THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

INFRASTRUCTURE COMMITTEE MEETING

OF THE VILLAGE OF LIONS BAY
HELD ON MONDAY, JUNE 25, 2018 at 7:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY

AGENDA

1. Call to Order

2. Appointment of Recorder

3. Approval of the Agenda

4. Public Questions & Comments

5. Approval of Minutes
- A. Infrastructure Committee – May 28, 2018 (Page 3)
  - i. Action Items from the Minutes

6. Business Arising from the Minutes

7. Unfinished Business
- A. CWWF Projects
  - i. Harvey Tank Update
- B. Wells
- C. Magnesia and Harvey Condition
- D. Bridge Inspections
- E. AECOM (Page 7)
- F. Infiltration Gallery

8. New Business

9. Public Questions & Comments

10. Adjournment

11. Next Meeting – July 23, 2018

LIONS BAY INFRASTRUCTURE COMMITTEE MEETING
MONDAY May 28th 2018 AT 7:00 PM
COUNCIL CHAMBERS, 400 CENTER ROAD, LIONS BAY
DRAFT
MINUTES OF THE MEETING

In Attendance:

Karl Buhr – Mayor
Fred Bain – Councillor and Committee Chair
Jim Mutrie – Resident
Naizam Jaffer – Public Works Manager
Norm Barmeier – Councillor
Brain Ulrich – Resident
Ron McLaughlin – Councillor

Regrets: Tony Greville - Resident

1. **Call to Order**
   Meeting was called to order at 1900hrs.

2. **Appointment of Recorder**
   Norm Barmeier volunteered to record

3. **Public Participation**
   No Public Questions or comments

4. **Approval of the Agenda**

5. **Approval of the Minutes of April 23rd, 2017**
   Approved as circulated

6. **Business Arising from the Minutes**

   Nai BD May 27th 51.

7. **Unfinished Business**

   CWWF Projects
   Harvey Tank Update
   Structural inspection from AECOM was out twice. They did a very thorough investigation of the exterior of the tank. Interior work has yet to start. Nai has asked them to stop work until exterior report has been produced. AECOM suggested a submersible at $3000 to inspect the

tank. Nai feels better approach is proper interior investigation with divers and scaffold which will allow for sampling. ROV is not available until June.
Sneak preview of exterior examination suggests there is some concern with the concept of repairing. The tension in the cables appear to be inadequate to prevent leaking. As soon as you rehabilitate a tank you have to bring it up to seismic code.
Wait for exterior report with some estimates of cost to repair.
AECOM has a copy of the original tank drawings by Webb Engineering.
Discussion on what the new approach for CWWF spending should be. Do we start with ancillaries before Harvey replacement?
Nai to confirm whether structural report will speak to live span.
Committee members can approach contractors directly to see if there is interest.
Nai suggested a bladder liner in Harvey could extend the life of the tank to allow for better market conditions for the tank replacement.
Karl asked whether Graham of AECOM had a change to look into equalization tank options, like a surge tank or tall column.

Magnesia and Harvey Condition:
Harvey access road is 90% complete. Because of design change a liner has to be placed lower down.
Magnesia intake has been cleared.
Creus wants to see the infiltration gallery the next time it is plugged and have no comment yet on larger media. The committee would prefer not to wait.
Action: Ask Creus an opinion about media change.
Fred wondered whether an auger would help work the fines out the sluice gate?

Bridge inspection:
Load ratings report now avaible, Nai is still waiting on maintenance report from ISL. Inspections were done in November 2017. Report is quite late. We have a holdback of approximately $17,000.

8. New Business

Oceanview drainage. History is a plugged culvert was abandoned. Instead a large black temporary pipe was installed along Oceanview.
Action item: Nai will get a CCTV inspection done.

Survey:
Brian feels the survey is too long.
Does a paper survey make sense, or should it be online? Survey results would result in a lot of clerical work.
Brian suggested to focus on one large topic (for example) septic versus centralized sewer system.
Fred suggested that the IC committee posts questions in the weekly update for key issues.
Karl would like to see a private census, with a person going door to door completing surveys.
Test run with next Village update to see if that approach works. Consider one question a month with publishing results a month later.

9. Public Questions and Comments - none

10. Reporting out – nothing to report out.

11. Next Meeting
June 25th, 2018

12. Adjournment

AECOM Imagine it. Delivered.

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To:
Nai Jaffer, Manager of Public Works

CC:

Project name:
Water Reservoirs Replacement

Project ref:
60222155 (402.25)

From:
Bill Moore, P.Eng., PE
Graham Walker, P.Eng.

Date:
June 12, 2018

Technical Memorandum

Subject: Harvey Water Reservoir – Preliminary Structural Condition Assessment

INTRODUCTION

The Village of Lions Bay (the Village) has acquired the services of AECOM Canada Ltd. (AECOM) to investigate the condition of the Harvey Reservoir and determine the feasibility of repairing the existing reservoir to increase its service life.

It is AECOM's understanding that the Village is looking for a phased approach to the condition assessment, including:

- Phase 1 – Desktop Review and Site Investigation (only outside condition);
- Phase 2 – Internal Tank Inspection;
- Phase 3 – Tank Restoration and Improvements Design.

At the progress meeting on April 30, 2018, the Village of Lions Bay instructed AECOM to provide a scope of work for Phase 1 of the Harvey Reservoir Condition assessment. Following the completion of Phase 1, the Village of Lions Bay will evaluate the need to complete subsequent phases based in part on the feasibility of a successful restoration of the existing tank. If subsequent phases are requested, AECOM will provide a separate scope change at that time.

STRUCTURE DESCRIPTION

The Harvey Creek reservoir is located approximately 250 m past the end of Oceanview Road (on a gravel access road), in the Village of Lions Bay. The reservoir is approximately 500 m south of Harvey Creek. The Harvey Creek reservoir has a storage capacity approximate storage capacity of 1.79 ML.

In accordance with the recorded drawings provided by the Village of Lions Bay, the Harvey Creek reservoir is a circular pre-cast concrete structure with an internal diameter of 15.780 m. Its wall is 0.200 m thick by 10.125 m high, reinforced with post-tensioned strand tendons in both the vertical and circumferential directions. The reservoir roof is composed of 16 pre-cast concrete T-beams consisting of a 0.125 m thick slab supported on 0.475 m by 0.200 m beams spanning from a column in the center of the reservoir to the reservoir wall. The reservoir is supported on a 0.150 m thick reinforced concrete slab foundation, with a 0.680 m by 0.500 m reinforced concrete ring beam around the perimeter of the base slab. The ring beam was supposed to provide lateral restraint for the bottom of the reservoir wall.

BACKGROUND INFORMATION

AECOM conducted a review of the available background information for the Harvey Reservoir. The purpose of the review was to establish an understanding of the design aspects of Harvey Reservoir, the structural condition of the tank at various times within its service life, information on known deficiencies and issues with the tank and lastly the extent and success of previous repair efforts.

