Canada-Surveys Inc.

MULTI-BEAM SONAR
BATHYMETRIC SURVEY

BELLA COOLA - SMALL CRAFT HARBOUR

Date: Monday, Monday, July 23, 2018

Hydrographic Survey, Bella Coola

Introduction:
CRA-Canada Surveys Inc. was selected to perform a Multi-beam Sonar bathymetric survey of the Small Craft Harbour at Bella Coola, BC.

The purpose of the survey was to create a Seabed surface for engineering inspection purposes at the Bella Coola Small Craft Harbour site.

CRA-Canada Surveys was required to collect data, process an ASCII data set, produce a surface in Chart Datum and produce a short report.

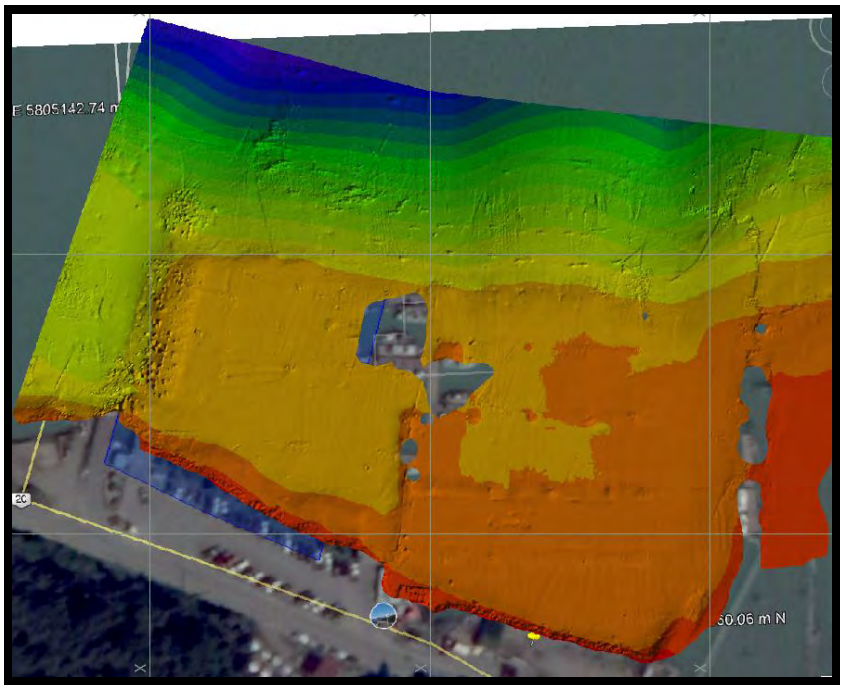
Methodology:

Multi-beam Hydrographic Survey -Methodology

The Multi-beam bathymetric data was collected using a state-of-the-art hydrographic system. The Reson SeaBat 7125 SV2 also called a multi-beam sonar system collects data in a swath configuration. This gives a higher resolution and larger data set compared to a single transducer echo sounder. This system consists of a single transducer multi-beam array. Coupled with a motion, heading sensor, RTK GPS positioning system, and velocimeter. The complete system produces accurate depth measurements (IHO standards) over a 140-degree swath. The motion sensor accurately tracks the sonar beam in addition it will also correct for the RTK GPS antenna movement. This data set was then reduced for heave, pitch, and roll. Sound velocity and tidal corrections were applied real time to the data. Hypack Hysweep software was used post process and to statistically select data from a 0.25 meter bin sizes to produce a final X,Y,Z ASCII data set.

Project Limitations

This survey was a challenging hydrographic survey.
The survey required navigating the survey Vessel at close quarters with parked vessels. In and out of marina race ways.
Coverage was limited in some areas due to the large amount of commercial fish boats that were rafted up at the dock. Owners of these boats were waiting for a salmon fishery to open.
Many of the vessels were occupied and had there sonar systems running (quite typical) which created extra noise in the water column. This can make it difficult to get good bottom tracking.



Coverage Area of the survey

Bathymetric Survey Equipment:

The following equipment was provided:

- Reson 7125 SV2 swath bathymetry system 140-degree width
- TSS DSM-05 Heave, Pitch, Roll, Motion Sensor
- Hemishpere's VS 110 heading and Position sensor
- AML Minos-x, Velocimeter
- HYPACK/ Hysweep software
- Single Beam Echo Sounder and 200khz Transducer
- Data collection/processing computers with multiple com-ports
- Trimble GNSS R8 GPS receiver and GNSS Base station
- Truck and Survey ready Coast Guard approved 18' survey vessel

Field Activity:

July-2-3, 2018	- mobilization to Bella Coola from, Chilliwack BC
July 4, 2018	-Tailboard meeting -Supply Stantec with Zodiac inflatable boat for dock inspection -Launch vessel – set GPS Base Station control point - Tie into existing CHS and geodetic control points - Calibrate Multi-beam Sonar -Start Acquisition of Multi-beam Sonar Data -Complete Survey 8:00pm -End of field work
July 5-7	-Demobe back to Chilliwack, BC
July18th-23rd 2018	-Data Processing-file compilation & Report writing
July 23rd, 2018	-Final data and report were prepared and submitted.

Horizontal Control: NAD 83 - UTM Zone 9N

Horizontal positioning for this project was achieved by using a Real-time Kinematic GPS receiver and base station. This is based on using a TRIMBLE GNSS RTKGPS Receiver, The receiver has a horizontal accuracy of a +/-0.05m of a meter real-time.

Vertical Datum: Chart Datum

Vertical positioning for this project was achieved by using a GNSS RTKGPS Base station and Rover. The base station was set over a known point, and field crew checked into known control points. Control point used is listed below. Geoid model Ht 2.0, Conversion to Geodetic 2.685m

Base station Control points were set using RTK GPS corrections and later tied to:

BM's tied 2018 Survey. Bella Coola Harbour

#1 Unique Number: 98C9105
Station Name: Bella Coola, B.C.
Benchmark Condition: Good Setting: HORIZONTAL Type: Bronze Tablet
Agency: CHS Last Inspected: 2009
Description:
At the Bella Coola BC Ferries Terminal, set in concrete in the northeast corner of the dock, a bronze tablet inscribed, "Hydrographic Service, Canada BM 98C9105"

Holding Benchmark	Datum Name	Elevation (metres)	Status
NO	CD	6.572	ACTIVE
NO	CGVD28(HTv2)2010	3.948	ACTIVE

Unique Number: 66C9522 20-1966
Station Name: Bella Coola, B.C.
Latitude: 52.373 º N Longitude: 26.79 º W
Established:1966
Benchmark Condition: Good
Type: Bronze Tablet
Agency: CHS Last Inspected: 2013

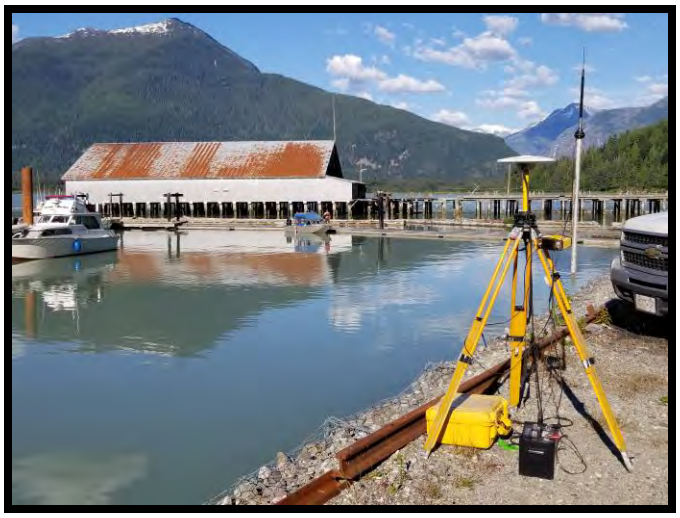
Holding Benchmark	Datum Name	Elevation (metres)	Status
NO	CD	7.9	ACTIVE
NO	GSC	5.215	ACTIVE

It was found that benchmarks in the area have slightly different published values for the datum conversion between Chart and Geodetic. We found 0.061m difference between the two CHS bench marks listed above. However the previous plan from 93-03-24 used BM 20-1966 so we held that value for our conversion. To ensure both data sets are referenced to the same datum.

#3 BM Tied #887004 Geodetic Monument
N 5805056.644
E 6500095.965
Elevation: 4.621 CGVD28

CRA Control Point

Pt# 100 PPP Nail set
N 5804960.320
E 650237.185
Elevation: 3.550 CGVD28



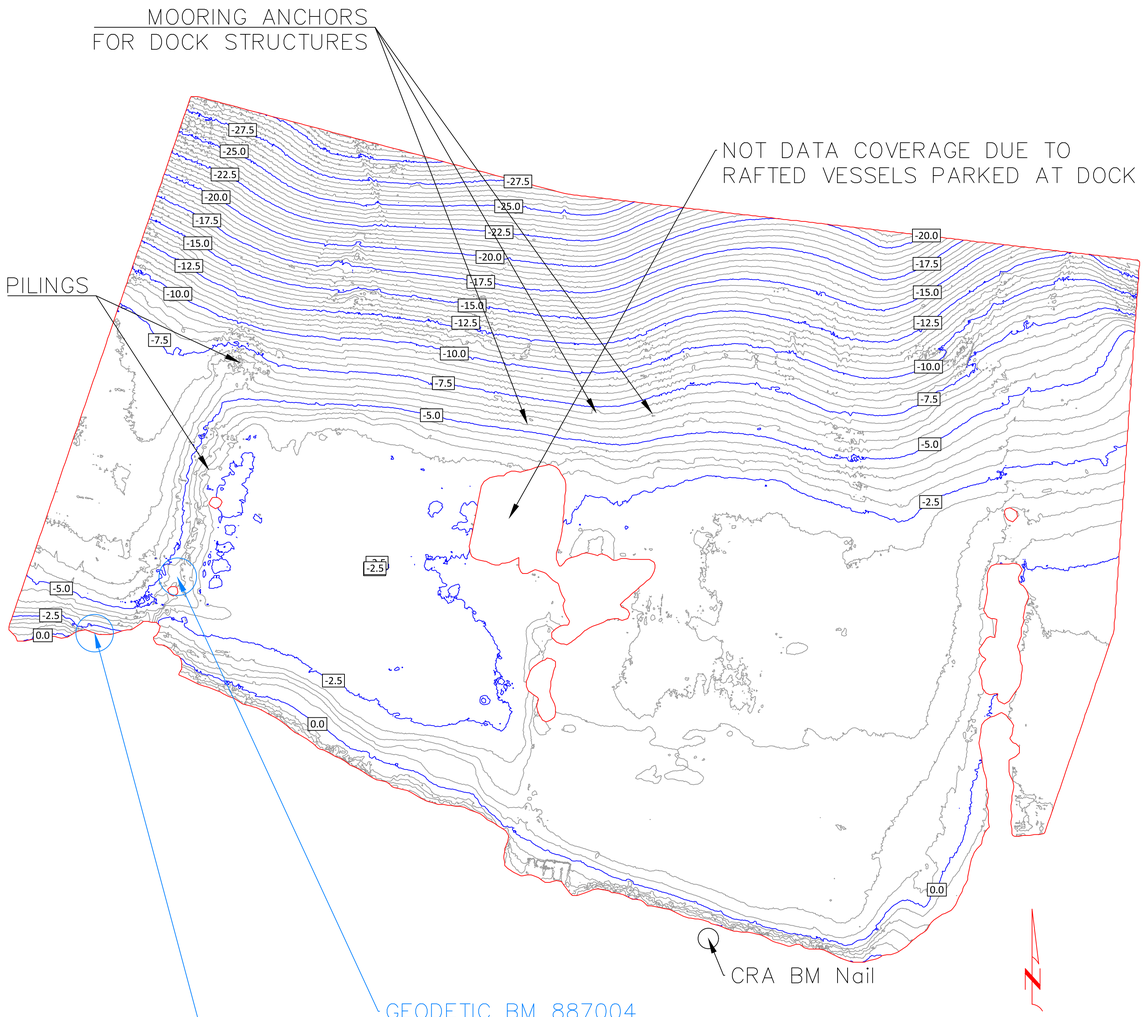
Personnel:
Senior Hydrographer- Alex Howden ASTTBC
Survey Tech.- Reece Howden SAIT- Survey Student

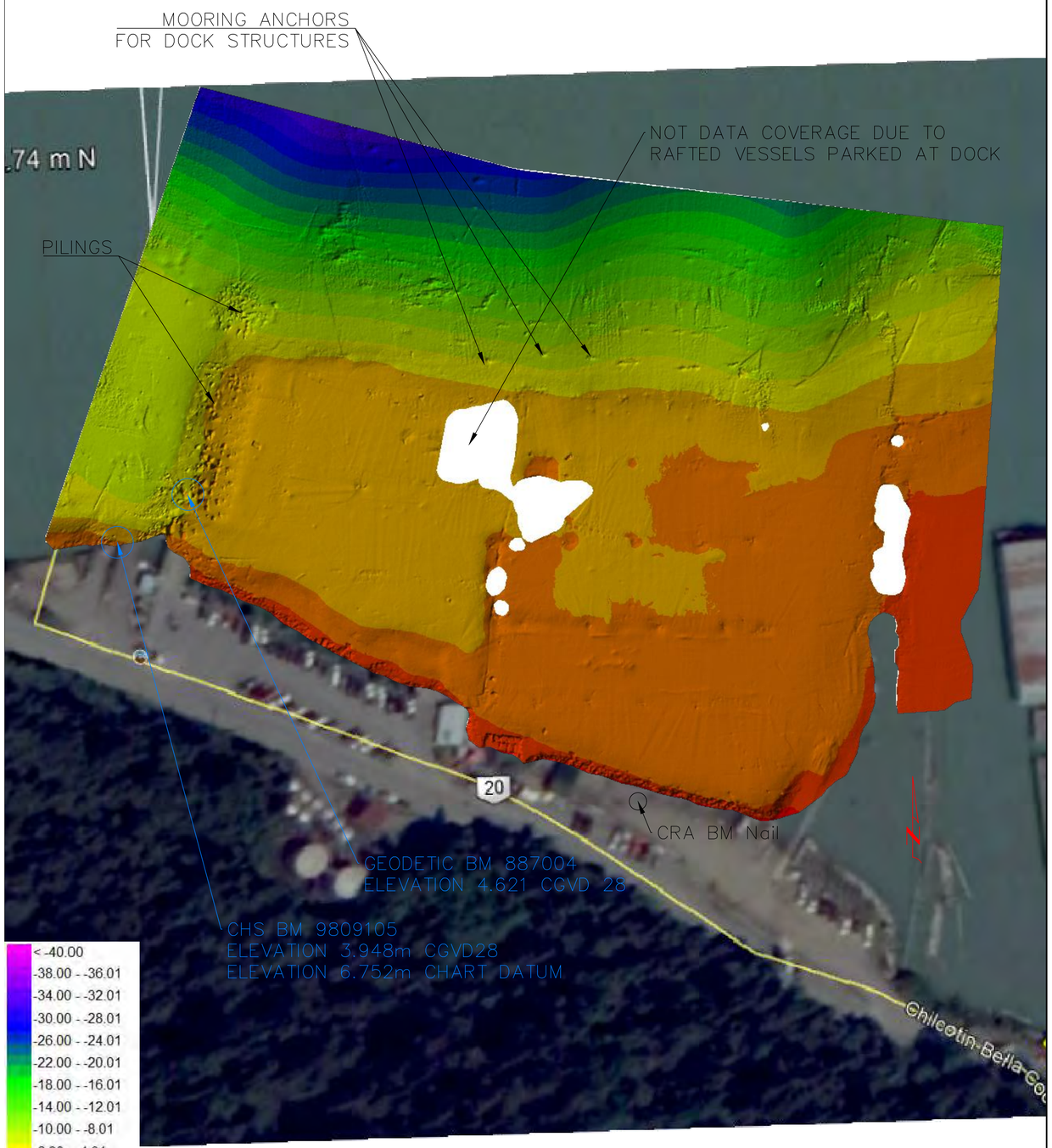
Deliverables:

