

2026

ANNAPOLIS ROYAL WHARF

STRUCTURAL ASSESSMENT AND CONDITION REPORT

Prepared For

Town of Annapolis Royal
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TABLE OF CONTENTS

1 INTRODUCTION 2
2 STRUCTURAL ASSESSMENT AND CONDITION REPORT 3
2.1 INVESTIGATION 3
2.2 STRUCTURAL ANALYSIS 14
3 EXISTING AND FUTURE USE OF WHARF 14
4 REQUIRED MAINTENANCE AND INSPECTIONS 15
5 RECOMMENDATIONS AND CONCLUSIONS 16

TABLE OF FIGURES

Figure 1 - Annapolis Royal in July 1931 2
Figure 2 - Annual Wharf Measurements (2022-2026, Inclusive) 4
Figure 3 - East Side of Wharf 5
Figure 4 - Sheet Pile Deterioration at Drainage System Level, East Side of Wharf Near North End 2024 6
Figure 5 - Rust Deterioration of Same Hole in 2025. Note New Holes. 6
Figure 6 - Rust Deterioration on Same Section in 2026. Note New Holes and Increased Sizes 7
Figure 7 - West Side of Wharf 7
Figure 8 - West Side of Wharf (Middle Section) 8
Figure 9 - Floating Dock with Aluminum Ramp & Stairs 9
Figure 10 - Ladder on East Side with Removed Rungs 9
Figure 11 - Portable Aluminum Ladder in Good Condition on the West Side 9
Figure 12 - Steel Bollards Anchored in Concrete 10
Figure 13 - Fallen Tire Fenders 11
Figure 14 - Rotten Timber Curbs from 2025 Replaced on East Side 11
Figure 15 - Missing Wooden Fenders on East Side of Wharf 12
Figure 16 - Floating Dock for Recreational Boaters 12
Figure 17 - Settling Along Sides of Asphalt Deck 13
Figure 18 - Longitudinal Cracking Along Northwest Side of Wharf 13
Figure 19 - Bench Seats 13

LIST OF APPENDICES

APPENDIX A

- Additional Wharf Pictures

1 INTRODUCTION

In 2022, the Town of Annapolis Royal approached ABLE Engineering Services Inc., "ABLE", to complete an annual structural assessment of the town wharf. The following report will represent the fifth annual structural assessment performed by ABLE.

The existing wharf was constructed in the 1980's by D.J Lowe Contracting. At that time, sheet piles were installed around an existing wooden structure, filled with rock and the surface then paved.

Presently, the Town of Annapolis Royal has only one wharf left, which is no longer used by local fisherman and recreational boaters as there is no mooring to the wharf allowed. The portion of wharf closest to shore is still used as parking for the downtown area. Nearly a century ago, there were a dozen wharfs on the Annapolis side of the Annapolis Basin, and 8 to 10 on the Granville Ferry side. An image of the wharfs in Annapolis Royal in July 1931 can be seen in Figure 1.

In 2022, the wharf was found to be nearing the end of its useful life. At that time, the remaining service life was estimated at five years, meaning the wharf would need to be replaced or rebuilt by 2027. The recommendations below have been put forth to maximize the service life remaining of the wharf:

- Maintain parking restrictions to the inner two-thirds of the wharf's surface
- Sacrificial anodes be installed on the sheet piling
- Ladders be repaired or replaced as they are still necessary if someone should fall off
- Timber curbs be repaired or replaced
- General hole patching of sheet piling, with priority on lower holes that are enlarging.

Continued maintenance will be required until the structure is eventually replaced, or removed. Planning for the future of the wharf is still in progress and maintenance is required if the plan is to keep the wharf. The use of the wharf is being restricted by the Town by posting signs indicating that ships are prohibited to tie up to the wharf and parking is restricted to the inner part.