The documents included in the review will be the following of which some were recently provided:

- Harvey Tank Design Drawings, File No. 44018 As Built Drawings S1, S2, S3 and S4, Crosier Kilgour & Partners Ltd., May 1984;
- Harvey Creek Tank Water Reservoir Inspection Sheet, Earth-Tech, September 2004;
- Harvey Creek 400k Gallon Reservoir Preliminary Structural Assessment, Earth-Tech, March 2006;
- Post Construction Inspection Report, Earth-Tech, March 2006; and
- Harvey Creek Water Reservoir Wall Review, WSP, April 2017.

In 2004, AECOM (formerly Earth Tech) noted that the structure has some critical defects, such as extensive water leakage, which require urgent attention. The leaking between the wall panels is a concern because it could cause rapid deterioration of the post-tensioning steel. In 2006, a preliminary structural assessment was completed to determine the cause of the cracks and leakage which found that the foundation ring beam appears to be inadequate to support the hoop tension at the base of the wall. It is understood that internal rehabilitation works were attempted in early 2006 to seal both the vertical and horizontal joints (see Figure 2) and were only partially successful (see Figure 1) and that the full recommendations of the report were not implemented.

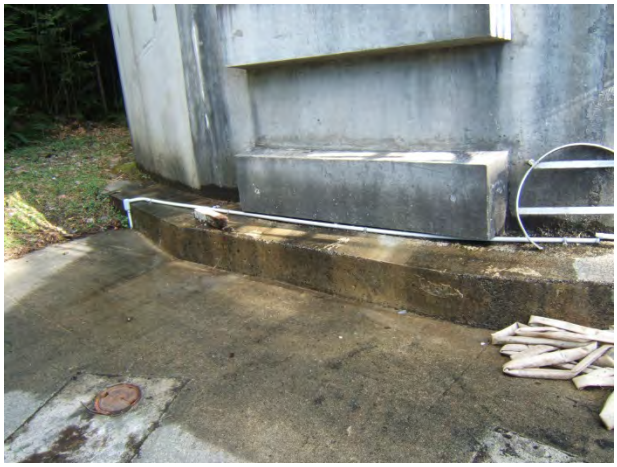

Figure 1: Record Photo of Horizontal Seam Leakage (March 20, 2006)

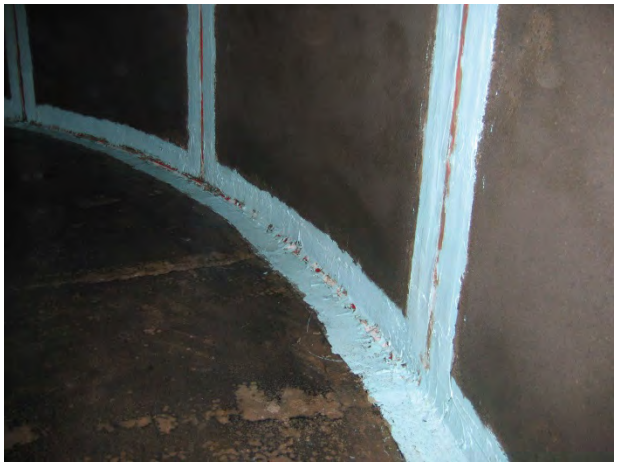

Figure 2: Record Photo of Internal Tank Joint Sealant (Feb 27, 2006)

PRELIMINARY SITE INVESTIGATION

Following the review of existing information, AECOM's structural team consisting of William Moore and Sam Zhao conducted a site investigation of Harvey Creek reservoir on May 11, 2018. The purpose of the site investigation was to visually compare the findings of the existing inspection reports to the current condition of Harvey Creek reservoir based on external inspection of the structure. The site investigation was preliminary in nature and did not include inspection of the interior of the tank nor complete material testing. Below is a list of the notable findings from the site investigation on May 11, 2018:

- One vertical joint between tank precast wall panels displaying leakage from the bottom to 2/3 of the tank height. There was a small amount of water dripping down along the joint with white efflorescence deposit along the joint. Similar white efflorescence deposits were observed at other wall panel joint locations, however the joints are dry upon touch.
- One precast wall panel shown diagonal crack at the top in one corner near the ladder in 2005. This corner piece was partially missing during this site investigation. The waterstop at the top between the wall and roof was exposed and discontinued at this location, see Figure A2.2.5. Comparison of photos taken in the 2005 inspection to current status, all joints between wall panels show progressed deterioration, however there was less wet leakage observed during the 2018 site visit. The leaking joints indicate that the joint detail at the interior of the wall has failed.
- The recommended ring beam upgrades do not appear to have been completed.
- Growth of green moss and vegetation continuing to progress on the roof of the tank.
- Evidence that external joint repair by injection has failed, particularly on southwest of tank approximately 1.5 metres above grade, see Figure A.2.1.4.
- Nearly all buttresses are showing white efflorescence deposit at the post tension grouted pockets at each end. This provides evidence that water has infiltrated the tensioning steel strands which will lead to corrosion and deterioration. It also indicates weakened tension stresses in the steel stand cables, which comprise the structural function of the post tensioned tank wall panels.

Further photos from the inspection are provided in Appendix B for reference.

STRUCTURAL ANALYSIS REVIEW

The analysis was based on the record drawings provided by the Village of Lions Bay, drawings with the assumptions that the reservoir was built as per the drawings. It should be noted that neither design criteria, codes & standards, nor load combinations are explicitly indicated on the record drawings. The record drawings only depict dimensions of the structure, size and spacing of normal reinforcement, and locations and size of the post-tensioning tendons.

Finite element analysis was completed in 2006 by AECOM (Earth Tech) which found that there was insufficient circumferential residual stress on the reservoir to properly seal the cracks. The structural integrity of the reservoir also depends on the capacity of the base slab ring beam which will be required to be strengthened to have adequate capacity to support the shear forces transferred from the base of the reservoir wall. The construction of a reinforced concrete beam along the bottom of the reservoir wall is recommended to strengthen the ring beam and increase the residual stress of the reservoir wall. The integrity of the reservoir depends on the roof beams remaining connected to the reservoir walls and centre column. Steel brackets and a centre plate were recommended to be installed to adequately fasten the roof beams to the reservoir walls and columns respectively which does not appear to have been completed in accordance with the previous recommendations. It is also recommended that a circular steel plate be installed at the center of the roof to provided additional anchorage between the roof beams and the center column.

Lastly, due to the inadequate crack control of the reservoir roof, it is recommended that a waterproofing membrane be installed over the entire roof area. This will prevent contaminants from entering the reservoir through cracks which may form in the roof slab.

As part of our analysis, AECOM has reviewed this information and agree that these findings are still valid based visual observations and preliminary validation calculations. Although there have been revision to the applicable standards since the previous assessment, it was determined that the previously provided design and rehabilitation approach is a reasonable basis for estimating the level of effort required for structural rehabilitation of the existing tank and was used for cost estimation purposes. Further review and design would be required to be completed in the event that the Village chooses to pursue structural rehabilitation of the existing tank.

