Photograph No. 24: View of shoreline looking north at Station 700 N. The beach is comprised of natural material at this location, with some regrading of the top of the bank to form a flat storage area. (August 19, 2000).

Photograph No. 25: View of shoreline looking south at Station 700 N. (August 19, 2000).

APPENDIX C

Datums, Tide Elevations and Currents

DATUMS, TIDE ELEVATIONS AND CURRENTS

Datums

General

A datum is a horizontal plane from which elevations are measured, positive up. Datums for the site include:

- Chart Datum (CD), which is defined as the lowest normal tide.
- Plant Datum (PD), which is approximately 2.3 m above CD.
- Mine Datum (MD), the datum used for surveying in the underground mine. This datum is 1,000 m below the PD in order to maintain positive values of elevation in the mine. MD is approximately 997.7 m below CD.

The datum used in the drawings prepared by Westmar is the present PD.

Establishing the Datum

Elevations to CD of three benchmarks at Polaris Mine were provided to Westmar by the Canadian Hydrographic Service. Based on this information and the measurements by Cominco Surveyors of elevations to PD taken on the same three benchmarks, it was determined that PD is 2.3 m above CD.

It appears that PD has changed since 1981. The top of the fill at the dock was shown as 4.57 m in the design drawings and was recently measured as 3.2 m to the current PD. The present PD is therefore about 1.37 m above the original PD.

Tide Elevations

Tide elevations to Chart Datum at Polaris Mine, are provided in the Canadian Tide and Current Tables (2000). The tide elevations to Chart, Plant and Mine Datums are given in *Table 1* on the following page.

TABLE 1: Tide Elevations to Chart, Plant and Mine Datums

Tide	Tide Elevations to Chart Datum (CD)	Tide Elevations to Plant Datum (PD)[1]	Tide Elevations to Mine Datum (MD)[2]
Higher High Water, Large Tide (HHWL)	1.7 m	-0.6 m	999.4 m
Mean Water Level (MWL)	0.9 m	-1.4 m	998.6 m
Lower Low Water, Large Tide (LLWL)	0.0 m	-2.3 m	997.7 m

Note: 1. PD is 2.3 m above CD.

2. MD is 1,000 m below PD to maintain positive values for all elevations in the underground mine.

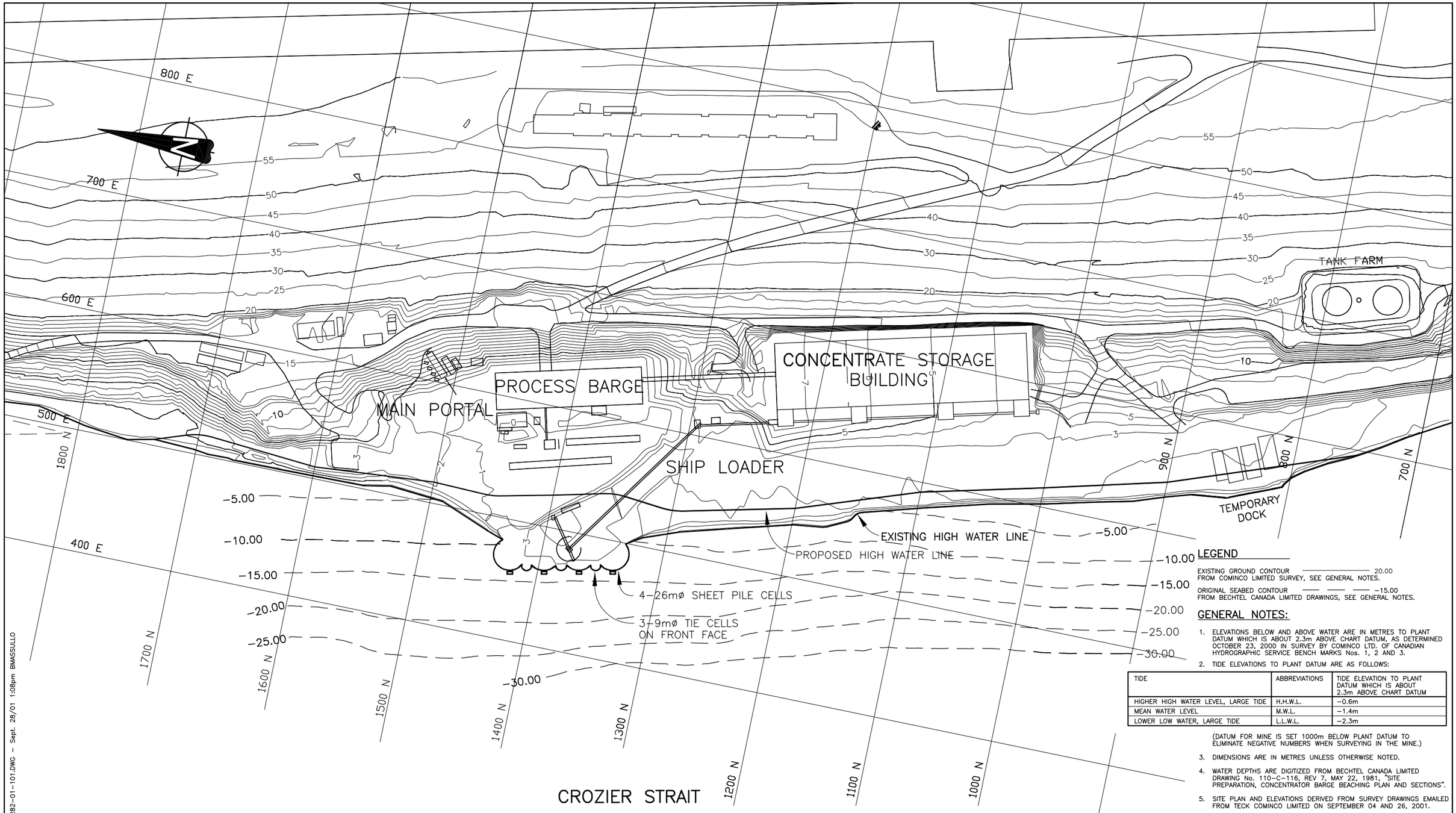
Currents

Wind and tide driven current along Crozier Strait has been observed during the open water period, but the magnitude at these currents is unknown.

