

SUMMARY REPORT FOR SOUTHERN GULF ISLAND HARBOUR COMMISSION (SGIHC) FACILITIES

Prepared for:

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SUMMARY REPORT FOR SGIHC FACILITIES

December 11, 2015

M&N Project No. 8985 VC15

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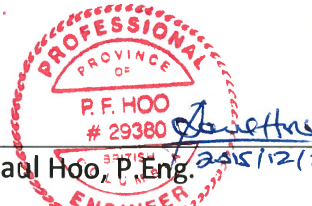
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1 INTRODUCTION

The Capital Regional District (CRD) requested an engineering review and condition assessment be completed by Moffatt & Nichol (M&N) for each of 11 dock facilities which are operated by the Southern Gulf Islands Harbour Commission (SGIHC). These subject facilities are small craft harbours located in the Southern Gulf Islands, and at Swartz Bay on Vancouver Island and are essential for residents of the Southern Gulf Islands, providing access for supplies, mail delivery, water taxis, and seaplanes, emergency services such as police or water ambulances, in addition to recreational use.

All of these public dock facilities were previously operated as Federal Department of Fisheries and Oceans facilities (DFO), nine of which have been divested to the CRD, and two of which are leased from the DFO but operated by the SGIHC and CRD.¹ The CRD has completed previous engineering studies of these facilities, and some improvements had been made on an annual basis, however our assessment was completed based on the current condition upon the date of inspection. CRD has also requested that we include information herein regarding legal reviews for water leases, Rights-of-Way, or other agreements, which is provided by CRD.

M&N provided above-water and underwater inspection and engineering services to review of the condition of these dock facilities. In doing so, we have also reviewed the intended and current use of the facilities, have established the current condition providing recommendations for potential capital improvements, estimated remaining service life and have developed a capital asset plan for future remedial work. The components that were reviewed and inspected included:

- Wharfs, decking, gangway and moorage components including connections
- Flotation
- Pile structure and cross supports
- Bulkheads
- Anchorage systems
- Attenuation components and breakwaters
- Ancillary equipment including fuel dispensing equipment and lifting devices

¹ M&N was also requested to inspect and assess the Fernwood dock, administered by the Salt Spring Island Harbour Commission (SSIHC), for which conclusions are included in the individual facility report.



- Decommissioned works including fuel
- Walkways and handrails

Individual reports have been developed for each facility, but to assist in the planning for costs overall for all 11 facilities, we are summarizing the conclusions of our inspection reports for CRD's and SGIHC's convenience. To keep costs of repairs and improvements down, we have not included improvement to the facilities level of service, such as increasing the deck loading, and lighting or expansions, such as adding new floats. The capital costs of the suggested repairs have been estimated and recommendations made as to the order of priority for capital expenditure over the next 5 years. Budget placeholder values for years 6 to 10 are included since repairs will be required in these years but it is difficult to estimate required repairs in those years. These placeholder values are estimated based on a ratio of approximate facility replacement cost and current required repairs.

The facilities that were inspected include the following SGIHC docks:

1. Galiano Island
 - a. Retreat Cove
 - b. Montague Harbour
 - c. Sturdies Bay
2. Mayne Island
 - a. Miners Bay (vehicle access for trestle but not wharf head)
 - b. Horton Bay
3. Saturna Island
 - a. Lyall Harbour
4. Pender Island
 - a. Port Washington (vehicle access for trestle but not wharf head)
 - b. Hope Bay (previously drive-on, currently no drive-on permitted)
 - c. Port Browning
5. Piers Island
6. Swartz Bay

General layouts for each facility can be found in Appendix B.



2 EXISTING FACILITY USES, SUMMARY OF UPDATES, LEGAL ISSUES

2.1 SUMMARY OF FACILITY VESSEL USES

While many of these former DFO facilities have been utilized by the fishing industry in the past, fisheries related use has declined, and now the facilities mainly serve the local residents and transient visitors. Having been in place for many years, in one case over 100 years (Miners Bay), the facilities provide essential services for local residents, namely school transportation for School District 64, water taxi, seaplanes, mail, and use by service providers such as RCMP, Water Ambulance Services, Royal Canadian Marine Search and Rescue (SAR), BC Hydro, Telus, deliveries, etc. The facilities also provide refuge in case of inclement weather or vessel malfunctions, which may be life-saving for the boating public. Water taxis and seaplanes support island businesses and provision of access to service providers such as BC Hydro and Telus permit better maintenance of island infrastructure. Access by water ambulance results in less tax payer costs, since air evacuation can be avoided, and access to policing is important for island residents. We have summarized the current uses of the facilities on the next page, for each dock facility in Table 1.

Table 1: Summary of Current Vessel Uses at SGIHC Facilities

Island	Facility	Ambulance	RCMP	School Boat	Water Taxi	Seaplane	Services (hydro, Telus, Mail, Goods)	Local Boat Mooring
Galiano	Retreat Cove		X		X			X
	Montague Harbour	X	X			X		X
	Sturdies Bay	X	X	X	X		X	X
Mayne	Miners Bay	X	X	X	X	X	X	X
	Horton Bay (DFO)		X					X

Saturna	Lyall Harbour (DFO)	X	X	X	X	X	X	X
Pender	Port Washington	X	X	X	X	X	X	X
	Hope Bay		X				SAR drills	X
	Port Browning		X				SAR drills	X
Piers Island	Piers Island	X	X		X		X	X
Vancouver Island	Swartz Bay	X			X			X

2.2 SUMMARY OF AGE OF FACILITIES & COMPARISON OF ORIGINAL INTENT, CURRENT USE

As requested by CRD, we have provided details as to the facility original use, current use, as well as the issues brought up in meetings with the Wharfingers in Table 2. Some common items that were brought up, besides maintenance issues, are the lack of lighting, security, fire protection, and environmental protection. We are also including comments that were in the previous SGIHC Minutes of Meeting.

A particularly sensitive issue with some residents surrounds the provision of drive-on capability at facilities that used to provide that capability, but currently have been blocked off to vehicle use. During the inspection, we have found that some facilities have had repairs done that compromise the capability of vehicle use, such as the use of planking rather than structural wood members for decking. In addition, we are in agreement with the conclusion in a previous report by Hugh Tuttle that the use of vehicles, even where the capability still exists, will create more wear of surfaces, and reduce the facility lifetime. In addition, it increases the insurance premiums for the facilities and increases hazards to pedestrians. Given the importance of maintaining the operations of the facilities, and the vehicle cause of the large fire on the Lyall Harbour facility in 2003, the provision of vehicle capacity comes with some definite negative effects.



The residual life estimates were provided in the individual condition assessment reports for each facility. These are rough estimated values based on the recommendations outlined in “Procedures for Inspection and Assessment of Fixed Timber Docks” and subjective judgment of the current deterioration and observed damages in the structural elements and in no way provides a guarantee on actual life span. It is important to note that components could last shorter or longer depending on the surrounding environment and level of use. Rot and marine bores can spread very quickly greatly reducing the estimated values.

Through ongoing inspections and repairs of individual elements, the remaining usable life of the facility could be extended beyond the structural design life as evident in many of the inspected facilities. In addition, future business case analysis, change in environmental conditions such as more frequent storm events could also change the remaining usable life of a structure. Therefore, it is difficult to predict the remaining usable life of the overall facility. At some point in the future the individual facilities will require replacement once repair cost of the facility exceeds an unreasonable amount and replacement is deemed more prudent.

Assuming that the facilities will be routinely inspected and scheduled maintenance repairs done, review of the residual life estimates can be updated resulting in the service life of the structures extended beyond their design life as seen in many of the facilities. However at some point in time, depending on the rate of deterioration, it may make economic sense to do full replacement and planning should take this aspect into consideration.

The original uses, current uses, comments from SGIHC meetings and wharfinger comments are included in the Table 3 on the next page.



Table 2: Comparison of Original Intended Uses and Current Uses and Operating Issues

Island	Facility	Estimated Replacement Cost*	Original Construction	Previous Repairs/ Replacements	Previous Inspections	Coastal Considerations	Intended Uses	Current Uses	Operating Issues
									Legend: A/W – Above Water Inspection U/W – Under Water Inspection Env – Environmental Assessment O/M – Operations and Maintenance C – Capital Item D – Discretionary Items
Galiano Island	Retreat Cove	\$194,000	1946 (original) 1959 (reconstruction)	1970 2003	2002 U/W 2003 A/W 2012	-Well protected	-Pedestrian access only	-Pedestrian access only -Potential escape route to Ganges	-Difficult to see entrance (reflective sign) (O/M) -1 Safety ladder on dock/not in water (O/M) -1 Life ring present, check condition for UV exposure (O/M) -1 Fire extinguisher present, check for recharging (O/M) -No lighting or electrical (D) -Issues with Kayakers with height of dock (D) -No property for kayaker camp (D)
	Montague Harbour	\$254,000	1962	1972 ext 2007	1996 Env 1998 U/W 2006 U/W	-Well protected, large bay	-Pedestrian access only -was next to BC Ferry dock (removed)	-Pedestrian access only	-possible extension and expansion of water lot discussed (D) -1 safety ladder only – want to have 2 (O/M) -1 Life ring present, check condition for UV exposure (O/M) -1 Fire extinguisher present, check for recharging (O/M) -1 light fixture on abutment, 1 each on 2 floats wired with Teck cable, check if light is operable (O/M)
	Sturdies Bay	\$615,000	1932 (original) 1963 (BC Ferries trestle) 1974 (reconstruction)	1990 (float) 2003 (wharf head)	1996 A/W 1996 Env 1998 U/W 2003 A/W 2004 Env	-Partially protected by panel breakwater, some ferry wake, strong currents -CRD website warns of wakes making moorage uncomfortable, and waves from high winds -Suffered storm damage in 2004	-BC Ferry trestle - Vehicle access off ferry trestle onto abutment -3 tonne crane	-Replacement wharf head designed for pedestrian access only, permanent barrier -crane removed when wharf head replaced (or before)	-Moving uses to Montague was discussed (C) -Ramp very steep and metal grid slippery when wet (O/M) -No safety ladder (O/M) -1 Life ring present, check condition for UV exposure deterioration (O/M) -1 Fire extinguisher present, check for recharging (O/M)
Mayne Island	Miners Bay	\$1,556,000	1878 (original) 1885 (reconstruction) 1954 (trans to PWC)	1984 (floats) 1987 (repairs) 1991 fire 1993/4 (repairs) 2002 (float A) 2005 (major repairs) 2009 (bracing and decking)	1996 A/W 1996 Env 1998 U/W 2001 A/W 2003 A/W 2009 A/W	-Partial poor protection only from wharf head, exposed to ferry and other wakes, strong currents -CRD website warns of wakes making moorage uncomfortable, excessive rolling of floats, and waves from high winds	-BC Ferry trestle -Vehicle access on trestle to wharf head was 10,000 lbs GVW -Fuel dock	-Pedestrian access only but can remove bollard for emergency use, however GVW rating may be less due to varying deck board thicknesses -Fuel dock decommissioned after risk review in 2007 due to issues with fuel barge loads on structure (estimated)	-Moving uses to new facility at Village Bay has been discussed (C) -Addition of a breakwater has been discussed(C) -2 safety ladders, however, fouled with sea life (O/M) -2 life rings present, check condition for UV exposure (O/M) -1 fire extinguisher present, check for recharging (O/M) -Add security camera (C) -Herring spawning geotextile fabric added, check condition (O/M) -Erosion issues (O/M) -Concern with fuel lines, however, they are drained according to CRD (O/M)

*Previously estimated replacement cost by others 2009/2010 escalated to 2015



Island	Facility	Estimated Replacement Cost*	Original Construction	Previous Repairs/ Replacements	Previous Inspections	Coastal Considerations	Intended Uses	Current Uses	Operating Issues
									Legend: A/W – Above Water Inspection U/W – Under Water Inspection Env – Environmental Assessment O/M – Operations and Maintenance C – Capital Item D – Discretionary Items
	Horton Bay	DFO info unknown	DFO info unknown	DFO info unknown	DFO info unknown	-Well protected	-Pedestrian access only	-Pedestrian access only -Dock size reduced by 50%	-Easement for roadway to approach, and roadway very narrow at 12 feet -No legal parking nearby -Move to new site at Anson Road or expansion discussed -No safety ladder (O/M) -1 life rings present, check condition for UV exposure (O/M) -2 fire extinguishers present, check for recharging (O/M)
Saturna Island	Lyall Harbour	DFO Info unknown	DFO info unknown	-2003 Fire occurred from vehicle -Other DFO info unknown	DFO info unknown	-subject to Ferry and other wakes	-Vehicle access on trestle -fuel dock	--Vehicle access on wharf head, 16,000 kg/9,000 kg (new signage) -Fuel dock is operational	-limited parking in area, and not permitted on wharf head (O/M) -1 safety ladder on wharf head, fouled a bit with sea life (O/M) -1 life rings present, check condition for UV exposure (O/M) -1 fire extinguisher present on wharf head (fuel shack locked and non-outside) , check for recharging (O/M) -1 spill kit present on wharf head (fuel shack locked and none outside) check condition of equipment(O/M) -Security? (O/M) -Issues with Kayakers with height of dock (D) -Wiring to gas dock with Teck cable with Kellems grips for strain relief. Check condition(O/M)
Pender Island	Port Washington	\$811,000	Unknown	1988 (floats) 2005 2013 (repairs)	2003 A/W 2012 A/W	-Somewhat protected, some ferry wake	-Vehicle access on trestle	-vehicles can drive on approach 10,000 lb GVW (on sign) -Pedestrian access only on wharf head permanently blocked to vehicles.	-Need for more parking (C) - 1 safety ladder on wharf head (O/M) - 2 life rings present (1 each float) , check condition for UV exposure (O/M) - 1 fire extinguisher present, check for recharging (O/M) -Asked for a berth at the wharf head(C) -1 light fixture on the approach, 1 on wharf head, 1 fixture on brace for piling for each gangway, and 1 fixture on each of 2 floats -Comment from MOM - issues with unsafe wiring. -Hole cut in panel for viewing of meter face on incoming panel to avoid tampering. Should be bushings for cabling. (O/M) -ground issue (O/M)

