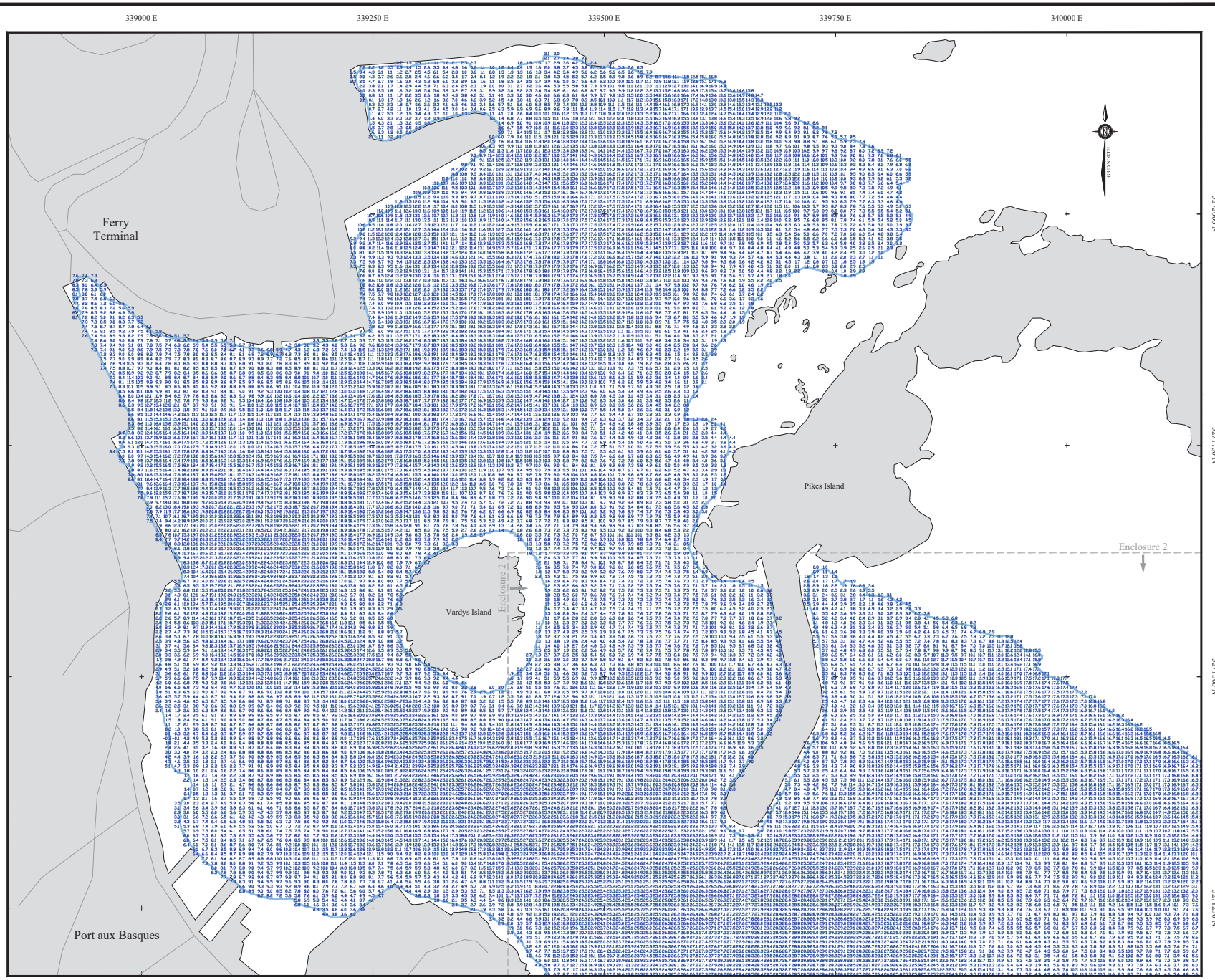
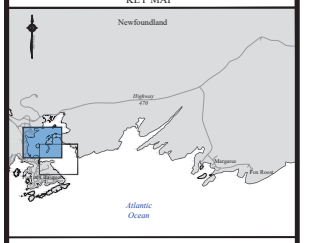


KEY MAP



LEGEND

9.9 Shoalest sounding within 5 m x 10 m cell (see notes)

Multibeam data extent

Adjacent enclosure boundary

UTM Graticule

GEODETIC PARAMETERS

Horizontal Datum:	NAD 83 CSRS	Projection:	UTM Zone 21
Vertical Datum:	Chart Datum	Units:	Metres

SCALE

Horizontal Scale (metres)

1 : 1500

0 25 50 75 100 125 150

CLIENT

CBCL LIMITED

Consulting Engineers

NOTES

CSR conducted the hydrographic and geophysical survey from January 20 to January 30, 2020

HYDROGRAPHIC SURVEY EQUIPMENT

Vessel:	SeaQuest' (Roxborough RF-246)
Survey Software:	Hypack
Multibeam Software:	Hysweep / Seabat UI
Positioning:	Trimble 5700 RTK-GPS, Hemisphere VS330 GNSS
Motion Sensor:	SBG Ekinox 2 D
Heading:	SBG Ekinox 2 D, Hemisphere VS330 GNSS
Multibeam Echosounder:	Reson T20P
Velocimeter:	AML Micro-X SVP and Odom Digibar Pro
Tide Gauge:	Hobo U20
Seismic Reflection:	EGⅈG 240 Boomer (400-10000 Hz), Applied Acoustics CSP-300 Power Supply,Minisitreamer with GeoSpectrum M5 Hydrophones

BATHYMETRY

Multibeam data were recorded continuously along survey lines using a Reson T20P multibeam echosounder using 256 beam mode operating at 200 kHz. The speed of sound in water at the transducer was recorded with an AML Oceanographic SVP. Sound velocity through the water column was acquired with an Odom Digibar-Pro. The survey was conducted using RTK-GPS ellipsoidal survey techniques. Observed water levels were obtained for CHS Port aux Basques Tide Station (9665) and also acquired with a CSR tide gauge deployed during the survey and levelled to Chart datum

The multibeam data were post processed using CARIS HIPS/SIPS software and exported as a 1 m x 1 m CUBE surface type. The exported data set was imported into HyPack and grid cells of 5 m x 10 m were established. Each cell is represented on the chart by text indicating the shoalest (minimum) sounding value within that cell. The cell center is at the decimal point of the text and the shoalest sounding values were rounded to the nearest tenth of a metre.

This chart represents results at the time of the survey and can only be considered as indicating the conditions at that time.

BACKGROUND

Roads were obtained from https://maps.canada.ca/czs/index-en.html. The coastline was digitized from Google Earth Pro and is considered approximate.

