Newfoundland and Labrador Hydro
Hydro Place. 500 Columbus Drive
P.O. Box 12400. St. John's. NL
Canada A1B 4K7
t. 709.737.1400 I f. 709.737.1800
nlhydro.com

July 25, 2022

Board of Commissioners of Public Utilities
Prince Charles Building
120 Torbay Road, P.O. Box 21040
St. John's, NL A1A 5B2

Attention: Ms. Cheryl Blundon
Director of Corporate Services and Board Secretary

Dear Ms. Blundon:

Re: *Reliability and Resource Adequacy Study Review* – Design Review for L'Anse au Diable and Dowden's Point Grounding Stations

In its correspondence dated November 30, 2021, Newfoundland and Labrador Hydro ("Hydro") provided the Board of Commissioners of Public Utilities with a report from Tiller Engineering Inc. ("TEI") containing the results of a root-cause analysis that was undertaken following significant damage to the breakwater at the Labrador grounding site located in L'Anse au Diable ("TEI Report").[1]

TEI's review of the site conditions and design considerations determined that the root cause of the damage is that the breakwater's crest is not high enough to protect against extreme site conditions. TEI recommended upgrades to mitigate the impact of significant wave events on the breakwater, better enabling it to protect the electrode site.

The TEI Report also included a design review and an updated wave study, which was used to determine the cause of the washouts experienced at the site. The TEI Report recommended the use of different assumptions than those originally used with respect to the available wave data, including a larger design wave at the site. Changing these assumptions will result in an increase in the required crest height of the breakwater to protect against these predicted values. TEI noted that its proposed design wave heights and related breakwater crest height were based on extreme conditions representing the worst-case design scenario. TEI recommended the following actions be taken prior to a final determination regarding the next steps:

1. Perform the nearshore wave/period modelling with a numerical model to re assess the worst-case scenario for a wave/period combination given the site geometry, wind generated surge and potential sea-level rise for 100 years.

2. Raise the breakwater crest height to the appropriate elevation, thus determined from recommendation 1.

3. Re-assess the armourstone sizes and internal geometry for the breakwater.

[1] "Labrador Island Link Limited Partnership Root Cause Analysis Report – L'Anse au Diable Grounding Station Phase 2 Breakwater," Tiller Engineering Inc., November 12, 2021.

4. An inspection of the structure to determine that the deformation is limited or not occurring and evaluation of construction quality.[2]

Following the TEI Report, Hydro evaluated its contents and instructed TEI to proceed with the recommendations in order to determine both the recommended wave height and increase in crest height in an effort to refine the values. This work has been completed and the technical results, including a new increased wave height and crest height, are included as Attachments 1 and 2. Hydro has commenced the detailed engineering and project-planning phase with a focus to begin the construction work in 2022. An updated schedule for completion of the work at the grounding site will be available in the fourth quarter of 2022.

Furthermore, Hydro has commenced a design review of the Dowden's Point Grounding Site, located on the Island's Avalon Peninsula. This review will complete a similar wave study to that which was completed for the Labrador Site. The scope of the Dowden's Point Grounding Site wave study is to evaluate this breakwater's original design parameters. It is expected that this wave study will be completed by the fourth quarter of 2022.

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

Shirley A. Walsh
Senior Legal Counsel, Regulatory
SAW/sk

Encl.

ecc:

Board of Commissioners of Public Utilities
Jacqui H. Glynn
Maureen Greene, QC
PUB Official Email

Consumer Advocate
Dennis M. Browne, QC, Browne Fitzgerald Morgan Avis & Wadden
Stephen F. Fitzgerald, Browne Fitzgerald Morgan Avis & Wadden
Sarah G. Fitzgerald, Browne Fitzgerald Morgan Avis & Wadden
Bernice Bailey, Browne Fitzgerald Morgan Avis & Wadden
Bernard M. Coffey, QC

Labrador Interconnected Group
Senwung F. Luk, Olthuis Kleer Townshend LLP
Joshua H. Favel, Olthuis Kleer Townshend LLP

Island Industrial Customer Group
Paul L. Coxworthy, Stewart McKelvey
Denis J. Fleming, Cox & Palmer
Dean A. Porter, Poole Althouse

Newfoundland Power Inc.
Dominic J. Foley
Lindsay S.A. Hollett
Regulatory Email

[2] "Labrador Island Link Limited Partnership Root Cause Analysis Report – L'Anse au Diable Grounding Station Phase 2 Breakwater," Tiller Engineering Inc., November 12, 2021, p. 20.

Attachment 1

L’Anse au Diable Breakwater Rehabilitation Design Brief

newfoundland labrador hydro

L'Anse-au-Diable Breakwater

Rehabilitation Design Brief

Prepared by:
Tiller Engineering Inc.
PO Box 403
50 Hamlyn Rd. Plaza
St. John's, NL,
Canada, A1E 5X7

TILLER ENGINEERING INC

Issue and Date:	Status:	Project #:	Issued By:	Checked By:	Approved By:
April 1, 2022	R0-Issued for Review	2021-227	RT	MT	RT
MAY 11, 2022	R1-Reissued		RT	RT	RT

TABLE OF CONTENTS

LIST OF APENDICIES

1.0 Introduction

The L'Anse-au-Diable breakwater was completed in 2016 as a protection for shoreline pond electrodes as part of the Lower Churchill Project. The purpose of the breakwater was to protect the electrodes from wind and wave forces which otherwise may damage it. However, in the five (5) years since construction the breakwater has sustained damage including shifting armor stones, washouts, and damage to the electrode well due to overtopping. Redesign and Rehabilitation was required to ensure no further damage occurs to breakwater and electrode wells.

1.1 Purpose

Tiller Engineering Inc. (TEI) was engaged by the client to review the project drawings and specifications and related contractual and construction progress documentation and to provide an independent opinion on the basis of design and construction processes associated with the project.

TEI reviewed the documentation and the project drawings and specifications with respect to industry guidelines.

Industry Standards, Guidelines, and data used by TEI in this review included:

i) National Building Code of Canada, 2015
ii) Shore Protection Manual (US Army Corps of Engineers, 1984)
iii) American Society for Testing Materials
iv) Meteorological Service of Canada (MSC50 Hindcast data)
v) Meco - Wind/Wave Analysis and Breakwater Design L'Anse-Au-Diable Breakwater

2.0 Scope

TEI was responsible for providing a new wave and wind analysis to compare with previous wave and wind measurements and modelling. New wave and wind data was then be used by TEI to complete a Root Cause Analysis for damage on the L'Anse au Diable breakwater structure. A redesign to modify the existing breakwater in order to eliminate any further damage was provided by TEI.