- Hydrographic xyz data file
- Contours and Image showing coverage PDF and Auto Cad Format
- DEM Civil 3D format
- Report in PDF Format

CRA Canada Surveys INC.
3859 Joyce Drive
Cultus Lake, BC
V2R 5A5

Ph. 604-824-9609 Cell. 604-845-0174





< -40.00
-38.00 - -36.01
-34.00 - -32.01
-30.00 - -28.01
-26.00 - -24.01
-22.00 - -20.01
-18.00 - -16.01
-14.00 - -12.01
-10.00 - -8.01
-6.00 - -4.01
-2.00 - -0.01
>= 2.00

ELEVATION METERS BELOW CHART DATUM

HYDROGRAPHIC DATA COLLECTION EQUIPMENT USED FOR THIS PROJECT:

1. RESON SEABAT 7125 140 X 0.5 DEGREE MULTI-BEAM SONAR.
2. APPLANIX M320 WAVE MASTER GNSS RTK GPS, HEADING & MOTION SENSOR.
3. APPLIED SCIENCE AML MINOS VELOCIMETER.
4. HYPACK/HYSWEEP DATA COLLECTION SOFTWARE

SCALE (METRES) 1 : 750

0 10 25 50 100

SCALE (METRES) 1 : 750

0 10 25 50 100

GENERAL NOTES:

1. HORIZONTAL POSITIONING BY TRIMBLE APPLANIX GNSS RTKGPS RECEIVER, TO UTM GRID ZONE 9N, NAD 83.
2. SOUNDINGS OBTAINED USING AN INTERNATIONAL ORGANIZATION HYDROGRAPHIC SURVEY GRADE MULTI-BEAM ECHOSOUNDER.
3.DEPTHS ARE METERS AND ARE REDUCED TO CHART DATUM (CONVERSION 2.624m TO GEODETIC DATUM,CHS BM LISTING)
4. CONTOUR INTERVAL IS 0.5m.
5.ELEVATIONS DERIVED FROM CHS BM 9809105 ELEVATION 6.572 CD.
6. REFERENCE DRAWING INFO FOR BACKGROUND GOOGLE EARTH, FOR REFERENCE ONLY.
7. ALL INFORMATION OF THIS PLAN IS REPRESENTATIVE OF CONDITIONS AT TIME OF SURVEY.

CRA -Canada Surveys Inc.
HYDROGRAPHIC SURVEYS & MARINE INVESTIGATIONS
CRA CANADA SURVEYS INC.
3859 JOYCE DRIVE
CULTUS LAKE, BC
TEL. (604) 824-9609
www.cracan.com

NO.	DATE	REVISION / ISSUE	BY	CH	AP
1	XX / XX / XX	XXX	HAH	HAH	HAH

CLIENT:
STANTEC AND DEPARTMENT OF FISHERIES AND OCEANS

PROJECT:
INSPECTION OF BELLA COOLA HARBOUR SEABED CONDITION SURVEY

SURVEYED BY: HAH / RH DATE: 07 / 04 / 2018

PROCESSED BY: HAH DATE: 07 / 20 / 2018

DRAWING TITLE:
BATHYMETRIC CONTOUR PLAN OF BELLA COOLA HARBOUR , NORTH BENTINICK ARM, BC SURVEYED 07/04/2018

SCALE:	1 : 750
JOB NUMBER:	602_18
DRAWING NUMBER:	602_07022018
REV	-

North Coast Calendar Fiscal Year 2023

April 2022

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
Week Two																	**1**			**2**		
	10																Prince Rupert		11:00	Bella Bella	01:00	02:00
																	Klemtu	20:30	21:30	Port Hardy	09:00	18:00
	11																Skidegate		00:30			
																	Prince Rupert	07:00				
	28A																Bella Coola		14:45	Bella Bella	00:00	00:40
																	Ocean Falls	19:00	19:35	Shearwater	01:25	
																	Shearwater	22:45	23:15			
Week One		**3**			**4**			**5**			**6**			**7**			**8**			**9**		
	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week Two		**10**			**11**			**12**			**13**			**14**			**15**			**16**		
	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week One		**17**			**18**			**19**			**20**			**21**			**22**			**23**		
	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week Two		**24**			**25**			**26**			**27**			**28**			**29**			**30**		
	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			

May 2022

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
		1			**2**			**3**			**4**			**5**			**6**			**7**		
Week One	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		8			**9**			**10**			**11**			**12**			**13**			**14**		
Week Two	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		15			**16**			**17**			**18**			**19**			**20**			**21**		
Week One	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		22			**23**			**24**			**25**			**26**			**27**			**28**		
Week Two	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		29			**30**			**31**														
Week One	10	Bella Bella	01:00	02:00																		
		Klemtu	05:30	06:30																		
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00												
					Prince Rupert	17:00	22:00	Prince Rupert	17:00													
	28A	Shearwater		01:30																		
		Bella Bella	02:15	02:55																		
		Shearwater	03:40	04:10																		
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			

June 2022

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
											1			**2**			**3**			**4**		
Week One	10 PEAK										Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30
											Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00	Bella Bella	17:10	18:10
											Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30	
	11										CREW			Prince Rupert		10:30	Prince Rupert	06:00				
														Skidegate	17:30	22:00						
	28A										Bella Coola		08:30	Ocean Falls		10:00						
											Bella Bella	14:10	14:40	Shearwater	12:55	13:10						
											Shearwater	15:30	15:45	Bella Bella	14:00	14:30						
											Ocean Falls	18:40		Bella Coola	20:10							
		5			**6**			**7**			**8**			**9**			**10**			**11**		
Week Two	10 PEAK	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30
		Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00
		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30	
	11	Prince Rupert		10:00	Skidegate		10:00	Skidegate	06:00	10:00				Prince Rupert		10:00	Prince Rupert	05:00				
		Skidegate	17:00		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Bella Coola		08:30	Ocean Falls		10:00															
		Bella Bella	14:10	14:40	Shearwater	12:55	13:10															
		Shearwater	15:30	15:45	Bella Bella	14:00	14:30															
		Ocean Falls	18:40		Bella Coola	20:10																
		12			**13**			**14**			**15**			**16**			**17**			**18**		
Week One	10 PEAK	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30
		Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00	Bella Bella	17:10	18:10
		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30	
	11	Prince Rupert		10:30	Skidegate		10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:30	Prince Rupert	06:00	10:00	Prince Rupert	05:00	
		Skidegate	17:30		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:30	22:00	Skidegate	17:00	22:00			
	28A										Bella Coola		08:30	Ocean Falls		10:00						
											Bella Bella	14:10	14:40	Shearwater	12:55	13:10						
											Shearwater	15:30	15:45	Bella Bella	14:00	14:30						
											Ocean Falls	18:40		Bella Coola	20:10							
		19			**20**			**21**			**22**			**23**			**24**			**25**		
Week Two	10 PEAK	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30
		Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00
		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30	
	11	Prince Rupert		10:00	Skidegate		10:00	Skidegate	06:00	10:00				Prince Rupert		10:00	Prince Rupert	05:00	10:30	Prince Rupert	06:00	10:00
		Skidegate	17:00		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00	Skidegate	17:30	22:00	Skidegate	17:00	22:00
	28A	Bella Coola		08:30	Ocean Falls		10:00															
		Bella Bella	14:10	14:40	Shearwater	12:55	13:10															
		Shearwater	15:30	15:45	Bella Bella	14:00	14:30															
		Ocean Falls	18:40		Bella Coola	20:10																
	28							Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30
								Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30	
		26			**27**			**28**			**29**			**30**								
Week One	10 PEAK	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30						
		Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10						
		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30							
	11	Prince Rupert	05:00	10:30	Skidegate		10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:30						
		Skidegate	17:30		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:30	22:00						
	28A										Bella Coola		08:30	Ocean Falls		10:00						
											Bella Bella	14:10	14:40	Shearwater	12:55	13:10						
											Shearwater	15:30	15:45	Bella Bella	14:00	14:30						
											Ocean Falls	18:40		Bella Coola	20:10							
	28	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30												
		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30													

July 2022

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
Week One																	**1**			**2**		
	10 PEAK																Port Hardy		07:30	Prince Rupert		07:30
																	Klemtu	15:00	16:00	Bella Bella	17:10	18:10
																	Prince Rupert	23:30		Port Hardy	23:30	
	11																Prince Rupert	06:00	10:00	Prince Rupert	05:00	10:30
																	Skidegate	17:00	22:00	Skidegate	17:30	22:00
	28																Bella Coola		07:30	Port Hardy		07:30
																	Port Hardy	17:30		Bella Coola	17:30	
Week Two		**3**			**4**			**5**			**6**			**7**			**8**			**9**		
	10 PEAK	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30
		Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00
		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30	
	11	Prince Rupert	06:00	10:00	Skidegate		10:00	Skidegate	06:00	10:00				Prince Rupert		10:00	Prince Rupert	05:00	10:30	Prince Rupert	06:00	10:00
		Skidegate	17:00		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00	Skidegate	17:30	22:00	Skidegate	17:00	22:00
	28A	Bella Coola		08:30	Ocean Falls		10:00															
		Bella Bella	14:10	14:40	Shearwater	12:55	13:10															
		Shearwater	15:30	15:45	Bella Bella	14:00	14:30															
		Ocean Falls	18:40		Bella Coola	20:10																
	28							Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30
								Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30	
Week One		**10**			**11**			**12**			**13**			**14**			**15**			**16**		
	10 PEAK	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30
		Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00	Bella Bella	17:10	18:10
		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30	
	11	Prince Rupert	05:00	10:30	Skidegate		10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:30	Prince Rupert	06:00	10:00	Prince Rupert	05:00	10:30
		Skidegate	17:30		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:30	22:00	Skidegate	17:00	22:00	Skidegate	17:30	22:00
	28A										Bella Coola		08:30	Ocean Falls		10:00						
											Bella Bella	14:10	14:40	Shearwater	12:55	13:10						
											Shearwater	15:30	15:45	Bella Bella	14:00	14:30						
											Ocean Falls	18:40		Bella Coola	20:10							
	28	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30							Bella Coola		07:30	Port Hardy		07:30
		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30								Port Hardy	17:30		Bella Coola	17:30	
Week Two		**17**			**18**			**19**			**20**			**21**			**22**			**23**		
	10 PEAK	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30
		Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00
		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30	
	11	Prince Rupert	06:00	10:00	Skidegate		10:00	Skidegate	06:00	10:00				Prince Rupert		10:00	Prince Rupert	05:00	10:30	Prince Rupert	06:00	10:00
		Skidegate	17:00		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00	Skidegate	17:30	22:00	Skidegate	17:00	22:00
	28A	Bella Coola		08:30	Ocean Falls		10:00															
		Bella Bella	14:10	14:40	Shearwater	12:55	13:10															
		Shearwater	15:30	15:45	Bella Bella	14:00	14:30															
		Ocean Falls	18:40		Bella Coola	20:10																
	28							Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30
								Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30	
Week One		**24**			**25**			**26**			**27**			**28**			**29**			**30**		
	10 PEAK	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30
		Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00	Bella Bella	17:10	18:10
		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30	
	11	Prince Rupert	05:00	10:30	Skidegate		10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:30	Prince Rupert	06:00	10:00	Prince Rupert	05:00	10:30
		Skidegate	17:30		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:30	22:00	Skidegate	17:00	22:00	Skidegate	17:30	22:00
	28A										Bella Coola		08:30	Ocean Falls		10:00						
											Bella Bella	14:10	14:40	Shearwater	12:55	13:10						
											Shearwater	15:30	15:45	Bella Bella	14:00	14:30						
											Ocean Falls	18:40		Bella Coola	20:10							
	28	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30							Bella Coola		07:30	Port Hardy		07:30
		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30								Port Hardy	17:30		Bella Coola	17:30	
Week Two		**31**																				
	10 PEAK	Port Hardy		07:30																		
		Bella Bella	12:50	13:50																		
		Prince Rupert	23:30																			
	11	Prince Rupert	06:00	10:00																		
		Skidegate	17:00																			
	28A	Bella Coola		08:30																		
		Bella Bella	14:10	14:40																		
		Shearwater	15:30	15:45																		
		Ocean Falls	18:40																			

