of the s/s fill pipe
11:00:00	Moving past fill pipe funnel, views of the walls
11:00:45	View of staining from the roof to wall joint
11:03:10	View down at parged area along wall with sediment cleared using ROV down motors
11:03:30	Continue moving left of ladder along wall to floor area
11:03:45	View down at joint grouting, continue moving along wall to floor area

11:05:00	Moving past wall joint, continue looking down at wall to floor area
11:06:15	View small section of floor with sediment cleared
11:06:45	Continue moving around outer floor area
11:07:00	Wide view of floor; continue moving around floor to wall area
11:08:45	Small spots of staining on outer floor coating, continue moving around outer floor area
11:11:00	Up wall to water surface
11:11:30	Begin pulling ROV back, looking up
11:12:20	Underside of roof, calcium deposits
11:12:30	Centre roof support pillar (views to 11:14:40)
11:15:30	Roof vent openings, again
11:16:00	View straight up into vent openings
11:17:00	Centre roof support pillar, again
11:18:30	Random views of main floor sediment (to 11:19:30)
11:21:00	Views of centre roof support pillar, again (to 11:25:30)
11:26:00	Pulling ROV back, looking up (end File 02 @ 11:26:27)
File 03	Labeled 2024-10-24_11-26-33_HV South Res
11:26:35	Pulling ROV back, looking up
11:29:00	Roof to wall area, near manway
11:31:00	Viewing down wall
11:32:00	Moving right of manway
11:32:30	Moving across floor with good views of sediment
11:37:30	Areas along wall to floor with sediment on flaked off areas of parging
11:37:50	Moving up wall
11:38:40	View staining at wall to roof joint
11:39:30	Minor roof cracking, calcium deposits
11:40:00	Pull ROV back, looking up (@ 11:41:00, pulling past roof support pillar)
11:42:00	Back at manway, looking up
11:44:45	Move to right of manway, good views of upper wall (to 11:47:30), joints ok where seen
11:47:30	Moving down a wall joint with protective coating cover to floor @ 11:49:00
11:49:40	Looking down at a floor joint
11:50:00	Moving up wall
11:51:00	Pulling back ROV
11:53:15	Moving down wall to floor (@ 11:56:30 end of File 03 recording)
File 04	Labeled 2024-10-24_11-56-37_HV South Res
11:56:35	Wide view of ladder structure
11:57:15	ROV lifted out of the reservoir (end recording File 04)

5.2 North Reservoir – details, explanations with comments of the inspection video:

Clock Time	Comments
File 05	Labeled 2024-10-24_13-27-06_HV North Res
13:27:05	Begin recording
13:27:30	Views of the access ladder below the manway, no safety cage or fall-arrest rail seen
13:29:30	View up at the roof to wall joint, some staining seen
13:29:45	Moving right (counter clock-wise, if orientation is looking down) of hatchway at
13:31:20	Views up at roof, roof to wall
13:31:30	Down wall to view outer floor
13:32:20	Floor to wall area, blueish “sand” seen buildup around the floor edge
13:33:15	Continue moving around the floor to wall area
13:36:15	Viewing horizontal fill pipe, concrete supports, flanges and pipe to wall interface
13:39:15	View up vertical overflow pipe, funnel and structural wall attachments
13:40:45	View white, smooth area of roof underside above pipe funnel opening
13:41:00	Pull ROV back viewing up at roof
13:43:15	Back at start point, below manway
13:44:00	Begin moving left of hatchway (clock-wise, if orientation is looking down)
13:44:15	Vertical pipe funnel, structural attachments, typical rust deposits
13:46:00	Moving past and around the vertical pipe
13:46:30	View up at main roof joint, white deposits
13:47:15	Wide view looking back at the ladder structure
13:47:20	Continue moving “clock-wise” viewing the upper walls
13:48:00	Move to the floor to wall area, continue moving around the outer floor – good views
13:49:00	Viewing up, continue clock-wise around the outside
13:49:30	Overflow pipe reached from the opposite side
13:50:30	Pulling ROV back, looking up
13:51:00	Roof support pillar
13:51:50	View down at horizontal fill pipe adjacent to bottom of support pillar
13:53:50	Roof vent openings (13:57:00 end of File 05)
File 06	Labeled 2024-10-24_13-57-13_HV North Res
13:57:05	Begin recording; close up views of remaining bits of concrete surfacing
13:58:30	Views down at wall areas
14:01:45	Upper section of vertical pipe funnel
14:06:30	Roof support pillar, again
14:08:15	ROV pulled out onto plastic tarp, (end of File 06 recording)