3.0 Abbreviations

TABLE OF ACRYNOMS

TEI	TILLER ENGINEERING INC
LCP	LOWER CHURCHILL PROJECT
SPM	SHORE PROTECTION MANUAL
MSC	METEOROLOGICAL SERVICE OF CANADA
LIDAR	LIGHT DECTION AND RANGING
SWAN	SIMULATING WAVES NEARSHORE SOFTWARE

4.0 References

[1] - Technical Memorandum Report - Wind/Wave Analysis and Breakwater Design

[2] - ILK-SN-CD-8610-CV-RP-0001001 - Wave Climate and Extremes at L'Anse au Diable, Strait of Belle Isle

[3] - LCP-PT-MD-8610-EN-PR-0002-01 - L'Anse au Diable Grounding Station Phase 2 Breakwater Design Re-Evaluation Scope of Work

[4] - MFA-SN-CD-6300-CV-DC-0001-01 - SHORELINE POND ELECTRODES CIVIL/MARINE DESIGN CRITERIA

[5] - ILK-SN-CD-8610-CV-PL-0009-02 - Electrode Station Breakwater Section A, B, C &D

[6] - ILK-HJ-SD-8610-CV-R02-0005-01 - Supply and Install Electrode Sites – L'Anse Au Diable BREAKWATER CONSTRUCTION

[7] - ILK-SN-CD-8600-CV-TS-0001-01 - ELECTRODE SITES BREAKWATER INSTALLATION TECHNICAL SPECIFICATION

[8] - SHORE PROTECTION MANUAL (US ARMY CORPS OF ENGINEERS, 1984)

5.0 Original Design Fundamentals

5.1 Climate Data Used

During design the Meteorological Service of Canada (MSC50) wave hindcast data in the central Strait of Belle Isle was transformed to the project site, L'Anse au Diable. Using Delft3D/Simulating Waves Nearshore Software (SWAN), a spectral wave model was set up to closely analyze the near-shore wave climate and extreme waves of the immediate vicinity.

5.2 Water Depths

Indicated within the provided documents is a high water between 1.4 and 1.7 meters, a sea level rise of one meter is also mentioned however, it is not clear which height was used when determining the height of the breakwater. In the documents provided, storm surge is not mentioned in design. Accurate water levels, tidal ranges and storm surges are necessary in determining the elevation of the breakwater.

5.3 Wind Speed

Within the design criteria for the breakwater SLI outlines monthly wind speeds along with direction and average speed. While the average wind speed and gusts are mentioned the report does not specify the design wind speed used.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average Km/h	22.7	22.3	23.1	21.2	16.6	15.1	12.8	14.2	16.9	19.5	22.7	24.8	**19.3**
Direction	W	W	SW	NE	NE	SW	SW	SW	SW	SW	W	W	**SW**

Average Wind Speed [4]

5.4 Wave Height

Upon inspection of the original design criteria the following Table suggests the significant wave height which was used in the design of the breakwater. A significant design wave of 4.4 meters for a 200 year return was used.

Return Period (Years)	Extreme Wave, Hs (m) Location 1	2	3	4	5	6	7	8
1	2.2 ± 0.1	2.2 ± 0.1	2.3 ± 0.1	2.6 ± 0.1	2.2 ± 0.1	2.2 ± 0.1	2.2 ± 0.1	2.2 ± 0.1
2	2.3 ± 0.1	2.4 ± 0.1	2.5 ± 0.1	2.8 ± 0.1	2.4 ± 0.1	2.3 ± 0.1	2.4 ± 0.1	2.5 ± 0.1
5	2.6 ± 0.1	2.7 ± 0.1	2.8 ± 0.1	3.1 ± 0.2	2.6 ± 0.1	2.6 ± 0.1	2.7 ± 0.1	2.7 ± 0.1
10	2.8 ± 0.2	2.9 ± 0.2	3.0 ± 0.2	3.4 ± 0.2	2.8 ± 0.2	2.8 ± 0.2	2.9 ± 0.2	3.0 ± 0.2
25	3.0 ± 0.3	3.1 ± 0.3	3.2 ± 0.3	3.7 ± 0.3	3.0 ± 0.2	3.0 ± 0.2	3.2 ± 0.3	3.2 ± 0.3
50	3.2 ± 0.3	3.3 ± 0.3	3.5 ± 0.3	3.9 ± 0.4	3.2 ± 0.3	3.2 ± 0.3	3.4 ± 0.4	3.4 ± 0.4
100	3.4 ± 0.4	3.5 ± 0.4	3.7 ± 0.4	4.1 ± 0.5	3.4 ± 0.4	3.4 ± 0.4	3.6 ± 0.4	3.7 ± 0.4
200	3.6 ± 0.4	3.7 ± 0.4	3.9 ± 0.5	4.4 ± 0.5	3.6 ± 0.4	3.6 ± 0.4	3.8 ± 0.5	3.9 ± 0.5

Significant Wave Heights Presented [4]

Design criteria provided outlined that the breakwater should be designed for a "expected worst case" site conditions. Design wave height was taken as the 200 year significant wave height, a one meter sea level rise, and a high water level as 1.5 meters were included in design. All of which play a large role in the design of the crest elevation, and armor stones sizes. It is likely that the design values were low. As noted it is not clear whether storm surge water levels were considered in the design, higher water levels attributed to a storm surge have the possibility to produce higher than designed for waves with a more significant run-up on the breakwater.

5.5 Design Summary

The following table summarizes all original design values used for the breakwater:

Item	Value
Armor Stone Sizes	6 – 10 Tonnes
Filter Stone Sizes	0.6 – 1.0 Tonnes
Wave Height	4.1 Meters
High Water Line	1.5 Meters
Crest Elevation	8.3 Meters
Filter & Core Stone Elevation	4.9 Meters
Wind Speed	As above

Table Original Design Summary

6.0 Construction- Original and New

6.1 Construction Methodology

Construction of a breakwater includes excavation of the sea bed, laying of the core, filter and armor stones. In the case of L'Anse-au-Diable the same processes were undertaken with the additional construction of electrode wells to facilitate the Lower Churchill Project (LCP). Core stones are first placed on the seabed in sections and filter and armor stones are sequentially added to protect the core stones from wave action. This procedure continues until the breakwater is complete. Crest width is an important factor to consider as heavy equipment is needed to lay armor stones and the crest must be wide enough so the equipment can safely reach all points of the breakwater.

Core, filter, armor stone sizes and width layers are all determined through design and the construction requires the breakwater to be built as close as possible to the design to retain the structural resistance against wave action.

6.2 As-Built Elevations

Design documents include a site overview as well as cross sections are various points along the breakwater. Elevations on the design drawings include height for core, filter, and armor stones; as-built elevations are to be as close as possible to these elevations as these elevations are the determined heights for the breakwater to resist wave action.

When reviewing as-built elevations it appears that numerous points along the breakwater have lower than design elevations. The low elevations are not limited to a certain layers but are present in the core, filter, and armor stones.

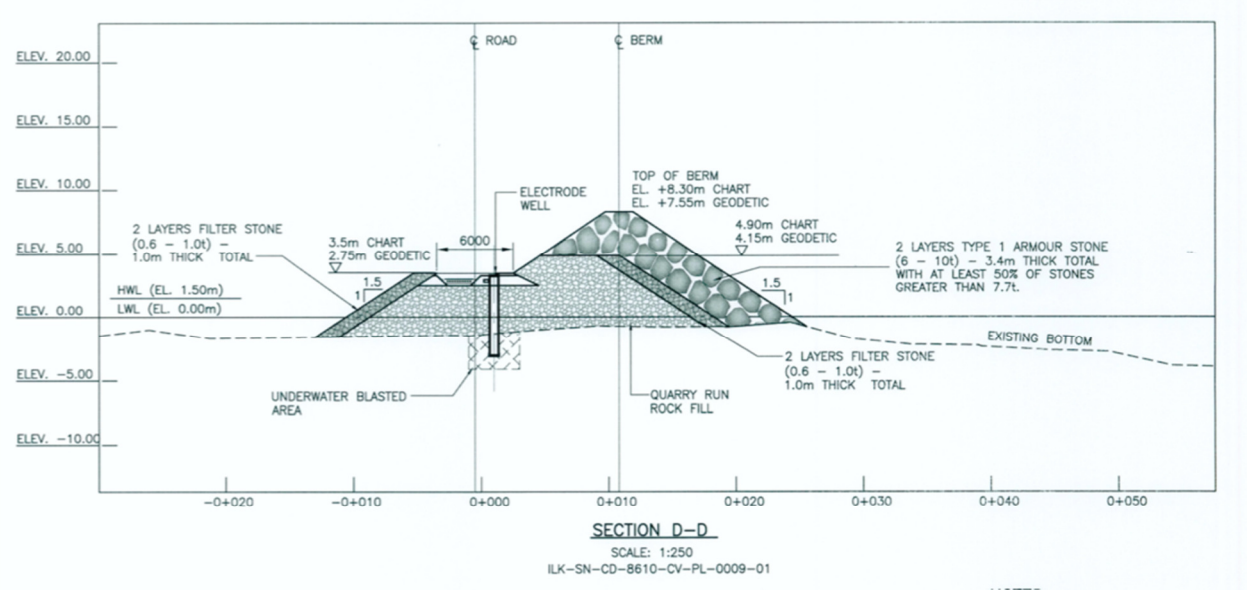


Figure Design Cross Section D-D [5]