CSR GEOSURVEYS LTD.
341 MYRA ROAD, PORTERS LAKE, NOVA SCOTIA
CANADA
B3E 1G2
Tel: (902) 827 4200 Fax: (902) 827 2002
Email: info@csr-marine.com

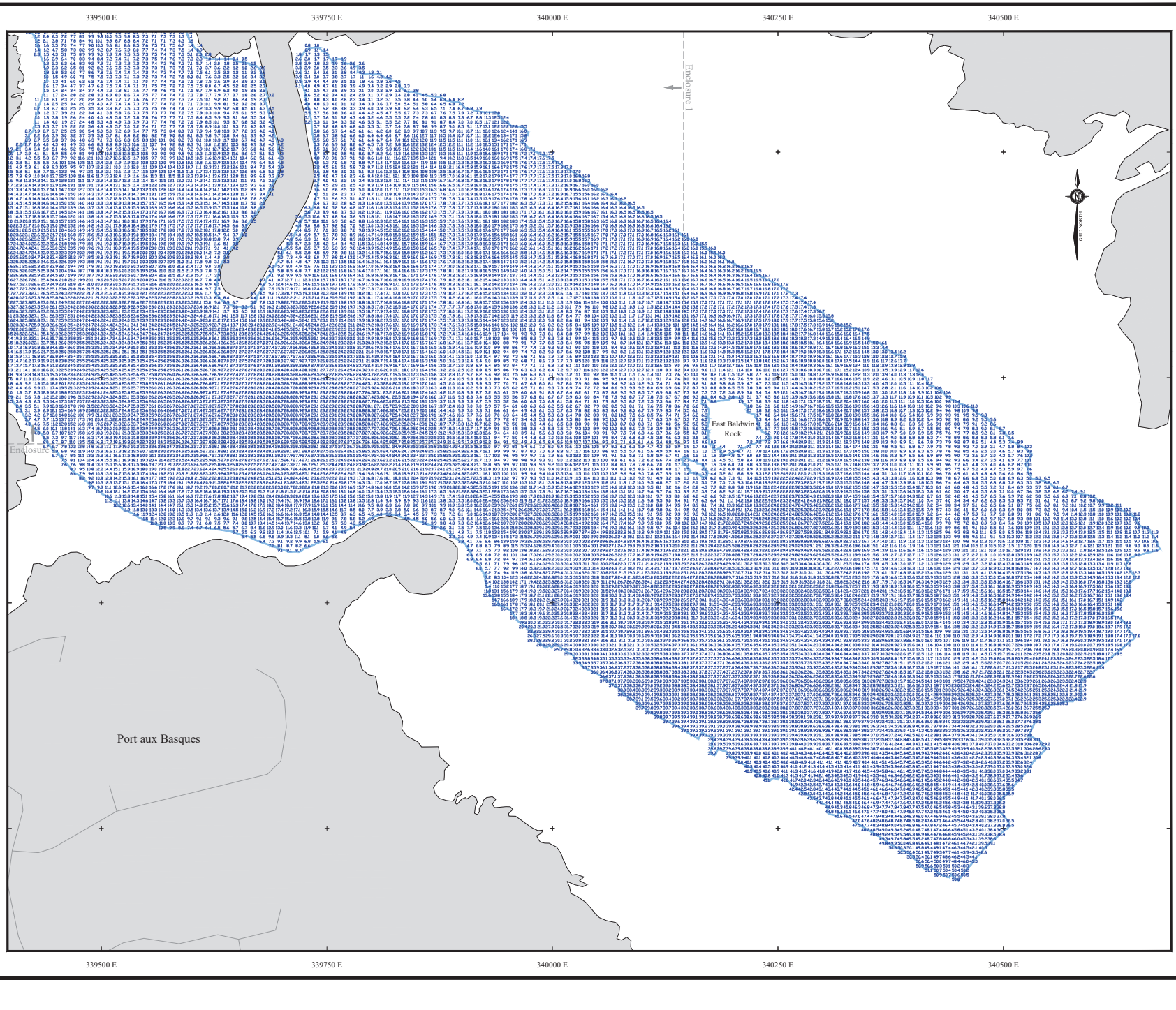
ENGINEERING & ENVIRONMENTAL GEOPHYSICS

PAB Vardy's Island – Navigation Improvements
Port aux Basques, Newfoundland
Bathymetric Sounding Chart (North)
Enclosure 1

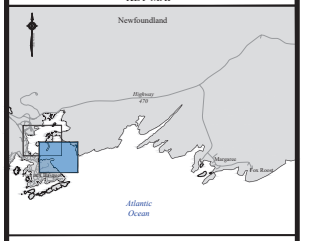
REV	DATE	REMARKS	INTERPRETED BY	COMPILED BY	CHECKED BY
0	Mar 05, 2020	Draft	AD	MW	FC
1	Nov 06, 2020	Final	AD	MW	FC

SCALE: 1:1500 | PROJECTION: UTM Zone 21

CSR PROJECT #: 1945 | FILE: 1945_SC_20201106.dwg



KEY MAP



LEGEND

- 9.9 Shoalest sounding within 5 m x 10 m cell (see notes)
- Multibeam data extent
- Adjacent enclosure boundary
- UTM Graticule

GEODETIC PARAMETERS

Horizontal Datum:	NAD 83 CSRS	Projection:	UTM Zone 21
Vertical Datum:	Chart Datum	Units:	Metres

SCALE

Horizontal Scale (metres)
1 : 1500
0 25 50 75 100 125 150

CLIENT

CBCL LIMITED
Consulting Engineers

NOTES

CSR conducted the hydrographic and geophysical survey from January 20 to January 30, 2020

HYDROGRAPHIC SURVEY EQUIPMENT

Vessel:	NorQuest' (Rosborough RF-246)
Survey Software:	Hypack
Multibeam Software:	Hysweep / Seabat UI
Positioning:	Trimble 5700 RTK-GPS, Hemisphere VS330 GNSS
Motion Sensor:	SBG Ekinox 2 D
Heading:	SBG Ekinox 2 D, Hemisphere VS330 GNSS
Multibeam Echosounder:	Reson T20P
Velocimeter:	AML Micro-X SVP and Odom Digibar Pro
Tide Gauge:	Hobo U20
Seismic Reflection:	EGⅈG 240 Boomer (400-10000 Hz), Applied Acoustics CSP-300 Power Supply,Minisireamer with GeoSpectrum M5 Hydrophones

BATHYMETRY

Multibeam data were recorded continuously along survey lines using a Reson T20P multibeam echosounder using 256 beam mode operating at 200 kHz. The speed of sound in water at the transducer was recorded with an AML Oceanographic SVP. Sound velocity through the water column was acquired with an Odom Digibar-Pro. The survey was conducted using RTK-GPS ellipsoidal survey techniques. Observed water levels were obtained for CHS Port aux Basques Tide Station (#665) and also acquired with a CSR tide gauge deployed during the survey and leveled to Chart datum

The multibeam data were post processed using CARIS HIPS/SIPS software and exported as a 1 m x 1 m CUBE surface rye. The exported data set was imported into HyPack and grid cells of 5 m x 10 m were established. Each cell is represented on the chart by text indicating the shoalest (minimum) sounding value within that cell. The cell center is at the decimal point of the text and the shoalest sounding values were rounded to the nearest tenth of a metre.