6.1 South Reservoir – photos with comments

Overall view of South Reservoir

Concrete base for roof manway; two cracks marked

Manway cover; rubber seal in good condition

Protective cage around two gooseneck vents

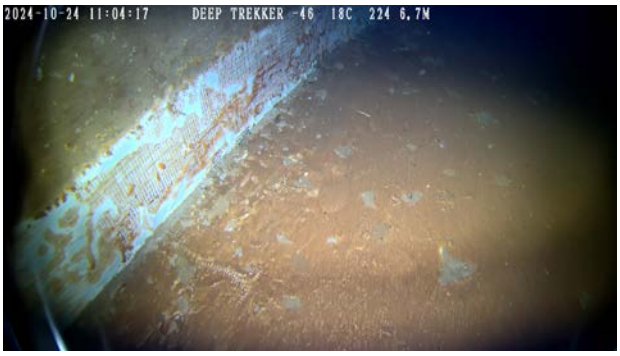
Underside of 1st gooseneck vent screen – ok

Underside of 2nd gooseneck vent screen – ok

6.1 South Reservoir – photos with comments (continued)

Outer floor, parging layer flaked off

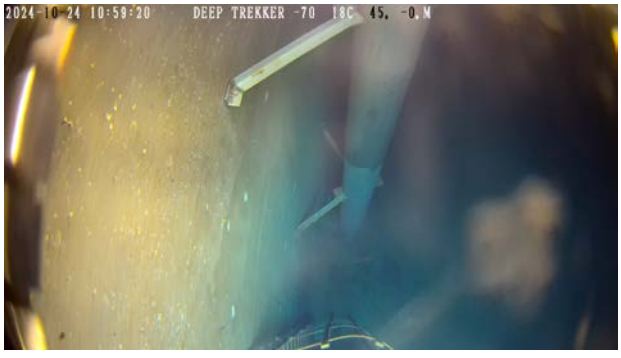
Cleared sediment away; cracked parging underneath



Wall to floor joint

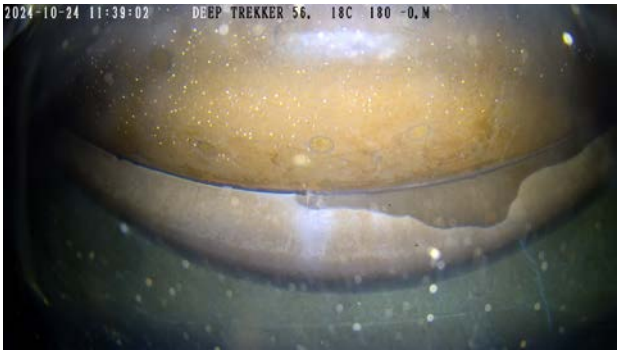
Floor to wall area; sediment cleared away by ROV

Stainless steel funnel and vertical pipe



View stainless steel pipe and brackets

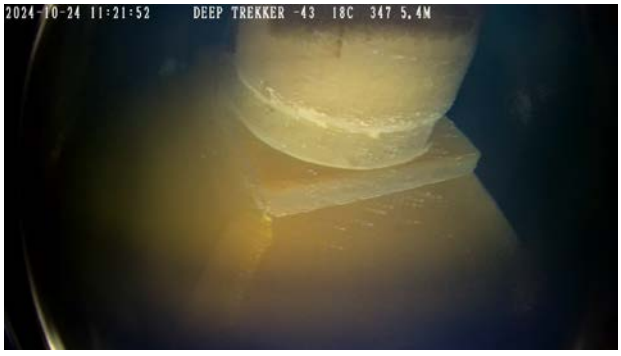
6.1 South Reservoir – photos with comments (continued)