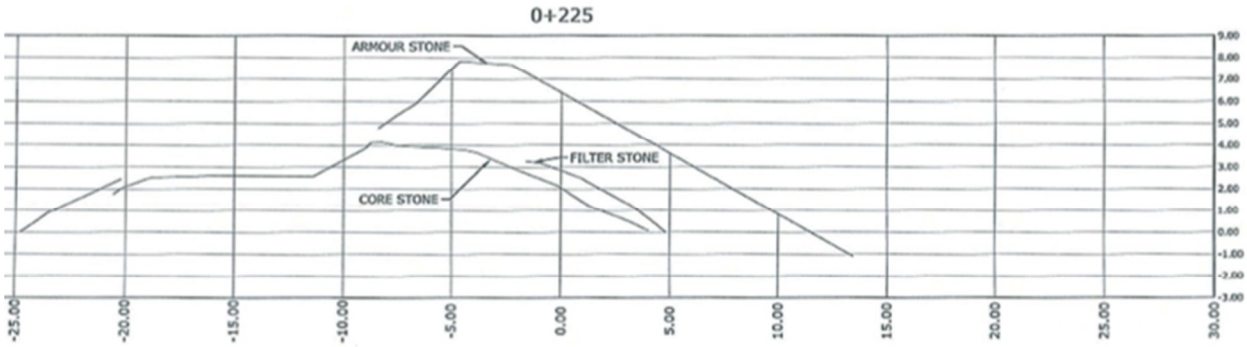


Figure As-Built Elevations [6]

	Armor		Filter		Core Seaward		Core Landward	
Station – Cross Section	Design	Actual	Design	Actual	Design	Actual	Design	Actual
0+050 – A-A	7.55	7.75	4.15	4.50	4.15	4.25	-	-
0+075	7.55	7.75	4.15	4.50	4.15	4.00	-	-
0+125 – B-B	7.55	7.75	4.15	4.70	4.15	4.00	2.75	2.50
0+175 – C-C	7.55	7.75	4.15	3.95	4.15	4.10	2.75	2.75
0+225 – D-D	7.55	7.80	4.15	3.20	4.15	4.10	2.75	2.60
0+275 – E-E	7.55	7.20	4.15	4.5	4.15	4.15	2.75	2.60

Table As-Built Elevations versus Design Elevation (m)

6.3 Rock Sizes

The rock sizes in both the filter and armor stone layers are found using the design inputs for the breakwater. Various rock sizes are used to promote interlocking of the structure and provide added structural integrity. All rock sizes outlined in the L'Anse-au-Diable breakwater must be greater than the minimum outlined size and over 50 percent must be greater than 10 Tonnes.

6.4 Compressed Rock Strength

Within the Technical Specification for Breakwater Installation SLI defines the required compressed rock strength to be in exceedance of 170 Mpa [7]. Materials testing on numerous samples from L'Anse-au-Diable concluded the average compressed strength of the rock used was just 153.6 Mpa [6].

7.0 Conclusions and Recommendations

The following recommendations were included in the rehabilitation design work.

Re-assess the worst-case scenario for a wave/period combination given the site geometry, wind generated surge and potential sea level rise for 100 years.

Raise the breakwater crest height to the appropriate elevation

Re-assess the armour stone sizes and internal geometry for the breakwater.

We did perform an inspection of the structure to determine that the existing damage is limited and that the existing of construction quality is satisfactory.

We have proceeded to complete a design remediation as per reference [8] producing drawings to remediate the breakwater under extreme conditions. All design values match the existing except we used the worst-case design scenario of an offshore wave of 7 m reduced by a factor of 0.88 for an inshore design wave of 6.1 m increased from the original design value.

The remediation design has increased the crest height of the breakwater to a proposed height of 9.0m to 10m as shown in the accompanying drawings titled L'anse au Diable Phase 2 Grounding Station Break Water Design Re-Evaluation Rehabilitation.

Appendix A: Rehabilitation Drawings

Attachment 2

L’Anse au Diable Phase 2 Grounding Station Breakwater Design Re-Evaluation Rehabilitation

newfoundland labrador hydro

L'ANSE AU DIABLE PHASE 2
GROUNDING STATION
BREAKWATER DESIGN RE-EVALUATION
REHABILITATION

Prepared by: TEI™

119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com

A member firm of Association of Consulting Engineering Companies NL (ACEC-NL)

Prepared for: Labrador Island Link Limited Partnership
350 Torbay Road Suite 2
St. John's NL
A1A 4E1

Project No.: 2021-227

R1 - Reissued to Client Date: March 31, 2022
R0 - Issued to Client Date: November 12, 2021

DRAWING INDEX

SHEET #	SHEET TITLE	REV.
–	COVER SHEET	
S0	NOTES	R1
S1	OVERALL PLAN VIEW	R1
S2	EXISTING BREAKWATER CROSS SECTIONS	R1
S3	EXISTING BREAKWATER CROSS SECTIONS	R1
S4	EXISTING BREAKWATER CROSS SECTIONS WITH REMEDIATIONS	R1
S5	EXISTING BREAKWATER CROSS SECTIONS WITH REMEDIATIONS	R1

GENERAL NOTES:

1. CHECK ALL RELEVANT DRAWINGS PRIOR TO STARTING ANY CONSTRUCTION. CLIENT TO COORDINATE ALL DETAILS AND DIMENSIONS WITH RELEVANT DRAWINGS.
2. ALL WORK TO BE DONE IN A QUALITY SAFE MANNER IN ACCORDANCE WITH ALL FEDERAL, PROVINCIAL AND MUNICIPAL REGULATIONS.
3. CONTRACTOR SHALL DESIGN, INSTALL AND MAINTAIN ADEQUATE TEMPORARY BRACING AND SHORING OF ALL STRUCTURAL COMPONENTS FOR STABILITY AND SAFETY AS REQUIRED DURING CONSTRUCTION.
4. ALL THIRD PARTY PRODUCTS SHALL BE INSTALLED IN STRICT ADHERENCE TO MANUFACTURER'S SPECIFICATIONS. CONTRACTOR TO OBTAIN ANY TRAINING REQUIRED BY MANUFACTURER PRIOR TO INSTALLATION.
5. CONSTRUCTION DRAWINGS AND SPECIFICATIONS ARE IN METRIC UNITS. DIMENSIONS ARE IN MILLIMETERS AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED.
6. 0.00m GEODETIC DATUM = 0.75m CHART DATUM.
7. DO NOT SCALE THESE DRAWINGS.
8. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THESE DRAWINGS AND PROJECT SPECIFICATIONS.
9. ALL DIMENSIONS AND MEASUREMENTS MUST BE VERIFIED ON SITE PRIOR TO COMMENCING WORK.
10. EXISTING DAMAGE TO THE BREAKWATER SHALL BE RESTORED PRIOR TO COMMENCING WORK.
11. LOCATION AND EXTENT OF ALL EXISTING ELECTRODE WELLS PRIOR TO THE COMMENCEMENT OF WORK.
12. DRAWINGS REFLECT A CONCEPT FOR REHABILITATION BASED ON A INSHORE DESIGN WAVE OF 6.3m ± 10%.
13. REFER TO ALL PAST NL HYDRO AND LCP PROJECT SPECIFICATIONS RELATED TO BREAKWATER.

