

SAINT ANDREWS WHARF - ASSESSMENT REPORT

TOWN OF SAINT ANDREWS

212 WATER STREET

SAINT ANDREWS, NB

Prepared for:

Town of Saint Andrews
212 Water Street
Saint Andrew, NB
E2B 2Y2

Attn: Chris Spear
CAO

February 25th, 2026

Project No: 18959

FUNDY Engineering

Serving Our Clients' Needs First

OFFICES IN SAINT JOHN AND CLYDE RIVER



JOB FILE:	18959		
PROJECT TITLE:	Saint Andrews Wharf Assessment Report		
VERSION	ISSUANCE DATE	PREPARED BY	REVIEWED BY
DRAFT	January 30 th , 2026	Gordon Moulant, <i>M. Eng, P. Eng.</i>	Eric Orser, <i>P. Eng.</i>
1.0	February 25 th , 2026	Gordon Moulant, <i>M. Eng, P. Eng.</i>	Eric Orser, <i>P. Eng.</i>

FUNDY Engineering

Serving Our Clients' Needs First

This report was prepared for the sole use of the Client. The material and observations presented reflects Fundy Engineering & Consulting Ltd.'s opinion and best judgment based on the information available. Fundy Engineering & Consulting Ltd. accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon the material, observations, and / or opinions by any third-party or for any damages suffered by any third-party resulting from the use of this report.

PROFESSIONAL SEAL:



TABLE OF CONTENTS

1.0 INTRODUCTION	6
1.1 Scope of Work Completed	7
1.2 Limitations.....	9
2.0 REVIEW OF EXISTING DATA	9
2.1 Review of Information	9
2.2 Inner Approach Wharf.....	9
2.3 Outer Approach Wharf.....	14
2.4 Head of Wharf.....	16
2.5 Market Wharf and Day Adventure Wharf.....	22
2.6 Test Pits Inner Approach Structure.....	29
2.7 Gangways.....	31
2.8 Floating Docks	33
2.9 Guide Piles and Fender Piles	33
2.10 Existing Crib Structure	34
3.0 CONCLUSIONS	35
3.1 Inner Approach Structure.....	35
3.2 Outer Approach Structure	35
3.3 Head of Wharf.....	35
3.4 Recommendations.....	35
4.0 PRIORITIES.....	36
4.1 H Pile Repairs / Low Water Jackets.....	36
4.2 Head of Wharf Anodes	36
4.3 Inner Approach Road Deck.....	37
4.4 Inner Approach Road Trestle Structures.....	37
4.5 Walers and Cross bracing (1/3)	37
4.6 Day Adventure Sea Wall Next to Access Ramp	38
4.7 Market Wharf Face / Expansion.....	38
4.8 Walers and Cross bracing (2/3)	39
4.9 H Pile Repairs / High Water Jackets.....	39
4.10 Walers and Cross bracing (3/3)	39
4.11 Day Adventure Seawall South Face	39
4.12 Guide Piles	39
4.13 Whale Gangway / Floating Dock.....	39
4.14 Fire Water Line	40
4.15 Dinghy Floats.....	40
4.16 Wood pile Jackets.....	40
5.0 COST ESIMTATES AND SEA LEVEL RISE	40
6.0 CLOSING REMARKS	41

LIST OF FIGURES

<i>Figure 1 – Aerial view of the Saint Andrews Wharf.....</i>	<i>6</i>
<i>Figure 2 – Collapsed ballast floor</i>	<i>10</i>
<i>Figure 3 – Between lines 2 and 4 on row A deck rot at edge of the wharf was observed..</i>	<i>10</i>
<i>Figure 4 – Typical repairs to pile bents.....</i>	<i>11</i>
<i>Figure 5 – Line C trestle column is compromised.....</i>	<i>11</i>
<i>Figure 6 – Inner approach deck with repaired section in the foreground with centerline cracks and repairs.....</i>	<i>12</i>
<i>Figure 7 – Inner Approach Deck patch (200 x 450mm) in need of repairs.....</i>	<i>13</i>
<i>Figure 8 – Alkaline reactivity on concrete decking.....</i>	<i>14</i>
<i>Figure 9 – Walers and cross bracing are in poor condition.....</i>	<i>15</i>
<i>Figure 10 – Southern end of outer approach structure and head of wharf.....</i>	<i>15</i>
<i>Figure 11 – East end of head of wharf.....</i>	<i>16</i>
<i>Figure 12 – H Pile at Southeast Corner (Pile 22-A).....</i>	<i>17</i>
<i>Figure 13 – Fender and guide piles at South End of wharf.....</i>	<i>17</i>
<i>Figure 14 – H Pile at lines 11-A and under side of deck in good condition.....</i>	<i>18</i>
<i>Figure 15 – East end of wharf head deck in good condition.....</i>	<i>18</i>
<i>Figure 16 – Utilities attached to approach structure.....</i>	<i>19</i>
<i>Figure 17 – Structural H pile with significant hour glassing / loss of pile steel.....</i>	<i>20</i>
<i>Figure 18 – Structural H pile showing anode depletion and hour glassing.....</i>	<i>21</i>
<i>Figure 19 – Sacrificial anodes in very poor condition.....</i>	<i>22</i>
<i>Figure 20 – Market Square from Inner Approach Wharf.....</i>	<i>23</i>
<i>Figure 21 – Len of market wharf and deck.....</i>	<i>23</i>
<i>Figure 22 – Void at bottom of market wharf.....</i>	<i>24</i>
<i>Figure 23 – Depression behind market wharf crib structure.....</i>	<i>23</i>
<i>Figure 24 – The end of the tie back is compromised due to rot.....</i>	<i>26</i>
<i>Figure 25 – Leaning underside of Market Wharf deck.....</i>	<i>26</i>
<i>Figure 26 – Crib wall next to shoreline access.....</i>	<i>27</i>
<i>Figure 27 – Day Adventure Wharf wall facing seaward.....</i>	<i>28</i>
<i>Figure 28 – Day Adventure Wharf.....</i>	<i>29</i>
<i>Figure 29 – Photo of Test Pit #1 on Inner Approach Wharf Column.....</i>	<i>30</i>
<i>Figure 30 – Test Pit #1 and Test Pit #2 section details.....</i>	<i>31</i>
<i>Figure 31 – Eastern Gangway in good condition.....</i>	<i>32</i>
<i>Figure 32 – Western Gangway in good condition.....</i>	<i>32</i>
<i>Figure 33 – Timber fender piles and steel H pile guide piles (South face of Main Wharf)....</i>	<i>34</i>

LIST OF APPENDICES

APPENDIX I.....	PREVIOUS CONSTRUCTION DRAWINGS
APPENDIX II.....	CONCEPTUAL DRAWINGS
APPENDIX III.....	COST ESTIMATE SUMMARY
APPENDIX IV.....	LIMITATIONS

1.0 INTRODUCTION

Fundy Engineering & Consulting Ltd. (Fundy Engineering) was retained by the Town of Saint Andrews through the CAO Mr. Chris Spear to carry out an assessment of the wharf sections and retaining structures.



Figure 1 - Aerial View of the Saint Andrews Wharf

The Town Wharf is used for loading and unload vessels including fishing, whale boats, coast guard, private craft and for maintenance. The Saint Andrews Wharf was built and rebuilt in stages between 1960 and 1990. It is constructed in three sections that include:

Inner Approach Road (1960, Repairs 2010)

Using wooden trestles founded on bedrock approximately 1 to 2 meters below the harbour bottom. The trestles support a composite wood / concrete deck. The deck is made of 75 mm timbers laid on their side across the pile caps. The timbers are nailed together and toe nailed to the pile caps. The timbers are topped with concrete to complete the deck.

Outer Approach Road (1996)

Using wooden piles driven into a harbour bottom consisting of a Dense Sand. The piles support concrete pile bents supporting a reinforced concrete deck.

Head of Wharf (1996)

Using steel H piles driven into a harbour bottom over the remnant of an old wharf (1960) that had partially burnt. The piles support concrete pile bents supporting a reinforced concrete deck similar in construction to the outer approach road.

The inner approach to the wharf is approximately 117 m (384 ft) long. The outer approach to the wharf is approximately 123.3 m (404 ft) long. The piles are cross braced and braced horizontally. The Head of the wharf is 47 m (154 ft) by 19 m (62 ft). The total length of the wharf from abutment to head of wharf is 259.3 m (850.5 ft)

Drawings for the approach sections and the Main Wharf can be found in Appendix II.

Market Square & Day Adventure Sea Walls

The Market Square and Day Adventure Sea Wall cells are constructed from pressure treated square timbers and poles. The cribs are interlocking and are filled free draining ballast and granular material. The decks on both structures are made of 2x4" pressure treated dimensional lumber. A section of the deck near the boat launch on the Day Adventure Sea Wall is a concrete surface (parking stalls reserved for Town maintenance workers).

There is a timber pier on the Market Square Seawall that serves as an observation deck for the public. The Market Square Seawall extends approximately 40 m (131 ft) and the Day Adventure Seawall extends approximately 70 m (230 ft) forming a 90-degree corner inland. Both walls are approximately 3.2 m (10.5 ft) high. There is a 600 mm diameter concrete storm outfall pipe which protrudes through the face of the wall and outlets into the harbour.

1.1 SCOPE OF WORK COMPLETED

This following scope of work was performed by Fundy Engineering as part of the assessment including the Inspection of the wharf sections retaining structures noted,

recommendations / concepts and preliminary cost estimates for required repairs and subsequent scope of work for the required repairs at the above noted site.

Collection of Data

- Review Existing data from client, including PWGSC files and our files.
- Visual inspection of structures above and below water.
- General review of deck components. (also, chain drag)
- Above and below water assessment of braces, bents and cribwork.
- Sample coring of timber crib, bent timbers and piles, bracing and cap beams to the extent required to aid in assessment of condition.
- Visual inspection of existing steel H piles, including representative thickness measurements.
- Investigate scour and condition of timber cribwork at head of wharf.
- Condition assessment of structure.
- Visual assessment of floating docks and gangways.

Report of Conditions

- Type wharf construction;
- General summary of conditions with photos;
- Recommended work plan;
- Class D cost estimates for recommendations.
- Prioritize recommendations within a 10 year range or beyond.
- Calculate any immediate weight instructions that should be put in place due to findings

Market Square and Day Adventure Seawalls

- Review Existing data from client.
- Visual inspection of seawalls and 5 m behind seawalls.
- Provide 2 to 3 options for replacement to the wooden seawalls.

Deliverables

- Key components of the structures and their current state of repair.
- Provide 2 to 3 options with cost estimates for proposed remedial work.
- Prioritize recommendations within a 10-year range or beyond.
- Specifications and work descriptions
- Detailed Cost Estimates

1.2 LIMITATIONS

The observations made and facts presented in this report are based on our investigation carried out during the period from November 2025 to January 2026. Our Standard Limitations are found in Appendix IV.

2.0 REVIEW OF EXISTING DATA

2.1 REVIEW OF INFORMATION

Fundy Engineering & Consulting Ltd. has reviewed the existing historical information for the existing infrastructure and the ongoing repairs and upgrades.

We have reviewed all existing documents / drawings and reports, historical information, relevant to the work;

Previous Project Descriptions:

1. Fundy Engineering Drawings
2. 1967 – Marginal Wharf Geotechnical Drawings (PWGSC)
3. 1967 – Marginal Wharf design Drawings used in the 1970 Wharf construction (PWGSC)

2.2 INNER APPROACH WHARF

Based on our experience, reviews of the existing documents / drawings, reports we carried out a site inspection looking at piling, bracing, walers and the deck. Line 1 was assumed to be the trestle bent at the north end of the structure after the crib bulkhead. Row A was assumed to be on the eastern face of the wharf. The grid was the same as used in previous historical documents.

The Inner Approach Wharf is generally of wooden construction and had issues with wooden support columns, ballast floors and deck integrity. In 2000 this section of the wharf repaired by sistering new columns, reinforcing plates, deck supports timbers and replacing a section of the deck. In general, on-going maintenance has addressed previous issues except for the deck which is difficult to address because of the type of construction. A load limit of 9000 kg has been imposed on the deck. From the inspection the following observations were noted.



Figure 2: Collapsed Ballast Floor.



Figure 3: Between bents deck rot at edge of the wharf in numerous locations.



Figure 4: Typical repairs to pile bents.



Figure 5: Line C trestle column is compromised.

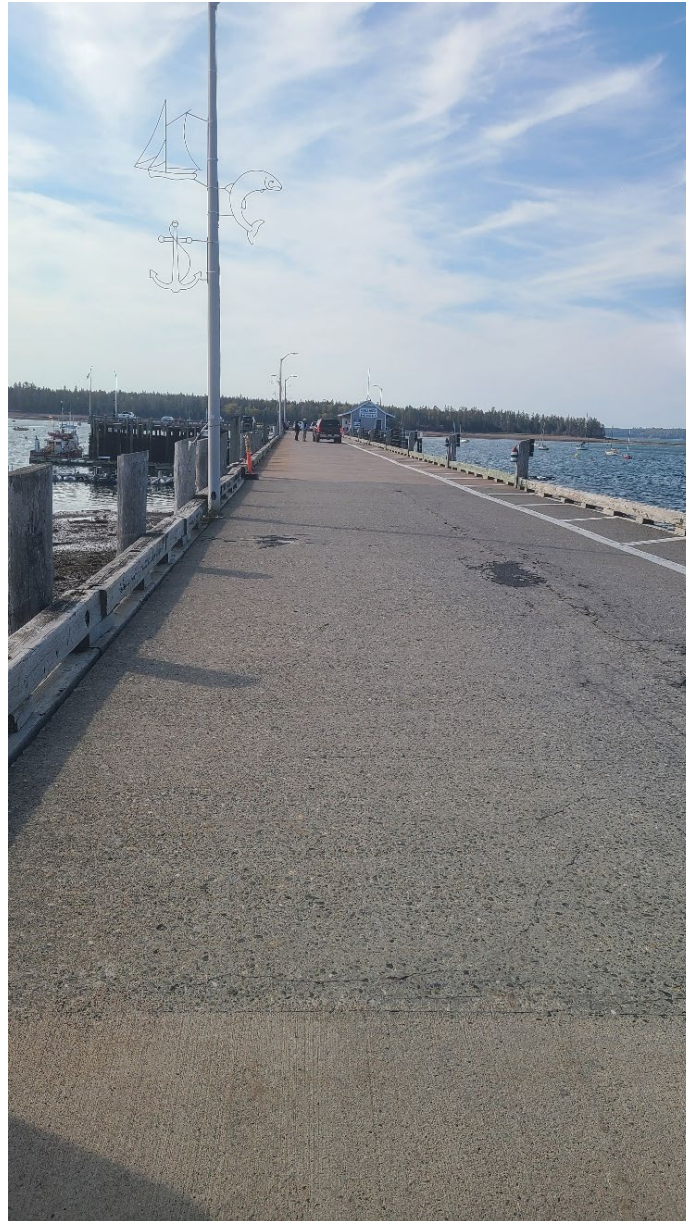


Figure 6: Inner Approach Deck with Repaired Section in Foreground with Centerline Cracks and Repairs.



Figure 7: Inner Approach Wharf Deck Patch (200 x 450 mm) in Need of Repairs.



Figure 8: Alkaline Reactivity on Inner Approach Wharf concrete decking

2.3 OUTER APPROACH WHARF

Line 1 was assumed to be the first concrete bent after the last trestle bent at the north end of the structure. Row A was assumed to be on the eastern face of the wharf. The grid was the same as used in previous historical documents.

The Outer Approach Wharf is of more modern construction. Creosoted wooden piles are driven into the harbour bottom and support reinforced concrete pile bents, with a reinforced concrete deck. The wharf is generally in good condition. The exceptions are some of the piles have delaminated along the wood grain and the majority of the cross

ties and bracing are deteriorated, damaged or missing. These members are treated wood that appears to have an accelerated failure.



Figure 9: Walers and cross bracing are in poor condition.



Figure 10: Southern End of Outer Approach Structure and Head of Wharf.

2.4 HEAD OF WHARF

Steel H piles driven into a harbour bottom over and through the remnant of an old wharf that had partially burnt. The piles support concrete pile bents supporting a reinforced concrete deck. The piling was in good condition except for limited corrosion at the top of piles and some significant hour glassing corrosion near the bottoms of some of the piles. Sacrificial anodes were almost or completely depleted.



Figure 11: East End of Head of Wharf.



Figure 12: H Pile at Southeast Corner (Pile 22-A) with Corrosion in Splash Zone.

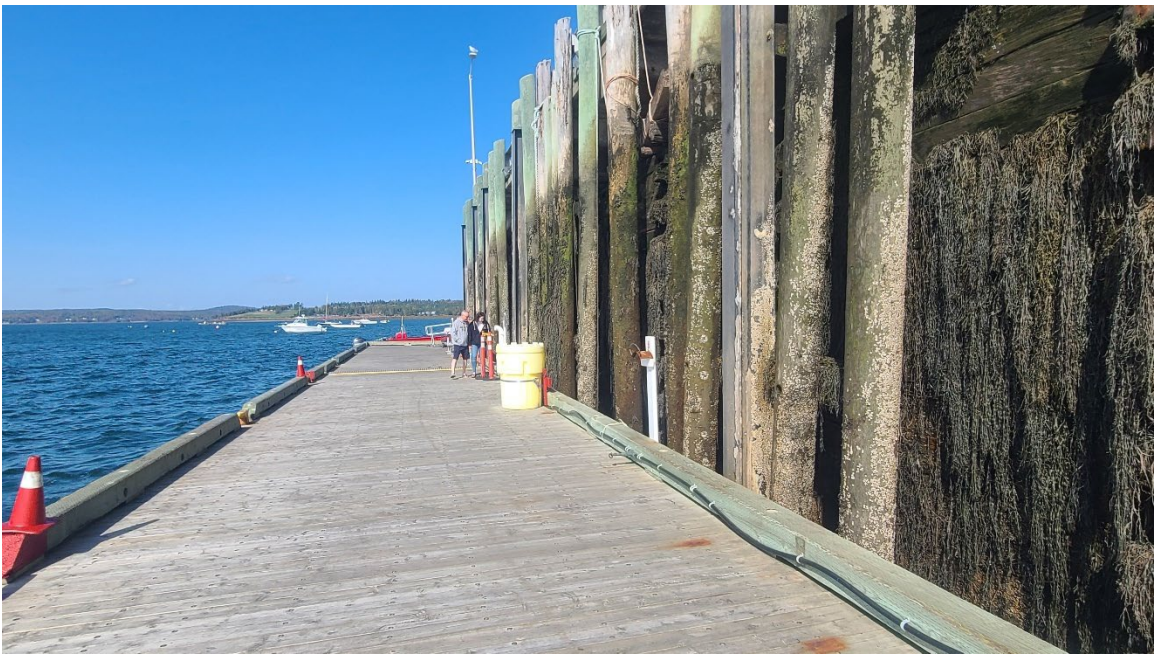


Figure 13: Fender and Guide Piles at South End of Wharf.



Figure 14: H pile at lines 11 – A and underside of deck in good condition.



Figure 15: East end of wharf head deck in good condition.



Figure 16: Utilities attached to Approach Structure.



Figure 17: Structural H pile with significant hour glassing / loss of pile steel.



Figure 18: Structural H pile showing anode depletion and severe hour glassing / loss of pile steel.



Figure 19: Sacrificial anodes in very poor condition.

2.5 MARKET WHARF AND DAY ADVENTURE WHARF

The Market Wharf and Day Adventure Wharf are of wooden crib construction. The Day Adventure is more recent construction. Several repairs have been carried out on the Market Wharf. The crib structure is leaning seaward and there has been a loss of ground behind the crib face. The Day Adventure Wharf next to the shore access ramp is leaning significantly. The main face of the Whale Wharf is leaning at the top 2 m.



