



January 25, 2019

0017-359

Via email: [art.groot@nanaimo.ca](mailto:art.groot@nanaimo.ca)

City of Nanaimo  
455 Wallace Street  
Nanaimo, BC  
V9R 5J6

Attn: Art Groot, Manager, Facility Planning & Operations

**Re: City Dockhead at Gallows Point Follow-Up Condition Assessment - DRAFT**

Mr. Groot:

At your request, Herold Engineering Limited (Herold Engineering) has completed a follow-up assessment of the City Dockhead located at Gallows Point on the southwest tip of Protection Island, Nanaimo, BC. The assessment was requested by the City of Nanaimo (the City) in response to reported damage to the facility following a winter storm event occurring December 21-22, 2018.

The assessment and following letter report were based on correspondence between the City and Herold Engineering throughout the month of January 2019, as well as a condition assessment report for the facility prepared by Herold Engineering in May 2017.

This letter represents a brief summary of the site activities and assessment findings, as well as remediation recommendations to extend the service life an additional 1-3 years in anticipation of a major upgrade (replacement). It is understood the upgrade is currently moving into detailed design phase and is intended to be implemented within the next two years.

**General Arrangement and Reference System**

The approach is comprised of pre-cast concrete hollow core panels supported on treated timber pilecaps and bearing piles. Treated timber cross bracing provides lateral capacity to the structure. An aluminum truss gangway extends from the seaward end of the approach and lands on a concrete float moored by timber mooring pile dolphins. There is a boat ramp along the north side of the facility which is comprised of pre-cast concrete panels bearing on grade.

The reference system is per the general arrangement sketches and sections prepared by Herold Engineering and appended to this report, along with photographs taken during the assessment.

**Site Activities**

The assessment was conducted from above water, with access provided by a work boat. The site visit was phased such that the above water portion of the structure was inspected during a daytime review, and low tides during the nighttime were utilized to inspect the previously submerged portions of the timber bearing piles and boat ramp during a second visit.

Herold Engineering mobilized to the site twice to conduct a facility assessment. The first inspection was undertaken during daylight hours on Thursday January 17<sup>th</sup>, 2019. Two representatives from Herold Engineering were present, and were escorted by Faron Hayes, trades supervisor for The City. The boat used to access the facility was provided by the City and captained by Faron.

The second site visit occurred during low tide (0.6m chart datum) at approximately 2130 on January 18, 2019. One representative from Herold Engineering was present, and the site was accessed by boat. The boat was provided and captained by John Dekker of Westcoast Diving Contractors Limited (WDC).

## Assessment Results

The condition of the facility has not changed significantly since the 2017 inspection. The following items were noted during the 2017 inspection as requiring repair/remediation as follows:

### Approach:

- At the seaward end of the chain-link fence there is a gap between the end of the fence and the gangway handrail. The gap width exceeds 102mm, and does not meet OH&S requirements for guards.
- The pre-cast hollow core panels have long longitudinal cracks which penetrate the section. There is evidence of water seepage through the cracks.
- The timber cross bracing is significantly decayed at the cut ends. This deterioration penetrates the lower connection in various locations.
- Bearing pile 4B has a large hole at the mudline with 80% cross sectional loss (CSL).

### Gangway:

- Moderate biological decay to the undersides of the timber decking.
- Moderate CSL due to abrasion at the UHMWPE strip on the seaward transition plate.
- The steel roller is missing pillow blocks.

### Landing Float:

- The four main mooring piles have moderate amounts of abrasion in the intertidal zone.
- The mooring cleat at the west edge of the float is broken and improperly mounted.
- The concrete panels have minor spalling and cracking in various locations.
- The timber blocking on the south mooring dolphin has 75% CSL due to biological decay.
- No safety ladder is located on the float.

### Boat Ramp:

- Significant undermining of the pre-cast panels, the damage is more severe on the north aspect where the cast wall has failed. There is significant evidence of sediment transport and erosion. The cast wall is not armoured at this time.

- Moderate cracking of the concrete panels due to settlement/undermining. There is visible reinforcing steel with evidence of corrosion.

At the time of the follow-up inspections (January 2019), the recommendations from the 2017 report did not appear to have been implemented.

In addition to the damages noted above, the following were noted during the follow-up assessment:

- The pre-cast concrete deck panel along the approach has moderate amounts of spalling at the gangway thru-bolt connection. Reinforcing steel is visible and appears corroded.
- Bearing pile 2A was identified as having 75-80% CSL at an abandoned lower bolt hole located within the intertidal zone.