ARMOUR STONE NOTES:

1. PROPOSED SOURCE AND REQUIRED PERMITS OF AGGREGATES SHALL BE APPROVED BY CLIENT.
2. ARMOUR STONES TO BE FRACTURED AND ANGULAR.
3. ARMOUR STONE IS TO BE FREE FROM CRACKS, SEAMS AND OTHER DEFECTS WHICH MAY IMPAIR DURABILITY.
4. AGGREGATE SHALL BE TRANSPORTED WITH CARE TO AVOID DEGRADATION.
5. WEIGH SCALES SHALL BE OF SUFFICIENT CAPACITY TO WEIGH LOADED VEHICLES.
6. ARMOUR STONE WILL BE MEASURED IN TONNES AND MEET THE FINAL DIMENSIONS INDICATED ON THE DRAWINGS.
7. ARMOR STONES TO BE 8 – 12 TONNES.
8. GREATER THAN 50% OF ARMOR STONES TO BE LARGER THEN 10 TONNES.
9. ARMOR STONES TO BE BETWEEN 1.85m – 2.05m IN DIAMETER.
10. ARMOUR STONES SHALL BE PLACED TO ELEVATIONS, GRADES AND DIMENSIONS AS INDICATED IN THE DRAWINGS.
11. SLOPE OF PROPOSED BREAKWATER REMEDIATION TO BE MAINTAINED (EITHER 1.5:1 OR 2:1).
12. STABLE POSITIONS SHALL BE CHOSEN FOR ARMOUR STONE PLACEMENT.
13. ROCKS SHALL BE INTERLOCKED AND SURFACES SHALL BE MADE AS UNIFORM AS POSSIBLE.

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador — PERMIT HOLDER

This Permit Allows

TILLER ENGINEERING INC.

MIRC #02255

To practice Professional Engineering In Newfoundland and Labrador. Permit No. as Issued by PEG P0227 which is valid for the year 2022

STAMP

REGISTERED PROFESSIONAL ENGINEER — R. W. TILLER — SIGNATURE — 31 MAR/2022 — DATE — PROVINCE OF NEWFOUNDLAND

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com

A member firm of Association of Consulting Engineering Companies NL (ACEC-NL)

NO.	REVISIONS	DATE
R1	REISSUED TO CLIENT	31/03/22
R0	ISSUED TO CLIENT	12/11/21

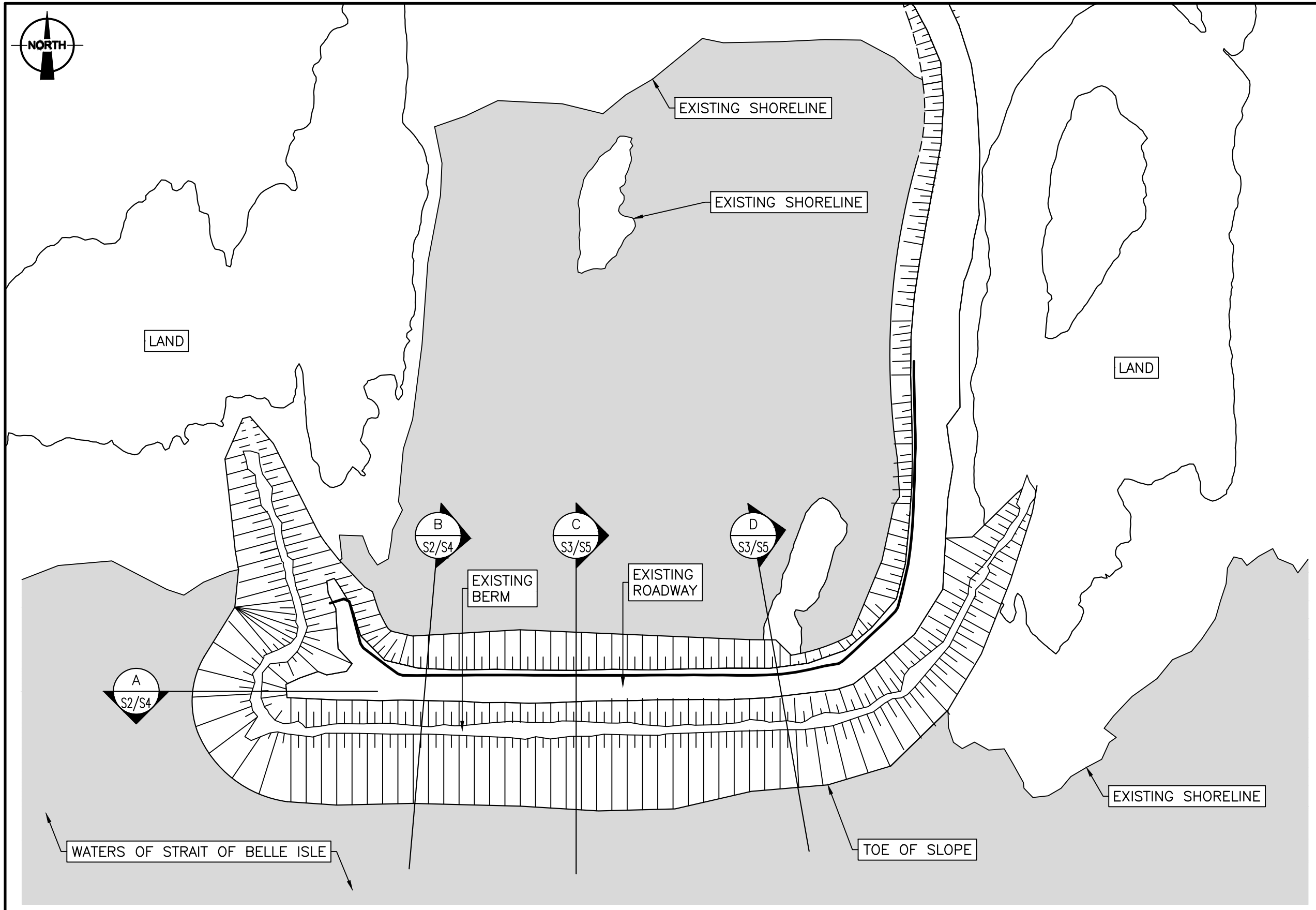
CLIENT: LABRADOR ISLAND LINK LIMITED PARTNERSHIP

PROJECT: L'ANSE AU DIABLE PHASE 2 GROUNDING STATION BREAKWATER DESIGN RE–EVALUATION REHABILITATION

TITLE: NOTES

DESIGNED	R.T.	APPROVED	J.S./R.T.
DRAWN	J.D.	CHECKED	J.S./R.T.
SCALE	N/A	DATED	31/03/22
PROJECT NO.	2021–227	DRAWING NO.	S0

C:\Users\jdoyle\Desktop\PROJECTS 2022\2021-227-ES-LCP-L'ANSE AU DIABLE GROUNDING STN-BREAKWATER DESIGN RE-EVALUATION\Drawings\L'anseAuDiable-Phase2-GroundingStn-BreakwaterDesignRe-evaluation-2021-227-LabIslandLink-RITC



OVERALL PLAN VIEW – L'ANSE AU DIABLE BREAKWATER

1:1000

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador — PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

PERMIT HOLDER
This Permit Allows

TILLER ENGINEERING INC.