Figure 20: Market Square from Inner Approach Wharf



Figure 21: Len of Market Wharf and deck



Figure 22: Void at bottom of Market Wharf (May be related to Figure 24)



Figure 23: Subsidence behind Market Wharf crib structure.



Figure 24: The end of the tie back is compromised due to rot.



Figure 25: Leaning underside of Market Wharf deck.



Figure 26: Crib Wall next to Shoreline Access.



Figure 27: Day Adventure Sea Wall.



Figure 28: Day Adventure Sea Walls.

2.6 TEST PITS INNER APPROACH STRUCTURE

Two Test Pits were put down next to two columns to determine the depth to bedrock. In addition, the Test Pits were to confirm the founding of the trestle columns on bedrock. In both Test Pits bedrock was encountered at approximately 1.2 m. In Test Pit #1 the original column was founded on bedrock. The bottom of the sistered column which is connected to the original column was 100 mm above bedrock. The lower portion of the original column was sound.

In Test Pit #2 a new column was determined to be founded on bedrock.



Figure 29: Test Pit #1

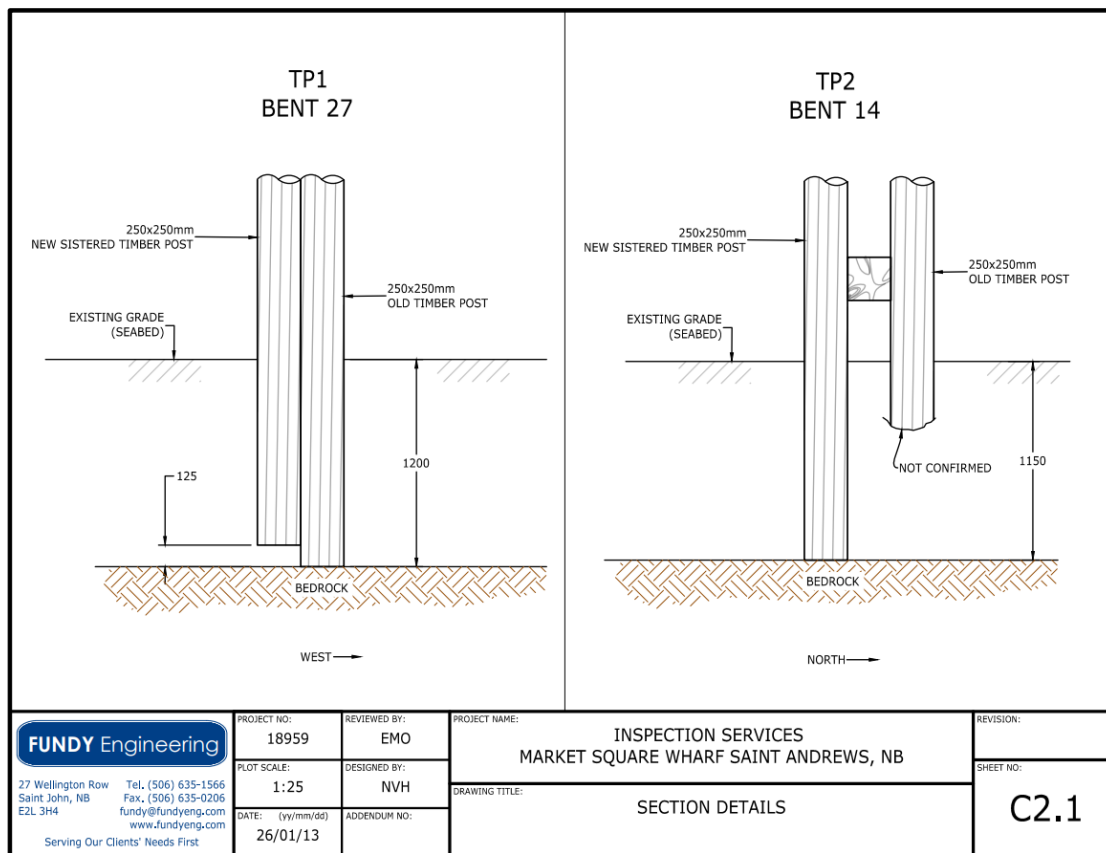


Figure 30: Test Pit #1 and Test Pit #2

2.7 GANGWAYS

There are two gangways leading to the floating docks. One providing access to the East floating docks and the other to the West set of floating docks. Both gangways are aluminum with platform grating on the walkways and proper handrails. The gangways use a pin and roller system to adjust with the tides. The East gangway is most used by commercial industries, and the West gangway is intended for use of the public to access whale watching vessels although each gangway is not restricted by user type.

Both gangways are in good condition with the Western gangway being newer and providing a consistent, gradual, grade for users from the main wharf deck to the timber floating docks and dinghy docks. Wooden support piles underneath the Western gangway showed moderate to severe rotting. The Eastern gangway has a transitioning grade on the lower section that connects the rollers to rails. It is assumed this was required as the width of the timber floating dock is reduced a short distance after the landing area and access around the gangway to the wider section of the dock would be restricted. There are also signs of a repair at the landing between the Eastern gangway and the floating dock where treads have been installed over the timbers. It is assumed

that these were repairs to cover damaged timbers that have created a tripping hazard. The floats appeared to be in good condition although visuals were obstructed by marine vegetation in many areas. Overall, the condition of the gangways is good.



Figure 31: Eastern Gangway in Good Condition

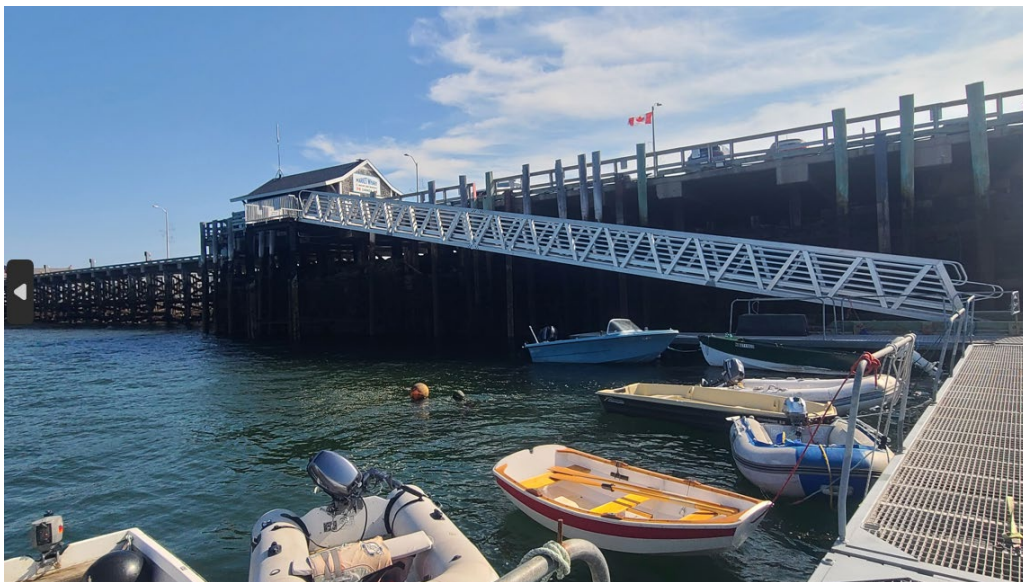


Figure 32: Western Gangway in Good Condition

2.8 *FLOATING DOCKS*

The floating docks are comprised of pressure treated dimensional lumber and the dinghy docks are comprised of aluminum railings and grating. Plastic aquaculture floats are used in both sets of docks.

The timber docks vary in width and appear to be in good condition with minimal wear to the deck boards and no noted separations between boards. The wheel guards and bollards are also in good condition and connections property fastened.

The West dinghy dock is in fair condition, some of the railing posts are slightly out of plumb likely from boats colliding with the posts. There are limited sections with railings which may be intentional to allow unobstructed passage from watercraft onto the docks.

The East dinghy dock is in good condition and is newer than the Western dock. The East dinghy dock is owned by the St. Andrews Yacht Club. Well-spaced handrails are present for berth separation and access onto the dock. There are timber running boards on the edges of the walkway grating.

Rubber fenders are placed on both dinghy docks and are in good condition but not present on all sides or sections of the docks.

2.9 *GUIDE PILES AND FENDER PILES*

The main wharf guide piles for the floating docks are steel H-piles. The piles showed minor signs of corrosion within the splash zone of the piles but did not show any severe signs of hour glassing or cross-sectional area loss. The epoxy tar coating was still present on several of the piles that were assessed.

Zinc-anode depletion was most severe on the H-piles on the Western face of the main wharf, while the guide piles on the Southern face of the main wharf showed only between 5 to 20% depletions.

The timber fender piles showed signs of mild splintering and some natural decay but no significant cross-sectional losses. Over-time the splintering may worsen and checks may form. All fender and guide piles were examined for scouring and/or undermining at the base by the dive team, in which none of the piles exhibited signs of.



Figure 33: Timber Fender Piles and Steel H-Pile Guide Piles (South Face of Main Wharf)

2.10 EXISTING CRIB STRUCTURE

The remnant crib structure was inspected as part of the assessment. Scouring of the underside of the timber cribbing may result in loss of ballast material or overall failure of the crib structures. This could potentially cause adverse lateral forces on the new structural H-piles.

Several sections along the East, South and West faces of the main wharf showed slight undermining of the bottom timber (~4 to 8 inches) or the bottom timbers had been entirely rotted away creating a gap between the seabed and the timber crib structure. No ballast material was observed on the exterior of the cribbing or is assumed to have been lost from the structure. The upper timbers appeared to be in fair condition with moderate splintering.

Slight horizontal separation of timbers was also noted in areas and on the South and East corner of the wharf. This may be caused by wave action and shifting of the ballast material causing outward pressures on the crib walls.

3.0 CONCLUSIONS

3.1 INNER APPROACH STRUCTURE

In general, the Inner Approach Wharf is 55 years old and past the end of its expected 50-year life cycle. The Inner Approach Road deck is a composite structure and is constructed with timber and a concrete deck. The timbers have collapsed in some areas and show signs of rot over a significant portion of the structure.

To repair the deck in localised areas would be difficult as the deck structurally is a continuous one-way timber slab. Cutting the timber slab to make repairs from trestle to trestle decreases the remaining deck structure support capacity. In addition, the concrete deck shows signs of Alkali-Aggregate Reactivity (AAR)¹ which is causing the deck to break down creating potholes and exposing the reinforcing steel to corrosion.

3.2 OUTER APPROACH STRUCTURE

Cross ties and bracing were in poor condition with some evidence of cracked and missing timbers. Not all connections were observed to be intact. Some of the connections were missing and some were corroded. Wooden Piles are in good condition except for 21 out of 140 piles that need partial Grout filled Fiberglass Jackets. It is anticipated that a pile inspection and jacket program may continue for a number of years. The Outer Approach Road and Head of Wharf Decks are in very good condition and with maintenance as required are good for many years.

3.3 HEAD OF WHARF

The Head of Wharf structure is in very good condition except for, as shown in Figure 19 The H pile have significant loss of steel. We recommend that these piles be assigned the highest priority be repaired as soon as possible, i.e. this year. The jackets will be designed to carry the structural loading. See Drawing C3.5. The deck in the areas indicated on the drawing are subject the 9000 kg load limit. In the areas indicated on drawing C1.4 supported by piles with a square, the max total load for each of those areas is 9000 kg.

In addition, there are 51 of the H piles at the splash zone at high water level that need to be protected from corrosion. These jackets would be non structural.

3.4 RECOMMENDATIONS

The Inner Approach Road deck structure has significant localized deficiencies, and its general condition is poor to very poor. In the short term the loads on the deck should be limited to cars and half ton vehicles. Boom trucks and other heavy load activities should

¹ Alkali-Aggregate Reactivity: Is a chemical reaction between alkali hydroxides in cement and certain siliceous or carbonate aggregates causing structural deterioration. The chemical reaction causes an increase in volume around the aggregates similar to rust and oxidation,

not be permitted as they would exceed the existing 9,000 kg load Limit. This section of the structure is to be replaced in the immediate future.

The Outer Approach Road require timber pile jacket and eventual replacement of all the Cross Bracing and Whalers.

The Head of Wharf has the highest priority for the piles requiring pile jackets at the low water level.

Additional items for repair / replacement are listed below.

4.0 PRIORITIES

In general, the remedial actions are listed in priority.

4.1 H PILE REPAIRS / LOW WATER JACKETS

There are 51 Head of Wharf H Piles that need immediate repair. Recommendations on load restrictions will be forthcoming. In locations where steel H piles are identified as requiring repairs (See 'H Pile Repair Summary' Sheets). The proposed repair method involves welding of 30 mm thick steel plates to the web and flange at the top and bottom of the damaged sections, addition of a reinforcing steel cage and fiber-reinforced polymer (FRP) jackets. The jackets are to be filled with structural grout through ports on the jacket. (See details on drawing C3.5).

4.2 HEAD OF WHARF ANODES

The zinc sacrificial anodes on the steel H piles (structural and guide piles) are showing signs of significant depletion in areas and should be replaced to slow down the electrolysis corrosion process. In order of severity noted from the assessment, the anodes should be first replaced on the North facing side of the Head of the Wharf. (Lines 15-22 Row E, and lines 15-19, rows C and D).

Second priority, would be to replace the anodes on the Western face of the Head of the Wharf H piles from Lines 1-13 Row A. Furthermore, the remaining anodes should be monitored and replaced as budget allows. Anode depletions of 5-20% were observed on the South face of the Head of Wharf, which would take final priority. The anode attachments need to be redesigned.

If anode connection points on the piles can be lowered closer to the seabed this may reduce hour-glassing below the anode. It was noted that hour-glassing and loss of steel on H-piles were significantly worse below the anode locations.

4.3 INNER APPROACH ROAD DECK

The inner approach road decking is comprised of concrete and 75mm timbers. The concrete overlay is showing signs of spalling, alkaline reactivity and popouts. The concrete decking has had previous cold patch repairs completed in areas.

The thickness of the concrete decking varies along the approach and in places was observed to only be 90 mm. To sustain the 9000 kg load limit, temporary repairs can be made such as the installation of steel plates where significant spalling and popouts has reduced the deck thickness and corrosion of reinforcing steel.

If work is completed to replace the concrete decking, a minimum thickness of 200 mm should be used, and a waterproofing membrane should be used below the concrete surfacing and above the precast deck panels. (See details on drawing C3.4).

4.4 INNER APPROACH ROAD TRESTLE STRUCTURES

It is recommended that the inner approach road trestle structures be replaced with cast in place concrete piers and pre-cast concrete deck panels laid overtop to support the final surfacing of the inner approach decking. It is anticipated that the concrete piers could be installed on every second bent and support longer spans (7.3 metres) than the existing structure (3.6 metres). The cast-in-place pier footings should be poured onto a properly prepared bedrock surface. Rock cores may need to be taken on the underlying Bedrock which is assumed to be Red Sandstone to confirm bearing capacities. (See detail C3.4).

A C-1 or C-XL exposure class concrete mix should be used in the piers with a maximum water cement ratio (W/CM) of 0.45. Additional measures to prevent reinforcing steel from corrosion may also be taken such as the use of fly ash, corrosion inhibitors and increased concrete cover.

4.5 WALERS AND CROSS BRACING (1/3)

The timber walers and cross-bracing on the wooden trestles are in poor condition and will require new timber members and galvanized hardware. All members along the inner and outer approach wharves require repair. For budgeting purposes, it is recommended that repairs be staggered to support financing of other repairs. A third of the repairs are suggested to be completed at a time, as schedule and finances allow.

It is recommended that any new hardware be hot dip galvanized which is ideal for coastal structures. Walers and cross bracing must be installed after jacketing of any of the timber piles is completed. Where not all the timber piles will require jackets, some repairs can be made immediately.

4.6 DAY ADVENTURE SEA WALL NEXT TO ACCESS RAMP

The portion of the Day Adventure Sea Wall that runs parallel with the access ramp is in fair condition and may be left as is in the short term. If the Market Wharf seawall face is extended outward this portion of the boat ramp and front of face will be infilled with rock fill. The access ramp would be extended out further with the top of slope being in alignment with the face of the Day Adventure Seawall face.

4.7 MARKET WHARF FACE / EXPANSION

Two options are proposed for the repair of the Market Wharf seawall face. A segmental retaining seawall or a timber crib seawall. We have also considered footprint options which include expansion. (See drawings C1.5, C1.6 and C1.7). Each of the options provide viable solutions to repair the wall, however, cost restraints, public input, intended use will be the driving factors in decision making.

Prior to repairing the face of the existing wall, it was noted during the assessment that loss off ballast or granular material was present causing subsidence in the decking. (See Figures 23 and 24). This may be due to undermining of the bottom timber of the crib face in isolated areas. This should be repaired prior to refacing the seawall.

A segmental seawall consists of using modular block walls at the face, a geogrid tie-back system, and granular backfill behind the wall. There is a drainage layer behind the interlocking modular block comprised of clear stone and perforated pipes to prevent hydrostatic pressures. (See typical sections on drawing C3.1 and C3.2). Rock fill may be used as a levelling course for the base course of the blocks. Concrete decking is recommended for this type of repair. Various face styles or veneers are available from suppliers to suit aesthetics.

A second option is to re-face and/or expand the existing wall with additional timber cribbing that would be filled with free draining ballast and granular material. 200x200 mm pressure treated square timber cross ties are recommended and fasteners should be hot dip galvanized. (See Typical Sections are shown on drawing C3.1 and C3.2). Cell dimensions are to be 3600 mm x 3600 mm.

It should be noted that in the cost estimates provided in Appendix III, there is no allowance for resurfacing of any expansion area in the Market Square. Estimates allow for crushed stone topping in the expansion footprints but do not consider concrete, asphalt, pavers, or timber decking surfacing. These costs can be included upon request once a decision is made by the Town on the desired remediation option and confirmation on usage is made (i.e. parking area, boardwalk etc.)

4.8 *WALERS AND CROSS BRACING (2/3)*

Continuation of waler and cross bracing repairs is recommended once the repairs have been addressed in the above sections. Any remaining areas that do not require wood pile jackets may be worked on.

4.9 *H PILE REPAIRS / HIGH WATER JACKETS*

High Water Jackets are required in the Splash Zone. Fiber-reinforced polymer (FRP) pile jackets are to be installed over the damaged sections including a 1 metre lap, top and bottom from corroded to intact steel zones. A filler material is required between the pile web and flanges. FRP jackets are to be secured with strapping until grout has achieved 50% of its required strength.

4.10 *WALERS AND CROSS BRACING (3/3)*

The remaining third of the walers and cross bracing can be completed once the wooden pile jackets have been installed.

4.11 *DAY ADVENTURE SEAWALL SOUTH FACE*

During the assessment it was noted that frost jacking had caused the top portion (2m, 6.5 ft) of the timber crib face to heave outward. This may be the result of fine-grained granular material used under the decking being exposed to repeated freeze-thaw cycles.

It is recommended that the top portion of the timber crib on the South face be replaced and the ballast and or granular material be regraded. Non-frost susceptible granular material should be used under the decking or a proper drainage system be installed to prevent frost jacket. All new fasteners should be hot dip galvanized material.

4.12 *GUIDE PILES*

The main wharf pier head guide piles should have the zinc anodes replaced while the zinc anodes are being replaced on the structural H pile. The cold tar epoxy coating is showing signs of wear and delamination on some of the guide piles on the South face of the pier head of the wharf. Surface corrosion was present on some of the guide piles on the Western side of the pier head of the wharf. Areas with light surface corrosion may be prepped with sanders and the piles can be re-coated with a cold tar epoxy.