REMEDIAL OPTIONS REVIEW

Through preliminary analysis of the existing Harvey Creek reservoir, we have prepared the following three options:

- Option 1 – Internal Bladder Liner
- Option 2 – Seismic Upgrades and Sealant
- Option 3 – Demolition and Replacement

Option 1 – Internal Bladder Liner

The installation of an internal tank liner using HDPE or similar product allows for the existing tank to be lined with a waterproof membrane. The objective of using an internal bladder liner is to minimize future degradation of the structure as a result of water leaking through the panel joints causing deterioration of the reinforcing steel, tensioning steel and concrete surface.

The internal bladder liner would be formed around and welded to column and existing pipe penetrations within the reservoir to form a watertight seal. The liner would be mechanically mounted to the walls to hold the liner in place and the top of the liner would be sealed to the top of the walls to prevent excess water or condensation from filling the void space behind the liner and the reservoir wall panels.

The product is installed either with detailed measurements of the tank dimensions prior to arrival onsite or by assembly using welded seams from rolls of material onsite. Constructability is a significant challenge for this option as the existing Harvey Creek tank roof is equipped within only a single access entry hatch. Materials would be brought inside the tank either through the existing access hatch, through a newly constructed large entry point, or after the removal of the existing roof which would later require replacement. Repair of the reservoir roof by either replacement or rehabilitation using a waterproof geomembrane liner is recommended consistent with the past report recommendations. Based on our estimates, rehabilitation of the reservoir roof is likely most cost effective solution compared with removal of the roof. However, clarification is required throughout the design process based on the viability of constructing the tank liner through the existing tank access.

A breakdown of the pros and cons of the system are provided in Table 1 below.

Table 1. Option 1 - Pros & Cons of Internal Bladder Liner

Pros	Cons
• Lowest capital cost leak prevention • Minimizes risk of future structural deterioration • Fast construction with minimal service disruption • UV-stable, chemical and rot resistant • Concrete patching to provide surficial improvement	• No seismic or structural benefits • Tank access uncertainty for transferring materials inside and installation • Duration of benefit from liner is short lived versus structural improvement options

The internal tank bladder does not provide structural or seismic upgrades to the existing tank which has been identified as deficient in both. Seismic upgrades, as discussed in the following section, could be considered in conjunction with a tank liner depending on the objectives of the Village. If structural and seismic upgrades are not completed, we would recommend that surface concrete patching and repairs be carried out as part of the works. For the purpose of cost estimation we have assumed for Option 1 that only the internal tank bladder, roof waterproofing membrane and concrete patching will be completed.

Option 2 – Seismic Upgrades and Sealant

Seismic upgrades and sealant can be used to repair the defects in the reservoir and meet the current code requirements while correcting the inadequate circumferential residual stress in the wall. The footing will be upgraded to ensure the ring beam can support the seismic shaking forces to code including diagonal seismic cables at the base to resist lateral (shear) seismic loads. Additional structural upgrades would include external post tensioning, likely in a methodology similar to that of a AWWA D110 tank, to re-establish sufficient horizontal hoop compression to counteract stresses due to hydrostatic load.

In addition to seismic upgrades, repair and resealing of vertical joints is required. Repairing the vertical joints between precast wall panels includes: removing current interior repairs; routing out interior joints and patching with a waterproof patching mortar; repair exterior failed joints where required and inject leaks (as required); install exterior tensioning and shotcrete the entire exterior surface. The roof will require repair and resealing after installation of walls. Following vertical joint repair, resealing of the base joint between the wall and base slab including removal of existing repair is recommended.

Constraints facing construction include limited record drawings. The existing buttresses on the exterior of the tank inhibit the exterior wrapping of the AWWA D115 cables due to uneven vertical surfaces which will require levelling or custom fabricated post-tensioning. The tank will be out of service both during tensioning and roof replacement. Materials required include cast-in-place concrete and use of specialized firms to complete the exterior tensioning. A breakdown of the pros and cons of the system are provided in Table 2 below.

Table 2. Option 2 - Pros & Cons of Seismic Upgrades and Sealant

Pros	Cons
• Provision of seismic load resistance as per current code requirements. • Resealing provides solution to water leakage at joints by creating watertight seal. • Addresses the foundation ring beam inadequacy in supporting the hoop tension at the base of the wall	• Inability to engage in pre fabrication construction techniques • Tank out of service for extended period during rehabilitation works • Existing buttresses create uneven vertical surface to apply exterior tensioning • High capital cost for repair of existing without significant assurances of long term performance

Option 3 – Demolition and Replacement

Demolition and replacement of the Harvey Water Reservoir presents the opportunity to revisit the tank replacement options based on the 2017 AECOM pre-design report. There are at least three available tank and reservoir material options which would meet the requirements of the Village including:

- Option 3.1 – Fused Glass Lined Bolted Steel Tanks (AWWA D103)
- Option 3.2 – Conventional Cast-In-Place Concrete Tank
- Option 3.3 – Prestressed Cast-In-Place Concrete Tank (AWWA D110 Type I)

Evaluation of options is considered based on material properties in the existing environment, resistance to damage, constructability, long term maintenance requirements and sustainability and cost. The main benefits of demolition and replacement common to all three options include seismic and structural improvements, permanent, long term solution for water leakage at joints and efflorescence deposits which will reduce the need to frequently maintain and tend to recurring issues. The drawbacks of demolition and replacement include high capital investment cost, extended project timeline and susceptibility to temperature gradients and cracking associated with freeze thaw cycles (concrete options in particular).

Based on supplier quotations gathered during the pre-design period, it was determined that Fused Glass Lined Steel Tanks designed to AWWA D103 are the least costly replacement option which still meets the minimum performance objectives of the Village. One objective of this analysis was to review cost effective means for repair, rehabilitation and replacement of the existing Harvey tank and as such AWWA D103 tank was used as the basis for the replacement option herein.

A glass-fused-to-steel tank and lining system that is impermeable to liquids and vapours. The system relies on cathodic protection system which consists of sacrificial anodes that mitigate corrosion and provide protection to internal submerged surfaces of the tank. The system is simple, reliable and requires only minimum inspection and maintenance.

Bolted steel tanks are sent to the site as individual steel panels and then assembled to form the tank of required diameter and height atop a concrete base slab. Glass-fused-to-steel lining is applied as an internal protective layer to prevent corrosion and eliminate the need for frequent maintenance. The coating can also be applied to the exterior surfaces to guard against weather, corrosion and from which graffiti can easily be removed. A flat aluminum roof/cover is recommended to be lifted into place after installation of base and tank due to corrosion prevention benefits. A breakdown of the pros and cons of the system are provided in Table 3 below. Fast construction is a benefit to this method due to premanufactured panels which would minimize downtime during construction.

Based on our estimates, the glass-fused bolted steel tank has the lowest capital investment cost of the three demolition and replacement options and thus is recommended as the option to pursue in this section.