MIRC #02255

To practice Professional Engineering
In Newfoundland and Labrador.
Permit No. as Issued by PEG P0227
which is valid for the year 2022

STAMP

REGISTERED PROFESSIONAL ENGINEER
R. W. TILLER
SIGNATURE
31 MAR/2022
DATE
PROVINCE OF NEWFOUNDLAND

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com

A member firm of Association of Consulting Engineering Companies NL (ACEC-NL)

NO.	REVISIONS	DATE
R1	REISSUED TO CLIENT	31/03/22
R0	ISSUED TO CLIENT	12/11/21

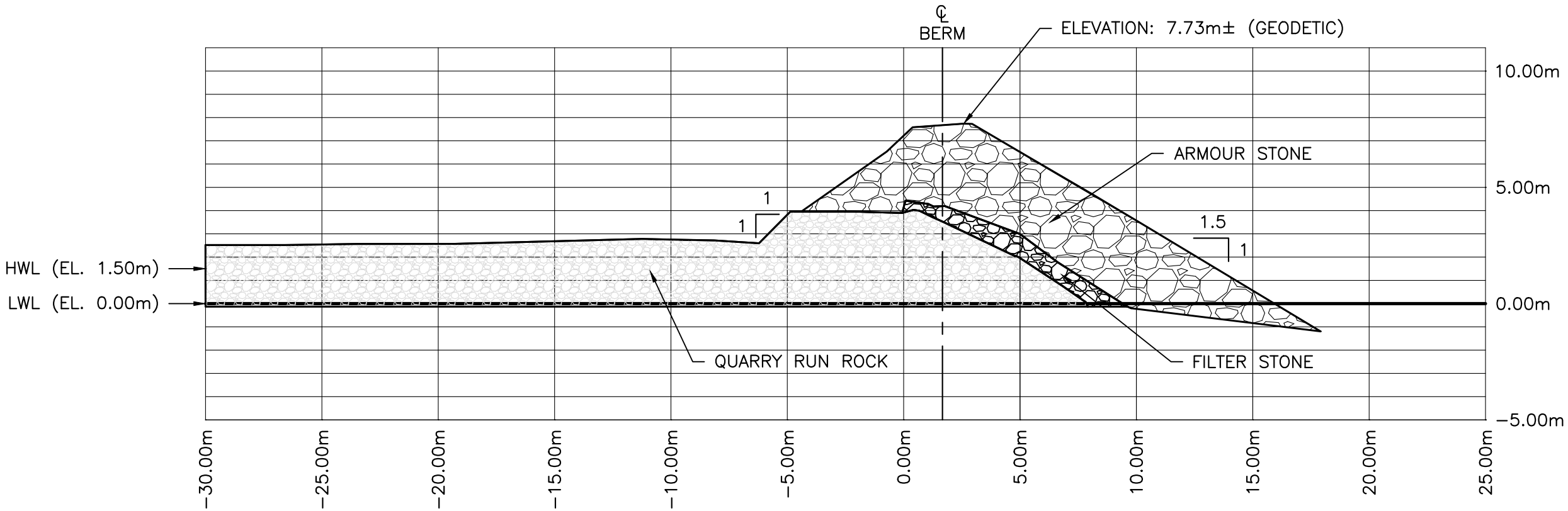
CLIENT
LABRADOR ISLAND LINK
LIMITED PARTNERSHIP

PROJECT
L'ANSE AU DIABLE
PHASE 2 GROUNDING STATION
BREAKWATER DESIGN
RE–EVALUATION REHABILITATION

TITLE
OVERALL PLAN VIEW

DESIGNED	R.T.	APPROVED	J.S./R.T.
DRAWN	J.D.	CHECKED	J.S./R.T.
SCALE	1:750	DATED	31/03/22
PROJECT NO.	2021–227	DRAWING NO.	S1

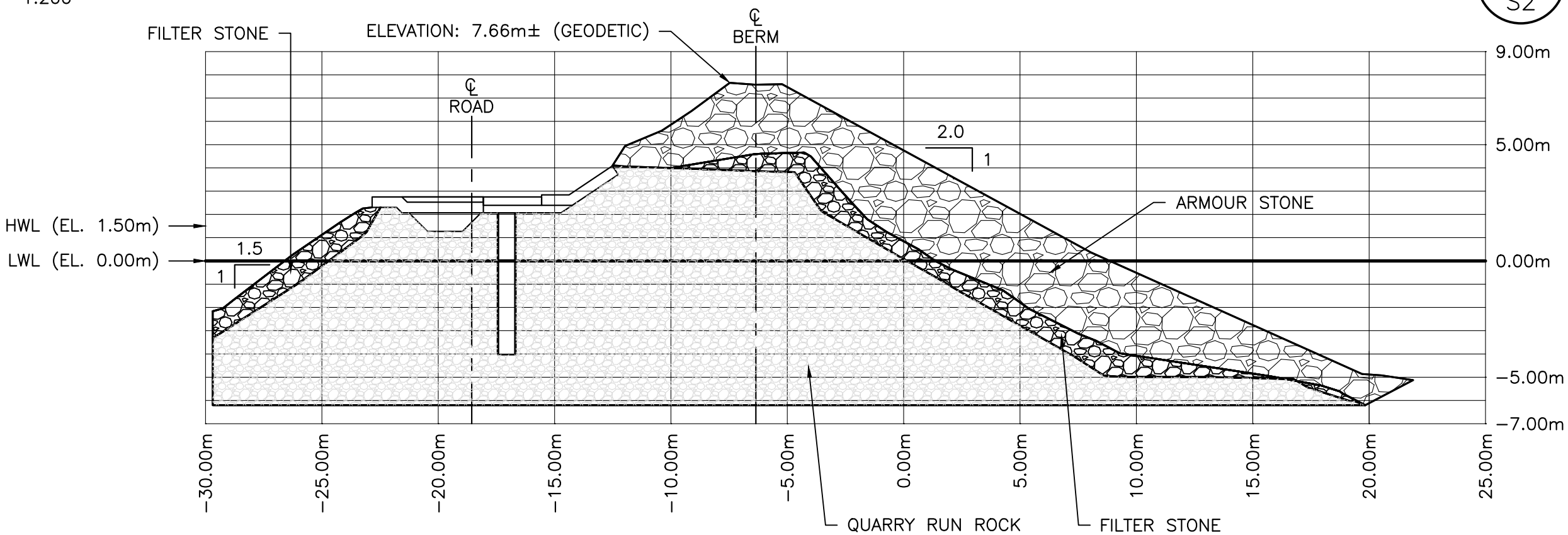
C:\Users\jdoyle\Desktop\PROJECTS 2022\2021-227-ES-LCP-L'ANSE AU DIABLE GROUNDING STN-BREAKWATER DESIGN RE-EVALUATION\Drawings\L'anseAuDiable-Phase2-GroundingStn-BreakwaterDesignRe-evaluation-2021-227-LabIslandLink-RITC



EXISTING – SECTION A (0+075.00)

1:200

A
S2



EXISTING – SECTION B (0+125.00)

1:200

B
S2

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador — PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

PERMIT HOLDER
This Permit Allows

TILLER ENGINEERING INC.

