# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

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Prepared for the

Alberta Department of the Environment

Volume II – Drawings

Prepared Jointly by

Techman Ltd.

and

Rheinbraun – Consulting GmbH

# OIL SAND RECLAMATION

## A STUDY INTEGRATING MINING, TAILINGS DISPOSAL AND RECLAMATION

## VOLUME II - DRAWINGS

Prepared for:

ALBERTA DEPARTMENT OF THE ENVIRONMENT

Prepared Jointly by:
TECHMAN LTD.
&
RHEINBRAUN - CONSULTING GmbH

JULY, 1979

COPY NO. 206

# VOLUME II - DRAWINGS

## INTRODUCTION

Volume II of this report contains the drawings pertaining to Volume I - Text. The drawings are explained in corresponding chapters of the text, and relate to: selection and description of the three ore bodies, surficial geology and hydrology, geological cross-sections, tailings pond dyke, organization charts as well as mine plans. A total of sixty-eight drawings show the mining, tailings disposal and reclamation of the twelve mine designs developed in the study. These drawings are described in Chapter 7, 8 and 9.

# VOLUME II - DRAWINGS

## LIST OF DRAWINGS

| Title | TECHMAN Drawing No. |
|---|---|
| Ore Body Locations Within Regional Mining Area | B22910-01-00 |
| Ore Bodies No. 1 & 2 - Under Changing Mining Cut-off | E22910-02-00 |
| Ore Body No. 4 - Under Changing Mining Cut-off | D22910-03-00 |
| Ore Bodies No. 1 & 2 - Surficial Geology, Hydrology, and Topography | F22941-04-00 |
| Ore Body No. 4 - Surficial Geology, Hydrology and Topography | E22941-05-00 |
| Ore Body No. 1 Cross-section $B_1$-$B_1$ | BR22915-06-00 |
| Ore Body No. 1 Cross-section $C_1$-$C_1$ | BR22915-07-00 |
| Ore Body No. 1 Cross-section $D_1$-$D_1$ | BR22915-08-00 |
| Ore Body No. 1 Cross-section $E_1$-$E_1$ | BR22915-09-00 |
| Ore Body No. 2 Cross-section $B_2$-$B_2$ | BR22915-10-00 |
| Ore Body No. 2 Cross-section $C_2$-$C_2$ | BR22915-11-00 |
| Ore Body No. 2 Cross-section $D_2$-$D_2$ | BR22915-12-00 |
| Ore Body No. 2 Cross-section $E_2$-$E_2$ | BR22915-13-00 |
| Ore Body No. 4 Cross-section $B_4$-$B_4$ | BR22915-14-00 |
| Tailings Pond Dyke - Cross-section at Maximum Height | BR22944-15-00 |
| Typical Departmental Organization Chart (excluding treatment and associated facilities) | BR22902-16-00 |
| Organization Chart - Mine Operations 120,000 BPCD, B.W.E. Scheme - Minimum Level | BR22902-17-00 |
| Organization Chart - Equipment Maintenance Operations 120,000 BPCD, B.W.E. Scheme - Minimum Level | BR22902-18-00 |
| Organization Chart-Planning Operations 120,000 BPCD, B.W.E. Scheme - Minimum Level | BR22902-19-00 |
| Mining and Tailings Disposal - Year 3 Minimum Level of Reclamation 1 B.W.E. & 4 Draglines Mining Scheme Ore Body No. 2 (120,000 BPCD) | D22918-20-00 |

## VOLUME II - DRAWINGS

### LIST OF DRAWINGS . . . Page 2.


| Title | TECHMAN Drawing No. |
|---|---|
| Mining and Tailings Disposal - Year 15<br>Minimum Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-21-00 |
| Mining and Tailings Disposal - Year 22<br>Minimum Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-22-00 |
| Material Distribution Plan (Year 25)<br>Minimum Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,00 BPCD) | D22916-23-00 |
| Reclamation Plan<br>Minimum Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22980-24-00 |
| Mining and Tailings Disposal - Year 15<br>Improved Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-25-00 |
| Material Distribution Plan (Year 25)<br>Improved Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22916-26-00 |
| Reclamation Plan<br>Improved Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22980-27-00 |
| Mining and Tailings Disposal - Year 15<br>Enhanced Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-28-00 |
| Material Distribution Plan (Year 25)<br>Enhanced Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22916-29-00 |
| Reclamation Plan<br>Enhanced Level of Reclamation<br>1 B.W.E. & 4 Draglines Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22980-30-00 |

## VOLUME II - DRAWINGS

### LIST OF DRAWINGS . . . Page 3.

| Title | TECHMAN Drawing No. |
|---|---|
| General Mine Layout<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22910-31-00 |
| Mine Opening - Year 1<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-32-00 |
| Mining and Tailings Disposal - Year 7<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-33-00 |
| Mining and Tailings Disposal - Year 12<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Schjeme<br>Ore Body No. 2 (120,000 BPCD) | D22918-34-00 |
| Mining and Tailings Disposal - Year 15<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-35-00 |
| Mining and Tailings Disposal - Year 19<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-36-00 |
| Mining and Tailings Disposal - Year 23<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-37-00 |
| Material Distribution Plan (Year 25)<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22916-38-00 |
| Reclamation Plan<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22980-39-00 |
| Mining and Tailings Disposal - Year 19<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-40-00 |

## VOLUME II - DRAWINGS

### LIST OF DRAWINGS . . . Page 4.

| Title | TECHMAN Drawing No. |
|---|---|
| Material Distribution Plan (Year 25)<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22916-41-00 |
| Reclamation Plan<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22980-42-00 |
| Mine Opening - Year 1<br>Enhanced Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-43-00 |
| Mining and Tailings Disposal - Year 7<br>Enhanced Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-44-00 |
| Mining and Tailings Disposal - Year 12<br>Enhanced Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-45-00 |
| Mining and Tailings Disposal - Year 15<br>Enhanced Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-46-00 |
| Mining and Tailings Disposal - Year 21<br>Enhanced Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22918-47-00 |
| Material Distribution Plan (Year 25)<br>Enhanced Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22916-48-00 |
| Reclamation Plan<br>Enhanced Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120,000 BPCD) | D22980-49-00 |
| General Mine Layout<br>Minimum Level of Reclamation<br>1 B.W.E. and 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22910-50-00 |

## VOLUME II - DRAWINGS

### LIST OF DRAWINGS . . . Page 5.


| Title | TECHMAN Drawing No. |
|---|---|
| Mining and Tailings Disposal - Year 4<br>Minimum Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-51-00 |
| Mining and Tailings Disposal - Year 13<br>Minimum Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-52-00 |
| Mining and Tailings Disposal - Year 22<br>Minimum Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-53-00 |
| Material Distribution Plan (Year 25)<br>Minimum Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 2 (60,000 BPCD) | D22916-54-00 |
| Reclamation Plan<br>Minimum Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22980-55-00 |
| General Mine Layout<br>Improved Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22910-56-00 |
| Mining and Tailings Disposal - Year 4<br>Improved Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-57-00 |
| Mining and Tailings Disposal - Year 13<br>Improved Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-58-00 |
| Mining and Tailings Disposal - Year 22<br>Improved Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-59-00 |
| Material Distribution Plan (Year 25)<br>Improved Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22916-60-00 |

## VOLUME II - DRAWINGS

### LIST OF DRAWINGS . . . Page 6.

| Title | TECHMAN Drawing No. |
|---|---|
| Reclamation Plan<br>Improved Level of Reclamation<br>1 B.W.E. & 2 Draglines Mining Scheme<br>Ore Body No 4 (60,000 BPCD) | D22980-61-00 |
| General Mine Layout<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22910-62-00 |
| Mining and Tailings Disposal - Year 4<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-63-00 |
| Mining and Tailings Disposal - Year 13<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-64-00 |
| Mining and Tailings Disposal - Year 22<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-65-00 |
| Material Distribution Plan (Year 25)<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22916-66-00 |
| Reclamation Plan<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22980-67-00 |
| General Mine Layout<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22910-68-00 |
| Mining and Tailings Disposal - Year 4<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-69-00 |
| Mining and Tailings Disposal - Year 13<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-70-00 |

## VOLUME II - DRAWINGS

### LIST OF DRAWINGS . . . Page 7.


| Title | TECHMAN Drawing No. |
|---|---|
| Mining and Tailings Disposal - Year 22<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22918-71-00 |
| Material Distribution Plan (Year 25)<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22916-72-00 |
| Reclamation Plan<br>Improved Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 4 (60,000 BPCD) | D22980-73-00 |
| General Mine Layout<br>Minimum Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22910-74-00 |
| Mining and Tailings Disposal - Year 1<br>Minimum Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No 1 (240,000 BPCD) | E22918-75-00 |
| Mining and Tailings Disposal - Year 7<br>Minimum Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22918-76-00 |
| Mining and Tailings Disposal - Year 14<br>Minimum Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22918-77-00 |
| Mining and Tailings Disposal - Year 22<br>Minimum Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22918-78-00 |
| Material Distribution Plan (Year 26)<br>Minimum Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22916-79-00 |
| Reclamation Plan<br>Minimum Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22980-80-00 |

## VOLUME II - DRAWINGS

### LIST OF DRAWINGS . . . Page 8.

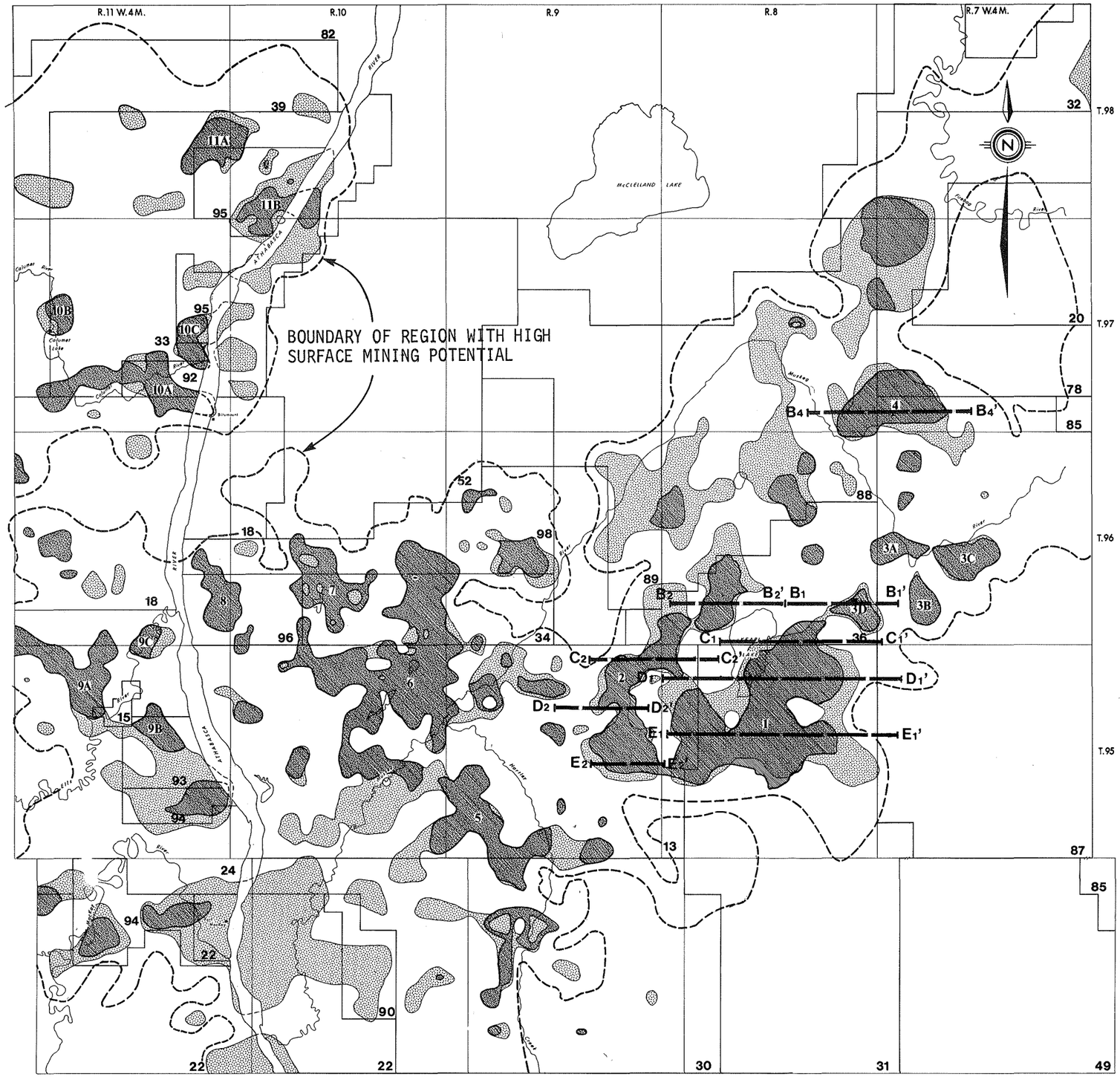

| Title | TECHMAN Drawing No. |
|---|---|
| General Mine Layout<br>Enhanced Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E229210-81-00 |
| Mining and Tailings Disposal - Year 1<br>Enhanced Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22918-82-00 |
| Mining and Tailings Disposal - Year 7<br>Enhanced Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22918-83-00 |
| Mining and Tailings Disposal - Year 14<br>Enhanced Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22918-84-00 |
| Mining and Tailings Disposal - Year 22<br>Enhanced Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22918-85-00 |
| Material Distribution<br>Enhanced Level of Reclamation (Year 26)<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E2296-86-00 |
| Reclamation Plan<br>Enhanced Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No. 1 (240,000 BPCD) | E22980-87-00 |

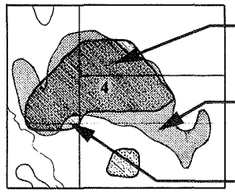
# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Bodies –

Mining Cut-off, Surf. Geol., Hydrology, Topography



LEGEND

ORE BODY WITH R-FACTOR GREATER OR EQUAL TO 0.6 AND GRAMT GREATER OR EQUAL TO 400 EXCEPT ORE BODY NO.4

R-FACTOR GREATER OR EQUAL TO 0.6

ORE BODY WITH R-FACTOR GREATER OR EQUAL TO 0.6 AND GRAMT GREATER OR EQUAL TO 400 DEFINED WITH UPDATED DATA BASE

NOTE 1: ORE BODY NO. 1, 2 AND 4 HAVE BEEN DELINEATED USING AN UPDATED GEOLOGICAL DATA BASE.

NOTE 2: ORE BODY NO. 4 DELINEATED USING R-FACTOR GREATER OR EQUAL TO 0.6 AND GRAMT GREATER OR EQUAL TO 500.

B4 — B4' LOCATION OF GEOLOGICAL CROSS-SECTIONS

87 DESIGNATES OIL SANDS LEASE

4 DESIGNATES ORE BODY WITHIN STUDY AREA

METERS
5000 0 5000 10000

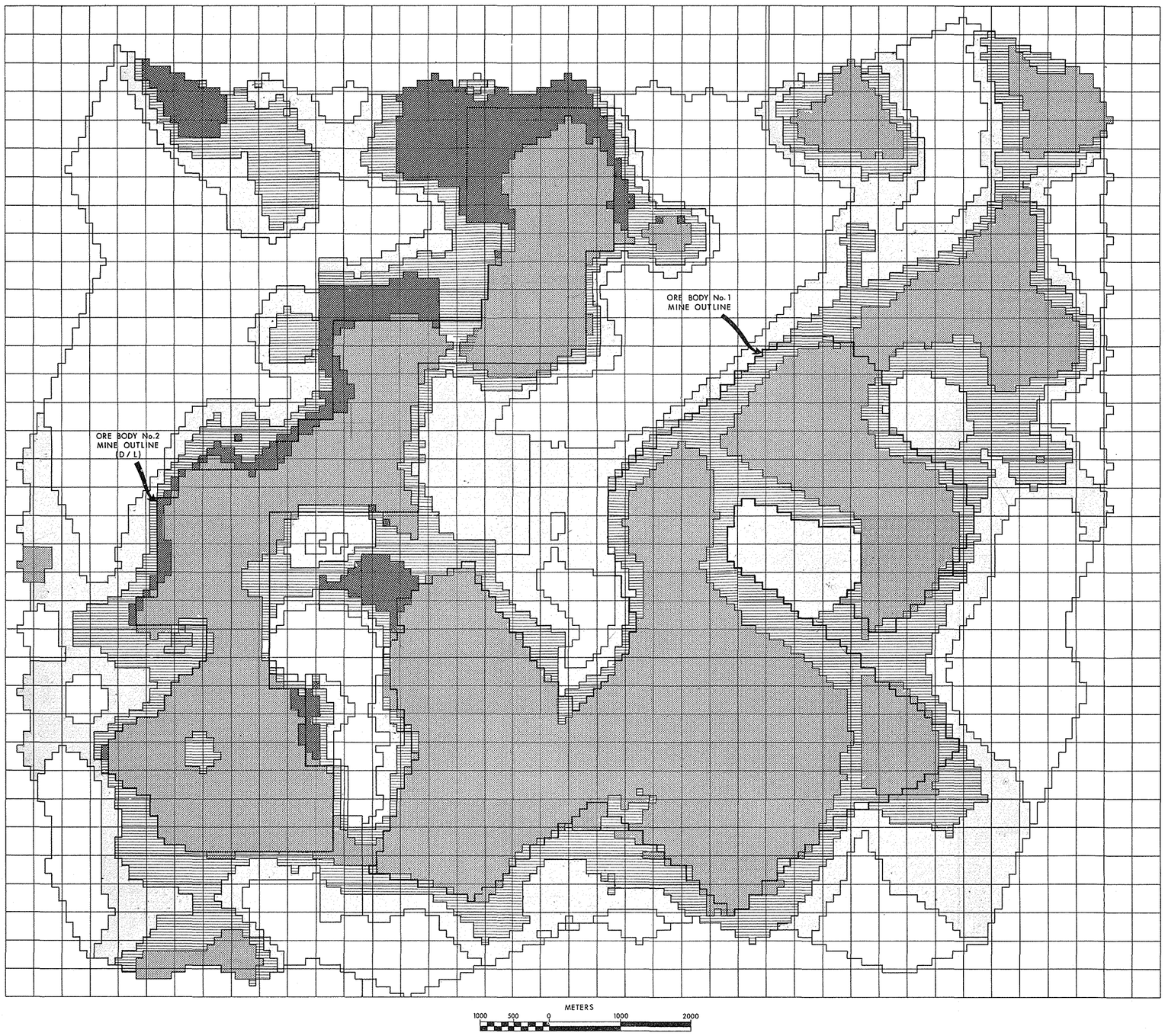
| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: ORE BODY LOCATIONS WITHIN REGIONAL MINING AREA | | | |
| SCALE: AS SHOWN | DATE: AUG. 1978 | DRAWN BY: TM ☐ RC ☐ S.M. | TM DRAWING No. B 22910-01-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No.: TM ☐ RC ☐ TM - 229 | RC DRAWING No. |

RGE. 9 | RGE. 8 | RGE. 7

TWP. 96

TWP. 95

TWP. 94




LEGEND:

| | | |
|---|---|---|
| GRAMT 400, R-F 0.6 | MAIN MINE BODY |
| GRAMT 0, R-F 0.6 | 1st EXTENSION |
| GRAMT 0, R-F 0.5 | 2nd EXTENSION |
| GRAMT 0, R-F 0.4 | 3rd EXTENSION |

9911.0
45419.0

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

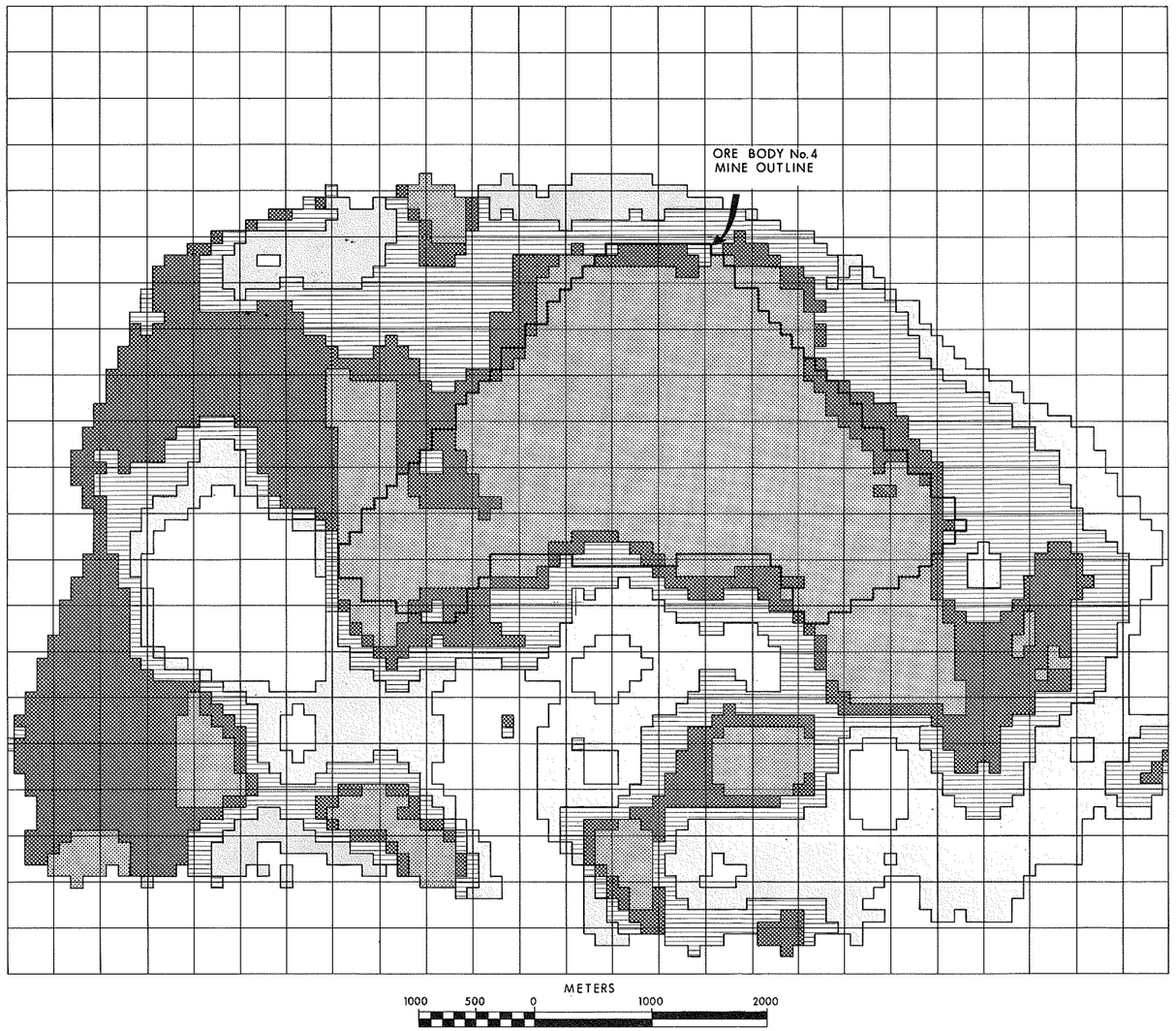
TITLE: ORE BODIES No.1 AND No.2 UNDER CHANGING MINING CUT-OFF

| | | | |
|---|---|---|---|
| SCALE: AS SHOWN | DATE: NOV. 1978 | DRAWN BY: TM ☐ RC ☐ D.C. | TM DRAWING No. E22910-02-00 |
| APPR. PROJ. ENGR. J.H. | APPR. PROJ. MANGR. TM RC | PROJECT No. TM ☐ RC ☐ TM-229 | RC DRAWING No. |

RGE. 8 | RGE. 7

TWP. 97

TWP. 96




TWP. 97

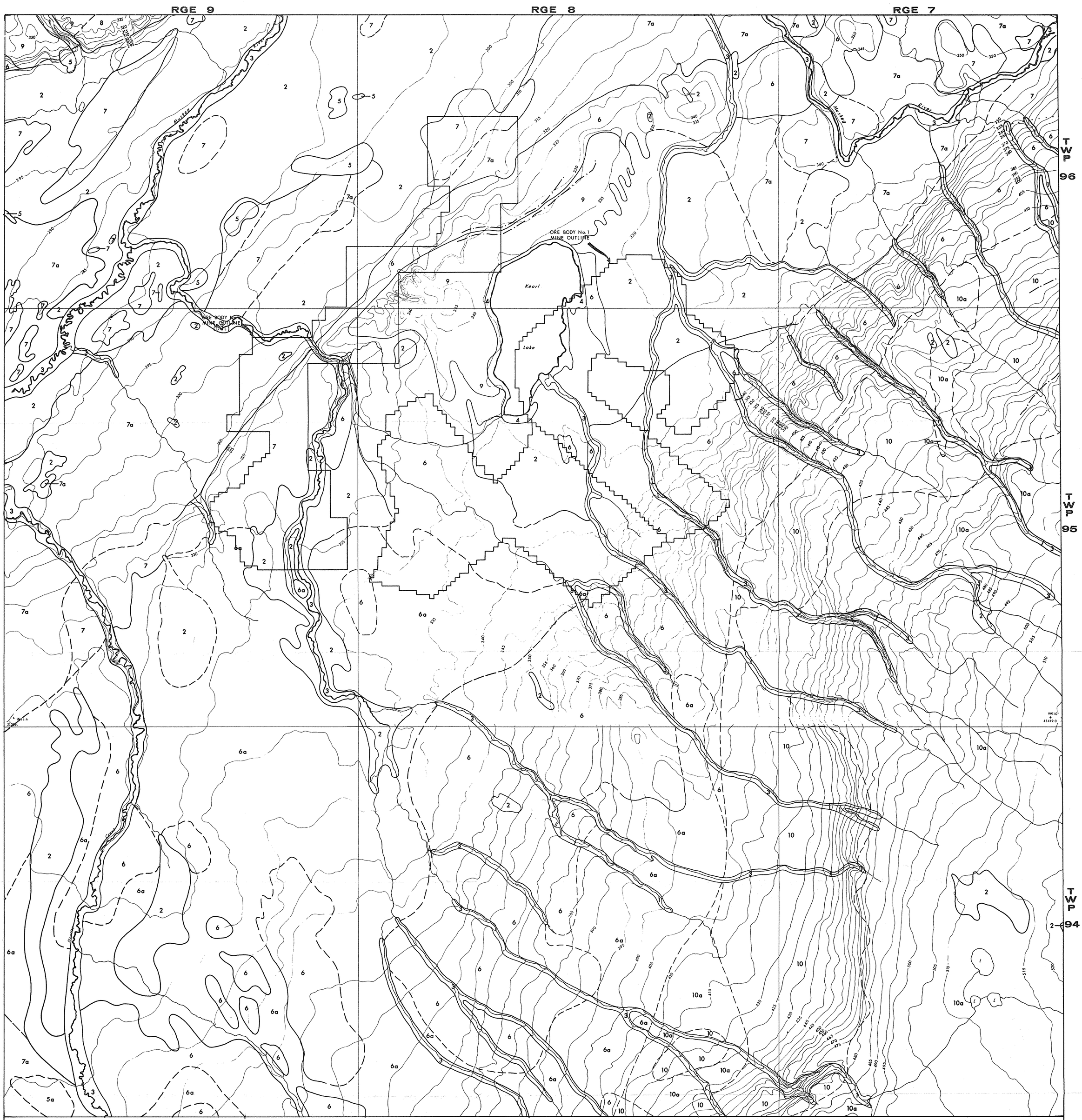
TWP. 96

LEGEND:

- GRAMT 400, R-F 0.65 MAIN MINE BODY
- GRAMT 0, R-F 0.6 1st EXTENSION
- GRAMT 0, R-F 0.5 2nd EXTENSION
- GRAMT 0, R-F 0.4 3rd EXTENSION

RGE. 8 | RGE. 7

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: ORE BODY No. 4 UNDER CHANGING MINING CUT-OFF | | | |
| SCALE: AS SHOWN | DATE: NOV. 1978 | DRAWN BY: TM ☒ RC ☐ D.C. | TM DRAWING No. D22910-03-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☒ RC ☐ TM-229 | RC DRAWING No. |




SOURCE: TOPOGRAPHIC CONTOURS TAKEN FROM AIRPHOTO MOSAICS PRODUCED BY NORTH WEST SURVEY CORP. (YUKON) LTD. AND SURVEYS AND PROPERTY BRANCH, ALBERTA TRANSPORTATION, 1976.