Table 3. Option 3 - Pros & Cons of Fused Glass Lined Bolted Steel Tanks

Pros	Cons
• Least costly of the replacement options. . • Fast construction due to premanufactured panels which would minimize reservoir downtime during construction. • Turnkey procurement process with the manufacturer providing the design, material supply and acting as subcontractor during installation • Construction using steel panels minimizes the construction equipment mobilization and concrete truck traffic. • Customizable dimensions and appurtenances to meet project requirements. • If required the tank could be expanded, disassembled or relocated. • Seismic and structural improvements in line with codes.	• High capital cost partially driven due to demolition and site reconfiguration works. • 50 year design life. • Interior glass finish and exterior coating subject to damage during shipping and construction. • Maintenance includes the replacement of cathodic protection and failure to complete maintenance can lead to expedited corrosion. • Recoating of the exterior of the tank required every 20-25 years at a cost of ~$125,000. • Options are available for glass lined exteriors but these would be subject to damage and vandalism. • Bolt holes and sheet seems have the potential for corrosion and need to be monitored and resealed. • Cannot be buried and needs to be kept clear for visual observation.

Alternatively, the design of conventional reinforced concrete and prestressed concrete to AWWA D110 have been developed to detailed design phase which offer increased durability and reduced maintenance over the service life of the asset in comparison to AWWA D103 tanks and which can be revisited if desired by the Village.

Cost Estimates

Cost estimates have been developed for each of the presented remedial options discussed in the previous section as summarized in Table 4 below. All cost estimates include engineering (both design and construction contract administration and inspection), contingency (25%) but exclude GST.

Table 4. Summary of Cost Estimates

Option	Works	Cost
1	Internal Bladder Liner	$0.66 M
2	Seismic Upgrades and Sealant	$1.06 M
3	Demolition and Replacement	$1.64 M

Estimates for options 1 and 2 are based on correspondence with contractors and suppliers and provided budgetary figures. Finalization of the designs would need to be completed in order to reduce the contingency and refine the estimate value. Based on our estimates and the 2016 AECOM pre-design report and in subsequent reviews, there is a higher capital investment cost associated with concrete tank tank options. The Glass-Fused Bolted Steel Tank is the least expensive option of the three demolition and rebuild possibilities. Thus, this option is carried forward as the recommended method for option 3, as shown in Table 4 with an assumed increase of 20% was carried due to regional price fluctuations in steel due to geopolitical factors.

Option Comparison

Based on the review completed by AECOM and the options presented in the previous sections, we have prepared a summary of the presented options for consideration in decision analysis as outlined below in Table 5. Estimated service life of each rehabilitation option is based on the information available at the time of this assessment and therefore is limited and indicative only. The deterioration of the structural would require further investigation, design and review in order to proceed with either rehabilitation option. The service life of the internal bladder liner materials from Option 1 would have a service life beyond of 100+ years but the service life of the rehabilitation is unknown until further investigation of the tank interior, material testing and subsequent material testing. In contrast, the provided approximate 15 year service life of Option 2 is based on this being a minimum objective which would need to be met through the detailed design process in our opinion for value to be realized and the works be progressed to construction.

Table 5. Option Comparison Summary

Criterion	Option 1	Option 2	Option 3
	Internal Bladder Liner	Seismic Upgrades and Sealant	Demolition and Replacement
Resilience			
Estimate Service Life	Unknown	~15 yrs.	50+ yrs.
Meets Minimum Seismic Design Requirements	✗	✓	✓
Constructability			
Construction Complexity	✓	✗	✓
Minimize Construction Operational Impacts	✓	✗	✗
Estimated Construction Schedule	3-5 months	6-8 months	6-12 months
Local Expertise and Common Practice	✗	✗	✓
Maintenance			
Minimize Maintenance Requirements	✗	✓	✓

We have provided an indicative schedules for each of the options which vary in approximate schedules from 3 to 8 months including the required design, procurement and construction for each option. Option 1 provides the most expedient schedule as the design would be completed in a turnkey process by the liner supplier post-procurement. Option 2 will require further investigation, testing and analysis in order to complete the design complete prior to procurement. Option 3 would require minimal revisions to the previously developed procurement package to incorporate new tank material alternatives including glass fused to steel and the schedule would be dependent on which option was selected for construction. It is anticipated that by using this approach that it is feasible to complete all three options prior to the CWWF Fund deadline of March 31, 2019.

CONCLUSIONS

The condition assessment for the Harvey tank was based upon available background information and a preliminary site visit. Based on this review, we have three remedial options that provide a range of service life improvement ranging from limiting further deterioration of the structure, upgrading to meet current standards, and complete replacement. We submit these options for consideration by the Village of Lions Bay and trust this report satisfies your requirements at this time. If you have any further questions, please do not hesitate to contact AECOM for further information.

APPENDIX A – SITE INSPECTION PHOTOS

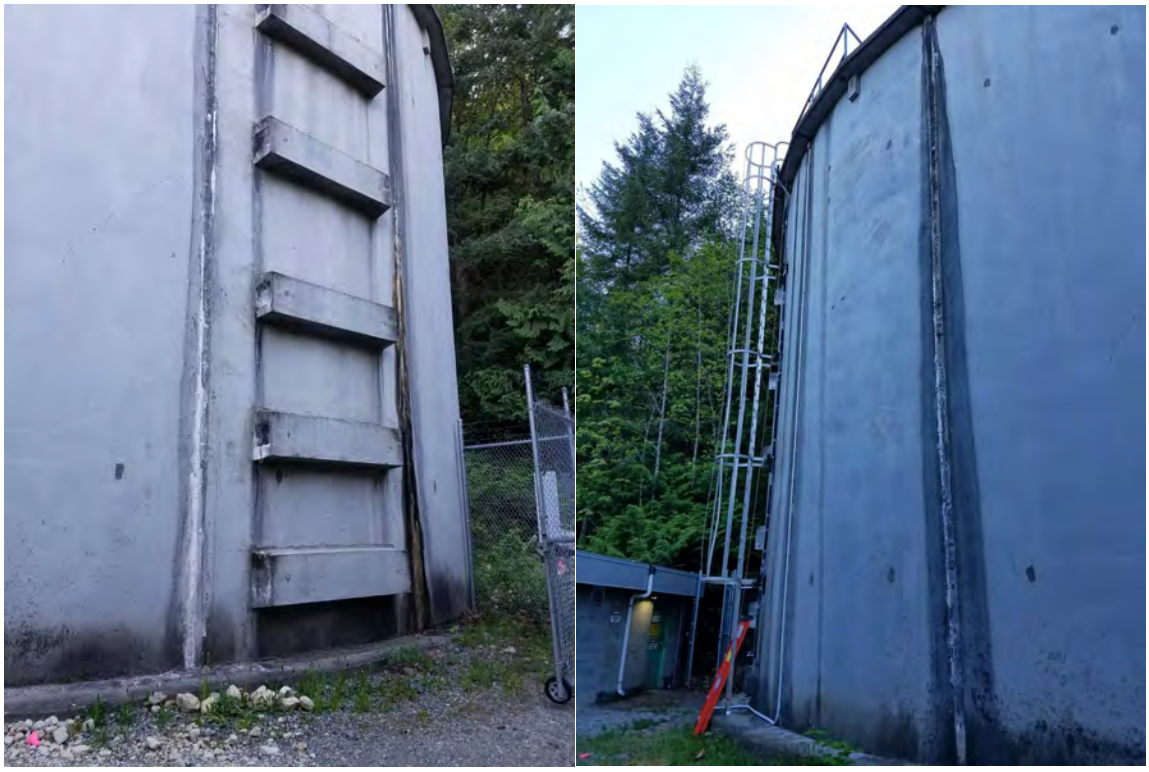

Figure A2.1.1: Wall panel leakage facing southwest (left) and northwest (right)