## Recommendations

In anticipation of the planned upgrade, the following recommendations address immediate structural concerns at the facility, and have been selected to extend the service life of the facility an additional 1 to 3 years. Other items noted above remain in serviceable condition and do not require remediation at this time.

The longitudinal cracks penetrating the pre-cast hollow core panels are recommended to have crack monitoring assemblies installed along the underside of the panel. The crack size is recommended to be monitored at each routine facility inspection. The assembly is a simple system which Herold Engineering is pleased to install at the facility should the City require.

The spall on the underside of the pre-cast panel at the gangway connection is recommended to be patched.

Two timber bearing piles (2A and 4B) are recommended to be fitted with concrete grout bags, and high strength grout be injected into the bag to reinforce the compromised timber cross section. A generic detail has been appended to this report for reference.

Six timber cross braces are recommended to be replaced utilizing the existing bolt holes to connect the new brace elements. Due to long lead times for receiving treated timber, it is acceptable to replace the treated braces with an untreated alternative, understanding that the service life will be greatly reduced due to exposure. It is recommended that the braces be D.Fir No. 1, keeping with the material type typical at marine facilities of this nature. It is also recommended that the timber have an increase edge distance of at least 300mm beyond the bolted connections to accommodate the increased rate of deterioration.

The boat ramp is recommended to be cored and concrete pumped below the panels to restore bearing. The north side of the ramp is recommended to be armoured with filter cloth and appropriately sized riprap to mitigate erosion and sediment transport.

All recommended repairs have been identified by markup on the attached general arrangement sketches appended to this report.

Based on the overall complexity of the repairs, as well as the existing condition of the facility, it is recommended that the facility be monitored via periodic follow-up inspections until the upgrade begins. It is understood that the City would like these inspections to be undertaken by

Herold Engineering. We propose an interval of six months between follow-up inspections, unless the condition degrades.

Should the upgrade be delayed, the repairs are not intended to serve as long (3+ years) repairs, and are recommended to be re-assessed at the time by a professional structural engineer registered to practice in British Columbia.

## Conclusion

The facility did not appear to have sustained significant structural damage as a result of the storm event on December 21-22, 2018. Items noted during the 2017 and 2019 inspections which are required to be remediated/replaced to extend the life of the facility an additional 1 to 3 years are as follows:

- Monitoring of longitudinal cracks in pre-cast deck panels (on approach)
- Patching of spall at gangway thru-bolt (on approach)
- Repair of two timber bearing piles (2A & 4B)
- Replacement of six timber cross braces
- Core and pump concrete into the void below the boat ramp
- Armour the north edge of the ramp to mitigate erosion

A follow-up inspection interval of six to nine months is recommended to ensure no additional damage to the facility, as well as to monitor the specified repairs. It is understood that the City would like Herold Engineering to conduct these reviews.

Should the repairs noted above be in service for greater than three years, re-assessment by a professional structural engineer registered to practice in British Columbia is required to determine the feasibility of the repairs remaining for a longer term.

We trust this letter report meets your immediate needs. Please contact the undersigned should you have questions, comments, or require assistance with repair implementation.

Yours truly,

## HEROLD ENGINEERING LIMITED

Prepared by:

Reviewed by:



Shannon Summersides, EIT  
Design Engineer

Craig Work, P.Eng  
Project Engineer

Enclosure



Photograph 1: City Dockhead at Gallows Point, note: general arrangement



Photograph 2: Pre-cast hollow core deck panels, note: longitudinal crack penetrating the section, water seepage



Photograph 3: Pre-cast hollow core deck panels, note: spalling at thru-bolt location