Figure 1 - Annapolis Royal in July 1931

2 STRUCTURAL ASSESSMENT AND CONDITION REPORT

2.1 INVESTIGATION

On June 17th, 2026, ABLE conducted a visual inspection of the wharf during low tide to ensure the sheet piling was exposed in order to determine the change in its condition.

Wharf Measurements

Each year since 2022, the top width of the wharf has been measured at 5-metre intervals for its full length to document irregularities and to be used for comparison of sheet piling displacement over time. ABLE took its first set of wharf measurements on June 7, 2022, then again in 2023, 2024, 2025, and 2026. Comparative measurements can be found in Figure 2.

When returning to site in June of 2023, it was observed the curb was displaced to facilitate the addition of a new sign. Measurements for 2023 were again taken to the timber curb, see Figure 2, but a second set of measurements to steel angle iron were also taken. Measurements from 2024, 2025, and 2026 have been added to Figure 2 showing measurements from the angle iron have been stable over time.

Readings this year were stable compared to last year with most stations having only a centimeter or two of change. The measurements taken in 2026 indicate the width of the wharf has shown little change in the past year.

For future comparison, the measurement method at six measurement locations have been updated due to the placement of boulders blocking past measurement locations. The changes are listed below. All other measurements have been taken using the existing method.

1. **10m:** As the measurement is located on a bollard, the method has been updated for future consistency and has been measured to the inside of the concrete base. The discrepancy between 2025 and 2026 is due to this change. The new measurement for future comparison will be 15.01m.
2. **40m:** Due to a large rock located at the measurement location, it was measured 2-feet closer to the road on both sides. Any inconsistencies between 2025 and 2026 are due to this update.
3. **55m:** Due to a concrete base, it is measured 1-foot closer to the road on both sides. Any inconsistencies are due to the change in measurement location.
4. **80m:** Due to the row of boulders, the measurement was made 2-feet closer to the road on both sides.

Sheet Piling

The deterioration of the steel sheet piling continues to progress, particularly at the northeast end of the wharf, where corrosion has resulted in the expansion of existing holes near the base of the sheet piles. Several sheet piles have experienced severe section loss, with some having corroded through more than half of their original thickness or width.

Due to insufficient funding, cathodic protection has not been installed to mitigate corrosion and extend the service life of the wharf. In addition, no repairs or steel patching have been completed on the sheet piling during the past year.

As corrosion continues to advance, the feasibility of welding repairs in affected areas will become increasingly limited. In several locations, the remaining steel may be too thin and structurally compromised to provide an adequate substrate for welded patches, potentially requiring more extensive rehabilitation or replacement.

At present, no maintenance or repair work has been scheduled for the sheet piling this year, nor has installation of the required sacrificial anodes been scheduled. Without cathodic protection and timely repairs, corrosion will continue to occur on both the interior and exterior surfaces of the sheet piling, further reducing the remaining service life and structural capacity of the wharf.