## NOTES:

1. THE SURFICIAL GEOLOGY ILLUSTRATED ON THIS MAP WAS OBTAINED FROM A REPORT ENTITLED "SURFICIAL GEOLOGY OF POTENTIAL MINING AREAS IN THE ATHABASCA OIL SANDS REGION" PREPARED BY R.A. McPHERSON AND C.P. KATHOL, JULY 1977.
2. THE ORIGINAL MAP WAS PREPARED FOR AIR PHOTOGRAPH INTERPRETATIONS AND HELICOPTER SUPPORTED FIELD TRAVERSES. GEOLOGIC BOUNDARIES WERE SELECTED PRIMARILY FROM AIR PHOTOGRAPH INTERPRETATIONS.
3. THE MAP IS INTENDED TO SHOW SEDIMENT TYPES FOUND IN THE UPPER 3 METERS (BELOW SURFACE); EXCEPTIONS ARE THE RECENT SEDIMENTS WHICH ARE OFTEN LESS THAN 3 METERS THICK.

## LEGEND

RECENT

EROSIONAL FEATURES

| | |
|---|---|
| 1 | ERODED SLOPE, GULLY, STREAM VALLEY: DISCONTINUOUS COLLUVIAL COVER ON SLOPES: DISCONTINUOUS ALLUVIAL GRAVEL, SAND, SILT AND CLAY ALONG STREAMS. |

ORGANIC DEPOSITS

| | |
|---|---|
| 2 | MUSKEG: GENERALLY LESS THAN 3 METERS THICK BUT OCCASIONALLY UP TO 9 METERS THICK: MOSS BOGS GENERALLY THIN AND SEDGE AND STRING BOGS THICKER; IN PLACES THE MUSKEG IS DISCONTINUOUS. |

ALLUVIAL DEPOSITS

| | |
|---|---|
| 3 | ALLUVIAL SILT AND CLAY: MINOR SAND AND GRAVEL; COMMON ALONG MOST STREAMS; GENERALLY DISCONTINUOUS AND LESS THAN 3 METERS THICK. |

LACUSTRINE DEPOSITS

| | |
|---|---|
| 4 | SILT AND CLAY, MINOR SAND: COMMON AROUND MODERN LAKES, GENERALLY LESS THAN 1.5 METERS THICK. |

AEOLIAN DEPOSITS

| | |
|---|---|
| 5, 5a | AEOLIAN SAND: FINE TO MEDIUM GRAINED SAND IN SHEET AND DUNE FORM; THICKER IN DUNES, DISCONTINUOUS AND THIN IN SHEET SAND; 5A: OVERLAIN BY DISCONTINUOUS MUSKEG. |

GEOLOGIC BOUNDARY: DEFINED, APPROXIMATE, ASSUMED -
ABANDONED BEACH -
SINK HOLE -

PLEISTOCENE

GLACIOLACUSTRINE DEPOSITS

| | |
|---|---|
| 6, 6a | MIXED: STRATIFIED CLAY, SILT AND SAND WITH PEBBLES AND TILL-LIKE LAYERS: PORTIONS OF THESE DEPOSITS MAY BE WATERLAID TILL. 6A: OVERLAIN BY DISCONTINUOUS MUSKEG. |

GLACIOFLUVIAL DEPOSITS

| | |
|---|---|
| 7, 7a | OUTWASH SAND: COMMONLY VERY FINE TO FINE GRAINED; ALSO CONTAINS MINOR MEDIUM TO COARSE GRAINED SAND, GRAVEL LAYERS, TILL FRAGMENTS, PEBBLES, BOULDERS AND SILT AND CLAY; SURFACE LEVEL TO GENTLY UNDULATING. 7A: OVERLAIN BY DISCONTINUOUS MUSKEG. |
| 8 | ERODED KAMES AND KAME MORAINE: HIGHLY DISSECTED BY POST-DEPOSITIONAL EROSION; COMPOSED PRIMARILY OF STRATIFIED SAND AND SILT WITH MINOR GRAVEL, CLAY AND TILL LENSES. |
| 9, 9a | KAMES AND KAME MORAINE: COMPOSED PRIMARILY OF STRATIFIED SAND AND SILT WITH MINOR GRAVEL, CLAY AND TILL LENSES; ROLLING TOPOGRAPHY; LARGER KAMES MARK ICE-MARGINAL POSITION OF GLACIAL ADVANCES. 9A: OVERLAIN BY DISCONTINUOUS MUSKEG. |

GLACIAL DEPOSITS

| | |
|---|---|
| 10, 10a | LOW RELIEF TILL (LESS THAN 8 METERS THICK): TILL COMPOSED OF SAND, SILT AND CLAY WITH GRAVEL AND BOULDERS; VARIABLE IN THICKNESS; TOPOGRAPHY LEVEL TO UNDULATING; OVERLAIN BY THIN LACUSTRINE AND ORGANIC DEPOSITS IN DEPRESSIONS; 10A: OVERLAIN BY DISCONTINUOUS MUSKEG. |

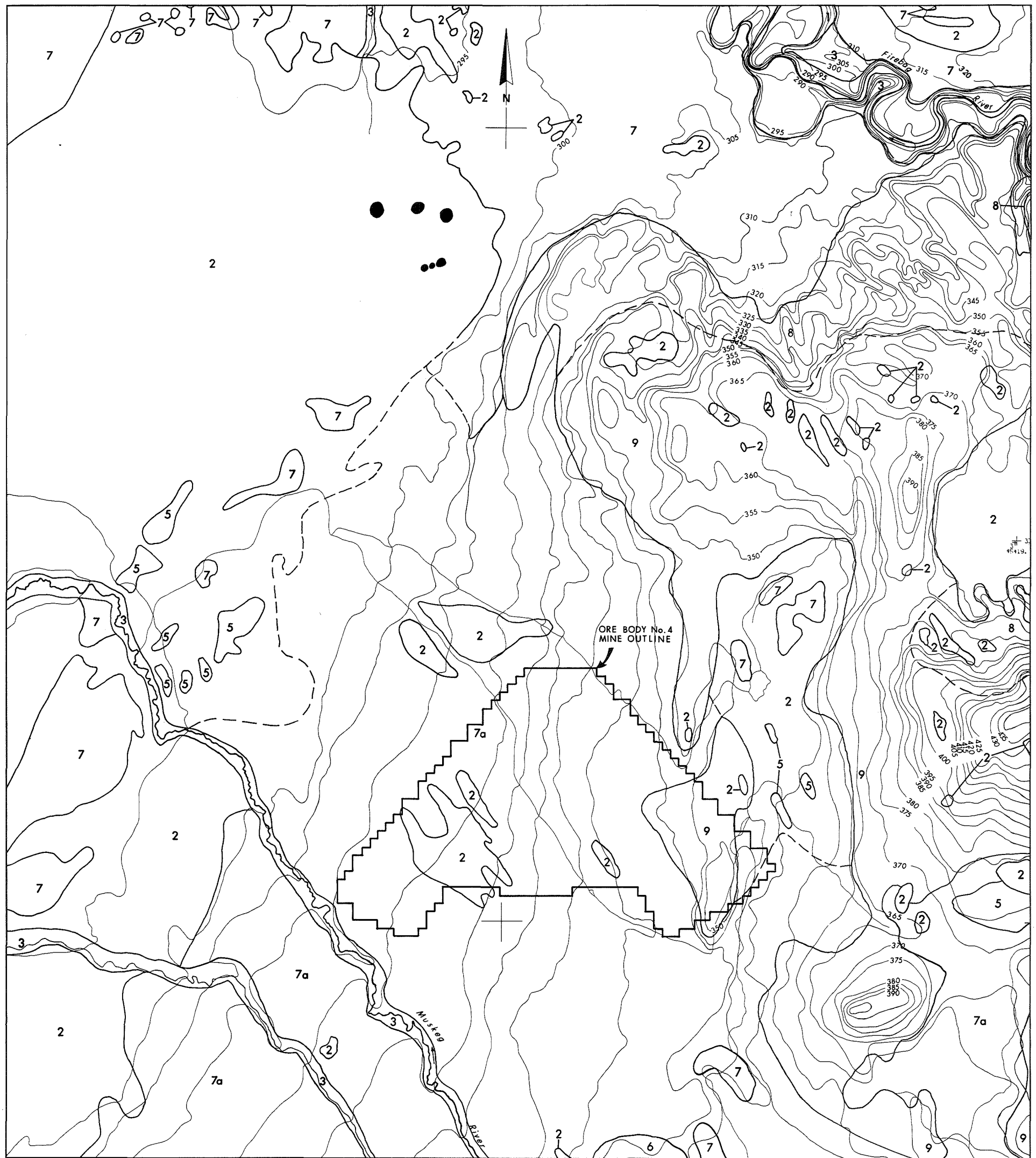
METRES
500 250 0 250 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: SURFICIAL GEOLOGY, HYDROLOGY & TOPOGRAPHY ORE BODY No. 1 & No.2

| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: RB / DK | TM DRAWING No. F 22941-04-00 |
|---|---|---|---|
| APPR. PROJ. ENGR. | APPR. PROJ. MANGR. | PROJECT No. TM-229 | RC DRAWING No. |




## LEGEND

### RECENT

**EROSIONAL FEATURES**

| | |
|---|---|
| 1 | ERODED SLOPE, GULLY, STREAM VALLEY: DISCONTINUOUS COLLUVIAL COVER ON SLOPES; DISCONTINUOUS ALLUVIAL GRAVEL, SAND, SILT AND CLAY ALONG STREAMS. |

**ORGANIC DEPOSITS**

| | |
|---|---|
| 2 | MUSKEG: GENERALLY LESS THAN 3 METRES THICK BUT OCCASIONALLY UP TO 9 METRES THICK; MOSS BOGS GENERALLY THIN AND SEDGE AND STRING BOGS THICKER; IN PLACES THE MUSKEG IS DISCONTINUOUS |

**ALLUVIAL DEPOSITS**

| | |
|---|---|
| 3 | ALLUVIAL SILT AND CLAY: MINOR SAND AND GRAVEL; COMMON ALONG MOST STREAMS; GENERALLY DISCONTINUOUS AND LESS THAN 3 METRES THICK. |

**LACUSTRINE DEPOSITS**

| | |
|---|---|
| 4 | SILT AND CLAY, MINOR SAND: COMMON AROUND MODERN LAKES, GENERALLY LESS THAN 1.5 METRES THICK. |

**AEOLIAN DEPOSITS**

| | |
|---|---|
| 5, 5a | AEOLIAN SAND: FINE TO MEDIUM GRAINED SAND IN SHEET AND DUNE FORM; THICKER IN DUNES, DISCONTINUOUS AND THIN IN SHEET SAND. 5A: OVERLAIN BY DISCONTINUOUS MUSKEG. |

GEOLOGIC BOUNDARY : DEFINED, APPROXIMATE, ASSUMED
ABANDONED BEACH . . . . . .
SINK HOLE . . . . . .

### PLEISTOCENE

**GLACIO-LACUSTRINE DEPOSITS**

| | |
|---|---|
| 6, 6a | MIXED: STRATIFIED CLAY, SILT AND SAND WITH PEBBLES AND TILL-LIKE LAYERS; PORTIONS OF THESE DEPOSITS MAY BE WATERLAID TILL. 6A: OVERLAIN BY DISCONTINUOUS MUSKEG. |
| 7, 7a | OUTWASH SAND: COMMONLY VERY FINE TO FINE GRAINED; ALSO CONTAINS MINOR MEDIUM TO COARSE GRAINED SAND, GRAVEL LAYERS, TILL FRAGMENTS, PEBBLES, BOULDERS AND SILT AND CLAY; SURFACE LEVEL TO GENTLY UNDULATING. 7A: OVERLAIN BY DISCONTINUOUS MUSKEG. |
| 8 | ERODED KAMES AND KAME MORAINE: HIGHLY DISSECTED BY POST-DEPOSITIONAL EROSION; COMPOSED PRIMARILY OF STRATIFIED SAND AND SILT WITH MINOR GRAVEL, CLAY AND TILL LENSES. |
| 9, 9a | KAMES AND KAME MORAINE: COMPOSED PRIMARILY OF STRATIFIED SAND AND SILT WITH MINOR GRAVEL, CLAY AND TILL LENSES; ROLLING TOPOGRAPHY; LARGER KAMES MARK ICE-MARGINAL POSITION OF GLACIAL ADVANCES. 9A: OVERLAIN BY DISCONTINUOUS MUSKEG. |

**GLACIAL DEPOSITS**

| | |
|---|---|
| 10, 10a | LOW RELIEF TILL (6 METRES): TILL COMPOSED OF SAND, SILT AND CLAY WITH GRAVEL AND BOULDERS; VARIABLE IN THICKNESS; TOPOGRAPHY LEVEL TO UNDULATING; OVERLAIN. 10A: OVERLAIN BY DISCONTINUOUS MUSKEG. |

SOURCE: TOPOGRAPHIC CONTOURS TAKEN FROM AIRPHOTO MOSAICS PRODUCED BY NORTH WEST SURVEY CORP. (YUKON) LTD. AND SURVEYS AND PROPERTY BRANCH, ALBERTA TRANSPORTATION, 1976.

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

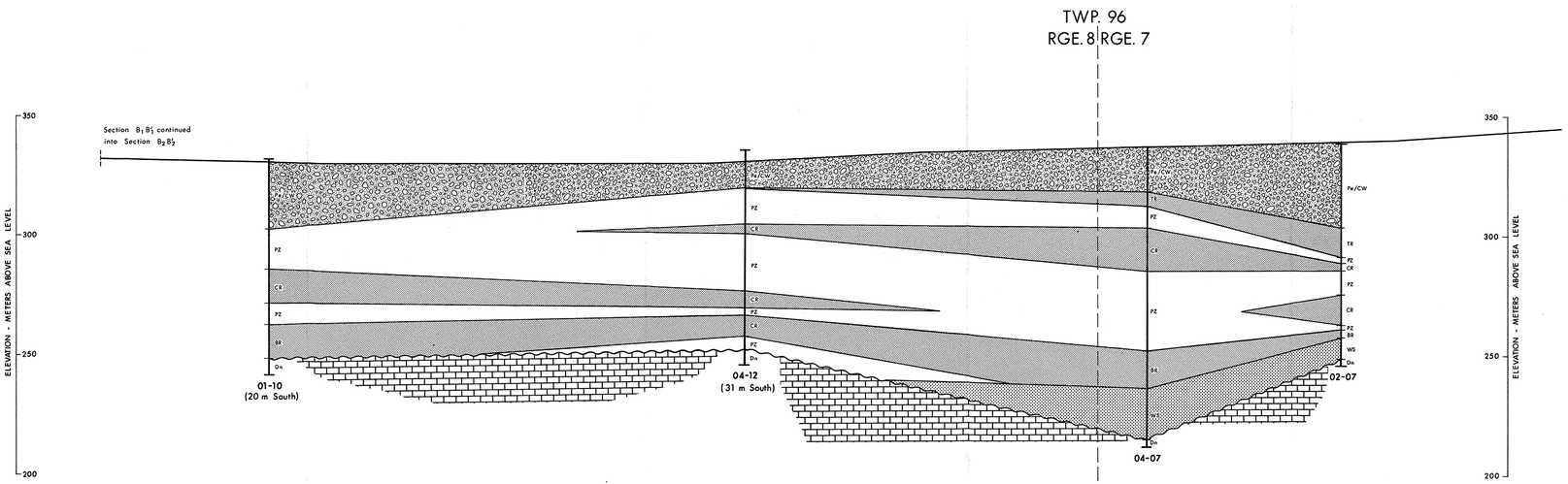
TITLE: SURFICIAL GEOLOGY, HYDROLOGY & TOPOGRAPHY ORE BODY No. 4

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | MAY ,1978 | D. C. | E22941-05-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| J. H. | TM. RC. | TM - 229 | |

# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Geological Cross-sections




NOTE: FOR LOCATION SEE DRAWING B22910-01-00

LEGEND

| | |
|---|---|
| PLEISTOCENE MATERIAL | Pe |
| CLEARWATER FORMATION | CW |
| TOP REJECT ZONE | TR |
| PAY ZONE | PZ |
| CENTER REJECT ZONE | CR |
| BOTTOM REJECT ZONE | BR |
| WATERSAND (AQUIFER) | WS |
| DEVONIAN LIMESTONE | Dn |

HORIZONTAL SCALE

1: 10,000

METERS

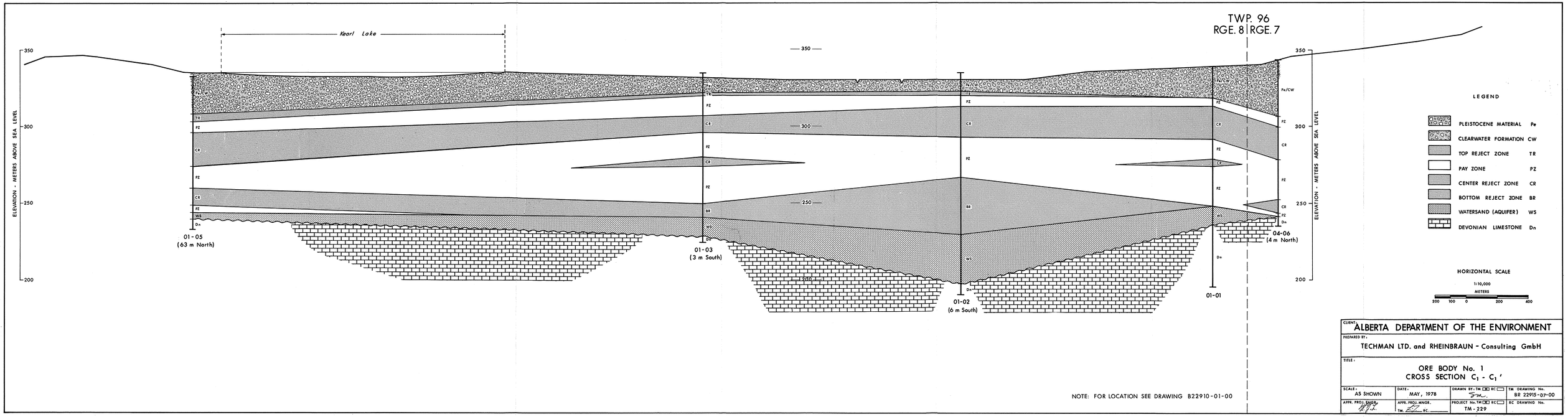
200 100 0 200 400

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

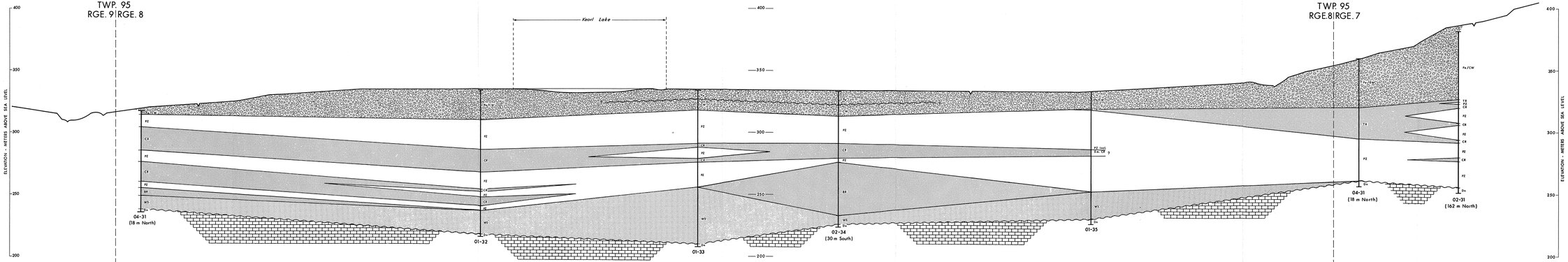
TITLE: ORE BODY No. 1
CROSS SECTION $B_1 - B_1'$

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | MAY, 1978 | | BR 22915-06-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| | TM RC | TM - 229 | |




NOTE: FOR LOCATION SEE DRAWING B22910-01-00

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: ORE BODY No. 1 CROSS SECTION $C_1$ - $C_1$ ' | | | |
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. BR 22915-07-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☒ RC ☐ TM-229 | RC DRAWING No. |




NOTE: FOR LOCATION SEE DRAWING B22910-01-00

## LEGEND

| | |
|---|---|
| PLEISTOCENE MATERIAL | Pe |
| CLEARWATER FORMATION | CW |
| TOP REJECT ZONE | TR |
| PAY ZONE | PZ |
| CENTER REJECT ZONE | CR |
| BOTTOM REJECT ZONE | BR |
| WATERSAND (AQUIFER) | WS |
| DEVONIAN LIMESTONE | Dn |

HORIZONTAL SCALE

1:10,000

METRES

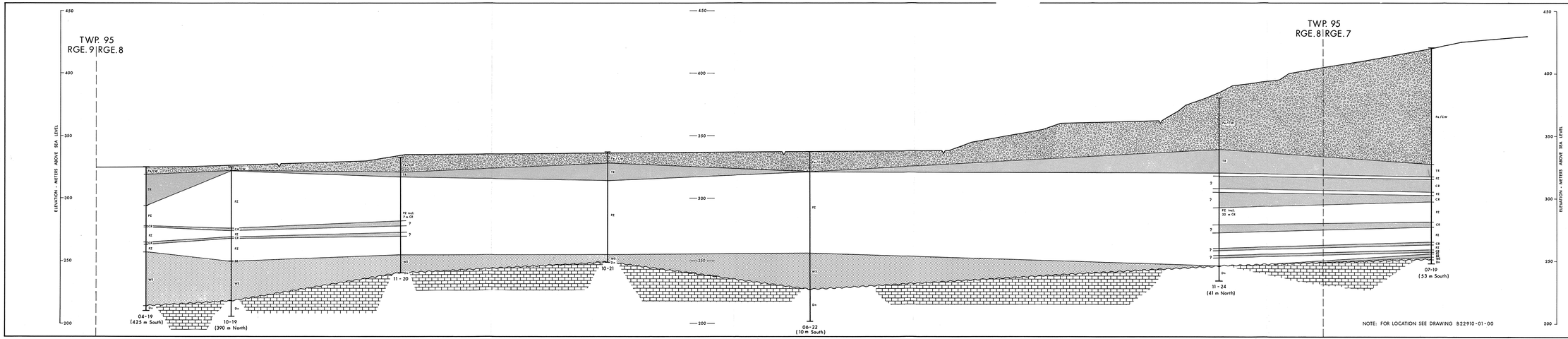
200 100 0 200 400

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: ORE BODY No. 1
CROSS SECTION $D_1$ - $D_1'$

| | | | |
|---|---|---|---|
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM [X] RC [ ] S | TM DRAWING No. BR 22915-08-00 |
| APPR. PROJ. ENGR. TM | APPR. PROJ. MNGR. TM RC | PROJECT No: TM [X] RC [ ] TM - 229 | RC DRAWING No. |




LEGEND

| | | |
|---|---|---|
| | PLEISTOCENE MATERIAL | Pe |
| | CLEARWATER FORMATION | CW |
| | TOP REJECT ZONE | TR |
| | PAY ZONE | PZ |
| | CENTER REJECT ZONE | CR |
| | BOTTOM REJECT ZONE | BR |
| | WATERSAND (AQUIFER) | WS |
| | DEVONIAN LIMESTONE | Dn |