Slight hour-glassing was observed near the seabed on the guide piles below the anode connection point although section loss was minimal.

4.13 *WHALE GANGWAY / FLOATING DOCK*

As previously mentioned, the Eastern gangway transitions to a steeper grade near the landing to the floating docks, which may pose safety concerns for the public. The change

in grade is due to the narrowing of the floating dock at the Northeast corner of the pier head. Widening of the floating dock in this area to match the width of the connecting sections would provide adequate space for passage in both directions on the dock. The lower gangway section could be replaced with a new section to match the grade of the upper portion of the gangway.

4.14 FIRE WATER LINE

A 50mm diameter water main extends to the market wharf area which could serve as a connection point for a fire-water line to the pier head. Pressures tests should be completed near the tie-in point to verify if there are sufficient residual pressures and flowrates to support a fire-water line or if a booster pump would be required.

Alternatively, a fire-cache location on the wharf may be a more cost-effective option if available pressures and required flow rates are not available from the 50 mm main. A pump system could be implemented to draw water from the harbour.

If a larger fire-water line is required such as a 100 mm diameter pipe, the tie-in point will need to be connected at the main on Water Street. It has been made aware to us through discussion with the Town Council that adequate pressures are available on the mains to support a fire-water line to the Head of the Wharf.

4.15 DINGHY FLOATS

The dinghy floats may be extended to allow for more berth locations as needed. Railings, platform grating and timber runners should be monitored and repaired as needed. The Western dinghy wharf railings should be a priority to be replaced. There were no noted immediate repairs to the Eastern dinghy floats.

4.16 WOOD PILE JACKETS

Wooden pile repairs are recommended in locations identified in the outer approach bent repair summary sheets. Fiber-reinforced polymer (FRP) pile jackets are to be installed over the damaged sections including a 1 metre lap, top and bottom from damaged to intact wood zones. FRP jackets are to be secured with strapping until grout has achieve 50% of its required strength. Jackets are to be installed prior to repairs made to the cross bracing and walers.

5.0 COST ESIMTATES AND SEA LEVEL RISE

Sea Level Rise for Saint Andrews has been determined to be 0.4 m. This has not been shown on the drawings but has been included in the cost estimates. Consideration of the deference in the remaining outer wharf and back up land elevations will need to be part of the overall planning and design.

Cost estimates for the various elements are shown in Appendix III.

The opinion of probable costs has been prepared in accordance with acceptable practices. It is presented based on previous experience, engineering judgement and qualifications. Market fluctuations, unanticipated labour rates, unforeseen site conditions, non-competitive bidding, etc. are beyond the control of Fundy Engineering. Fundy cannot guarantee that the actual costs will not vary from the estimate opinions.

6.0 CLOSING REMARKS

The recommendations herein have been devised based on our current knowledge and understanding of the site in its present state. If there are any changes or discoveries identified in the future that may pertain to the aspects of this undertaking, we must be notified immediately to make any necessary changes or adjustments to our recommendations.

We trust this is sufficient for your present needs, please feel free to contact the undersigned for any additional information or clarification that may be required. This report has been prepared by Gordon Mouland, *M.Eng. P.Eng.* and reviewed by Eric Orser, *P.Eng.*

Yours truly,

Fundy Engineering & Consulting Ltd.



Mr. Gordon Mouland, *M.Eng., P.Eng.*

Senior Geotechnical Engineer



Mr. Eric Orser, *P.Eng.*

Intermediate Geotechnical Engineer

APPENDIX I

PREVIOUS CONSTRUCTION DRAWINGS

Sheet List Table

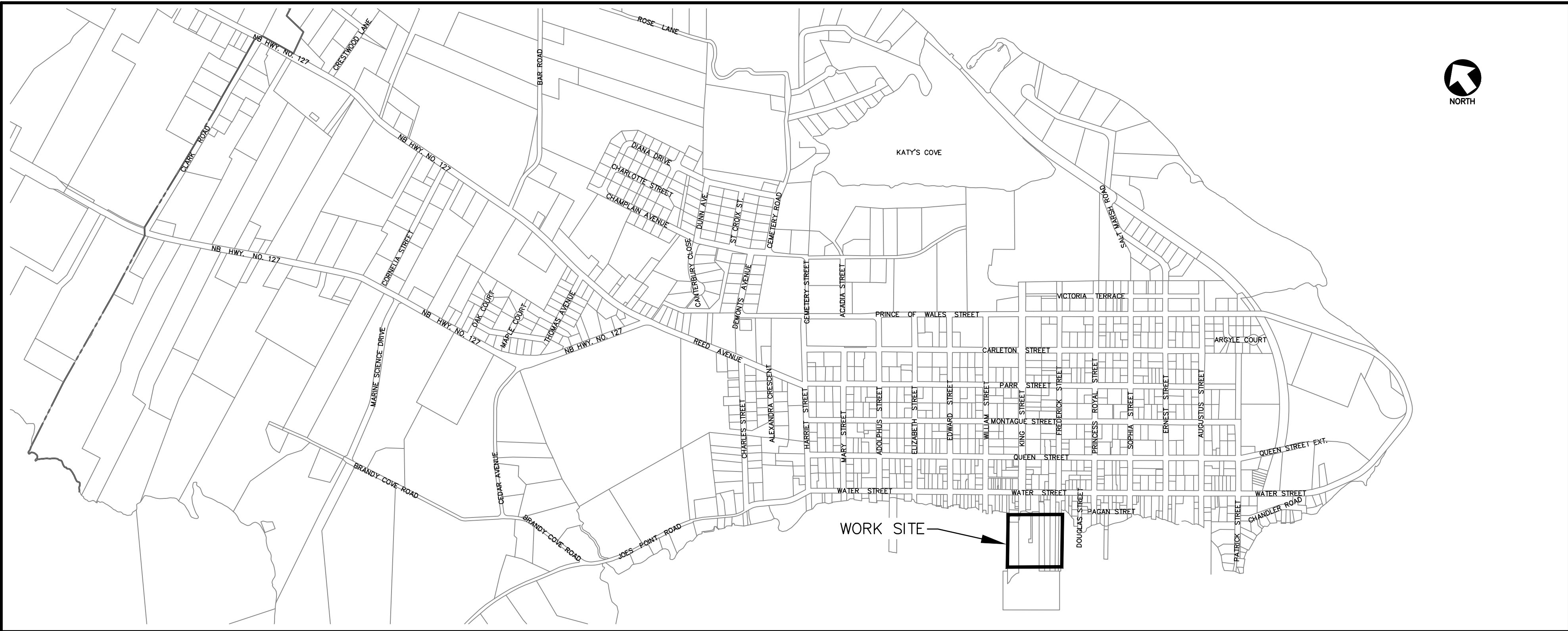
Sheet Title	
000	COVER SHEET
STRUCTURAL	
M01	Site Plan and Borehole Location Plan
M02	Borehole Logs
M10	Approach Trestle – Existing Conditions and Removals
M11	Approach Trestle – Existing Conditions and Removals Sections
M12	Approach Trestle – General Arrangement, Elevation and Sections
M13	Approach Trestle – Pile Layout Plan, Sections and Details
M14	Approach Trestle – Concrete Precast Panel Plan and Details
M15	Approach Trestle – Pile Cap and Precast Panel Sections
M16	Approach Trestle – Concrete Deck Plan and Sections
M17	Approach Trestle – Abutment Plan, Sections and Details
M18	Approach Trestle – Miscellaneous Details
M19	Approach Trestle – Miscellaneous Details
M20	Intermediate Trestle –Existing Conditions and Removals Plan, EIEVATION AND SECTIONS
M21	INTERMEDIATE TRESTLE – BRACING REPAIRS PLAN, ELEVATION AND SECTIONS
M22	Intermediate Trestle –Pile Repair Details
M30	Pier Head –Existing Conditions Plan, Elevation and Sections
M31	Pier Head –Pile Wrap Plan and Schedules
M40	Stair Plan, Sections and Details
M41	Stair Details
CIVIL	
C01	WATER, SANITARY, STORM SERVICES
C02	GRADING PLAN
C03	DETAILS
ELECTRICAL	
E–01	ELECTRICAL DEMOLITION
E–02	ELECTRICAL NEW CONSTRUCTION
E–03	DETAILS
E–04	SINGLE LINE DIAGRAM AND SCHEDULES

TOWN OF SAINT ANDREWS

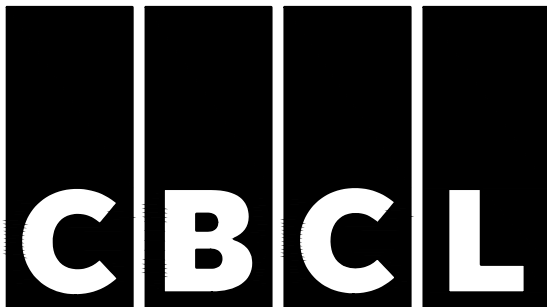


Town of Saint Andrews
New Brunswick, Canada

TSA WHARF APPROACH
REPLACEMENT



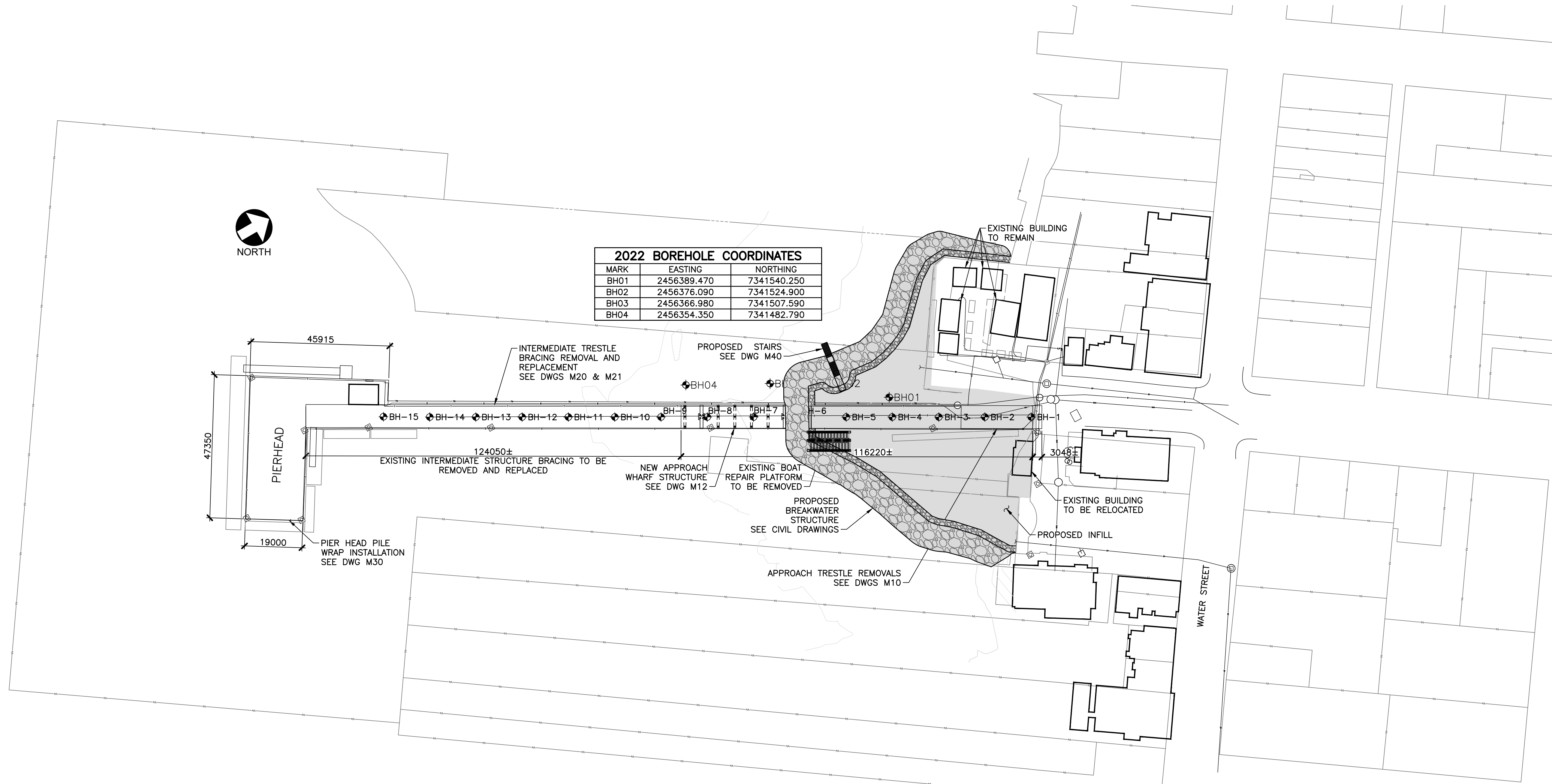
KEY PLAN
1:10,000



Client Contract No. TSA 2024-03

ISSUED FOR
TENDER

AUGUST 14, 2025



SITE PLAN WHARF RECONSTRUCTION AND INFILL AREA
1:750

GENERAL NOTES:

- REFER TO PROJECT SPECIFICATION DOCUMENT FOR OTHER APPLICABLE CODES, STANDARDS, MATERIALS, AND EXECUTION REQUIREMENTS.
- ALL WORK AND MATERIALS TO CONFORM TO THE REQUIREMENTS OF THE NATIONAL BUILDING CODE OF CANADA, LATEST EDITION.
- DETAILS, DIMENSIONS, AND ELEVATIONS OF THE EXISTING CONDITIONS SHOWN ON THESE DRAWINGS ARE BASED ON INFORMATION OBTAINED FROM HISTORICAL DATA PROVIDED BY THE CLIENT AND SITE SURVEYS. THE CONTRACTOR MUST FIELD VERIFY ALL SUCH DETAILS, DIMENSIONS, AND ELEVATIONS PRIOR TO FABRICATION OR ERECTION OF WORK AND REPORT DISCREPANCIES TO THE ENGINEER.
- NO ALTERATIONS TO STRUCTURAL DETAILS TO BE MADE WITHOUT THE WRITTEN PERMISSION OF THE ENGINEER. CONSTRUCTION ERRORS ARE TO BE DOCUMENTED AND REPORTED TO THE ENGINEER BEFORE PROCEEDING WITH SUBSEQUENT WORK.
- PERIODIC AND DISCRETIONARY SITE OBSERVATIONS ARE MADE AT THE JOB SITE BY THE ENGINEER AND ARE NECESSARILY LIMITED IN SCOPE TO OBSERVATION OF WORK IN PROGRESS AT THE TIME OF THE SITE OBSERVATION. THESE SITE OBSERVATIONS DO NOT RELIEVE THE CONTRACTOR OF THEIR RESPONSIBILITY TO PROVIDE CONTINUOUS ON-SITE SUPERVISION OF ALL STRUCTURAL WORK TO ENSURE THAT BOTH THE INTENT AND DETAILS OF THE DRAWINGS AND SPECIFICATIONS ARE BEING FOLLOWED.
- THE HORIZONTAL DATUM UTILIZED IN NAD83 (CSRS) NEW BRUNSWICK DOUBLE STEREOGRAPHIC PROJECTION.
- ALL ELEVATIONS ARE IN GEODETIC METRES AND REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28).
- CONTRACTOR TO BE RESPONSIBLE FOR STABILITY OF ALL STRUCTURE DURING REPAIRS AND CONSTRUCTION OF NEW STRUCTURE.

REINFORCED CONCRETE NOTES:

- ALL CONCRETE, CONCRETE MATERIALS, FORMS, WORKING PROCEDURES AND THE LIKE TO CONFORM TO CSA A23.1, LATEST EDITION, UNLESS NOTED OTHERWISE.
- MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AND CLASS OF EXPOSURE SHALL BE AS FOLLOWS:
 - ROCK SOCKETS..... 40 MPa AT 28 DAYS/C-3 WITH S-3 EXPOSURE REQUIREMENTS.
 - CONCRETE DECK, PRECAST PANEL, PILE CAP AND RETAINING WALLS..... 35 MPa AT 56 DAYS/C-1 WITH S-3 EXPOSURE REQUIREMENTS.
- CONCRETE PROTECTIVE COVER TO REINFORCING STEEL TO BE 75 mm UNLESS NOTED OTHERWISE ON DRAWINGS.
- ALL REINFORCING BARS MUST BE ACCURATELY SUPPORTED ON PLASTIC COATED STEEL HIGH CHAIRS TO MAINTAIN EXACT CONCRETE COVER.
- CONSTRUCTION JOINTS TO BE LOCATED AS TO LEAST IMPAIR THE STRENGTH OF THE STRUCTURE. LOCATIONS TO BE AS SHOWN ON THE DRAWINGS OR CONTRACTOR IS TO SUBMIT PROPOSED CONSTRUCTION JOINTS FOR THE ENGINEERS APPROVAL. CONSTRUCTION JOINTS TO BE KEYED AND REINFORCEMENT TO NOT BE INTERRUPTING.
- ALL REINFORCING STEEL TO HAVE A MINIMUM YIELD POINT STRENGTH OF 400MPa (WELDABLE) AND TO CONFORM TO CSA G30.18.
- REINFORCING STEEL TO BE PROVIDED WITH A 'CLASS B' TENSION LAP TO CSA A23.3, LATEST EDITION AT ALL SPLICE LOCATIONS, UNLESS NOTED OTHERWISE.
- REINFORCING STEEL IS TO BE CONTINUOUS AT ALL CORNERS, UNLESS NOTED OTHERWISE.

STRUCTURAL STEEL NOTES:

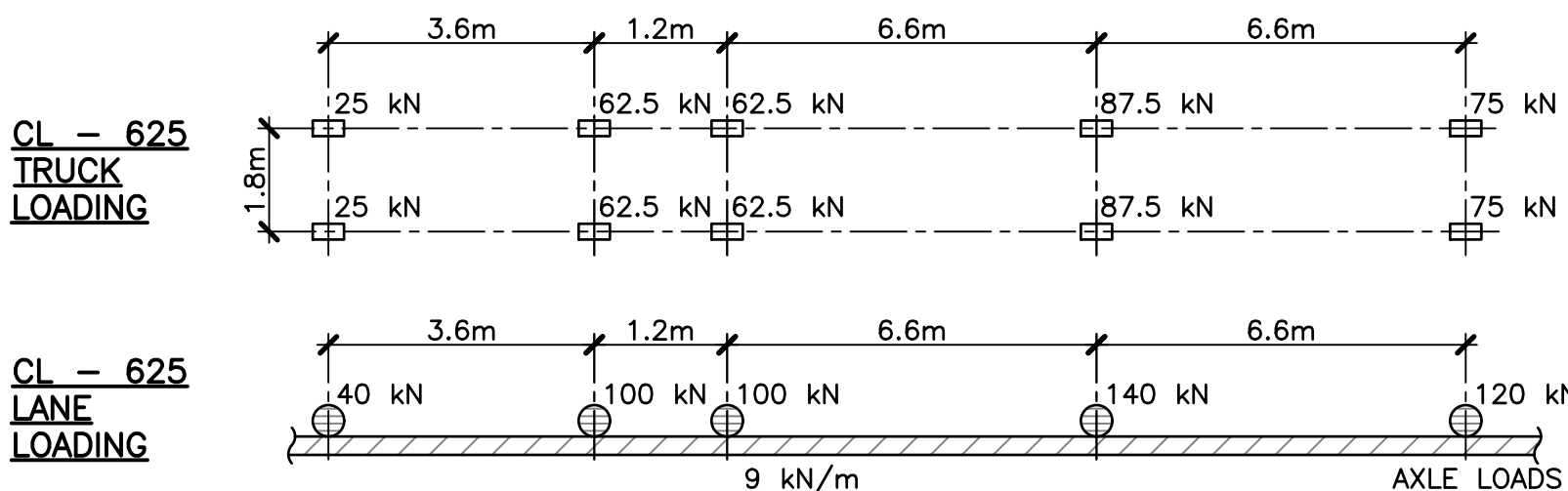
- STRUCTURAL STEEL SHALL CONFORM TO FOLLOWING CSA STANDARDS AND ASTM STANDARDS:
 - PIPE PILE ASTM A572 GRADE 50 (345 MPa YIELD STRENGTH) or EQUIVALENT.
 - ANGLES, CHANNELS AND MISCELLANEOUS PLATES..... 300 W OR EQUIVALENT.
- ALL WELDING SHALL BE IN ACCORDANCE WITH CSA STANDARD W59, LATEST EDITION.
- FABRICATE, DELIVER TO SITE AND ERECT STEELWORK IN ACCORDANCE WITH CAN/CSA-S16, LATEST EDITION.