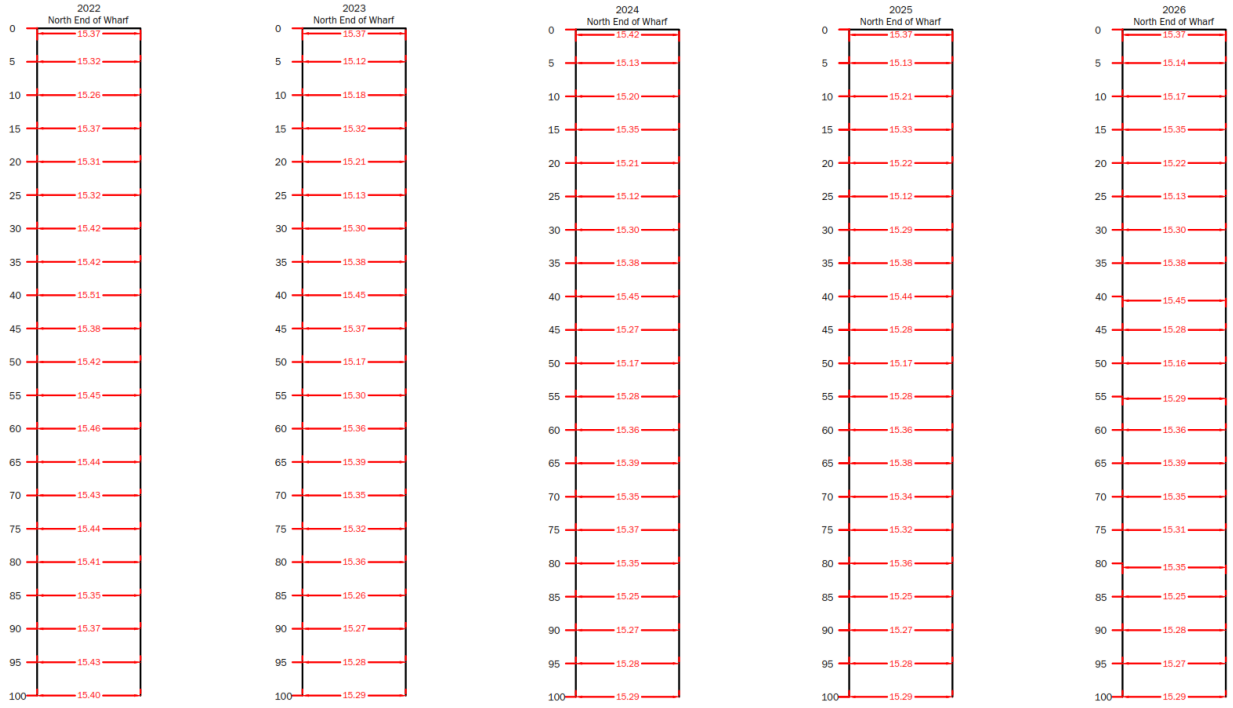


Figure 2 - Annual Wharf Measurements (2022-2026, Inclusive)

Further deterioration and holes left unpatched from the 2023 assessment were also noted during the May 2024 inspection, and the June 2025 and 2026 inspections, particularly on the east side of the wharf. There were several large holes completely through the sheet piles which will allow the rock to wash out if not patched. Where repairs were done on the west side of the wharf it was noted that these were holding up well.



Figure 3 - East Side of Wharf

The sheet pile deterioration was most pronounced on the lower sections of the east side near the north end (see Figures 4, 5, and 6). It was noted that there are many large holes near the bottom of the wharf where the floating ramp sits at low tide.
The 3 pictures below show the visible deterioration over the last 3 years of just one of the holes in the wharf. These holes at the bottom of the wharf are worrisome as the bottom of the sheet

piling weakens, they could suddenly let go in a storm event and spill rocks out the bottom leading to the collapse of the top surface down on itself.



Figure 4 - Sheet Pile Deterioration at Drainage System Level, East Side of Wharf Near North End 2024



Figure 5 - Rust Deterioration of Same Hole in 2025. Note New Holes.



Figure 6 - Rust Deterioration on Same Section in 2026. Note New Holes and Increased Sizes.

The area of rust deterioration at the bottom of the structure is of greatest concern as the sheet piles continue to rust away. The piles will eventually rust off and the rocks filling the structure will spill out. As the weight of the structure rests on these piles, further deterioration and rusting will result in interior rocks spilling out and structure collapse.

During the 2026 inspection, it was noted that on the west side the rusting is more pronounced on the top 10 feet of the steel sheet piling. However, rusting around the drains near the bottom is also expanding. (see Figure 7 and 8).



Figure 7 - West Side of Wharf



Figure 8 - West Side of Wharf (Middle Section)

Ladders

During the 2025 inspection, it was noted the existing ladders are no longer in use but are available in case of an emergency for someone in the event of a fall. It was noted that mooring of boats is no longer permitted. The ladder and boat use restrictions are the same in 2026.