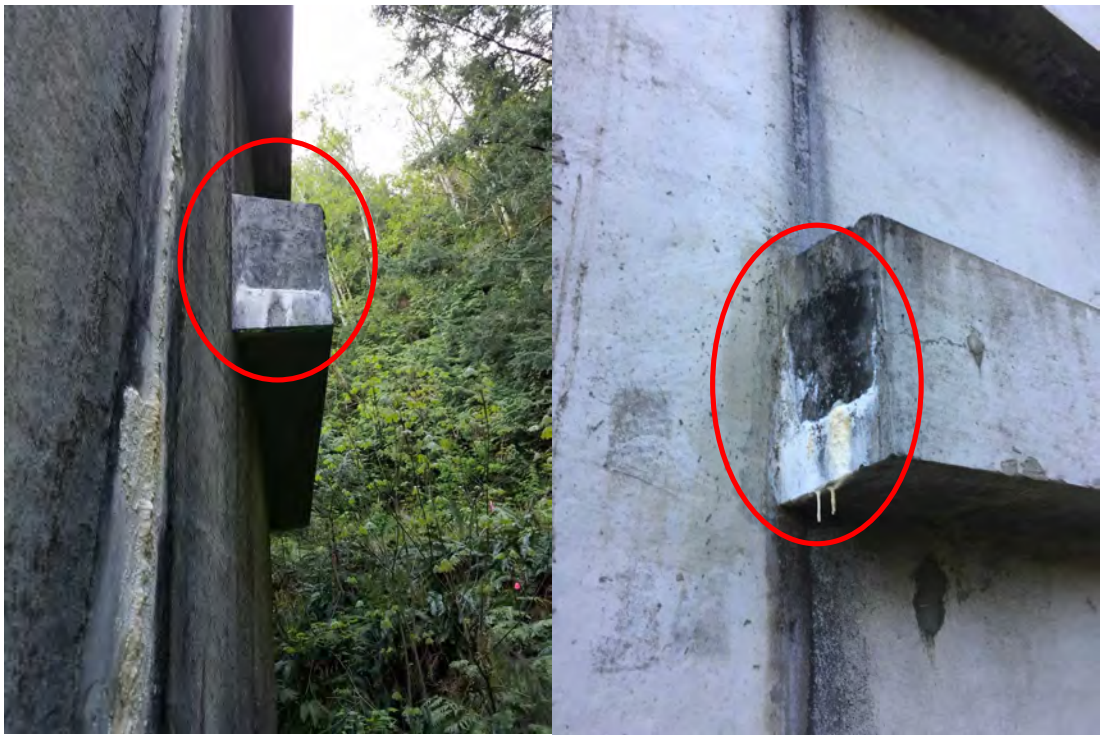

Figure A2.1.2: White efflorescence deposits at grout filled pockets on each end of the post tension buttress

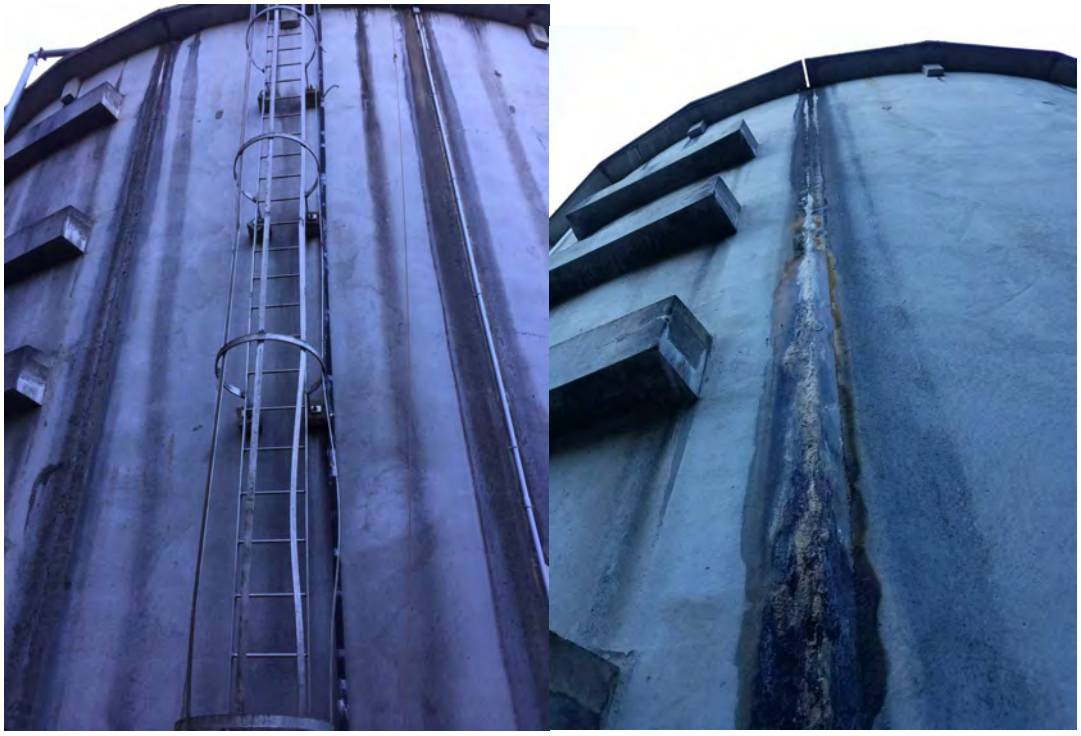

Figure A2.1.3: External access ladder cage (left) and wall panel leakage (right)