TIMBER NOTES:

- TIMBER MATERIALS:
 - TIMBER BRACING: GRADED AND STAMPED TO NATIONAL LUMBER GRADING AUTHORITY (NLGA) NO.1 STRUCTURAL. EASTERN HEMLOCK, WESTERN HELMLOCK, OR DOUGLAS FIR SPECIES ONLY WILL BE USED.
 - ROUND WOOD PILES: DOUGLAS FIR, OR SOUTHERN YELLOW PINE.
- TIMBER TO BE TREATED TO CAN/CSA-080 SERIES-15 FOR MARINE CONSTRUCTION COASTAL WATERS, UNLESS NOTED OTHERWISE.
- GALVANIZE ALL HARDWARE TO ASTM A123, MINIMUM ZINC COATING OF 705g/m2, UNLESS NOTED OTHERWISE.
- GALVANIZED ANCHORS SHALL NOT BE IN DIRECT CONTACT WITH REBAR.

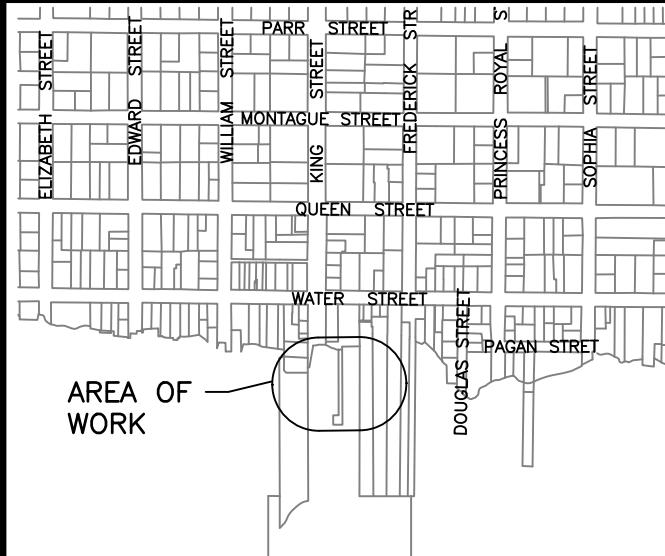
DESIGN LOADING:

- LOADING AND GENERAL DESIGN TO UFC 4-152- 01 (2017) (UNIFIED FACILITIES CRITERIA - DESIGN: PIERS AND WHARVES) AND CSA S6-19, NBCC 2020.
- LIVE LOADS (NEW APPROACH STRUCTURE):
 - UNIFORMLY DISTRIBUTED LOAD..... 15 kPa.
 - CL-625 AS PER CSA S6-19



- WAVE FORCES - DECK UPLIFT 10 kPa.
- SEISMIC HAZARD ACCORDING TO NBCC 2020 FOR 2% PROBABILITY OF EXCEEDANCE IN 50 YEARS. SITE DESIGNATION FALLS IN SITE CLASS C.
- NEW STEEL PIPE SUPPORTED CONCRETE DECK STRUCTURE FALLS IN SEISMIC CATEGORY 3 AND OTHER BRIDGES ACCORDING TO CSA S6-19. SEISMIC DESIGN PERFORMED ACCORDING TO CSA S6-19 AND ASCE 61-14 FOR NEW STRUCTURE.
- INTERMEDIATE TRESTLE UNIFORM LIVE LOAD IS TO BE REDUCED FROM THE EXISTING 15kPa TO 10kPa.
- INTERMEDIATE TRESTLE TRUCK LOADING: MS 200 TRUCK LOADING.

Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)
1.13	0.634	0.306	0.124



KEY PLAN
1:10000

LEGEND:

- ⊕ BH## - DENOTES 2022 BOREHOLE - SEE DRAWINGS M02 FOR BOREHOLE LOGS.
- ⊕ BH-## - DENOTES 1995 BOREHOLE - SEE DRAWINGS M02 FOR BOREHOLE LOGS.

No.	Description	Date	By
0	ISSUED FOR TENDER	AUG. 14/25	GKP
B	ISSUED FOR 100% REVIEW	MAY 07/25	GKP
A	ISSUED FOR 70% REVIEW	MAY 6/24	GKP

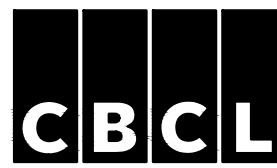
Revision or Issue

TOWN OF SAINT ANDREWS

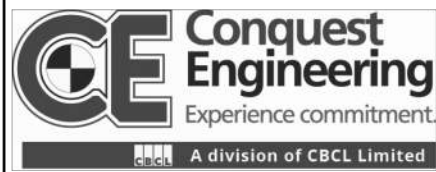
TSA WHARF APPROACH
REPLACEMENT

STRUCTURAL

SITE PLAN AND BOREHOLE
LOCATION PLAN



CBCL No 242835-00	Contract No TSA 2024-03	Date APR 2024	Scale AS NOTED
LICENCED PROFESSIONAL ENGINEER Province of New Brunswick		Designed MK	Drawn LL
Checked KM		Approved	
Sheet No 1 of 19		Drawing No	
Date AUGUST 14, 2025		M01	
INGENIEUR TITULAIRE DE PERMIS Province du Nouveau-Brunswick			



BOREHOLE RECORD

Project Name: Market Wharf Approach Trestle
Project Number: 222828.00
Client: Town of Saint Andrews
Location: Saint Andrews, NB
Water Level: Tidal

BH - 01
Date Drilled: February 25, 2022
Page: 1 of 1
Datum: Chart
Water Level Date: N.A

Depth (m)	Water Level (m)	Sample Type	Sample Number	N Value or RQD %	Recovery (mm) or %	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	SPT N-Value (Blows/300mm)			■		
									20 40 60 80			■		
									Undrained Shear Strength (kPa)			□		
									500 1000 1500 2000					
									Moisture Content / Atterberg Limits			□		
									Wp 1—6—1 (WL) (%)			○		
									20 40 60 80					
0								5.0						
1														
2														
3														
4		SS	1	SSR	200		Dense brown SAND with gravel ~ some cobbles shells	3.8						
5		HQ	2	17%	100%		Very severely fractured to sound red SANDSTONE							
6														
7		HQ	3	58%	80%									
8														
9														
10														
11														
12														
13		HQ	4	57%	100%									
14														
15														
16														
17														
18		HQ	5	50%	93%									
19														
20														
21														
22														
23		HQ	6	80%	100%									
24														
25														
26														
27														
28		HQ	7	88%	100%									
29														
30								-4.3						
31							End of Borehole at 9.3 m							
32														
33														

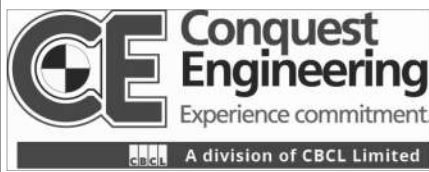


BOREHOLE RECORD

Project Name: Market Wharf Approach Trestle
Project Number: 222828.00
Client: Town of Saint Andrews
Location: Saint Andrews, NB
Water Level: Tidal

BH - 02
Date Drilled: February 25, 2022
Page: 1 of 1
Datum: Chart
Water Level Date: N.A

Depth (m)	Water Level (m)	Sample Type	Sample Number	N Value or RQD %	Recovery (mm) or %	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	SPT N-Value (Blows/300mm)			Undrained Shear Strength (kPa)			Moisture Content / Atterberg Limits Wp 1e-3 - LI (%)		
									20 40 60 80								
									500 1000 1500 2000								
									20 40 60 80								
0								4.0									
1		SS	1	21	375		Compact brown to black silty SAND with gravel - some shells	3.4									
2							End of Borehole at 0.6 m - SPLIT SPOON REFUSAL ON INFERRED BEDROCK										
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
32																	
33																	



BOREHOLE RECORD

Project Name: Market Wharf Approach Trestle
Project Number: 222828.00
Client: Town of Saint Andrews
Location: Saint Andrews, NB
Water Level: Tidal

BH - 03
Date Drilled: February 25, 2022
Page: 1 of 1
Datum: Chart
Water Level Date: N.A

Depth (m)	Water Level (m)	Sample Type	Sample Number	N Value or RQD %	Recovery (mm) or %	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	SPT N-Value (Blows/300mm)					
									■	20	40	60	80	■
									Undrained Shear Strength (kPa)					
									□	500	1000	1500	2000	□
									Moisture Content / Atterberg Limits					
									□	Wp 1-c=1 WL (%)			□	
									□	20	40	60	80	□
0								3.7						
1		SS	1	17	400		Compact brown to black silty SAND with gravel - some shells	3.1		■	17			
2							End of Borehole at 0.6 m - SPLIT SPOON REFUSAL ON INFERRED BEDROCK							
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
32														
33														

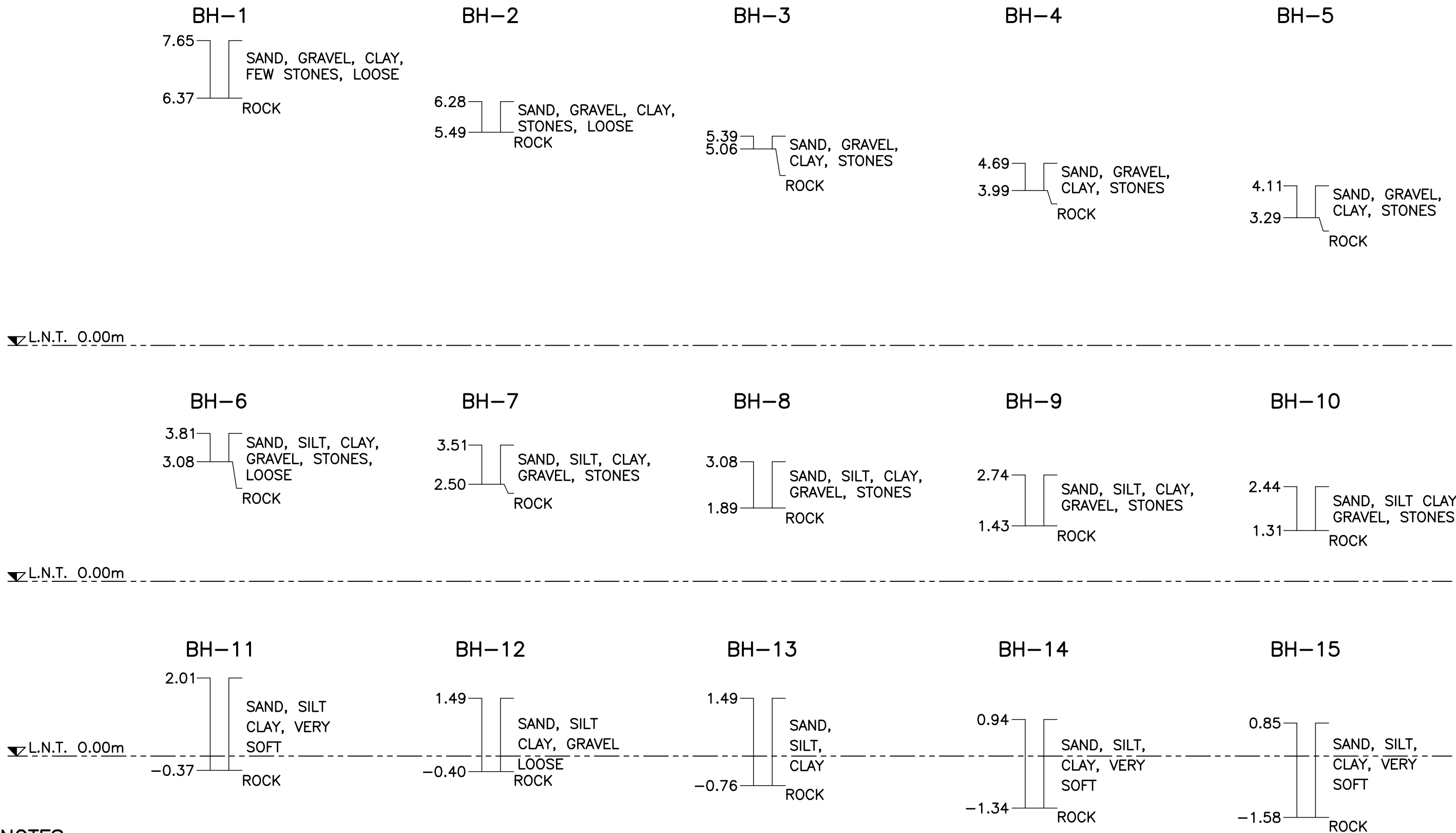


BOREHOLE RECORD

Project Name: Market Wharf Approach Trestle
Project Number: 222828.00
Client: Town of Saint Andrews
Location: Saint Andrews, NB
Water Level: Tidal

BH - 04
Date Drilled: February 25, 2022
Page: 1 of 1
Datum: Chart
Water Level Date: N.A

Depth (m)	Water Level (m)	Sample Type	Sample Number	N Value or RQD %	Recovery (mm) or %	Symbols	SOIL AND/OR ROCK DESCRIPTION	SPT N-Value (Blows/300mm)					
								■	20	40	80	■	
								Undrained Shear Strength (kPa)					
								□	500	1000	1500	2000	□
Moisture Content / Atterberg Limits								Moisture Content / Atterberg Limits					
								○	20	40	60	80	○
0								3.2					
1		SS	1	7	300		Loose to compact brown to reddish brown SAND with gravel to silty SAND with gravel - some shells						
2													
3		SS	2	11	400								
4													
5		SS	3	SSR	25								
6													
7													
8		HQ	4	47%	100%		Severely fractured red SANDSTONE						
9													
10													
11													
12													
13		HQ	5	40%	100%								
14													
15													
16							End of Borehole at 4.7 m	-1.5					
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													

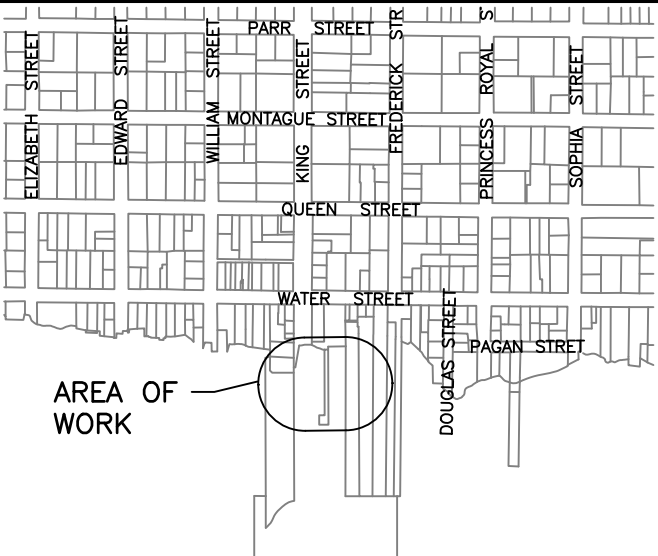


NOTES:

- BOREHOLES DONE BY PUBLIC WORKS OF CANADA IN MARCH, 1955.
- ANY INFORMATION PERTAINING TO SOILS AND ALL BOREHOLE DATA ARE FURNISHED BY THE ENGINEER AS A MATTER OF INFORMATION ONLY. BOREHOLE DATA IS NOT TO BE INTERPRETED AS DESCRIPTIVE OF CONDITIONS AT LOCATIONS OTHER THAN THOSE DESCRIBED BY THE BOREHOLES THEMSELVES.
- CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD AND REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO START OF WORK.

1995 BOREHOLE LOGS

SCALE: 1:100



KEY PLAN

1:10000

0	ISSUED FOR TENDER	AUG 14/25 GKP
8	ISSUED FOR 100% REVIEW	MAY 07/25 GKP
A	ISSUED FOR 70% REVIEW	MAY 6/24 GKP
No.	Description	Date By

Revision or Issue

TOWN OF SAINT ANDREWS

TSA WHARF APPROACH REPLACEMENT

STRUCTURAL

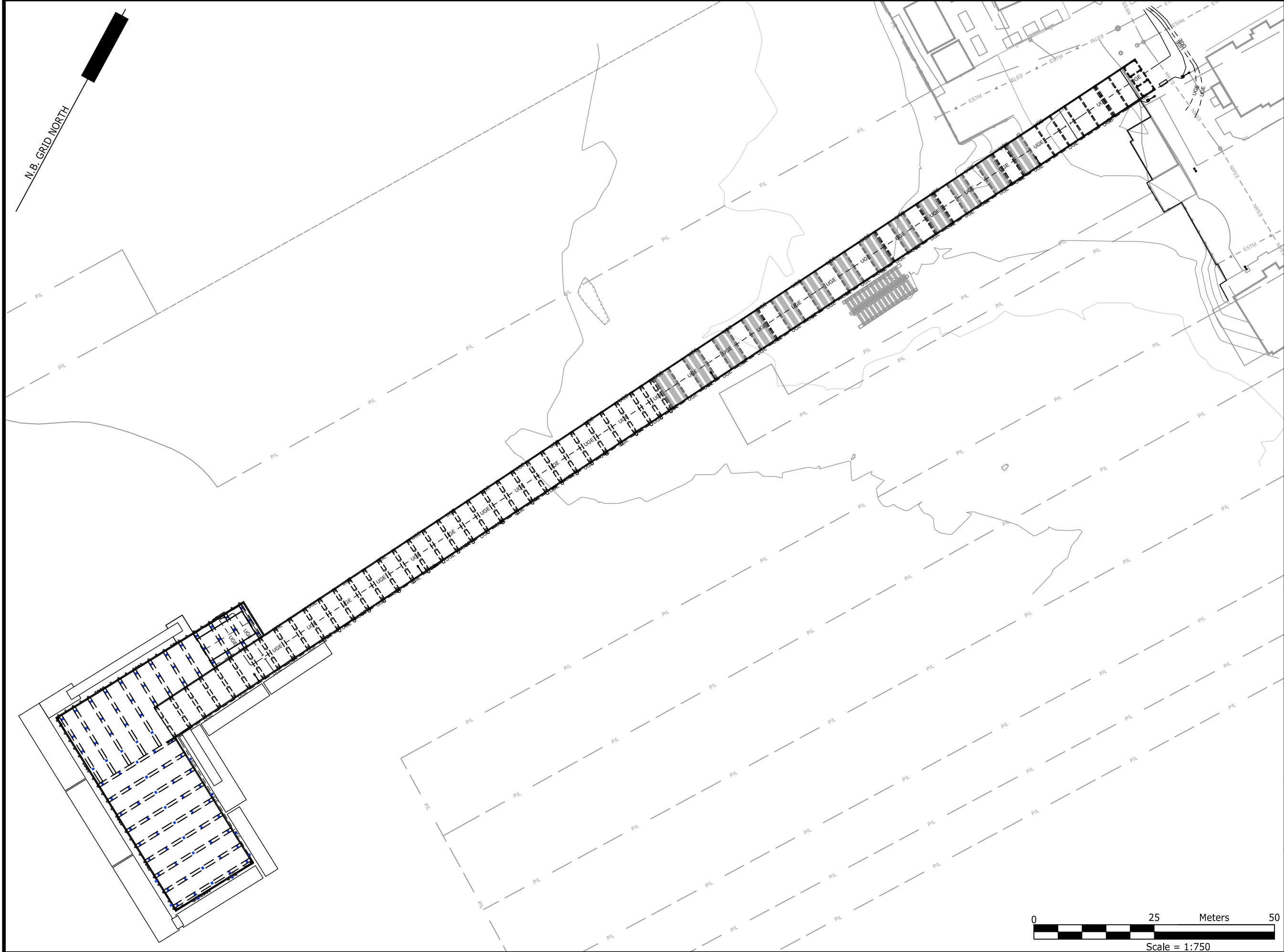
BOREHOLE LOGS



CBCL No 242835.00	Contract No TSA 2024-03	Date APR 2024	Scale AS NOTED
Licensed Professional Engineer Province of New Brunswick	Designed MK	Drawn LL	
Checked KM	Approved ----		
Sheet No 2	of 19		
Drawing No M02			

APPENDIX II

CONCEPTUAL DRAWINGS



GENERAL NOTES

1. All dimensions in millimeters unless otherwise specified.
2. All elevations are in meters.
3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
4. This drawing is not a survey and any property boundaries are shown for reference only.