Figure 9 - Floating Dock with Aluminum Ramp & Stairs



Figure 10 - Ladder on East Side with Removed Rungs



Figure 11 - Portable Aluminum Ladder in Good Condition on the West Side

Bollards

The steel bollards themselves appear to be in good condition; however, they are supported on top of rusting and deteriorating sheet piling. This implies they are only going to hold as much as the sheet piling beneath them can support the lateral loads. The bollards can be seen in Figure 12. With no ships or boats tying up anymore, they are no longer used for their intended purpose.

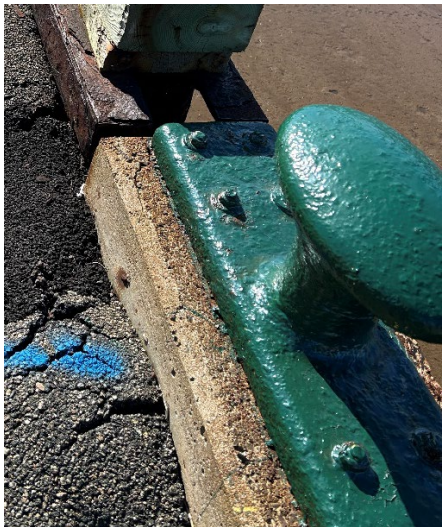


Figure 12 - Steel Bollards Anchored in Concrete

Timber Curbs and Tire Fenders

The wharf's surface has an 8" x 8" timber curb running along the perimeter. The condition of the curbs is considered fair since replacements were made to curb sections. Previous curb sections that were noted to be rotting in the 2025 inspection have been replaced. The steel that the timbers are fastened to is deteriorating. Therefore, the rocks have been placed along the edge to keep vehicles back and rope fences have been placed along the northern sections to keep the public back from the outer edges of the wharf. Even these measures did not keep an ambulance from backing up over the curbs and into the water in May of this year. The police report indicated this was accidental.





Figure 13 - Fallen Tire Fenders



Figure 14 - Rotten Timber Curbs from 2025 Replaced on East Side

The tire fenders that used to hang on the sides of the wharf to prevent vessels from damaging the wharf (and themselves) have all rusted off. The steel cables holding them in place rusted away, and the tires have fallen to the bottom of the wharf (Figure 13). No tire fenders remain on the wharf and they are no longer needed as boats can no longer dock here.



Figure 15 - Missing Wooden Fenders on East Side of Wharf

Floating Adjustable Dock

Small boats would likely use the floating adjustable height dock at the east side of the wharf at the north end if they were allowed, but this is no longer allowed, and it is roped off. This is much newer and was not part of the original construction. It appears to be in much better condition (Figure 16).



Figure 16 - Floating Dock for Recreational Boaters

Asphalt Deck

The asphalt deck is still in fair condition, but has some signs of settlement and longitudinal cracking 12” to 24” from the side of the wharf.

In addition, some grasses and vegetation are starting to grow in the cracks in the asphalt.
There does not appear to have been any substantial loss of materials from inside the rusting piles and the depressions that exist along the sides do not appear to be any worse when compared to 2022.

The asphalt should be observed closely and inspected frequently for any signs of further settlement. An example of asphalt settling along the sides of the wharf can be seen in Figure 17. An example of the asphalt cracking can be seen in Figure 18.

Sheet piling repairs, as previously mentioned, should be carried out this year to prevent the condition of the asphalt deck and wharf from further deterioration. Particular attention should be given to the lower section of the east side.



Figure 17 - Settling Along Sides of Asphalt Deck



Figure 18 - Longitudinal Cracking Along Northwest Side of Wharf

Benches & Rock Barriers

Park benches are still installed on the north end of the wharf. A large row of boulders, trash, and recycling bins have been placed as traffic barriers to keep vehicle traffic from driving out to the end of the wharf.