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BACKGROUND

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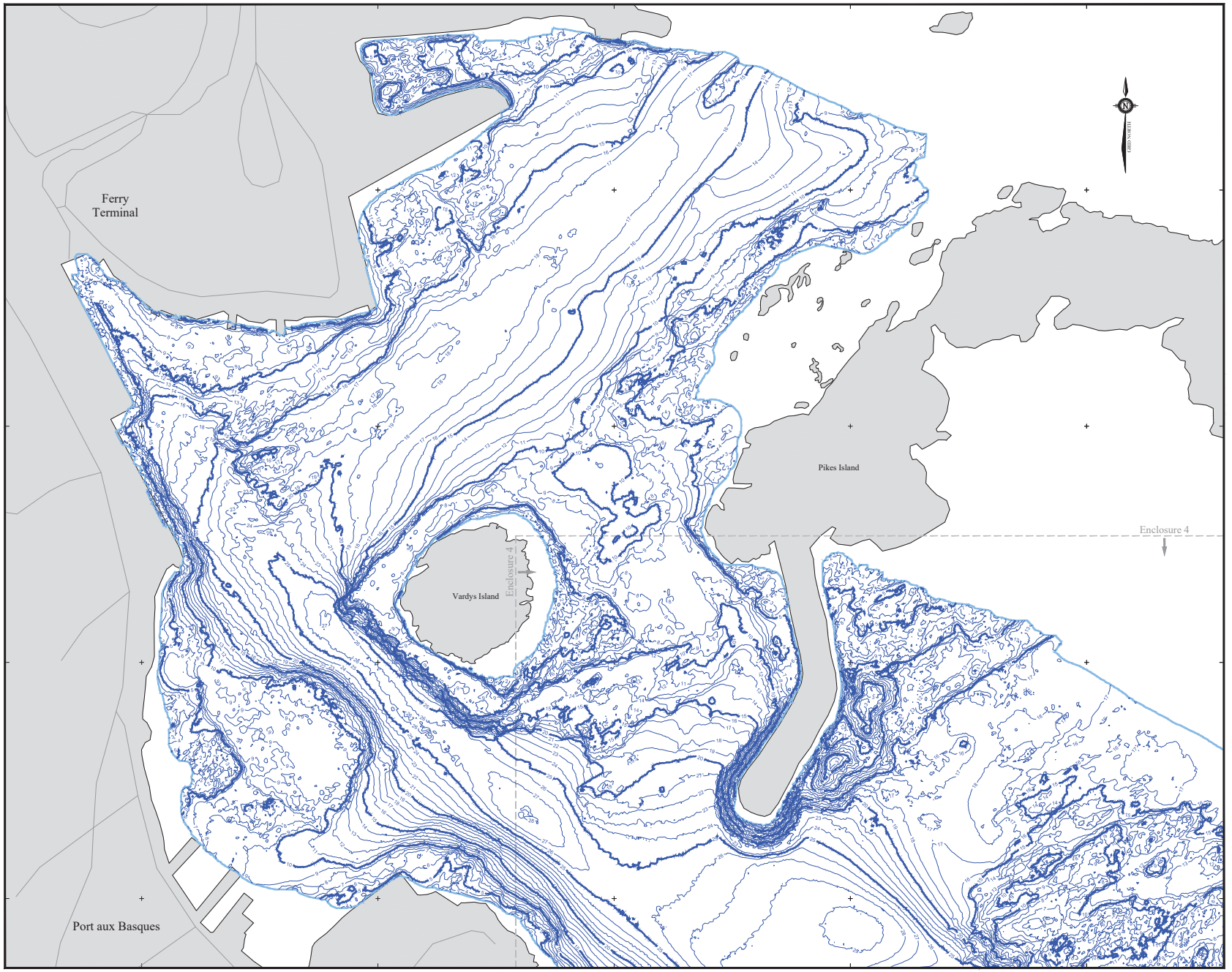
341 MYRA ROAD, PORTERS LAKE, NOVA SCOTIA
CANADA
B3E 1G2
Tel: (902) 827 4200 Fax: (902) 827 2002
Email: info@csr-marine.com

ENGINEERING & ENVIRONMENTAL GEOPHYSICS

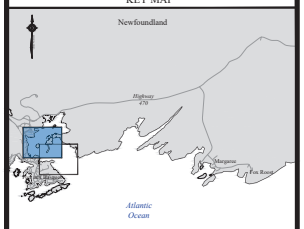
PAB Vardy's Island – Navigation Improvements
Port aux Basques, Newfoundland
Bathymetric Sounding Chart (South)
Enclosure 2

REV	DATE	REMARKS	INTERPRETED BY	COMPILED BY	CHECKED BY
0	Mar 05, 2020	Draft	AD	MW	PC
1	Nov 06, 2020	Final	AD	MW	PC

SCALE: 1:1500
PROJECTION: UTM Zone 21
CSR PROJECT #: 1945
FILE: 1945_SC_20201106.dwg



KEY MAP



LEGEND

- Bathymetric contour (1 m interval)
- Bathymetric contour (5 m interval)
- Multibeam data extent
- Adjacent enclosure boundary
- UTM Graticule

GEODETIC PARAMETERS

Horizontal Datum:	NAD 83 CSRS	Projection:	UTM Zone 21
Vertical Datum:	Chart Datum	Units:	Metres

SCALE

Horizontal Scale (metres)
1 : 1500

0 25 50 75 100 125 150

CLIENT

CBCL LIMITED
Consulting Engineers

NOTES

CSR conducted the hydrographic and geophysical survey from January 20 to January 30, 2020

HYDROGRAPHIC SURVEY EQUIPMENT

Vessel:	NorQuest' (Roxborough RF-246)
Survey Software:	Hypack
Multibeam Software:	Hysweep / Seabat UI
Positioning:	Trimble 5700 RTK-GPS, Hemisphere VS330 GNSS
Motion Sensor:	SBG Ekinox 2 D
Heading:	SBG Ekinox 2 D, Hemisphere VS330 GNSS
Multibeam Echosounder:	Reson T20P
Velocimeter:	AML Micro-X SVP and Odom Digibar Pro
Tide Gauge:	Hobo U20
Seismic Reflection:	EG&G 240 Boomer (400-10000 Hz), Applied Acoustics CSP-300 Power Supply,Ministreamer with GeoSpectrum M5 Hydrophones

BATHYMETRY

Multibeam data were recorded continuously along survey lines using a Reson T20P multibeam echosounder using 256 beam mode operating at 200 kHz. The speed of sound in water at the transducer was recorded with an AML Oceanographic SVP. Sound velocity through the water column was acquired with an Odom Digibar-Pro. The survey was conducted using RTK-GPS ellipsoidal survey techniques. Observed water levels were obtained for CHS Port aux Basques Tide Station (#665) and also acquired with a CSR tide gauge deployed during the survey and levelled to Chart datum

The multibeam data were post processed using CARIS HIPS/SIPS software and exported as a 1 m x 1 m CUBE surface xyz. The exported data set was imported into Surfer 17 and grid cells of 1 m x 1 m were established based on a kriging interpolation algorithm. Contours were generated at 1 metre intervals based on the gridded data.

This chart represents results at the time of the survey and can only be considered as indicating the conditions at that time.

BACKGROUND

Roads were obtained from https://maps.canada.ca/czs/index-en.html. The coastline was digitized from Google Earth Pro and is considered approximate.