August 2022

Week Type	Route	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Week Two			**1**	**2**	**3**	**4**	**5**	**6**
	10 PEAK		Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Klemtu 15:00 16:00 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Klemtu 15:00 16:00 Prince Rupert 23:30
	11		Skidegate 10:00 Prince Rupert 17:00 22:00	Skidegate 06:00 10:00 Prince Rupert 17:00		Prince Rupert 10:00 Skidegate 17:00 22:00	Prince Rupert 05:00 10:30 Skidegate 17:30 22:00	Prince Rupert 06:00 10:00 Skidegate 17:00 22:00
	28A		Ocean Falls 10:00 Shearwater 12:55 13:10 Bella Bella 14:00 14:30 Bella Coola 20:10					
	28			Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30	Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30	Bella Coola 07:30 Port Hardy 17:30
Week One		**7**	**8**	**9**	**10**	**11**	**12**	**13**
	10 PEAK	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Klemtu 15:00 16:00 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Klemtu 15:00 16:00 Prince Rupert 23:30	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30
	11	Prince Rupert 05:00 10:30 Skidegate 17:30	Skidegate 10:00 Prince Rupert 17:00 22:00	Skidegate 06:00 10:00 Prince Rupert 17:00	CREW	Prince Rupert 10:30 Skidegate 17:30 22:00	Prince Rupert 06:00 10:00 Skidegate 17:00 22:00	Prince Rupert 05:00 10:30 Skidegate 17:30 22:00
	28A				Bella Coola 08:30 Bella Bella 14:10 14:40 Shearwater 15:30 15:45 Ocean Falls 18:40	Ocean Falls 10:00 Shearwater 12:55 13:10 Bella Bella 14:00 14:30 Bella Coola 20:10		
	28	Port Hardy 07:30 Bella Coola 17:30	Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30			Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30
Week Two		**14**	**15**	**16**	**17**	**18**	**19**	**20**
	10 PEAK	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Klemtu 15:00 16:00 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Klemtu 15:00 16:00 Prince Rupert 23:30
	11	Prince Rupert 06:00 10:00 Skidegate 17:00	Skidegate 10:00 Prince Rupert 17:00 22:00	Skidegate 06:00 10:00 Prince Rupert 17:00		Prince Rupert 10:00 Skidegate 17:00 22:00	Prince Rupert 05:00 10:30 Skidegate 17:30 22:00	Prince Rupert 06:00 10:00 Skidegate 17:00 22:00
	28A	Bella Coola 08:30 Bella Bella 14:10 14:40 Shearwater 15:30 15:45 Ocean Falls 18:40	Ocean Falls 10:00 Shearwater 12:55 13:10 Bella Bella 14:00 14:30 Bella Coola 20:10					
	28		Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30	Port Hardy 07:30 Bella Coola 17:30	Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30	Bella Coola 07:30 Port Hardy 17:30
Week One		**21**	**22**	**23**	**24**	**25**	**26**	**27**
	10 PEAK	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Klemtu 15:00 16:00 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Klemtu 15:00 16:00 Prince Rupert 23:30	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30
	11	Prince Rupert 05:00 10:30 Skidegate 17:30	Skidegate 10:00 Prince Rupert 17:00 22:00	Skidegate 06:00 10:00 Prince Rupert 17:00	CREW	Prince Rupert 10:30 Skidegate 17:30 22:00	Prince Rupert 06:00 10:00 Skidegate 17:00 22:00	Prince Rupert 05:00 10:30 Skidegate 17:30 22:00
	28A				Bella Coola 08:30 Bella Bella 14:10 14:40 Shearwater 15:30 15:45 Ocean Falls 18:40	Ocean Falls 10:00 Shearwater 12:55 13:10 Bella Bella 14:00 14:30 Bella Coola 20:10		
	28	Port Hardy 07:30 Bella Coola 17:30	Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30			Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30
Week Two		**28**	**29**	**30**	**31**			
	10 PEAK	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Bella Bella 17:10 18:10 Port Hardy 23:30	Port Hardy 07:30 Bella Bella 12:50 13:50 Prince Rupert 23:30	Prince Rupert 07:30 Klemtu 15:00 16:00 Port Hardy 23:30			
	11	Prince Rupert 06:00 10:00 Skidegate 17:00	Skidegate 10:00 Prince Rupert 17:00 22:00	Skidegate 06:00 10:00 Prince Rupert 17:00				
	28A	Bella Coola 08:30 Bella Bella 14:10 14:40 Shearwater 15:30 15:45 Ocean Falls 18:40	Ocean Falls 10:00 Shearwater 12:55 13:10 Bella Bella 14:00 14:30 Bella Coola 20:10					
	28			Bella Coola 07:30 Port Hardy 17:30	Port Hardy 07:30 Bella Coola 17:30			

September 2022

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
Week Two														**1**			**2**			**3**		
	10 PEAK													Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30
														Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00
														Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30	
	11													Prince Rupert		10:00	Prince Rupert	05:00	10:30	Prince Rupert	06:00	10:00
														Skidegate	17:00	22:00	Skidegate	17:30	22:00	Skidegate	17:00	22:00
	28													Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30
														Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30	
		4			**5**			**6**			**7**			**8**			**9**			**10**		
Week One	10 PEAK	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30
		Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00	Bella Bella	17:10	18:10
		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30	
	11	Prince Rupert	05:00	10:30	Skidegate		10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:30	Prince Rupert	06:00	10:00	Prince Rupert	05:00	
		Skidegate	17:30		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:30	22:00	Skidegate	17:00	22:00			
	28A										Bella Coola		08:30	Ocean Falls		10:00						
											Bella Bella	14:10	14:40	Shearwater	12:55	13:10						
											Shearwater	15:30	15:45	Bella Bella	14:00	14:30						
											Ocean Falls	18:40		Bella Coola	20:10							
	28	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30							Bella Coola		07:30	Port Hardy		07:30
		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30								Port Hardy	17:30		Bella Coola	17:30	
		11			**12**			**13**			**14**			**15**			**16**			**17**		
Week Two	10 PEAK	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30
		Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00
		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30	
	11	Prince Rupert		10:00	Skidegate		10:00	Skidegate	06:00	10:00				Prince Rupert		10:00	Prince Rupert	05:00	10:30	Prince Rupert	06:00	
		Skidegate	17:00		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00	Skidegate	17:30	22:00			
	28A	Bella Coola		08:30	Ocean Falls		10:00															
		Bella Bella	14:10	14:40	Shearwater	12:55	13:10															
		Shearwater	15:30	15:45	Bella Bella	14:00	14:30															
		Ocean Falls	18:40		Bella Coola	20:10																
	28							Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30
								Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30	
		18			**19**			**20**			**21**			**22**			**23**			**24**		
Week One	10 PEAK	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30
		Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Klemtu	15:00	16:00	Bella Bella	17:10	18:10
		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30	
	11	Prince Rupert		10:30	Skidegate		10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:30	Prince Rupert	06:00				
		Skidegate	17:30		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:30	22:00						
	28A										Bella Coola		08:30	Ocean Falls		10:00						
											Bella Bella	14:10	14:40	Shearwater	12:55	13:10						
											Shearwater	15:30	15:45	Bella Bella	14:00	14:30						
											Ocean Falls	18:40		Bella Coola	20:10							
	28	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30							Bella Coola		07:30	Port Hardy		07:30
		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30								Port Hardy	17:30		Bella Coola	17:30	
		25			**26**			**27**			**28**			**29**			**30**					
Week Two	10 PEAK	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30	Port Hardy		07:30	Prince Rupert		07:30			
		Bella Bella	12:50	13:50	Bella Bella	17:10	18:10	Bella Bella	12:50	13:50	Klemtu	15:00	16:00	Bella Bella	12:50	13:50	Bella Bella	17:10	18:10			
		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30		Prince Rupert	23:30		Port Hardy	23:30				
																	Prince Rupert		11:00			
																	Klemtu	20:30	21:30			
	11	Prince Rupert		10:00	Skidegate		10:00	Skidegate	06:00	10:00	(Vessel Swap)			Prince Rupert		10:00	Prince Rupert	05:00				
		Skidegate	17:00		Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Bella Coola		08:30	Ocean Falls		10:00															
		Bella Bella	14:10	14:40	Shearwater	12:55	13:10															
		Shearwater	15:30	15:45	Bella Bella	14:00	14:30															
		Ocean Falls	18:40		Bella Coola	20:10																
	28							Bella Coola		07:30	Port Hardy		07:30	Bella Coola		07:30	Port Hardy		07:30			
								Port Hardy	17:30		Bella Coola	17:30		Port Hardy	17:30		Bella Coola	17:30				

October 2022

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
																				1		
Week Two	10																			Bella Bella	01:00	02:00
																				Port Hardy	09:00	18:00
	11																					
	28A																					
		2			**3**			**4**			**5**			**6**			**7**			**8**		
Week One	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A																Bella Coola		14:45	Bella Bella	00:00	00:40
																	Ocean Falls	19:00	19:35	Shearwater	01:25	
																	Shearwater	22:45	23:15			
		9			**10**			**11**			**12**			**13**			**14**			**15**		
Week Two	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		16			**17**			**18**			**19**			**20**			**21**			**22**		
Week One	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		23			**24**			**25**			**26**			**27**			**28**			**29**		
Week Two	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		30			**31**																	
Week One	10	Bella Bella	01:00	02:00																		
		Klemtu	05:30	06:30																		
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00															
					Prince Rupert	17:00	22:00															
	28A	Shearwater		01:30																		
		Bella Bella	02:15	02:55																		
		Shearwater	03:40	04:10																		
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			

November 2022

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
Week One								**1**			**2**			**3**			**4**			**5**		
	10																Prince Rupert		11:00	Bella Bella	01:00	02:00
																	Klemtu	20:30	21:30	Port Hardy	09:00	18:00
	11							Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
								Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A																Bella Coola		14:45	Bella Bella	00:00	00:40
																	Ocean Falls	19:00	19:35	Shearwater	01:25	
																	Shearwater	22:45	23:15			
Week Two		**6**			**7**			**8**			**9**			**10**			**11**			**12**		
	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week One		**13**			**14**			**15**			**16**			**17**			**18**			**19**		
	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week Two		**20**			**21**			**22**			**23**			**24**			**25**			**26**		
	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week One		**27**			**28**			**29**			**30**											
	10	Bella Bella	01:00	02:00																		
		Klemtu	05:30	06:30																		
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW											
					Prince Rupert	17:00	22:00	Prince Rupert	17:00													
	28A	Shearwater		01:30																		
		Bella Bella	02:15	02:55																		
		Shearwater	03:40	04:10																		
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			

December 2022

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
Week One														1			2			3		
	10																Prince Rupert		11:00	Bella Bella	01:00	02:00
																	Klemtu	20:30	21:30	Port Hardy	09:00	18:00
	11													Prince Rupert		10:00	Prince Rupert	07:00				
														Skidegate	17:00	22:00						
	28A																Bella Coola		14:45	Bella Bella	00:00	00:40
																	Ocean Falls	19:00	19:35	Shearwater	01:25	
																	Shearwater	22:45	23:15			
Week Two		4			5			6			7			8			9			10		
	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week One		11			12			13			14			15			16			17		
	10	Bella Bella	01:00	02:00													Prince Rupert *		17:00	Klemtu	01:30	02:30
		Klemtu	05:30	06:30																Bella Bella	05:30	06:30
		Prince Rupert	16:00																	Port Hardy *	13:00	19:00
																	(* Delayed departure)			(* Delayed departure)		
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		19:25	Ocean Falls		00:15
		Bella Bella	02:15	02:55													Ocean Falls	23:40		Shearwater	03:25	03:55
		Shearwater	03:40	04:10																Bella Bella	04:40	05:20
		Ocean Falls	07:20	08:05																Shearwater	06:05	
		Bella Coola	12:15														(* Delayed departure)					
Week Two		18			19			20			21			22			23			24		
	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week One		25			26			27			28			29			30			31		
	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			

January 2023

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
		1			**2**			**3**			**4**			**5**			**6**			**7**		
Week Two	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		8			**9**			**10**			**11**			**12**			**13**			**14**		
Week One	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		15			**16**			**17**			**18**			**19**			**20**			**21**		
Week Two	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		22			**23**			**24**			**25**			**26**			**27**			**28**		
Week One	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30													Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW			Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
		29			**30**			**31**														
Week Two	10	Bella Bella	01:00	02:00				Prince Rupert		20:00												
		Klemtu	05:30	06:30																		
		Prince Rupert	16:00																			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00												
					Prince Rupert	17:00	22:00	Prince Rupert	16:30													
	28A	Shearwater		01:30																		
		Bella Bella	02:15	02:55																		
		Shearwater	03:40	04:10																		
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			

February 2023

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
Week Two											**1**			**2**			**3**			**4**		
	10										Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
											Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
											Bella Bella	23:30										
	11													Prince Rupert		14:30	Skidegate		00:30			
														Skidegate	21:00		Prince Rupert	07:00				
	28A																Bella Coola		14:45	Bella Bella	00:00	00:40
																	Ocean Falls	19:00	19:35	Shearwater	01:25	
																	Shearwater	22:45	23:15			
Week One		**5**			**6**			**7**			**8**			**9**			**10**			**11**		
	10	Bella Bella	01:00	02:00													Bella Bella		00:10	Prince Rupert	07:00	
		Klemtu	05:30	06:30										Prince Rupert		10:00	Port Hardy	07:00	11:00			
		Prince Rupert	16:00											Klemtu	19:00	20:00	Bella Bella	17:30	18:30			
														Bella Bella	23:10		Klemtu	21:35	22:35			
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00	CREW									Prince Rupert		11:00
					Prince Rupert	17:00	22:00	Prince Rupert	17:00											Skidegate	18:00	22:00
	28A	Shearwater		01:30										Bella Coola		13:05	Shearwater		17:55	Ocean Falls		00:35
		Bella Bella	02:15	02:55										Ocean Falls	17:20	17:55	Bella Bella	18:45	19:25	Bella Coola	04:50	
		Shearwater	03:40	04:10										Shearwater	21:05	21:35	Shearwater	20:10	20:40			
		Ocean Falls	07:20	08:05										Bella Bella	22:20	23:00	Ocean Falls	23:50				
		Bella Coola	12:15											Shearwater	23:50							
Week Two		**12**			**13**			**14**			**15**			**16**			**17**			**18**		
	10							Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		09:00	Port Hardy	05:00	09:00
											Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	17:30	18:30	Bella Bella	15:00	16:00
											Bella Bella	23:30					Bella Bella	21:30	22:30	Klemtu	19:00	20:00
	11	Prince Rupert	06:00	22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Prince Rupert	05:30				
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	20:30	23:30						
	28A																Bella Coola		11:15	Shearwater		15:30
																	Ocean Falls	15:30	16:05	Bella Bella	16:15	16:55
																	Shearwater	19:15	19:55	Shearwater	17:40	18:10
																	Bella Bella	20:40	21:20	Ocean Falls	21:20	22:05
																	Shearwater	22:05				
Week One		**19**			**20**			**21**			**22**			**23**			**24**			**25**		
	10	Prince Rupert	04:00		Prince Rupert		01:00	Port Hardy		07:00							Prince Rupert		11:00	Bella Bella	01:00	02:00
					Klemtu	10:20	11:20	Bella Bella	13:00	14:00	CREW						Klemtu	20:30	21:30	Port Hardy	09:00	18:00
					Bella Bella	14:30	15:30	Prince Rupert	23:59													
					Port Hardy	22:00																
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		Prince Rupert	22:00								Prince Rupert	23:00										
	28A	Bella Coola	02:20														Bella Coola		14:45	Bella Bella	00:00	00:40
																	Ocean Falls	19:00	19:35	Shearwater	01:25	
																	Shearwater	22:45	23:15			
Week Two		**26**			**27**			**28**														
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		Prince Rupert	16:00																			
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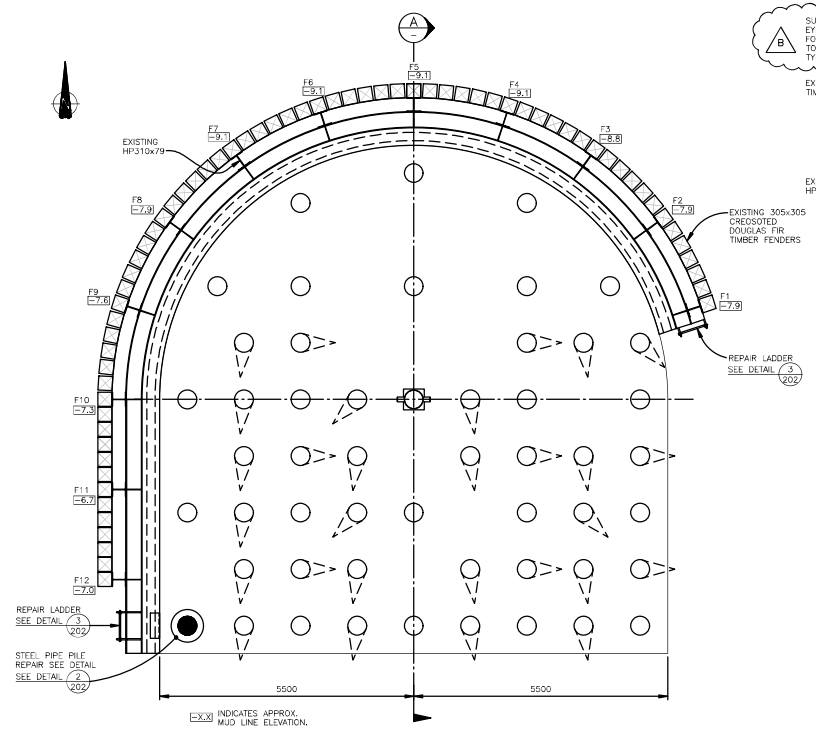
					Prince Rupert	17:00	22:00	Prince Rupert	16:30													
	28A	Shearwater		01:30																		
		Bella Bella	02:15	02:55																		
		Shearwater	03:40	04:10																		
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			