During the winter months, the ice is landfast and tidal currents under the ice have been observed by divers. These currents will not affect the shoreline as the ice is landfast at the site during this period.

APPENDIX D

Drawings



PLAN
1:3000

LEGEND

EXISTING GROUND CONTOUR ——— 20.00
FROM COMINCO LIMITED SURVEY, SEE GENERAL NOTES.

ORIGINAL SEABED CONTOUR — — — −15.00
FROM BECHTEL CANADA LIMITED DRAWINGS, SEE GENERAL NOTES.

GENERAL NOTES:

1. ELEVATIONS BELOW AND ABOVE WATER ARE IN METRES TO PLANT DATUM WHICH IS ABOUT 2.3m ABOVE CHART DATUM, AS DETERMINED OCTOBER 23, 2000 IN SURVEY BY COMINCO LTD. OF CANADIAN HYDROGRAPHIC SERVICE BENCH MARKS Nos. 1, 2 AND 3.
2. TIDE ELEVATIONS TO PLANT DATUM ARE AS FOLLOWS:

TIDE	ABBREVIATIONS	TIDE ELEVATION TO PLANT DATUM WHICH IS ABOUT 2.3m ABOVE CHART DATUM
HIGHER HIGH WATER LEVEL, LARGE TIDE	H.H.W.L.	−0.6m
MEAN WATER LEVEL	M.W.L.	−1.4m
LOWER LOW WATER, LARGE TIDE	L.L.W.L.	−2.3m

(DATUM FOR MINE IS SET 1000m BELOW PLANT DATUM TO ELIMINATE NEGATIVE NUMBERS WHEN SURVEYING IN THE MINE.)

3. DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
4. WATER DEPTHS ARE DIGITIZED FROM BECHTEL CANADA LIMITED DRAWING No. 110−C−116, REV 7, MAY 22, 1981, "SITE PREPARATION, CONCENTRATOR BARGE BEACHING PLAN AND SECTIONS".
5. SITE PLAN AND ELEVATIONS DERIVED FROM SURVEY DRAWINGS EMAILED FROM TECK COMINCO LIMITED ON SEPTEMBER 04 AND 26, 2001.

CLIENT: teckcominco

PROJECT: POLARIS MINE
DECOMMISSIONING OF DOCK

Westmar
Maritime, Structural, Civil and Materials Handling Engineers

TITLE: GENERAL ARRANGEMENT

SCALE	DATE	DRAWING NUMBER
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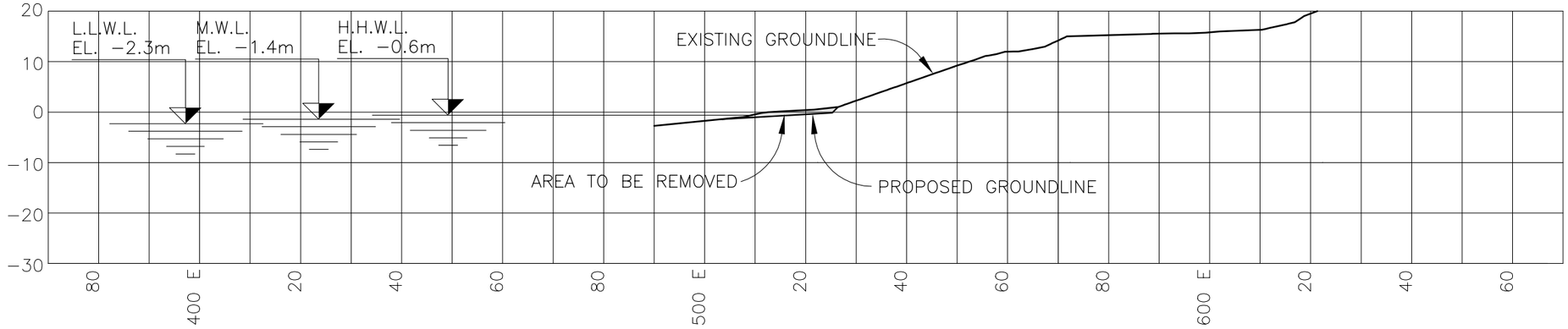