Roof to wall joint; some staining seen

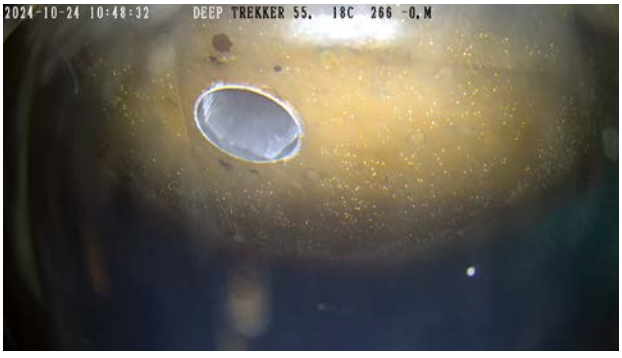
Wide view of wall to floor joint

View up at roof support pillar to roof interface



View down at roof support pillar to floor interface

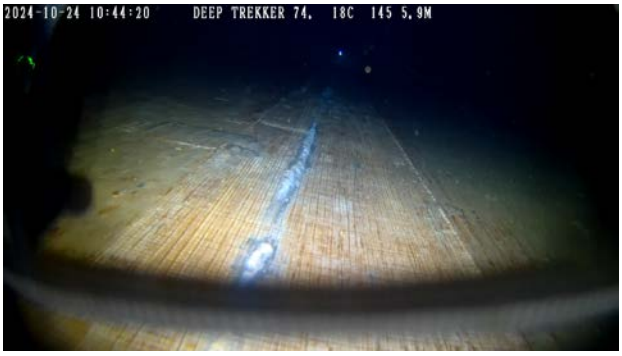
View up at roof to wall joint interface



One of two roof vent openings

6.1 South Reservoir – photos with comments (continued)

Ladder bottom, see pipe and support behind it



View up wall joint; white deposits coming through

Upper ladder cage and tie off post

South Reservoir - view from North Reservoir roof

Roof top “spider crack”