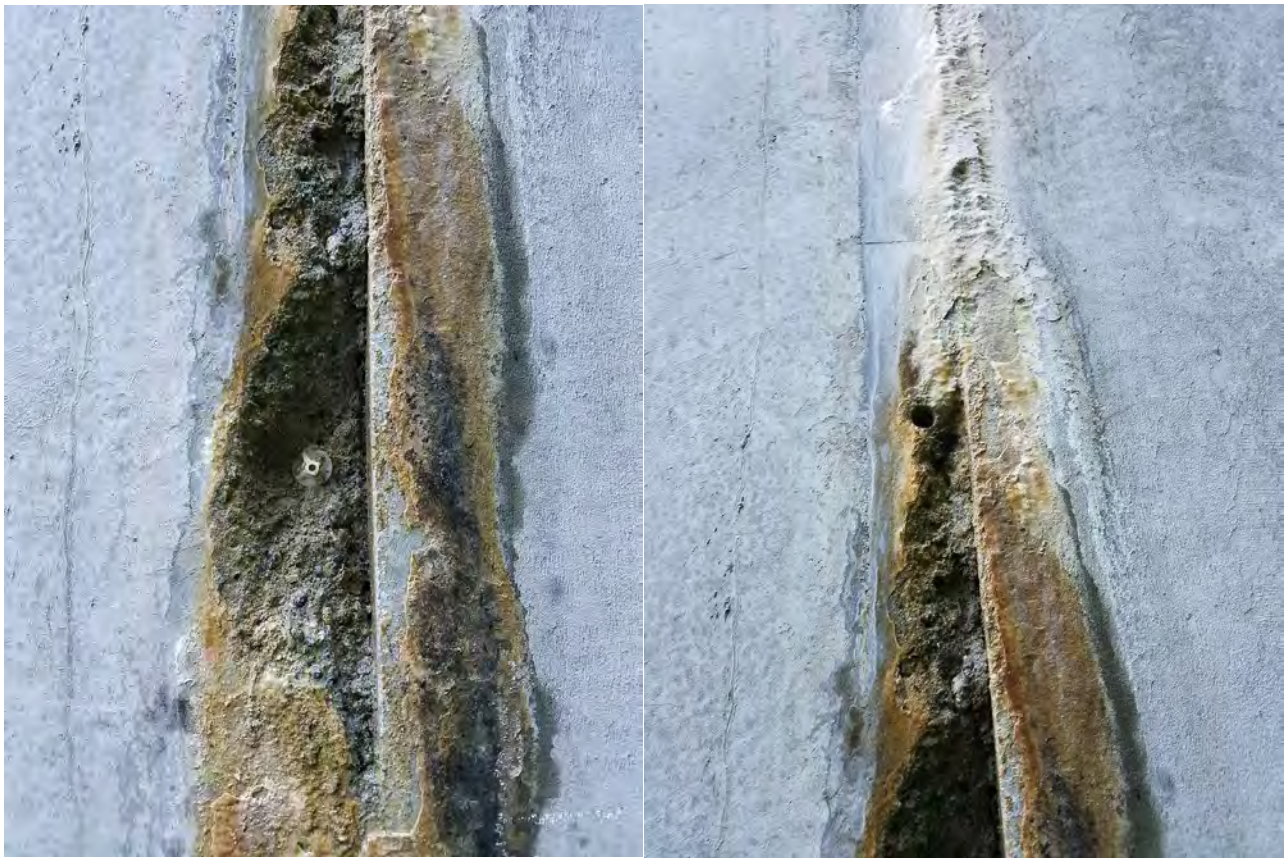

Figure A2.1.4: Wall panel material deterioration and evidence from previous repairs

EXTERNAL RESERVOIR ROOF PHOTOS

Figure A2.2.1: Roof facing southeast (two photos)