*Previously estimated replacement cost by others 2009/2010 escalated to 2015



Island	Facility	Estimated Replacement Cost*	Original Construction	Previous Repairs/ Replacements	Previous Inspections	Coastal Considerations	Intended Uses	Current Uses	Operating Issues
									Legend: A/W – Above Water Inspection U/W – Under Water Inspection Env – Environmental Assessment O/M – Operations and Maintenance C – Capital Item D – Discretionary Items
Pender Island	Hope Bay	\$523,000	1930 (original)	1997 (fire & demolish buildings) 2002/3 (repairs) 2009 (repairs) 2011 (painted)	2007 A/W	-Very exposed, and has suffered damage in winter storms	-Vehicle access on trestle -5 tonne crane	--Pedestrian access only but can remove bollard for emergency use, with 6900 kg GVW rating -crane currently not operational and requires permit to operate	-expansion has been discussed for another float (C) -float separation (too long) (O/M) -would like security camera (C) - 1 safety ladder on wharf head, check condition(O/M) - 1 life ring present?, if missing provide, otherwise check condition for UV exposure (O/M) - 1 fire extinguisher present, check for recharging (O/M) -Crane bearing binding (O/M) -Would like to have drive on access (D) -fire protection installed under dock, but wiring not according to code (O/M) -Two lights on pole on wharf head (O/M)
	Port Browning	\$290,000	unknown	2011 (repairs)		-Very exposed, and has suffered damage in winter storms	-Pedestrian access only - 3 tonne crane	-Pedestrian access only	-Easement for very narrow roadway to approach(C) -Parking lot usually full, need more capacity - 1 safety ladder on float (O/M) - 1 life ring present top of gangway, check condition for UV exposure (O/M) - 1 fire extinguisher present, check for recharging (O/M) -Issues with otters (Env) -no Hydro power available (D) -1 light fixture on the approach and 1 on wharf head (motion activated solar lights) check for function(O/M)
Piers Island	Piers Island	\$226,000	1950	1956 (floats replaced) 1960 (repairs) 1984 (floats) 1990 (piles replaced) 2002 (repairs) 2009 (painted) 2014 (repairs)	1991 A/W 1996 Env 1996 A/W 1998 U/W 2001 U/W	-Exposed to Ferry wake	-Pedestrian access only	-Pedestrian access only	-discussion regarding expanded facility needed (C) -reconfigure dock arrangement? (C) -steep ramp (C) - 1 safety ladder present (O/M) - 1 life ring present on float, check condition for UV exposure (O/M) - 1 fire extinguisher present, check for recharging (O/M) -No lighting, (D)
Vancouver Island	Swartz Bay	\$289,000	1950	1956 (floats replaced) 1984 (floats) 2002 (repairs) 2014 (repairs)	1991 A/W 1996 Env 1998 U/W 2004 A/W	-Exposed to Ferry wake	-Pedestrian access only	-Pedestrian access only	- 1 safety ladder present on end of float (O/M) - 1 life rings present, check condition for UV exposure (O/M) - 1 fire extinguisher present, check for recharging (O/M) - Looked at replacing lighting with LED (O/M) - Five light fixtures on trestle check for function(O/M) - Hole cut in panel for viewing of meter face on incoming panel to avoid tampering. Should be bushings for cabling. (O/M)

*Previously estimated replacement cost by others 2009/2010 escalated to 2015



2.3 OPERATIONAL, STRUCTURAL AND MAINTENANCE ISSUES

Comments regarding operational issues from wharfingers, recommendations for structural condition of the facilities assessed during the inspection, and maintenance are mentioned in the reports for each of the 11 SGIHC facilities. During the inspections, the presence of safety equipment such as fire extinguishers, life rings, and safety ladders was noted, due to the potential for liability for the CRD. Note that statements apply at the time of the inspection, and the presence and suitability for use of the safety equipment should be verified on a periodic basis by the wharfingers.

Structural conditions varied, with a need for rehabilitative capital investment for several of the facilities. For suggested remaining lifetime, and specific required repairs for each facility, please refer to the individual facility Inspection Reports. A summary of the costs optimized for the next five years is included in Section 3 of this Summary Report. Capacity for vehicle use on the facilities causes increased wear, increases insurance premiums, and hazards to pedestrians. As such, allowing pedestrian access only will extend the lifetime of the facilities.

Marine borer damage was discovered during the inspections of timber piles, and because it is difficult to assess the damage within the pile, the damage from marine borers can escalate rapidly. Performance of a regular inspection program can extend the life of the facilities by verifying repairs needed and effectiveness of cathodic protection. As a result, we recommend that periodic inspections be performed on a regular timetable. Since costs are reduced by combining inspections for several facilities, we recommend a schedule of topsides inspections every 3 years, and an underwater inspection every 6 years.

The metocean condition summary memorandum for the facilities, herein Appendix A, provides a general discussion on water levels, sea level rise, wind speed, wind waves, and vessel generated waves. The water levels in the region range from +4.5m (Higher High Water Large Tide) Chart Datum (CD) to 0.0m (Lower Low Water Large Tide) CD. Sea level rise, relative to current levels, is estimated at +0.44m by 2050 and +0.88m by 2100². The wind speed is estimated for the region using information provided at Victoria Harbour. Maximum wind speeds is from the Southwest and is found to be 40 knots for 5 year return period, 56 knots for 50 year return period, and 61 knots for 100 year return period. The conservative estimate of maximum wave heights from wind is in the range of 0.4m to 2.4m. Vessel wakes for the facilities next to the ferry routes is approximately 0.3m to 0.6m.

² BC Ministry of Environment 2011, Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use Draft Policy Discussion Paper. January 27, 2011



3 SUMMARY OF FACILITY CAPITAL REPAIRS OVER NEXT 5 YEARS

The multi-year capital expenditure plan is designed to assist CRD with approximate budgeting repair and maintenance costs over the next years. The costs herein are from the cost estimates provided in the individual facilities reports. The costs shown are based on a combination of current material and labour prices obtained from various material suppliers and contractors as well as parametric unit rates from historical data and updated to reflect the location of site and current date.

In addition to the general limitations discussed in the individual reports, the multi-year capital expenditure plan has the following assumptions:

- All future cost assume an inflation rate of 2% per year;
- All costs are given as Canadian Dollars;
- Due to lack of maintenance and the limitations of a visual inspection of the facility, further deterioration may be present in components and may increase repair or replacement costs; and,
- Construction contingency of 25% is included in final costs.

The current cost estimates reported in the individual inspection reports resulted in several costs being moved forward to the next three years, which would be difficult for CRD and the SGIHC budgeting process.

As a result, the suggested capital spending for repairs has been optimized by reducing the number of site visits required by a contractor. Repairing all critical items on the different facilities within the next year will allow for a more comprehensive funding plan where all repair work can be scheduled for a several facilities per year reducing the requirement for multiple mobilizations and demobilizations to the same facility. This optimized multi-year funding plan is in Table 3 on the following page. Details of the yearly repairs for each facility are reported in Appendix C.

It should be noted that the cost estimates are an opinion of cost made by M&N. In providing the cost estimate, it is recognized that neither CRD nor M&N has control over the costs of labor, equipment, materials, or contractors' methods of determining prices or bidding. This cost estimate is based on the consultant's reasonable professional judgment and experience and does not constitute a warranty, express or implied, that contractors' bids or negotiated prices of the work will not vary from CRD budget or from any costs prepared by M&N.

The costs shown in this report are based on a combination of current material and labour prices obtained from various material suppliers and contractors as well as parametric unit rates from historical data and updated to reflect the location of site and current date.



4 BUDGET FOR YEARS 6 THROUGH 10

Detailed repairs have not been identified for Years 6 through 10, however, it can be expected that continued spending will be required to maintain the current levels of service through ongoing capital projects or potential facility replacement. The condition of marine facilities 6 to 10 Years from now is difficult to quantify and requires ongoing maintenance to ensure as usable facility. The budget placeholder numbers are representative of possible cost to repair in the future. These placeholder values are estimated based on a ratio of approximate facility replacement cost and current required repairs.

5 MULTI-YEAR FUNDING PLAN

Under the Southern Gulf Islands Harbours Service (SGIHS), there are 11 dock facilities on 6 islands. Nine of the facilities are owned by the Capital Regional District (CRD) and 2 facilities (Horton Bay and Lyall Harbour) remain under Department of Fisheries and Oceans Canada (DFO) ownership, but operated by the CRD under a Management Agreement. We have developed two multiyear funding plans; one for the CRD owned facilities and one for the DFO owned facilities.

It has been assumed that the identified repairs on the nine CRD owned facilities, will be the responsibility of the SGIHS, and repairs on the Horton Bay and Lyall Harbour docks will be the responsibility of DFO. We understand that CRD staff are currently in communication with DFO to confirm responsibilities for maintenance and repairs of the Lyall Harbour and Horton Bay docks. Initial discussions have confirmed the 'major' repair works will be the responsibility of DFO while ongoing 'minor' repair and maintenance efforts fall under SGIHS responsibility. Assessment reports for Lyall Harbour and Horton Bay have been provided to DFO and they will be providing a response confirming the scope of the repair work and associated schedule. All DFO works will be coordinated with the CRD and the Commission prior to implementation.

The multi-year funding plan incorporates all the facilities into a manageable plan for repairing each facility in a timely manner. The funding plan address critical repairs required for the facilities within the first year, this allows the less critical repairs to be spread out over the next five years. The subsequent years are organized with the more pertinent repairs required to extend the service life of the facility occurring in Year 2 and progressing through to Year 5.

Table 3 summarizes the multi-year funding plan for the CRD owned facilities and Table 4 summarizes the multi-year funding plan for DFO owned facilities.



Table 3: Multi-Year Funding Plan – CRD Owned Facilities

Facilities	Capital Repairs or Improvements							
	Urgent Electrical Repairs	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 to 10	Total
Retreat Cove	\$0	\$23,900	\$0	\$0	\$0	\$179,400	\$43,500	\$246,800
Montague Harbour	\$7,700	\$27,500	\$0	\$188,400	\$0	\$0	\$70,000	\$293,600
Sturdies Bay	\$5,400	\$35,700	\$0	\$0	\$0	\$94,600	\$138,250	\$273,950
Miners Bay	\$6,900	\$47,900	\$0	\$0	\$0	\$255,800	\$350,000	\$660,600
Port Washington	\$6,900	\$0	\$0	\$0	\$214,700	\$0	\$182,500	\$404,100
Hope Bay	\$0	\$61,200	\$0	\$0	\$0	\$0	\$117,500	\$178,700
Port Browning	\$0	\$52,100	\$0	\$0	\$76,700	\$0	\$65,250	\$194,050
Piers Island	\$0	\$15,600	\$155,000	\$0	\$0	\$0	\$50,750	\$221,350
Swartz Bay	\$9,300	\$50,600	\$0	\$0	\$0	\$0	\$65,000	\$124,900
Sub-Total	\$36,200	\$314,500	\$155,000	\$188,400	\$291,400	\$529,800	\$1,082,750	\$2,598,050
Eng/Mngmt	\$18,100	\$157,250	\$77,500	\$94,200	\$145,700	\$264,900	\$541,375	\$1,299,025
Inspections	\$0	\$0	\$0	\$81,818	\$0	\$0	\$122,727	\$204,545
Total	\$54,300	\$471,750	\$232,500	\$364,418	\$437,100	\$794,700	\$1,746,852	\$4,101,620

Table 4: Multi-Year Funding Plan – DFO Owned Facilities

Facilities	Capital Repairs or Improvements							
	Urgent Electrical Repairs	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 to 10	Total
Horton Bay	\$6,100	\$0	\$0	\$82,700	\$0	\$31,400	\$50,000	\$170,200
Lyll Harbour	\$0	\$131,000	\$74,900	\$0	\$0	\$0	\$125,000	\$330,900
Sub-Total	\$6,100	\$131,000	\$74,900	\$82,700	\$0	\$31,400	\$175,000	\$501,100
Eng/Mngmt	\$3,050	\$65,500	\$37,450	\$41,350	\$0	\$15,700	\$87,500	\$250,550
Inspections	\$0	\$0	\$0	\$18,182	\$0	\$0	\$27,273	\$45,455
Total	\$9,150	\$196,500	\$112,350	\$142,232	\$0	\$47,100	\$289,773	\$797,105



APPENDIX A:

COASTAL OVERVIEW MEMORANDUM



MEMORANDUM

To: Ian Sander, P.Eng. Capital Regional District

From: Christopher Devick, PE, Moffatt & Nichol

Date: 06 November 2015

Subject: Capital Regional District Dock Inspection & Assessment -
Metocean Conditions Summary

M&N Job No.: 8985- Revision 1

Introduction

This memorandum provides a general discussion of metocean conditions (water levels, sea level rise, wind speeds, wind waves and vessel generated waves) for the Southern Gulf Islands Harbour Commission Facilities located in the Southern Gulf Islands, and at Swartz Bay on Vancouver Island. This memorandum is to be used as a basis for future preliminary design of repairs, upgrades, and site evaluations for the facilities. This analysis is conservative and further refinement of the metocean conditions for specific site locations would be required for detailed design.