**DRAFT
NOT FOR
CONSTRUCTION**

No.	REVISION/ISSUE	DATE
-----	----------------	------

FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

Drawing:

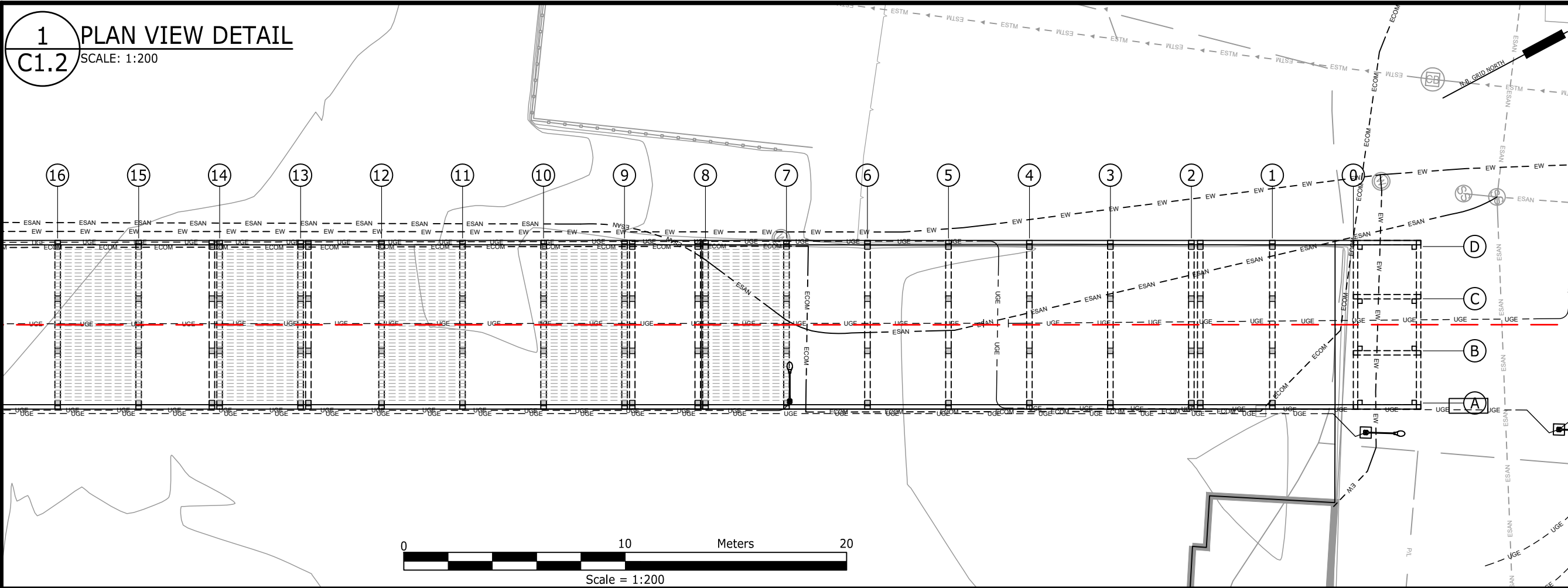
SITE OVERVIEW

Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30

Scale	Designed By	Rev.
1:750	RTH	

Sheet

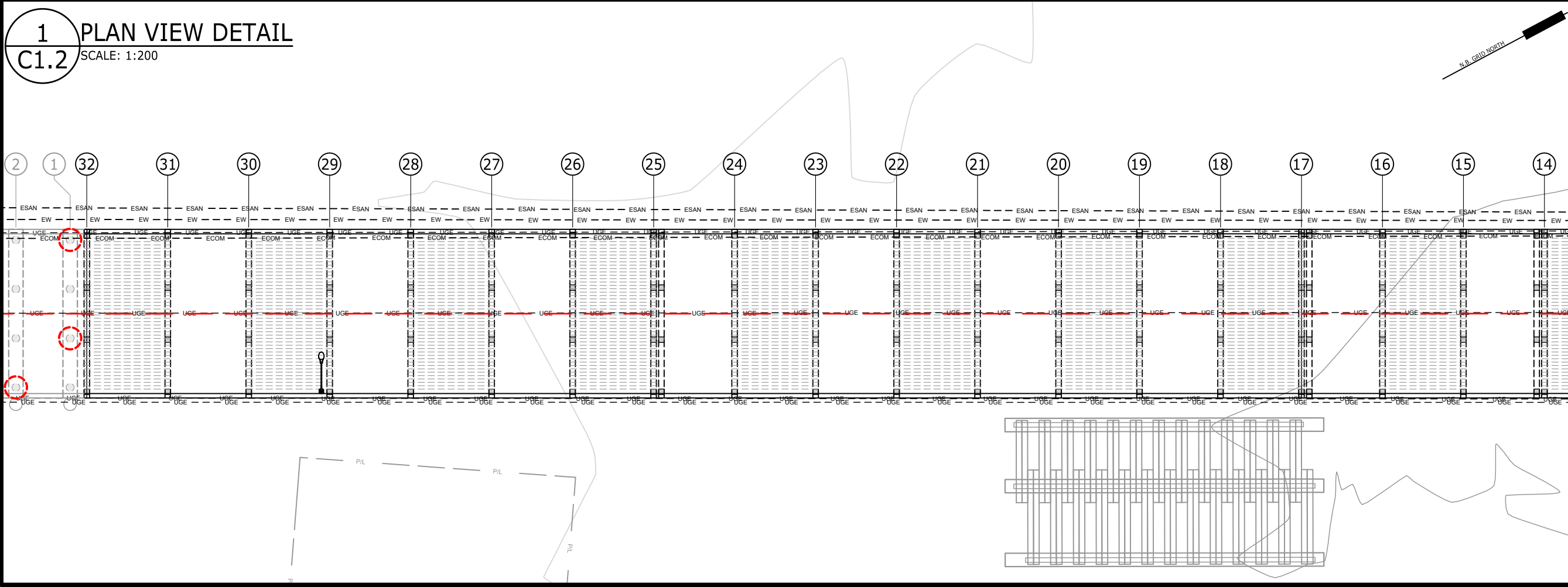
C1.1



- GENERAL NOTES
1. All dimensions in millimeters unless otherwise specified.
 2. All elevations are in meters.
 3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
 3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
 4. This drawing is not a survey and any property boundaries are shown for reference only.

DRAFT
NOT FOR
CONSTRUCTION

No.	REVISION/ISSUE	DATE



FUNDY Engineering

27 Wellington Row Saint John, NB E2L 3H4
Tel. (506) 635-1566 Fax. (506) 635-0206
fundy@fundyeng.com www.fundyeng.com

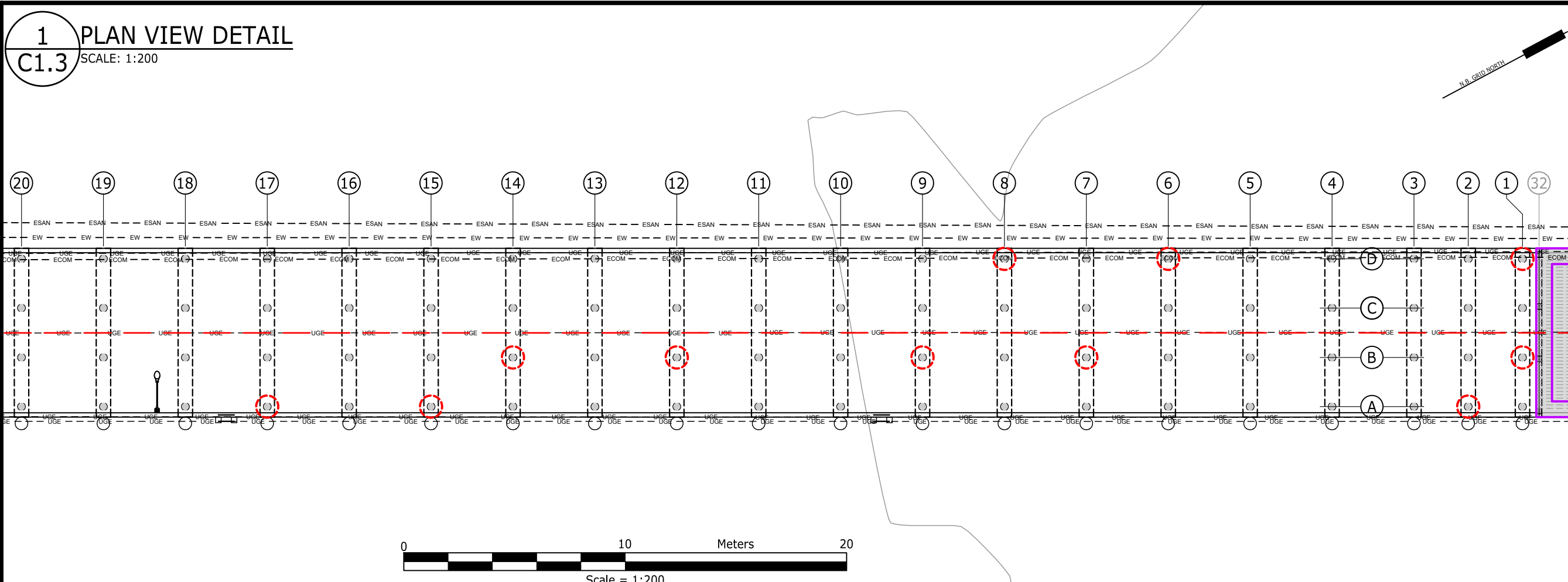
Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

Drawing:
**INNER APPROACH WHARF
PLAN VIEW DETAIL**

Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30
Scale	Designed By	Rev.
1:200	RTH	
Sheet		

C1.2

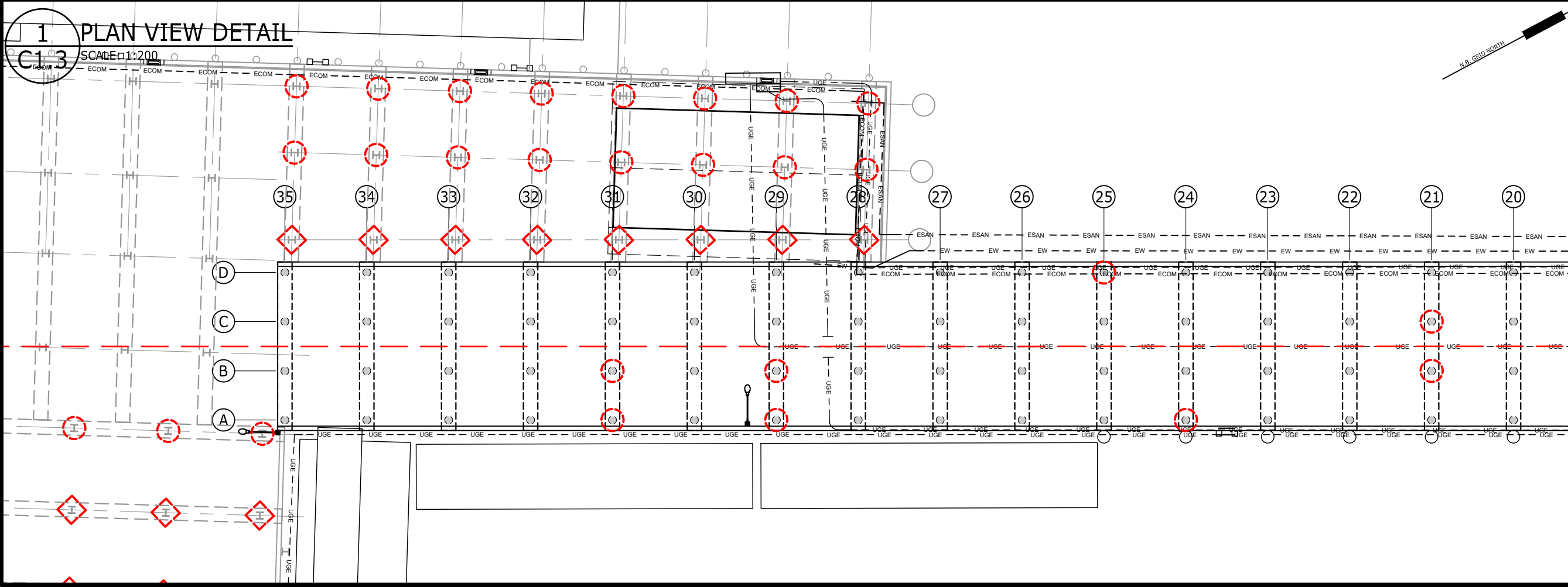


- GENERAL NOTES
1. All dimensions in millimeters unless otherwise specified.
 2. All elevations are in meters.
 3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
 3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
 4. This drawing is not a survey and any property boundaries are shown for reference only.

- PROPOSED UPPER REPAIR
- ◇ PROPOSED LOWER REPAIR

**DRAFT
NOT FOR
CONSTRUCTION**

No.	REVISION/ISSUE	DATE
-----	----------------	------



FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

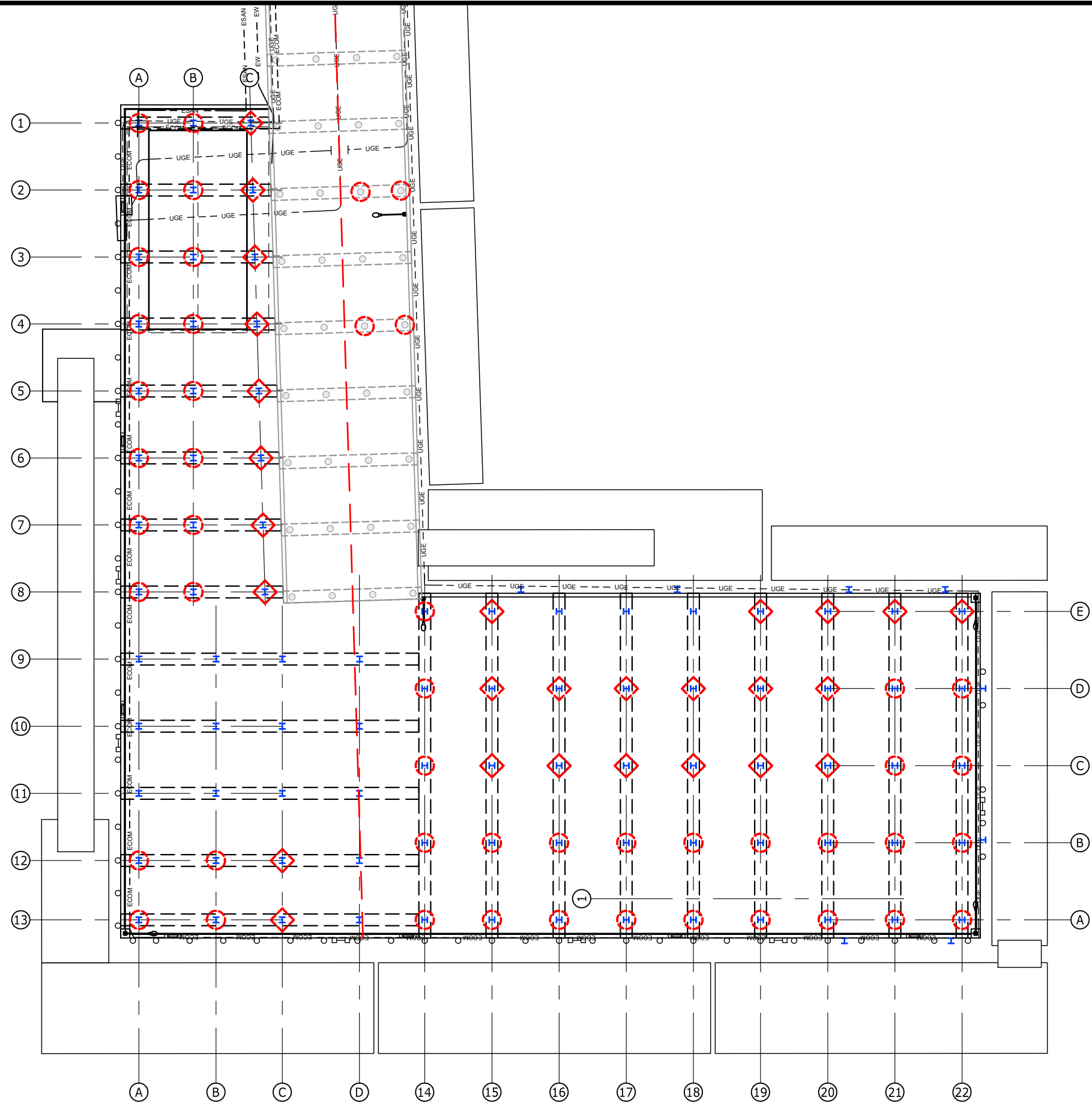
Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

Drawing:
**OUTER APPROACH WHARF
PLAN VIEW DETAIL
PILE REPAIRS**

Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30
Scale	Designed By	Rev.
1:200	RTH	

Sheet

C1.3



- GENERAL NOTES**
1. All dimensions in millimeters unless otherwise specified.
 2. All elevations are in meters.
 3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
 3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
 4. This drawing is not a survey and any property boundaries are shown for reference only.
- PROPOSED UPPER REPAIR
◇ PROPOSED LOWER REPAIR