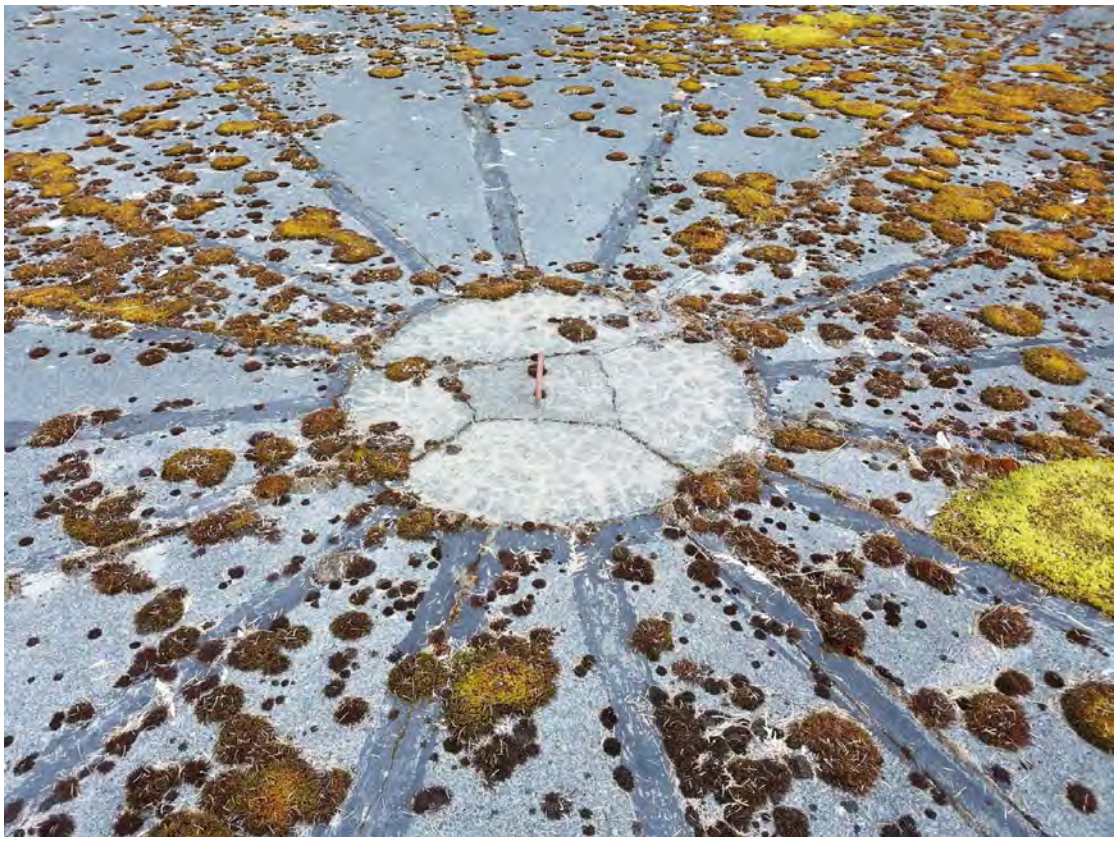

Figure A2.2.2: Center column roof connection

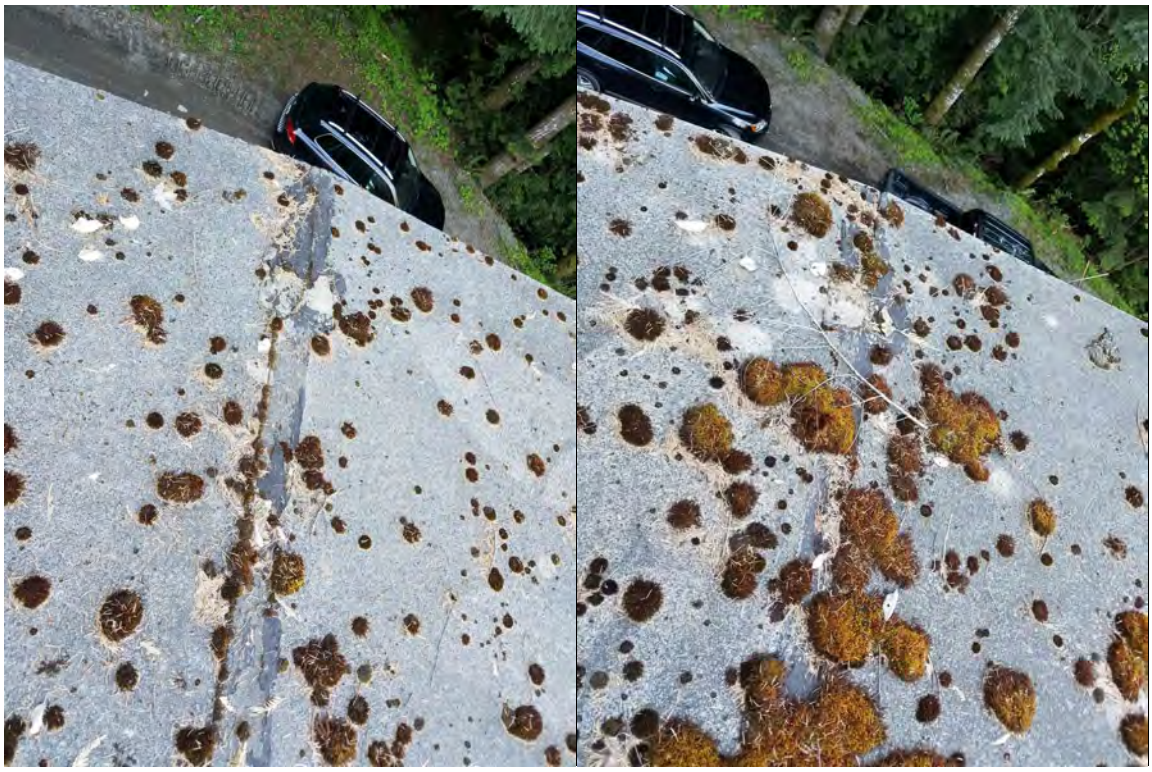

Figure A2.2.3: Roof panel joint examples

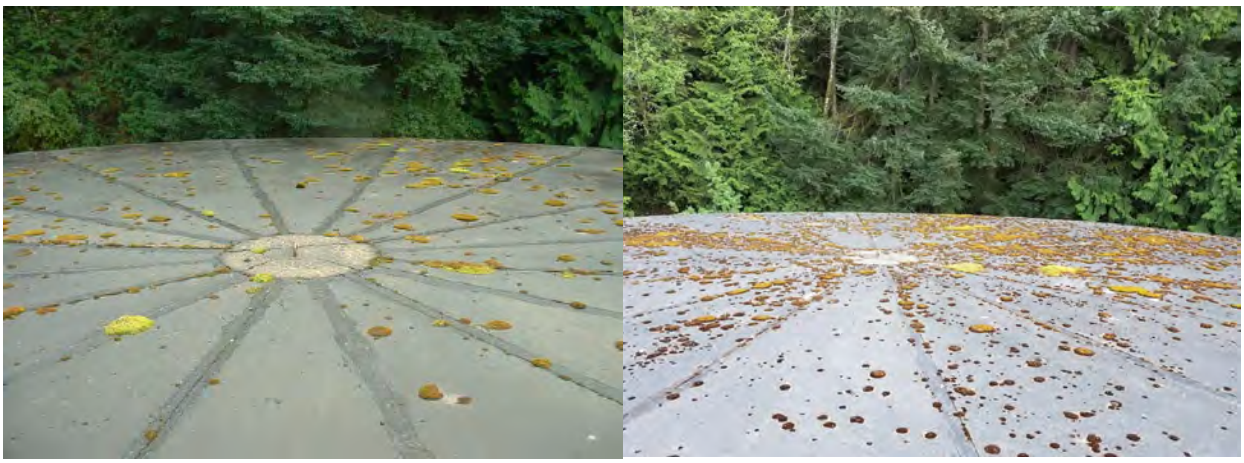

Figure A2.2.4: More green moss/vegetation growing on the roof, left picture from 2005, right picture from 2018

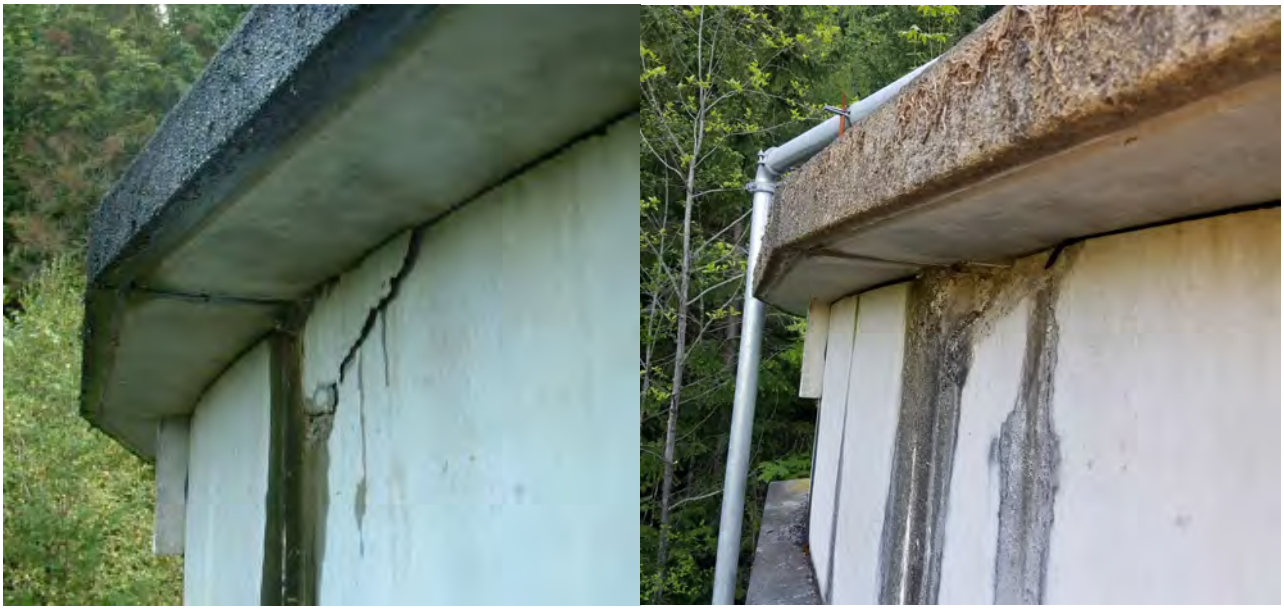

Figure A2.2.5: Wall/roof connection damage on north panels, left picture from 2005, right picture from 2018