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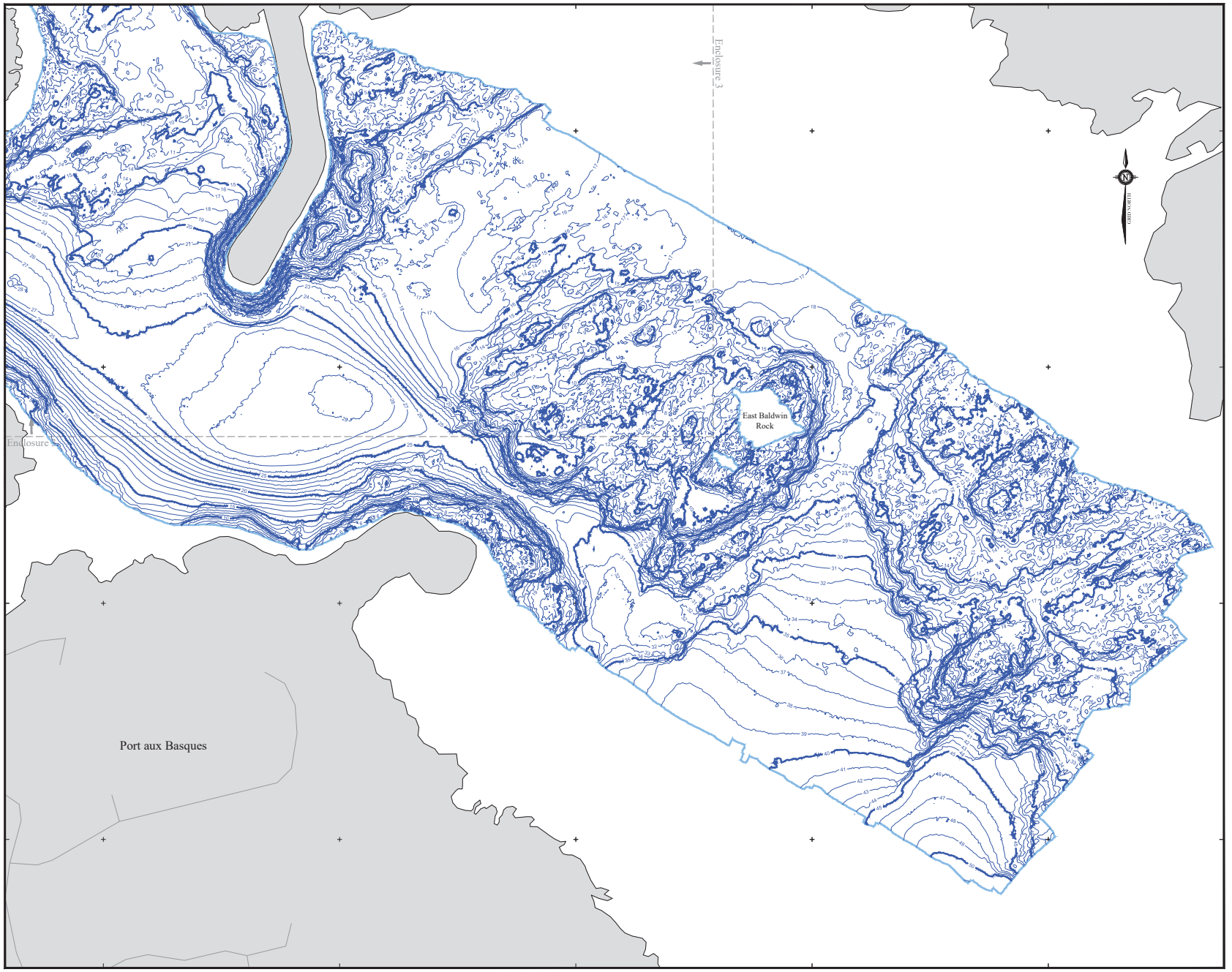
341 MYRA ROAD, PORTERS LAKE, NOVA SCOTIA
CANADA B3E 1G2
Tel: (902) 827 4200 Fax: (902) 827 2002
Email: info@csr-marine.com

ENGINEERING & ENVIRONMENTAL GEOPHYSICS

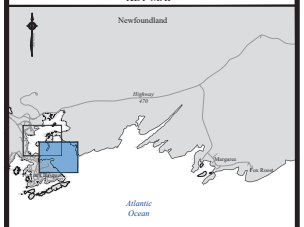
PAB Vardy's Island – Navigation Improvements
Port aux Basques, Newfoundland
Bathymetric Contour Chart (North)
Enclosure 3

REV	DATE	REMARKS	INTERPRETED BY	COMPILED BY	CHECKED BY
0	Mar 06, 2020	Draft	AD	MW	PC
1	Nov 06, 2020	Final	AD	MW	PC

SCALE: 1:1500	PROJECTION: UTM Zone 21
CSR PROJECT #: 1945	FILE: 1945_BC_20201106.dwg



KEY MAP



LEGEND

- Bathymetric contour (1 m interval)
- Bathymetric contour (5 m interval)
- Multibeam data extent
- Adjacent enclosure boundary
- UTM Graticule

GEODETIC PARAMETERS

Horizontal Datum:	NAD 83 CSRS	Projection:	UTM Zone 21
Vertical Datum:	Chart Datum	Units:	Metres

SCALE

Horizontal Scale (metres)
1 : 1500

0 25 50 75 100 125 150

CLIENT

CBCL LIMITED
Consulting Engineers

NOTES

CSR conducted the hydrographic and geophysical survey from January 20 to January 30, 2020

HYDROGRAPHIC SURVEY EQUIPMENT

Vessel:	'SeaQuest' (Roxborough RF-246)
Survey Software:	Hypack
Multibeam Software:	Hysweep / Seabat UI
Positioning:	Trimble 5700 RTK-GPS, Hemisphere VS330 GNSS
Motion Sensor:	SBG Ekinox 2 D
Heading:	SBG Ekinox 2 D, Hemisphere VS330 GNSS
Multibeam Echosounder:	Reson T20P
Velocimeter:	AML Micro-X SVP and Odom Digibar Pro
Tide Gauge:	Hydro I/20
Seismic Reflection:	EG&G 240 Boomer (400-10000 Hz), Applied Acoustics CSP-300 Power Supply,Ministreamer with GeoSpectrum M5 Hydrophones

BATHYMETRY

Multibeam data were recorded continuously along survey lines using a Reson T20P multibeam echosounder using 256 beam mode operating at 200 kHz. The speed of sound in water at the transducer was recorded with an AML Oceanographic SVP. Sound velocity through the water column was acquired with an Odom Digibar-Pro. The survey was conducted using RTK-GPS ellipsoidal survey techniques. Observed water levels were obtained for CHS Port aux Basques Tide Station (#665) and also acquired with a CSR tide gauge deployed during the survey and levelled to Chart datum

The multibeam data were post processed using CARIS HIPS/SIPS software and exported as a 1 m x 1 m CUBE surface xyz. The exported data set was imported into Surfer 17 and grid cells of 1 m x 1 m were established based on a kriging interpolation algorithm. Contours were generated at 1 metre intervals based on the gridded data.

This chart represents results at the time of the survey and can only be considered as indicating the conditions at that time.

BACKGROUND

Roads were obtained from https://maps.canada.ca/czs/index-en.html. The coastline was digitized from Google Earth Pro and is considered approximate.