A map showing the locations evaluated is presented in Figure 1. Provided below is a general discussion of water levels, sea level rise, winds and wind waves for all 11 locations as well as a concept level analysis of vessel generated waves for Sturdies Bay, Miners Bay, Lyall Harbour, Hope Bay, Port Washington, Swartz Bay and Piers Island Harbour. The analysis has been conducted based on the best available information at the time and is not intended for design at individual facilities. Refined analysis for site specific conditions is recommended if design conditions at a given facility are needed.

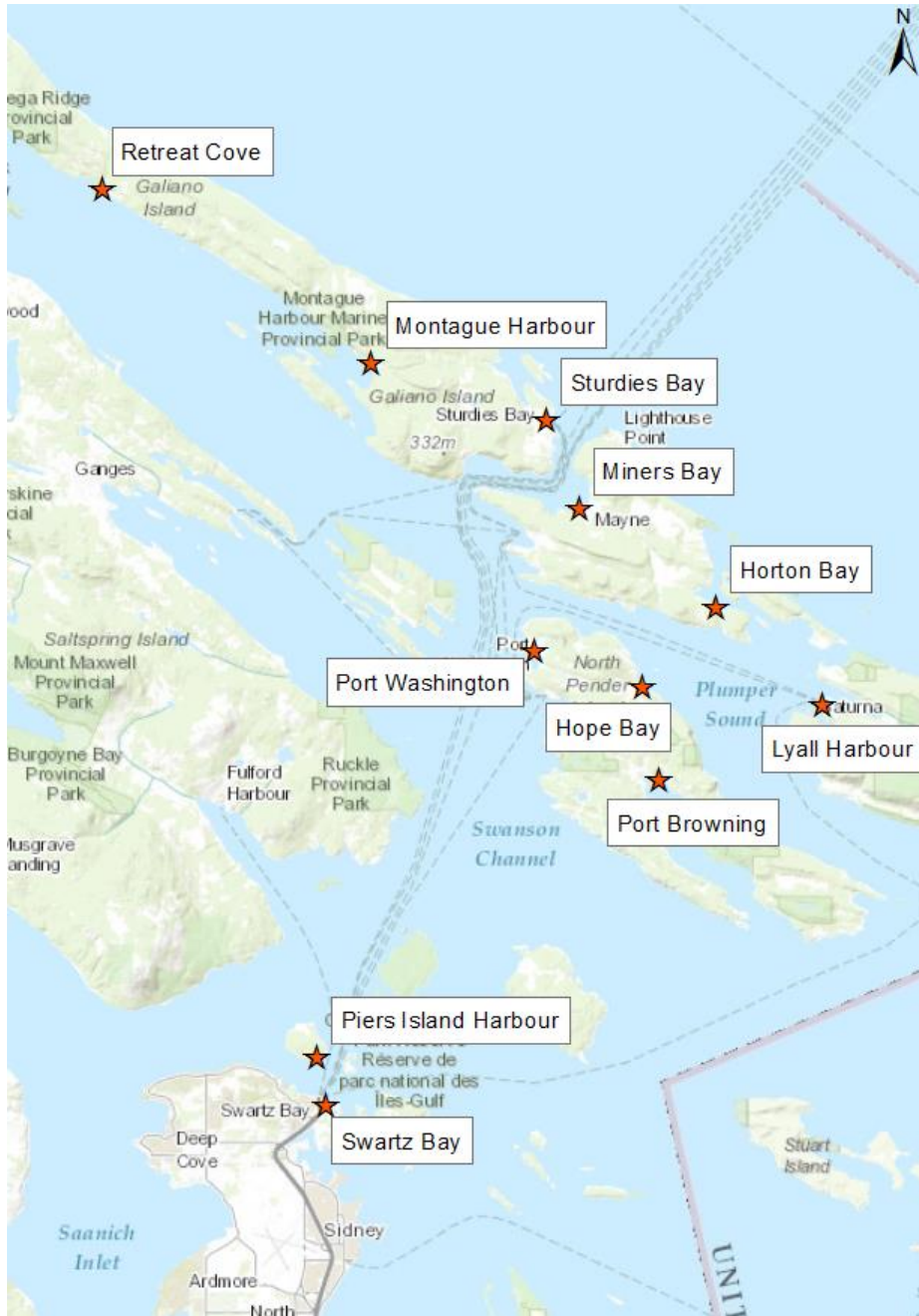


Figure 1: Site Locations Map

Tide Elevations

Tidal elevations vary within in the Southern Gulf Islands. A summary of various tidal elevations taken from Canadian Hydrographic services charts are presented in Table 1. Patricia Bay is located on the northwest coast of Saanich Island, Georgina Point is located on the northeast side of Mayne Island at the entrance to Active Pass and Montague Harbour is located in Montague Harbour, Galiano Island.

Table 1: Tidal Elevations at Various Locations within Southern Gulf Islands

Tidal plane	Water Level (m, Chart Datum)		
	Patricia Bay	Georgina Point	Montague Harbour
Higher High Water Large Tide (HHWLT)	3.8	4.5	4.1
Higher High Water Mean Tide (HHWMT)	3.2	3.8	3.4
Mean Water Level (MWL)	2.3	2.7	2.5
Lower Low Water Mean Tide (LLWMT)	0.7	1.0	0.9
Lower Low Water Large Tide (LLWLT)	-0.2	0.0	0.1

Sea Level Rise

Guidance for selecting sea level rise projections for British Columbia have been provided by the BC Ministry of Environment¹. They recommend for the short to medium term-life of 25 to 50 years a global sea level rise of 0.5 m and for longer term-life of up to year 2100 a global sea level rise of 1.0 m. These global rates are then adjusted for subsidence or uplift in the region. The longest term gauge of uplift in the area is located at Victoria which indicates a rate of 1.2 mm/year. The estimates of relative sea level rise in the Southern Gulf Islands are provided in Table 2 for the years 2050 and 2100.

Table 2: Sea Level Rise Values Relative to the Year 2000

Year	Global Sea Level Rise (m)	Regional Uplift (m)	Relative Sea Level Rise (m)
2050	0.5	0.06	0.44
2100	1.0	0.12	0.88

Wind Speeds

Hourly wind speed observations for Victoria Harbour were collected from Environment Canada for the time period of 1994 -2004. Extremal wind speeds for each direction were developed using a generalized extreme value distribution of annual maximum wind speeds from the 11 year record. Wind speeds for the 2 to 100 year return periods based on a Gumbel distribution are provided in Table 3.

¹ BC Ministry of Environment 2011. Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use Draft Policy Discussion Paper. January 27, 2011.



Table 3: Return Period Winds Speeds, Victoria Harbour

Return Period (year)	Wind Speed (knots)							
	North	Northeast	East	Southeast	South	Southwest	West	Northwest
2	19.5	21.6	22.6	27.3	21.9	32.9	30.9	16.9
5	25.8	28.5	27.4	31.0	28.6	40.5	34.3	20.0
10	29.9	33.1	30.5	33.4	33.0	45.4	36.6	22.1
25	35.1	39.0	34.5	36.5	38.5	51.7	39.4	24.7
50	39.0	43.3	37.4	38.8	42.7	56.4	41.5	26.7
100	42.9	47.6	40.3	41.0	46.7	61.0	43.6	28.6

Wind Wave Analysis

Based on the wind speeds presented in Table 3 return period wind wave conditions were approximated using the Coastal Engineering Design and Analysis System - Automated Coastal Engineering System (CEDAS-ACES) Wind Speed Adjustment and Wave Growth module. CEDAS-ACES estimates wind waves based on fetch length, or the water area over which the wind blows, wind speed, duration of observed wind speed, the air and sea temperature difference and latitude of observation. Wind Waves were estimated for the 50-year return period wind speeds from the direction of exposer for each site. The results of the wind wave analysis for all sites are provided in Table 4.

Table 4: 50-year Wind Wave Conditions

Location	Wave height (m)	Wave Period (sec)
Retreat Cove	0.6	2.6
Montague Harbour	0.4	1.9
Sturdies Bay	1.9	5.6
Miners Bay	2.4	6.4
Horton Bay	0.4	2.1
Lyll Harbour	1.4	4.3
Hope Bay	1.6	4.7
Port Browning	1.5	4.6
Port Washington	1.4	3.8
Piers Island Harbour	0.4	2.2
Swartz Bay	0.9	3.3

These wave heights represent offshore wave conditions and do not take into consideration wave transformation affects such as wave diffraction and refraction. Wave transformation affects, such as those through Active Pass, will have a significant effect on the wave conditions and should be taken into consideration if the metocean conditions for design are needed. At this time, these heights are considered conservative estimates appropriate for the level of analysis being performed.

Vessel Wake

Vessel generated wake is assumed to be caused by BC Ferry vessels transiting through the Southern Gulf Islands. Vessel wake has the potential to impact Sturdies Bay, Miners Bay, Lyall Harbour, Port Washington, Hope Bay, Piers Island Harbour and Swartz Bay and has been noted to be problematic at the Swartz Bay, Piers Island, Port Washington, Lyall Harbour, Miners Bay and Sturdies Bay sites. To assess the potential vessel generated wave conditions at each of these sites, various combination of sailing distance, vessel speed, water depths and a 3000 dead weight ton ferry were used. Vessel generated wave conditions were calculated based on Weggel and Sorensen 1986².

Water depths vary from shallower nearshore areas in the vicinity of Sturdies Bay, Lyall Harbour, Piers Island and Swartz Bay to deeper depths for vessels transiting past Port Washington, Hope Bay, Sturdies Bay and Miners Bay. Vessel speeds and distances also vary depending on location. Lower speeds and closer distances are anticipated for vessels approaching the ferry landings near Sturdies Bay, Lyall Harbour and Swartz Bay. Vessels transiting past Port Washington, Hope Bay, Piers Island, Miners Bay and Sturdies Bay are assumed to be travel at higher speeds and greater distances offshore. Table 5 provides the assumed depths, vessel speeds and distances along with the resulting calculated vessel generated wave conditions at each site.

Table 5: Vessel Generated Wave Conditions

Location	Water depth (m)	Vessel speed (knots)	Distance from sailing line (m)	Wave Height (m)	Wave Period (sec)
Sturdies Bay, Swartz Bay, Lyall Harbour	7-10	5-10	<100	0.5	2.7
Miners Bay, Sturdies Bay	40	20	1000	0.5	5.1
Piers Island	10-20	15	400	0.6	4.0
Port Washington	100	19	1000	0.3	5.1
Hope Bay	60	15	1500	0.15	4.1

² Weggel, J. Richard and Robert M. Sorensen. 1986. Ship Wave Prediction for Port and Channel Design. Ports 1986.



Conclusions

A desktop preliminary analysis of the metocean conditions was undertaken for the SGIHC facilities, and the overview has identified facilities at Sturdies Bay, Miners Bay, Hope Bay, Lyall Harbour and Port Browning can be affected by significantly wind-wave and currents.