SECTION − 1700 N

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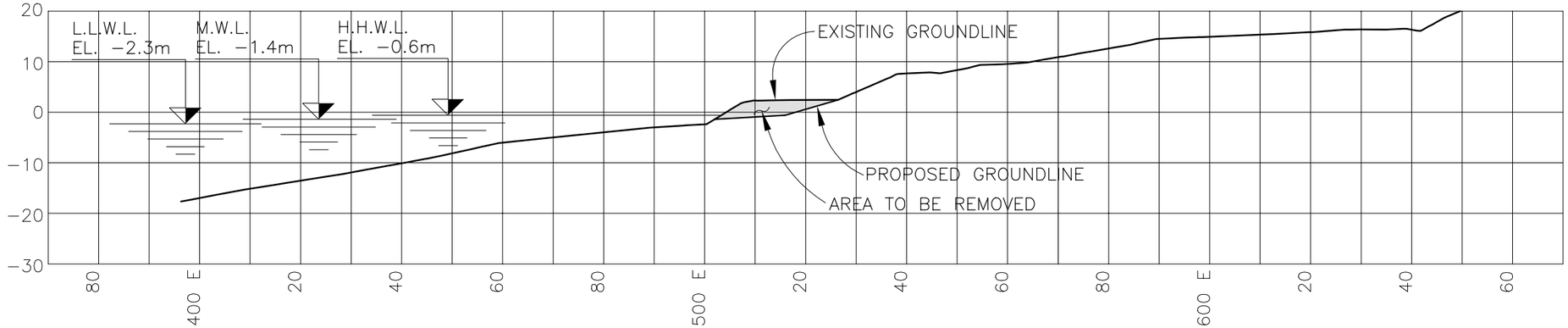

SECTION − 1600 N

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NOTES:

1. FOR GENERAL NOTES SEE DWG. −01−101.
2. EXISTING GROUNDLINE ABOVE WATER FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.
3. ORIGINAL GROUNDLINE BELOW WATER FROM INFORMATION PROVIDED ON BECHTEL CANADA DRAWINGS AND INTERPOLATED FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.

CLIENT: teckcominco

PROJECT: POLARIS MINE
DECOMMISSIONING OF DOCK

Westmar
Maritime, Structural, Civil and Materials Handling Engineers

TITLE: SECTIONS − SHEET 1

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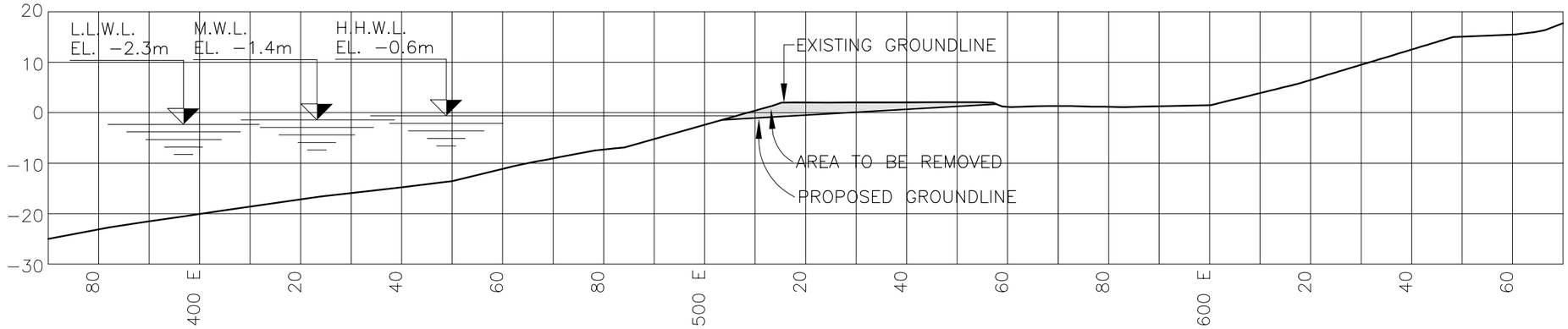

SECTION − 1500 N

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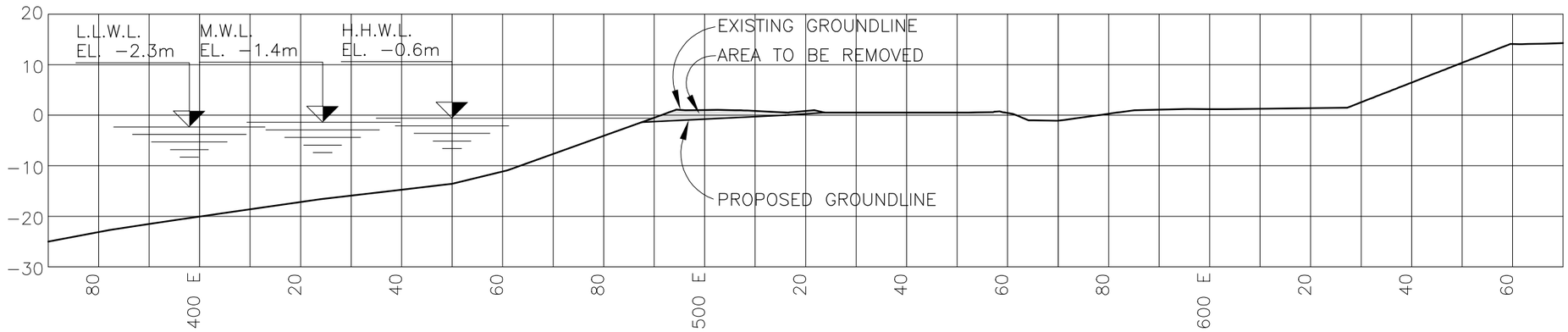

SECTION − 1450 N

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NOTES:

1. FOR GENERAL NOTES SEE DWG. −01−101.
2. EXISTING GROUNDLINE ABOVE WATER FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.
3. ORIGINAL GROUNDLINE BELOW WATER FROM INFORMATION PROVIDED ON BECHTEL CANADA DRAWINGS AND INTERPOLATED FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.