HORIZONTAL SCALE

1:10,000

METERS

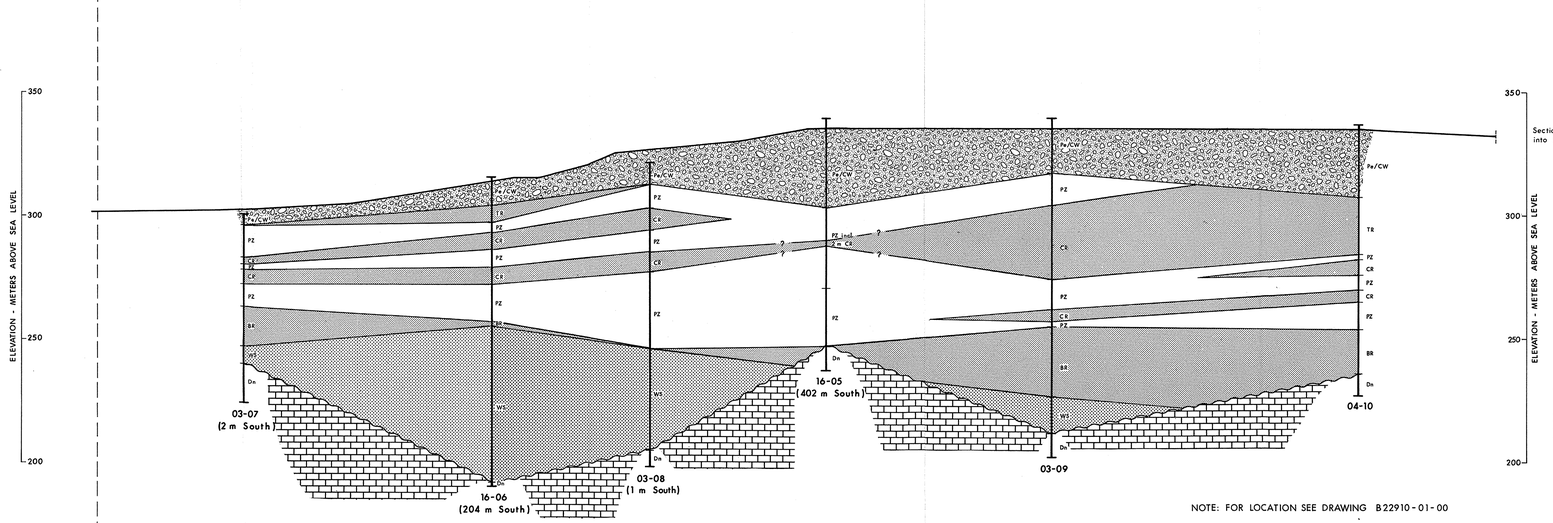
200 100 0 200 400

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: ORE BODY No. 1
CROSS SECTION $E_1$ - $E_1'$

| | | | |
|---|---|---|---|
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM / RC | TM DRAWING No. BR 22915-09-00 |
| APPR. PROJ. ENGR. | APPR. ENGL. MANAGER | PROJECT No. TM-229 | RC DRAWING No. |
| | TM RC | TM-229 | |




NOTE: FOR LOCATION SEE DRAWING B22910-01-00

LEGEND

| | |
|---|---|
| PLEISTOCENE MATERIAL | Pe |
| CLEARWATER FORMATION | CW |
| TOP REJECT ZONE | TR |
| PAY ZONE | PZ |
| CENTER REJECT ZONE | CR |
| BOTTOM REJECT ZONE | BR |
| WATERSAND (AQUIFER) | WS |
| DEVONIAN LIMESTONE | Dn |

HORIZONTAL SCALE

1:10,000

METERS

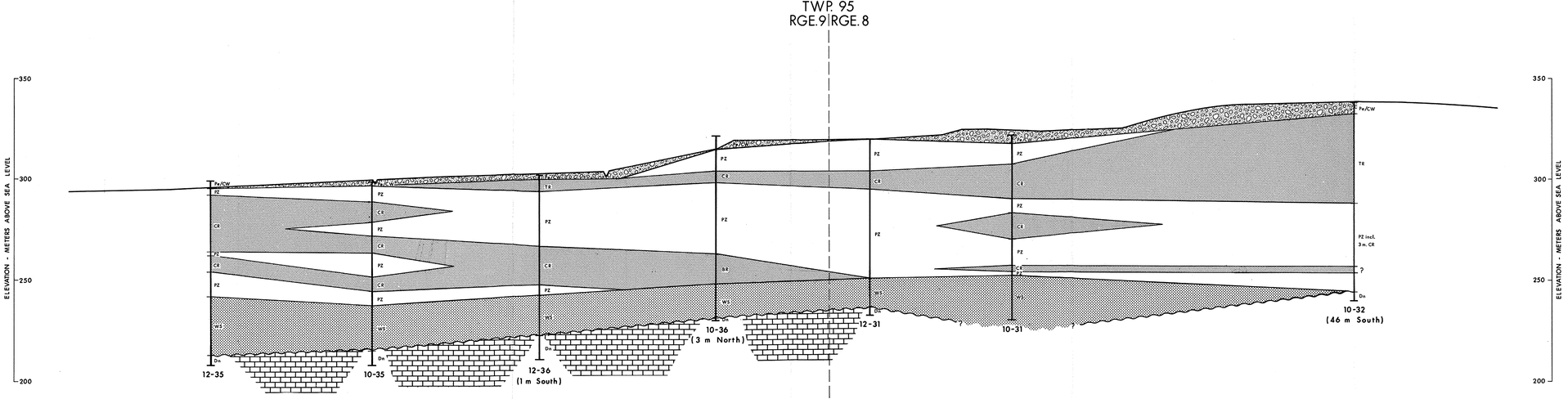
200 100 0 200 400

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: ORE BODY No. 2
CROSS SECTION $B_2$ - $B_2'$

| | | | |
|---|---|---|---|
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. BR 22915-10-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM ☒ RC ☐ | PROJECT No. TM ☒ RC ☐ TM - 229 | RC DRAWING No. |




NOTE: FOR LOCATION SEE DRAWING B22910-01-00

LEGEND

- PLEISTOCENE MATERIAL Pe
- CLEARWATER FORMATION CW
- TOP REJECT ZONE TR
- PAY ZONE PZ
- CENTER REJECT ZONE CR
- BOTTOM REJECT ZONE BR
- WATERSAND (AQUIFER) WS
- DEVONIAN LIMESTONE Dn

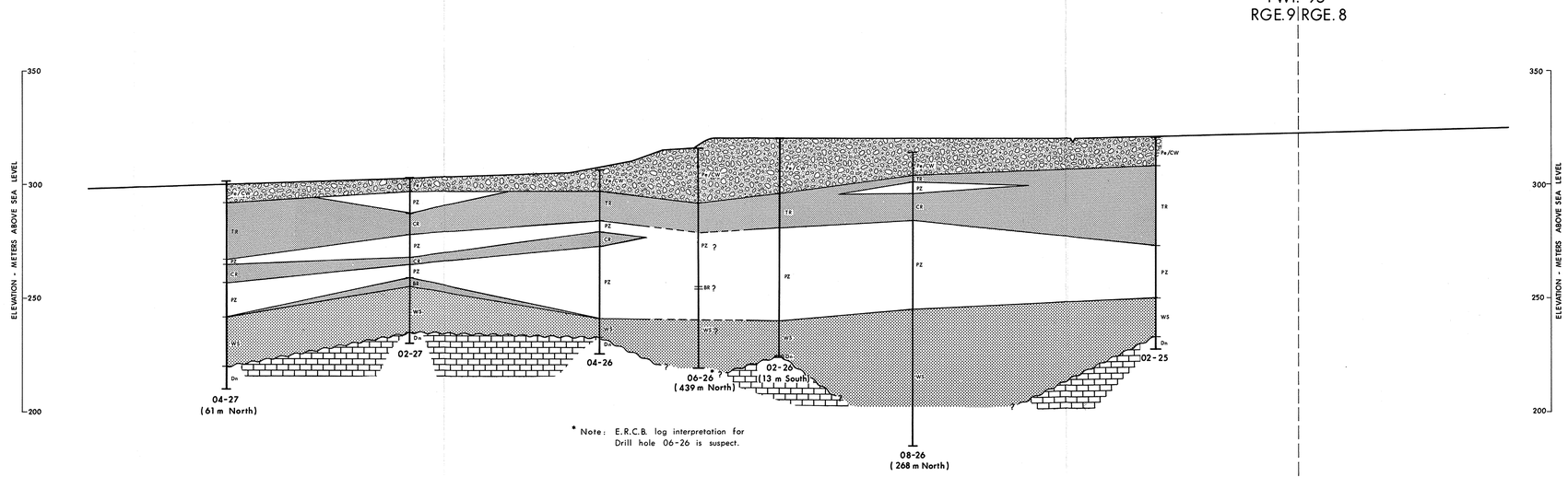
HORIZONTAL SCALE

1:10,000

METERS

200 100 0 200 400

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: ORE BODY No. 2 CROSS SECTION $C_2$ - $C_2'$ | | | |
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. BR 22915-11-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM ☐ RC ____ | PROJECT No: TM ☒ RC ☐ TM-229 | RC DRAWING No. |




NOTE: FOR LOCATION SEE DRAWING B22910-01-00

LEGEND

| | |
|---|---|
| PLEISTOCENE MATERIAL | Pe |
| CLEARWATER FORMATION | CW |
| TOP REJECT ZONE | TR |
| PAY ZONE | PZ |
| CENTER REJECT ZONE | CR |
| BOTTOM REJECT ZONE | BR |
| WATERSAND (AQUIFER) | WS |
| DEVONIAN LIMESTONE | Dn |

HORIZONTAL SCALE

1:10,000

METERS

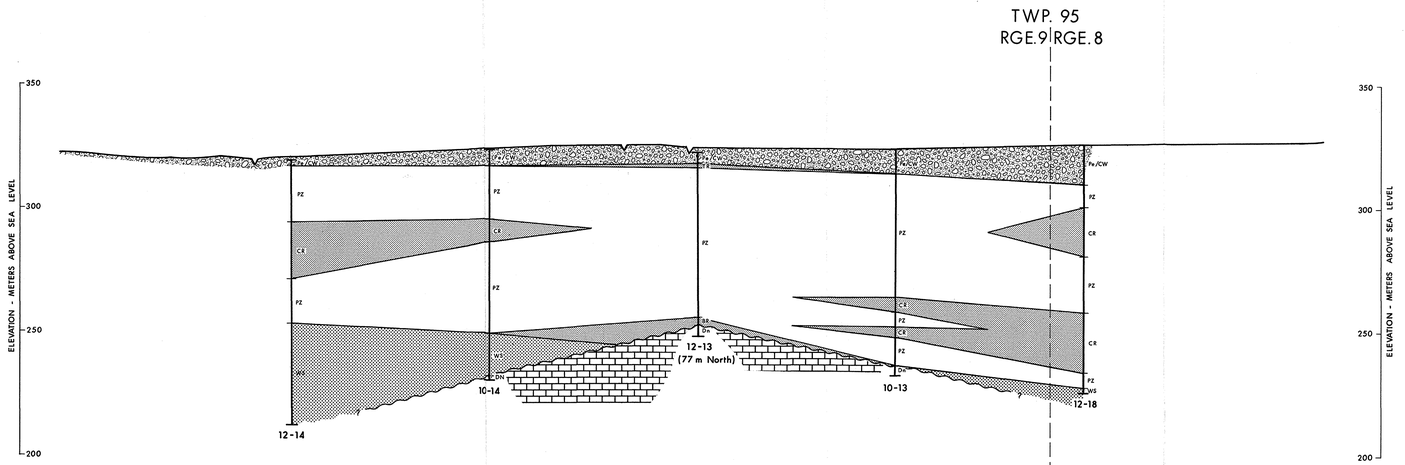
200 100 0 200 400

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: ORE BODY No. 2
CROSS SECTION $D_2$ - $D_2'$

| | | | |
|---|---|---|---|
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. BR 22915-12-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☒ RC ☐ TM-229 | RC DRAWING No. |




NOTE: FOR LOCATION SEE DRAWING B22910-01-00

LEGEND

| | | |
|---|---|---|
| | PLEISTOCENE MATERIAL | Pe |
| | CLEARWATER FORMATION | CW |
| | TOP REJECT ZONE | TR |
| | PAY ZONE | PZ |
| | CENTER REJECT ZONE | CR |
| | BOTTOM REJECT ZONE | BR |
| | WATERSAND (AQUIFER) | WS |
| | DEVONIAN LIMESTONE | Dn |

HORIZONTAL SCALE

1:10,000

METERS

200 100 0 200 400

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: ORE BODY No. 2 CROSS SECTION $E_2$ - $E_2'$ | | | |
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. BR 22915-13-00 |
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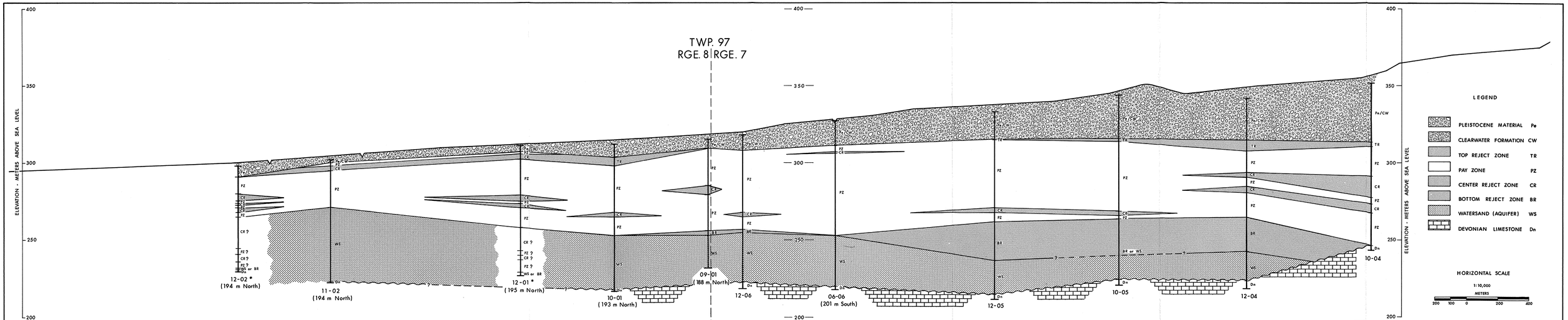



* Note: E.R.C.B. log interpretations for Drill holes 12-02 and 12-01 are suspect.

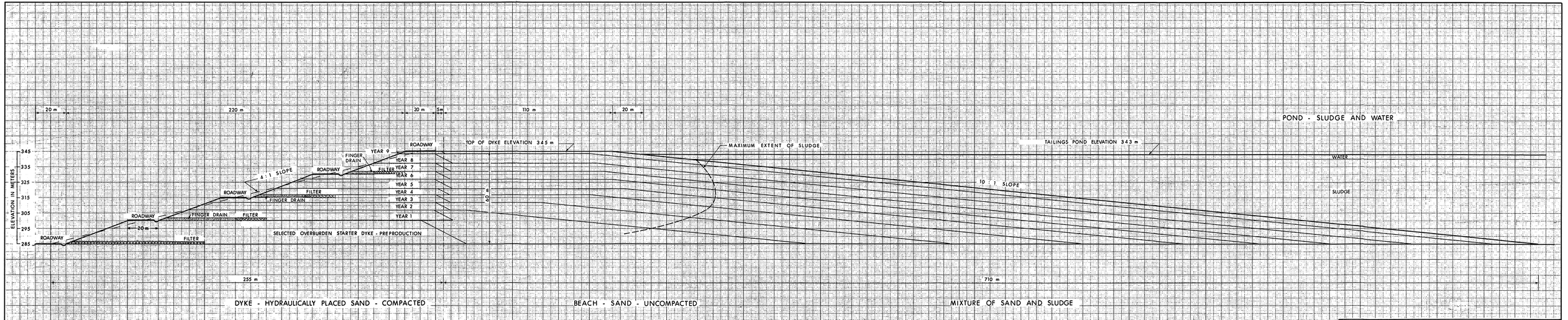
NOTE: FOR LOCATION SEE DRAWING B22910-01-00

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: ORE BODY No. 4 CROSS SECTION $B_4$ - $B_4'$ | | | |
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. BR 22915-14-00 |
| APPR. PROJ. MNGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☒ RC ☐ TM - 229 | RC DRAWING No. |

# OIL SAND RECLAMATION

## A Study Integrating Mining, Tailings Disposal and Reclamation

Tailings Pond Dyke




NOTE:
FILTERS: GRAVEL AND SAND
FINGER DRAINS: GRAVEL AND SAND OR PIPE.
FILTERS AND DRAINS ARE DIAGRAMATIC ONLY AND NOT TO BE USED FOR DESIGN PURPOSES
FILTERS: WIDTH 20m, THICKNESS 1m
ROADWAY WITH DITCH: WIDTH 20m
FINGER DRAINS: WIDTH 2m AT 100m SPACING, THICKNESS 1m

SCALE
1:1,000
METERS
20 10 0 10 20 40

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

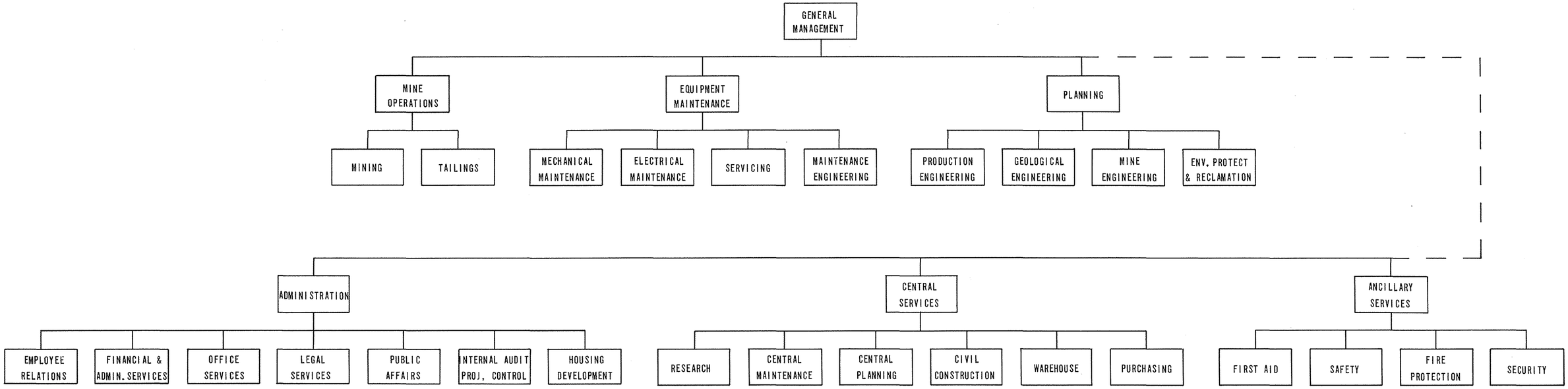
TITLE: TAILINGS POND DYKE
CROSS SECTION AT MAXIMUM HEIGHT

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | OCT., 1978 | S.M. | BR22944-15-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. | PROJ. No. TM ☒ RC ☐ | RC DRAWING No. |
| | TM RC | TM-229 | |

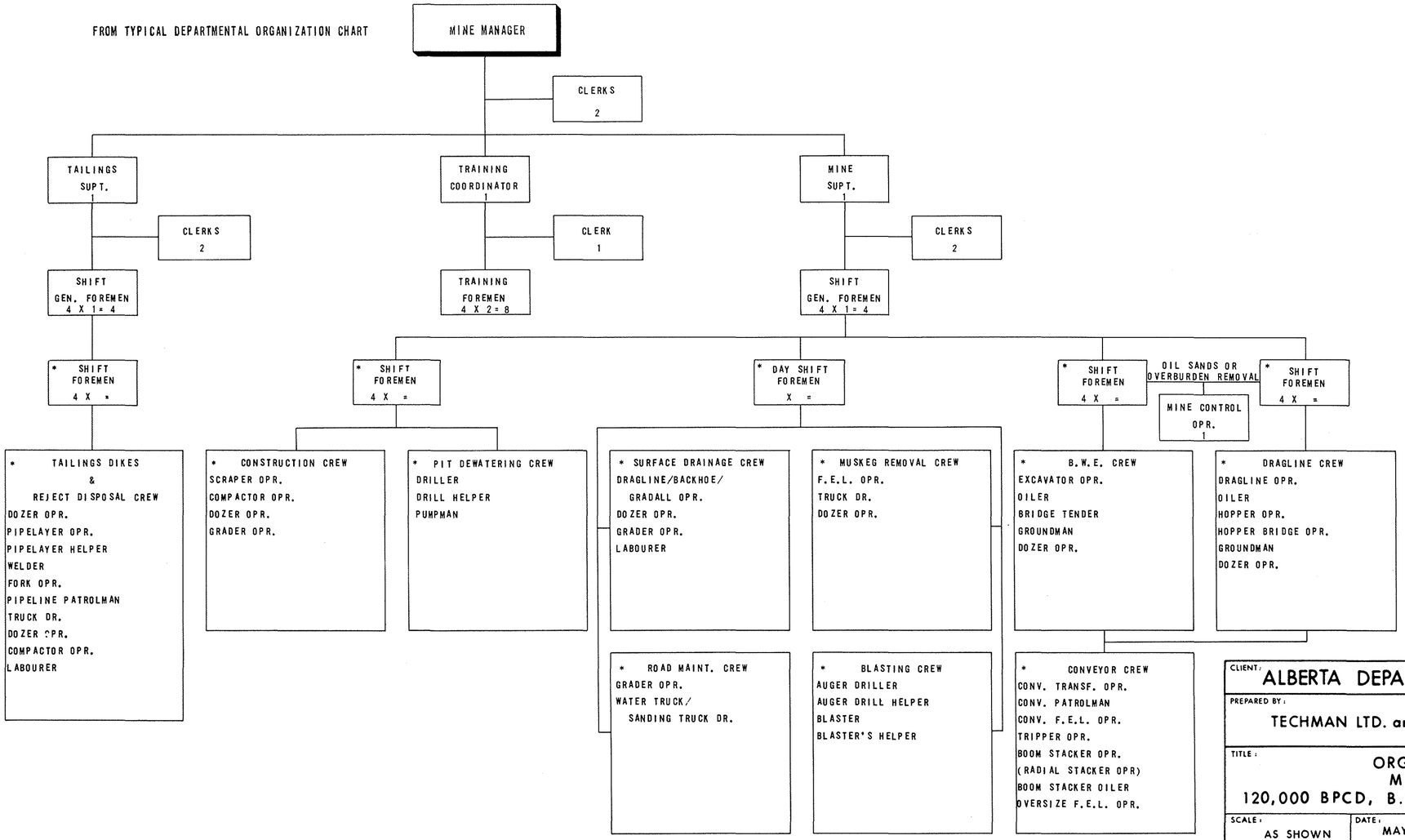
# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Organization Charts




| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: TYPICAL DEPARTMENTAL ORGANIZATION CHART (EXCLUDING TREATMENT AND ASSOCIATED FACILITIES) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1978 | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. BR 22902-16-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM. ☒ RC ☐ TM-229 | RC DRAWING No. |



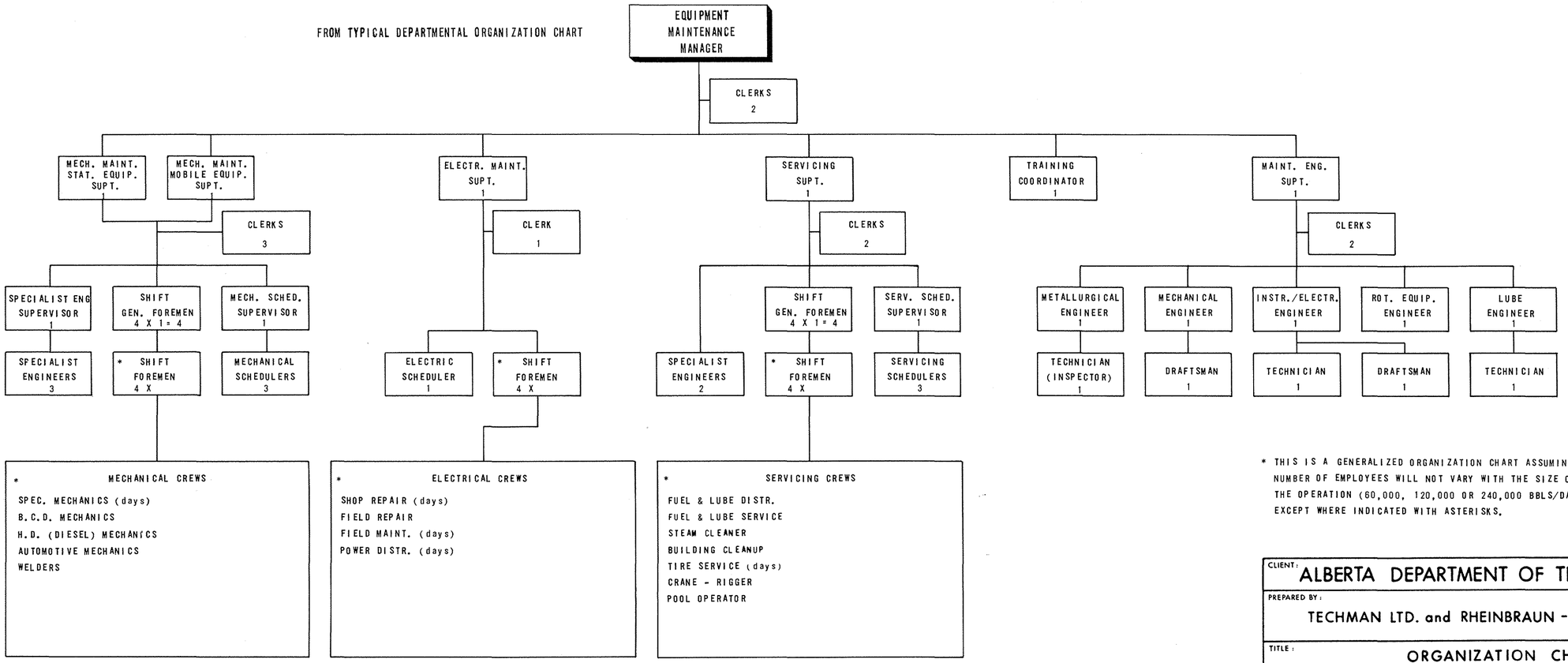

* THIS IS A GENERALIZED ORGANIZATION CHART ASSUMING THE NUMBER OF EMPLOYEES WILL NOT VARY WITH THE SIZE OF THE OPERATION (60,000, 120,000 OR 240,000 BBLS/DAY), EXCEPT WHERE INDICATED WITH ASTERISKS.