MIRC #02255

To practice Professional Engineering In Newfoundland and Labrador. Permit No. as Issued by PEG P0227 which is valid for the year 2022

STAMP

REGISTERED PROFESSIONAL ENGINEER
R. W. TILLER
SIGNATURE
31 MAR/2022
DATE
PROVINCE OF NEWFOUNDLAND

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com
A member firm of Association of Consulting Engineering Companies NL (ACEC-NL)

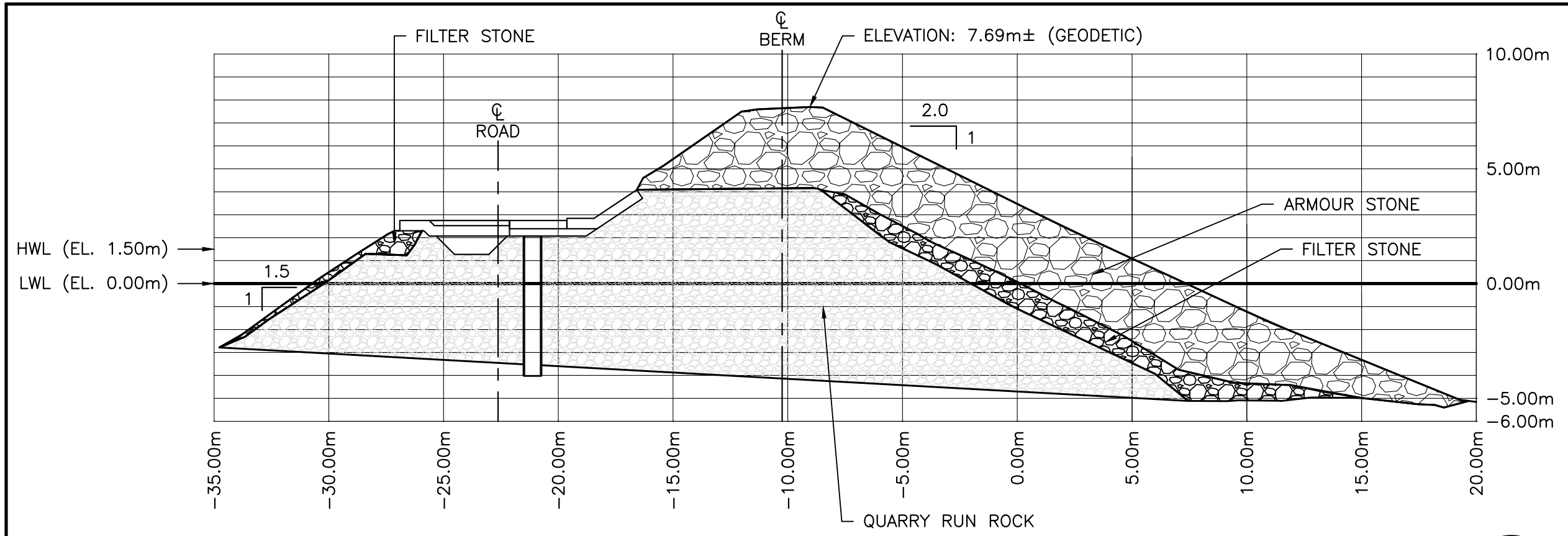
NO.	REVISIONS	DATE
R1	REISSUED TO CLIENT	31/03/22
R0	ISSUED TO CLIENT	12/11/21

CLIENT
LABRADOR ISLAND LINK LIMITED PARTNERSHIP

PROJECT
L'ANSE AU DIABLE
PHASE 2 GROUNDING STATION
BREAKWATER DESIGN
RE–EVALUATION REHABILITATION

TITLE
EXISTING BREAKWATER
CROSS SECTIONS

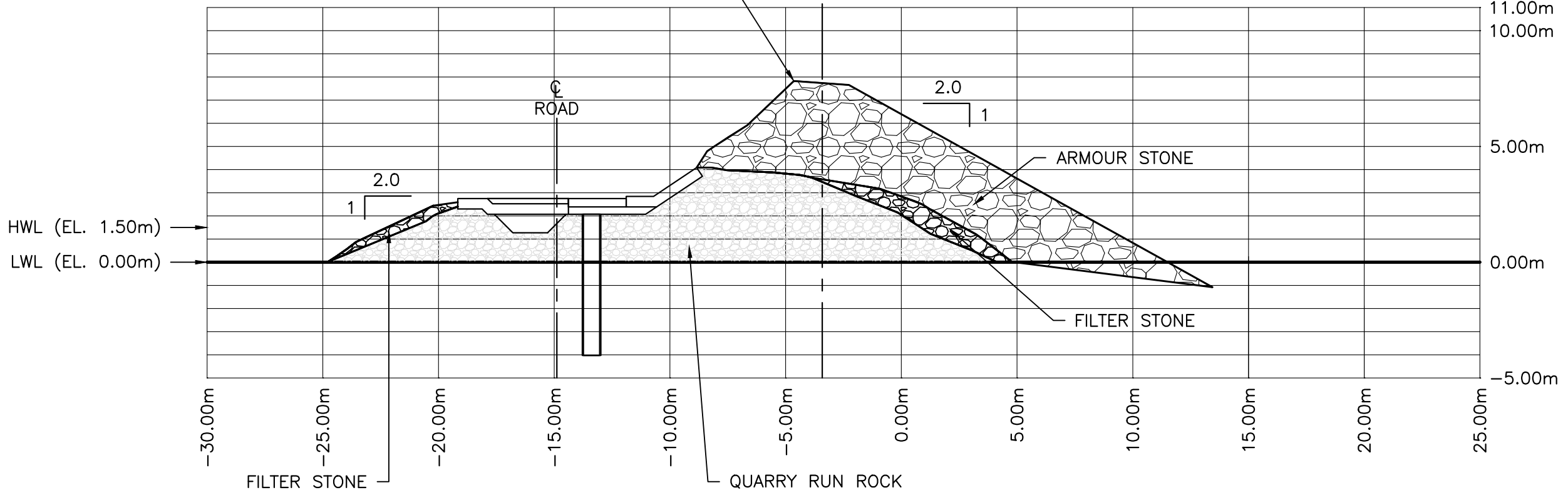
DESIGNED	R.T.	APPROVED	J.S./R.T.
DRAWN	J.D.	CHECKED	J.S./R.T.
SCALE	AS SHOWN	DATED	31/03/22
PROJECT NO.	2021–227	DRAWING NO.	S2



EXISTING – SECTION C (0+175.00)

1:200

C / S3



EXISTING – SECTION D (0+225.00)

1:200

D / S3

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador — PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

PERMIT HOLDER
This Permit Allows

TILLER ENGINEERING INC.