March 2023

Week Type	Route	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
		Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart	Terminal	Arrival	Depart
Week Two											**1**			**2**			**3**			**4**		
	10										Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
											Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
											Bella Bella	23:30										
	11													Prince Rupert		14:30	Skidegate		00:30			
														Skidegate	21:00		Prince Rupert	07:00				
	28A																Bella Coola		14:45	Bella Bella	00:00	00:40
																	Ocean Falls	19:00	19:35	Shearwater	01:25	
																	Shearwater	22:45	23:15			
Week One		**5**			**6**			**7**			**8**			**9**			**10**			**11**		
	10	Bella Bella	01:00	02:00													Prince Rupert *		17:00	Klemtu	02:00	03:00
		Klemtu	05:30	06:30													(* Delayed departure			Bella Bella	06:15	07:15
		Prince Rupert	16:00														for Spring Break)			Port Hardy *	14:00	19:00
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00		CREW		Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		19:55	Ocean Falls	00:10	00:45
		Bella Bella	02:15	02:55																Shearwater	03:55	04:25
		Shearwater	03:40	04:10													(* Delayed departure			Bella Bella	05:15	05:55
		Ocean Falls	07:20	08:05													for Spring Break)			Shearwater	06:45	
		Bella Coola	12:15																			
Week Two		**12**			**13**			**14**			**15**			**16**			**17**			**18**		
	10	Bella Bella	01:00	02:00				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00	Bella Bella	01:00	02:00
		Klemtu	05:30	06:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30	Port Hardy	09:00	18:00
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		01:30													Bella Coola		14:45	Bella Bella	00:00	00:40
		Bella Bella	02:15	02:55													Ocean Falls	19:00	19:35	Shearwater	01:25	
		Shearwater	03:40	04:10													Shearwater	22:45	23:15			
		Ocean Falls	07:20	08:05																		
		Bella Coola	12:15																			
Week One		**19**			**20**			**21**			**22**			**23**			**24**			**25**		
	10	Bella Bella	01:00	02:00													Prince Rupert		11:00	Port Hardy *	06:00	20:00
		Klemtu	05:30	06:30													Klemtu	19:00	20:00	(* Delayed departure)		
		Prince Rupert	16:00														Bella Bella	23:00	23:59	**VESSEL SWAP**		
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00		CREW		Prince Rupert		10:00	Prince Rupert	07:00				
					Prince Rupert	17:00	22:00	Prince Rupert	17:00					Skidegate	17:00	22:00						
	28A	Shearwater		01:30													Bella Coola		12:55	Shearwater	00:35	
		Bella Bella	02:15	02:55													Ocean Falls	17:10	17:45			
		Shearwater	03:40	04:10													Shearwater	20:55	21:25			
		Ocean Falls	07:20	08:05													Bella Bella	22:10	22:50			
		Bella Coola	12:15																			
Week Two		**26**			**27**			**28**			**29**			**30**			**31**					
	10	Bella Bella	02:20	03:20				Prince Rupert		20:00	Bella Bella	06:30	07:30	Bella Bella		00:30	Prince Rupert		11:00			
		Klemtu	06:30	07:30							Port Hardy	13:45	17:15	Prince Rupert	11:00		Klemtu	20:30	21:30			
		Prince Rupert	16:00								Bella Bella	23:30										
	11	Prince Rupert		22:00	Skidegate	06:00	10:00	Skidegate	06:00	10:00				Prince Rupert		14:30	Skidegate		00:30			
					Prince Rupert	17:00	22:00	Prince Rupert	16:30					Skidegate	21:00		Prince Rupert	07:00				
	28A	Shearwater		02:50													Bella Coola		14:45			
		Bella Bella	03:35	04:15													Ocean Falls	19:00	19:35			
		Shearwater	05:00	05:30													Shearwater	22:45	23:15			
		Ocean Falls	08:40	09:25																		
		Bella Coola	13:35																			



PLAN
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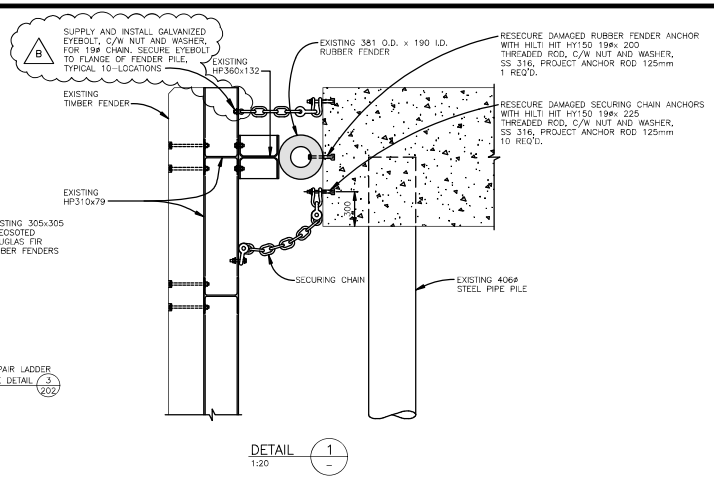

DETAIL 1
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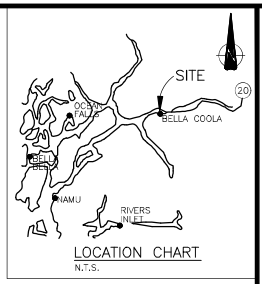
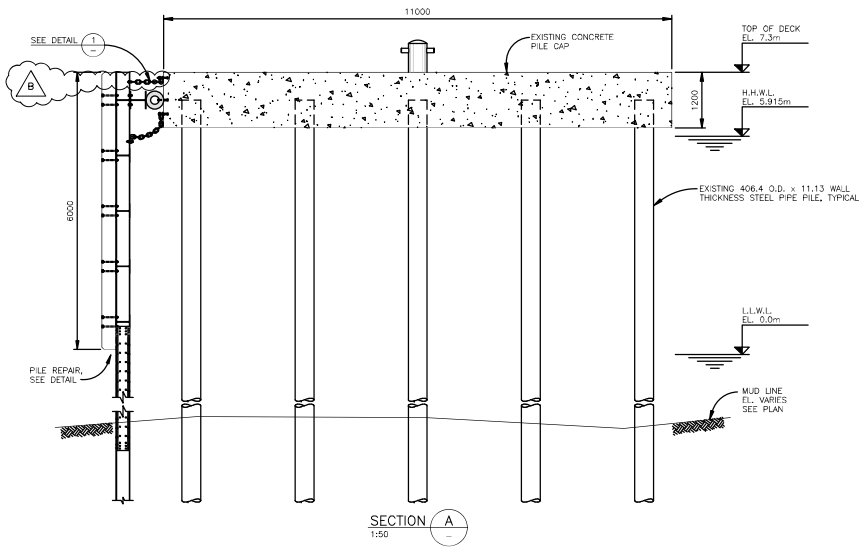


LOCATION CHART
N.T.S.



SECTION A
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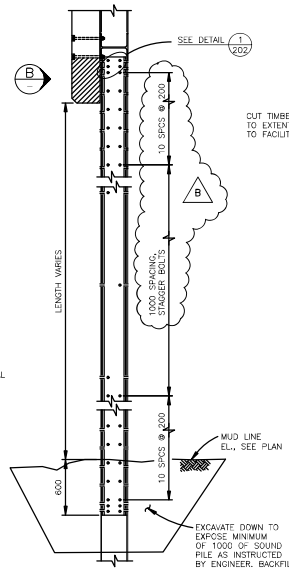
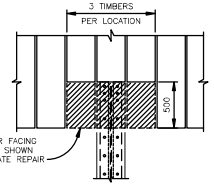


PILE REPAIR DETAIL
1:25



VIEW B
1:25

DRAWING LIST:

01676-00-201 – PLAN, SECTION AND DETAILS
01676-00-202 – MISCELLANEOUS DETAILS

NOTES:

1. DETAILED REQUIREMENTS FOR MATERIALS, FABRICATION AND INSTALLATION PROCEDURES ARE DESCRIBED IN THE SPECIFICATIONS. FOR CONVENIENCE CERTAIN EXTRACTS ARE REPRODUCED BELOW. IN THE EVENT OF CONFLICT, THE SPECIFICATION SHALL GOVERN.
2. THE CONTRACTOR SHALL NOTIFY THE HARBOUR MASTER REGARDING THE SPACE REQUIREMENTS TO EXECUTE THE WORK AND FOR TEMPORARY STORAGE OF CONSTRUCTION MATERIALS PRIOR TO COMMENCEMENT.
3. VERIFY ALL DIMENSIONS AND ELEVATIONS ON SITE PRIOR TO COMMENCING WORK.
4. ALL WORK SHALL CONFORM TO THE CANADA LABOUR CODE, THE B.C. BUILDING CODE, WCB INDUSTRIAL HEALTH AND SAFETY REGULATIONS, CSA A23.1, CSA S16.1 AND ANY OTHER CODE OR BYLAW OF FEDERAL, PROVINCIAL OR LOCAL APPLICATION.
5. THE CONTRACTOR SHALL COMPLY WITH FEDERAL, PROVINCIAL AND REGIONAL DISTRICT LAWS, ORDERS AND REGULATIONS CONCERNING THE DISPOSAL OR DISPERSION OF PRODUCTS INTO THE ENVIRONMENT.
6. SUBMIT DETAILS OF PROPOSED WORK METHODS TO ENGINEER PRIOR TO PROCEEDING WITH THE WORK. OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO CUTTING, DEMOLISHING OR REMOVING ANY EXISTING STRUCTURE OR SERVICE.
7. PILE PREPARATION: PILES TO BE REPAIRED SHALL BE CLEANED TO REMOVE ALL MARINE GROWTH, DEBRIS AND SURFACE SCALE TO THE APPROVAL OF THE ENGINEER.
8. SUBMIT FABRICATION DRAWINGS OF STRUCTURAL STEEL TO THE ENGINEER PRIOR TO COMMENCING FABRICATION.
9. STRUCTURAL STEEL FABRICATOR SHALL BE CERTIFIED UNDER CSA W47.1 AND CWB REGULATIONS TO DIV. 2.1.
10. LEAN MIX CONCRETE WITH MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 25 MPa, OR APPROVED NON-SHRINK GROUT.
11. ROLLED SHAPES, PLATES, AND ANGLES TO CSA G40.21 GRADE 300W.
12. BOLTS, NUTS AND WASHERS TO ASTM A325, U.N.O.
13. STAINLESS STEEL THREADED ROD AND HARDWARE TO ASTM A193-01c. INSTALL HILTI ADHESIVE SYSTEM IN STRICT ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
14. COAT CHANNELS WITH APPROVED COAL TAR EPOXY COATING. SURFACES SHALL RECEIVE 2-COATS, 203 MICRONS EACH DRY FILM THICKNESS. BLAST SURFACES TO A WHITE METAL FINISH IN ACCORDANCE WITH SSPC-SP10. APPLY COATING IN STRICT ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
15. REMOVE ALL DEBRIS AND SURPLUS MATERIALS FROM THE SITE AND LEAVE THE WORK AREA IN A CLEAN AND NEAT CONDITION TO THE SATISFACTION OF THE CROWN.

No.	Date	Description	Drawn by Dessiné par	Approved Approuvé
B	FEB19/02	REVISED AS SHOWN		
A	JAN11/02	ISSUED FOR CONSTRUCTION		
P1	DEC21/01	ISSUED FOR CLIENT REVIEW		

Revision / Revision

A/B Detail number / Numéro de detail; Sheet number / Numéro de la feuille

Linear dimensions in millimetres / Dimensions linéaires en millimètres

Consultant's Name / Nom de l'expert-conseil: Westmar — Maritime, Structural, Civil and Materials Handling Engineers — Westmar Project: 01676

Eng. Stamp / Sceau de l'ingénieur

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

Canada

Client/client: Fisheries and Oceans Canada / Pêches et Océans Canada — Small Craft Harbours / Ports pour Petits Bateaux

Project title/Titre du projet:

BELLA COOLA, BC
BERTH REPAIRS

Drawing title/Titre du dessin:

TURNING DOLPHIN REPAIRS
PLAN, SECTION AND DETAILS

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date
	BJM	DEC18/01
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
		SHOWN

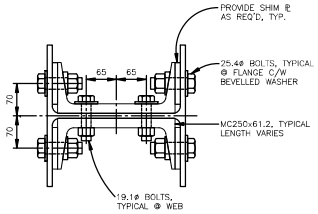
Tender, PWGSC Project Manager/Tendre, TPSGC Directeur de Projet

A & E SERVICES/GENIE ET ARCHITECTURE — Date

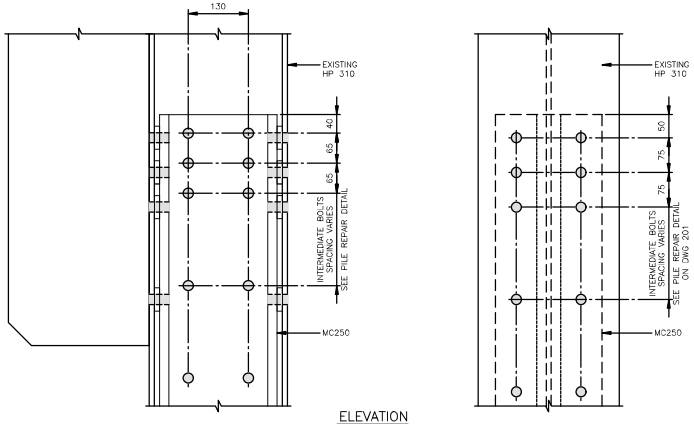
Project No./N°de projet	Asset No./N° de bien	Sheet No./N° de la feuille
849535		1 of 2

Drawing Reference No./N°de référence du dessin: 01676-00-201

Filename: P:\2001\01676\STRUCT\01676-00-201.DWG – Feb. 19/02 3:45pm JCHEFFINS



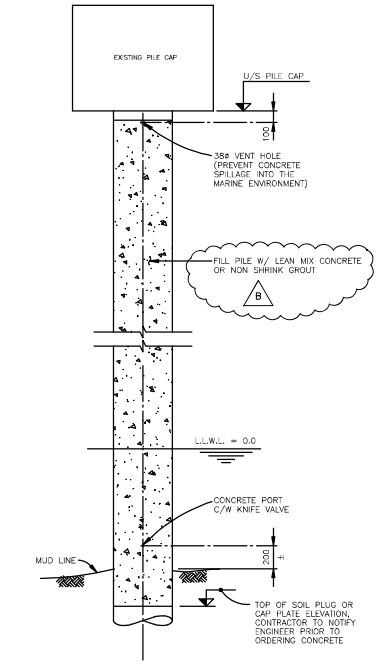
PLAN



ELEVATION

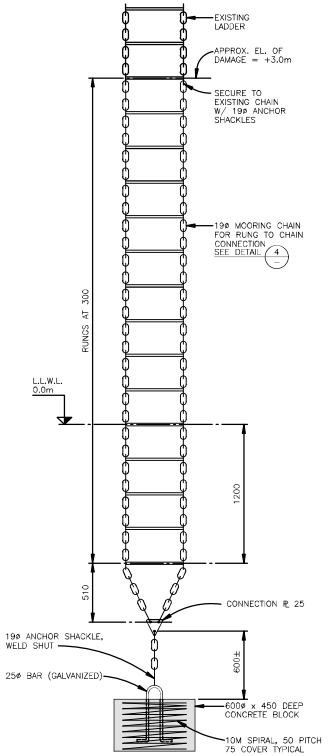
DETAIL 1 / 201
1:5

NOTE: DETAIL IS SIMILAR AT BOTTOM.