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: ORGANIZATION CHART
MINE OPERATIONS
120,000 BPCD, B.W.E. SCHEME - MINIMUM LEVEL

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | MAY, 1978 | | BR 22902-17-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. ✓ RC. | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| | | TM - 229 | |




B.C.D. BUCKET WHEEL/CONVEYOR/DRAGLINE

H.D. HEAVY DUTY

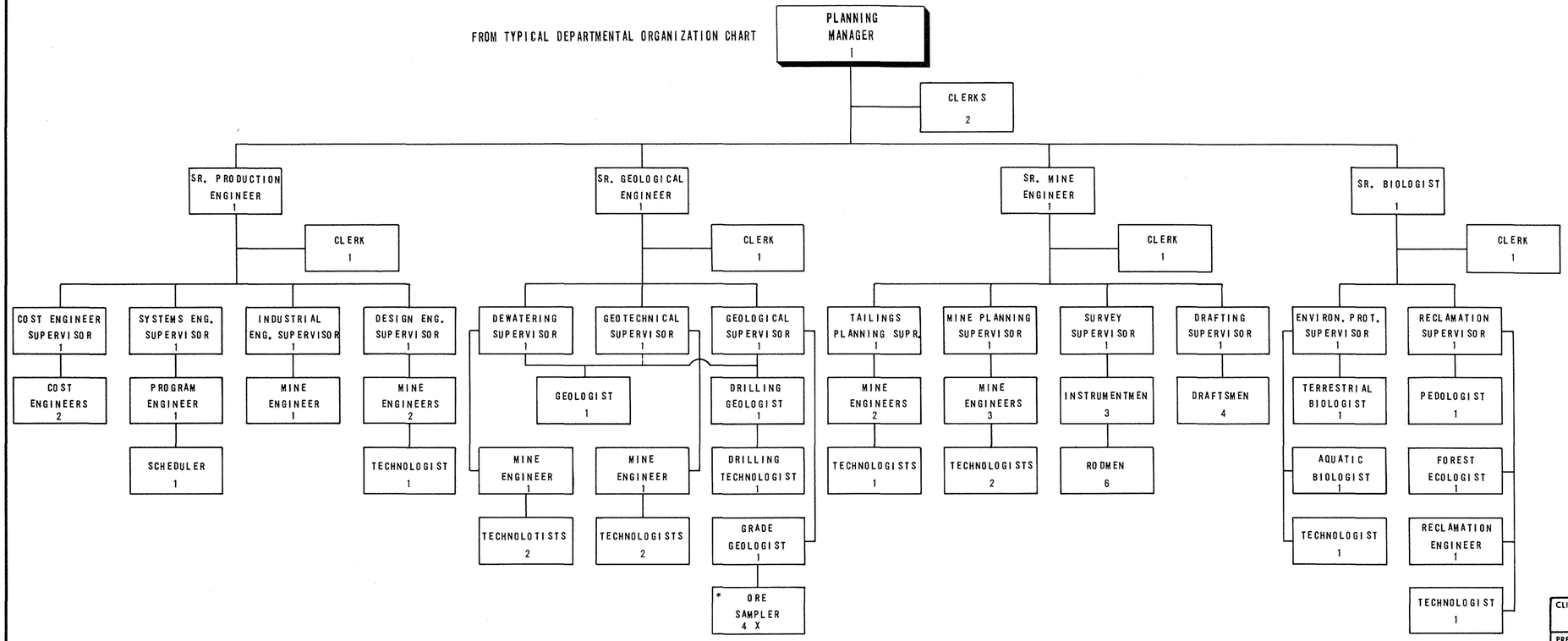
* THIS IS A GENERALIZED ORGANIZATION CHART ASSUMING THE NUMBER OF EMPLOYEES WILL NOT VARY WITH THE SIZE OF THE OPERATION (60,000, 120,000 OR 240,000 BBLS/DAY), EXCEPT WHERE INDICATED WITH ASTERISKS.

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: ORGANIZATION CHART
EQUIPMENT MAINTENANCE OPERATIONS
120,000 BPCD, B.W.E. SCHEME - MINIMUM LEVEL

| | | | |
|---|---|---|---|
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM [X] RC [ ] | TM DRAWING No. BR 22902-18-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC. | PROJECT No. TM [X] RC [ ] TM - 229 | RC DRAWING No. |




* THIS IS A GENERALIZED ORGANIZATION CHART ASSUMING THE NUMBER OF EMPLOYEES WILL NOT VARY WITH THE SIZE OF THE OPERATING (60,000, 120,000 OR 240,000 BBLS/DAY), EXCEPT WHERE INDICATED WITH ASTERISKS.

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: ORGANIZATION CHART PLANNING OPERATIONS 120,000 BPCD, B.W.E. SCHEME - MINIMUM LEVEL | | | |
| SCALE: AS SHOWN | DATE: MAY, 1978 | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. BR 22902-19-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☒ RC ☐ TM - 229 | RC DRAWING No. |

# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 2

(120,000 BPCD)

Dragline - Minimum

RGE 9 | RGE 8

TWP 96

TWP 95

Muskeg River

Hartley Creek

Kearl Lake

TOP OF DYKE
ELEV. 317.0 m

ACTIVE TAILINGS POND
POND ELEV. 310.2 m

OVERSIZE REJECT DUMP (TRUCKS)

PLANT SITE

MUSKEG DRAINAGE

MUSKEG REMOVAL F.E.L.-TRUCKS

MUSKEG DUMP

OVERBURDEN REMOVAL - B.W.E.

MUSKEG DUMP

OIL SAND REMOVAL - UPPER BENCH DRAGLINES

OIL SAND REMOVAL - LOWER BENCH DRAGLINES

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

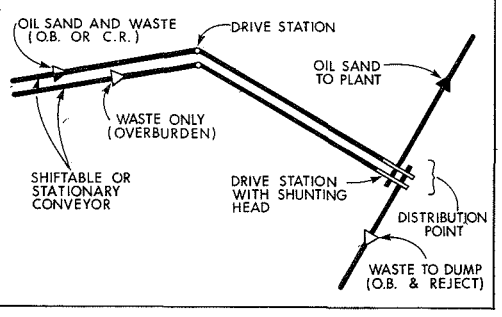
ORE BODY BOUNDARY
GRAMT 400 R.F. 0.6

MUSKEG DUMP

MUSKEG DUMP

OVERBURDEN AND CENTRE REJECT DUMP (SPREADER)

## BELT CONVEYOR SYMBOLS :




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MINING AND TAILINGS DISPOSAL - YEAR 3
MINIMUM LEVEL OF RECLAMATION
1 B.W.E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | NOV. 1978 | D.C. | D22918-20-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| | | TM - 229 | |

RGE 9 | RGE 8

TWP 96

TWP 95

Muskeg River

Hartley Creek

Kearl Lake

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

ORE BODY BOUNDARY
GRAMT 400
R.F. 0.6

OVERBURDEN REMOVAL - B.W.E.

OUTSIDE TAILINGS POND
BACKFILLED WITH TAILINGS SAND
TOP ELEV. 345 m

MUSKEG DUMP

OIL SAND REMOVAL
UPPER BENCH
DRAGLINES

OIL SAND REMOVAL
LOWER BENCH
DRAGLINES

WASTE DUMP
(OVERBURDEN AND
CENTRE REJECT)
-SPREADER

(OVERSIZE REJECT)
(TRUCKS)

TAILINGS SAND DYKE
TOP ELEV. 270 m

ACTIVE
TAILINGS POND

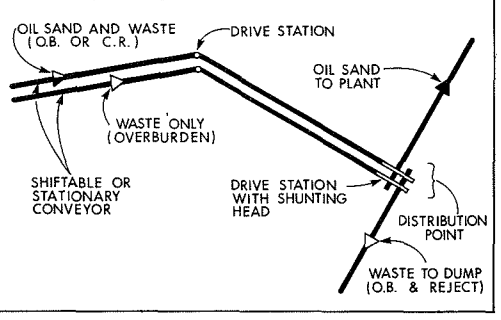
PLANT SITE

TAILINGS SAND DYKE
TOP ELEV. 322 m

SLUDGE POND
SOME TAILINGS WATER ON TOP
POND ELEV. 293 m

WASTE DUMP
AVE. HEIGHT 75 m

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MINING AND TAILINGS DISPOSAL-YEAR 15
MINIMUM LEVEL OF RECLAMATION
1 B.W.E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ BC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | NOV., 1978 | D.C. | D22918-21-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. BC. | PROJECT No. TM ☒ BC ☐ | BC DRAWING No. |
| | | TM - 229 | |

RGE 9 RGE 8

TWP 96

TWP 95

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

OVERBURDEN REMOVAL - B.W.E.

OIL SAND REMOVAL UPPER BENCH DRAGLINES

OIL SAND REMOVAL LOWER BENCH DRAGLINES

ORE BODY BOUNDARY
GRAMT 400
R.F. 0.6

SELECTED OVERBURDEN DYKE
TOP ELEV. 306 m

OVERBURDEN AND CENTRE REJECT BACKFILL (SPREADER)

OUTSIDE TAILINGS POND
BACKFILLED WITH TAILINGS SAND
TOP ELEV. 345 m

ACTIVE TAILINGS POND

WASTE DUMP
AVE. HEIGHT 75 m
(OVERBURDEN AND CENTRE REJECT)
(OVERSIZE REJECT)

TAILINGS SAND DYKE
TOP ELE. 311 m

TAILINGS SAND
AVE. TOP ELEV. 309 m

PLANT SITE

TAILINGS SAND DYKE
TOP. ELEV. 322 m

SLUDGE POND
SOME TAILINGS WATER ON TOP
POND ELEV. 315 m

WASTE DUMP
AVE. HEIGHT 75 m

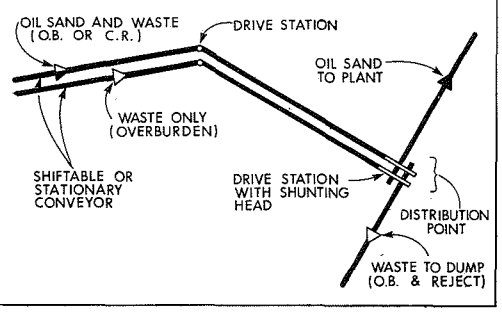
MUSKEG DUMP

Muskeg River

Hartley River

Keorl Lake

## BELT CONVEYOR SYMBOLS :




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

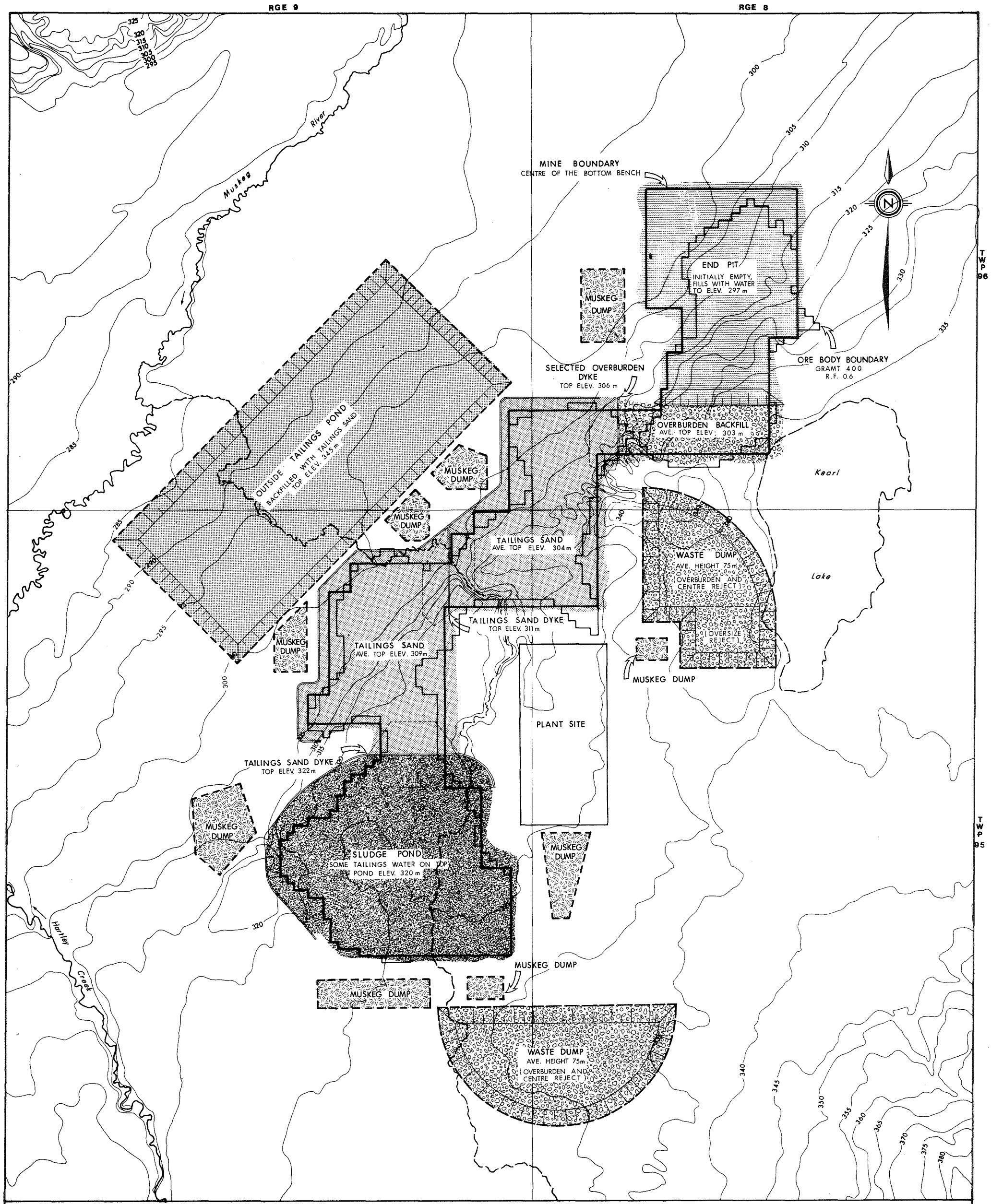
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MINING AND TAILINGS DISPOSAL-YEAR 22
MINIMUM LEVEL OF RECLAMATION
1 B.W.E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 B PCD)

| SCALE: AS SHOWN | DATE: NOV. 1978 | DRAWN BY: TM ☐ RC ☐ D.C. | TM DRAWING No. D22918-22-00 |
|---|---|---|---|
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ TM - 229 | RC DRAWING No. |




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MATERIAL DISTRIBUTION PLAN
MINIMUM LEVEL OF RECLAMATION
1 B. W. E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☑ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT., 1978 | | D 22916-23-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☑ RC ☐ | RC DRAWING No. |
| | | TM - 229 | |

RGE 9 | RGE 8

TWP 96

TWP 95

Muskeg River

Kearl Lake

Harley Creek

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

END PIT
INITIALLY EMPTY, FILLS WITH WATER TO ELEV. 297 m

ORE BODY BOUNDARY
GRAMT 400
R.F. 0.6

MUSKEG DUMP

RECLAIMED IN YEARS 26-28

SELECTED OVERBURDEN DYKE
TOP ELEV. 306 m

OVERBURDEN BACKFILL
AVE. TOP ELEV. 303 m

RECLAIMED IN YEARS 24 & 25

DYKES RECLAIMED IN YEARS 11&12

OUTSIDE TAILINGS POND
BACKFILLED WITH TAILINGS SAND
TOP ELEV. 345 m

RECLAIMED IN YEARS 18 & 19

TAILINGS SAND
AVE. TOP ELEV. 304 m

WASTE DUMP
AVE. HEIGHT 75 m
(OVERBURDEN AND CENTRE REJECT)

TOP WITH 1 m OVERBURDEN IN YEARS 26-29 AND RECLAIM IN YEAR 29

(OVERSIZE REJECT)

TOP RECLAIMED IN YEARS 15 - 17

TAILINGS SAND DYKE
TOP ELEV. 311 m

TAILINGS SAND
AVE. TOP ELEV. 309 m

MUSKEG DUMP

RECLAIMED IN YEARS 20-23

PLANT SITE

RECLAIMED IN YEAR 30

TAILINGS SAND DYKE
TOP ELEV. 322 m

SLUDGE POND
SOME TAILINGS WATER ON TOP
POND ELEV. 320 m

MUSKEG DUMP

RECLAIMED IN YEARS 13 & 14

WASTE DUMP
AVE. HEIGHT 75 m
(OVERBURDEN AND CENTRE REJECT)

290 285 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380

## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: RECLAMATION PLAN
MINIMUM LEVEL OF RECLAMATION
1 B.W.E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | NOV., 1978 | D.C. | D22980-24-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| | | TM - 229 | |

# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 2

(120,000 BPCD)

Dragline – Improved

RGE 9 | RGE 8

TWP 96

TWP 95

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

ORE BODY BOUNDARY
GRAMT 400
R.F. 0.6

OVERBURDEN REMOVAL
B.W.E.

OUTSIDE TAILINGS POND
BACKFILLED WITH TAILINGS SAND
TOP ELEV. 345m

MUSKEG DUMP

OIL SAND REMOVAL
UPPER BENCH DRAGLINES

OIL SAND REMOVAL
LOWER BENCH DRAGLINES

OVERBURDEN & REJECT BACKFILL
SPREADER

OVERBURDEN DYKE WITH TAILINGS SAND DYKE IN WEST TOE

WASTE DUMP
AVE. HEIGHT 75m
(OVERBURDEN AND CENTRE REJECT)

PREPARED SOIL BLENDING PILE

OVERSIZE REJECT

ACTIVE TAILINGS POND

SLUDGE TREATMENT PLANT

PLANT SITE

SELECTED OVERBURDEN DYKE
TOP ELEV. 322m

TREATED SLUDGE

Hartley Creek

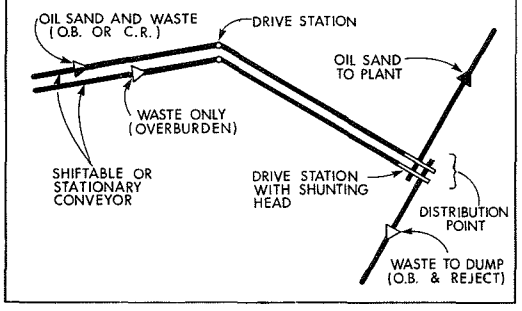
Muskeg River

Kearl Lake

PREPARED SOIL BLENDING PILE

WASTE DUMP
AVE. HEIGHT 75m

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

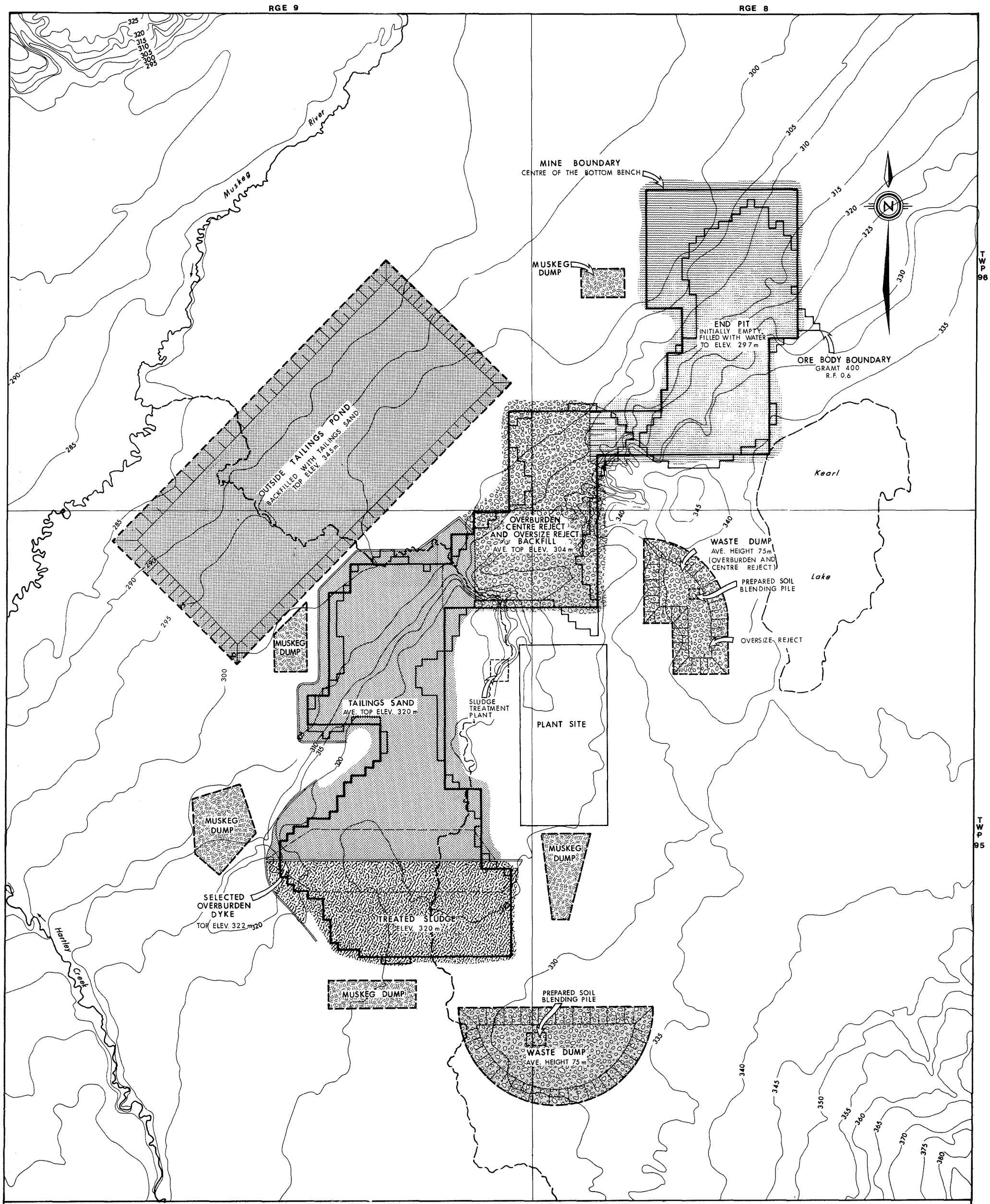
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MINING AND TAILINGS DISPOSAL - YEAR 15
IMPROVED LEVEL OF RECLAMATION
1 B.W.E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | NOV. 1978 | D.C. | D22918-25-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☐ RC ☐ TM-229 | RC DRAWING No. |




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT.
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MATERIAL DISTRIBUTION PLAN
IMPROVED LEVEL OF RECLAMATION
1 B. W. E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | NOV. 1978 | D.C. | D22916-26-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| | | TM-229 | |

RGE 9 | RGE 8

TWP 96

TWP 95

Muskeg River

Kearl Lake

Hartley Creek

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

MUSKEG DUMP

END PIT
INITIALLY EMPTY
FILLED WITH WATER
TO ELEV. 297m

ORE BODY BOUNDARY
GRAMT 400
R.F. 0.6

RECLAIMED
YEARS 16-23

OUTSIDE TAILINGS POND
BACKFILLED WITH TAILINGS SAND
TOP ELEV. 345m

RECLAIMED
YEARS 24-25

OVERBURDEN
BACKFILL
AVE. TOP ELEV. 304m

WASTE DUMP
AVE. HEIGHT 75m
(OVERBURDEN AND CENTRE REJECT)

RECLAIMED
YEARS 14&15

(OVERSIZE REJECT)

PREPARED SOIL
BLENDING PILE

SLUDGE
TREATMENT
PLANT

RECLAIMED
YEARS 26-29

TAILINGS SAND
AVE. TOP ELEV. 320m

PLANT SITE

PREPARED SOIL
BLENDING PILE

RECLAIMED
YEAR 30

MUSKEG
DUMP

SELECTED
OVERBURDEN
DYKE
ELEV. 322m

TREATED SLUDGE
ELEV. 320m

MUSKEG DUMP

WASTE DUMP
AVE. HEIGHT 75m

RECLAIMED
YEARS 11-14

## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: RECLAMATION PLAN
IMPROVED LEVEL OF RECLAMATION
1 B.W.E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No.2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | NOV. 1978 | D.C. | D22980-27-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| | | TM-229 | |

# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 2

(120,000 BPCD)

Dragline – Enhanced

RGE 9 | RGE 8

TWP 96

TWP 95

HYDRAULIC MUSKEG MINE

Muskeg River

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

MUSKEG DUMP

ORE BODY BOUNDARY
GRAMT 400
R.F. 0.6

OVERBURDEN REMOVAL - B.W.E.

Kearl Lake

OIL SAND REMOVAL UPPER BENCH DRAGLINE

OIL SAND REMOVAL LOWER BENCH DRAGLINES

TAILINGS SAND, O.B., C.R. BACKFILL - SPREADERS

MUSKEG DEWATERING PLANT

TAILINGS SAND OVERBURDEN AND CENTRE REJECT
(SPREADER)
AVE. TOP ELEV. 315 m

PREPARED SOIL STOCKPILE FOR F.E.L. & TRUCKS TO RECLAMATION

PREPARED SOIL BLENDING STOCKPILES STACKER & B.W.R.