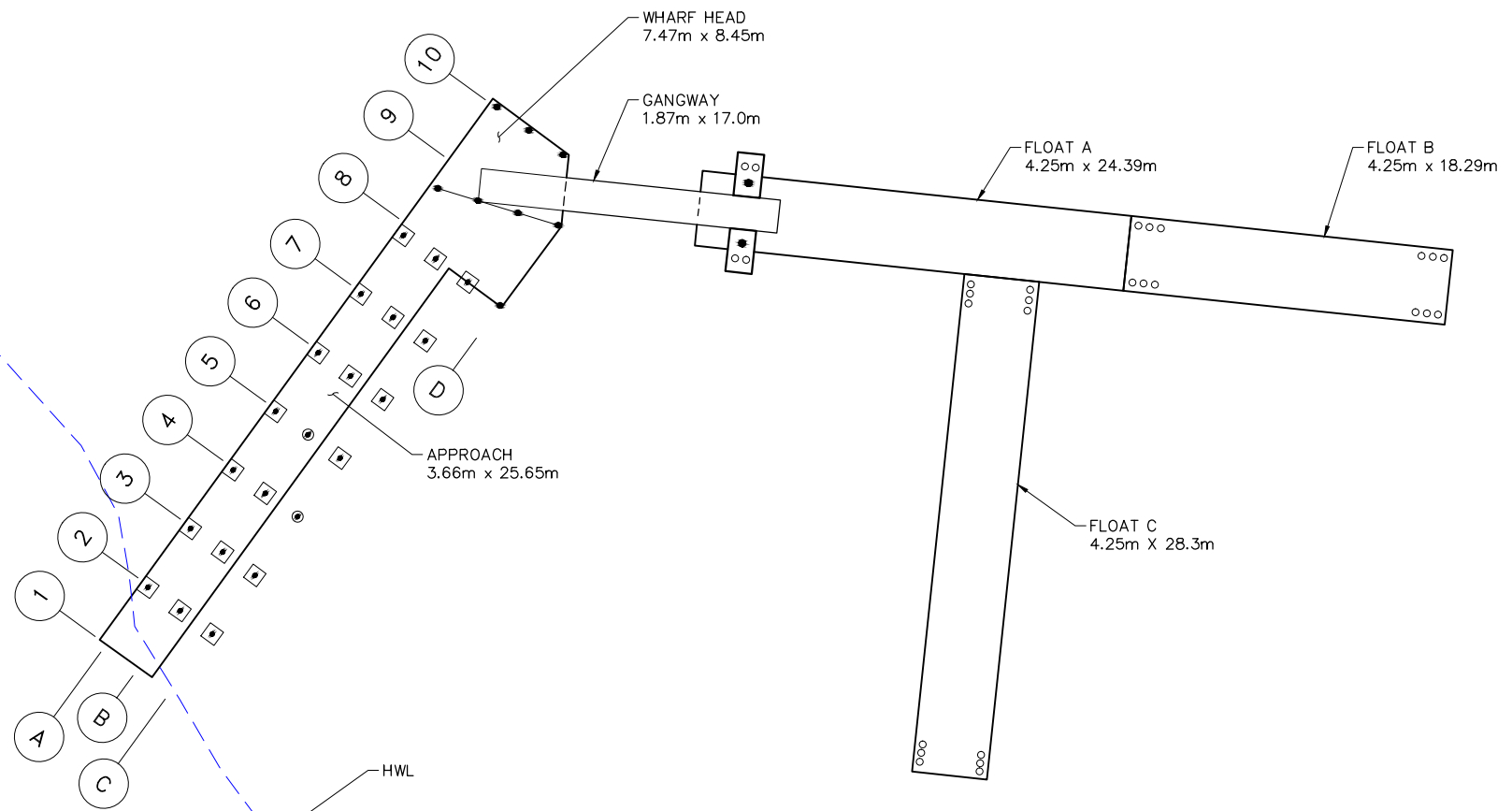
Facilities effected by ferry vessel wakes include Sturdies Bay, Miners Bay, Piers Island, Port Washington, Hope Bay, Lyall Harbour, and Swartz Bay.

For future detailed design repairs, upgrades, and site evaluations, it is recommended that these sites should be further analyzed to determine site specific effects due to wind, waves, currents and vessel wake waves. This analysis can provide possible mitigation measures to improve operating conditions or to explore alternate sites for possible future replacement.



APPENDIX B: DRAWINGS OF FACILTIES

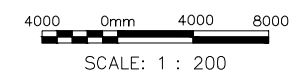




A
6100 **SITE PLAN**
SCALE: 1:200

LEGEND:

- TIMBER PILE ON CONCRETE FOUNDATION
- STEEL PILE ON CONCRETE FOUNDATION
- TIMBER PILE
- STEEL PIPE PILE
- PILE ON 24" CIRCULAR PEDESTAL



PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.
A	ISSUED FOR REVIEW	08/2015	JT

CRD DOCKS INSPECTION & ASSESSMENT

HOPE BAY
SITE PLAN AND G.A.

Designed by: JT	Date: MAY 15, 2015	Rev. A
Dwn by: PC/AM	M&N Project No.: 8985	
Pld by: PH	Drawing code:	
Reviewed by: PH	Drawing Scale:	
Submitted by: MOFFATT & NICHOL	Plot scale: 1:1 (Metric D)	

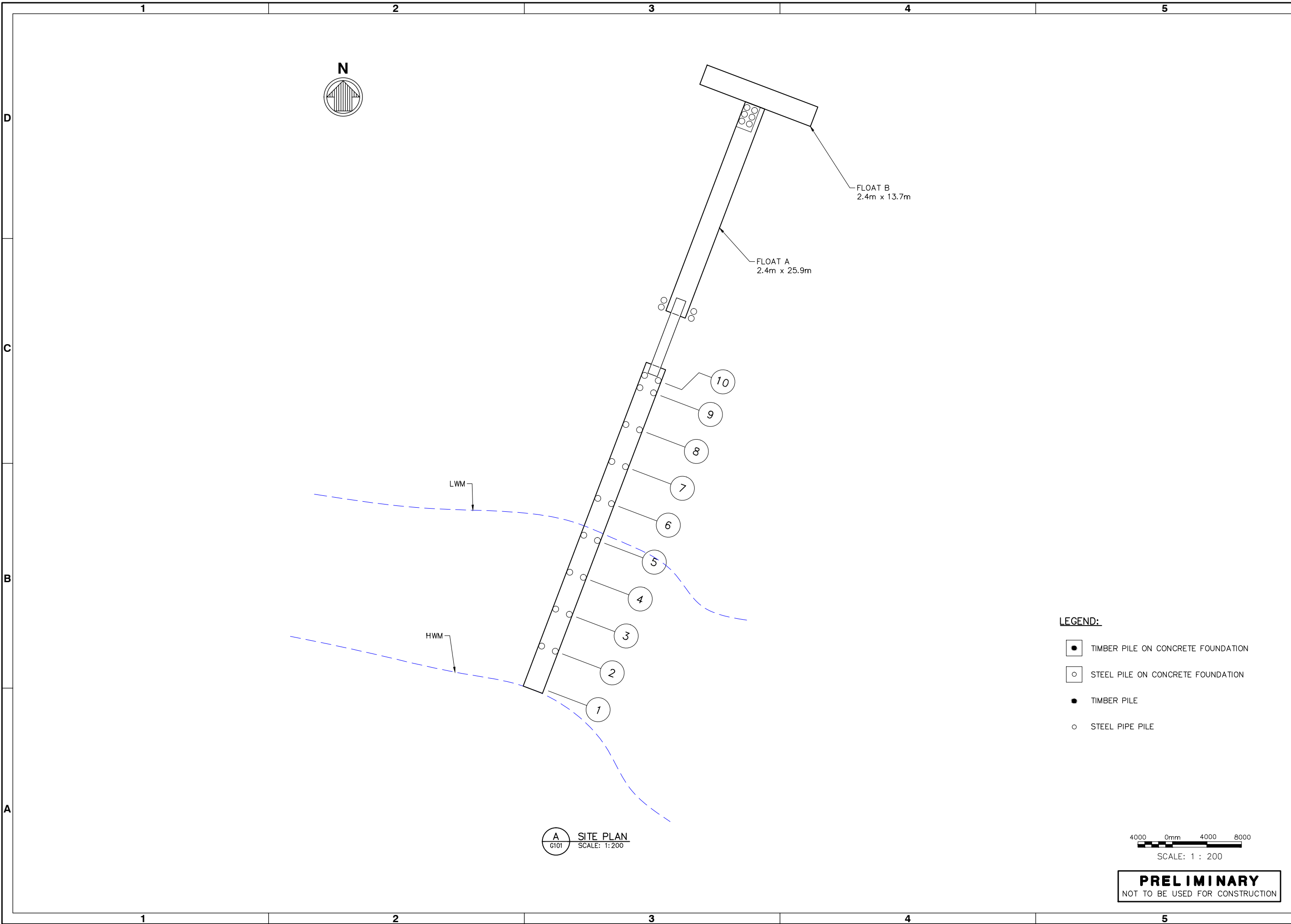
moffatt & nichol

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604-707-9004

SEAL

Sheet Reference No.
G100

INDEX: OF



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2.4m x 13.7m

FLOAT A
2.4m x 25.9m

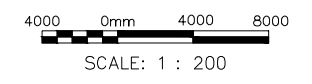
LWM

HWM

A
G101 SITE PLAN
SCALE: 1:200

LEGEND:

- TIMBER PILE ON CONCRETE FOUNDATION
- STEEL PILE ON CONCRETE FOUNDATION
- TIMBER PILE
- STEEL PIPE PILE



PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.
A	ISSUED FOR REVIEW	08/2015	JT

**CRD DOCKS INSPECTION
& ASSESSMENT**

**HORTON BAY
SITE PLAN AND G.A.**

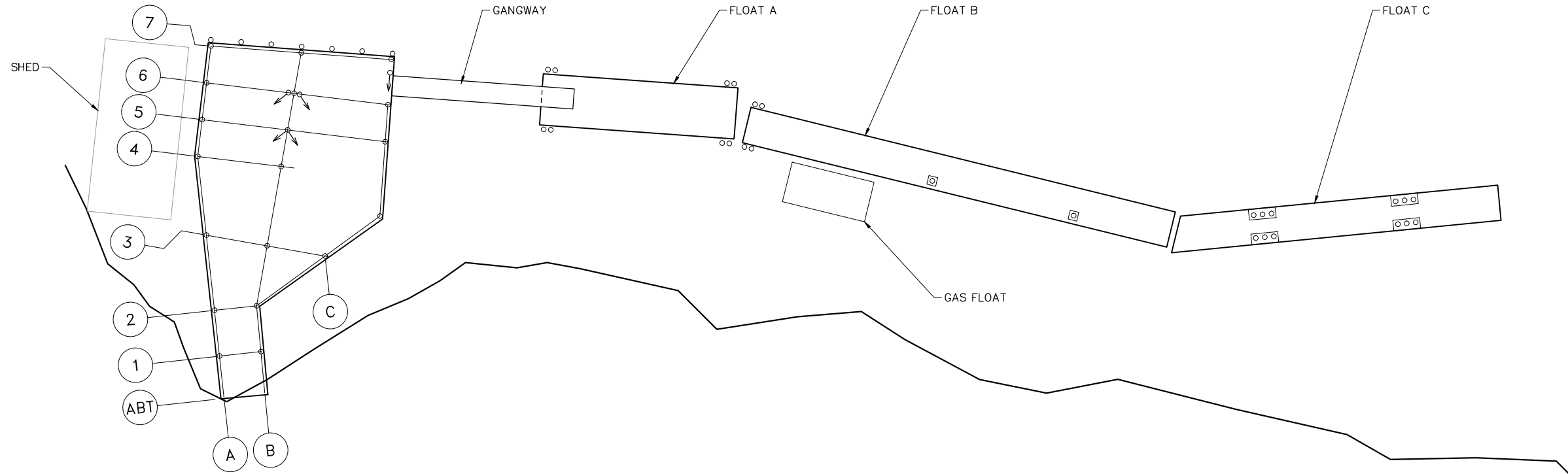
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Submitted by: MOFFATT & NICHOL	Plot scale: 1:1 (Metric D)	

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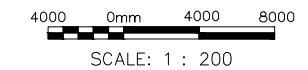
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A
G102 **SITE PLAN**
SCALE: 1: 200

LEGEND:

- TIMBER PILE ON CONCRETE FOUNDATION
- STEEL PILE ON CONCRETE FOUNDATION
- TIMBER PILE
- STEEL PIPE PILE
- BATTER PILE



SCALE: 1 : 200

PRELIMINARY
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Mark	Description	Date	Appr.
A	ISSUED FOR REVIEW	08/2015	JT

CRD DOCKS INSPECTION & ASSESSMENT

LYALL HARBOUR SITE PLAN AND G.A.