Figure 19 - Bench Seats

2.2 STRUCTURAL ANALYSIS

The wharf working surfaces are supported by rocks and gravel in crib work inside the sheet metal pile walls on three sides. Loads from trucks and vehicles are exerted in a downward direction supported by the underlying stone fill, however, there is a lateral component of this which is resisted by the sheet piling and the steel rods running under the wharf into the cribwork. The condition of these rods, which would highly likely be deteriorating due to the twice daily saltwater flow, is ultimately unknown.

Previous measurements of the sheet metal pile thickness by Hatch Engineering in 2018 (8 years ago) showed that it was rusted away by as much as half of the original material thickness in some places.

It is recommended the 12 metric tonne weight limit and restrictions on parking, be maintained. No parking should be allowed on the outer 30 metres of the wharf. The existence of the bench seats on the wharf, large rocks, and recycling and garbage bins, has effectively blocked traffic from the end of the wharf and made it more attractive for pedestrian use.

It is recommended that immediate repairs be made to patch any holes in the sheet piling with ½" steel plate welded in place to solid steel materials around the hole. This will help prevent the loss of rock and fill from inside the structure which would further weaken it, and to help maintain the structural integrity of the sheet piling.

The northeast end of the wharf on the east side has several rather large holes that need immediate repair near the low tide level. These are accessible at low tide from the floating ramp on that side. These appear to have been missed the last three years when repairs were being made, and these are the sheet piles that when they fail will cause the most damage to the wharf.

The wharf should be inspected regularly at low tide to see if any larger holes develop in the sheet piling, and for the loss of any fill from inside. Should this happen, the repairs should be made as soon as possible, and vehicles restricted from parking nearby until the repairs are completed.

A cathode protection system using zinc anodes was recommended starting in 2022 to help protect and slow the loss of the steel to corrosion. This should be installed as soon as possible. If funds are limited, they should first be installed on the outer or north end of the wharf first near the low tide level.

3 EXISTING AND FUTURE USE OF WHARF

As mentioned earlier, the wharf is the only remaining wharf structure in the Town. It has had its use severely restricted and no longer supports the three main uses, which helps to attract people into the Town (tourists, locals, etc.):

- Parking for access to the downtown core
- Access for recreational boaters to dock and access the town
- Use by local fisherman to dock, complete vessel repairs, etc.

The future use of the wharf is unknown as different plans are considered for the future. The Town of Annapolis Royal is presently working on a living shoreline project which will likely have an influence on the ultimate decision on what to do with the wharf. Funding has been unavailable for major repairs to the wharf for the last few years. It is clear, based on this report and those previous, that the wharf is quickly approaching the end of its useful life. Without significant repairs and maintenance, continued use could pose a significant safety risk. Unfortunately, regular maintenance will not prolong the useful life for much longer, the wharf will need to be rebuilt or dismantled.

4 REQUIRED MAINTENANCE AND INSPECTIONS

Below is a list of maintenance and inspections recommended to be completed this year. These are the same as previous years as not much maintenance has been completed.

- Patching of the rusted holes along the lower section of the sheet piles at the north end of the wharf.
    - These holes are getting larger. Since they are at the bottom, further pile deterioration could result in rock material from the interior spilling out and the collapse of the north end of the wharf.
    - Potential spillage of rock and materials from inside the wharf on this side, could also damage the floating dock and block the use of the slipway beside the wharf on the east side.
- Using cathodic protection system via sacrificial anodes, such as zinc bars fastened to the sheet piling to extend the useful life of the sheet piles in some areas. This should be done as soon as possible to slow the rate of corrosion, especially around the lower northeast corner of the wharf by the floating dock.
- Continue patching holes as they appear in the sheet piling to stop the loss of rock from inside the wharf structure. **Note: do not weld patches completely over the drain holes near the bottom of the sheet piling as these are needed to allow water pressure to equalize or be minimized from rising and falling tides.**
- Replace timbers around top of deck, where needed.
    - This can be done with locally obtained rough sawn timbers. Hemlock and cedar are good for this purpose as they do not need preservatives added to protect.
- Replace wooden fenders along the sides of the wharf.
- Repair ladders up the sides of the wharf as these provide a closer escape route for people to swim to if they should accidentally fall over the side.
- Continue to patch holes in asphalt where weeds are growing, and as more holes develop.
- Regular inspections are recommended.
    - In addition, it is recommended that town staff assess the structure to identify any of the above changes monthly and after any major storm. Should damage, movement or settling of the structure be detected they should request the services of a professional engineer for inspection as soon as possible. The Town may wish to consider a twice-annual inspection as the end of the useful life of the wharf approaches.