Typical roof topside crack

6.1 South Reservoir – photos with comments (continued)

Roof top cracks around centre support area

Example of multiple cracks with white deposits

View of wet deposits from concrete layer

Wide view of area where wet deposits are seen

Example of crack indication with white deposits

Roof hatch secured and locked after inspection

6.2 North Reservoir – photos with comments

Overall view of the North Reservoir

Roof hatch open during video inspection

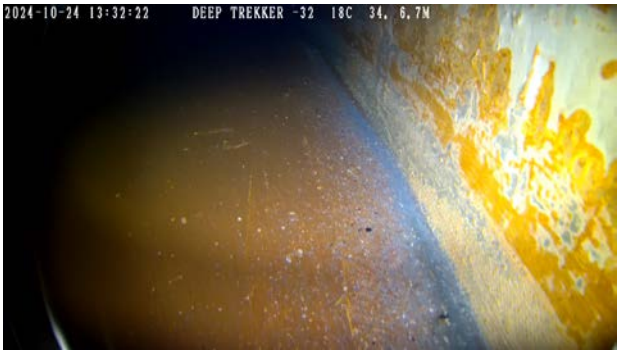
Protective cage around roof vent piping

One strap on top of protective cage is bent inward

Vent one of two, screening is ok

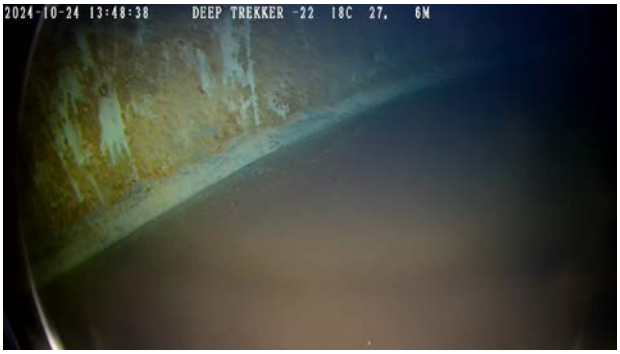
Vent two of two, screening is ok

6.2 North Reservoir – photos with comments (continued)



Wall to floor area, blue bits of grainy debris

Ladder bottom, bits of scale laying loose on floor



Typical thin layer of sediment across the floor

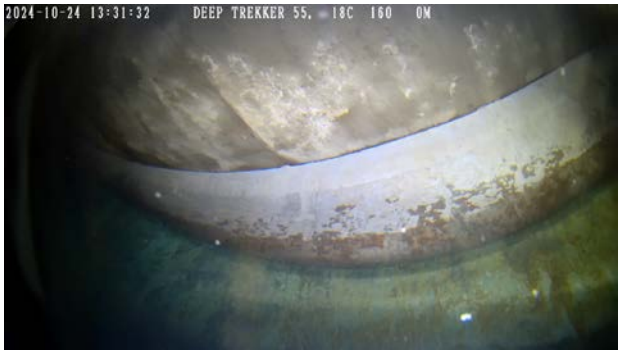
Fill pipe to wall interface, scale deposits on pipe

View down at ladder platform

Overflow pipe to wall interface

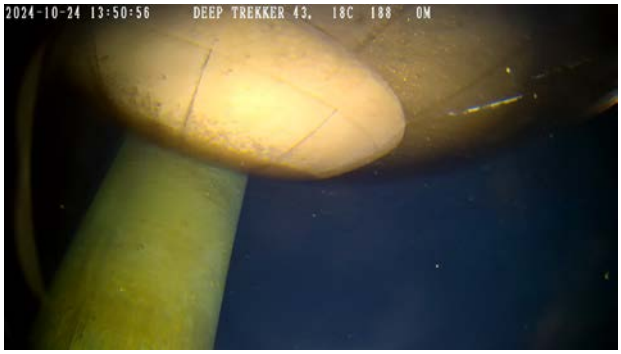
6.2 North Reservoir – photos with comments (continued)

Upper portion of overflow pipe and bracket



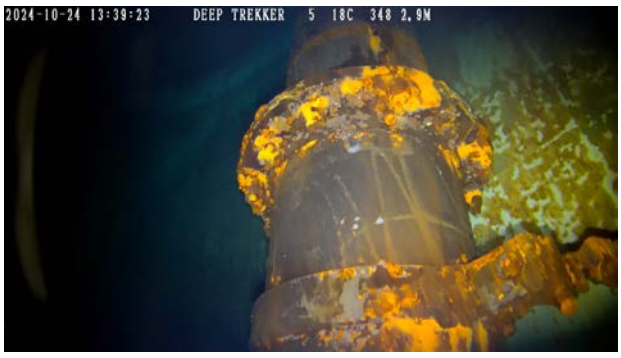
Section of the roof to wall joint

View up into one of two roof vents



View upper portion of centre roof support pillar

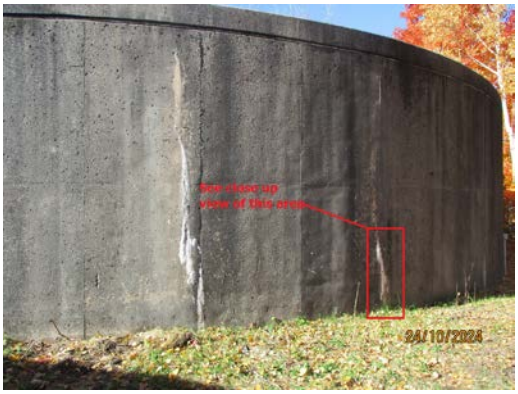
View lower portion of centre roof support pillar