INTERNAL RESERVOIR PHOTOS

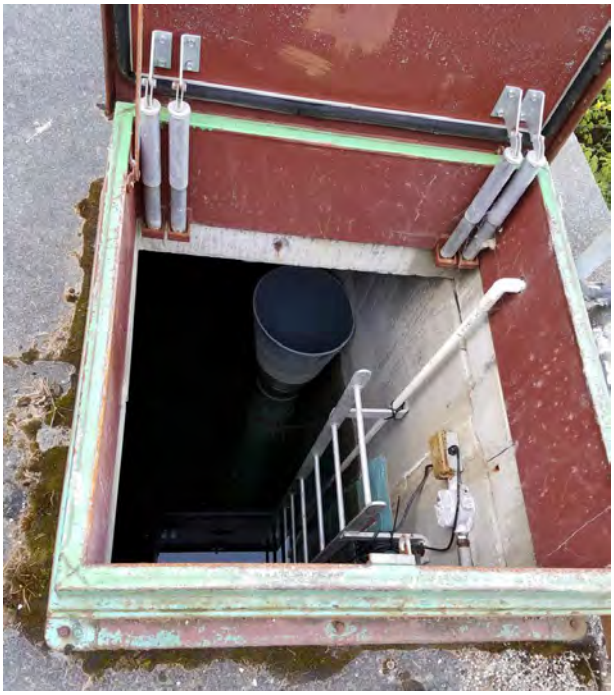

Figure A2.3.1: Roof access hatch

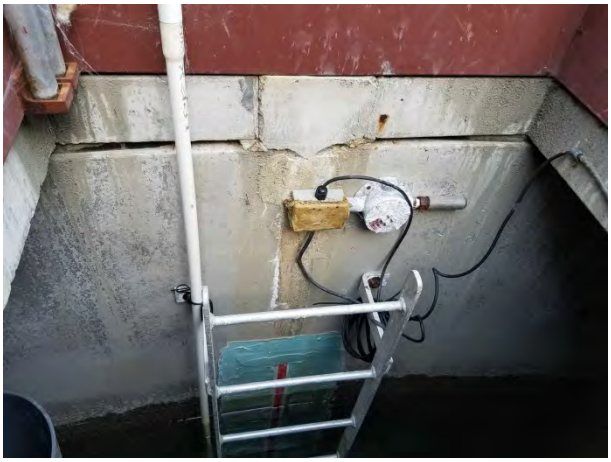

Figure A2.3.2: Internal access ladder and instrumentation. Evidence of previous rehabilitation on vertical panel seam observed behind ladder.

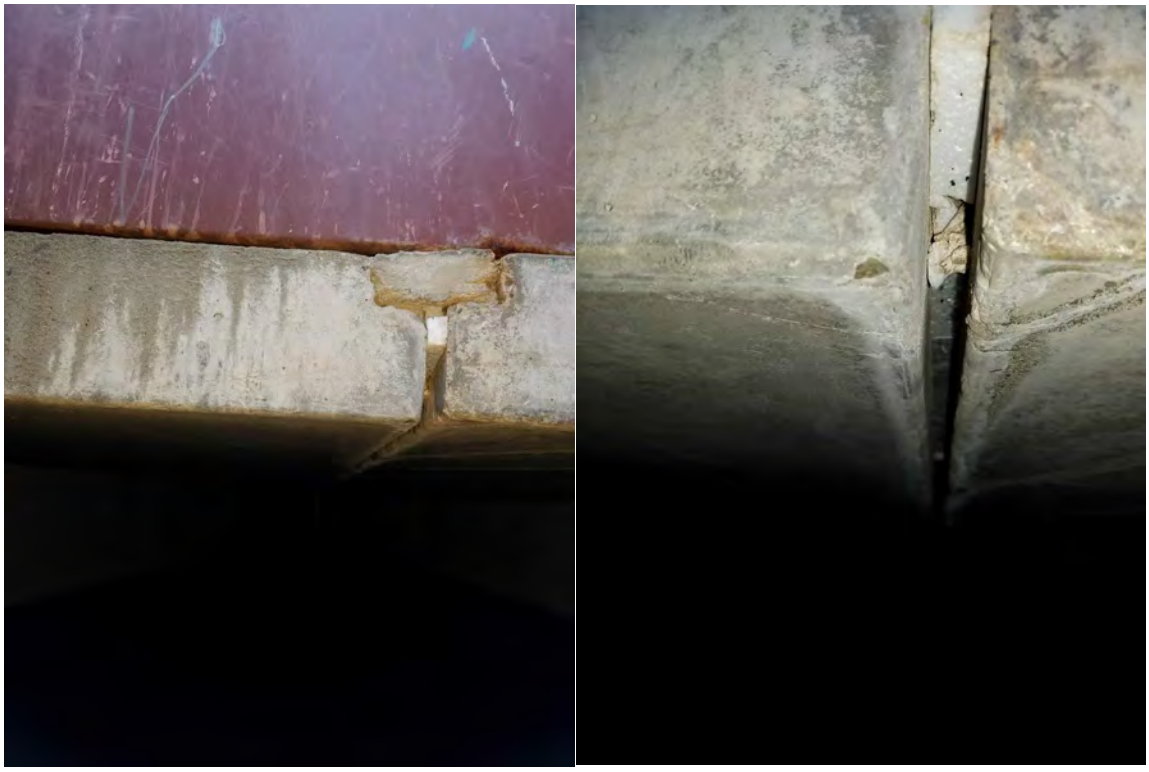

Figure A2.3.3: Roof panel joint cross-section observed at access hatch opening

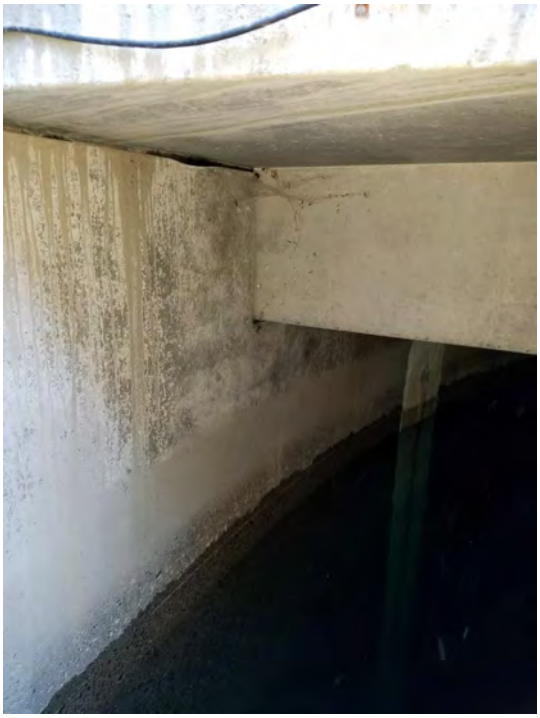

Figure A2.3.4: Roof support beam observed from access hatch opening