CLIENT: teckcominco

PROJECT: POLARIS MINE
DECOMMISSIONING OF DOCK

Westmar
Maritime, Structural, Civil and Materials Handling Engineers

TITLE: SECTIONS − SHEET 2

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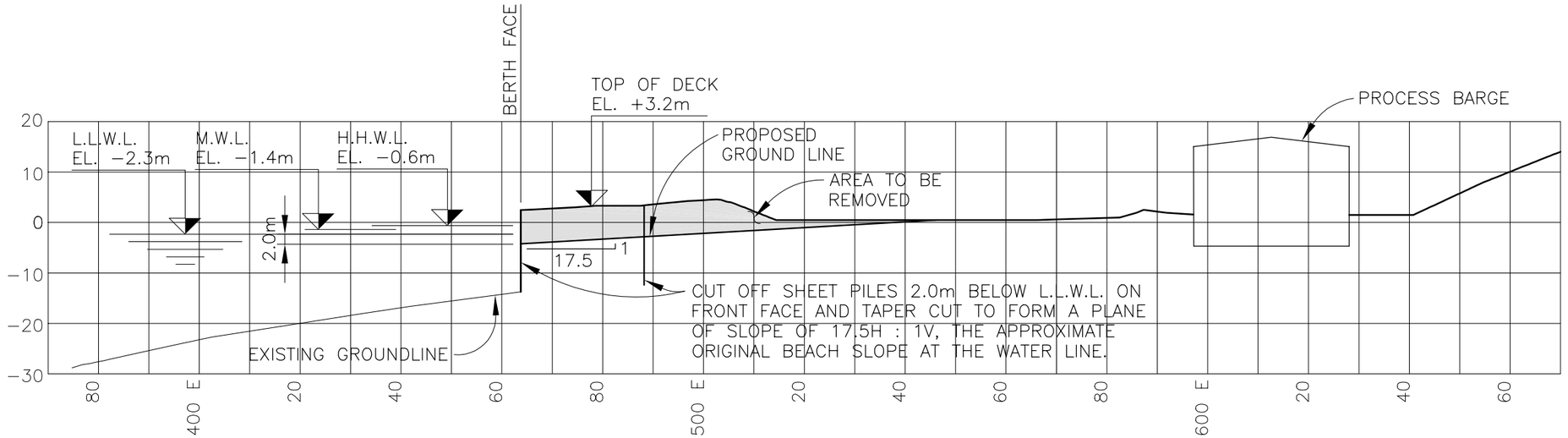

SECTION − 1400 N

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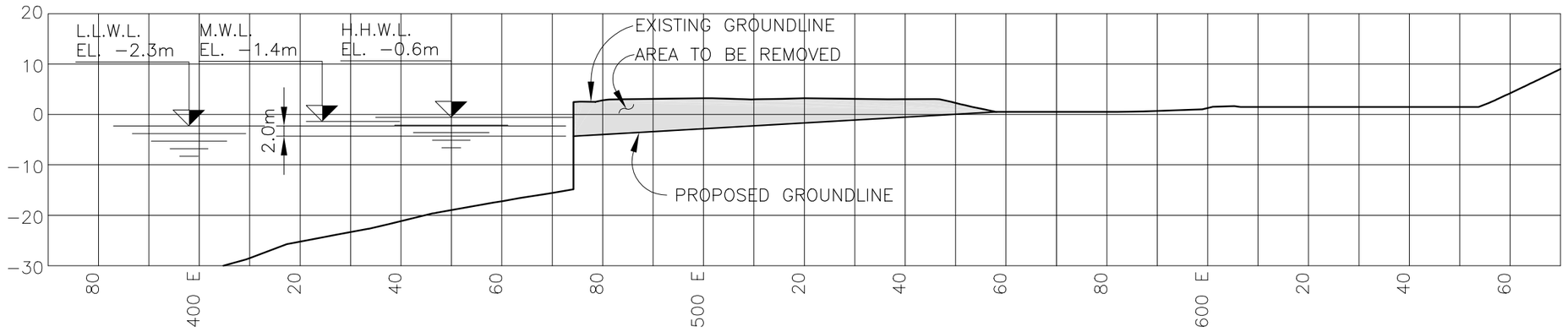

SECTION − 1350 N

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NOTES:

1. FOR GENERAL NOTES SEE DWG. −01−101.
2. EXISTING GROUNDLINE ABOVE WATER FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.
3. ORIGINAL GROUNDLINE BELOW WATER FROM INFORMATION PROVIDED ON BECHTEL CANADA DRAWINGS AND INTERPOLATED FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.