Designed by:	JT	Date:	MAY 15, 2015	Rev.:	A
Dwn by:	PC/AM	M&N Project No.:	8985	Drawing code:	
Pld by:	PH	Drawing Scale:		Plot scale:	1:1 (Metric D)
Reviewed by:	PH	Submitted by:	MOFFATT & NICHOL		

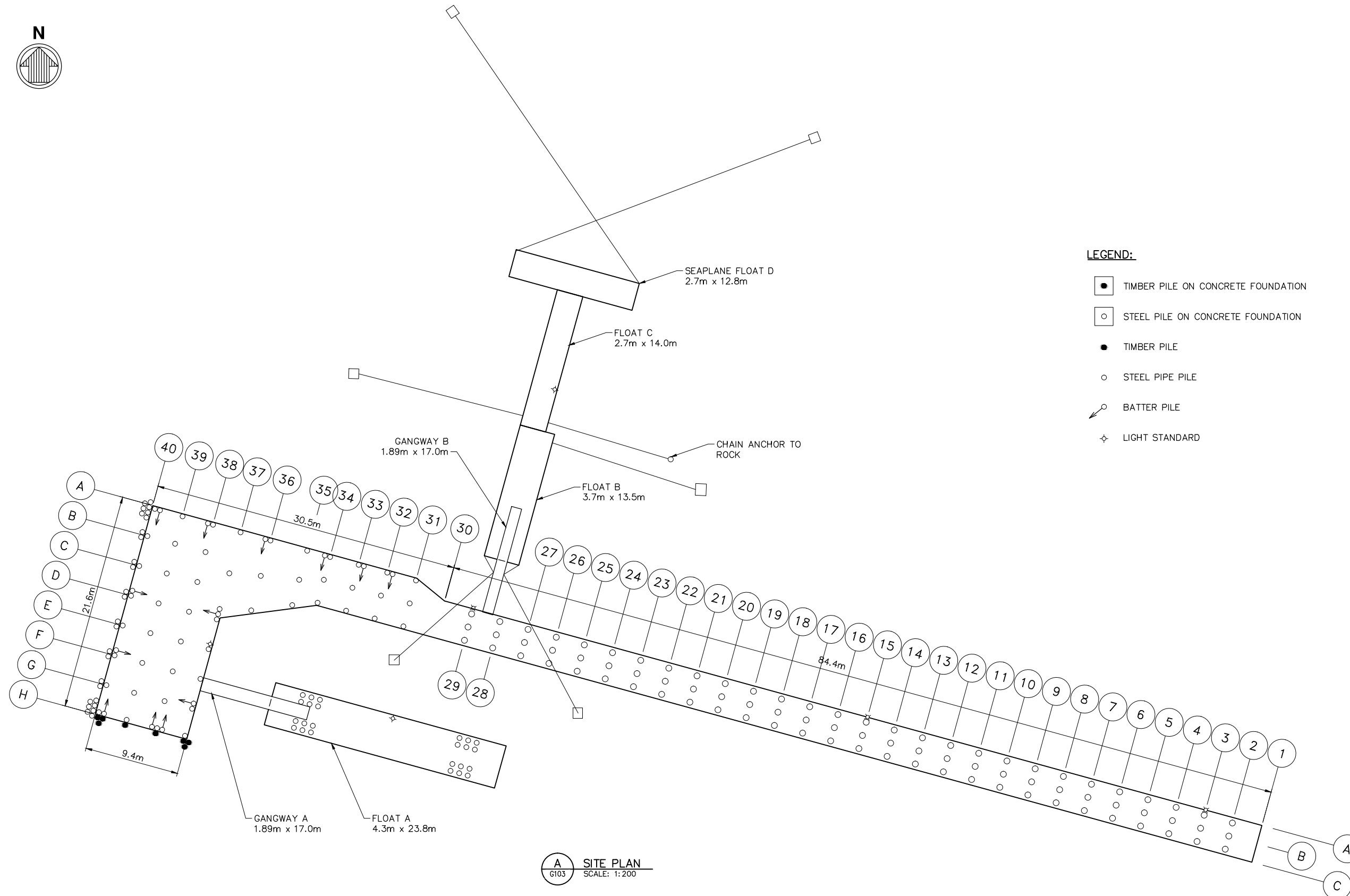
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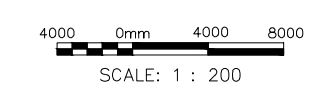
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LEGEND:

-  TIMBER PILE ON CONCRETE FOUNDATION
-  STEEL PILE ON CONCRETE FOUNDATION
-  TIMBER PILE
-  STEEL PIPE PILE
-  BATTER PILE
-  LIGHT STANDARD

A SITE PLAN
G103 SCALE: 1:200



PRELIMINARY
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Mark	Description	Date	Appr.
A	ISSUED FOR REVIEW	06/08/2015	JT

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MINERS BAY
SITE PLAN AND G.A.

Designed by:	JT	Drawn by:	PC/AM	Reviewed by:	PH	Submitted by:	MOFFATT & NICHOL
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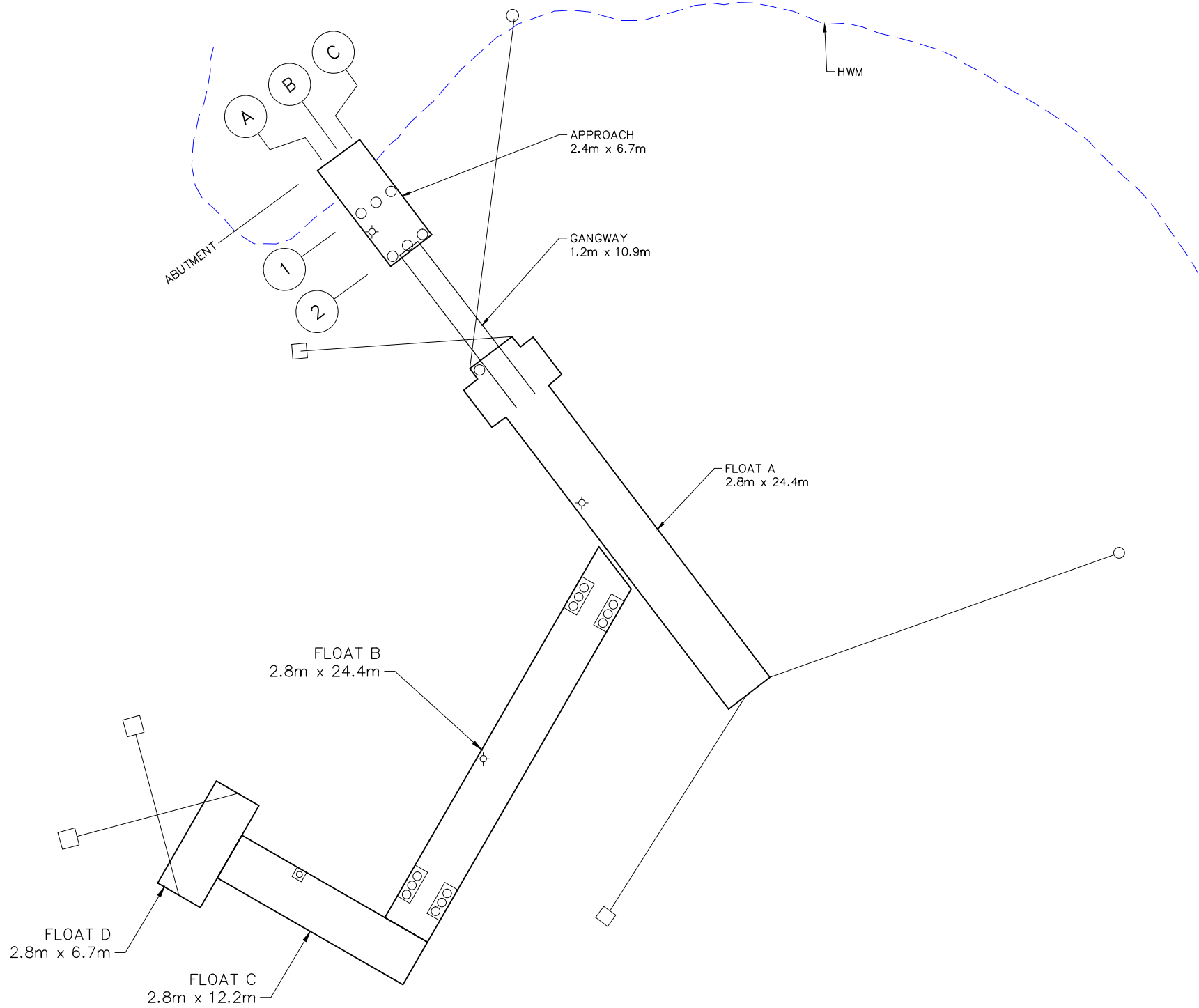
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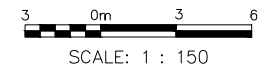
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A SITE PLAN
G104 SCALE: 1:200

LEGEND:

- TIMBER PILE ON CONCRETE FOUNDATION
- STEEL PILE ON CONCRETE FOUNDATION
- TIMBER PILE
- STEEL PIPE PILE
- BATTER PILE
- LIGHT STANDARD



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A	ISSUED FOR REVIEW	08/20/15	JT

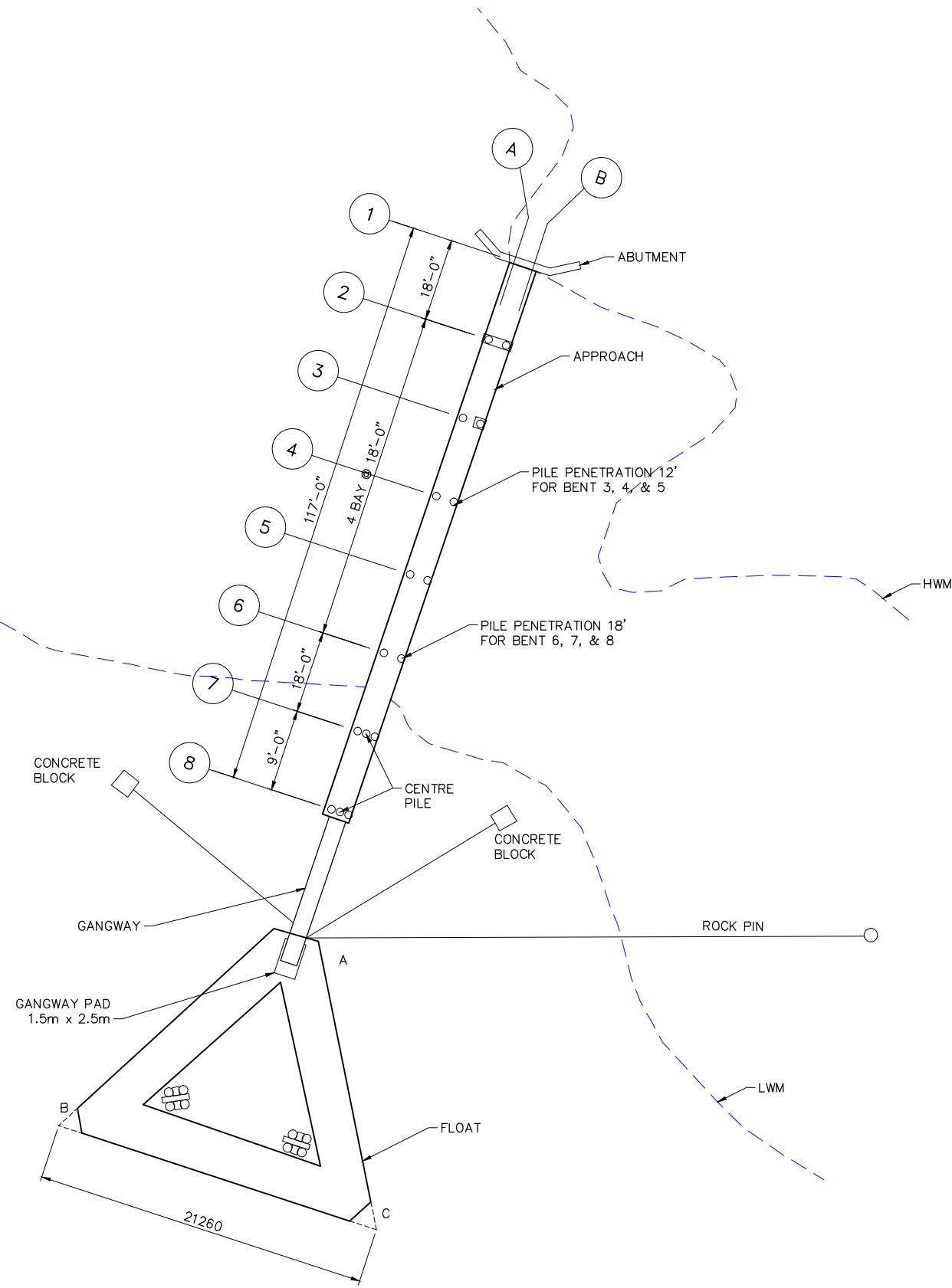
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Submitted by:	MOFFATT & NICHOL	Submitted by:	MOFFATT & NICHOL	Plot scale: 1:1 (Metric D)	

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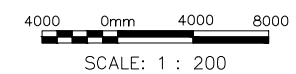
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A SITE PLAN
G105 SCALE: 1:200

- LEGEND:**
- TIMBER PILE ON CONCRETE FOUNDATION
 - STEEL PILE ON CONCRETE FOUNDATION
 - TIMBER PILE
 - STEEL PIPE PILE
 - BATTER PILE
 - LIGHT STANDARD