CSR GEOSURVEYS LTD.
341 MYRA ROAD, PORTERS LAKE, NOVA SCOTIA
CANADA B3E 1G2
Tel: (902) 827 4260 Fax: (902) 827 2002
Email: info@csr-marine.com

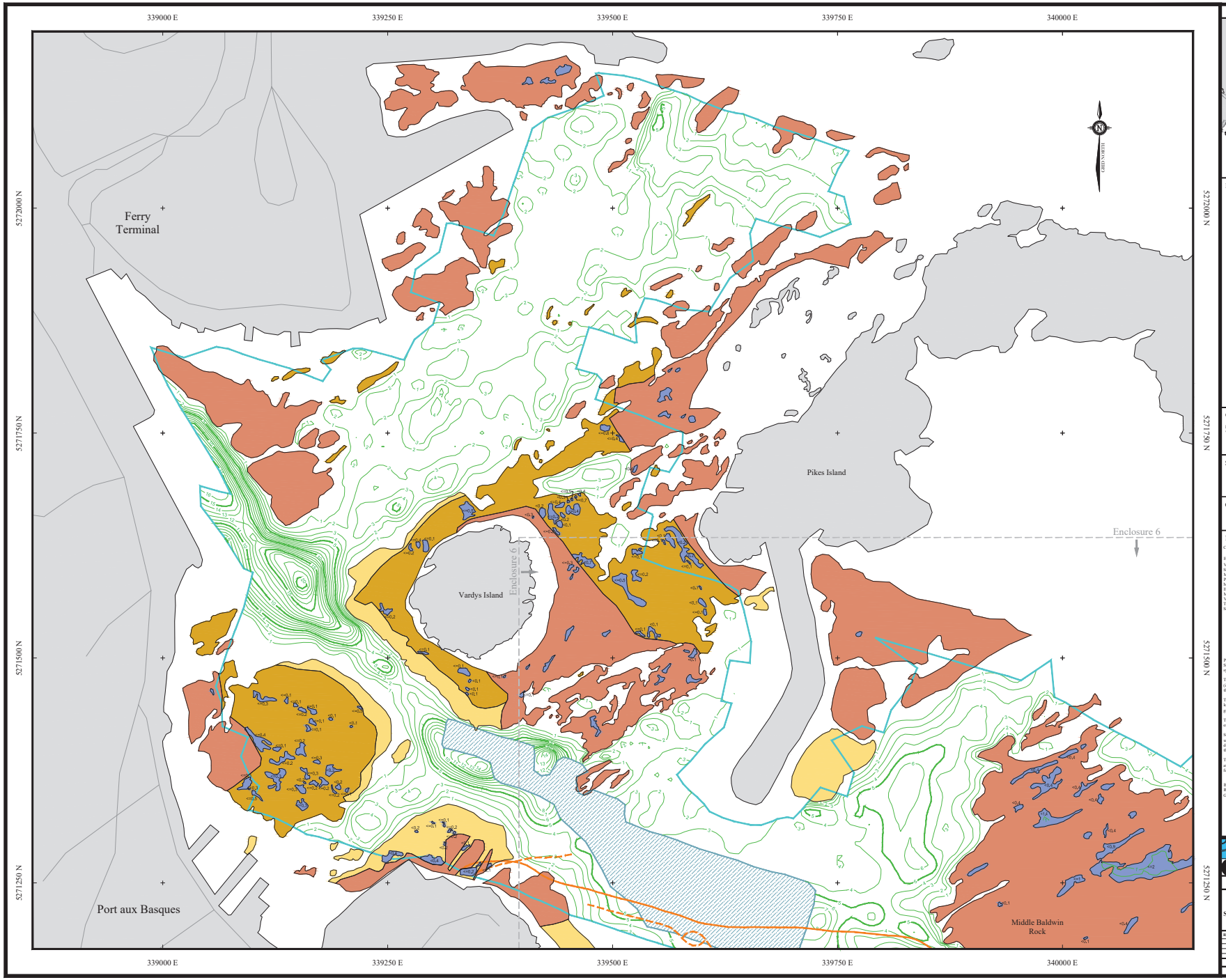
ENGINEERING & ENVIRONMENTAL GEOPHYSICS

PAB Vardy's Island – Navigation Improvements
Port aux Basques, Newfoundland
Bathymetric Contour Chart (South)
Enclosure 4

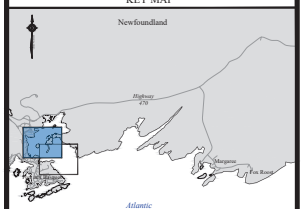
REV	DATE	REMARKS	INTERPRETED BY	COMPILED BY	CHECKED BY
0	Mar 06, 2020	Draft	AD	MW	PC
1	Nov 06, 2020	Final	AD	MW	PC

SCALE: 1:1500 PROJECTION: UTM Zone 21

CSR PROJECT #: 1945 FILE: 1945_BC_20201106.dwg



KEY MAP



LEGEND

- Sediment thickness isopach (1 m interval)
- Sediment thickness isopach (5 m interval)
- Sub-bottom data extent
- Pipeline Intake
- Abandoned Pipe
- Adjacent enclosure boundary
- UTM Graticule
- Bedrock at seabed (may include sediment patches)
- Bedrock with local sediment veneer (generally <0.2m)
- Bedrock / Boulders at seabed with local sediment veneer
- Undifferentiated Sediment (thickness labelled in metres where data is available)
- Area of no visible acoustic basement reflectors

GEODETIC PARAMETERS

Horizontal Datum:	NAD 83 CSRS	Projection:	UTM Zone 21
Vertical Datum:	Chart Datum	Units:	Metres

SCALE

Horizontal Scale (metres)
1 : 1500

0 25 50 75 100 125 150

CLIENT

CBCL LIMITED
Consulting Engineers

NOTES

CSR conducted the hydrographic and geophysical survey from January 20 to January 30, 2020

HYDROGRAPHIC SURVEY EQUIPMENT

Vessel:	'NorQuest' (Roxborough RF-246)
Survey Software:	Hypack
Multibeam Software:	Hysweep / Seabat UI
Positioning:	Trimble 5700 RTK-GPS, Hemisphere VS330 GNSS
Motion Sensor:	SBG Ekinox 2 D
Heading:	SBG Ekinox 2 D, Hemisphere VS330 GNSS
Multibeam Echosounder:	Reson T20P
Velocimeter:	AML Micro-X SVP and Odom Digibar Pro
Tide Gauge:	Hobo U20
Seismic Reflection:	EG&G 240 Boomer (400-10000 Hz), Applied Acoustics CSP-300 Power Supply,Ministeamer with GeoSpectrum M5 Hydrophones

PROCESSING and INTERPRETATION

Sub-bottom data were recorded along survey lines throughout the survey site using an EG&G 240 Boomer system.

The Boomer data were post processed using CODA Survey Engine 4.3 software. The acoustic basement (interpreted top of bedrock) was mapped using a subbottom sound velocity of 1600 m/s and the sediment thickness above acoustic basement xyz file was exported.

The exported data set was imported into Surfer 17 and grid cells of 5 m x 5 m were established based on a kriging interpolation algorithm. Sediment thickness isopachs were generated at 1 metre intervals based on the gridded data.

The area of no visible acoustic basement reflectors was caused by the decreased penetration of the seismic energy due to the coarse nature of the overlying Quaternary sediment.