**DRAFT
NOT FOR
CONSTRUCTION**

No.	REVISION/ISSUE	DATE
-----	----------------	------

FUNDY Engineering

27 Wellington Row Saint John, NB E2L 3H4
Tel. (506) 635-1566 Fax. (506) 635-0206
fundy@fundyeng.com www.fundyeng.com

Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

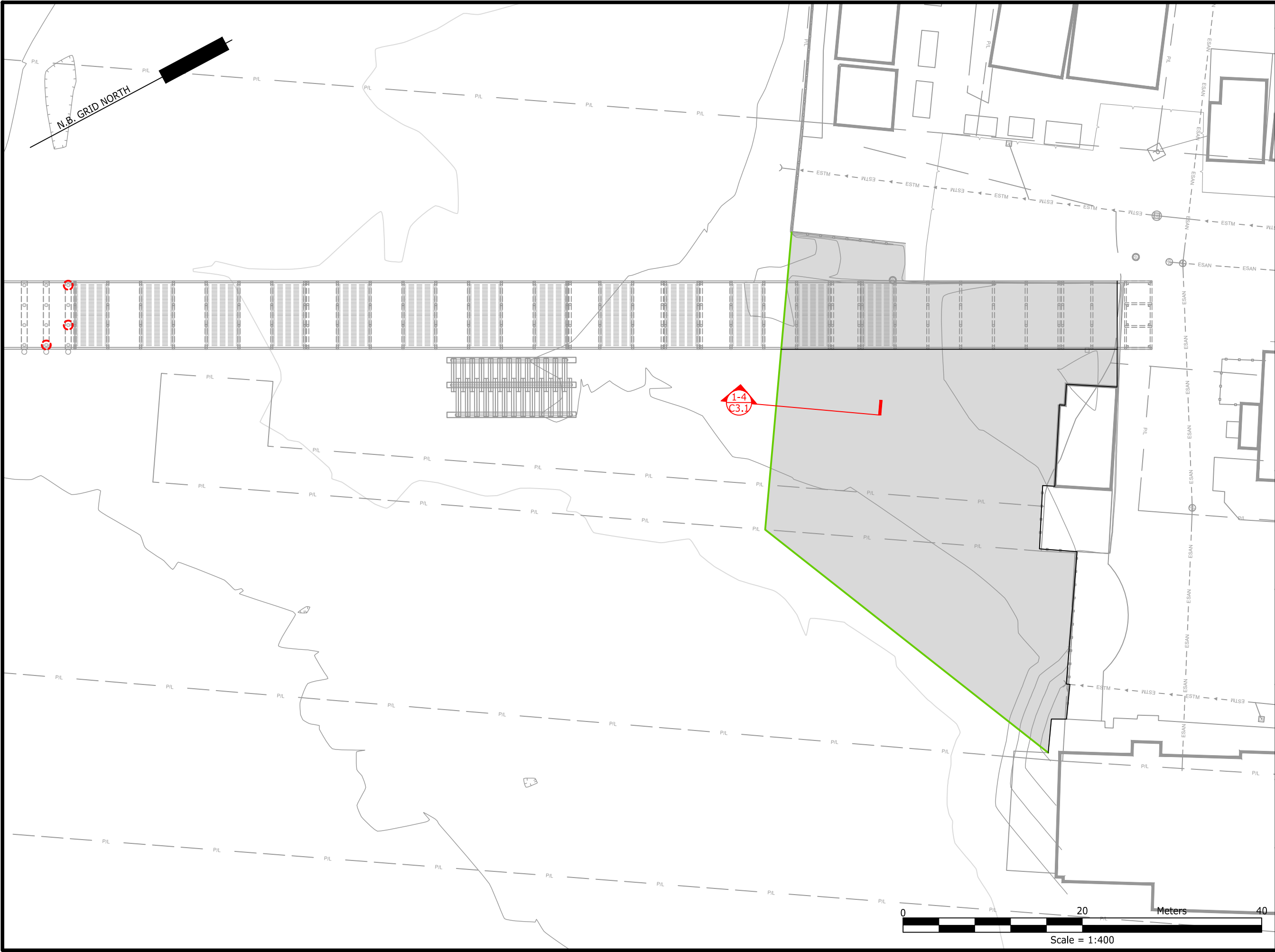
Drawing:

**HEAD OF WHARF
PLAN VIEW DETAIL
PILE REPAIRS**

Project No. 18959	Reviewed By GDM	Date (yy/m/d) 26/1/30
Scale 1:250	Designed By RTH	Rev.

Sheet

C1.4



GENERAL NOTES

1. All dimensions in millimeters unless otherwise specified.

2. All elevations are in meters.

3. Topographical data is based on the following:

- Projection = NB Double Stereographic (NAD83 CSRS)
- Vertical Datum = CHART

3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.

4. This drawing is not a survey and any property boundaries are shown for reference only.

DRAFT
NOT FOR
CONSTRUCTION

No.	REVISION/ISSUE	DATE

FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:

INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB

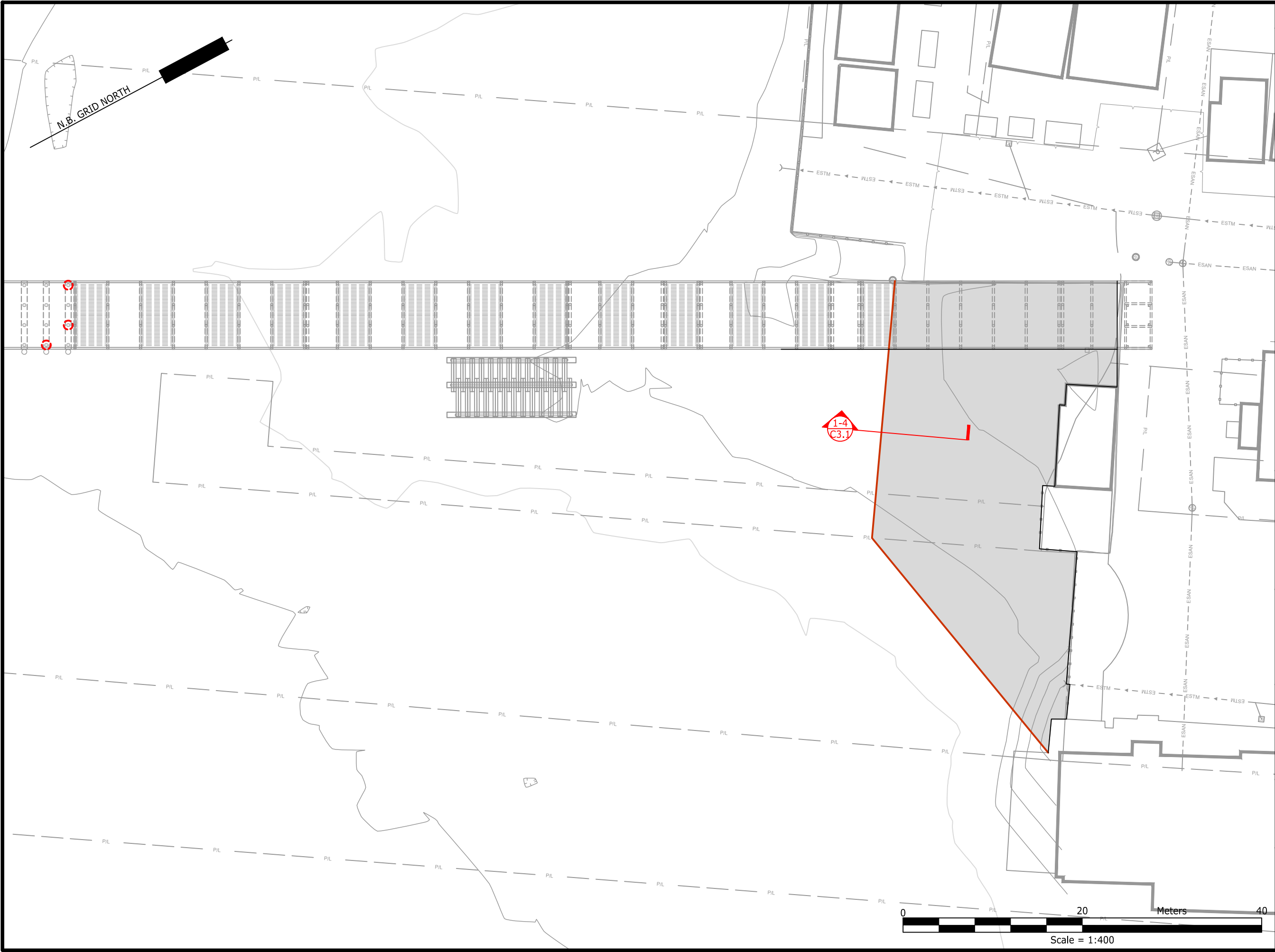
Drawing:

MARKET WHARF
OPTION 1

Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30
Scale	Designed By	Rev.
1:400	RTH	

Sheet

C1.5



GENERAL NOTES

1. All dimensions in millimeters unless otherwise specified.
2. All elevations are in meters.
3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
4. This drawing is not a survey and any property boundaries are shown for reference only.

**DRAFT
NOT FOR
CONSTRUCTION**

No.	REVISION/ISSUE	DATE
-----	----------------	------

FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

Drawing:

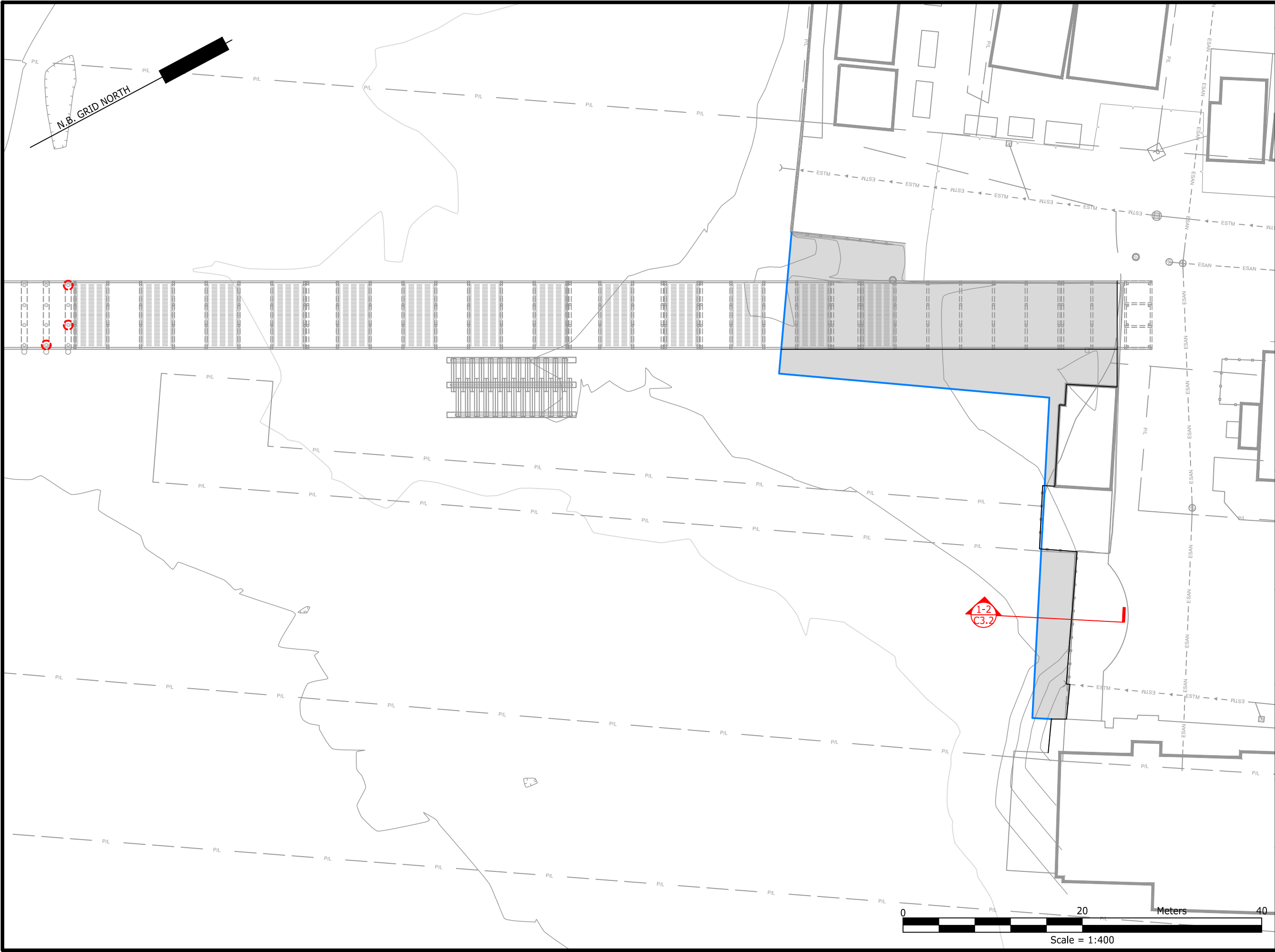
**MARKET WHARF
OPTION 2**

Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30

Scale	Designed By	Rev.
1:400	RTH	

Sheet

C1.6



GENERAL NOTES

1. All dimensions in millimeters unless otherwise specified.
2. All elevations are in meters.
3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
4. This drawing is not a survey and any property boundaries are shown for reference only.

**DRAFT
NOT FOR
CONSTRUCTION**

No.	REVISION/ISSUE	DATE
-----	----------------	------

FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

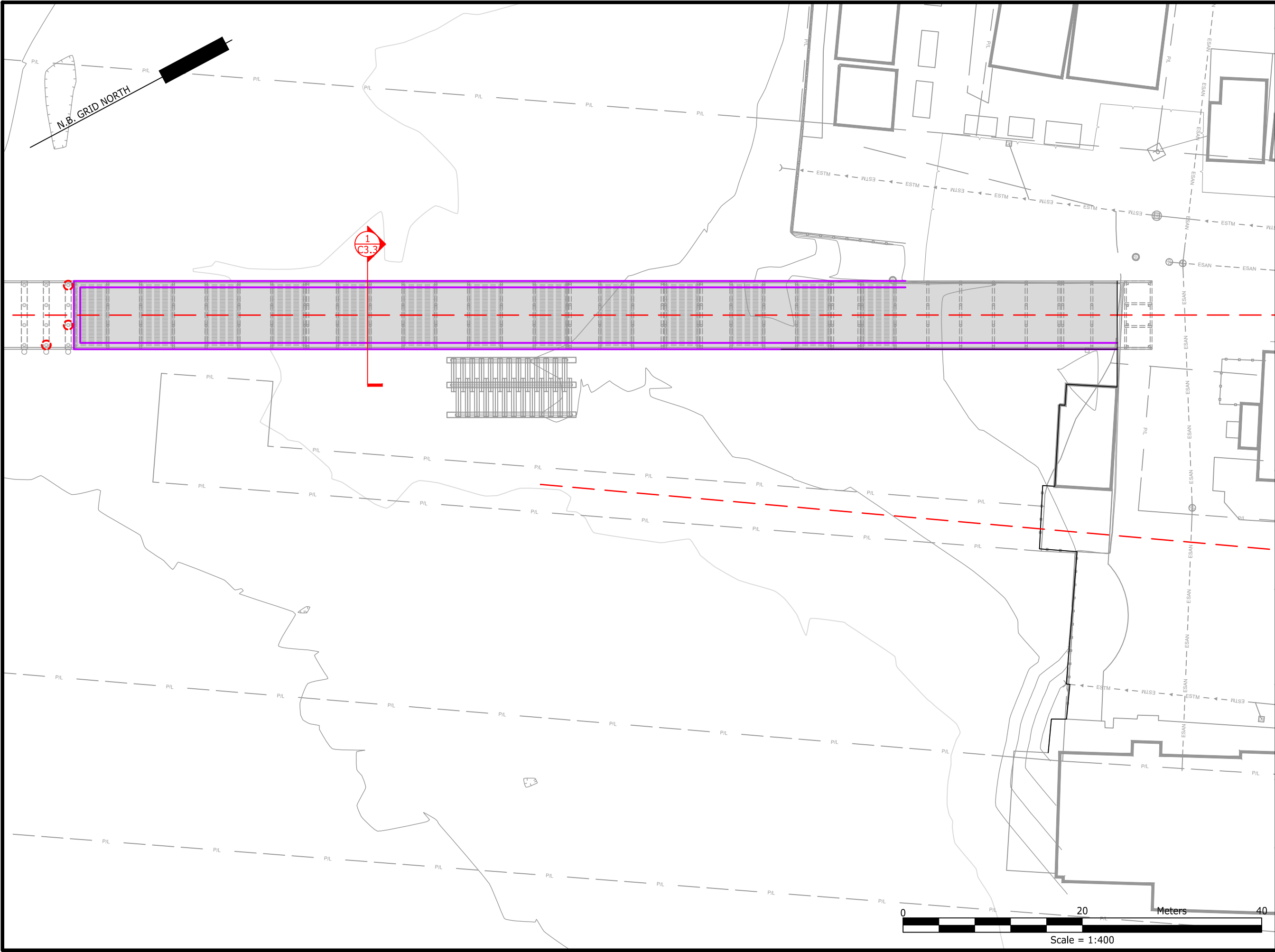
Drawing:
**MARKET WHARF
OPTION 3**

Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30

Scale	Designed By	Rev.
1:400	RTH	

Sheet

C1.7



GENERAL NOTES

- 1. All dimensions in millimeters unless otherwise specified.
- 2. All elevations are in meters.
- 3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
- 3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
- 4. This drawing is not a survey and any property boundaries are shown for reference only.