PRELIMINARY
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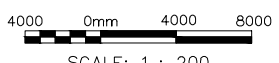
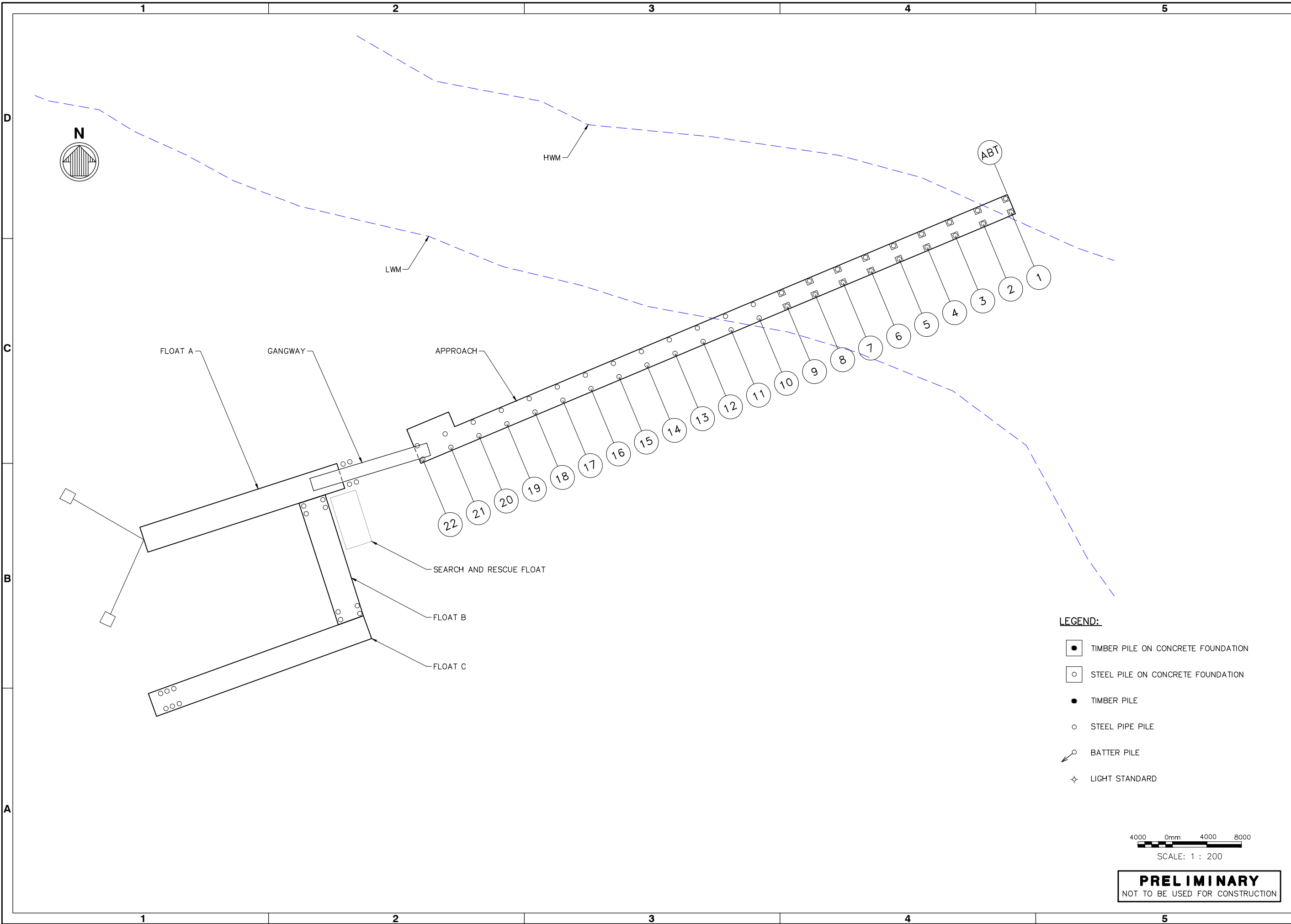
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Sheet Reference No.
G105
INDEX: OF



PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

- LEGEND:**
- TIMBER PILE ON CONCRETE FOUNDATION
 - STEEL PILE ON CONCRETE FOUNDATION
 - TIMBER PILE
 - STEEL PIPE PILE
 - BATTER PILE
 - ⊕ LIGHT STANDARD

Mark	Description	Date	Appr.
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PORT BROWNING SITE PLAN AND G.A.

Designed by:	JT	Date:	MAY 15, 2015	Rev.:	A
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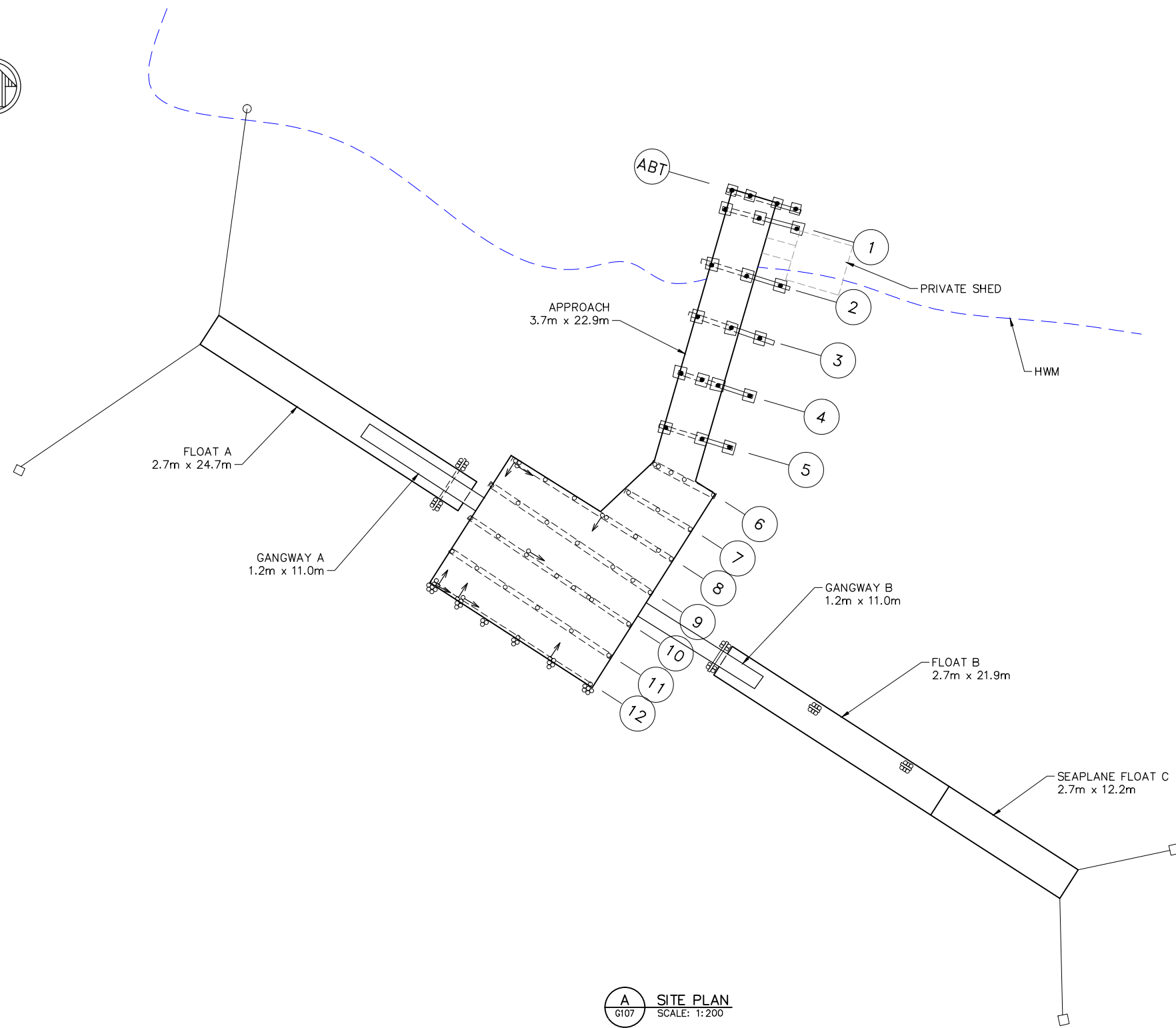
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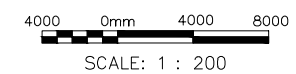
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A SITE PLAN
G107 SCALE: 1:200

LEGEND:

-  TIMBER PILE ON CONCRETE FOUNDATION
-  STEEL PILE ON CONCRETE FOUNDATION
-  TIMBER PILE
-  STEEL PIPE PILE
-  BATTER PILE
-  LIGHT STANDARD



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CRD DOCKS INSPECTION & ASSESSMENT

PORT WASHINGTON SITE PLAN AND G.A.

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Reviewed by:	PH				

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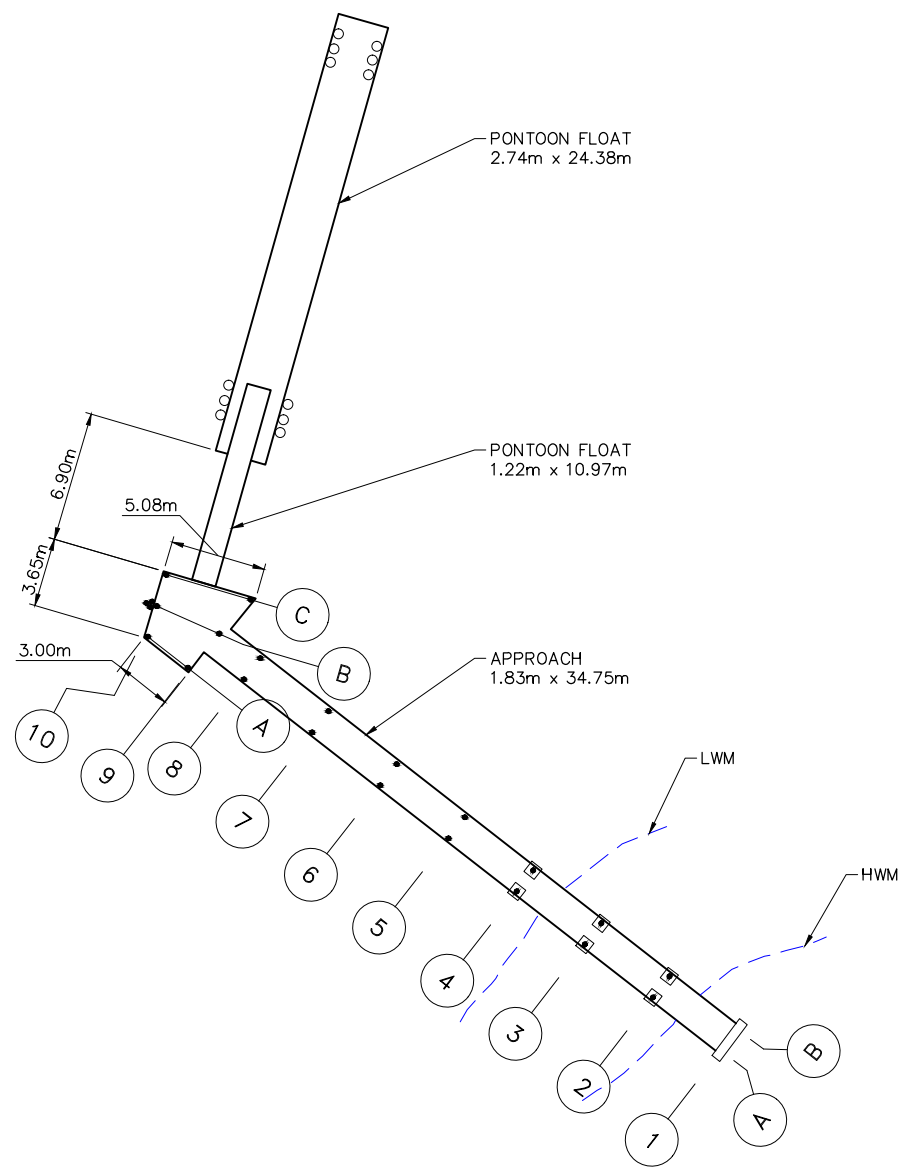
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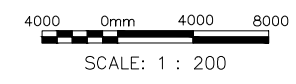
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A



A SITE PLAN
G108 SCALE: 1:200

- LEGEND:**
- TIMBER PILE ON CONCRETE FOUNDATION
 - STEEL PILE ON CONCRETE FOUNDATION
 - TIMBER PILE
 - STEEL PIPE PILE
 - BATTER PILE
 - LIGHT STANDARD



PRELIMINARY
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Mark	Description	Date	Appr.
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CRD DOCKS INSPECTION & ASSESSMENT

RETREAT COVE
SITE PLAN AND G.A.