- As mentioned previously, measurements of the width of the wharf were taken at 5-metre intervals along the length of the wharf. The results shown within this report show it has been relatively stable over the past year. These measurements should also be checked and compared at a minimum once per year to determine if the sheet piles are moving outward. This will most likely provide a good indication or early warning of failure of the steel tie backs that are not accessible to inspect inside the wharf rock fill.
- Pictures of the wharf and any areas damaged should also be taken each year so visual comparison of the change can be noted over time.

5 RECOMMENDATIONS AND CONCLUSIONS

The wharf is nearing the end of its useful life. The steel piling holding it in place is rusting away and there is no way of stopping this; only slowing its progress. Realistically, the wharf can only be expected to last another couple of years, and by then its use will be severely limited. It is noted that the wharf is no longer used for tying up ships and boats, and parking is restricted to the inner part of the wharf.

The repairs that were made 3 years ago appear to be holding up and have helped to reinforce the sheet piling. This work was mostly done on the west side. Our 2026 inspection revealed that there were several large holes where the sheet piling had rusted all the way through, which appear to have been missed (not patched with steel plates) on the east side near the low water level. These expanding holes should be patched as soon as possible. These are most likely to cause an early collapse of the wharf and need to be prioritized.

It is recommended that the above inspections and maintenance be carried out annually, at a minimum, to assess the continued capabilities and safety of this structure.

- The weight limit of 12 tonnes should be maintained on the wharf and vehicle parking can still be allowed on the inner two-thirds of the wharf.
- No parking should be allowed on the outer section of the wharf. If the rock and materials are contained in the structure, the weight of vehicles is being carried by the underlying rock so parking can still be allowed on the inner section.
- Should any buckling, deflection of the sheet piles, or large holes appear in the sheet piling allowing the loss of rock from inside the structure, then use of the wharf should be further restricted in that area and beyond. Similarly, if holes appear in the asphalt surfaces, parking should be restricted in these areas and beyond.
- Patch remaining large holes in sheet piling.
- Attach zinc anodes to the sheet piling to help slow corrosion.
- Maintain and repair damaged ladders.
- Replace deteriorated wooden curb timbers on the top of the wharf.
- Consider signage for areas with uneven asphalt, or patch as needed. This may cause people to stumble and possibly fall over the side.

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APPENDIX A



East Side of Wharf and Boat Launch



Sheet Pile on Lower East Side Nearly Rusted Through in 2024.



Same hole expanded in 2025 from last year shown above.



Same hole expanded in 2026 from previous years shown above.



West side of wharf in 2025 also rusting away near bottom



Same section has progressed in rusting in 2026. Note some rock ballast gone.



Roped off area on northeast side of outer wharf to keep people back from edge



East side of outer wharf fenced off closing use of floating dock facility and keeping people away from the side.



Wooden curb rotted away on east side of inner Wharf has been replaced with new curb.





Steps cut out of ladder to discourage people climbing on them



Patch on East side of wharf from a few years ago rusting through as shown in 2025



Patch on East side of wharf continuing to rust through in 2026.



Current conditions of patching on the east side



Visible Flaking from rusting