DRAFT
NOT FOR
CONSTRUCTION

No.	REVISION/ISSUE	DATE
-----	----------------	------

FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB

Drawing:

APPROACH WHARF
REDI-ROCK OPTION

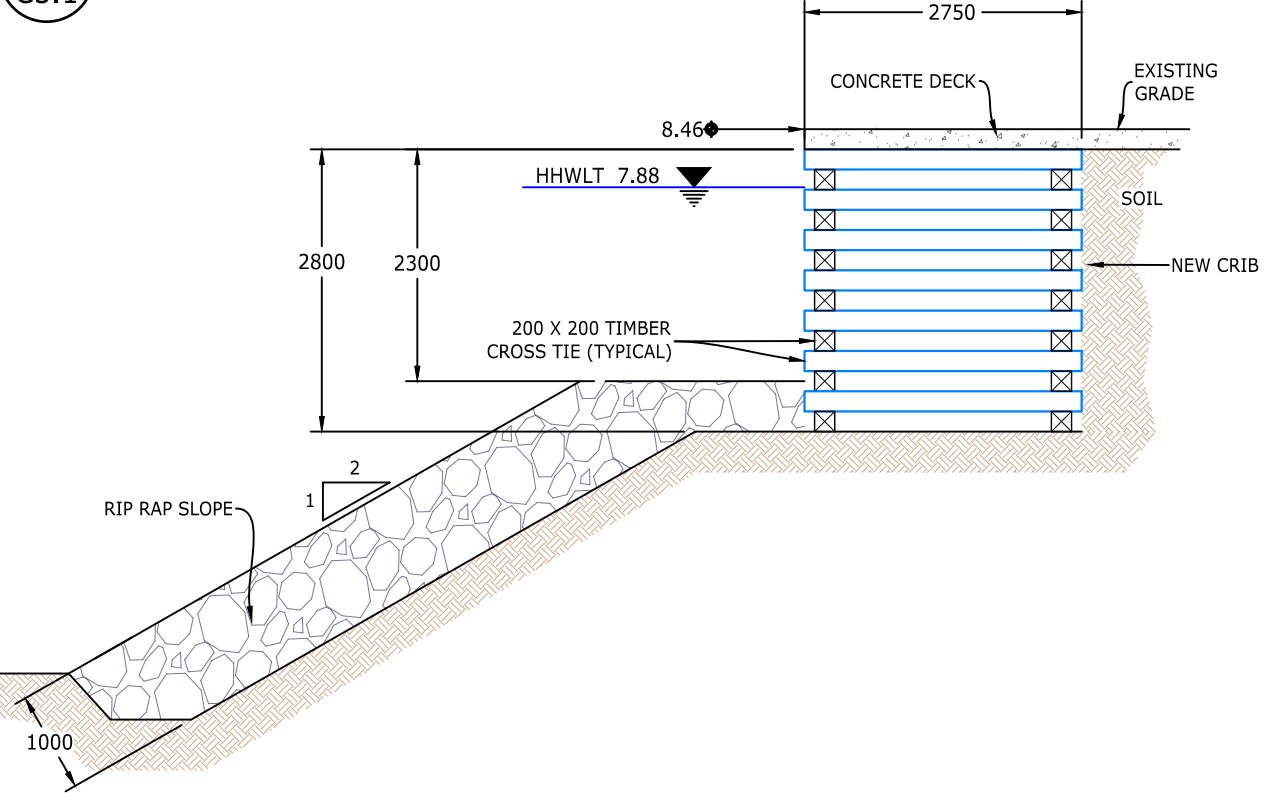
Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30

Scale	Designed By	Rev.
1:400	RTH	

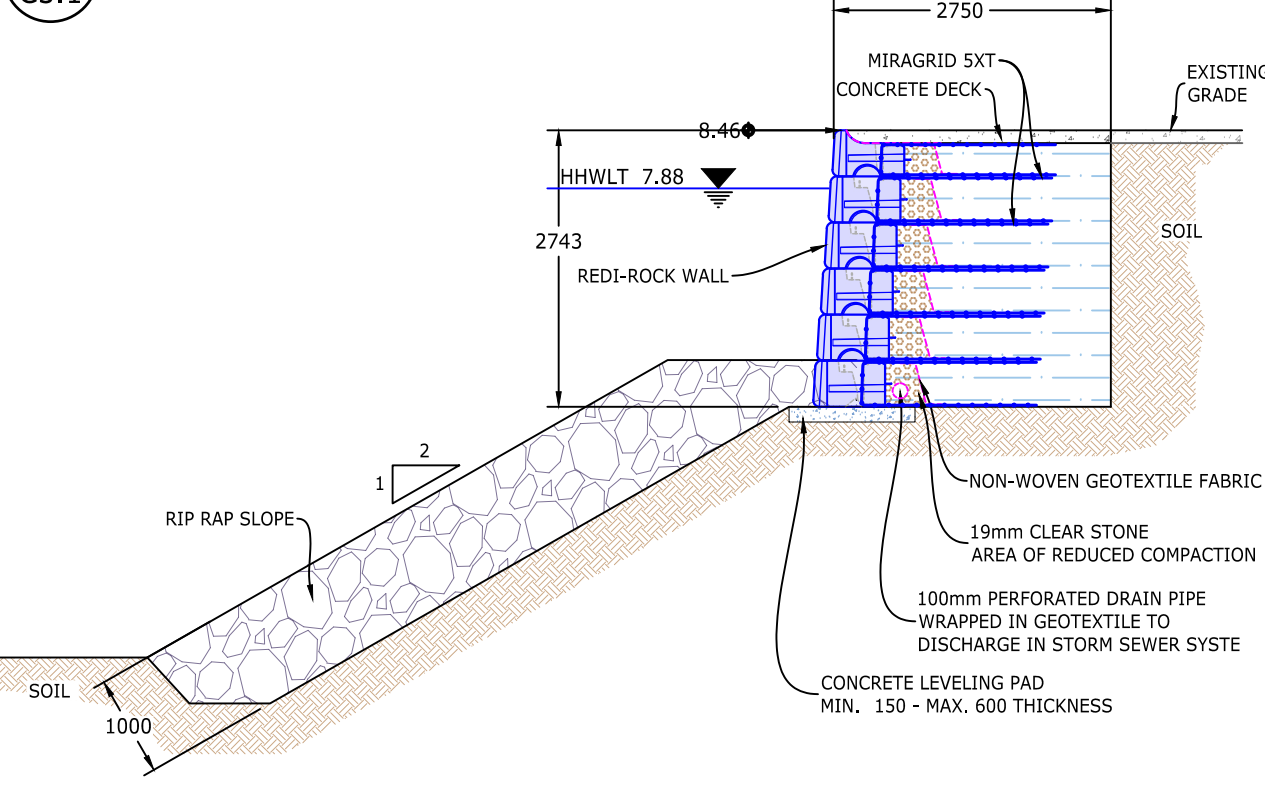
Sheet

C1.8

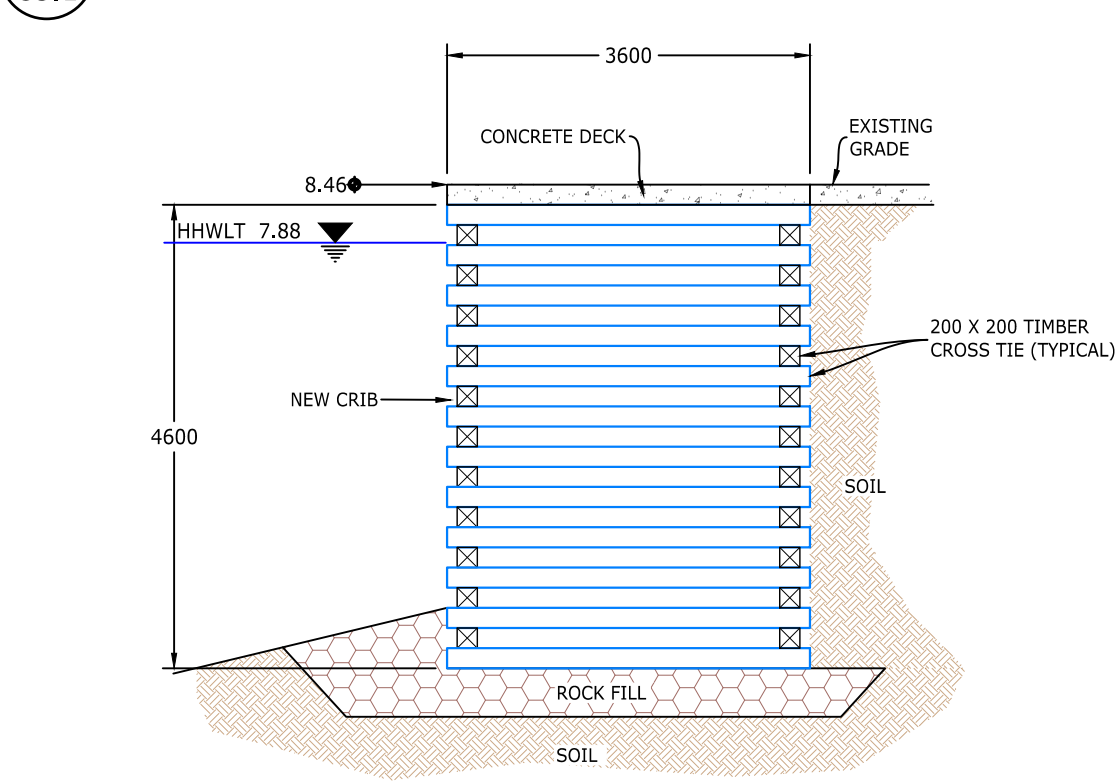
1
C3.1
OPTION A SECTION
SCALE: 1:75



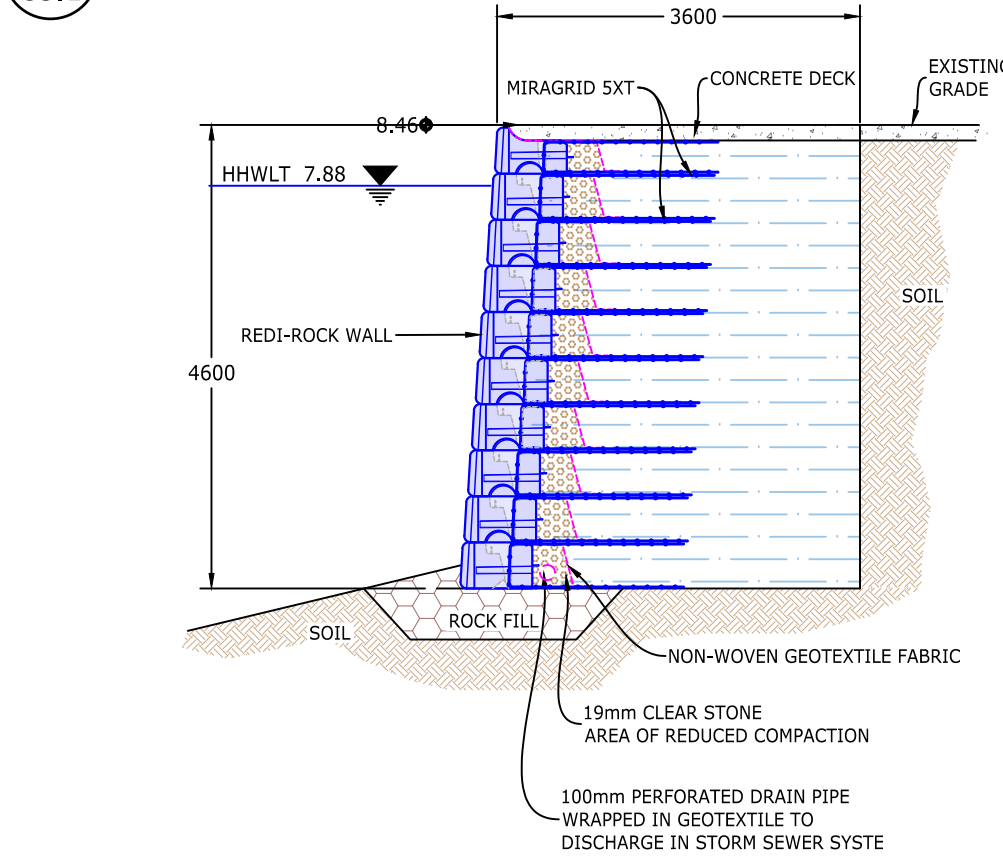
2
C3.1
OPTION A SECTION
SCALE: 1:75



3
C3.1
OPTION B SECTION
SCALE: 1:75



4
C3.1
OPTION B SECTION
SCALE: 1:75



GENERAL NOTES

- All dimensions in millimeters unless otherwise specified.
- All elevations are in meters.
- Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
- Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
- This drawing is not a survey and any property boundaries are shown for reference only.

**DRAFT
NOT FOR
CONSTRUCTION**

No.	REVISION/ISSUE	DATE

FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

Drawing:
**CRIB SECTIONS
OPTIONS A & B**

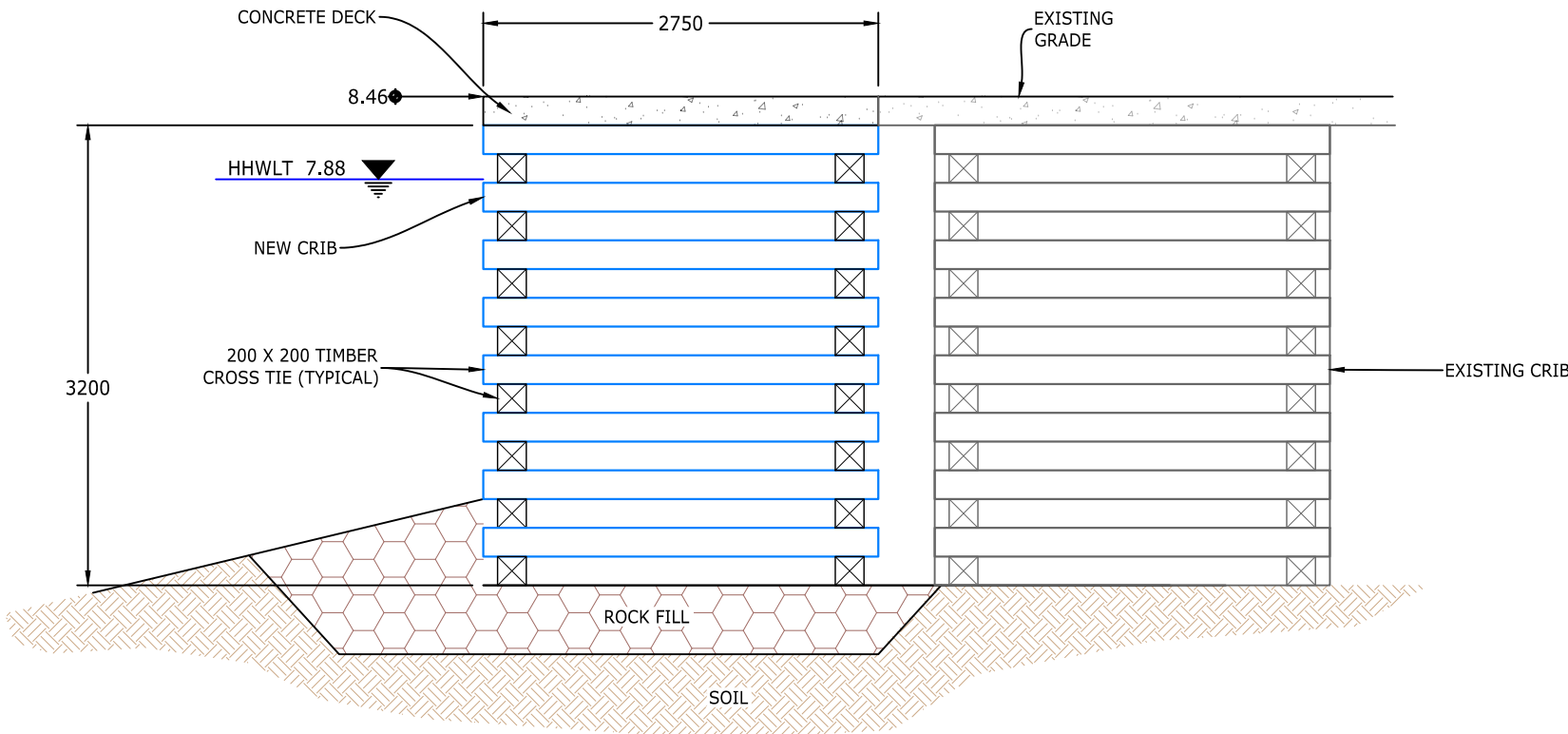
Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30

Scale	Designed By	Rev.
AS SHOWN	RTH	

Sheet

C3.1

1
C3.2
OPTION C SECTION
SCALE: 1:50

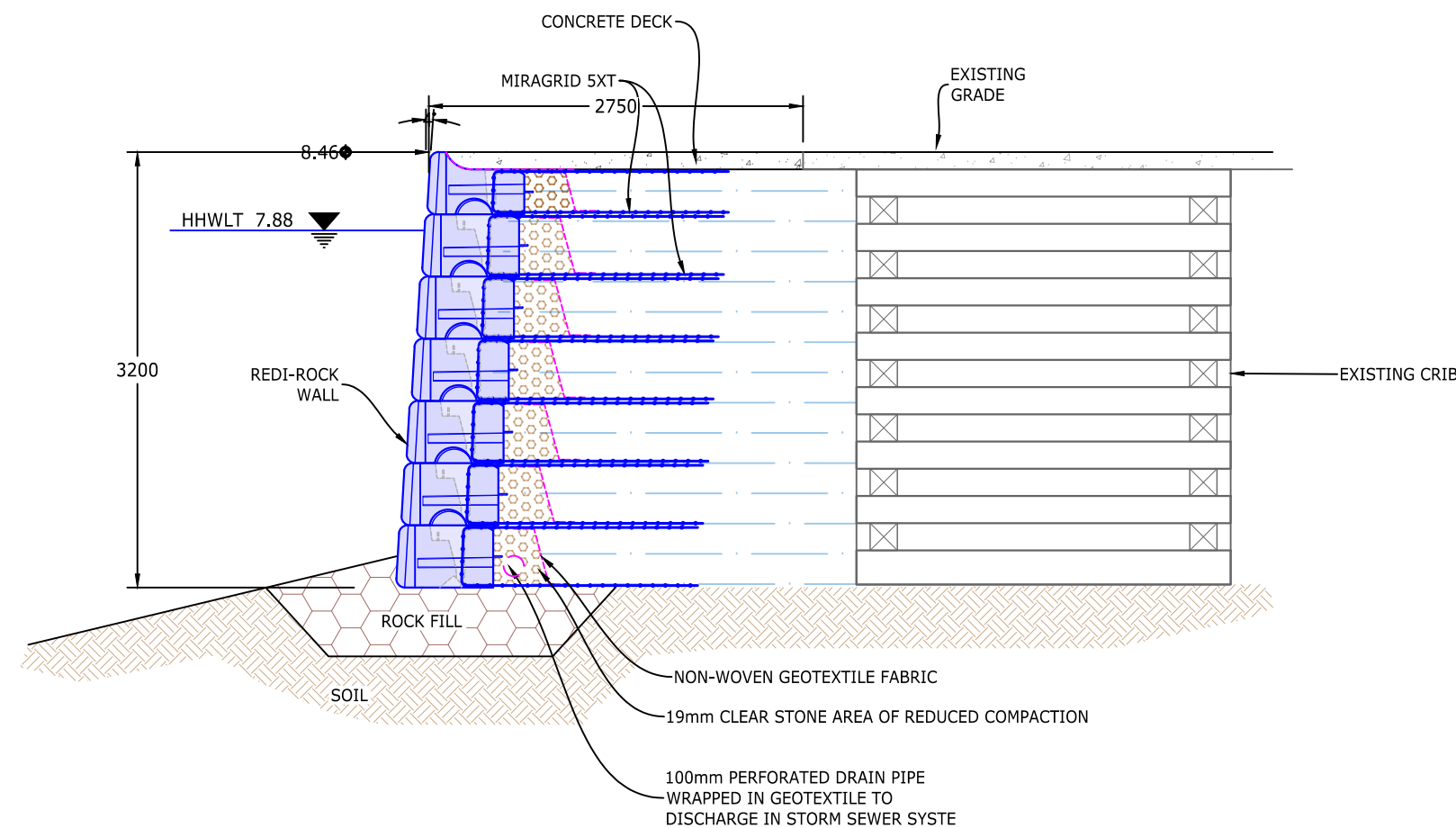


- GENERAL NOTES
1. All dimensions in millimeters unless otherwise specified.
 2. All elevations are in meters.
 3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
 3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
 4. This drawing is not a survey and any property boundaries are shown for reference only.