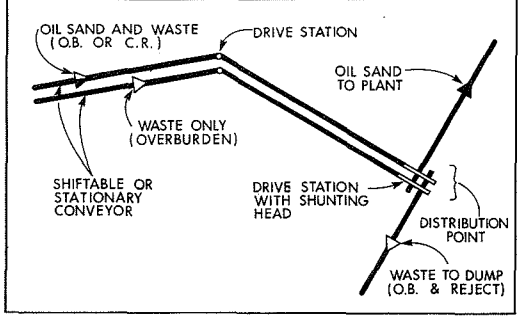
PLANT SITE

TAILINGS SAND, OVERDEN AND CENTRE REJECT
(SPREADER)
AVE. TOP ELEV. 334 m

Hartley Creek

WASTE DUMP
AVE. HEIGHT 75m

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MINING AND TAILINGS DISPOSAL-YEAR 15
ENHANCED LEVEL OF RECLAMATION
1 B. W. E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | NOV., 1978 | D.C. | D22918 - 28 - 00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| | | TM - 229 | |

RGE 9 | RGE 8

TWP 96

TWP 95

Muskeg River

HYDRAULIC MUSKEG MINE

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

END PIT
INITIALLY EMPTY
FILLED WITH WATER
TO ELEV. 297m

AVE. TOP ELEV. 298 m

MUSKEG DUMP

AVE. TOP ELEV. 322 m

ORE BODY BOUNDARY
GRAMT 400
R.F. 0.6

AVE. TOP ELEV. 327m

TAILINGS SAND OVERBURDEN AND CENTRE REJECT

Kearl Lake

MUSKEG DUMP

AVE. TOP ELEV. 325 m

REHANDLE OVERBURDEN
FOR PLANT SITE
RECLAMATION
-F.E.L. ONTO BELT CONVEYOR

MUSKEG DUMP

TAILINGS SAND
OVERBURDEN AND
CENTRE REJECT
(SPREADER)
AVE. TOP ELEV. 315 m

MUSKEG
DEWATERING
PLANT

PREPARED SOIL
BLENDING STOCKPILES
-STACKER & B.W.R.

BACKFILL WITH OVERBURDEN (IF REQUIRED)
RESURFACE WITH PREPARED SOIL
-SPREADER

PLANT
SITE

MUSKEG DUMP

MUSKEG DUMP

TAILINGS SAND OVERDEN
AND CENTRE REJECT
(SPREADER)
AVE. TOP ELEV 334m

MUSKEG DUMP

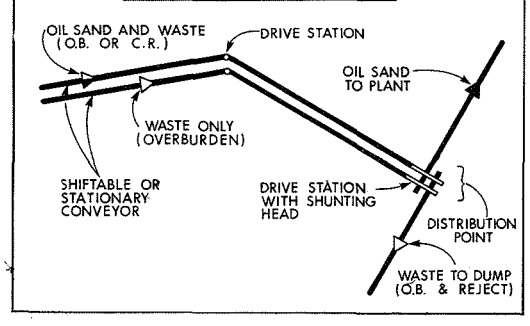
Hartley Creek

MUSKEG DUMP

MUSKEG DUMP

WASTE DUMP
AVE. HEIGHT 75m

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MATERIAL DISTRIBUTION PLAN
ENHANCED LEVEL OF RECLAMATION
1 B. W. E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: AS SHOWN. | DATE: NOV., 1978 | DRAWN BY: TM ☑ RC ☐ D.C. | TM DRAWING No. D22916-29-00 |
|---|---|---|---|
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☑ RC ☐ TM - 229 | RC DRAWING No. |

RGE 9 | RGE 8

TWP 96

TWP 95

HYDRAULIC MUSKEG MINE

Muskeg River

Hartley River

Kearl Lake

MINE BOUNDARY
CENTRE OF THE BOTTOM BENCH

END PIT
INITIALLY EMPTY, FILLED WITH WATER TO ELEV. 297m

RECLAIMED YEAR 25 & 26

MUSKEG DUMP

ORE BODY BOUNDARY
GRAMT 400
R.F. 0.6

RECLAIMED YEAR 24

RECLAIMED YEARS 17-21

MUSKEG DUMP

RECLAIMED YEAR 22 & 23

MINE AREA RECLAIMED AS BACKFILLED

RECLAIMED YEARS 13-16

MUSKEG DUMP

MUSKEG DEWATERING PLANT

PREPARED SOIL BLENDING STOCKPILE

MUSKEG DUMP

PLANT SITE

RECLAIMED YEARS 27 & 28

MUSKEG DUMP

MUSKEG DUMP

RECLAIMED YEARS 4-12

MUSKEG DUMP

MUSKEG DUMP

WASTE DUMP
AVE. HEIGHT 75m

RECLAIMED YEARS 1 & 2

290 285 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380

## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: RECLAMATION PLAN
ENHANCED LEVEL OF RECLAMATION
1 B. W. E. AND 4 DRAGLINES MINING SCHEME
ORE BODY No. 2 (120,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | NOV., 1978 | D.C. | D22980-30-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☒ RC ☐ | RC DRAWING No. |
| | | TM - 229 | |

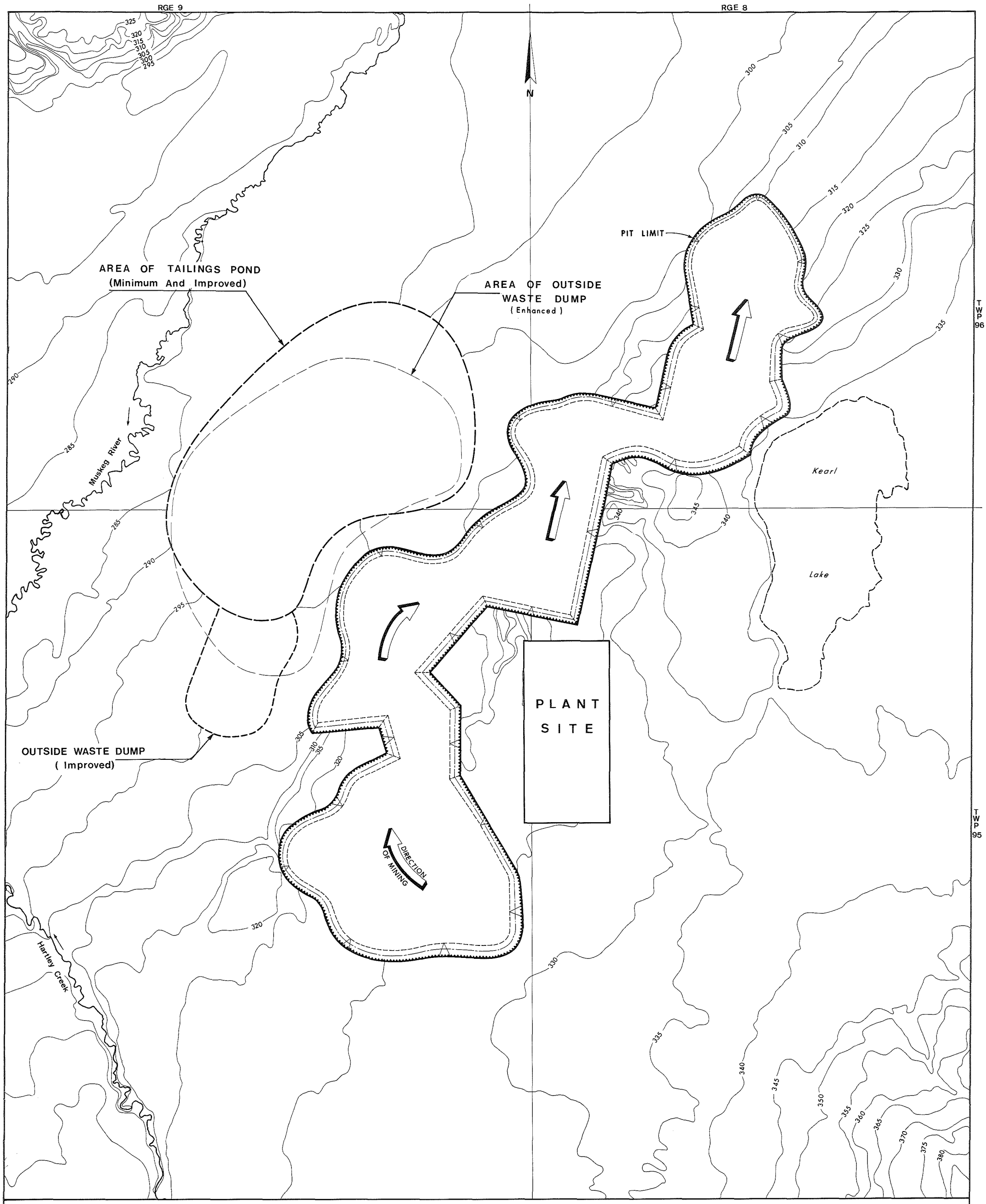
# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 2

(120,000 BPCD)

BWE – General layout




| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: General Mine Layout<br>3 B.W.E. Mining Scheme<br>Ore Body No 2 (120 000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22910-31-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/50 |

# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 2

(120,000 BPCD)

BWE – Minimum

RGE 9 | RGE 8

N

PIT LIMIT

STARTER DYKE

OUTSIDE TAILINGS POND

Muskeg River

Kearl Lake

OUTSIDE WASTE DUMP

PLANT SITE

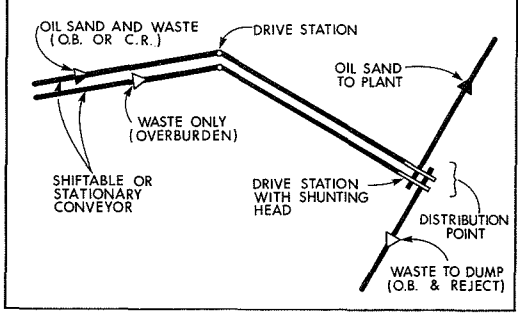
1st bench

Hartley Creek

TWP 96

TWP 95

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP: OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: Mine Opening - Year1<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120 000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22918-32-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5001 |

RGE 9

RGE 8

N

TWP 96

TWP 95

PIT LIMIT

OUTSIDE TAILINGS POND

OUTSIDE WASTE DUMP

PLANT SITE

INSIDE DUMP

Overburden stockpile (not prepared soil)

1st bench

2nd bench

3rd bench

Muskeg River

Hartley Creek

Kearl Lake

325 320 315 310 305 300 295 290 285 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380

METERS

500 250 0 500 1000

**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)

DRIVE STATION

OIL SAND TO PLANT

WASTE ONLY (OVERBURDEN)

SHIFTABLE OR STATIONARY CONVEYOR

DRIVE STATION WITH SHUNTING HEAD

DISTRIBUTION POINT

WASTE TO DUMP (O.B. & REJECT)

**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 7
Minimum Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22918-33-00 |
|---|---|---|---|
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5002 |

RGE 9

RGE 8

N

PIT LIMIT

OUTSIDE TAILINGS POND

-345

Muskeg River

Kearl Lake

OUTSIDE WASTE DUMP

1st bench

2nd bench

3rd bench

overburden stockpile for prepared soil

TAILINGS SAND DYKE

PLANT SITE

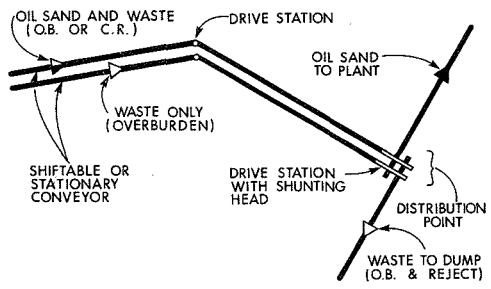
TAILINGS POND A

Harley Creek

TWP 96

TWP 95

## BELT CONVEYOR SYMBOLS :




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 12
Minimum Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22918-34-00 |
|---|---|---|---|
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5003 |

RGE 9

RGE 8

TWP 96

TWP 95

N

OUTSIDE TAILINGS POND

345

Muskeg River

Hartley Creek

OUTSIDE WASTE DUMP

INSIDE DUMP

Overburden stockpile (and prepared soil)

TAILINGS SAND DYKE

TAILINGS POND A

PLANT SITE

PIT LIMIT

1st bench

2nd bench

3rd bench

Kearl Lake

290 285 295 320 325 315 310 305 300 330 335 340 345 350 355 360 365 370 375 380

**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)

DRIVE STATION

OIL SAND TO PLANT

WASTE ONLY (OVERBURDEN)

SHIFTABLE OR STATIONARY CONVEYOR

DRIVE STATION WITH SHUNTING HEAD

DISTRIBUTION POINT

WASTE TO DUMP (O.B. & REJECT)

**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS

500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 15
Minimum Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | D22918-35-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5004 |

RGE 9 | RGE 8

N

PIT LIMIT

1st bench
2nd bench
3rd bench

INSIDE DUMP

overburden stockpile (For prepared soil)

OUTSIDE TAILINGS POND

345

Muskeg River

Kearl Lake

TAILINGS POND B

OUTSIDE WASTE DUMP

PLANT SITE

TAILINGS SAND DYKE

TAILINGS POND A

350

Hartley Creek

TWP 96

TWP 95

**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)
DRIVE STATION
OIL SAND TO PLANT
WASTE ONLY (OVERBURDEN)
SHIFTABLE OR STATIONARY CONVEYOR
DRIVE STATION WITH SHUNTING HEAD
DISTRIBUTION POINT
WASTE TO DUMP (O.B. & REJECT)

**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 19
Minimum Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: AS SHOWN* | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22918-36-00 |
|---|---|---|---|
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5005 |

RGE 9 RGE 8

N

PIT LIMIT

1st. BENCH

2nd. BENCH

BOTTOM BENCH

OVERBURDEN BUSHED AND REMOVED

INSIDE DUMP

Overburden stockpile (for prepared soil)

OUTSIDE TAILINGS POND

345

Muskeg River

TAILINGS SAND DYKE

TAILINGS POND B

OUTSIDE WASTE DUMP

PLANT SITE

TAILINGS SAND DYKE

TAILINGS POND A

350

Hartley Creek

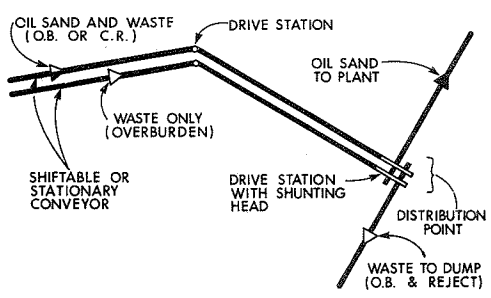
Kearl Lake

TWP 96

TWP 95

325 320 315 310 305 300 295 290 285 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS 500 250 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: Mining and Tailings Disposal - Year 23 Minimum Level of Reclamation 3 B.W.E. Mining Scheme Ore Body No. 2 (120 000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22918-37-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/50 |

RGE 9

RGE 8

N

TWP 96

TWP 95

OUTSIDE TAILINGS POND

+345

INSIDE DUMP

Kearl Lake

Muskeg River

OUTSIDE WASTE DUMP

TAILINGS POND B

+330

PLANT SITE

TAILINGS POND A

+350

Hartley Creek

325 320 315 310 305 300 295 290 285 280 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380

## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS

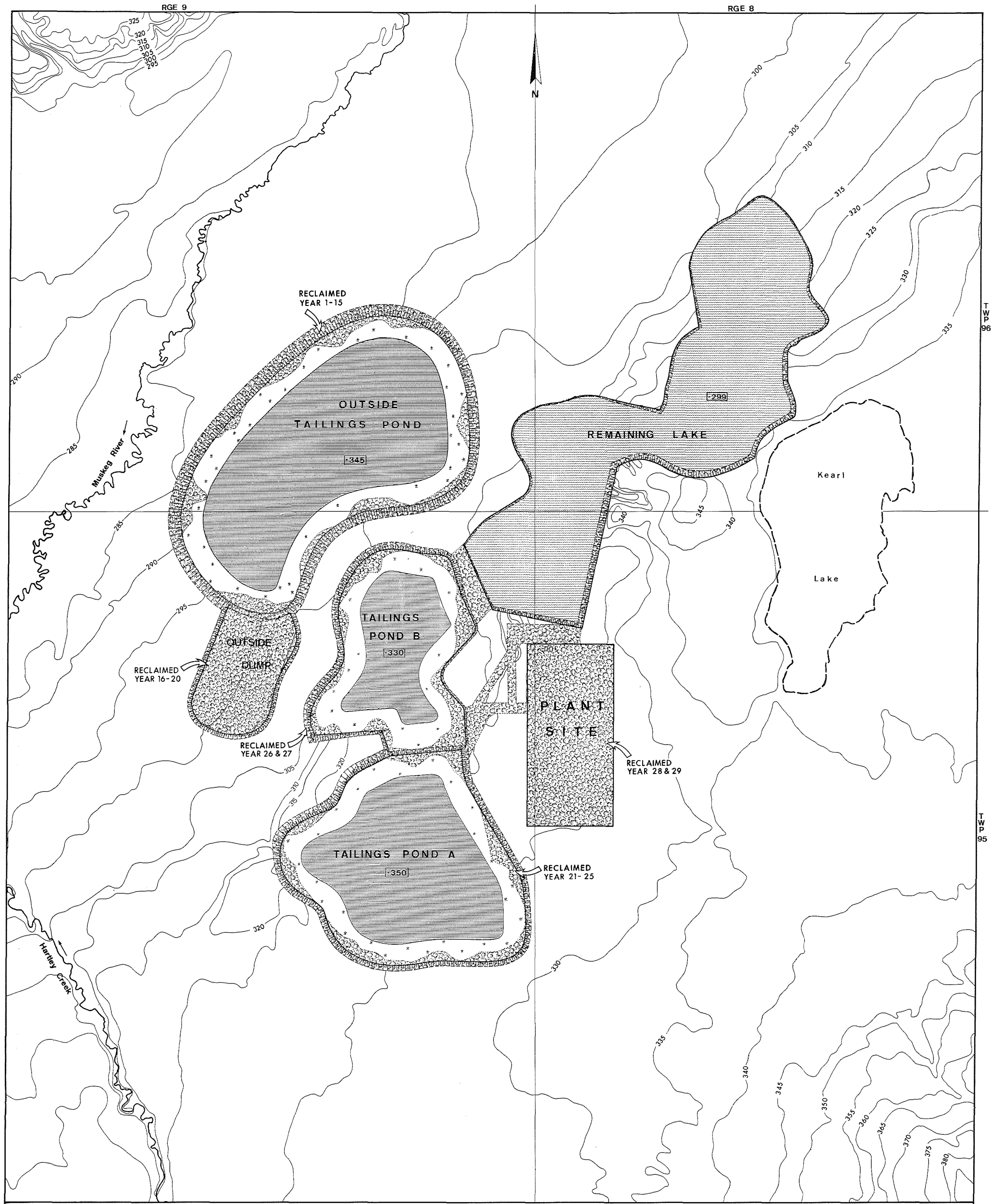
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Material Distribution Plan
Minimum Level of Reclamation
3 BWE Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | Biemann | D22916-38-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/50 |




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: Reclamation Plan<br>Minimum Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120 000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22980-39-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5006 |

# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 2

(120,000 BPCD)

BWE – Improved

RGE 9 | RGE 8

TWP 96

TWP 95

N

PIT LIMIT

OUTSIDE TAILINGS POND

Top of dyke Elev. 348m

Top of dyke Elev. 348 m

Muskeg River

INSIDE DUMP

1st bench

2nd bench

3rd bench

Overburden stockpile (for prepared soil)

Kearl Lake

TAILINGS POND B

SLUDGE TREATMENT PLANT

PLANT SITE

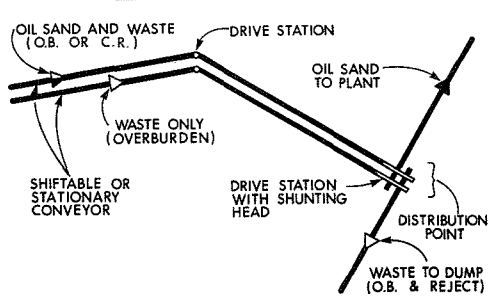
TAILINGS POND A

Top of Dyke Elev. 339m

Hartley Creek

290 285 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380

## BELT CONVEYOR SYMBOLS :




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

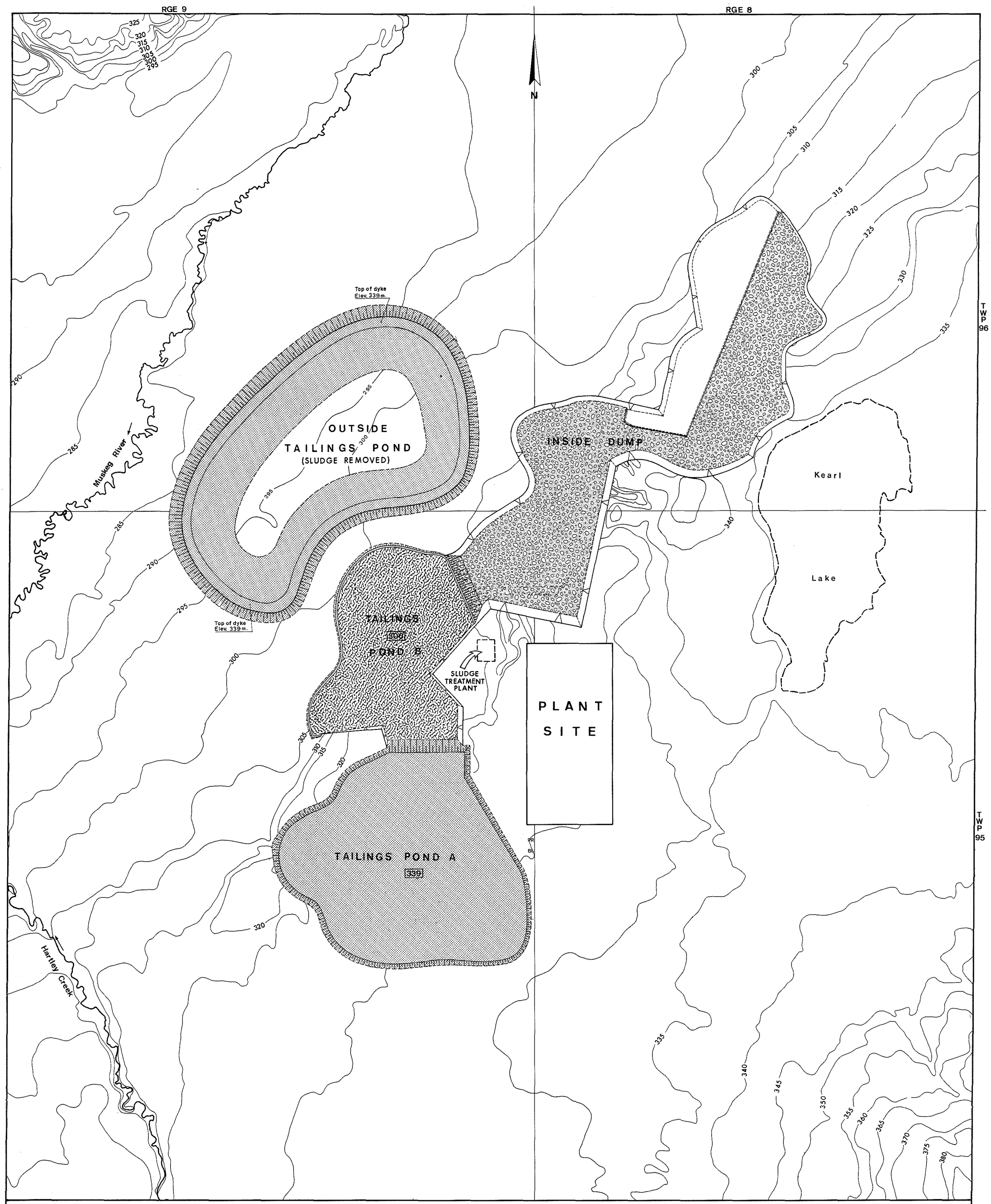
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 19
Improved Level of Reclamation
3 BWE Mining Scheme
Ore Body No 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | Basaran | D22918-40-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |
| | | | 93/70/14/50 |




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Material Distribution Plan
Improved Level of Reclamation
3 BWE Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | D22916-41-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |
| | | | 93/70/14/50 |

RGE 9 | RGE 8

N

TWP 96

TWP 95

Muskeg River

Hartley Creek

Kearl Lake

OUTSIDE TAILINGS POND

TOP RECLAIMED YEAR 12-14

BEACH RECLAIMED YEAR 21-26

DYKES RECLAIMED YEAR 4-11

BOTTOM RECLAIMED YEAR 27 & 28

REMAINING LAKE

TAILINGS POND B

SLUDGE TREATMENT PLANT

PLANT SITE

RECLAIMED YEAR 30

TAILINGS POND A

TOP RECLAIMED YEAR 16-26

DYKES RECLAIMED YEAR 15

MUSKEG DUMP

PREPARED SOIL BLENDING PILE

OVERBURDEN DUMP

## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Reclamation Plan
Improved Level of Reclamation
3 BWE Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | Basaras | D22980-42-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/50 |

# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 2

(120,000 BPCD)

BWE – Enhanced

RGE 9 RGE 8

N

MUSKEG MINE

PIT LIMIT

AREA of OUTSIDE DUMP

Muskeg River

DIRECTION OF DUMPING

1st bench

LOCATION OF PREPARED SOIL BLENDING YARD

Kearl Lake

PLANT SITE

1st bench

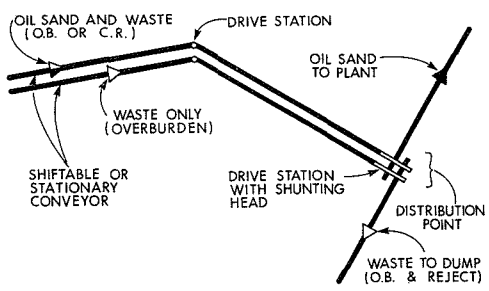
DIRECTION OF MINING

Hartley Creek

TWP 96

TWP 95

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS 500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mine Opening – Year 1
Enhanced Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22918-43-00 |
|---|---|---|---|
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5013 |