CLIENT: teckcominco

PROJECT: POLARIS MINE
DECOMMISSIONING OF DOCK

Westmar
Maritime, Structural, Civil and Materials Handling Engineers

TITLE: SECTIONS − SHEET 3

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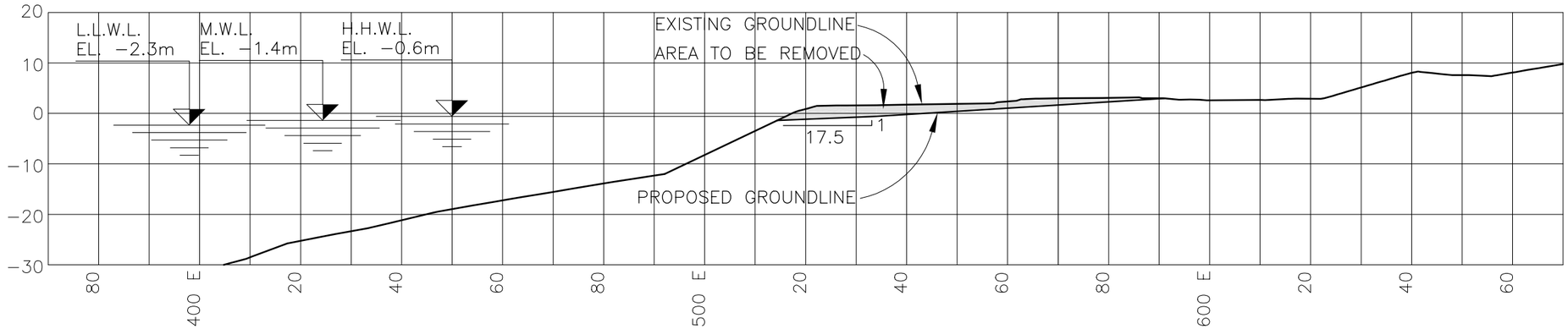

SECTION − 1300 N

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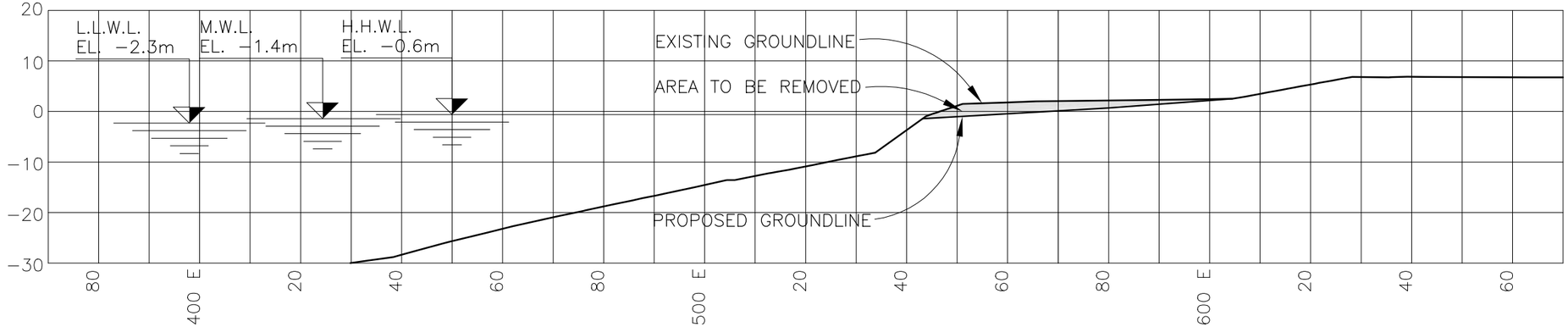

SECTION − 1200 N

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NOTES:

1. FOR GENERAL NOTES SEE DWG. −01−101.
2. EXISTING GROUNDLINE ABOVE WATER FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.
3. ORIGINAL GROUNDLINE BELOW WATER FROM INFORMATION PROVIDED ON BECHTEL CANADA DRAWINGS AND INTERPOLATED FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.

CLIENT: teckcominco

PROJECT: POLARIS MINE
DECOMMISSIONING OF DOCK

Westmar
Maritime, Structural, Civil and Materials Handling Engineers

TITLE: SECTIONS − SHEET 4

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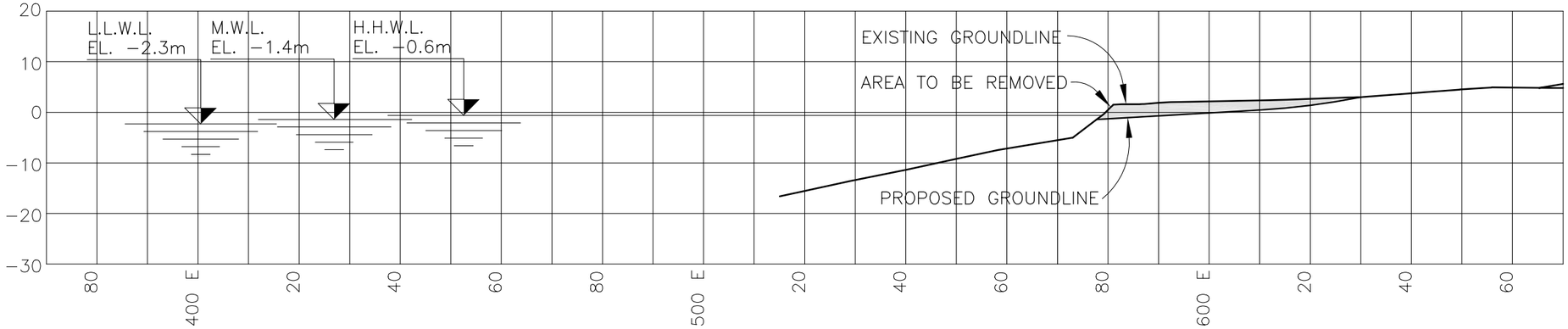