MIRC #02255

To practice Professional Engineering In Newfoundland and Labrador. Permit No. as Issued by PEG P0227 which is valid for the year 2022

STAMP

REGISTERED PROFESSIONAL ENGINEER
R. W. TILLER
SIGNATURE
31 MAR/2022
DATE
PROVINCE OF NEWFOUNDLAND

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com
A member firm of Association of Consulting Engineering Companies NL (ACEC-NL)

NO.	REVISIONS	DATE
R1	REISSUED TO CLIENT	31/03/22
R0	ISSUED TO CLIENT	12/11/21

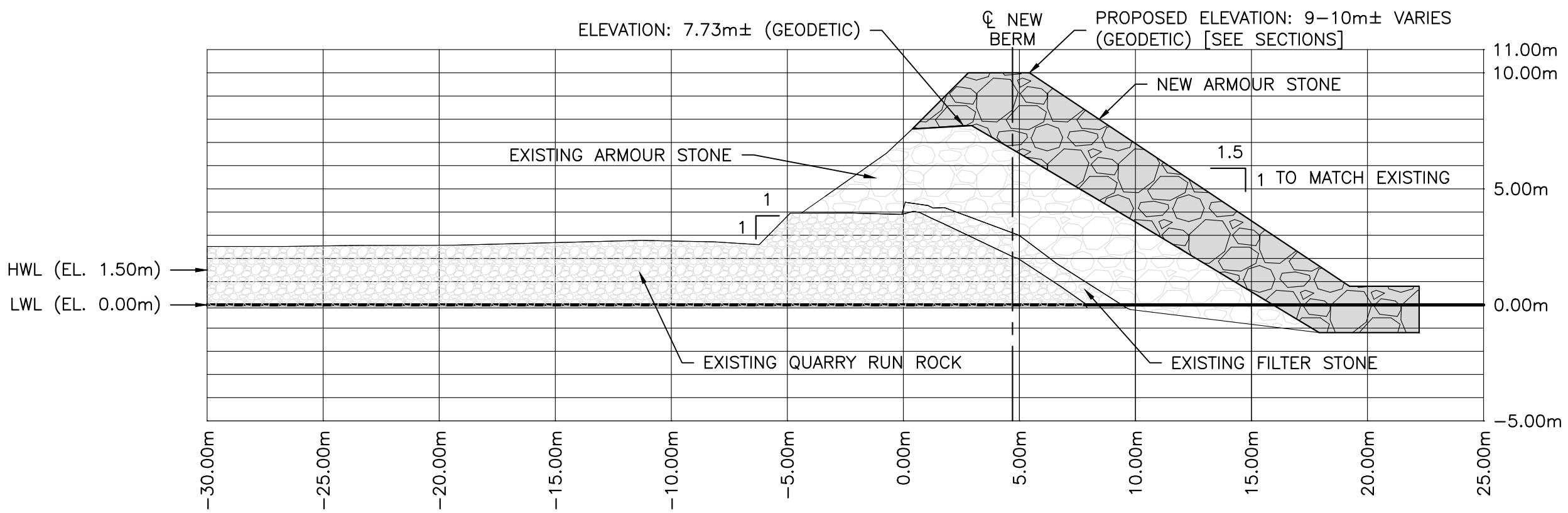
CLIENT
LABRADOR ISLAND LINK LIMITED PARTNERSHIP

PROJECT
L'ANSE AU DIABLE
PHASE 2 GROUNDING STATION
BREAKWATER DESIGN
RE–EVALUATION REHABILITATION

TITLE
EXISTING BREAKWATER CROSS SECTIONS

DESIGNED	R.T.	APPROVED	J.S./R.T.
DRAWN	J.D.	CHECKED	J.S./R.T.
SCALE	AS SHOWN	DATED	31/03/22
PROJECT NO.	2021–227	DRAWING NO.	S3

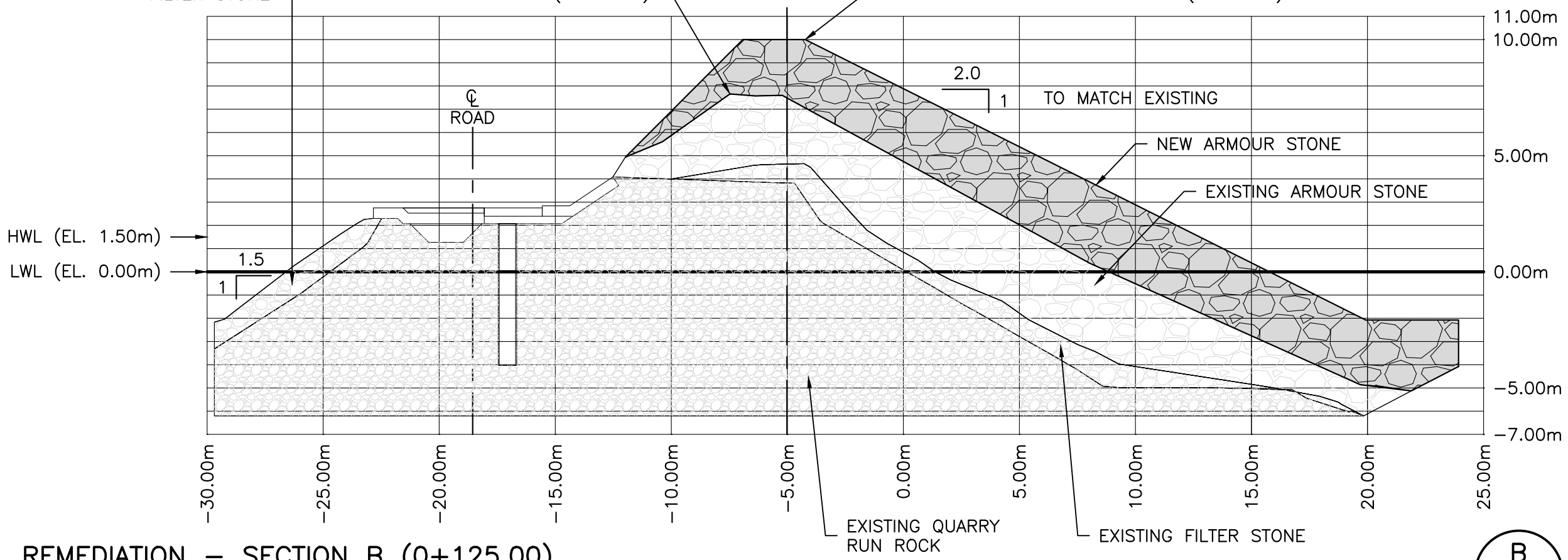
C:\Users\jdoyle\Desktop\PROJECTS 2022\2021-227-ES-LCP-L'ANSE AU DIABLE GROUNDING STN-BREAKWATER DESIGN RE-EVALUATION\Drawings\L'anseAuDiable-Phase2-GroundingStn-BreakwaterDesignRe-evaluation-2021-227-LablslandLink-RITC



REMEDIATION – SECTION A (0+075.00)

1:200

A / S4



REMEDIATION – SECTION B (0+125.00)

1:200

B / S4

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador — PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

PERMIT HOLDER
This Permit Allows

TILLER ENGINEERING INC.