Surficial bedrock areas and pipe locations were interpreted from multibeam sonar data along with areas of undifferentiated sediment within the surficial bedrock areas. Sediment thickness of these areas were determined from the sub-bottom data and manual diver probes where available. Probe positions and sediment thickness were obtained from CBCL.

This chart represents results at the time of the survey and can only be considered as indicating the conditions at that time. Geophysical surveying is a remote sensing method that may not detect all surface or sub-surface features of interest or concern.

BACKGROUND

Roads were obtained from https://maps.canada.ca/czs/index-en.html. The coastline was digitized from Google Earth Pro and is considered approximate.

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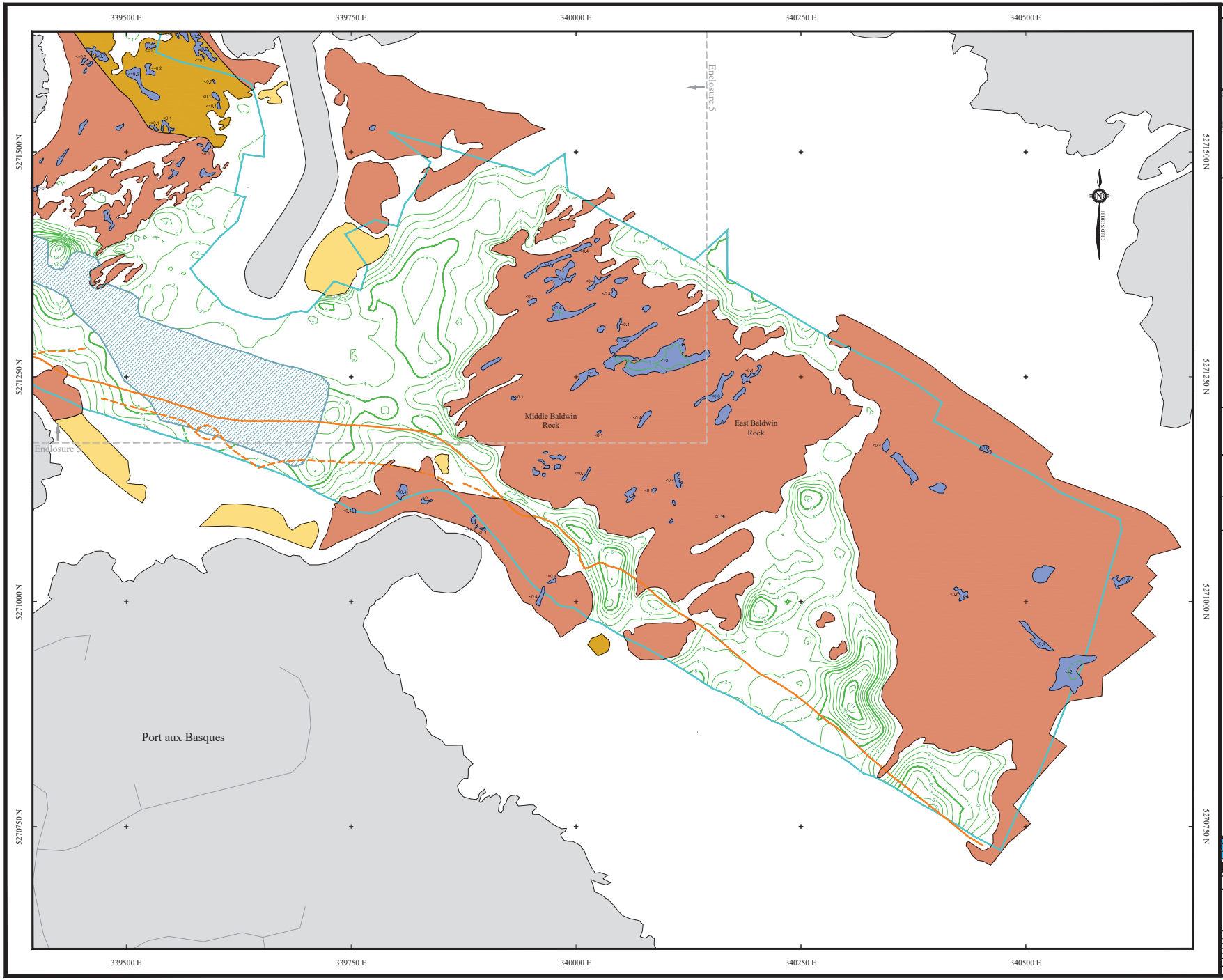
341 MYRA ROAD, PORTERS LAKE, NOVA SCOTIA
CANADA B3E 1G2
Tel: (902) 827 4200 Fax: (902) 827 2002
Email: info@csr-marine.com

ENGINEERING & ENVIRONMENTAL GEOPHYSICS

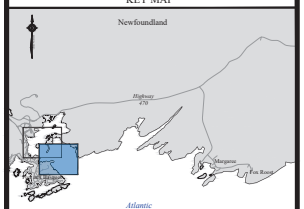
PAB Vardy's Island – Navigation Improvements
Port aux Basques, Newfoundland
Surficial Bedrock Geology & Acoustic Basement Isopach Map (North)
Enclosure 5

REV	DATE	REMARKS	INTERPRETED BY	COMPILED BY	CHECKED BY
0	Mar 16, 2020	Draft	MG	MW	PC
1	Mar 26, 2020	Draft	MG	MW	PC
2	Sept 16, 2020	Draft	MG	MW	PC
3	Nov 06, 2020	Final	MG	MW	PC

SCALE: 1:1500	PROJECTION: UTM Zone 21
CSR PROJECT #: 1945	FILE: 1945_AB_20201106.dwg



KEY MAP



LEGEND

- Sediment thickness isopach (1 m interval)
- Sediment thickness isopach (5 m interval)
- Sub-bottom data extent
- Pipeline Intake
- Abandoned Pipe
- Adjacent enclosure boundary
- UTM Graticule
- Bedrock at seabed (may include sediment patches)
- Bedrock with local sediment veneer (generally <0.2m)
- Bedrock / Boulders at seabed with local sediment veneer
- Undifferentiated Sediment (thickness labelled in metres where data is available)
- Area of no visible acoustic basement reflectors

GEODETIC PARAMETERS

Horizontal Datum:	NAD 83 CSRS	Projection:	UTM Zone 21
Vertical Datum:	Chart Datum	Units:	Metres

SCALE

Horizontal Scale (metres)
1 : 1500

0 25 50 75 100 125 150

CLIENT

CBCL LIMITED
Consulting Engineers

NOTES

CSR conducted the hydrographic and geophysical survey from January 20 to January 30, 2020

HYDROGRAPHIC SURVEY EQUIPMENT

Vessel:	'SeaQuest' (Rushborough RF-246)
Survey Software:	Hypack
Multibeam Software:	Hysweep / Seabat UI
Positioning:	Trimble 5700 RTK-GPS, Hemisphere VS330 GNSS
Motion Sensor:	SBG Ekinox 2 D
Heading:	SBG Ekinox 2 D, Hemisphere VS330 GNSS
Multibeam Echosounder:	Reson T20P
Velocimeter:	AML Micro-X SVP and Odom Digibar Pro
Tide Gauge:	Hobo U20
Seismic Reflection:	EG&G 240 Boomer (400-10000 Hz), Applied Acoustics CSP-300 Power Supply,Ministeamer with GeoSpectrum M5 Hydrophones