SECTION − 1100 N

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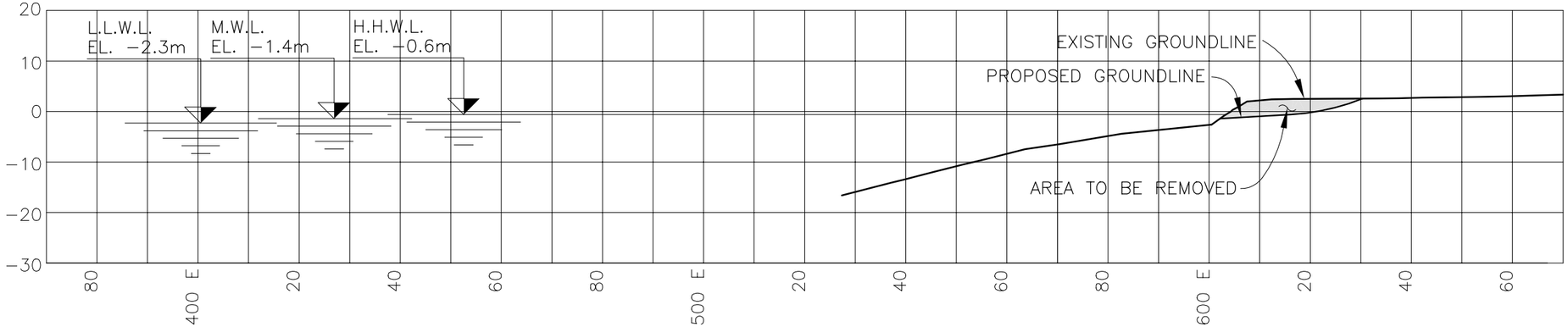

SECTION − 1000 N

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NOTES:

1. FOR GENERAL NOTES SEE DWG. −01−101.
2. EXISTING GROUNDLINE ABOVE WATER FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.
3. ORIGINAL GROUNDLINE BELOW WATER FROM INFORMATION PROVIDED ON BECHTEL CANADA DRAWINGS AND INTERPOLATED FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.

CLIENT

teckcominco

PROJECT

POLARIS MINE
DECOMMISSIONING OF DOCK

Westmar
Maritime, Structural, Civil and Materials Handling Engineers

TITLE

SECTIONS − SHEET 5

SCALE	DATE	DRAWING NUMBER
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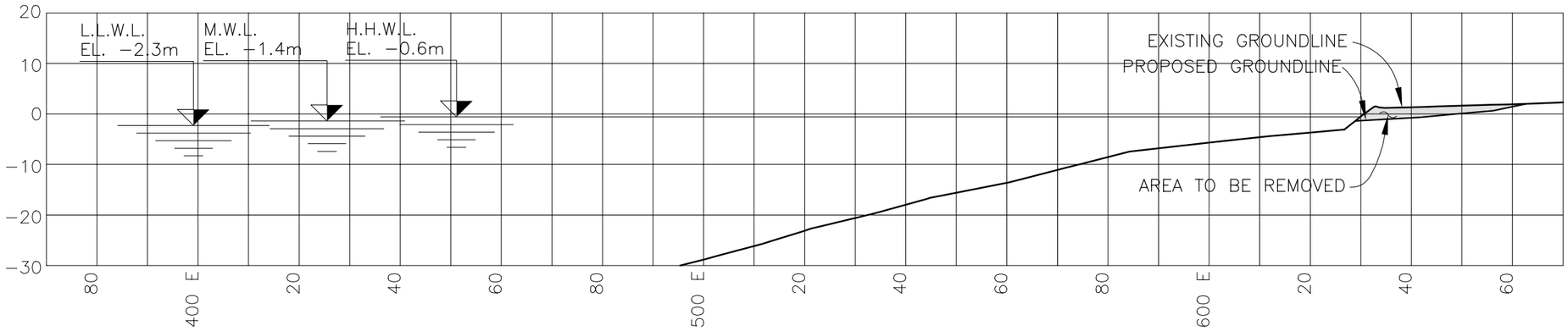

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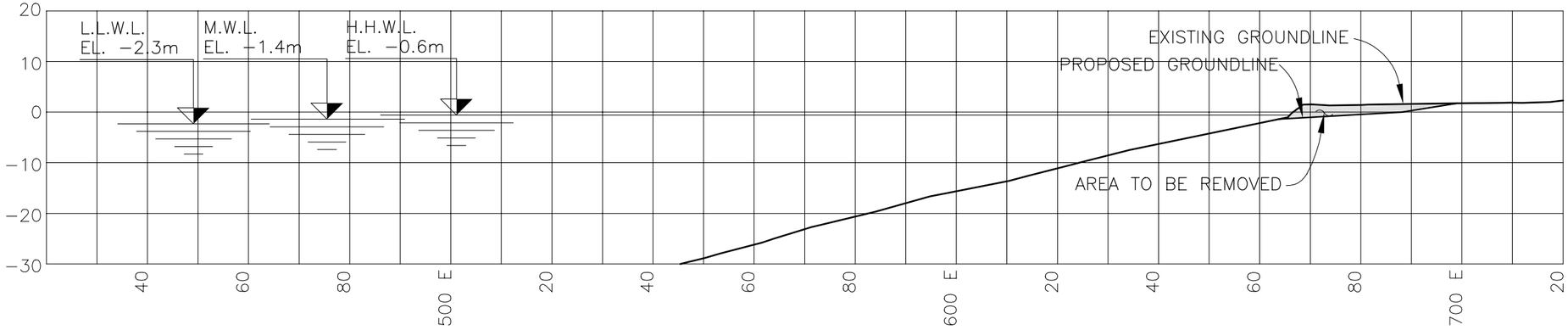

SECTION @ 800 N

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NOTES:

1. FOR GENERAL NOTES SEE DWG. −01−101.
2. EXISTING GROUNDLINE ABOVE WATER FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.
3. ORIGINAL GROUNDLINE BELOW WATER FROM INFORMATION PROVIDED ON BECHTEL CANADA DRAWINGS AND INTERPOLATED FROM SURVEY PROVIDED BY TECK COMINCO LIMITED.