Photograph 4: Timber cross bracing, note: significant deterioration of cut ends



Photograph 5: Bearing Pile 4B, note: large hole with 80-90% CSL

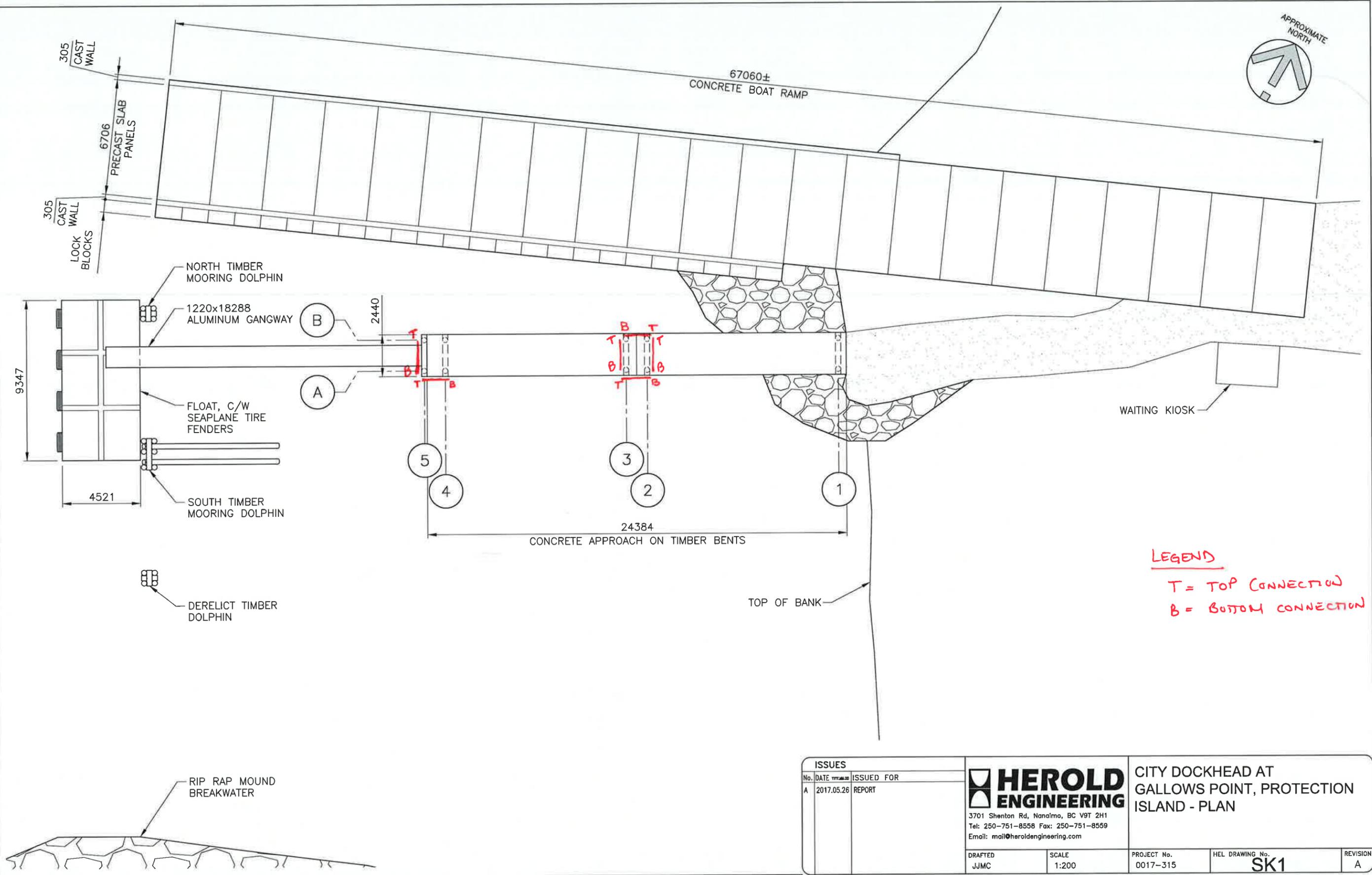


Photograph 6: Boat ramp, note: undermining of north side of ramp



Photograph 7: Boat Ramp, note: spalling of the concrete panels with exposed reinforcing