PROCESSING and INTERPRETATION

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BACKGROUND

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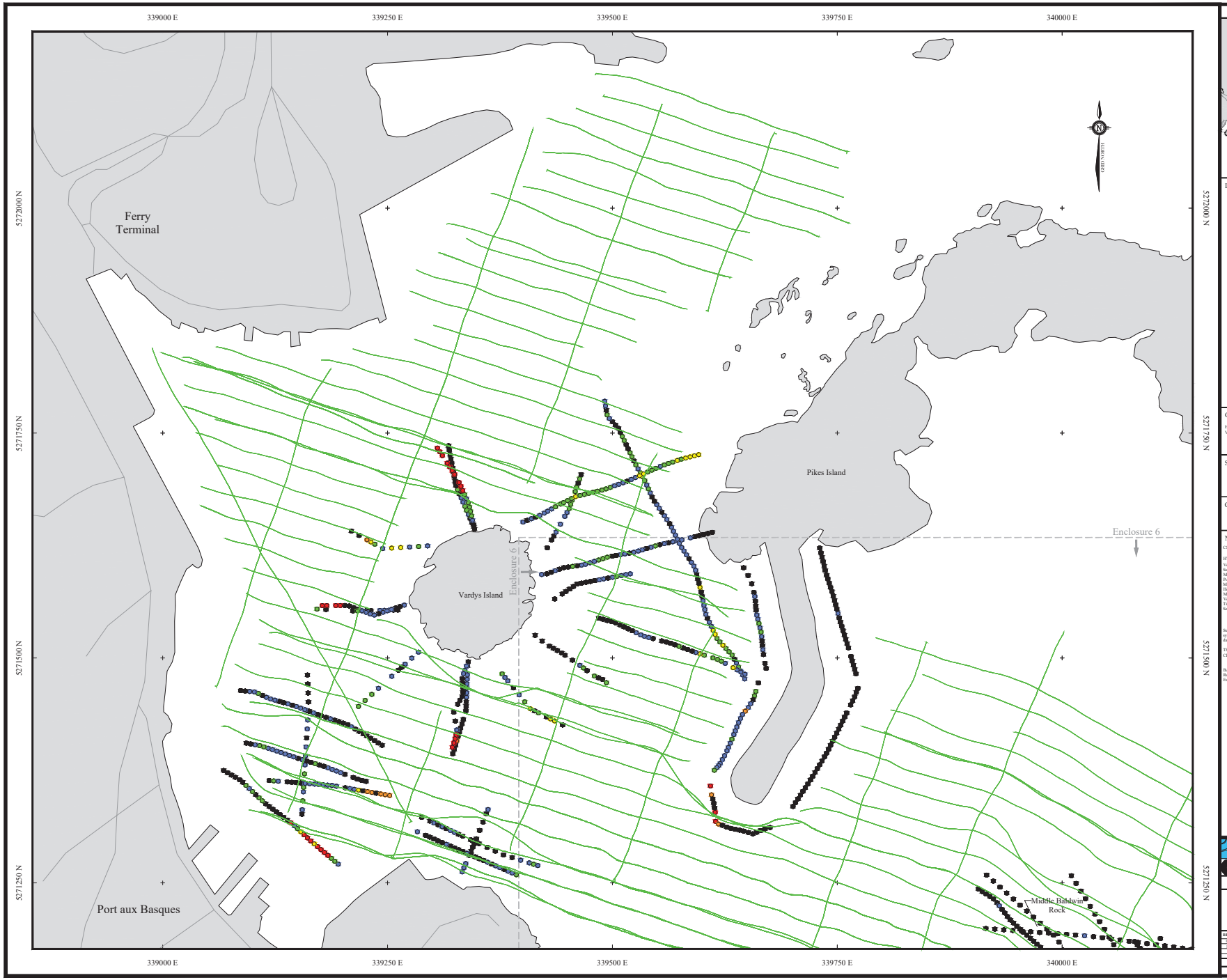
CANADA B3E 1G2
Tel: (902) 827 4200 Fax: (902) 827 2002
Email: info@csr-marine.com

ENGINEERING & ENVIRONMENTAL GEOPHYSICS

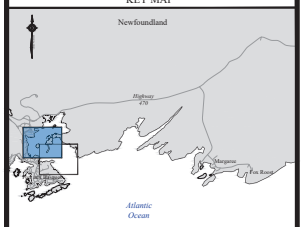
PAB Vardy's Island – Navigation Improvements
Port aux Basques, Newfoundland
Surficial Bedrock Geology & Acoustic Basement Isopach Map (South)
Enclosure 6

REV	DATE	REMARKS	INTERPRETED BY	COMPILED BY	CHECKED BY
0	Mar 16, 2020	Draft	MG	MW	PC
1	Mar 26, 2020	Draft	MG	MW	PC
2	Sept 16, 2020	Draft	MG	MW	PC
3	Nov 06, 2020	Final	MG	MW	PC

SCALE: 1:1500 | PROJECTION: UTM Zone 21
CSR PROJECT #: 1945 | FILE: 1945_AB_20201106.dwg



KEY MAP



LEGEND

- Sub-bottom trackline
- Adjacent enclosure boundary
- UTM Graticule

Manual Diver Probe Location (colour coded according to refusal depth)

- 0 m
- > 0 to 0.25 m
- > 0.25 to 0.50 m
- > 0.50 to 0.75 m
- > 0.75 to 1.00 m
- > 1.00 m

GEODETIC PARAMETERS

Horizontal Datum:	NAD 83 CSRS	Projection:	UTM Zone 21
Vertical Datum:	Chart Datum	Units:	Metres

SCALE

Horizontal Scale (metres)
1 : 1500

0 25 50 75 100 125 150

CLIENT

CBCL LIMITED
Consulting Engineers

NOTES

CSR conducted the hydrographic and geophysical survey from January 20 to January 30, 2020

HYDROGRAPHIC SURVEY EQUIPMENT

Vessel:	NunQuest' (Rushborough RF-246)
Survey Software:	Hypack
Multibeam Software:	Hysweep / Seabat UI
Positioning:	Trimble 5700 RTK-GPS, Hemisphere VS330 GNSS
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Heading:	SBG Ekinox 2 D, Hemisphere VS330 GNSS
Multibeam Echosounder:	Reson T20P
Velocimeter:	AML Micro-X SVP and Odom Digibar Pro
Tide Gauge:	Hobo U20
Seismic Reflection:	EG&G 240 Boomer (400-10000 Hz), Applied Acoustics CSP-300 Power Supply,Ministreamer with GeoSpectrum M5 Hydrophones

Sub-bottom data were recorded along survey lines throughout the survey site using an EG&G 240 Boomer system. The tracklines on this map represent the survey vessel's route during the collection of the sub-bottom data.

The positions and sediment thickness of the manual diver probes displayed on this map were obtained from CBCL.

BACKGROUND

Roads were obtained from https://maps.canada.ca/czs/index-en.html. The coastline was digitized from Google Earth Pro and is considered approximate.