DRAFT
NOT FOR
CONSTRUCTION

No.	REVISION/ISSUE	DATE

2
C3.2
OPTION C SECTION
SCALE: 1:50



FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

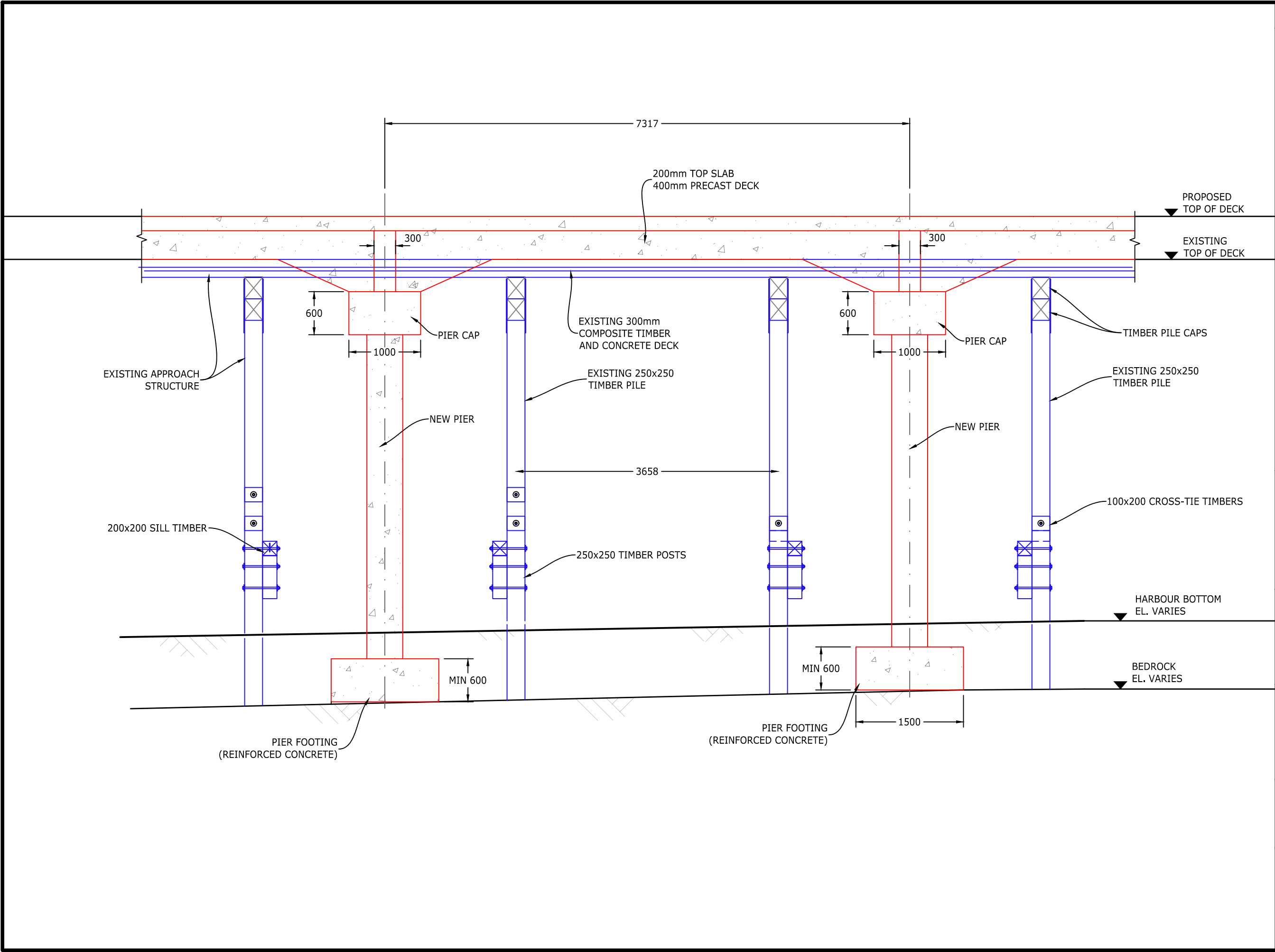
Drawing:
**SECTIONS
OPTION C**

Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30
Scale	Designed By	Rev.
AS SHOWN	RTH	
Sheet		

C3.2



C3.3



GENERAL NOTES

1. All dimensions in millimeters unless otherwise specified.
2. All elevations are in meters.
3. Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
3. Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
4. This drawing is not a survey and any property boundaries are shown for reference only.

**DRAFT
NOT FOR
CONSTRUCTION**

No.	REVISION/ISSUE	DATE

FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

Drawing:

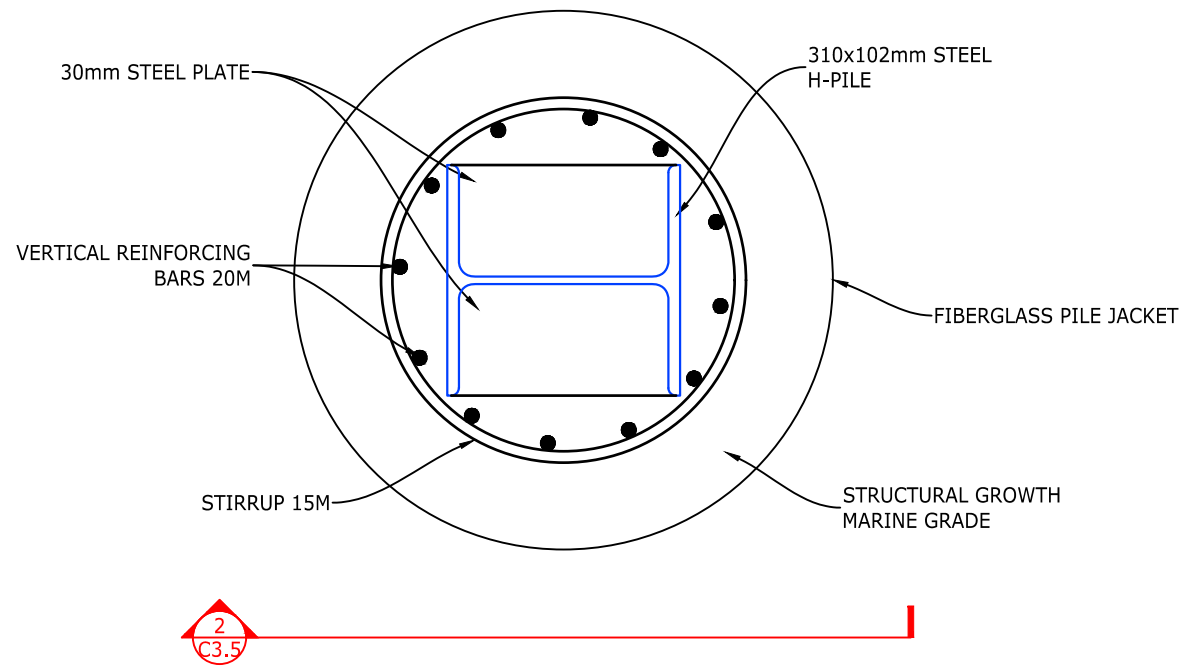
**PROPOSED
INNER APPROACH WHARF
ELEVATION**

Project No. 18959	Reviewed By GDM	Date (yy/m/d) 26/1/30
Scale 1:50	Designed By RTH	Rev.

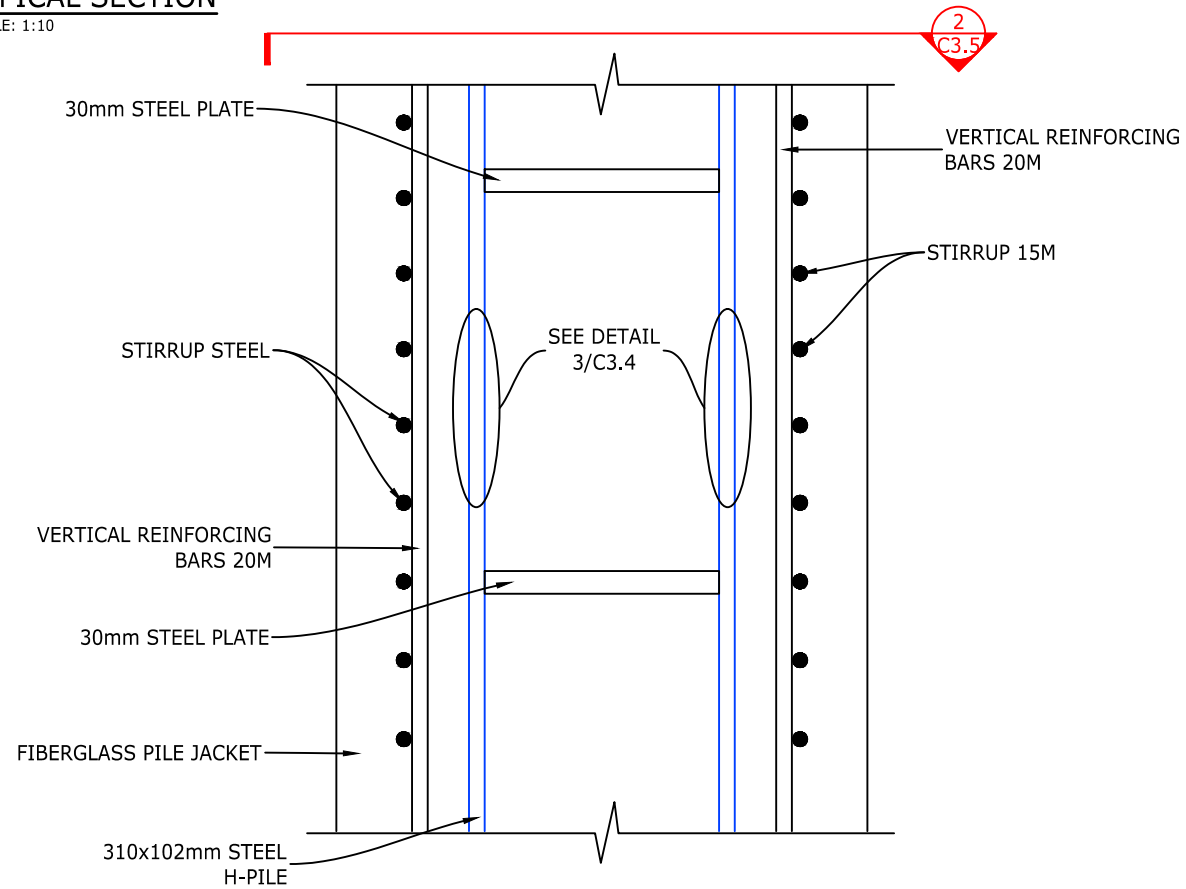
Sheet

C3.4

1 PLAN VIEW
C3.5 SCALE: 1:10



2 TYPICAL SECTION
C3.5 SCALE: 1:10



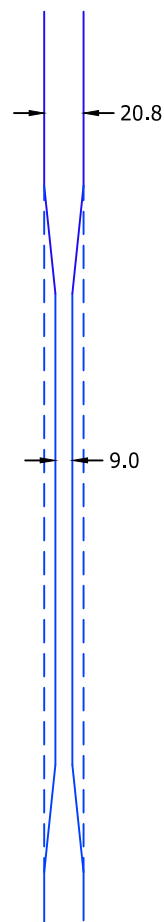
GENERAL NOTES

- All dimensions in millimeters unless otherwise specified.
- All elevations are in meters.
- Topographical data is based on the following:
 - Projection = NB Double Stereographic (NAD83 CSRS)
 - Vertical Datum = CHART
- Site Plan (underlay) provided by others and depicted for reference use only and not for construction.
- This drawing is not a survey and any property boundaries are shown for reference only.

**DRAFT
NOT FOR
CONSTRUCTION**

No.	REVISION/ISSUE	DATE

3 PILE CORROSION DETAIL
C3.5 SCALE: 1:4



FUNDY Engineering

27 Wellington Row
Saint John, NB
E2L 3H4

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
**INSPECTION SERVICES
MARKET SQUARE WHARF
KING STREET
ST. ANDREWS, NB**

Drawing:
PILE JACKET DETAILS

Project No.	Reviewed By	Date (yy/m/d)
18959	GDM	26/1/30

Scale	Designed By	Rev.
AS SHOWN	RTH	

Sheet

C3.5

APPENDIX III
COST ESTIMATE SUMMARY

FUNDY Engineering

27 Wellington Row
P.O. Box 6626
Saint John, NB
E2L 4S1

Phone: 506.635.1566
Fax: 506.635.0206
gord.mouland@fundyeng.com
www.fundyeng.com

**SAINT ANDREWS MARKET WHARF - Year 1
PROJECT COST ESTIMATES**

February 25, 2026
Job # 18959

Year	DESCRIPTION
1	Head of Wharf Lower Pile Jackets 30 \$1,180.0
1	Inner Approach Replacement Phase 1 Trestle \$872

Note: All cost x 1,000
Design and Construction Services ~ 10%
Plus HST

FUNDY Engineering27 Wellington Row
P.O. Box 6626
Saint John, NB
E2L 4S1Phone: 506.635.1566
Fax: 506.635.0206
gord.mouland@fundyeng.com
www.fundyeng.com**SAINT ANDREWS MARKET WHARF - Year 2
PROJECT COST ESTIMATES**February 25, 2026
Job # 18959

Year	DESCRIPTION			
2	Head of Wharf Upper Pile Jackets			
	51	\$362.0		
Environment				
2	Inner Approach Replacement Phase 2			
	Trestle Deck	\$1,269		
Alternate Redi-Rock Wall				
	Full Height	\$1,753	\$60	
2	DESCRIPTION	Crib Wall	Redi-Rock	Environment
2	Market Square Alignment 1			
	Hybrid	\$887	\$676	\$54
	Full Height	\$1,360	\$891	\$43
Alignment 2				
	Hybrid	\$726	\$506	\$36
	Full Height	\$1,079	\$644	\$26
Alignment 3				
	Full Height	\$614	\$422	\$20
DESCRIPTION				
2	Outer Approach Pile Jackets			
	21	\$280		
Cross Braces & Walers				
	10	\$80		
	Cost			
Day Adventure Alignment 1 - Replace Top 2.5 m				
	Crib	\$281		
Alignment 2 - Rebuild full height in front of existing wall				
	Hybrid	\$552	\$299	\$19
	Full Height	\$600	\$338	\$10
DESCRIPTION				
Note: All cost x 1,000				
Design and Construction Services ~ 10%				
Plus HST				

FUNDY Engineering

27 Wellington Row
P.O. Box 6626
Saint John, NB
E2L 4S1

Phone: 506.635.1566

Fax: 506.635.0206

gord.mouland@fundyeng.com

www.fundyeng.com

**SAINT ANDREWS MARKET WHARF - Year 3
PROJECT COST ESTIMATES**

February 25, 2026

Job # 18959

Year DESCRIPTION

**3 Outer Approach
Pile Jackets**
21 \$260

Cross Braces & Walers
10 \$80
Cost

DESCRIPTION

Environment

3 Day Adventure
Alignment 1 - Replace Top 2.5 m
Crib \$281

Alignment 2 - Rebuild full height in front of existing wall
Hybrid \$552 \$299 \$19

Full Height \$600 \$338 \$10

Note: All cost x 1,000

Design and Construction Services ~ 10%
Plus HST

FUNDY Engineering

27 Wellington Row
P.O. Box 6626
Saint John, NB
E2L 4S1

Phone: 506.635.1566

Fax: 506.635.0206

gord.mouland@fundyeng.com

www.fundyeng.com

SAINT ANDREWS MARKET WHARF - Year 4, 5
PROJECT COST ESTIMATES

February 25, 2026

Job # 18959

Year	DESCRIPTION
4	Outer Approach Pile Jackets 10 \$80 Cross Braces & Walers 5 \$40 Cost
4	DESCRIPTION Guide Piles - Refubish 21 \$300 Fire Water Line and Services \$150 Dingy Floats \$300
5	Outer Approach Pile Jackets 10 \$80 Cross Braces & Walers 5 \$40
Note: All cost x 1,000 Design and Construction Services ~ 10% Plus HST	

APPENDIX IV

LIMITATIONS

Wharf Assessments

Legal Notification

This report was prepared by Fundy Engineering & Consulting Ltd. (Fundy Engineering) for the sole use and benefit of The Town of Saint Andrews. (*i.e.*, the Client) and may not be reproduced in whole or in part or used or relied upon in whole or in part by any party other than the Town of Saint Andrews. for any purpose whatsoever without the express written consent of the Client.

Any use that a third party makes of this report, or any reliance on or decisions made based on this report, are the responsibility of such third parties. Fundy Engineering accepts no responsibility for damages, if any, suffered by any third party because of decisions made or actions taken based on this report. This report is subject to Fundy Engineering's Standard Terms and Conditions.

Basis of Report

This report is based on site conditions known or inferred during the assessment that was conducted during the period noted in this report. Should changes occur that could potentially impact the geotechnical or structural condition of the site, or if construction is initiated more than one year following the date of this report, Fundy Engineering's recommendations may require re-evaluation.

When completing a wharf assessment, Fundy Engineering adheres to appropriate codes and standards. This report is provided solely for the guidance of design engineers and assumes that their design will be in accordance with applicable codes and standards. Any changes in the design features that could potentially impact the analyses or issues concerning the geotechnical aspects of applicable codes and standards will necessitate a review of the design by Fundy Engineering. Additional fieldwork and reporting may be required as part of that review.

Where applicable, field services recommended by Fundy Engineering are those considered necessary to ascertain that the investigation will be carried out in general conformity with sound environmental investigation practices and the expertise of Fundy Engineering's trained professional and technical / scientific staff.

Where applicable, field services recommended by Fundy Engineering are those considered necessary to ascertain that construction will be carried out in general conformity with building code guidelines, sound geotechnical practices, and expertise of Fundy Engineering's trained professional and technical / scientific staff. Any reduction in the level of services recommended will result in Fundy Engineering providing qualified opinions regarding the adequacy of the work. Fundy Engineering can assist design professionals or contractors retained by the Client to review applicable plans, drawings, and specifications as they relate to this report or to conduct field reviews during construction.

Contractors contemplating work on the site are responsible for conducting an independent geotechnical investigation and interpretation of the results included in this report. The number of test pits and / or boreholes necessary to determine the localized underground

conditions as they impact construction costs, techniques, sequencing, equipment, and scheduling may be greater than those carried out for the purpose of this report.

Classification and identification of soils, rocks, geological units, contaminant materials, building envelope assessments, and engineering assessments are based on investigations performed in accordance with the standard of care set out below and require exercising judgement. Therefore, even comprehensive sampling and testing programs implemented with appropriate equipment by experienced personnel may fail to identify or locate some conditions. Although all Fundy Engineering assessments are completed by qualified persons using their professional experience and best practices, all assessments involve an inherent risk that some conditions may not be detected. All documents or records summarizing investigations are based on assumptions or inferences of what exists between the actual discrete points sampled. Actual conditions between the discrete points investigated may vary significantly. Some conditions are subject to change over time and this report presents the condition at the discrete points sampled during the period noted in this report. Where special concerns exist, or the Client has special considerations or requirements, those should be disclosed to Fundy Engineering to allow for additional or special investigations to be conducted that were not otherwise within the scope of work for the assessment completed for this report.

Reliance of Information Provided

The evaluation and conclusions provided in this report are based on conditions in evidence at the time of site inspections during the period noted in this report and information provided to Fundy Engineering by the Client and others. This report was prepared for the specific site, development, building, design, or building assessment objectives and purpose as communicated by the Client and noted in this report. Fundy Engineering has relied in good faith upon such representations, information, and instructions and accepts no responsibility for any deficiency, misstatement, or inaccuracy contained in this report because of any misstatements, omissions, misrepresentations, or fraudulent acts of persons providing the information. Unless specifically stated otherwise, the applicability and reliability of the findings, recommendations, suggestions, or opinions expressed in this report are only valid to the extent that there is no material alteration to or variation from any of the information provided to Fundy Engineering.

Standard of Care

This report was prepared in a manner consistent with the degree of care and skill exercised by geotechnical engineering consultants practicing under similar circumstances and similar location(s) during the period noted in this report and in accordance with the scope of work noted. No other warranty, expressed or implied, is made. Unless specifically stated otherwise, this report does not contain environmental consulting advice.

Complete Report

All documents, records, data, and files, whether electronic or otherwise, created as part of this work are part of this report. That material includes, but is not limited to, the terms of reference provided to Fundy Engineering by the Client, communications between Fundy Engineering and the Client, other reports, proposals, or documents prepared by Fundy Engineering for the Client in relation to the site described in this report. To adequately understand the suggestions, recommendations, and opinions expressed in this report,

reference must be made to this report in its entirety. Fundy Engineering is not responsible for use of portions of this report by any party.

Use of Report

The information and opinions expressed in this report, or any document forming part of this report, are for the sole benefit of the Client. No other party may use or rely upon this report in whole or in part without the express written consent of Fundy Engineering. Any use of this report, or any portion of this report, by a third party is the sole responsibility of that third party. Fundy Engineering is not responsible for damages suffered by any third party resulting from the unauthorized use of this report.

Report Format

Electronic files transmitted by Fundy Engineering involved the use of specific software and hardware systems. Fundy Engineering makes no representation about the compatibility of those files with the Client's current or future software and hardware systems. Regardless of format, the documents described within this report are Fundy Engineering's instruments of professional service and shall not be altered without the express written consent of Fundy Engineering.