RGE 9

RGE 8

TWP 96

TWP 95

N

MUSKEG MINE

PIT LIMIT

OUTSIDE DUMP

Muskeg River

Hartley Creek

Kearl Lake

LOCATION OF PREPARED SOIL BLENDING YARD

PLANT SITE

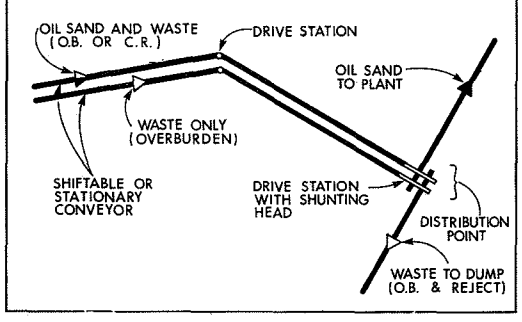
1st bench

2nd bench

3rd bench

325 320 315 310 305 300 295 290 285 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS 500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: Mining and Tailings Disposal - Year 7<br>Enhanced Level of Reclamation<br>3 B.W.E. Mining Scheme<br>Ore Body No. 2 (120 000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. D22918-44-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5014 |

RGE 9

RGE 8

N

MUSKEG MINE

PIT LIMIT

OUTSIDE DUMP

Muskeg River

Kearl

Lake

LOCATION OF PREPARED SOIL BLENDING YARD

1st bench

2nd bench

3rd bench

PLANT SITE

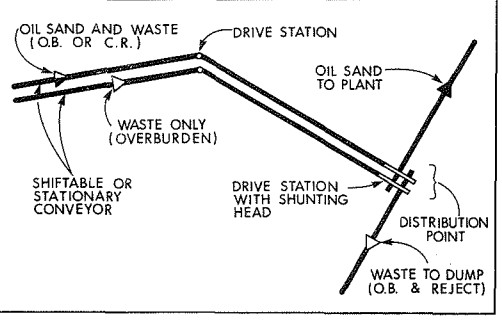
INSIDE DUMP

Hartley Creek

TWP 96

TWP 95

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 12
Enhanced Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | D22918-45-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5015 |

RGE 9 RGE 8

N

MUSKEG MINE

PIT LIMIT

TWP 96

Muskeg River

OUTSIDE DUMP

Kearl Lake

1st bench

2nd bench

3rd bench

LOCATION OF PREPARED SOIL BLENDING YARD

PLANT SITE

1st bench

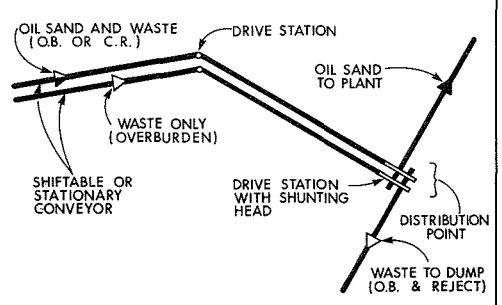
2nd bench

INSIDE DUMP

Hartley Creek

TWP 95

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 15
Enhanced Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | D22918-46-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5016 |

RGE 9 RGE 8

TWP 96

TWP 95

MUSKEG MINE

N

PIT LIMIT

1st bench

2nd bench

3rd bench

Kearl Lake

Muskeg River

OUTSIDE DUMP

INSIDE DUMP

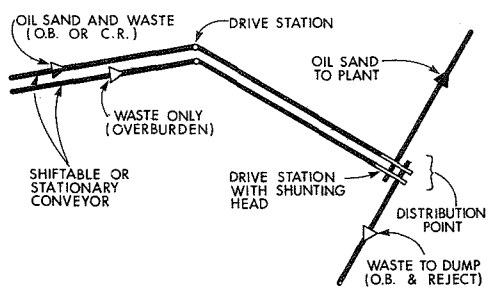
INSIDE DUMP

LOCATION OF PREPARED SOIL BLENDING YARD

PLANT SITE

Hartley Creek

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY-TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

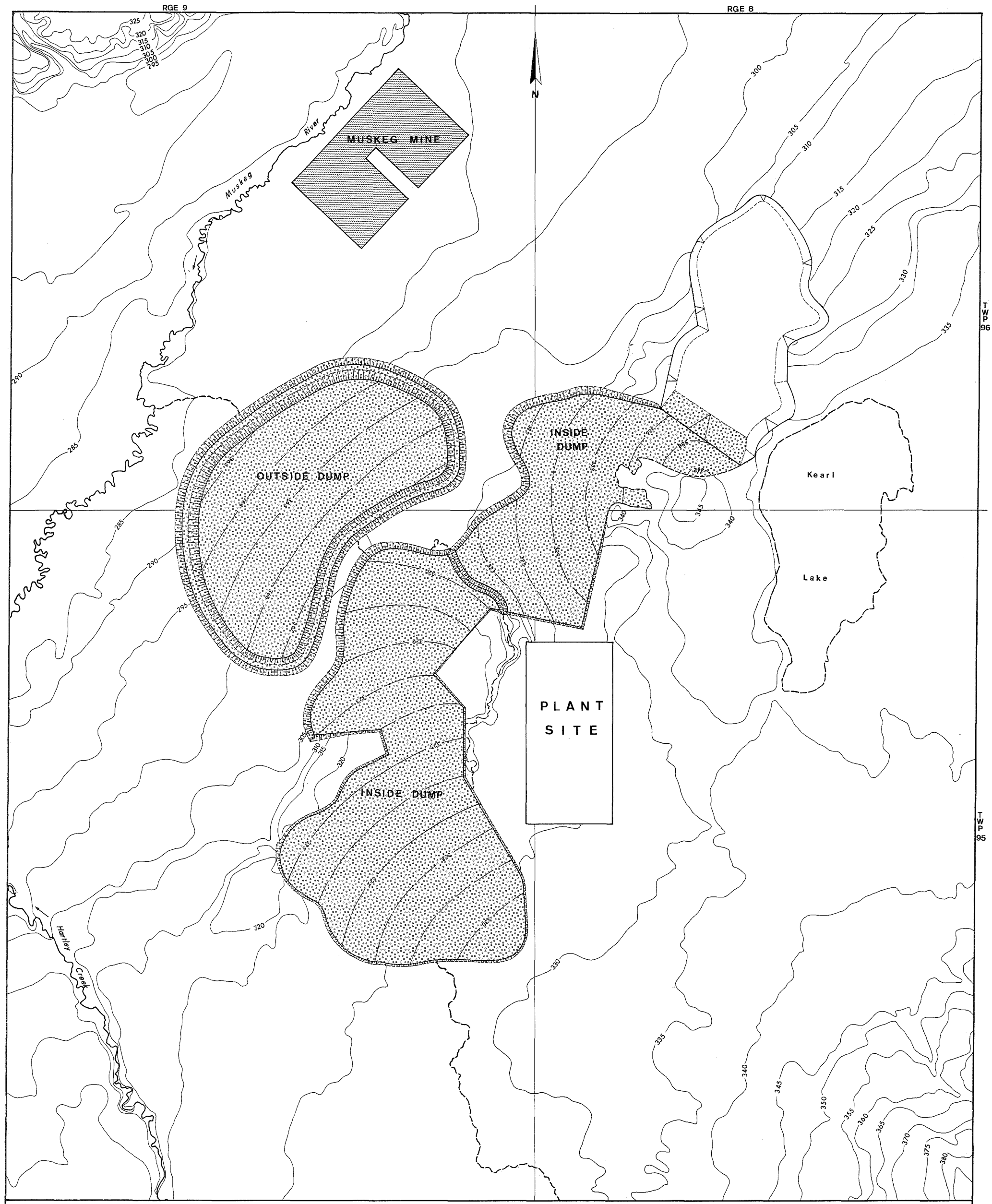
METERS 500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 21
Enhanced Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | D22918-47-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/5017 |




**LEGEND**

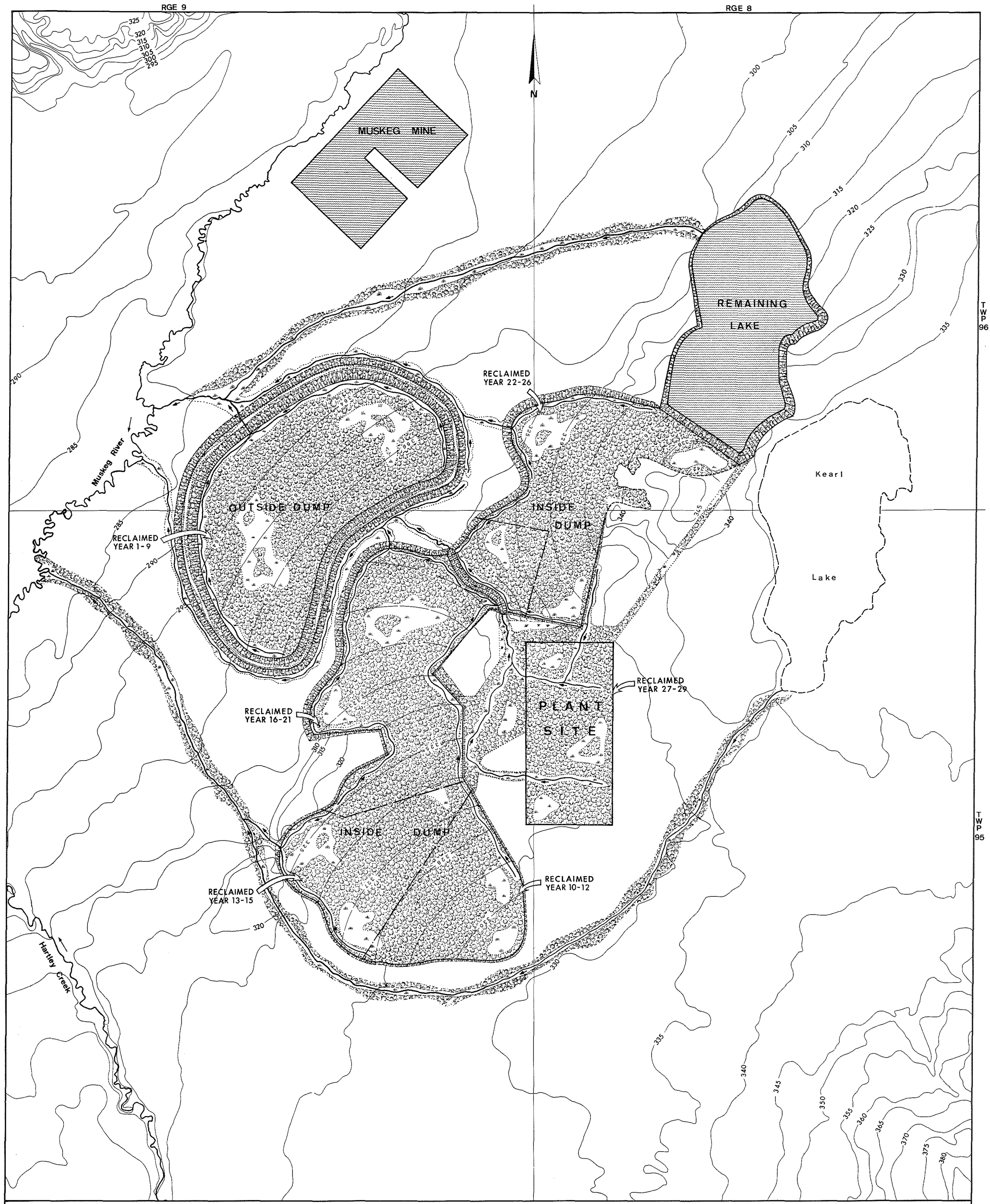
- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Material Distribution Plan
Enhanced Level of Reclamation
3 BWE Mining Scheme
Ore Body No. 2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | Biemann | D22916-48-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. 93/70/14/50 |




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

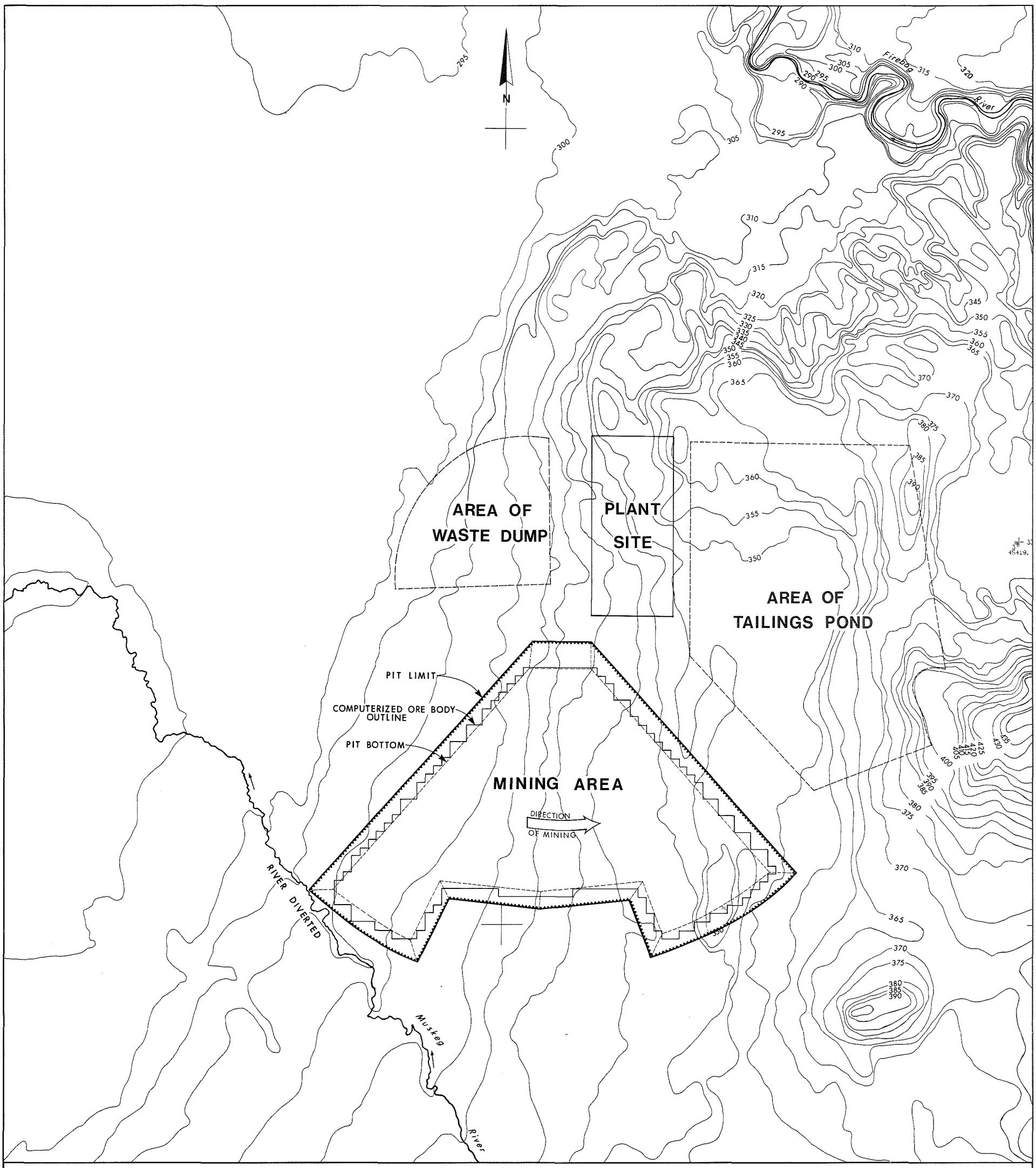
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Reclamation Plan
Enhanced Level of Reclamation
3 B.W.E. Mining Scheme
Ore Body No.2 (120 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | D22980-49-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |
| | | | 93/70/14/5018 |




CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: GENERAL MINE LAYOUT
MINIMUM LEVEL OF RECLAMATION
1 B.W.E & 2 DRAGLINES MINING SCHEME
ORE BODY No. 4 (60,000 B PCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | APRIL, 1979 | D. C. | D22910-50-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |
| J. H. | TM. RC. | | |

N

Firebag River

MUSKEG DUMP

WASTE DUMP
TOP ELEV 360m

SPREADER OVERBURDEN AND CENTRE REJECT DUMP

PLANT SITE

TOP OF DYKE ELEV. 373m

TAILINGS POND
ELEV. 368m

MUSKEG DUMP

BOTTOM BENCH DRAGLINE - OIL SAND REMOVAL

MIDDLE BENCH DRAGLINE - OIL SAND REMOVAL

TOP BENCH B.W.E. - OVERBURDEN REMOVAL

PIT LIMIT

RIVER DIVERTED

MUSKEG DUMP

Muskeg River

METERS
500 250 0 500 1000

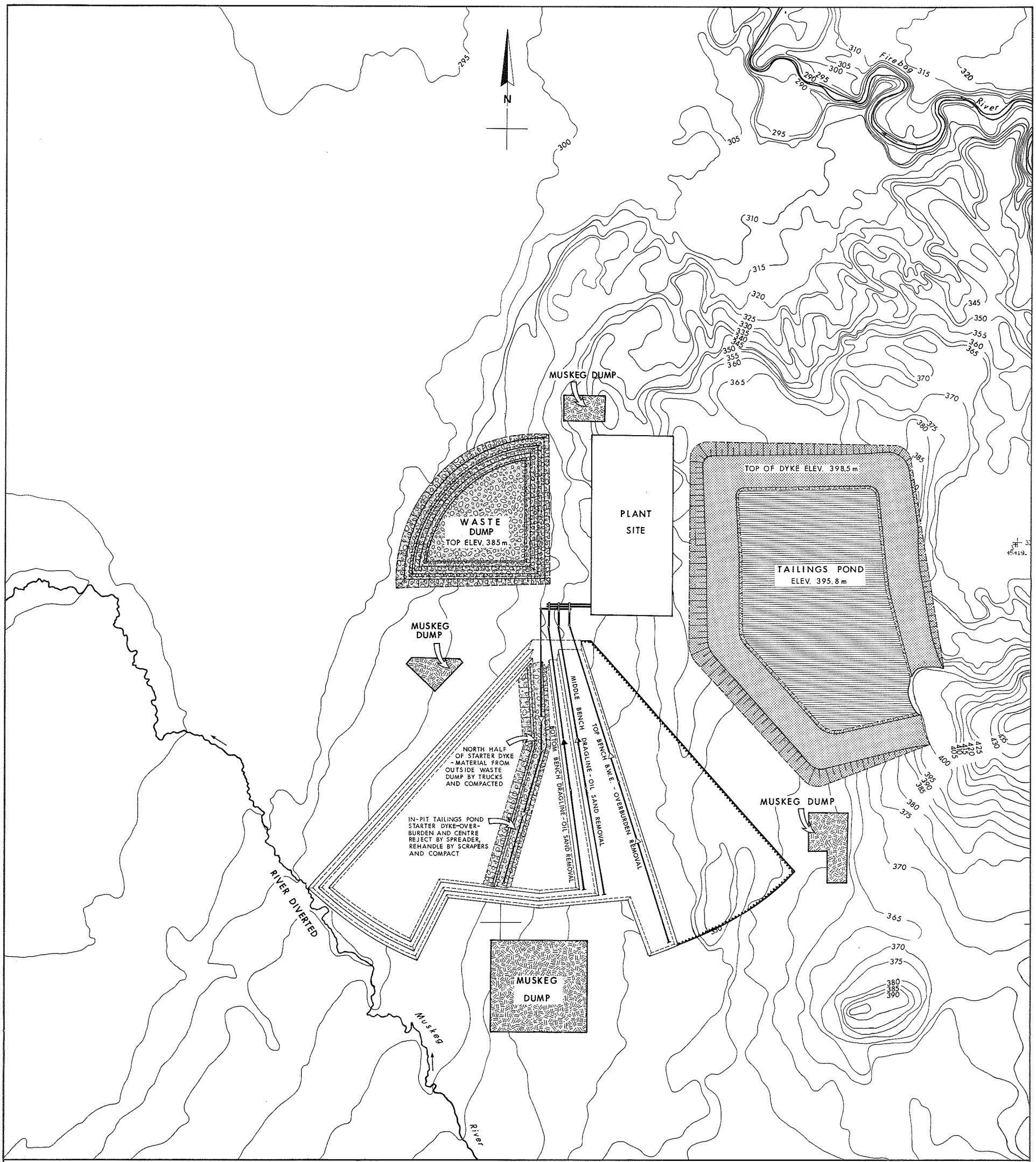
**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)
DRIVE STATION
OIL SAND TO PLANT
WASTE ONLY (OVERBURDEN)
SHIFTABLE OR STATIONARY CONVEYOR
DRIVE STATION WITH SHUNTING HEAD
DISTRIBUTION POINT
WASTE TO DUMP (O.B. & REJECT)

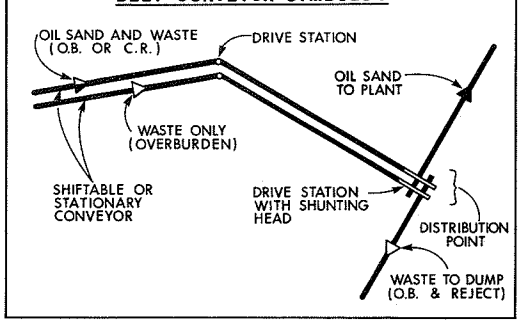
**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 4 MINIMUM LEVEL OF RECLAMATION 1 B.W.E. & 2 DRAGLINES MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D.C. | TM DRAWING No. D22918-51-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 13 MINIMUM LEVEL OF RECLAMATION 1 B.W.E. & 2 DRAGLINES MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL ,1979 | DRAWN BY: TM ☒ RC ☐ D. C. | TM DRAWING No. D22918-52-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

N

Firebag River

Muskeg River

MUSKEG DUMP

WASTE DUMP
TOP ELEV. 385 m

PLANT SITE

BEACH
ELEV. 398.5 m

TAILINGS POND

POND
ELEV. 396.5 m

MUSKEG DUMP

OVERBURDEN DYKE
TOP ELEV. 323 m

SLUDGE POND
ELEV. 310 m

BEACHED TAILINGS SAND
ELEV. 323 m

COMPACTED TAILINGS SAND DYKE

OVERBURDEN AND REJECT BACKFILL
(SPREADER)
AVE. TOP ELEV. 323 m

TOP BENCH B.W.E. - OVERBURDEN REMOVAL

MIDDLE BENCH DRAGLINE - OIL SAND REMOVAL

BOTTOM BENCH DRAGLINE - OIL SAND REMOVAL

MUSKEG DUMP

PIT LIMIT

RIVER DIVERTED

MUSKEG DUMP

**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)
DRIVE STATION
OIL SAND TO PLANT
WASTE ONLY (OVERBURDEN)
SHIFTABLE OR STATIONARY CONVEYOR
DRIVE STATION WITH SHUNTING HEAD
DISTRIBUTION POINT
WASTE TO DUMP (O.B. & REJECT)

**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MINING AND TAILINGS DISPOSAL - YEAR 22
MINIMUM LEVEL OF RECLAMATION
1 B.W.E. & 2 DRAGLINES MINING SCHEME
ORE BODY No. 4 (60,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | APRIL , 1979 | D. C. | D22918-53-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

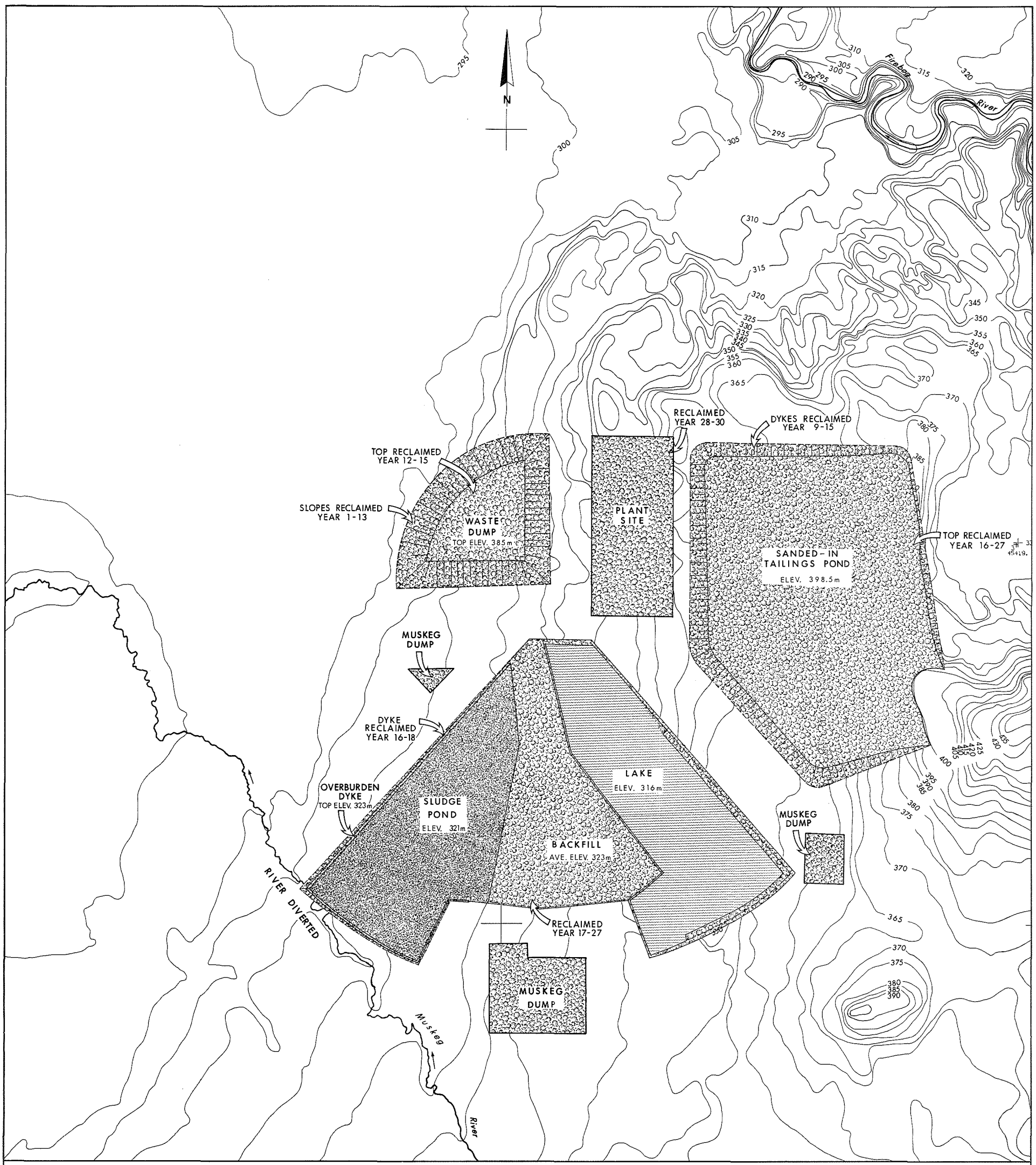
**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | |
|---|---|
| CLIENT: | ALBERTA DEPARTMENT OF THE ENVIRONMENT |
| PREPARED BY: | TECHMAN LTD. and RHEINBRAUN - Consulting GmbH |
| TITLE: | MATERIAL DISTRIBUTION PLAN (YEAR 25) MINIMUM LEVEL OF RECLAMATION 1 B.W.E. & 2 DRAGLINES MINING SCHEME ORE BODY No. 4 (60,000 BPCD) |