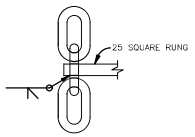
ELEVATION – STEEL PIPE PILE REPAIR

DETAIL 2 / –
1:20



DETAIL 3 / 201
1:20

NOTE: SECURE ALL SHACKLES WITH NYLON ZAP STRAPS.



DETAIL 4 / –
1:5

No.	Date	Description	Drawn by / Dessiné par	Approved / Approuvé
B	FEB19/02	REVISED AS SHOWN		
A	JAN11/02	ISSUED FOR CONSTRUCTION		
P1	DEC21/01	ISSUED FOR CLIENT REVIEW		

Revision / Revision

A/B — Detail number / Numéro de détail; Sheet number / Numéro de la feuille

Linear dimensions in millimetres / Dimensions linéaires en millimètres

Consultant's Name / Nom de l'expert-conseil

Westmar
Maritime, Structural, Civil and Materials Handling Engineers
Westmar Project: 01676

Eng. Stamp / Sceau de l'ingénieur

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

Canada

Client/client

Fisheries and Oceans Canada / Pêches et Océans Canada

Small Craft Harbours / Ports pour Petits Bateaux

Project title/Titre du projet

BELLA COOLA, BC
BERTH REPAIRS

Drawing title/Titre du dessin

TURNING DOLPHIN REPAIRS
MISCELLANEOUS DETAILS

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date
	BJM	DEC19/01
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
		SHOWN

Tender, PWGSC Project Manager/ Tendre, TPSGC Directeur de Projet

A & E SERVICES/ GÉNIE ET ARCHITECTURE — Date

Project No./N°de projet	Asset No./N° de bien	Sheet No./ N° de la feuille
849535		2 of 2

Drawing Reference No./N° de référence du dessin
01676–00–202

Filename: P:\2001\01676\STRUCT\01676-00-202.DWG – Feb. 19/02 3:33pm JCHEFFINS

RYZUK GEOTECHNICAL
Engineering & Materials Testing

28 Crease Avenue, Victoria, BC, V8Z 1S3 Tel: 250-475-3131 Fax: 250-475-3611 www.ryzuk.com

June 22, 2017
File No. 540-54

British Columbia Ferry Services Inc.
Suite 500 – 1321 Blanshard Street
Victoria, BC
V8W 0B7

Attn: Steve Mayall, Senior Project Manager – Terminal Construction

Re: Bella Coola Ferry Terminal
Test Pile Investigation

As requested, we attended the referenced site to complete a test pile investigation in the berth area of the Bella Coola Terminal. The purpose of the exploration was to assess subsurface soils conditions beneath the mudline and to determine depth to bedrock or other competent stratum for new piles that could be required as part of future terminal upgrade works. The following summarizes the results of the test pile investigation and provides preliminary geotechnical recommendations. Our work was completed in accordance with, and subject to, the attached Terms of Engagement.

SITE DESCRIPTION

The Bella Coola Ferry Terminal is located on the interior central coast of BC near the mouth of the Bella Coola River. The existing terminal is a single berth, located in an approximately north-south orientation, on the south side of the inlet. The terminal is located immediately adjacent to the west side of the existing Government wharf, and currently relies on the existing government wharf piles for pontoon and dolphin support. The ramp abutment currently consists of a steel sheet pile retaining structure.

The existing shoreline immediately surrounding the terminal generally consists of 0.3 to 0.9 m diameter riprap reinforced slopes. Immediately across the road from the terminal is an exposed bedrock bluff, which slopes down towards the water. Blasting has been locally completed for the highway. The bedrock was observed to generally consist of massive granitic igneous rock, with an estimated rock hardness of R4 to R5. Available bathymetric data indicates the seabed within the berth dips down moderately from the south to north, and is generally at between -5 to -7 m (chart) within the berth itself.

PROPOSED DEVELOPMENT

We understand that the project will involve a partial reconstruction of the terminal, including new pontoon supporting piles as well as new dolphin piles. The new terminal will utilize arrangement of vertical and possible battered steel pipe piles for support. While the design has yet to be finalized, it is expected that all piles will be subject to some element of vertical (compression/tension) and lateral loading, however the exact loading conditions are unknown at this time.

INVESTIGATION

The test piles were advanced by Sawchuck Pile Driving Ltd., under supervision by Ryzuk, at predetermined locations provided by others. The test pile investigation was limited to two working days onsite and the location and number of test piles were modified in the field based on time limitations access restraints as well as depth to competent soil layers. At the time of the investigation the Nimpkish Ferry was docked on the west side of the pontoon and undergoing engine overhaul.

In total, nine (9) test piles were completed on May 17 and 18, 2017. Four test piles were driven with a combination of vibratory and drop hammer methodology. In general, these piles were advanced with the vibratory hammer to roughly 5-15 m penetration, and then driven to depth with the drop hammer. The test piles were driven to either the limit of available pile length or until refusal was encountered on inferred bedrock. Penetration rates and blows per 0.3 m (1’) were recorded during the driving process. On two of the driven piles, a Pile Driving Analyzer (PDA) was utilized to determine actual capacity of the pile, as well as to determine approximate shaft unit resistances from the soil at the time of driving.

The remaining five test piles were “probes” and were driven by vibratory hammer to depth, until the limit of pile length of until refusal was encountered on bedrock.

The test piles consisted of a 273.0 mm (10.75”) outer diameter, 12.7 mm (0.5”) wall, open ended steel pipe pile. The vibratory hammer consisted of an ICE Model 216D, and the drop hammer utilized was 2273 kg (5000 lbs).

Water depths were recorded at various times during driving of the test piles, and tidal data at the time of driving was utilized to estimate tide levels, and subsequently mudline elevation (Chart datum) for each test pile, at an approximately plus or minus 0.5 m accuracy.

The Test Pile locations were located based on existing site infrastructure to an accuracy of roughly +/- 2 m. Approximate test pile location are shown on the attached Location Plan, drawing 540-54-1.

In addition to the above, pile depth markings were observed on some of the octagonal concrete precast piles supporting the existing government wharf. Based on correlation of the markings with the depths to bedrock observed in the test piles, it appears the that wharf piles were driven to the bedrock surface. The pile depth markings were recorded in all observed locations, and bedrock elevations were estimated assuming that all the piles were driven to rock. This additional information is provided on the attached drawings, and has been used to help interpolate the bedrock profile of the site.

RESULTS & PRELIMINARY DESIGN RECOMMENDATIONS

Based on the results of the test piles, and observations of markings on the adjacent wharf piles, the sub seabed soils within the terminal were noted to consist of an overburden layer of soft/loose soil overlying an intermittent compact/stiff layer overlying bedrock. As expected, the bedrock profile slopes down from the south to the north, from roughly -17 m near the foreshore to deeper than -39.7 m (chart). A cross section along the east side of the terminal showing the soil layers and bedrock profile encountered is attached for reference in drawing 540-54-2, Blow count information recorded in the upper soft/loose material ranged from 2 to 7 blows per 0.3 m, utilizing a 1.5 m drop height, generally increasing with depth. Within the stiff/compact layer intermittently present above bedrock, blow counts ranged from 10- 32 blows per 0.3 m (1.5 m drop). Where bedrock was encountered, refusal was abruptly met, with the pile helmet and hammer bouncing off the pile. Detailed test pile logs for each driven test pile are attached for reference.

The test probes, TP17-04 to -09 were advanced with the vibratory hammer to depth, until refusal on bedrock was encountered or to the limit of the pile length. Depth of bedrock encountered at each pile location is shown on the attached Location Plan drawing.

A soil sample obtained from the seabed within the berth, indicate that the upper soil consists of a grey/blue silt, which is expected given the geological environment. We expect the overburden soils to consist of intermittent layers of silt and fine sands due to seasonal variation in sediment load and flux of the Bella Coola River.

As noted above, high strain dynamic testing was completed on test piles TP17-01 and TP17-02. Test with the Pile Driving Analyzer (PDA) was completed within the overburden soils (prior to refusal on rock) to better determine soil strengths and shaft friction characteristics of the overburden soils. CAPWAP analysis of a typical blow from each test pile, in soil (prior to refusal on bedrock), are attached for reference. In general, the average ultimate shaft resistance of the overburden soils was found to be limited, with 2 to 20 kPa was noted in the overburden soils. Note that the above values are ultimate values taken at the time of driving, and it is expected that shaft friction may increase somewhat given additional setup time to allow pore water pressures to dissipate.

The above values are the ultimate values obtained during driving, we recommend that an appropriate safety factor be utilized for design. We expect that all piles under compressive loading will need to be driven to end bear on/within the bedrock layer. We expect that the compressive capacities required could be easily achieved on the bedrock surface. As noted, uplift resistance (shaft friction) of the soft/loose over burden soils is limited. If additional uplift resistance is required, we would recommend the use of rock anchors, or consideration could be given to socketing the piles into the bedrock. Further information on required rock anchor length can be provided if necessary.

Upon extraction of the driven test piles, minor tip damage was observed, as show in the picture below. The tip damage is likely the result of localized stress concentrations on the pile toe, due to contact with a sloping bedrock surface. Given the hardness of the rock, and sloping profile, we recommend that all pipe piles be driven with hardened Oslo tips. If rock anchors are required for additional uplift resistance, hollow or concrete plugged Oslo tips could be utilized.

Photograph 1. Tip Damage from Driven Piles

For lateral support, we recommend that the soils be modeled with the following parameters:

Layer	Recommended model	Phi	K (MPa/m)	e50	Su or UCS (kPa)
soft/loose overburden	Soft Clay (Matlock)	-	-	0.02	20
Stiff/compact layer	API SAND	32	10	-	-
Bedrock (if socketed)	Strong Rock	-	-	-	50,000

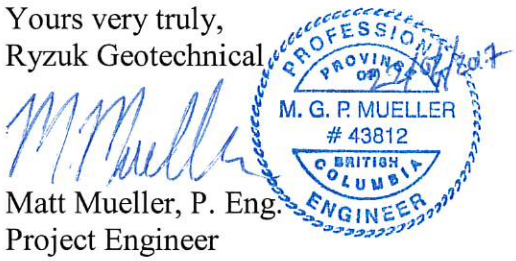
Table 1. Summary of recommended lateral pile analysis parameters.

Given the soft/loose nature of the upper soil layers, we recommend that some consideration be given to ignoring contribution to lateral and skin friction within the upper few meters.

CLOSURE

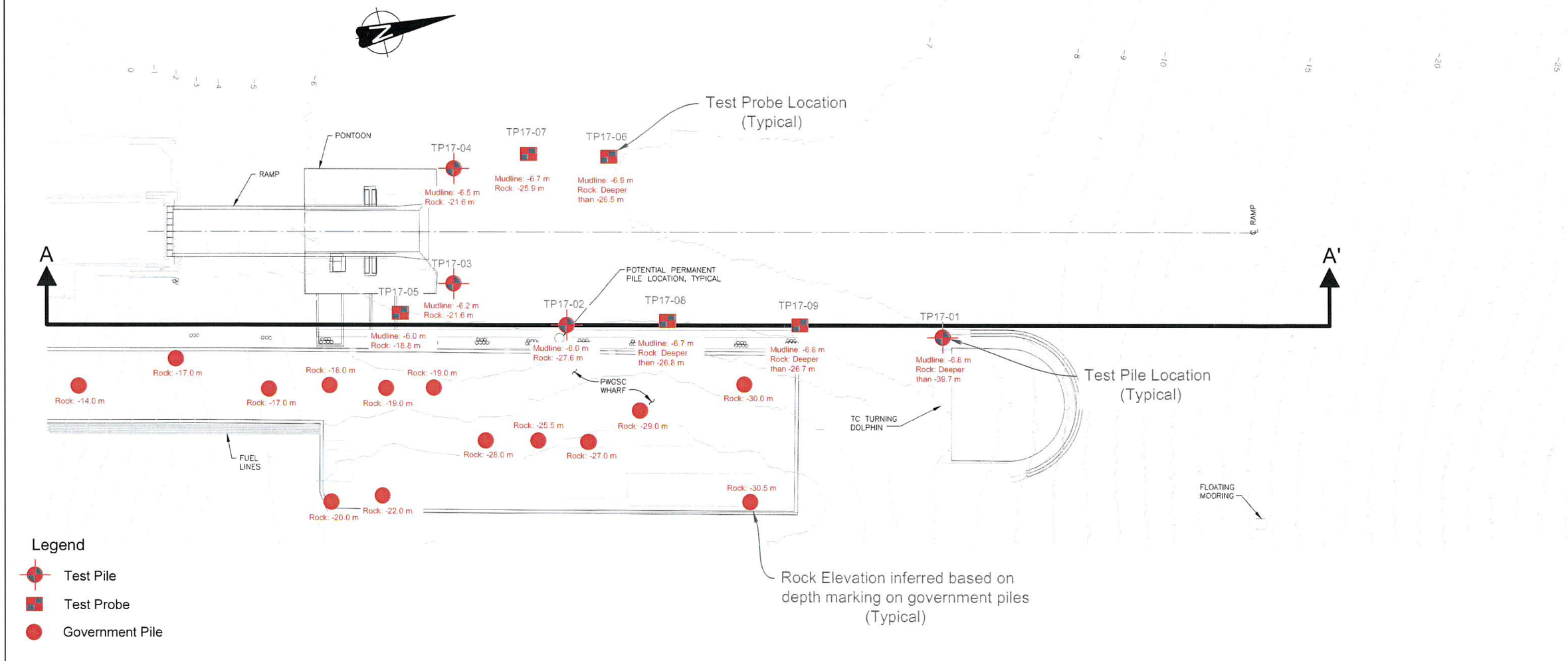
If you have any questions, or require additional information, please contact our office. We would be pleased to provide additional recommendations for final design, once loading conditions are finalized.

Yours very truly,
Ryzuk Geotechnical



Matt Mueller, P. Eng.
Project Engineer

Attachments: Terms of Engagement
Location Plan, drawing No. 540-54-1
Test Pile Logs TP17-01 through TP17-04
Typical Section, drawing 540-54-2
CAPWAP Analysis Results TP17-01 & TP17-02



Notes:

1. Base plantaken from WorleyParsons Drawing No. 68-19-SK-001 dated May 9, 2017.
2. Estimated rock elevations from test piles and adjacent pile markings.
3. Elevations from adjacent dock based on pile length markings obseerved on pile, relative to deck elevation (+7.3 m chart). Based on the assumption that piles were driven to rock.
4. See drawing 8-540-54-2 for cross section details.