Scale and deposits on overflow piping & bracket

6.2 North Reservoir – photos with comments (continued)

Grouting missing - external roof-wall joint



* Typical cracking with white deposits

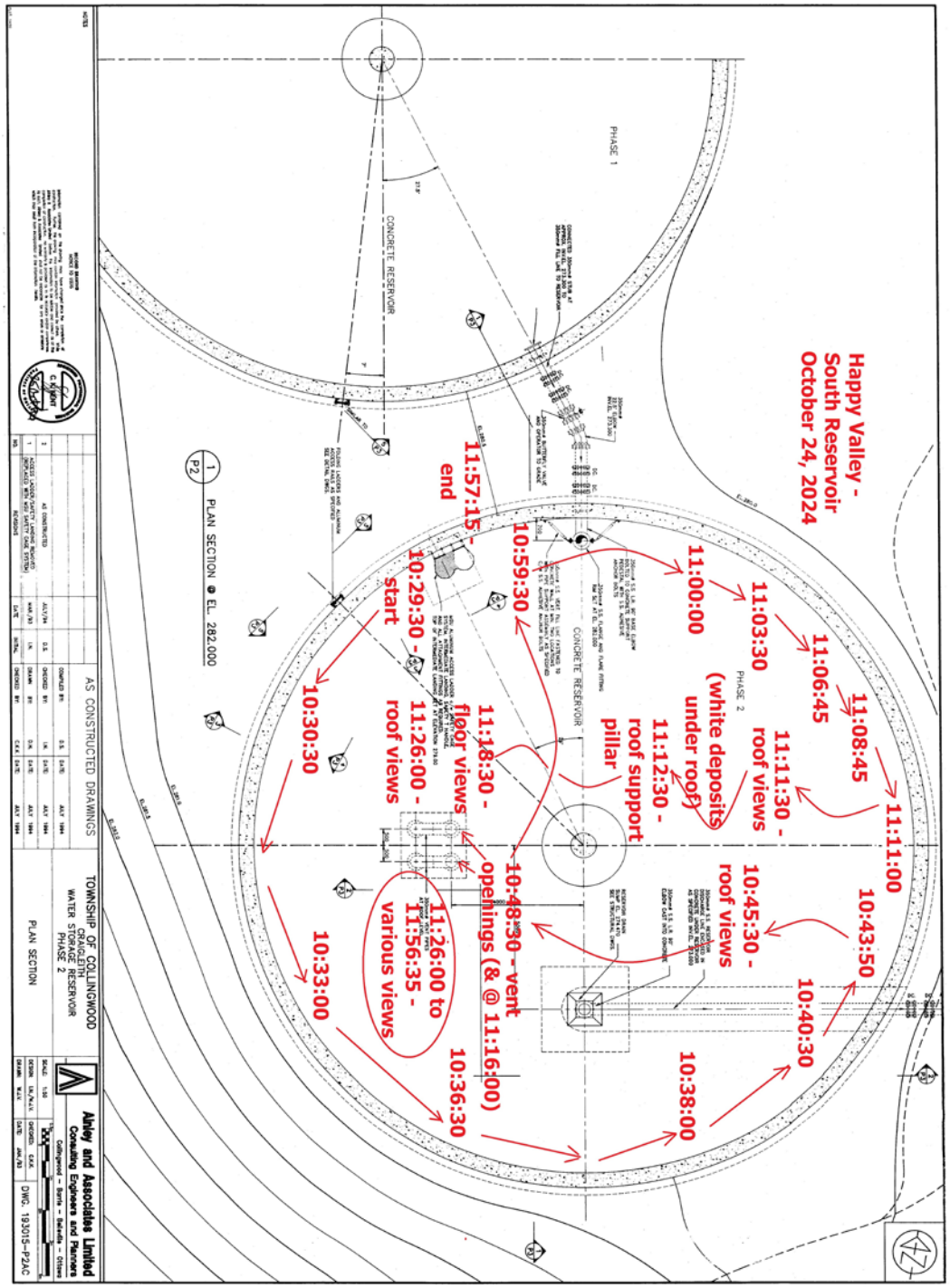
*Close up view: Typical cracking

Typical area of white deposits at joint

Typical white deposits

Area of the intersection of topside roof joints

7.1 South Reservoir – sketch of reservoir, plan view with approximate path of ROV



7.2 North Reservoir – sketch of reservoir, plan view with approximate path of ROV