Designed by:	JT	Date:	MAY 15, 2015	Rev.:	A
Dwn by:	PC/AM	M&N Project No.:	8985	Drawing code:	
Pld by:	PH	Reviewed by:	PH	Drawing Scale:	Plot scale: 1:1 (Metric D)
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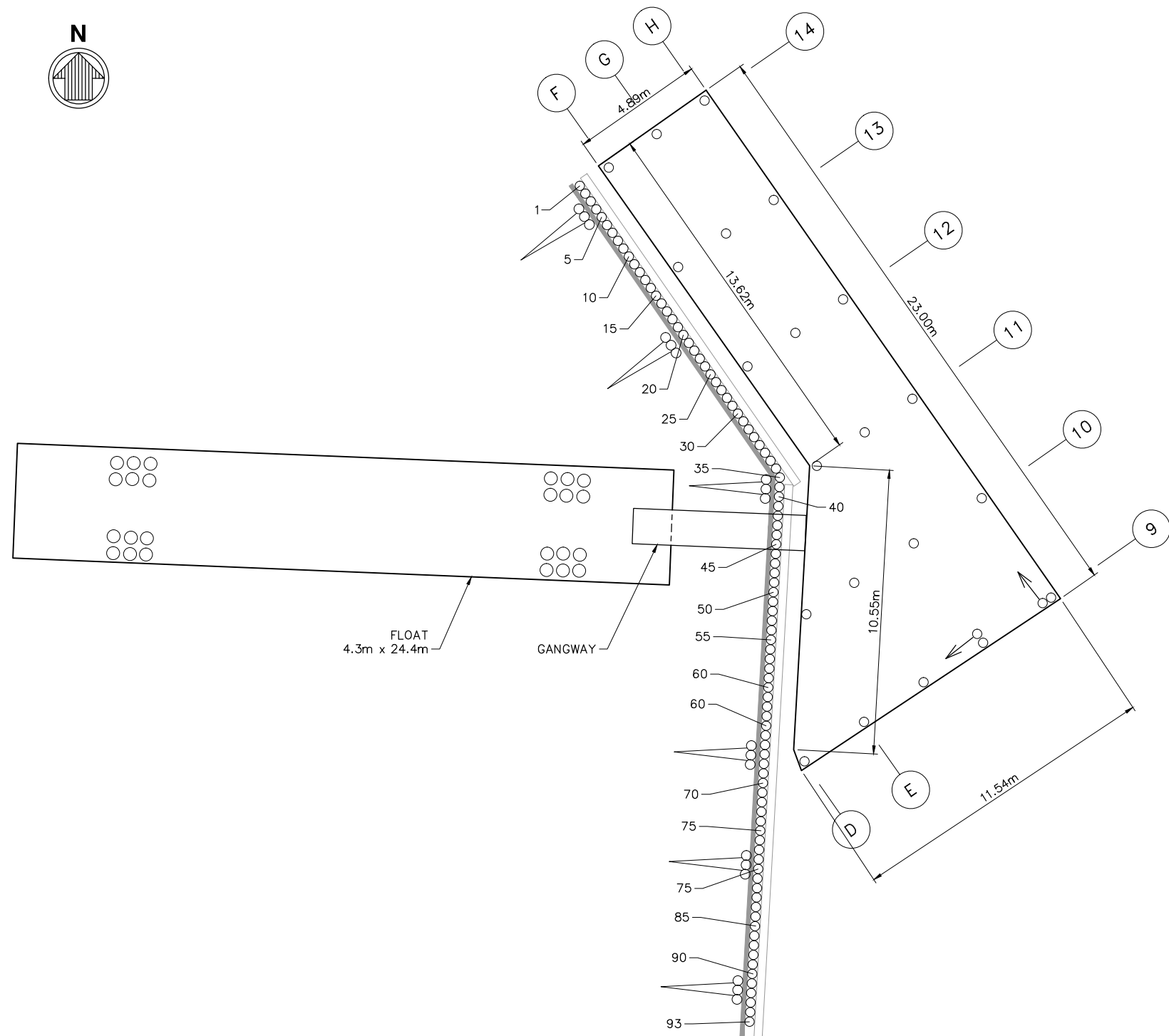
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VANCOUVER, BC, CANADA, V5Z 4J7
604-707-9004

SEAL







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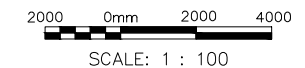
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A SITE PLAN
G109 SCALE: 1:100

LEGEND:

-  TIMBER PILE ON CONCRETE FOUNDATION
-  STEEL PILE ON CONCRETE FOUNDATION
-  TIMBER PILE
-  STEEL PIPE PILE
-  BATTER PILE
-  LIGHT STANDARD



SCALE: 1 : 100

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.
A	ISSUED FOR REVIEW	08/20/15	JT

CRD DOCKS INSPECTION & ASSESSMENT
STURDIES BAY SITE PLAN AND G.A.

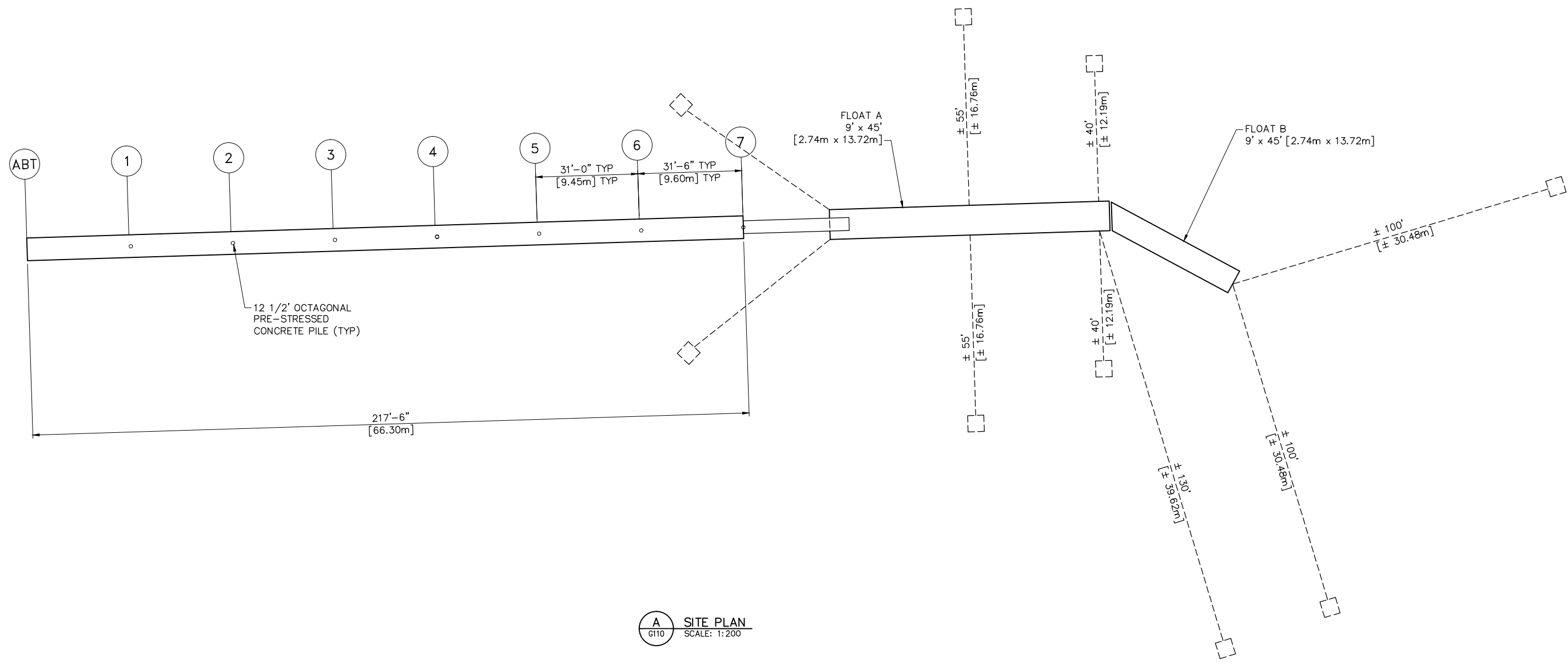
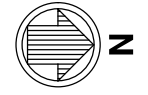
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Reviewed by: PH	Drawing Scale:	
Submitted by: MOFFATT & NICHOL	Plot scale: 1:1 (Metric D)	

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VANCOUVER, BC, CANADA, V6Z 4J7
604-707-9004

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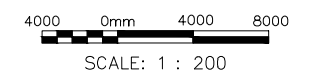
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- LEGEND:**
- TIMBER PILE ON CONCRETE FOUNDATION
 - STEEL PILE ON CONCRETE FOUNDATION
 - TIMBER PILE
 - STEEL PIPE PILE
 - BATTER PILE
 - LIGHT STANDARD

A SITE PLAN
G110 SCALE: 1:200



PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.
A	ISSUED FOR REVIEW	08/20/15	JT

CRD DOCKS INSPECTION & ASSESSMENT

SWARTZ BAY
SITE PLAN AND G.A.

Designed by:	JT	Date:	MAY 15, 2015	Rev.:	A
Dwn. by:	PC/AM	M&N Project No.:	8985	Drawing code:	
Reviewed by:	PH	Drawing Scale:		Drawing Scale:	Plot scale: 1:1 (Metric D)
Submitted by:	MOFFATT & NICHOL	File: P:\8985_V015_CRD Docks Inspection & Assessment\CADD\Active\8985 - G110; Plotted: 9/25/2015 11:34 AM by MANUZON, ALLEN; Saved: 9/25/2015 11:03 AM by AMANUZON			

moffatt & nichol

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SEAL


Sheet Reference No.
G110


INDEX: OF


APPENDIX C: SUMMARY OF ANNUAL REPAIRS





OPINION OF PROBABLE COST		DATE PREPARED 13-Sep-15	SHEET OF
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia		CONSTRUCTION CONTRACT NO.	 moffatt & nichol
PROJECT TITLE Summary of Repairs		ESTIMATED BY Moffatt & Nichol	
		STATUS OF DESIGN Draft	
		M&N JOB ORDER NUMBER 8985	
ITEM DESCRIPTION	REPAIRS	TOTAL	
SUMMARY OF ANNUAL REPAIRS			
Urgent Electrical Repairs		Total:	\$42,300
Montague Harbour			
Mobilization and Demobilization:			\$3,500
Utilities Repair Cost:	Rewire dock		\$4,200
		Total:	\$7,700
Sturdies Bay			
Mobilization and Demobilization:			\$3,500
Utilities Repair Cost:	Repair photocell Replace missing lamp standard cover Replace damaged wire back to junction box		\$1,900
		Total:	\$5,400
Miners Bay			
Mobilization and Demobilization:			\$3,500
Utilities Repair Cost:	Repair ground		\$3,400
		Total:	\$6,900
Horton Bay			
Mobilization and Demobilization:			\$3,500
Utilities Repair Cost:	Repair ground Replace missing lamp standard cover		\$2,600
		Total:	\$6,100
Port Washington			
Mobilization and Demobilization:			\$3,500
Utilities Repair Cost:	Repair ground Replace damaged wire back to junction box		\$3,400
		Total:	\$6,900
Swartz Bay			
Mobilization and Demobilization:			\$2,900
Utilities Repair Cost:	Repair ground Repair Lamp Standard bracket		\$6,400
		Total:	\$9,300


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		STATUS OF DESIGN Draft	
		M&N JOB ORDER NUMBER 8985	
ITEM DESCRIPTION	REPAIRS	TOTAL	
SUMMARY OF ANNUAL REPAIRS			
Year 1			Total: \$445,600
Retreat Cove			
Minor Mobilization and Demobilization:			\$10,600
Approach Repair Cost:	Timber handrails Timber midrails Timber decking		\$3,900
Gangway Repair Cost:	Sandblast and re-paint rusted areas of gangway Replace expanded metal walking surface Install UHMW wearing pads to transition plates Replace rusted C-channel Replace rusted L-braces Replace rusted L-guide rails Add Transition plate on top and bottom		\$9,400
			Total: \$23,900
Montague Harbour			
Major Mobilization and Demobilization:			\$18,400
Gangway Repair Cost:	Sandblast and re-paint rusted areas of gangway Add expanded metal walking surface Remove and replace roller bearings Timber decking Replace rusted L-guide rails Add transition plate on top		\$9,100
			Total: \$27,500
Sturdies Bay			
Major Mobilization and Demobilization:			\$18,400
Approach Pile Repair Cost:	Barge for transport brace to underside of deck X-brace at Pile Bent 11 X-brace at Pile Bent 13 Disposal of damage bracing		\$11,200
Gangway Repair Cost:	Sandblast and re-paint rusted areas of gangway Remove and replace expanded metal walking surface Remove and replace roller bearings Install UHMW wearing pads to transition plate		\$6,100
			Total: \$35,700
Miners Bay			
Minor Mobilization and Demobilization:			\$10,600
Approach Repair Cost:	Timber Handrail - Bent 19 Timber Decking - Bents 22-40 Repair cleat supports Paint handrails & bullrails (option not incl. in rpt)		\$23,300
Gangway Repair Cost:	Gangway A Repair Sandblast and re-paint rusted areas Remove and replace roller, and roller bearings Replace rusted L-guide rails Add Transition plate on top and bottom Gangway B Repair Install UHMW wearing pads to transition plates Sandblast and re-paint rusted areas Replace broken and rusted L-Braces Replace rusted angles and I beams Add Transition plate on top Remove and replace roller, and roller bearings		\$14,100
			Total: \$48,000
Lyall Harbour			
Minor Mobilization and Demobilization:			\$18,400
Utilities Repair (Fuel Dock) Cost:	Replace connector between hose and fuel nozzle		\$1,500
Float Repair Cost:	Float A Repair Repair decking Replace decking Replace rub board Pile hoops with rollers Repair pile well Install UHMW wearing pads pile well Remove old piles Replace piles Hinge connection between Floats A & B		\$111,100