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | APRIL, 1979 | D. C. | D22916-54-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: RECLAMATION PLAN MINIMUM LEVEL OF RECLAMATION 1 B.W.E. & 2 DRAGLINES MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D. C. | TM DRAWING No. D22980-55-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

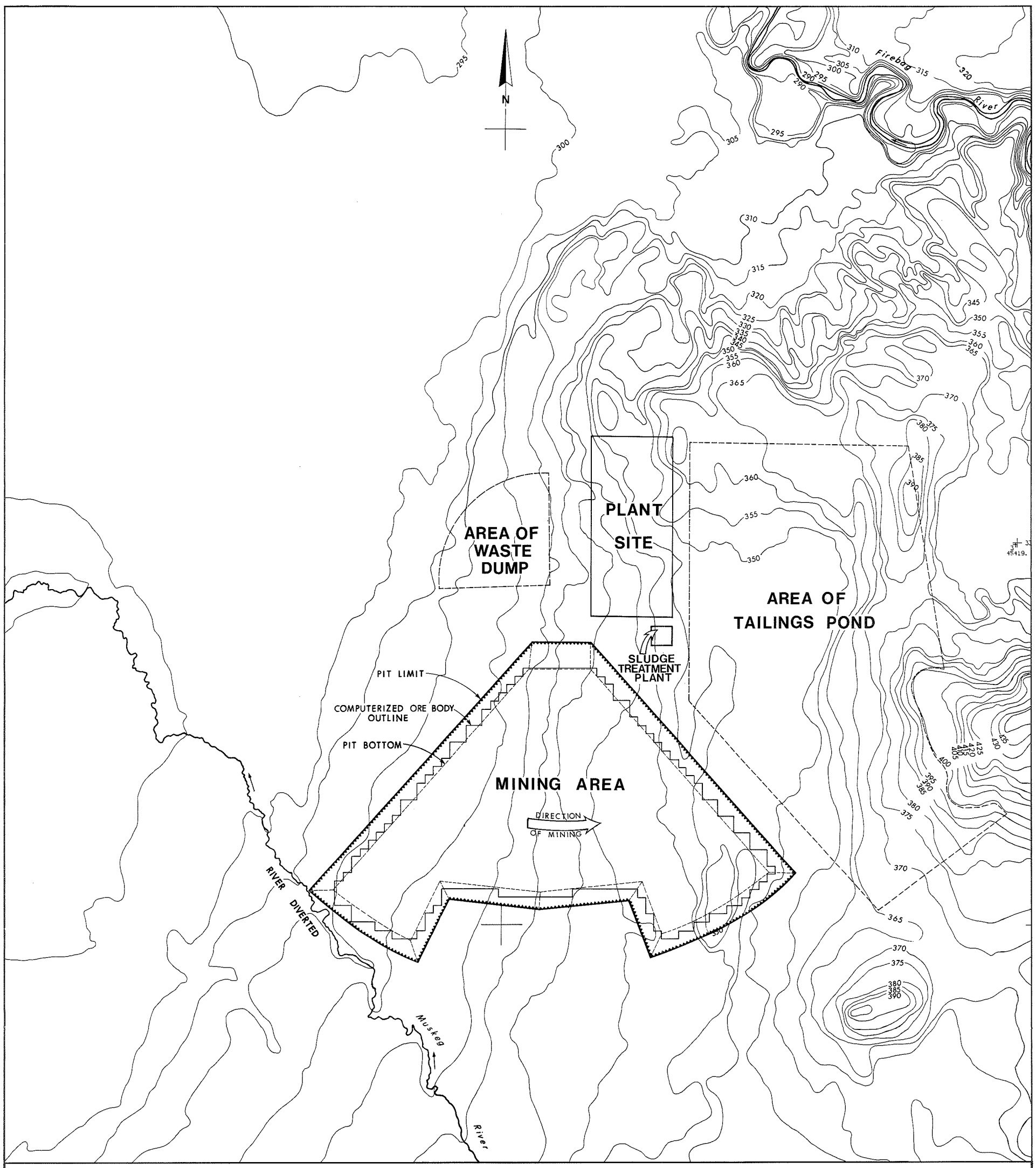
# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 4

(60,000 BPCD)

Dragline – Improved




| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: GENERAL MINE LAYOUT<br>IMPROVED LEVEL OF RECLAMATION<br>1 B.W.E & 2 DRAGLINES MINING SCHEME<br>ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D. C. | TM DRAWING No. D22910-56-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

N

Firebag River

MUSKEG DUMP

PLANT SITE

TOP OF DYKE ELEV. 369.3 m

TAILINGS POND
ELEV. 365.2 m

WASTE DUMP
TOP EL. 385 m

SPREADER-OVERBURDEN AND CENTRE REJECT DUMP

PREPARED SOIL BLENDING PILE

SLUDGE TREATMENT PLANT

MUSKEG DUMP

BOTTOM BENCH DRAGLINE - OIL SAND REMOVAL

MIDDLE BENCH DRAGLINE - OIL SAND REMOVAL

TOP BENCH B.W.E. - OVERBURDEN REMOVAL

RIVER DIVERTED

MUSKEG DUMP

PIT LIMIT

Muskeg River

**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)
DRIVE STATION
OIL SAND TO PLANT
WASTE ONLY (OVERBURDEN)
SHIFTABLE OR STATIONARY CONVEYOR
DRIVE STATION WITH SHUNTING HEAD
DISTRIBUTION POINT
WASTE TO DUMP (O.B. & REJECT)

**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MINING AND TAILINGS DISPOSAL - YEAR 4
IMPROVED LEVEL OF RECLAMATION
1 B.W.E. & 2 DRAGLINES MINING SCHEME
ORE BODY No. 4 (60,000 B PCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | APRIL, 1979 | D. C. | D22918-57-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

N

Firebag River

MUSKEG DUMP

PLANT SITE

TOP OF DYKE ELEV. 391.2 m

TAILINGS POND
ELEV. 387.5 m

WASTE DUMP
TOP EL. 385 m

SLUDGE TREATMENT PLANT

PREPARED SOIL BLENDING PILE

OVERBURDEN AND REJECT BACKFILL (SPREADER)
TOP ELEV. 308m

MIDDLE BENCH DRAGLINE - OIL SAND REMOVAL

TOP BENCH B.W.E - OVERBURDEN REMOVAL

BOTTOM BENCH DRAGLINE - OIL SAND REMOVAL

TREATED-SLUDGE POND
ELEV. 260m

RIVER DIVERTED

PIT LIMIT

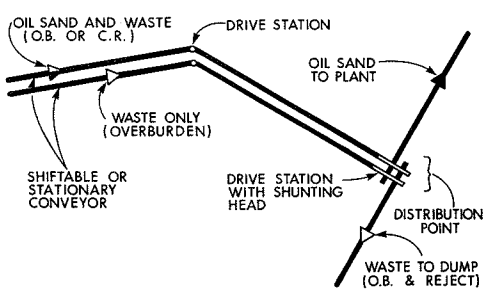
PREPARED SOIL BLENDING PILE

MUSKEG DUMP

MUSKEG DUMP

Muskeg River

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 13 IMPROVED LEVEL OF RECLAMATION 1 B.W.E. & 2 DRAGLINES MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D. C. | TM DRAWING No. D22918-58-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

N

Firebag River

MUSKEG DUMP

PLANT SITE

BEACH
ELEV. 398.5m

TAILINGS POND

POND
ELEV. 396.5m

WASTE DUMP
TOP EL. 385 m

SLUDGE TREATMENT PLANT

OVERBURDEN AND REJECT BACKFILL
(SPREADER)
AVE. TOP ELEV. 308 m.

TOP BENCH B.W.E. OVERBURDEN REMOVAL

MIDDLE BENCH DRAGLINE OIL SAND REMOVAL

BOTTOM BENCH DRAGLINE- OIL SAND REMOVAL

TREATED SLUDGE POND
ELEV. 306 m.

RIVER DIVERTED

PIT LIMIT

PREPARED SOIL BLENDING PILE

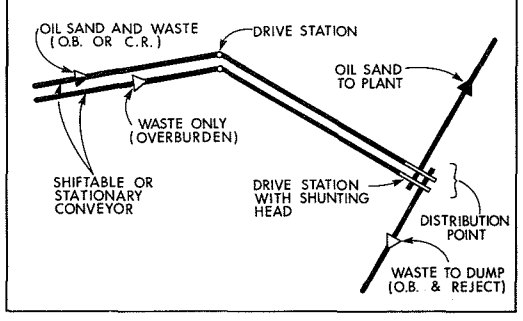
PREPARED SOIL BLENDING PILE

MUSKEG DUMP

MUSKEG DUMP

Muskeg River

**BELT CONVEYOR SYMBOLS :**

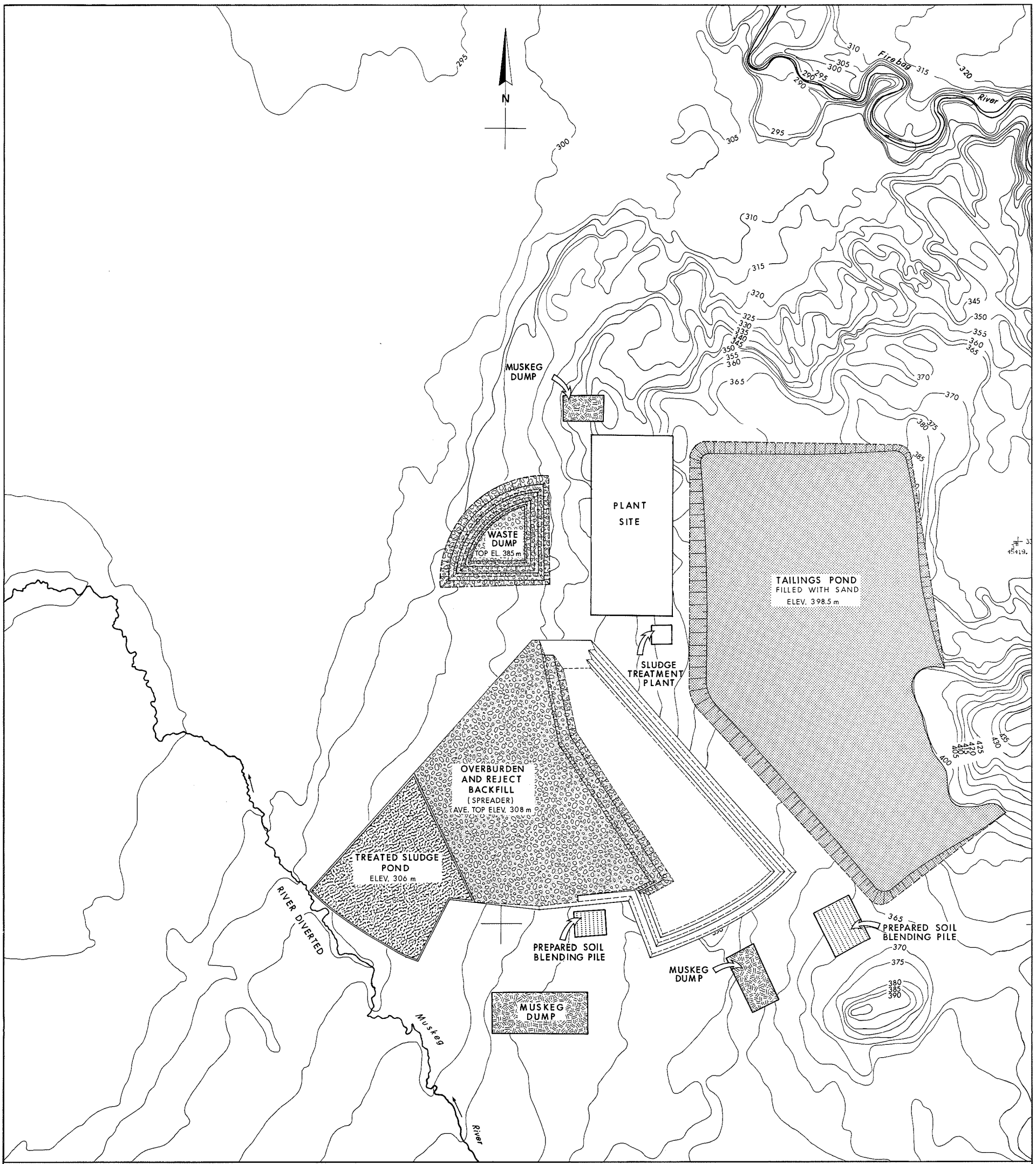



**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 22 IMPROVED LEVEL OF RECLAMATION 1 B.W.E. & 2 DRAGLINES MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D. C. | TM DRAWING No. D22918-59-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

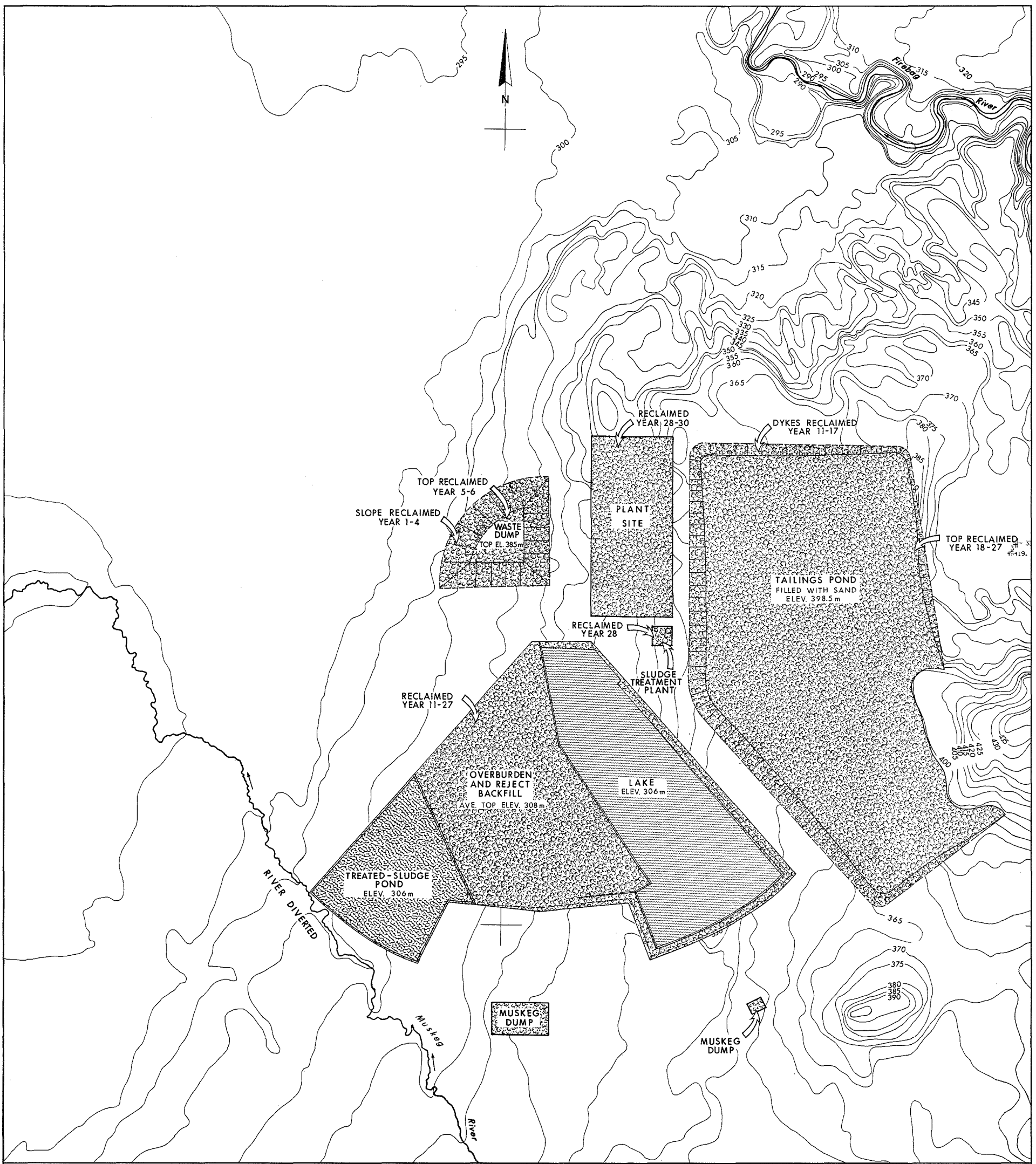
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MATERIAL DISTRIBUTION PLAN (YEAR 25)
IMPROVED LEVEL OF RECLAMATION
1 B.W.E. & 2 DRAGLINES MINING SCHEME
ORE BODY No. 4 (60,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | APRIL, 1979 | D.C. | D22916-60-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




## LEGEND

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: RECLAMATION PLAN IMPROVED LEVEL OF RECLAMATION 1 B.W.E. & 2 DRAGLINES MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D. C. | TM DRAWING No. D22980-61-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

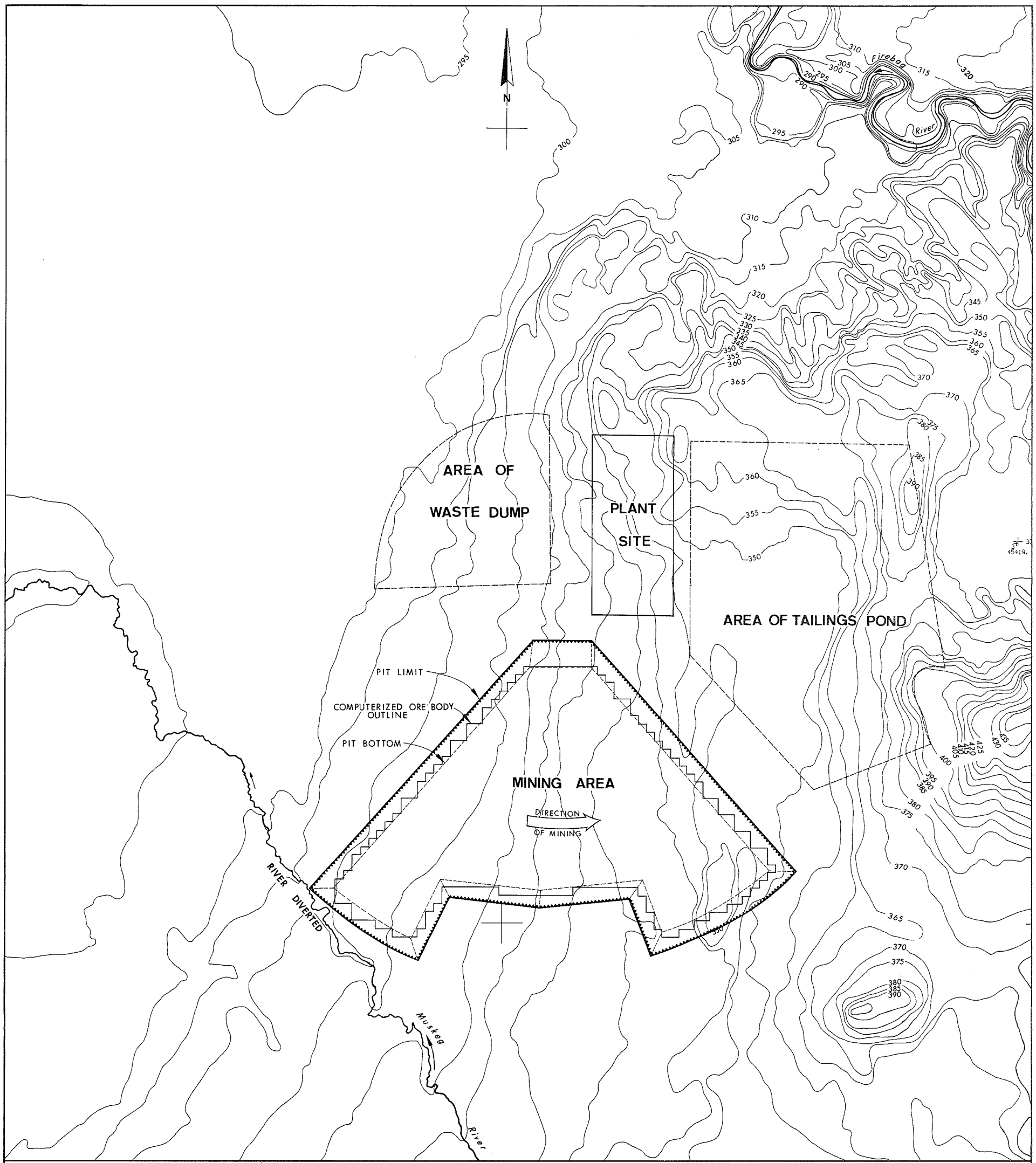
# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

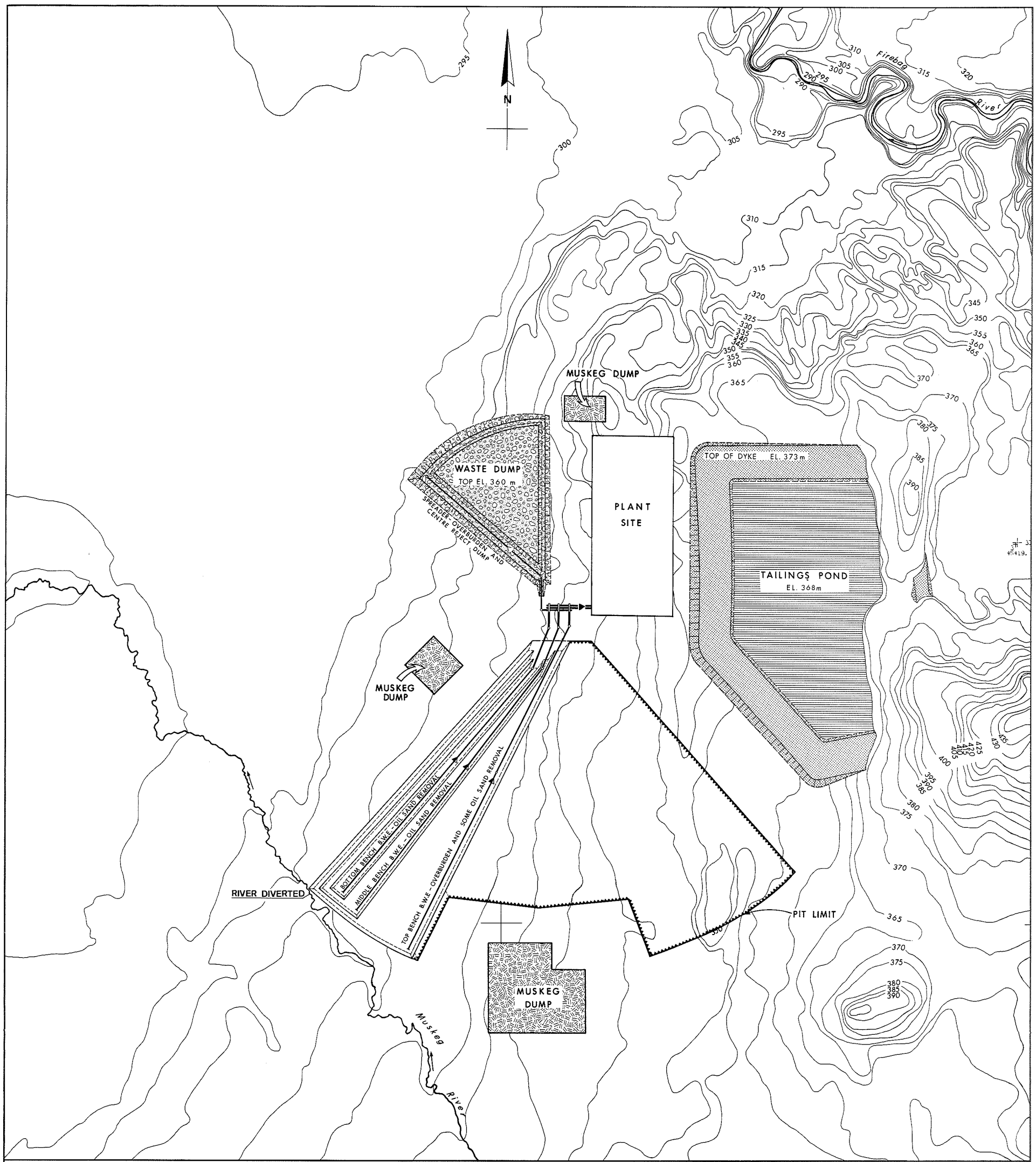
Ore Body No. 4

(60,000 BPCD)