British Columbia Ferry Services Inc.

TEST PILE LOCATION PLAN

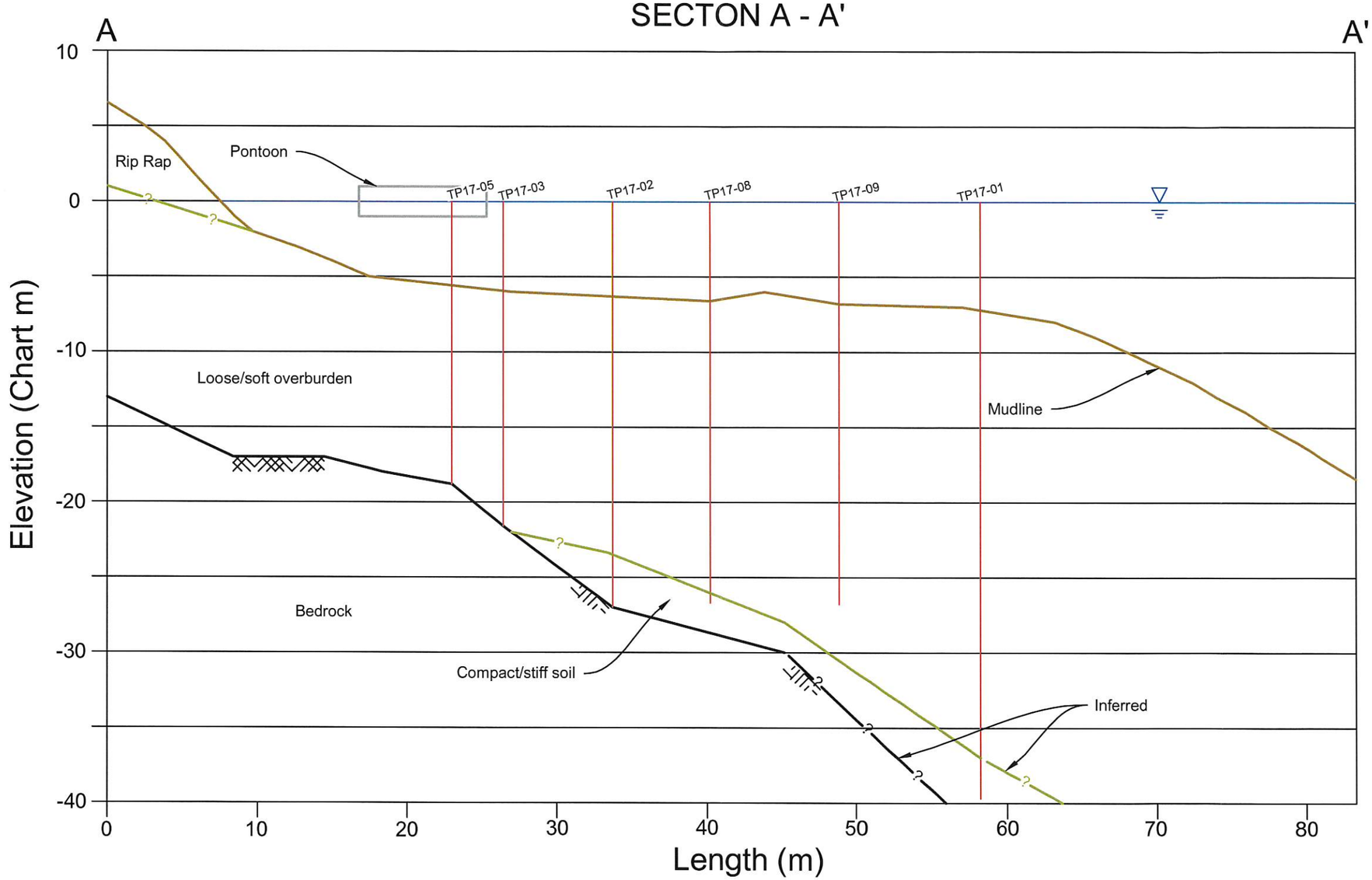
Proposed Terminal Upgrades

Ferry Terminal — Bella Coola, B.C.

RYZUK GEOTECHNICAL **Engineering & Materials Testing**

DRAWN	SDJ
DATE	June,2017
APPROVED	
SCALE	1:250
DRAWING No.	8-540-54-1

SECTON A - A'



Notes:

1. See drawing 8-540-54-1 for location of cross section A - A'.

British Columbia Ferry Services Inc.

Terminal Section

Proposed Terminal Upgrades

Bella Coola Ferry Terminal — Bella Coola, B.C.

RYZUK GEOTECHNICAL Engineering & Materials Testing

DRAWN	SDJ
DATE	June, 2017
APPROVED	
SCALE	1:300
DRAWING No.	8-540-54-2

RYZUK GEOTECHNICAL
ENGINEERING & MATERIALS TESTING

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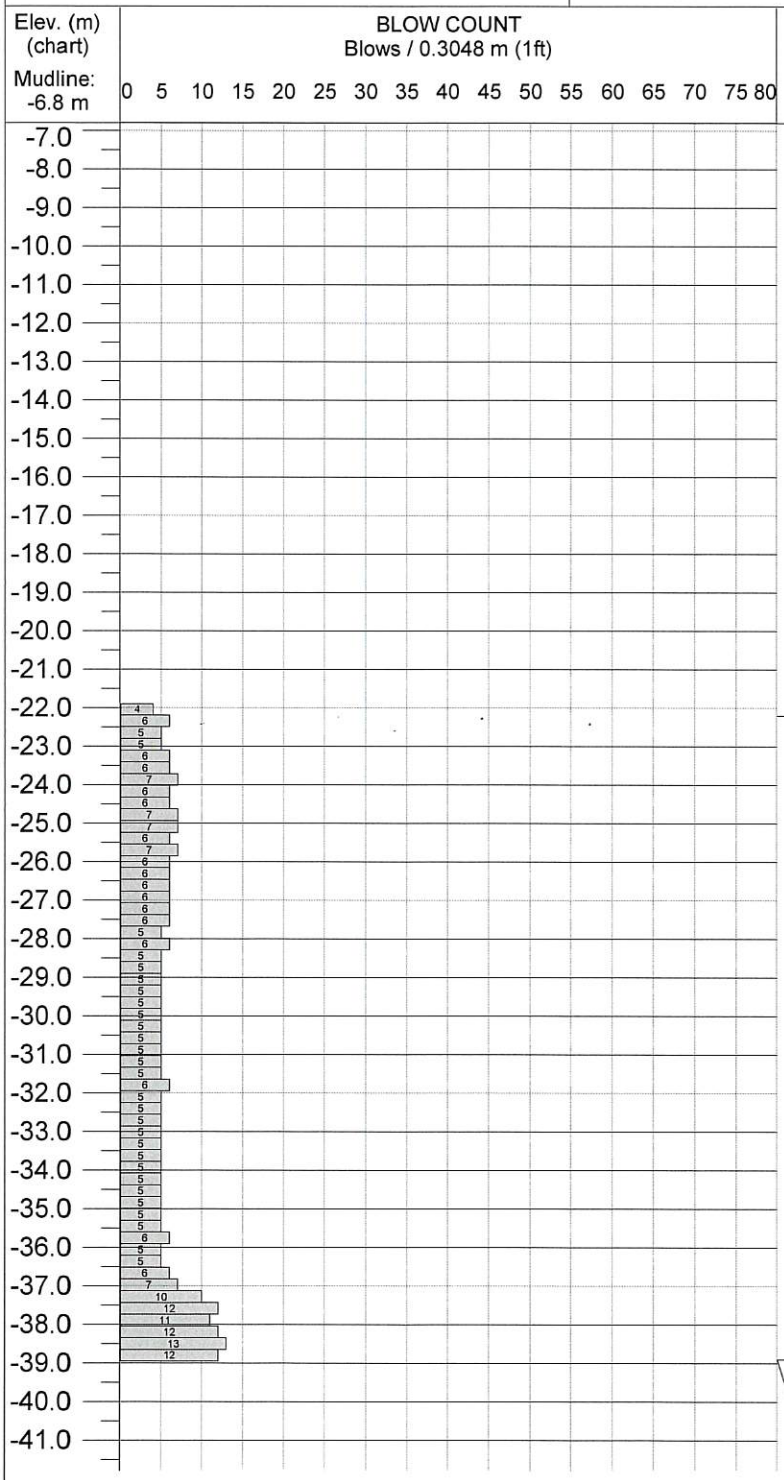
Victoria, BC
V8Z 1S3
Tel. 250-475-3131 Fax. 250-475-3611
mail@ryzuk.com www.ryzuk.com

TEST PILE LOG

TP17-01

Project:	Bella Coola Test Piles	Job #:	540-54
Client:	British Columbia Ferry Services Inc.	Inspector:	MGPM
Location:	Bella Coola, BC		
Drive Date:	5/17/2017		
Contractor:	Sawchuck Pile Driving Ltd.		
Method:	Vibratory and Drop Hammer		
Pile Type:	273 mm x 12.7 mm open ended steel pipe		



COMMENTS	Penetration (m)
Vibe to 15.4 m peneteration with ICE 216D vibratory driver.	0.0
Soft, with penetration rate of 1-2 seconds per 0.3 m.	1.0 – 14.0
Stop for Splice at 15.4 mpenetration.	15.0
Continue driving with 1.5 m drop using 2273 kg (5000 lb) drop hammer.	16.0 – 29.0
Driven under analysis of PDA between 30.5 and 31.8 m	30.0 – 31.0
End of Test Pile at 32.1 m Penetration (Limit of available pile)	32.0 – 35.0

COMMENTS: Chart elevations estimated based on tidal charts and water depths recorded onsite.
Estimated accuracy +/- 0.5 m.

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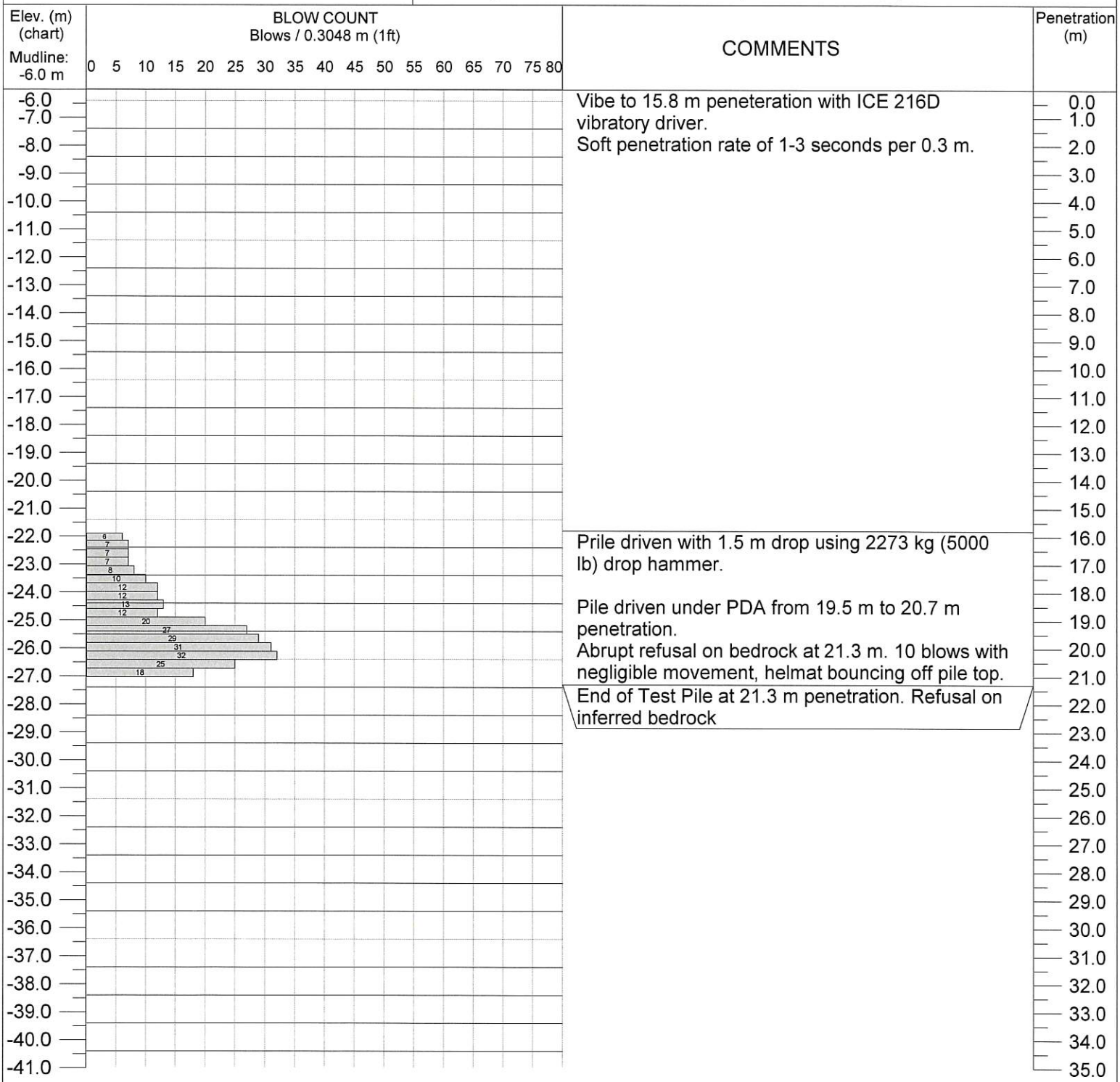
TEST PILE LOG

TP17-02

Project:	Bella Coola Test Piles	Job #:	540-54
Client:	British Columbia Ferry Services Inc.	Inspector:	MGPM
Location:	Bella Coola, BC		
Drive Date:	5/17/2017		
Contractor:	Sawchuck Pile Driving Ltd.		
Method:	Vibratory and Drop Hammer		
Pile Type:	273 mm x 12.7 mm open ended steel pipe		



COMMENTS: Chart elevations estimated based on tidal charts and water depths recorded onsite.
Estimated accuracy +/- 0.5 m.