CLIENT: teckcominco

PROJECT: POLARIS MINE
DECOMMISSIONING OF DOCK

Westmar
Maritime, Structural, Civil and Materials Handling Engineers

TITLE: SECTIONS − SHEET 6

SCALE	DATE	DRAWING NUMBER
SHOWN	SEP28/01	00282−01−107

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TECK COMINCO LTD.
Decommissioning of Dock Facilities at Polaris Mine
Little Cornwallis Island, Nunavut

APPENDIX E

Paper on Construction of Dock

REVISION 1

Westmar

Canadian Civil Engineer

February 1997

L'ingénieur civil canadien

février 1997

CIVIL ENGINEERING IN THE HIGH ARCTIC
LE GÉNIE CIVIL EN RÉGIONS ARCTIQUES

SPECIAL 25TH CSCE ANNUAL CONFERENCE INSERT INSIDE
ENCART SPÉCIAL – 25e CONGRÈS ANNUEL DE LA SCGC

DOCK FACILITIES ON LITTLE CORNWALLIS ISLAND

by
Jean Barthe, Vice-President
Tower Arctic Ltd.

The mining operation of Cominco at Little Cornwallis Island, also named Polaris mine, consists of underground mining for lead and zinc ore. The site installation involves a concentrator, which was fabricated in southern Canada, floated and permanently grounded at the site, a huge ore storage building, an outstanding living accommodation compound and a dock to accommodate the ore handling ships during the short season of sailing through the Arctic archipelago.

The construction of the deep sea dock was awarded to Tower Arctic Ltd. in the fall of 1980. Some heavy construction equipment was already on site, other pieces of equipment were flown in by Hercules from our operation at Resolute Bay.

The dock consisted of the construction of four circular sheet-pile-cells 26 m. in diameter joined together by smaller intermediate cells in 15 m. of water.

After an underwater investigation, the first location was abandoned due to questionable soil conditions.

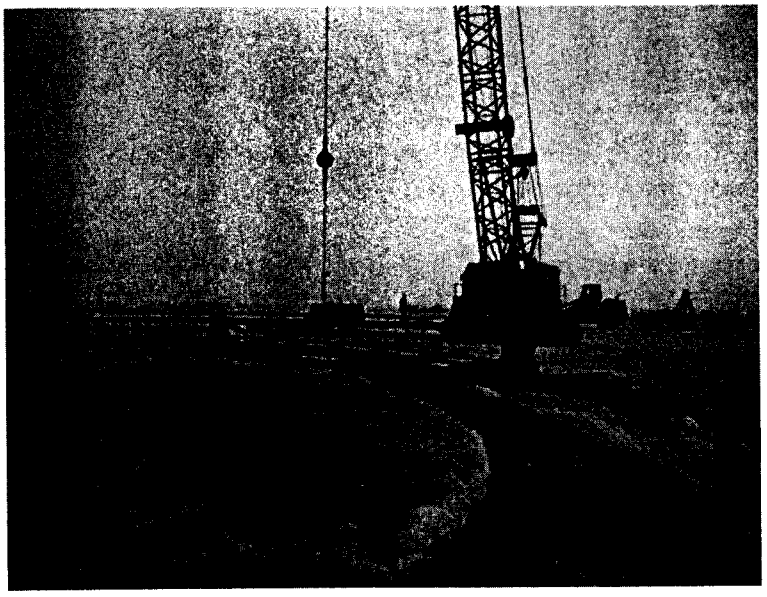
A new site was selected where the bottom of the ocean consisted of two to three meters of silt overlaying fractured limestone.

As soon as the Arctic night was over, being early March, when we could get a few hours of daylight, we started an operation of reinforcing the sea ice in order to develop a platform that would support the heavy pieces of equipment and the construction material.

In order to obtain this platform we started a flooding operation with sea water (-2°C), by pumping four to six cm of water every seven hours over the entire area, in order to develop a depth of 3 meters. An extra long auger was used to drill through the ice in order for our flooding pumps to have access to water.

This platform would allow 100 ton pieces of equipment to manoeuvre for a reasonable period of time. As a rule the heavier pieces of equipment were relocated every day so as not to develop any ice fatigue of cracking in the platform. Steel cables were also embedded in the platform ice to anchor it to shore.

Underwater inspection with divers revealed the presence of a chunk of multi-year old ice frozen into the surface ice exactly in the location of two of the cells. That multi-year old ice had to be removed, which involved a blasting and front-end loader operation. Divers from Arctic Divers Ltd., Yellowknife, were present for the duration of the job. The divers became very friendly with a seal who used to follow them underwater and breathe from their expelled air bubbles.



An exterior guide frame assembled in sections and deposited on the ice surface was our unconventional way of establishing the exact location of each piece of sheet piling. A trench was cut through the ice in order to allow each pile to be placed in the proper location.

Handling the 25 meter piles was a delicate operation. A special multi-grasp bridle was developed so that they could be picked up easily without the risk of developing kinks, as most often winds of up to 50 km/hour were present.