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**LEGEND**  
 T = TOP CONNECTION  
 B = BOTTOM CONNECTION

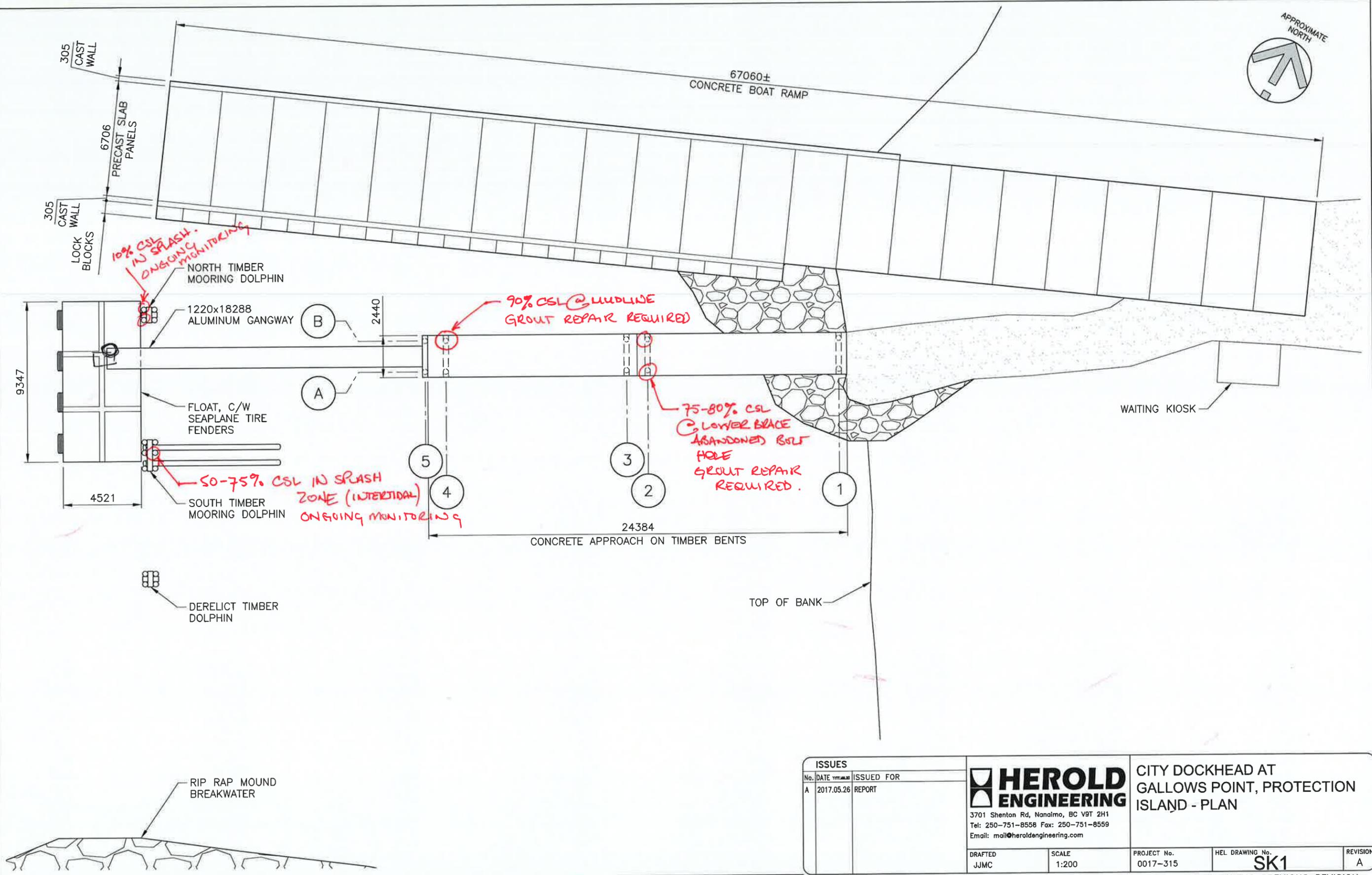
| ISSUES |            |            |
|--------|------------|------------|
| No.    | DATE       | ISSUED FOR |
| A      | 2017.05.26 | REPORT     |

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|--|----------------|--|-------------------------------|---------------|
|  |                | <b>CITY DOCKHEAD AT GALLOW'S POINT, PROTECTION ISLAND - PLAN</b> |                               |               |
| 3701 Shenton Rd, Nanaimo, BC V9T 2H1<br>Tel: 250-751-8558 Fax: 250-751-8559<br>Email: mail@heroldengineering.com |                | PROJECT No.<br>0017-315  | HEL DRAWING No.<br><b>SK1</b> | REVISION<br>A |
| DRAFTED<br>JJMC  | SCALE<br>1:200 | PROJECT No.<br>0017-315  | HEL DRAWING No.<br><b>SK1</b> | REVISION<br>A |