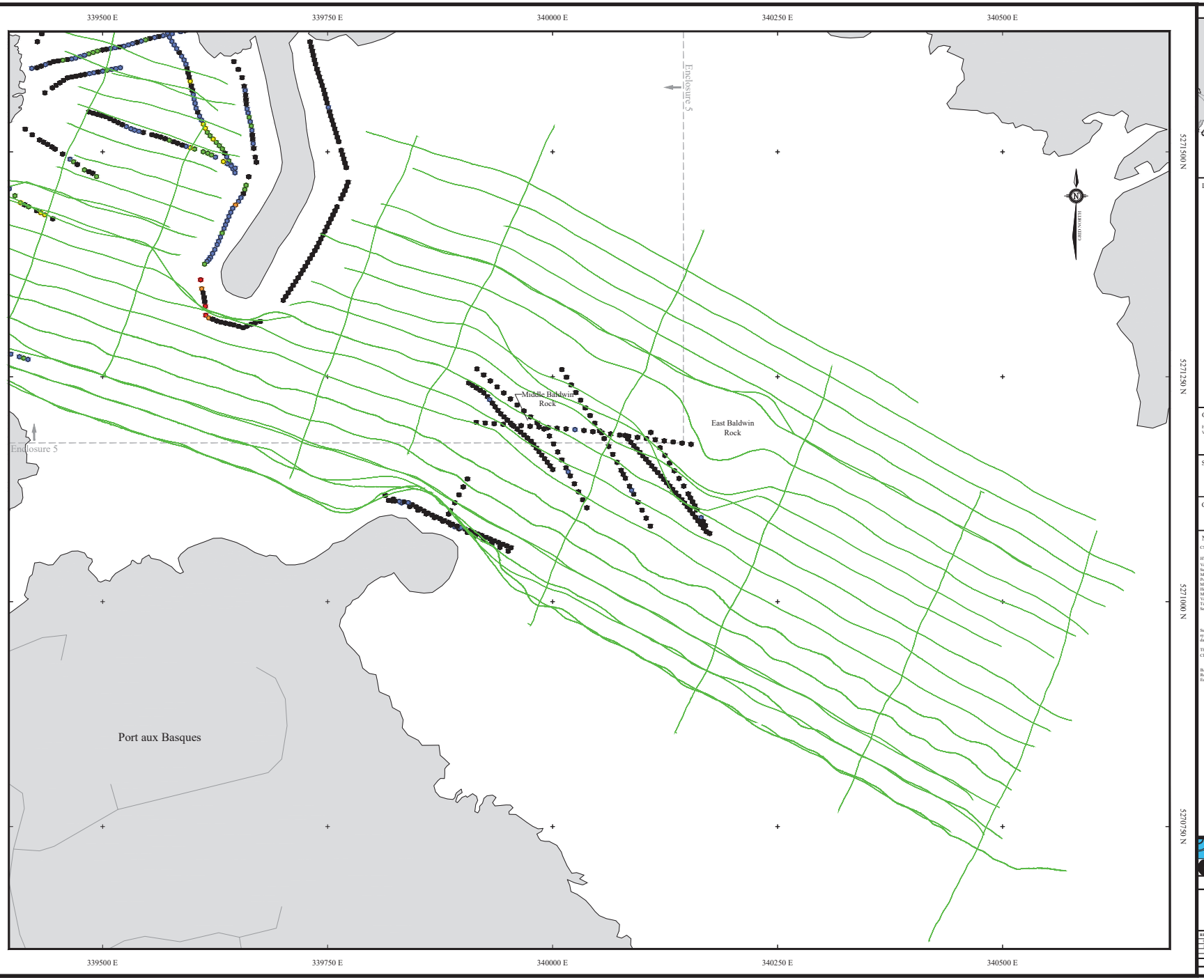
CSR GEOSURVEYS LTD.
341 MYRA ROAD, PORTERS LAKE, NOVA SCOTIA
CANADA B3E 1G2
Tel: (902) 827 4200 Fax: (902) 827 2002
Email: info@csr-marine.com

ENGINEERING & ENVIRONMENTAL GEOPHYSICS

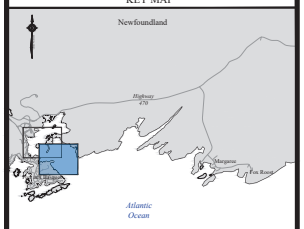
PAB Vardy's Island – Navigation Improvements
Port aux Basques, Newfoundland
Sub-bottom Trackline and Probe Location Map (North)
Enclosure 7

REV	DATE	REMARKS	INTERPRETED BY	COMPILED BY	CHECKED BY
0	Sep 16, 2020	Draft	MG	MW	PC
1	Nov 06, 2020	Final	MG	MW	PC

SCALE: 1:1500	PROJECTION: UTM Zone 21
CSR PROJECT #: 1945	FILE: 1945_TK_20201106.dwg



KEY MAP



LEGEND

- Sub-bottom trackline
- Adjacent enclosure boundary
- UTM Graticule

Manual Diver Probe Location (colour coded according to refusal depth)

- 0 m
- > 0 to 0.25 m
- > 0.25 to 0.50 m
- > 0.50 to 0.75 m
- > 0.75 to 1.00 m
- > 1.00 m

GEODETIC PARAMETERS

Horizontal Datum:	NAD 83 CSRS	Projection:	UTM Zone 21
Vertical Datum:	Chart Datum	Units:	Metres

SCALE

Horizontal Scale (metres)
1 : 1500

0 25 50 75 100 125 150

CLIENT

CBCL LIMITED
Consulting Engineers

NOTES

CSR conducted the hydrographic and geophysical survey from January 20 to January 30, 2020

HYDROGRAPHIC SURVEY EQUIPMENT

Vessel:	'SeaQuest' (Rushborough RF-246)
Survey Software:	Hypack
Multibeam Software:	Hysweep / Seabat UI
Positioning:	Trimble 5700 RTK-GPS, Hemisphere VS330 GNSS
Motion Sensor:	SBG Ekinox 2 D
Heading:	SBG Ekinox 2 D, Hemisphere VS330 GNSS
Multibeam Echosounder:	Reson T20P
Velocimeter:	AML Micro-X SVP and Odom Digibar Pro
Tide Gauge:	Hydro I/20
Seismic Reflection:	EG&G 240 Boomer (400-10000 Hz), Applied Acoustics CSP-300 Power Supply,Ministreamer with GeoSpectrum M5 Hydrophones

Sub-bottom data were recorded along survey lines throughout the survey site using an EG&G 240 Boomer system. The tracklines on this map represent the survey vessel's route during the collection of the sub-bottom data.

The positions and sediment thickness of the manual diver probes displayed on this map were obtained from CBCL.

BACKGROUND

Roads were obtained from https://maps.canada.ca/czs/index-en.html. The coastline was digitized from Google Earth Pro and is considered approximate.

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Email: info@csr-marine.com

ENGINEERING & ENVIRONMENTAL GEOPHYSICS

PAB Vardy's Island – Navigation Improvements
Port aux Basques, Newfoundland
Sub-bottom Trackline and Probe Location Map (South)
Enclosure 8

REV	DATE	REMARKS	INTERPRETED BY	COMPILED BY	CHECKED BY
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1	Nov 06, 2020	Final	MG	MW	PC

SCALE: 1:1500	PROJECTION: UTM Zone 21
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