When a few piles were threaded in place, an electric hammer with controls for the amplitude and frequency was used to drive each pile in place through the layer of silt and a few centimetres into limestone in order to socket the bottom. The driving of each pile was carefully monitored and recorded. The closing of each cell was with a Y pile and had to be a very accurate operation so that the cell locked safely in a cylindrical shape. These rigid Y piles were also attaching the main cells to the intermediate cells.

Throughout these operations, the weather conditions would not permit the engines of the equipment to be shut off. On the other hand, the long hours of daylight allowed work in two shifts. We had a great deal of respect for our crew who worked daily in these cold temperatures and almost always under constantly windy conditions.

Due to the level of polar bear activity in the area, watch dogs were used twenty-four hours a day in order to provide warning to the crew if a bear was in the vicinity.

Once the piles of a cell were in place, they reproduced the exact contours of the solid ground below. These piles had to be cut off at an even elevation of five meters above main sea level. The layer of ice that remained inside the cell had to be removed prior to starting the infill operation. That volume of ice, estimated at fifty tons per cell, had to be broken into blocks with a trencher and clammed out of each cell.

Prior to starting any infill operation, the silt at the front of the cells had to be clammed out and replaced with proper aggregates so as not to develop extreme horizontal pressure on the piles. At the back and sides, the exterior backfill would balance any pressure from the interior. The first fill at the bottom was with coarse material, finer gravely fill completed this operation. The rejects from the mine operation became very useful material for this purpose.

Another consideration given to this dock project was the need for the interior fill to become frozen solid as soon as possible, so a system with pipes and a compressor was installed in order to help nature freeze the material throughout. A layer of styrofoam was also placed against a portion of the interior of the piles so as to retain the fill in the frozen and solid state.

The operation that started in early March was completed by mid-May, just about ten days before the ice started to show serious signs of major movement. The tide at Little Cornwallis Island is in the order of 1.2 meters which was a major consideration for our construction methods.

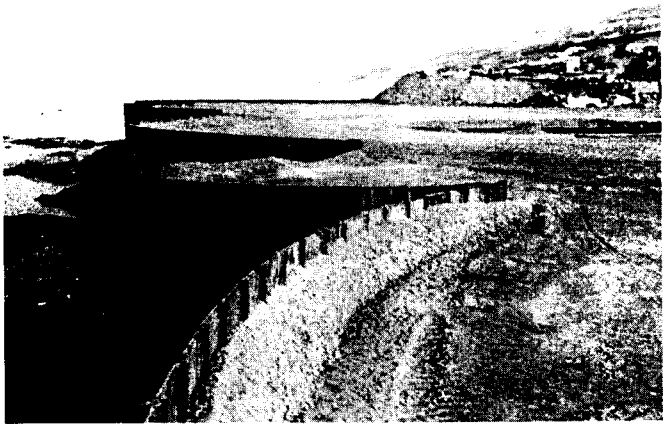
Also associated with this project Tower Arctic Ltd. installed the H.D.P.E tailings line, and the Ciba Geigy fibreglass water supply line for the mining facility.

This successful operation required a good knowledge of the extreme forces of nature in the Arctic which demand that very stage of construction be given the most serious attention to detail.

INSTALLATION PORTUAIRES: LITTLE CORNWALLIS ISLAND

par
Jean Barthe, Vice-président
Tower Arctic Ltd.

L'opération minière de la compagnie Cominco à Little Cornwallis, aussi appelée Mine Polaris, consiste à extraire en galerie souterraine le minerai de plomb et de zinc.



La construction du quai en eau profonde fut confiée à la compagnie Tower Arctic Ltd. à l'automne 1980. Bien que des équipements de construction étaient déjà en place, nous eurent à transporter par avion Hercules certains de nos propres équipements à partir de nos opérations de Resolute Bay.

Ce quai devait être construit en eau de 15 mètres de profondeur de façon à pouvoir accommoder les navires transporteurs de minerai.

A l'emplacement originalement désigné, des conditions de sol sous-marin inconsistants nous obligèrent à un déplacement de site.

Au nouveau site, le sol consistait en un dépôt de deux à trois mètres de limon sur calcaire fracturé, lequel servirait à fixer la base des paleplanches.

Au début de mars, là où la longue nuit arctique permet au soleil de commencer à poindre, nous débutions la mobilisation de nos premières équipes. Au grand étonnement des travailleurs qui arrivaient, le Boeing 737 se posait régulièrement sur la surface glacée du lac Garrow. Le terminus, un abri en contreplaqué, avait vite fait de ramener ces arrivants à la réalité des conditions de pionnier en territoire arctique.

Notre premier travail fut de consolider la glace de la plateforme de travail afin de pouvoir circuler et opérer avec les lourdes pièces d'équipement et le matériel de construction.

Cette opération nécessitait des arrosages trois fois par 24 heures afin de submerger de quatre à six centimètres d'eau de mer (-2° C.) à chaque arrosage l'entière surface de la plateforme. Une épaisseur de glace de trois mètres devait être atteinte. L'opération d'une tarrière à glace rallongée nous donnait accès à l'eau de mer. Des pompes de type à spirale donnait le rendement désiré.

La plateforme terminée, des pièces d'équipement lourd de 100 tonnes pouvaient maintenant opérer sécuritairement durant des periodes pratiques. Des poids de 300 tonnes étaient possible pour de courtes périodes. Les pièces d'équipement étaient relocalisées quotidiennement afin d'éviter que des failles se développent dans la glace. La