DESTROY ALL DRAWINGS SHOWING PREVIOUS REVISION

*BRACE REPLACEMENT  
0017-359.*

File: H:\Projects\0017-315 City Dockhead At Gallows Point - Condition Assessment\045 Drawings\Active\0017-315-SK1andSK2.dwg Plot Time: May, 17 2:24 PM User: Jonathan Cheffins  
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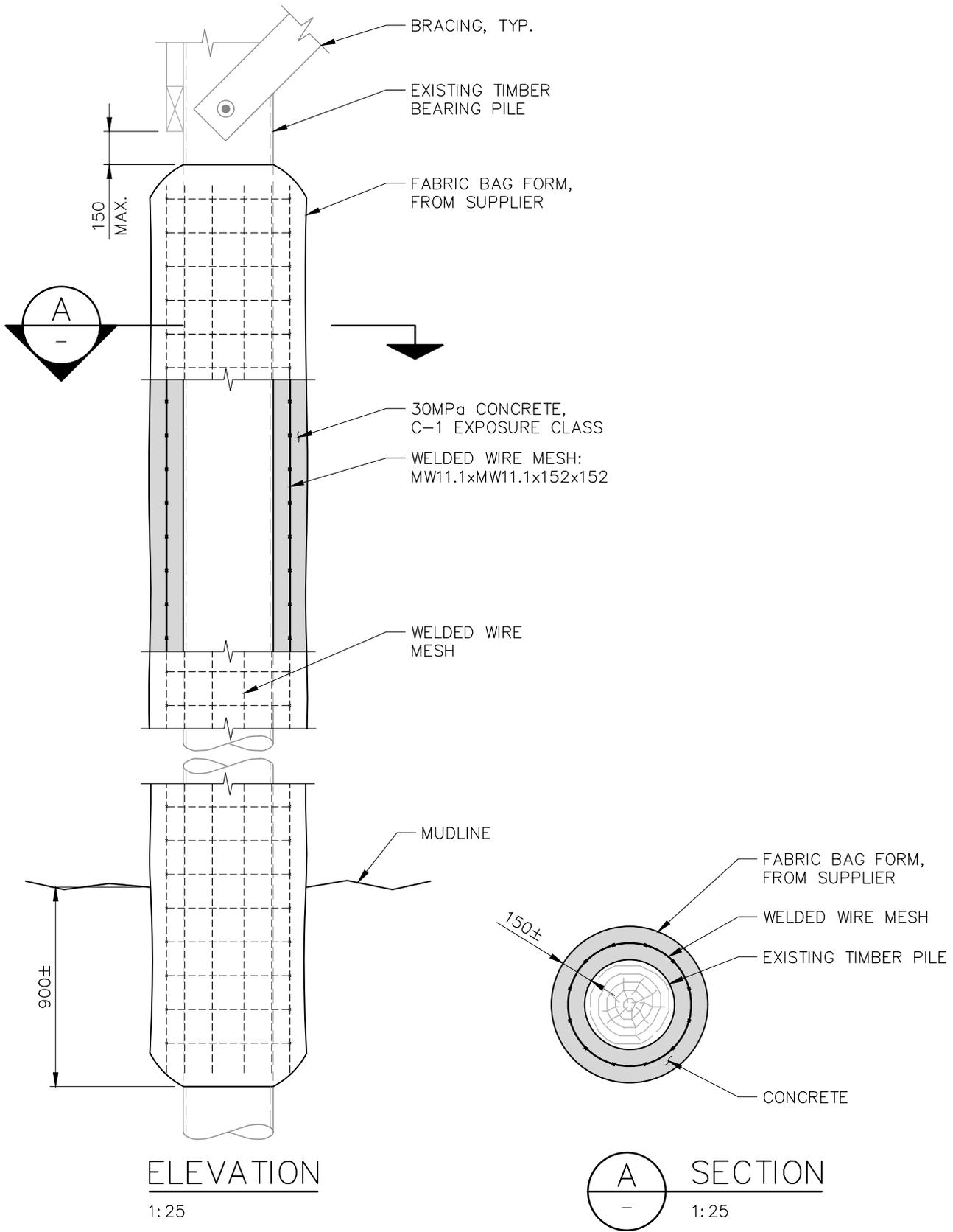
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 Tel: 250-751-8558 Fax: 250-751-8559  
 Email: mail@heroldengineering.com

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| REVISION<br>A   |                               |

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PILE REPAIRS/CONDITION



**ELEVATION**  
1: 25

**SECTION A-A**  
1: 25

**HEROLD ENGINEERING LIMITED**  
 Consulting Engineers  
 3701 Shenton Rd, Nanaimo, BC V9T 2H1  
 Tel: 250-751-8558 Fax: 250-751-8559  
 Email: mail@heroldengineering.com

|                                 |                 |                    |                      |                           |                    |
|---------------------------------|-----------------|--------------------|----------------------|---------------------------|--------------------|
| CITY DOCKHEAD AT GALLOWES POINT |                 |                    | PILE REPAIR          |                           |                    |
| FOLLOW-UP CONDITION ASSESSMENT  |                 |                    | BEARING PILE 2A & 4B |                           |                    |
| PROJECT No.<br>0017-359         | DESIGNED<br>SPS | DESIGN REVIEW<br>- | DRAFTED<br>JMC/GMW   | SCALE<br>AS SHOWN         | DATE<br>2019.01.25 |
|                                 |                 |                    |                      | DRAWING No.<br><b>SK1</b> | REV.<br>A          |