MIRC #02255

To practice Professional Engineering In Newfoundland and Labrador. Permit No. as Issued by PEG P0227 which is valid for the year 2022

STAMP

REGISTERED PROFESSIONAL ENGINEER
R. W. TILLER
SIGNATURE
31 MAR/2022
DATE
PROVINCE OF NEWFOUNDLAND

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com
A member firm of Association of Consulting Engineering Companies NL (ACEC-NL)

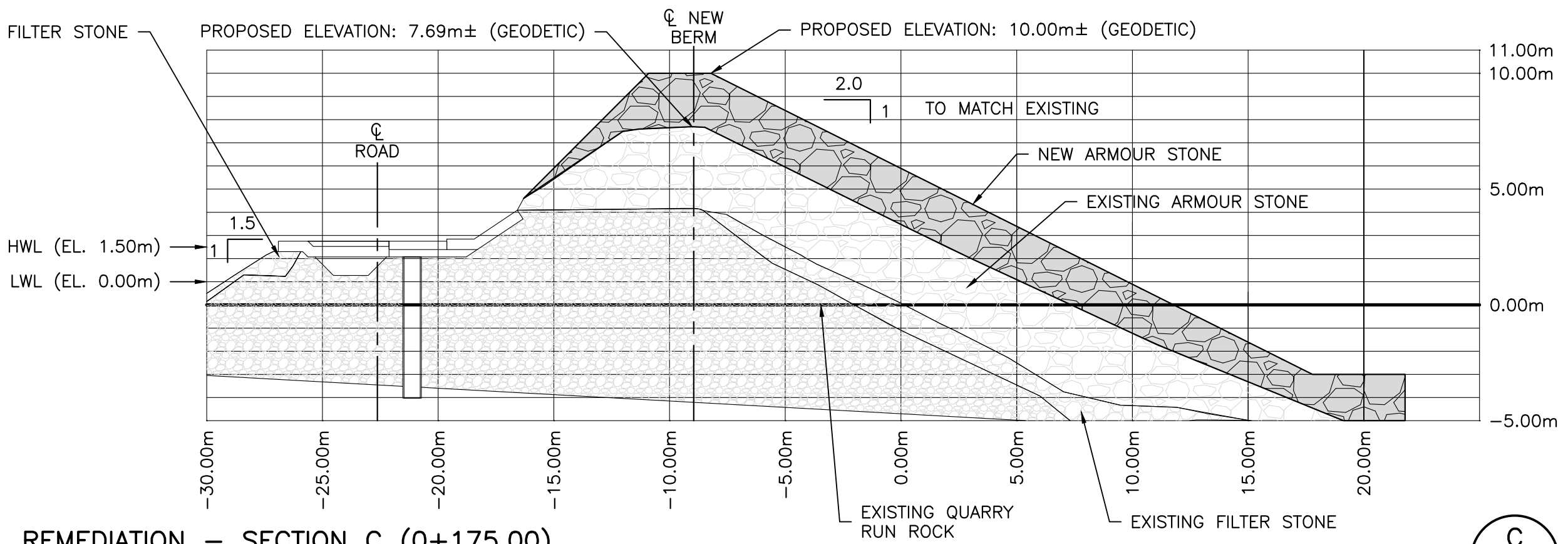
NO.	REVISIONS	DATE
R1	REISSUED TO CLIENT	31/03/22
R0	ISSUED TO CLIENT	12/11/21

CLIENT
LABRADOR ISLAND LINK LIMITED PARTNERSHIP

PROJECT
L'ANSE AU DIABLE
PHASE 2 GROUNDING STATION
BREAKWATER DESIGN
RE–EVALUATION REHABILITATION

TITLE
EXISTING BREAKWATER SECTIONS WITH PROPOSED REMEDIATION

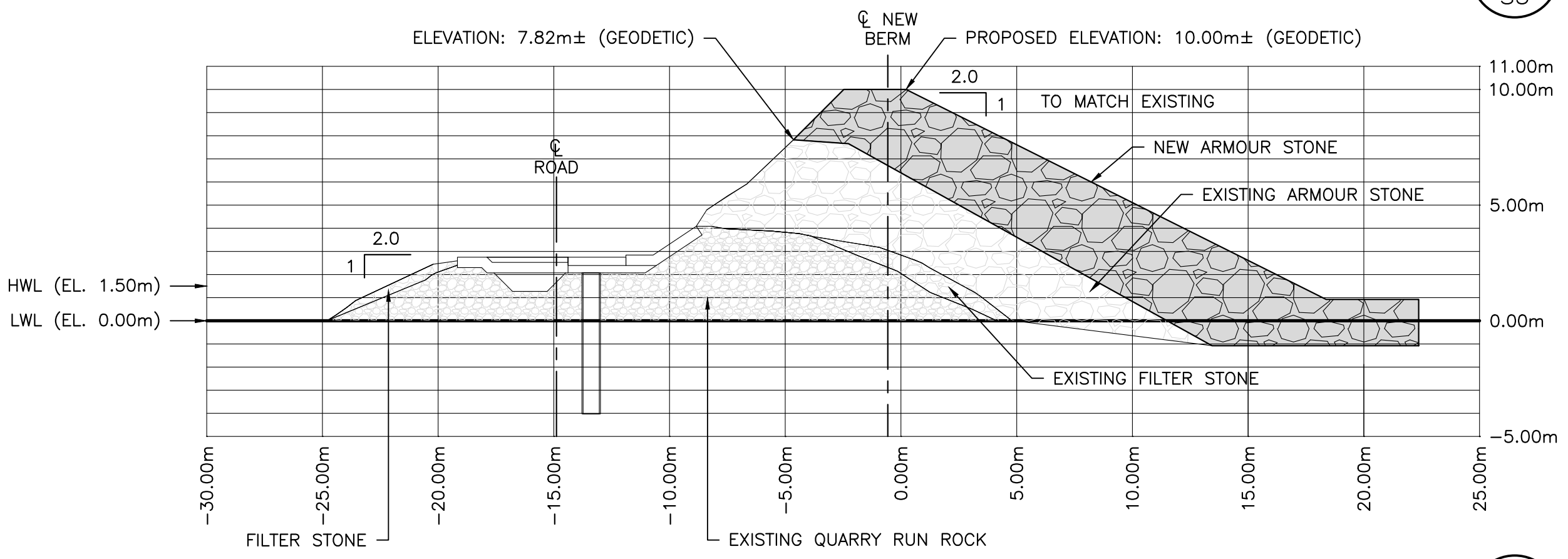
DESIGNED	R.T.	APPROVED	J.S./R.T.
DRAWN	J.D.	CHECKED	J.S./R.T.
SCALE	AS SHOWN	DATED	31/03/22
PROJECT NO.	2021–227	DRAWING NO.	S4



REMEDIATION – SECTION C (0+175.00)

1:200

C
S5



REMEDIATION – SECTION D (0+225.00)

1:200

D
S5

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

PERMIT HOLDER
This Permit Allows

TILLER ENGINEERING INC.

MIRC #02255

To practice Professional Engineering In Newfoundland and Labrador. Permit No. as Issued by PEG P0227 which is valid for the year 2022

STAMP

REGISTERED PROFESSIONAL ENGINEER
R. W. TILLER
SIGNATURE
31 MAR/2022
DATE
PROVINCE OF NEWFOUNDLAND

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com

A member firm of Association of Consulting Engineering Companies NL (ACEC-NL)

NO.	REVISIONS	DATE
R1	REISSUED TO CLIENT	31/03/22
R0	ISSUED TO CLIENT	12/11/21

CLIENT
LABRADOR ISLAND LINK LIMITED PARTNERSHIP

PROJECT
L'ANSE AU DIABLE
PHASE 2 GROUNDING STATION
BREAKWATER DESIGN
RE–EVALUATION REHABILITATION

TITLE
EXISTING BREAKWATER SECTIONS WITH PROPOSED REMEDIATION

DESIGNED	R.T.	APPROVED	J.S./R.T.
DRAWN	J.D.	CHECKED	J.S./R.T.
SCALE	AS SHOWN	DATED	31/03/22
PROJECT NO.	2021–227	DRAWING NO.	S5

C:\Users\jdoyle\Desktop\PROJECTS 2022\2021-227-ES-LCP-L'ANSE AU DIABLE GROUNDING STN-BREAKWATER DESIGN RE-EVALUATION\Drawings\L'anseAuDiable-Phase2-GroundingStn-BreakwaterDesignRe-evaluation-2021-227-LabIslandLink-RITC