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PROJECT TITLE Summary of Repairs		ESTIMATED BY Moffatt & Nichol	
		STATUS OF DESIGN Draft	
		M&N JOB ORDER NUMBER 8985	
ITEM DESCRIPTION	REPAIRS	TOTAL	
SUMMARY OF ANNUAL REPAIRS			
	Remove old Floatation (2) Replace Floatation (2) Float B Repair Repair bull rails Repair decking Replace Anodes on pile Install UHMW wearing pads pile well Remove old Floatation (2) Replace Floatation (2) Float C Repair Repair decking Repair transition plate hinge Install UHMW wearing pads between - Float B & C		Total: \$131,000
Hope Bay			
	Major Mobilization and Demobilization:		\$18,400
Approach Repair Cost:	Timber decking Replace bull rails		\$6,700
Approach Piles Cost:	Barge for transport brace to underside of deck X-brace at Pile Bent 6 X-brace at Pile Bent 8 X-brace at Pile Bent 10 Disposal of damage bracing		\$10,200
Float Repair Cost:	Float A Repair Remove broken float frame Repair decking Replace decking Replace N&S rub board Install UHMW wearing pads pile well rubber fenders between Floats A & B rubber fender connection between Floats A & C Install transition plates		\$17,700
Gangway Repair Cost:	Sandblast and re-paint rusted areas Replace expanded metal walking surface Remove and replace roller bearings Install UHMW wearing pads to transition plates		\$8,200
			Total: \$61,200
Port Browning			
	Major Mobilization and Demobilization:		\$18,400
Float Repair Cost:	Float A Repair Timber decking Remove old piles Replace piles Install UHMW wearing pads pile well Replace Rub Boards - N and S sides Float B Repair Secure UHMW wearing pads pile well Float C Repair Timber decking Install UHMW wearing pads pile well Replace bull rails - Float B		\$33,700
			Total: \$52,100
Piers Island			
	Minor Mobilization and Demobilization:		\$10,600
Gangway Repair Cost:	Sandblast and re-paint rusted areas Replace rusted transition plate Replace rusted C-channel beam Replace rusted L-braces		\$5,000
			Total: \$15,600
Swartz Bay			
	Minor Mobilization and Demobilization:		\$3,000
Approach Repair Cost:	Formwork Reinforcement Concrete Supply & install galvanized handrail		\$23,300
Float Repair Cost:	Rub rail - replace		\$16,900


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PROJECT TITLE Summary of Repairs		ESTIMATED BY Moffatt & Nichol	
		STATUS OF DESIGN Draft	M&N JOB ORDER NUMBER 8985
ITEM DESCRIPTION	REPAIRS	TOTAL	
SUMMARY OF ANNUAL REPAIRS			
	Deck board - fix loose board Replace rub board Replace anodes Rub boards and tire connectors		
Gangway Repair Cost:	Replace corroded C-channels Sandblast and paint repaired section Replace roller bearings Clean and repair roller		\$7,400
Total:			\$50,600

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PROJECT TITLE Summary of Repairs		ESTIMATED BY Moffatt & Nichol			
		STATUS OF DESIGN Draft			
		M&N JOB ORDER NUMBER 8985			
ITEM DESCRIPTION	REPAIRS	TOTAL			
SUMMARY OF ANNUAL REPAIRS					
Year 2				Total:	\$229,900
Lyll Harbour					
Major Mobilization and Demobilization:				\$18,700	
Approach Repair Cost:	Sandblast & paint pile cap 1			\$27,600	
	Sandblast & paint pile cap 2				
	Sandblast & paint pile cap 3				
	Sandblast & paint pile cap 4				
	Sandblast & paint pile cap 5				
	Sandblast & paint pile cap 6				
	Sandblast & paint pile cap 7				
	Scaffolding				
Approach Piles Cost:	Barge/skiff work transporting scaffold materials to underside of deck			\$20,100	
	Piles 1A -7C1 (19 piles)				
	Batter Piles 5B1, 5B3, 6B1, 6B3, 7C2				
	Scaffolding				
	Knee brace abutment and bent 1 (2No. @3.8m)				
Gangway Repair Cost:	Replace rusted guide rails			\$3,200	
	Remove and replace roller bearings				
Utilities Upgrades	Replace with LED fixtures			\$5,300	
				Total:	\$74,900
Piers Island					
Major Mobilization and Demobilization:				\$18,700	
Approach Repair Cost:	Abutment repair			\$9,300	
Approach Piles Cost:	Bent 2 - remove and recast footing			\$20,800	
	Bent 2 Pile B - replace pile				
	Bent 3 - remove and recast footing				
Float Repair Cost:	Timber decking - North end			\$106,200	
	Rub boards - South side				
	Replace anchor chains				
	Remove old floatation (10)				
	Replace floatation (10)				
	Repair pile well				
	Install UHMW wearing pads pile well				
	Remove old piles				
	Replace piles				
				Total:	\$155,000

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		M&N JOB ORDER NUMBER 8985	
ITEM DESCRIPTION	REPAIRS	TOTAL	
SUMMARY OF ANNUAL REPAIRS			
Year 3			Total: \$271,000
Montague Harbour			
Major Mobilization and Demobilization:			\$19,100
Approach Repair Cost:	Timber decking		\$3,200
Approach Pile Repair Cost:	Repair shim in Pile 2A, 2B, and 2C		\$2,100
Float Repair Cost:	Float A Repair		\$160,300
	Timber decking		
	Replace anchor chains		
	Replace anodes on pile		
	Secure one foam billet		
	Float B Repair		
	Remove old piles		
	Replace north group (6) piles		
	Replace pile frames		
	Repair pile well rub rail		
	Install UHMW wearing pads pile wells		
	Disposal of damage bracing		
	Replace foam billet fasteners		
	Timber decking		
	Float D Repair		
	Timber decking		
	Remove old floatation (4)		
	Replace floatation (4)		
	Replace anodes on pile		
Utilities Upgrades	Replace with LED fixtures		\$3,600
			Total: \$188,300
Horton Bay			
Major Mobilization and Demobilization:			\$19,100
Approach Repair Cost:	Timber handrail bents 4, 7, & 8		\$11,700
	Replace bull rails		
	Sandblast and re-paint rusted areas		
	Timber decking (Near Abutment)		
	Replace damaged stringers		
Approach Piles Cost:	Barge for transport brace to underside of deck		\$39,800
	X-brace at Pile Bent 1		
	X-brace at Pile Bent 5		
	Remove Piles 3A and 4A		
	Replace Piles 3A and 4A		
	Disposal of damage bracing		
Gangway Repair Cost:	Sandblast and re-paint rusted areas of gangway		\$8,500
	Remove and replace expanded metal walking surface		
	Remove and replace roller bearings		
	Install transition plates		
Utilities Upgrades	Replace with LED fixtures		\$3,600
			Total: \$82,700

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ITEM DESCRIPTION	REPAIRS	TOTAL	
SUMMARY OF ANNUAL REPAIRS			
Year 4			Total: \$291,400
Port Washington			
Major Mobilization and Demobilization:			\$19,500
Approach Repair Cost:	Timber Decking		\$48,100
Approach Piles Cost:	Remove tree at Bent 1 pile A Bent 3 Pile A - steel pipe coating repair Bent 3 Pile B - remove and recast footing Bent 4 Pile B - replace pile Bent 4 Pile C - replace pile Bent 6 Pile A - replace pile Bent 9 Pile F- replace pile Batter Pile 8A- replace pile Bent 12 Pile 8A replace fender pile Bent 12 Pile 10C replace fender pile Stringer between pile 8A to 11A Disposal of damage piles		\$109,700
Float Repair Cost:	Float B Repair Remove broken bull rails Replace bull rails Repair pile well Replace SW rub board & fix stringer beam Remove old piles Replace piles Install UHMW wearing pads pile well Replace rub boards between floats B & C Float C Repair Replace East rub board		\$25,700
Gangway Repair Cost:	Sandblast and re-paint rusted areas Replace metal walking surface Float A Replace roller bearings Replace rusted L-Guide Rails Add Transition plate on top gangways		\$11,800
			Total: \$214,800
Port Browning			
Major Mobilization and Demobilization:			\$19,500
Approach Repair Cost:	Timber decking Replace bull rail spacer		\$2,700
Abutment Repair Cost:	Lock block retaining wall		\$29,300
Approach Piles Cost:	Repair Foundation at Pile 7B Remove Debris Lodged in Bracing Remove Pile Attached to Pile 10B Barge for transport brace to underside of deck One X-brace at Pile Bent 20 Disposal of damage bracing		\$17,400
Gangway Repair Cost:	Sandblast and re-paint rusted areas Add expanded metal walking surface Remove and replace roller bearings Replace rusted C-channel Add Transition plate on top and bottom		\$7,700
			Total: \$76,600

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		M&N JOB ORDER NUMBER 8985	
ITEM DESCRIPTION	REPAIRS	TOTAL	
SUMMARY OF ANNUAL REPAIRS			
Year 5			Total: \$561,300
Retreat Cove			
Major Mobilization and Demobilization:			\$19,900
Approach Pile Repair Cost:	Bent 4 Pile A - foundation repair Bent 4 Pile B - replace pile and recast footing Bent 5 Pile A - replace pile, pilecap and bracing Bent 5 Pile B - replace pile, pilecap and bracing Bent 8 Pile B - replace pile and pilecap Center fender pile - replace pile One X-brace at Pile Bent 4 Two X-brace at Pile Bent 8 One X-brace at Pile Bent 9		\$107,800
Float Repair Cost:	Replace bull rails Replace decking Replace NW rub board & fix stringer beam Replace piles Install UHMW wearing pads pile well		\$51,800
			Total: \$179,500
Sturdies Bay			
Major Mobilization and Demobilization:			\$19,900
Approach Repair Cost:	Timber handrails		\$900
Float Repair Cost:	Remove broken bull rails Replace bull rails Repair decking Replace decking Replace SW rub board & fix stringer beam Remove old piles Replace piles		\$63,800
Breakwater Repair Cost:	Replace missing aluminum pile cap Replace damaged aluminum pile cap Replace broken timber blocking and bent bolts Remove and replace damaged waler		\$4,400
Utilities Upgrades	Replace with LED fixtures		\$5,600
			Total: \$94,600
Miners Bay			
Major Mobilization and Demobilization:			\$19,900
Approach Piles Cost:	Remove damaged piles Bent 18 Pile B - replace pile Bent 24 Pile B - replace pile Bent 32 Pile C - replace pile Bent 38 Pile A - replace pile Bent 38 Pile B - replace pile Bent 38 Pile H - replace batter pile Bent 39 Pile A - replace pile Bent 40 Pile A - replace pile Bent 40 Pile A - replace batter pile Disposal of damage piles Barge for transport brace to underside of deck One X-brace at Pile Bent 25 Disposal of damage bracing		\$91,300
Float Repair Cost:	Float A Repair Repair decking Remove old piles Replace piles Repair pile well rub rail Install UHMW wearing pads pile wells Repair rub rails Replace bull rails Remove old floatation (10) Replace floatation (10) Replace foam billet fasteners Float B Repair Replace bull rails Replace decking at gangway & grating Repair connection between floats B&C incl transition Repair rub rails Float C Repair		\$131,600

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		STATUS OF DESIGN Draft	M&N JOB ORDER NUMBER 8985
ITEM DESCRIPTION	REPAIRS	TOTAL	
SUMMARY OF ANNUAL REPAIRS			
	Replace anchor chains Float C Replace decking Repair connection between floats C&D incl transition Replace foam billet fasteners Float D Repair Repair decking		
Utilities Upgrades	Replace with LED fixtures		\$13,000
			Total: \$255,800
Horton Bay			
Minor Mobilization and Demobilization:			\$11,500
Float Repair Cost:	Replace bull rails Repair decking Replace decking Floats A & B Replace missing rub board Float A		\$19,900
			Total: \$31,400