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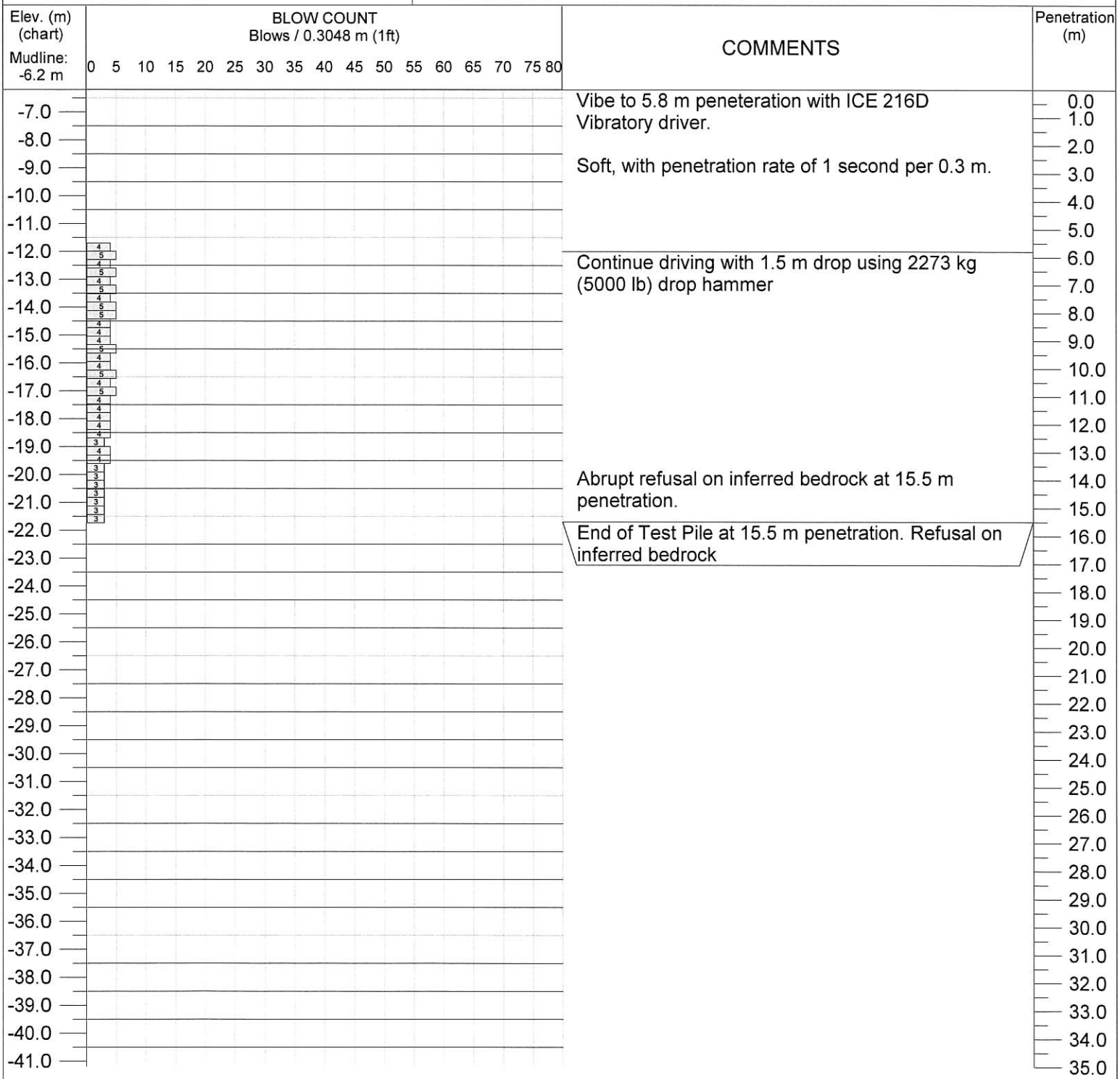
TEST PILE LOG

TP17-03

Project:	Bella Coola Test Piles	Job #:	540-54
Client:	British Columbia Ferry Services Inc.	Inspector:	MGPM
Location:	Bella Coola, BC		
Drive Date:	5/17/2017		
Contractor:	Sawchuck Pile Driving Ltd.		
Method:	Vibratory and Drop Hammer		
Pile Type:	273 mm x 12.7 mm open ended steel pipe		



COMMENTS: Chart elevations estimated based on tidal charts and water depths recorded onsite.
Estimated accuracy +/- 0.5 m.

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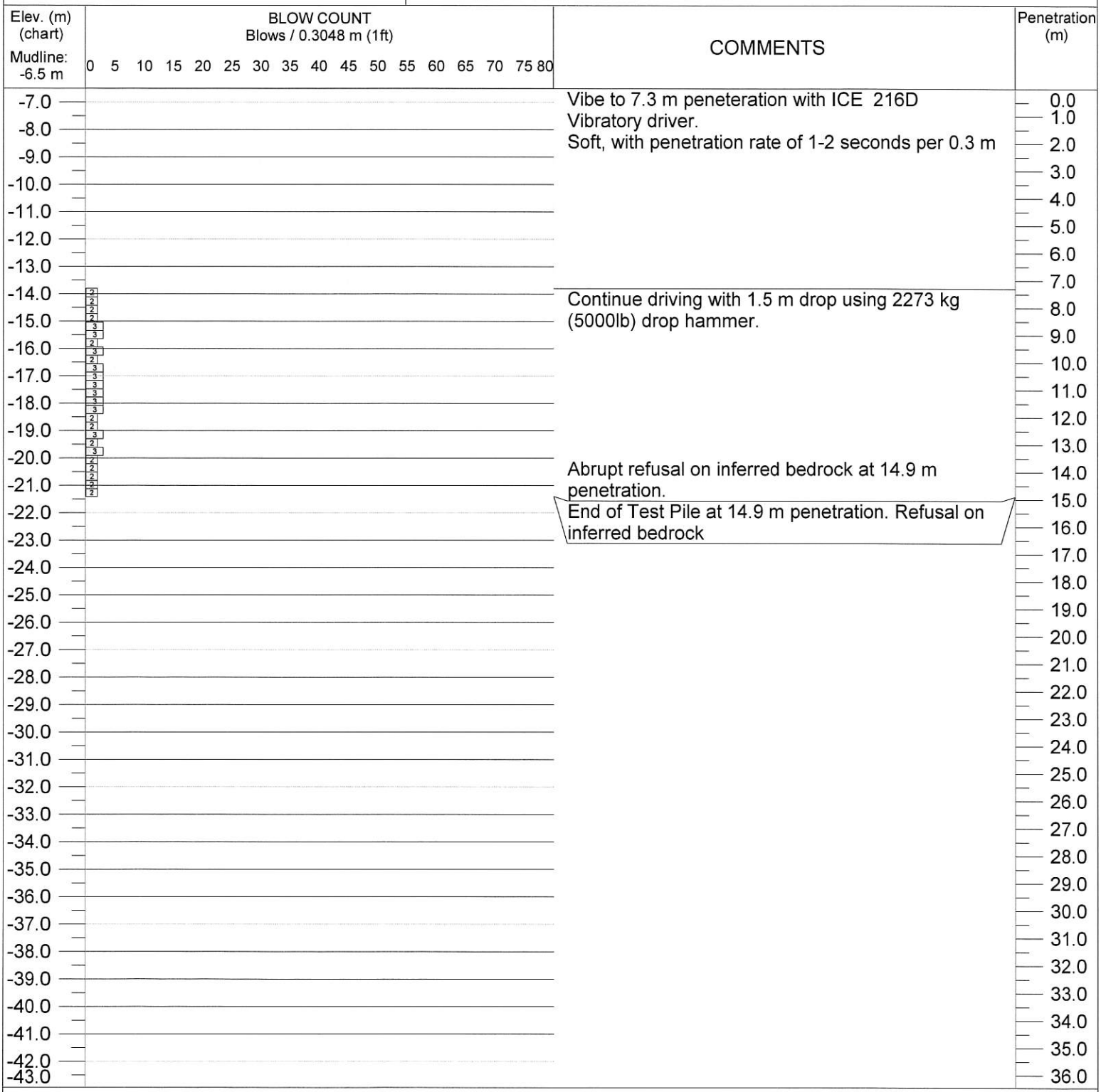
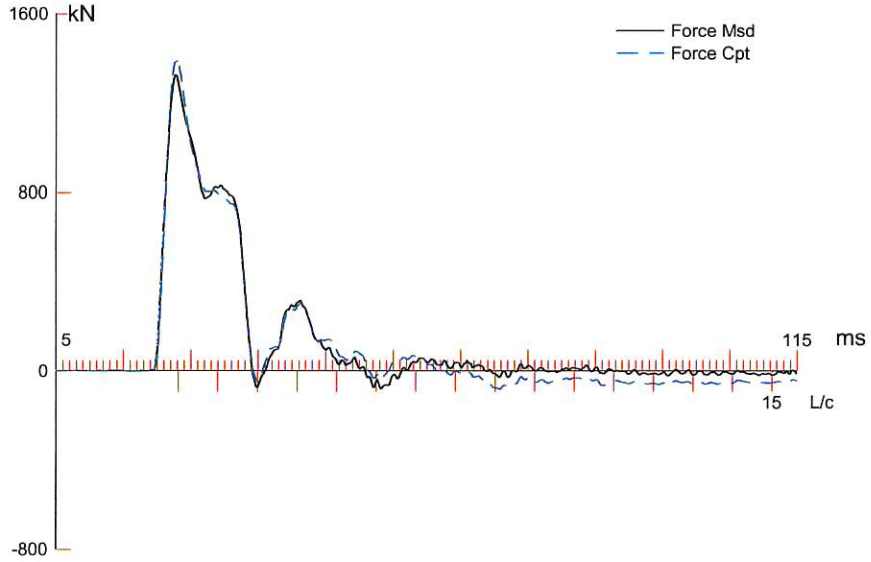
TEST PILE LOG

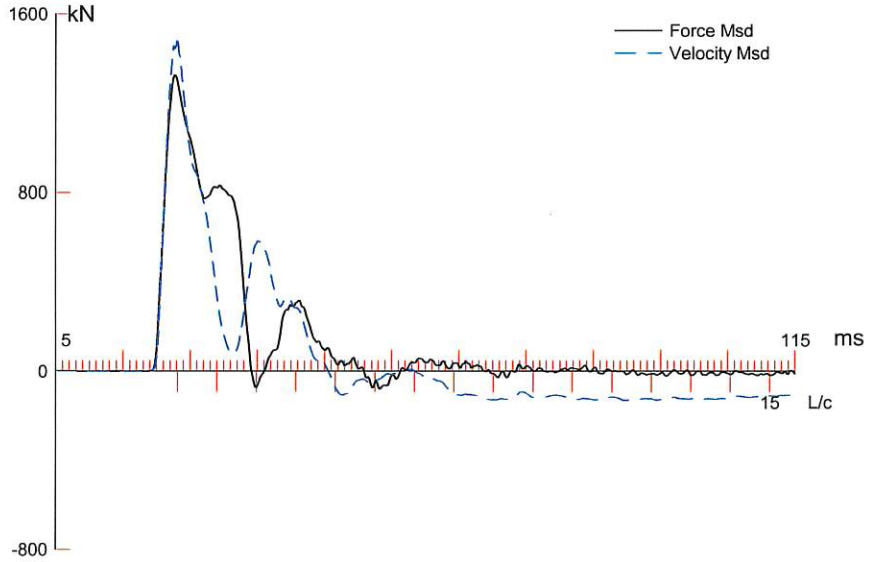
TP17-04

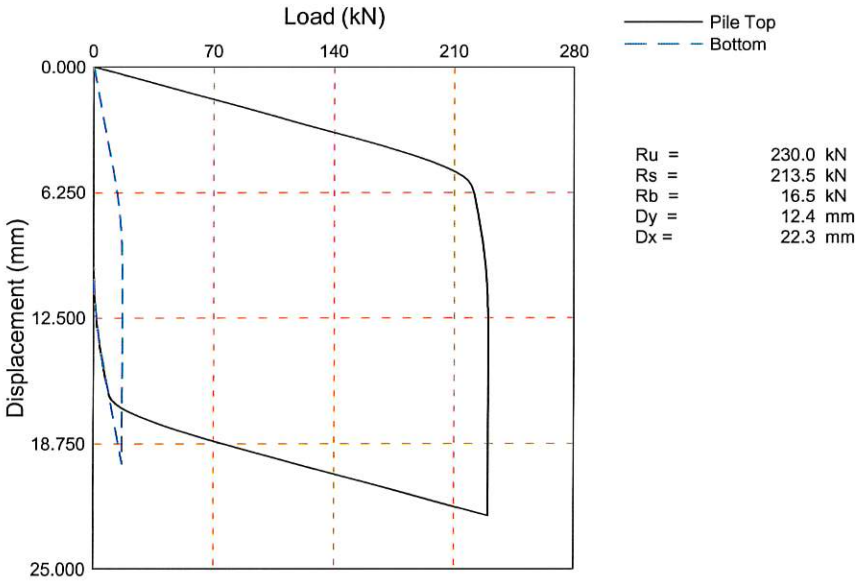
Project:	Bella Coola Test Piles	Job #:	540-54
Client:	British Columbia Ferry Services Inc.	Inspector:	MGPM
Location:	Bella Coola, BC		
Drive Date:	5/18/2017		
Contractor:	Sawchuck Pile Driving Ltd.		
Method:	Vibratory and Drop Hammer		
Pile Type:	273 mm x 12.7 mm open ended steel pipe		



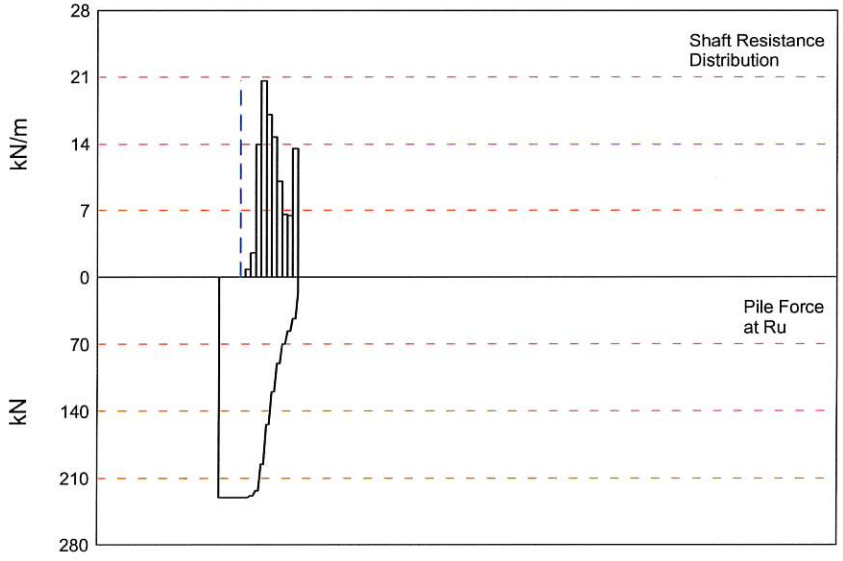
COMMENTS: Chart elevations estimated based on tidal charts and water depths recorded onsite.
Estimated accuracy +/- 0.5 m.







Ru = 230.0 kN
Rs = 213.5 kN
Rb = 16.5 kN
Dy = 12.4 mm
Dx = 22.3 mm



CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 230.0; along Shaft 213.5; at Toe 16.5 kN

Soil Sgmnt No.	Dist. Below Gages m	Depth Below Grade m	Ru kN	Force in Pile kN	Sum of Ru kN	Unit Resist. (Depth) kN/m	Unit Resist. (Area) kPa	Smith Damping Factor s/m
				230.0				
1	12.0	3.4	1.7	228.3	1.7	0.49	0.62	1.300
2	14.0	5.4	5.2	223.1	6.9	2.59	3.25	1.300
3	16.1	7.5	28.0	195.1	34.9	13.95	17.49	1.300
4	18.1	9.5	41.3	153.8	76.2	20.58	25.79	1.300
5	20.1	11.5	34.2	119.6	110.4	17.04	21.36	1.300
6	22.1	13.5	29.6	90.0	140.0	14.75	18.49	1.300
7	24.1	15.5	20.2	69.8	160.2	10.07	12.62	1.300
8	26.1	17.5	13.2	56.6	173.4	6.58	8.24	1.300
9	28.1	19.5	13.0	43.6	186.4	6.48	8.12	1.300
10	30.1	21.5	27.1	16.5	213.5	13.50	16.92	1.300
Avg. Shaft			21.3			9.93	12.44	1.300
Toe			16.5				281.88	0.200

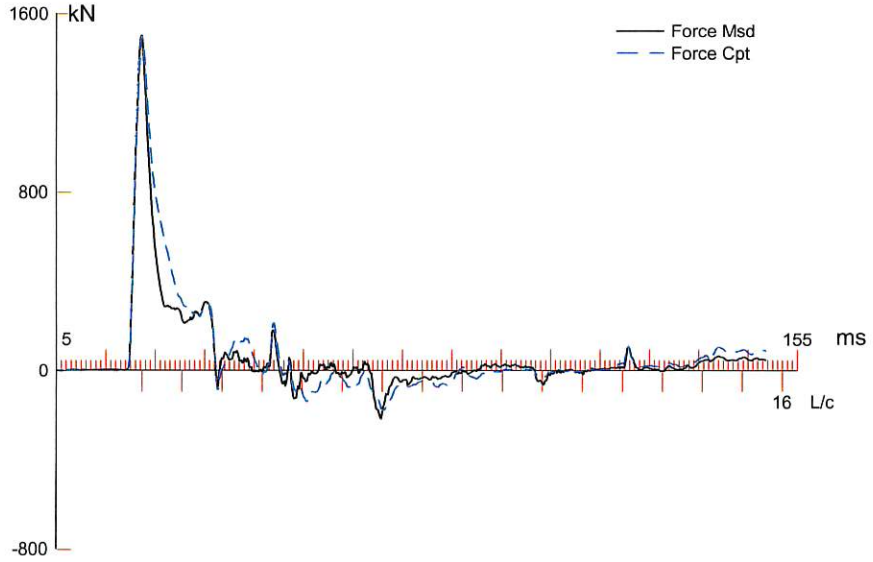
Soil Model Parameters/Extensions		Shaft	Toe
Quake	(mm)	3.000	7.500
Case Damping Factor		0.662	0.008
Unloading Quake	(% of loading quake)	30	107
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	0	
Soil Plug Weight	(kN)		0.50

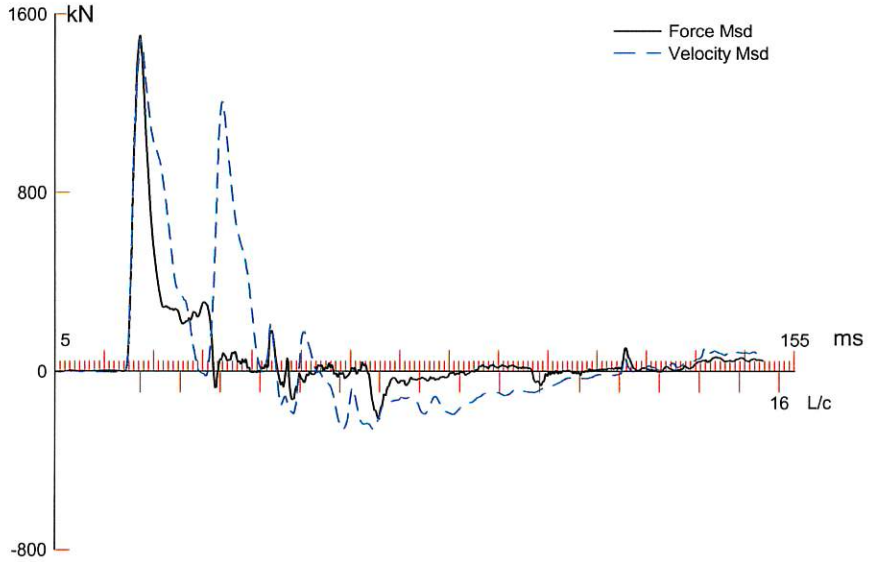
CAPWAP match quality = 9.24 (Wave Up Match) ; RSA = 0
Observed: final set = 10.000 mm; blow count = 100 b/m
Computed: final set = 19.599 mm; blow count = 51 b/m

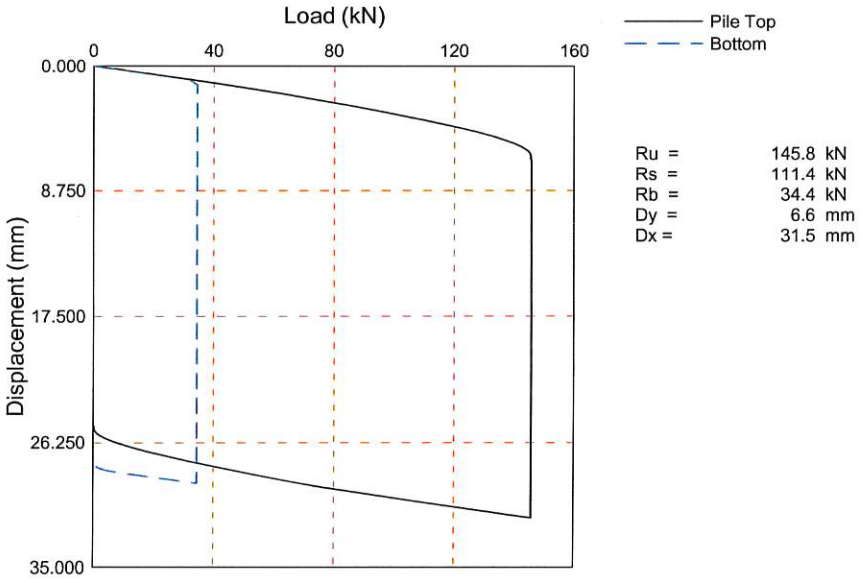
max. Top Comp. Stress = 145.1 MPa (T= 23.5 ms, max= 1.156 x Top)
max. Comp. Stress = 167.8 MPa (Z= 16.1 m, T= 26.4 ms)
max. Tens. Stress = -8.73 MPa (Z= 1.0 m, T= 71.1 ms)
max. Energy (EMX) = 24.32 kJ; max. Measured Top Displ. (DMX)=32.08 mm

EXTREMA TABLE

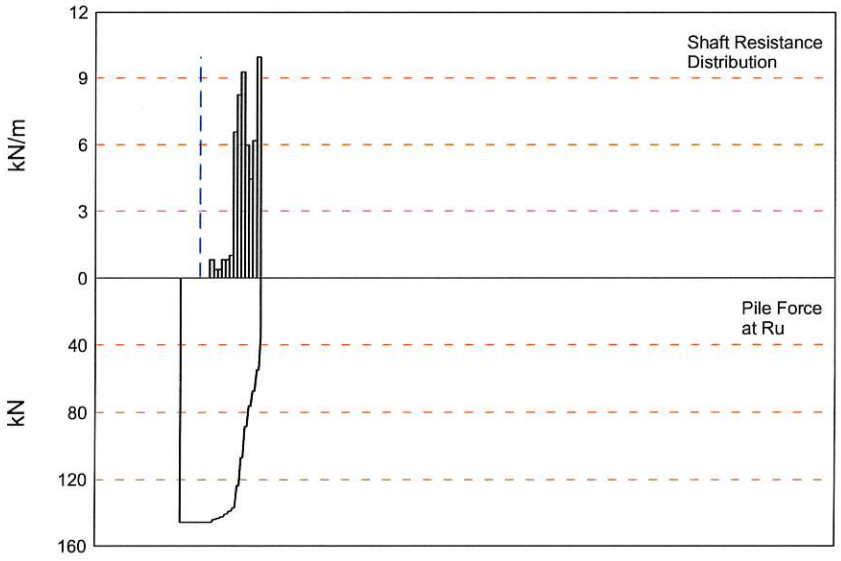
Pile Sgmnt No.	Dist. Below Gages m	max. Force kN	min. Force kN	max. Comp. Stress MPa	max. Tens. Stress MPa	max. Trnsfd. Energy kJ	max. Veloc. m/s	max. Displ. mm
1	1.0	1397.4	-84.1	145.1	-8.73	24.32	3.6	31.826
2	2.0	1397.5	-82.3	145.2	-8.55	24.32	3.6	31.745
4	4.0	1397.5	-76.5	145.2	-7.95	24.32	3.6	31.564
6	6.0	1399.5	-78.3	145.4	-8.13	24.31	3.6	31.374
8	8.0	1408.2	-73.4	146.3	-7.62	24.31	3.6	31.167
10	10.0	1438.9	-77.6	149.5	-8.06	24.31	3.5	30.975
12	12.0	1499.2	-71.3	155.7	-7.40	24.30	3.4	30.804
14	14.0	1568.3	-71.5	162.9	-7.43	24.12	3.2	30.624
16	16.1	1615.7	-72.6	167.8	-7.54	23.57	3.0	30.543
18	18.1	1540.0	-65.2	160.0	-6.77	20.70	2.9	30.518
19	19.1	1374.1	-53.8	142.7	-5.58	16.46	2.8	30.528
20	20.1	1395.1	-52.6	144.9	-5.46	16.46	2.8	30.535
21	21.1	1259.0	-40.1	130.8	-4.16	12.86	3.0	30.549
22	22.1	1261.8	-41.4	131.1	-4.30	12.86	3.1	30.555
23	23.1	1116.5	-33.6	116.0	-3.49	9.64	3.3	30.568
24	24.1	1099.0	-32.6	114.2	-3.38	9.64	3.4	30.576
25	25.1	946.4	-45.7	98.3	-4.75	7.33	3.6	30.587
26	26.1	855.9	-31.1	88.9	-3.23	7.33	3.8	30.590
27	27.1	692.1	-29.4	71.9	-3.06	5.75	4.0	30.593
28	28.1	563.7	-19.0	58.6	-1.97	5.75	4.2	30.596
29	29.1	371.0	-15.3	38.5	-1.59	4.12	4.3	30.598
30	30.1	249.1	-12.0	25.9	-1.25	0.69	4.3	30.590
Absolute	16.1			167.8			(T =	26.4 ms)
	1.0				-8.73		(T =	71.1 ms)







Ru = 145.8 kN
Rs = 111.4 kN
Rb = 34.4 kN
Dy = 6.6 mm
Dx = 31.5 mm



CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 145.8; along Shaft 111.4; at Toe 34.4 kN

Soil Sgmnt No.	Dist. Below Gages m	Depth Below Grade m	Ru kN	Force in Pile kN	Sum of Ru kN	Unit Resist. (Depth) kN/m	Unit Resist. (Area) kPa	Smith Damping Factor s/m
				145.8				
1	11.1	0.8	0.0	145.8	0.0	0.00	0.00	0.000
2	13.2	2.9	0.0	145.8	0.0	0.00	0.00	0.000
3	15.2	4.9	0.0	145.8	0.0	0.00	0.00	0.000
4	17.2	6.9	1.7	144.1	1.7	0.84	0.98	1.295
5	19.2	8.9	0.8	143.3	2.5	0.40	0.46	1.295
6	21.3	11.0	0.8	142.5	3.3	0.40	0.46	1.295
7	23.3	13.0	1.7	140.8	5.0	0.84	0.98	1.295
8	25.3	15.0	1.7	139.1	6.7	0.84	0.98	1.295
9	27.3	17.0	2.1	137.0	8.8	1.04	1.21	1.295
10	29.4	19.1	13.3	123.7	22.1	6.57	7.66	1.295
11	31.4	21.1	16.7	107.0	38.8	8.25	9.62	1.295
12	33.4	23.1	18.8	88.2	57.6	9.29	10.83	1.295
13	35.4	25.1	12.1	76.1	69.7	5.98	6.97	1.295
14	37.5	27.2	9.0	67.1	78.7	4.45	5.18	1.295
15	39.5	29.2	12.5	54.6	91.2	6.17	7.20	1.295
16	41.5	31.2	20.2	34.4	111.4	9.98	11.63	1.295
Avg. Shaft			7.0			3.57	4.16	1.295
Toe			34.4				587.68	1.092

Soil Model Parameters/Extensions		Shaft	Toe
Quake	(mm)	3.170	1.000
Case Damping Factor		0.344	0.090
Unloading Quake	(% of loading quake)	30	100
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	0	
Soil Plug Weight	(kN)		0.34

CAPWAP match quality = 7.14 (Wave Up Match) ; RSA = 0
Observed: final set = 25.000 mm; blow count = 40 b/m
Computed: final set = 22.582 mm; blow count = 44 b/m
Replay Factor: F4:1.000; V3:1.000; V4:1.000;

max. Top Comp. Stress = 144.1 MPa (T= 22.7 ms, max= 1.038 x Top)
max. Comp. Stress = 149.6 MPa (Z= 29.4 m, T= 28.3 ms)
max. Tens. Stress = -47.07 MPa (Z= 12.1 m, T= 36.7 ms)
max. Energy (EMX) = 20.25 kJ; max. Measured Top Displ. (DMX)=39.37 mm

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages m	max. Force kN	min. Force kN	max. Comp. Stress MPa	max. Tens. Stress MPa	max. Trnsfd. Energy kJ	max. Veloc. m/s	max. Displ. mm
1	1.0	1496.4	-219.7	144.1	-21.16	20.25	3.6	35.240
2	2.0	1496.0	-323.0	144.0	-31.10	20.25	3.6	35.260
4	4.0	1494.9	-428.0	143.9	-41.21	20.24	3.6	35.278
6	6.1	1493.9	-451.7	143.8	-43.49	20.23	3.6	35.262
8	8.1	1493.8	-475.5	143.8	-45.78	20.22	3.6	35.252
10	10.1	1493.7	-470.8	143.8	-45.33	20.21	3.6	35.221
12	12.1	1494.0	-488.8	143.9	-47.07	20.20	3.6	35.150
14	14.2	1495.9	-443.4	144.0	-42.69	20.19	3.5	35.233
16	16.2	1498.1	-406.7	144.2	-39.16	20.18	3.5	35.366
18	18.2	1491.0	-364.2	143.6	-35.07	19.97	3.5	35.528
20	20.2	1489.5	-352.9	143.4	-33.98	19.86	3.5	35.684
22	22.3	1489.6	-318.4	143.4	-30.66	19.76	3.5	35.792
24	24.3	1491.1	-291.8	143.6	-28.10	19.54	3.5	35.869
26	26.3	1506.5	-229.6	145.1	-22.11	19.33	3.4	35.922
28	28.3	1533.4	-207.3	147.7	-19.96	19.06	3.3	35.917
30	30.4	1504.1	-204.0	144.8	-19.64	17.41	3.2	35.849
32	32.4	1453.0	-177.7	139.9	-17.11	15.30	3.1	35.729
34	34.4	1382.1	-143.0	133.1	-13.77	12.85	3.4	35.580
36	36.4	1232.7	-166.2	118.7	-16.00	11.20	3.8	35.521
38	38.5	940.0	-135.9	90.5	-13.08	9.89	4.4	35.561
40	40.5	531.9	-79.5	51.2	-7.66	7.99	4.9	35.568
41	41.5	397.2	-53.8	38.2	-5.18	4.78	5.0	35.554
Absolute	29.4			149.6			(T =	28.3 ms)
	12.1				-47.07		(T =	36.7 ms)