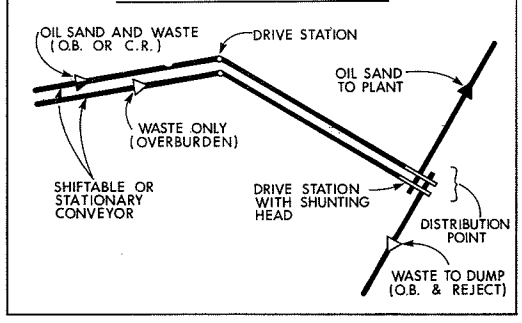
BWE – Minimum




| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: GENERAL MINE LAYOUT<br>MINIMUM LEVEL OF RECLAMATION<br>3 B.W.E. MINING SCHEME<br>ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1978 | DRAWN BY: TM ☐ RC ☒ Ziemann | TM DRAWING No. D22910-62-00 |
| APPR PROJ. ENGR. J.H. | APPR PROJ MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




**BELT CONVEYOR SYMBOLS :**

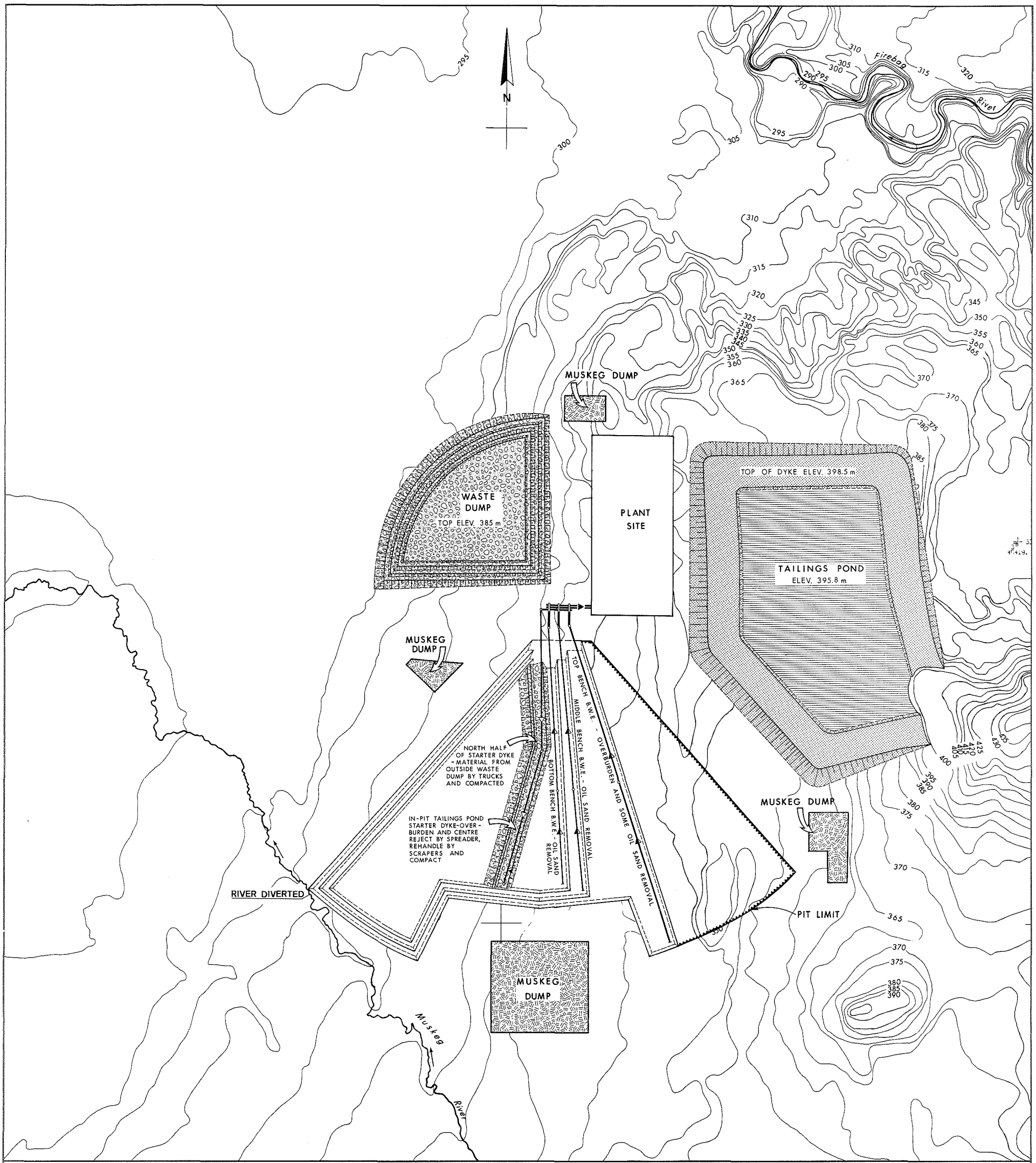



**LEGEND**

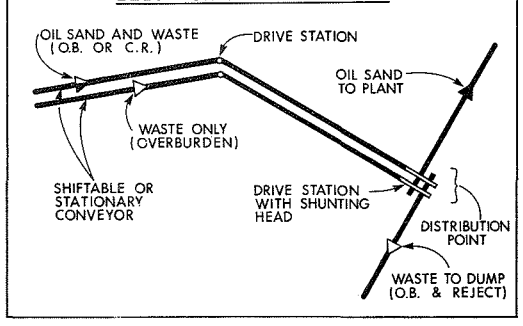
- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 4 MINIMUM LEVEL OF RECLAMATION 3 B.W.E. MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☐ RC ☒ Siemann | TM DRAWING No. D22918-63-00 |
| APPR. PROJ. ENGR. J.H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




**BELT CONVEYOR SYMBOLS :**

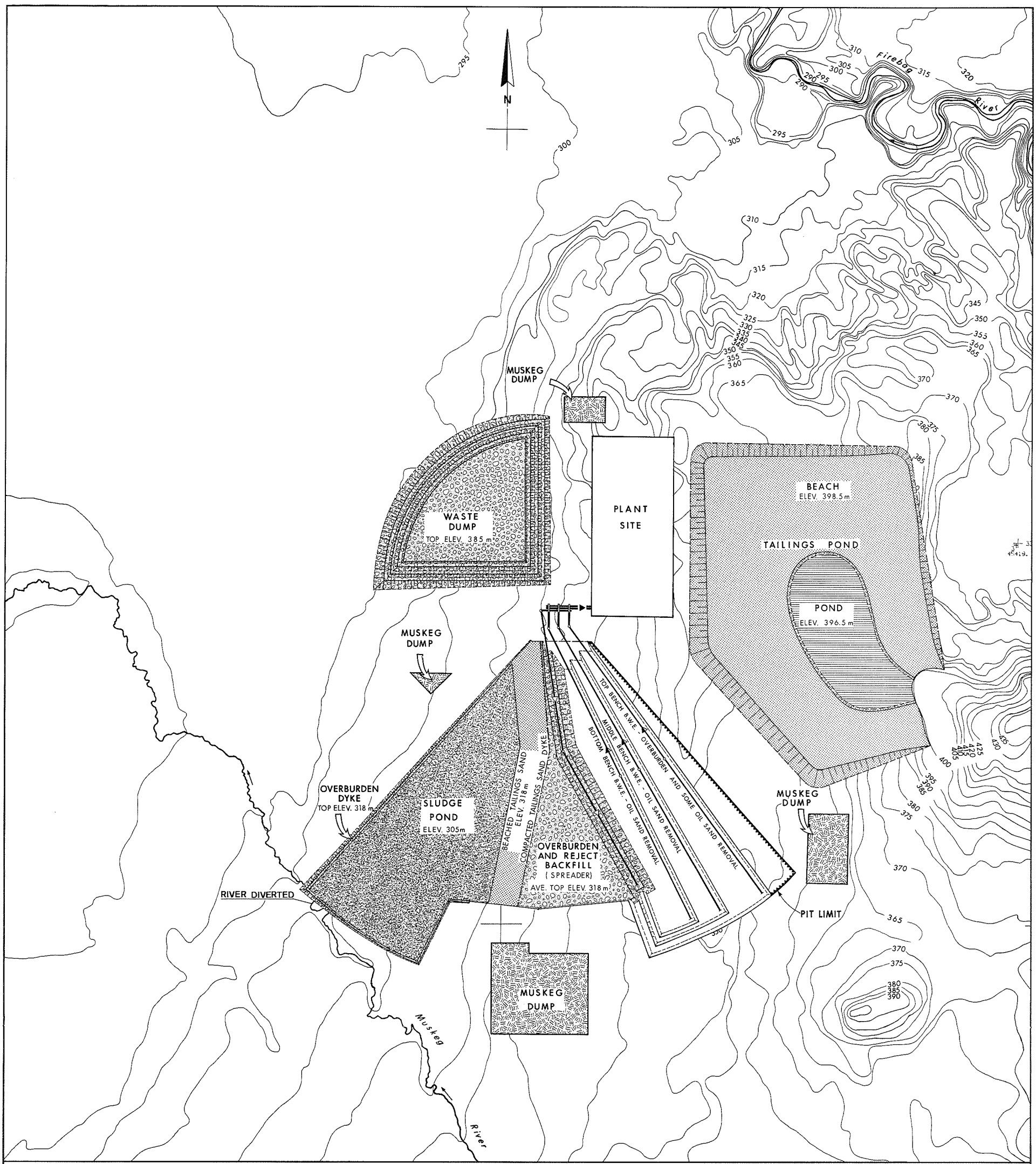



**LEGEND**

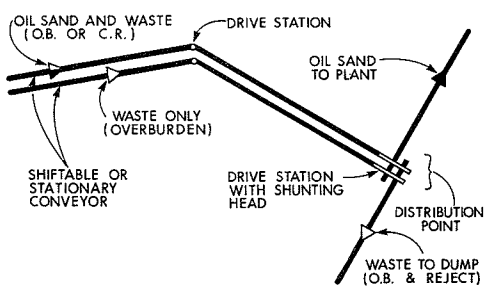
- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 13 MINIMUM LEVEL OF RECLAMATION 3 B.W.E. MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☐ RC ☒ Biemann | T.M. DRAWING No. D22918-64-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




**BELT CONVEYOR SYMBOLS :**

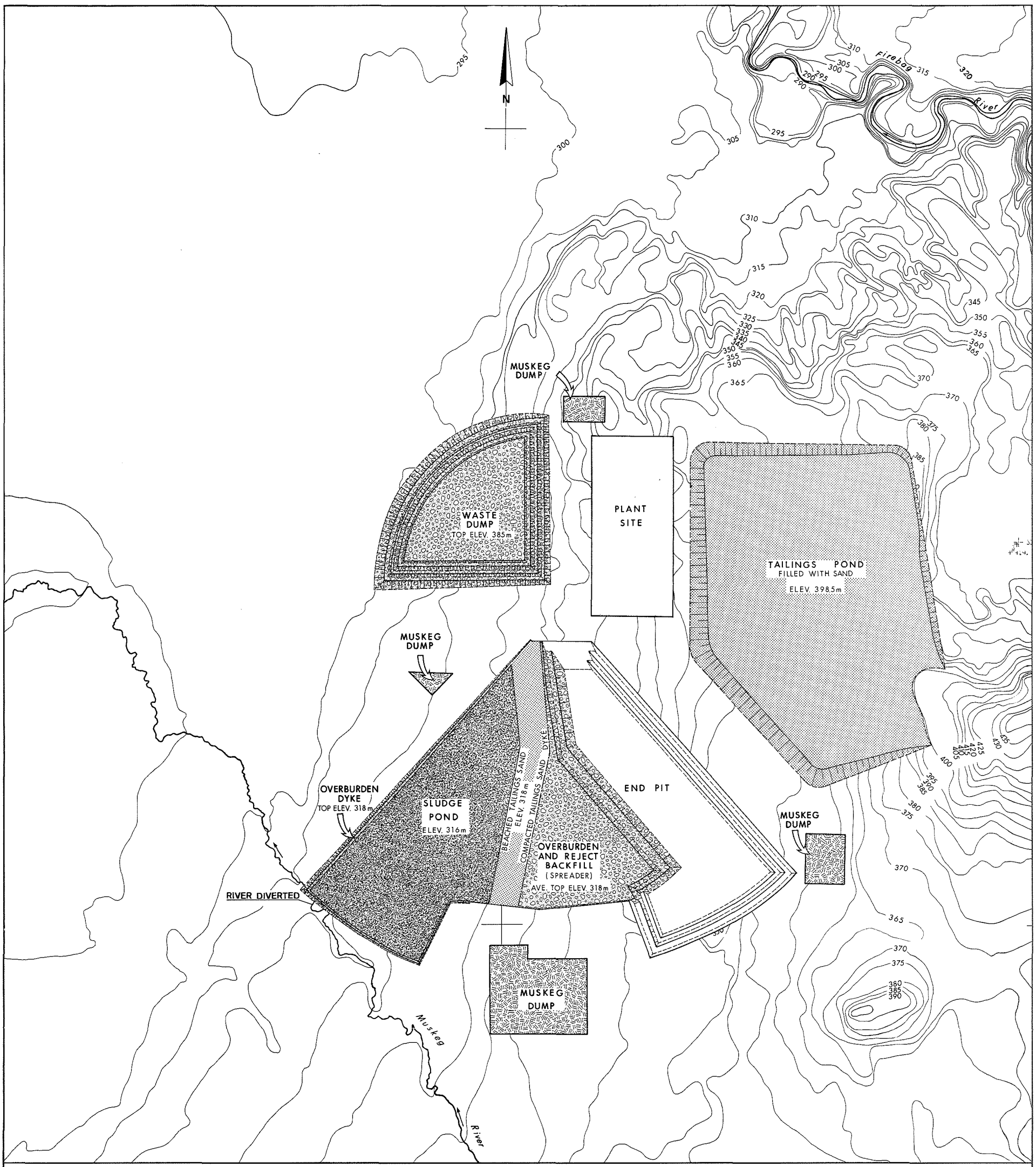



**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

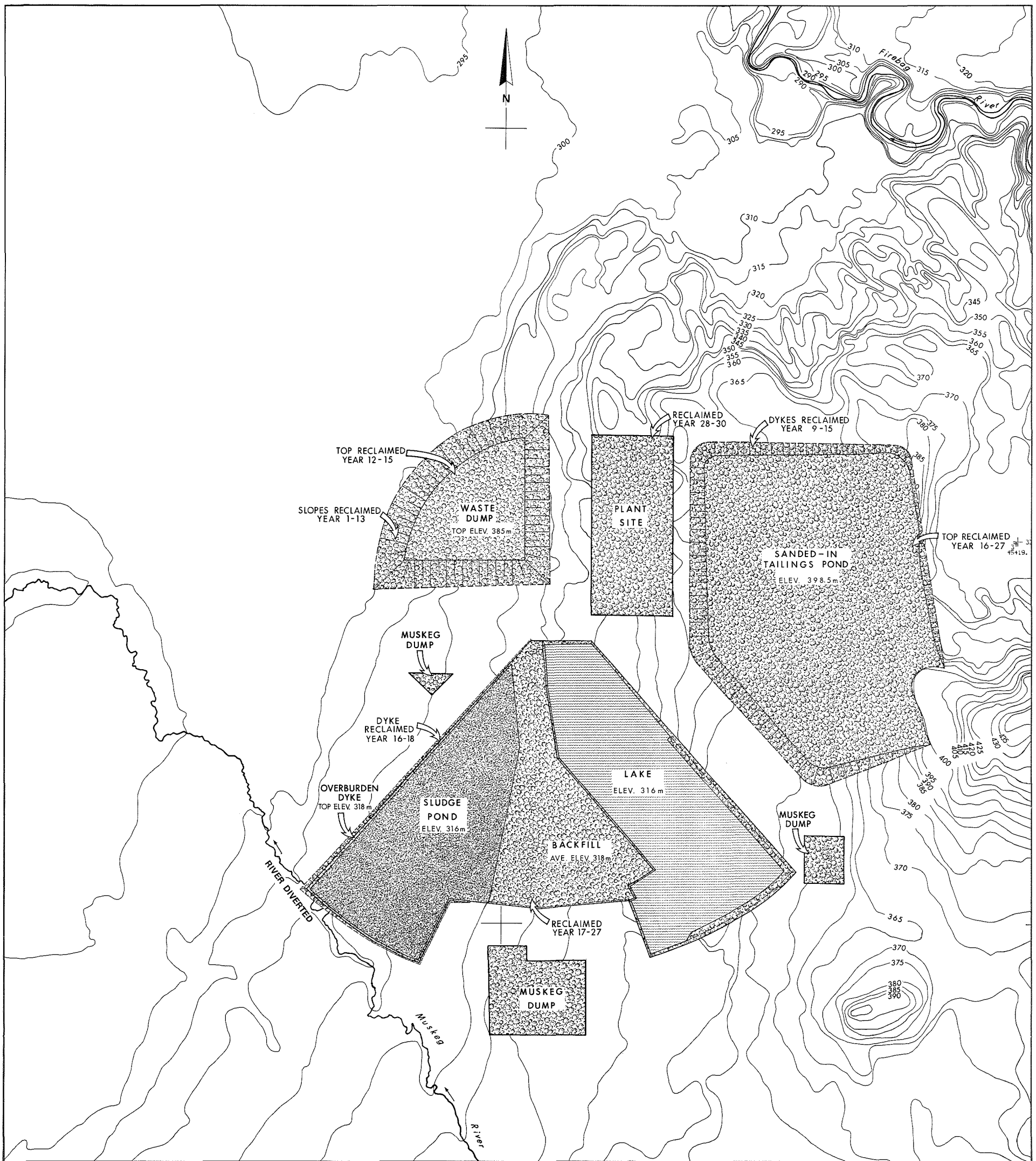
| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 22 MINIMUM LEVEL OF RECLAMATION 3 B.W.E. MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM RC Ziermann | TM DRAWING No. D22918-65-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM RC | RC DRAWING No. |




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MATERIAL DISTRIBUTION PLAN (YEAR 25) MINIMUM LEVEL OF RECLAMATION 3 B.W.E. MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM RC D.C. | TM DRAWING No. D22916-66-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM RC | RC DRAWING No. |




CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: RECLAMATION PLAN
MINIMUM LEVEL OF RECLAMATION
3 B.W.E. MINING SCHEME
ORE BODY No. 4 (60,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM RC | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | APRIL, 1979 | D.C. | D22980-67-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM RC | RC DRAWING No. |

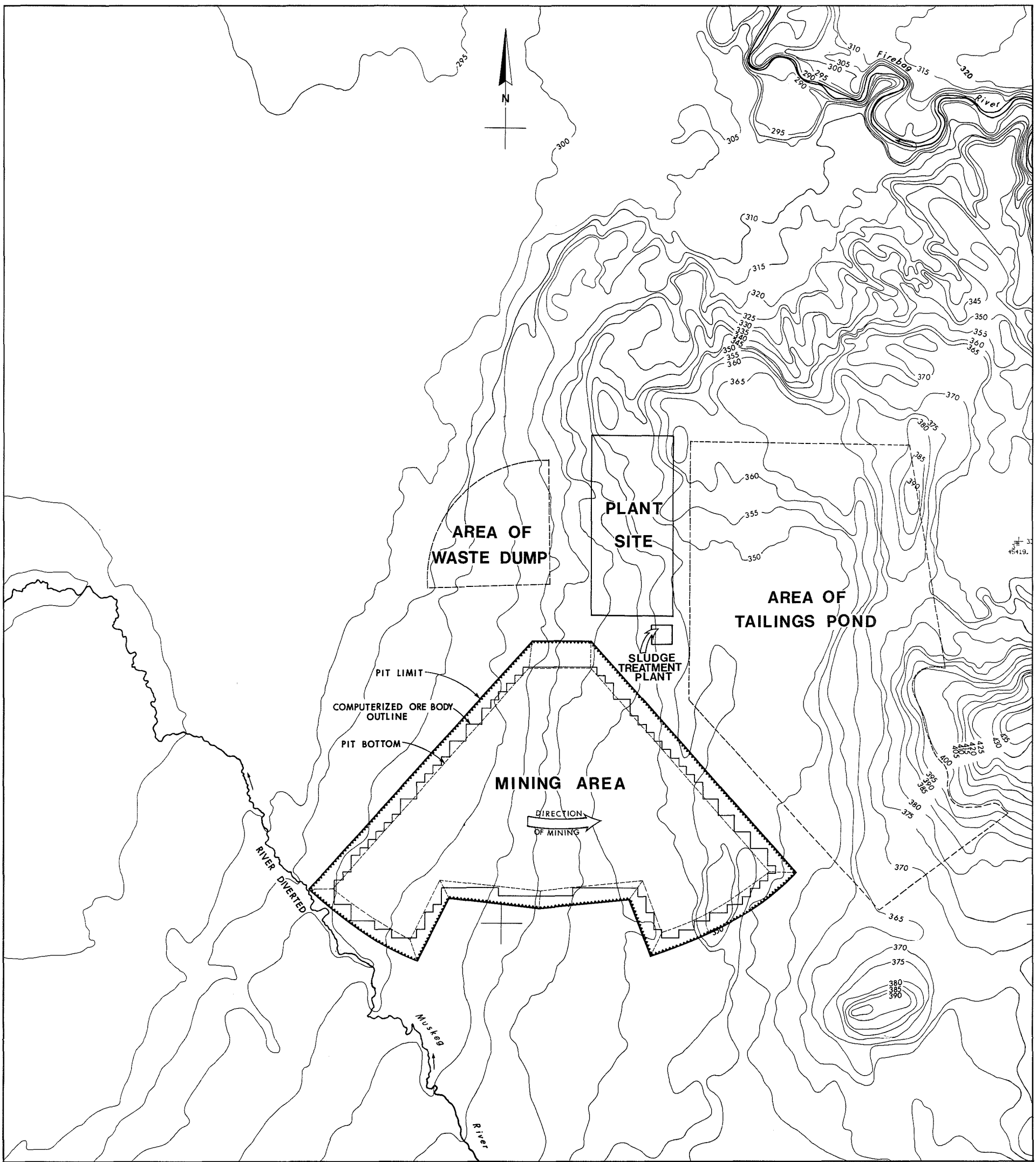
# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 4

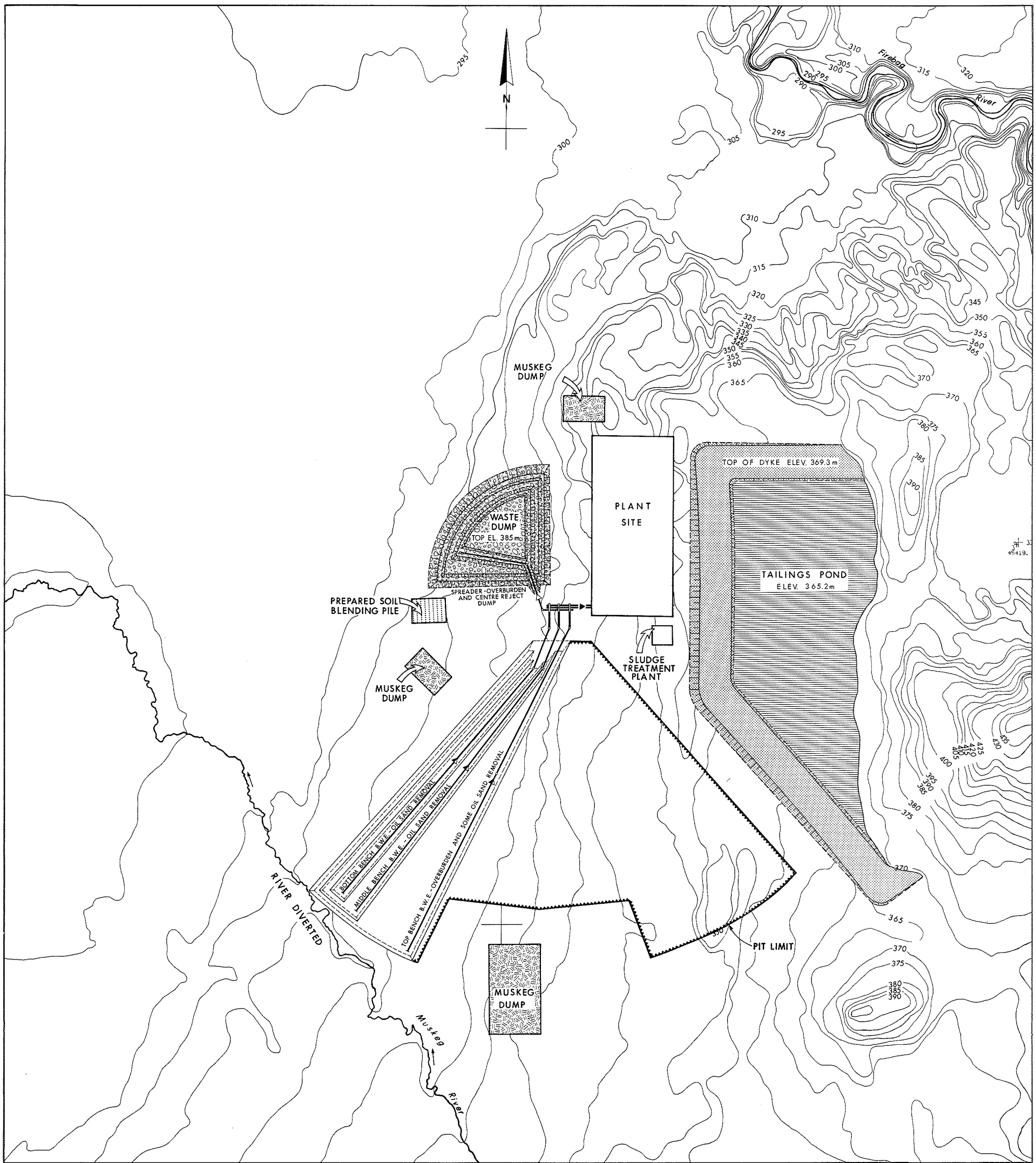
(60,000 BPCD)

BWE – Improved

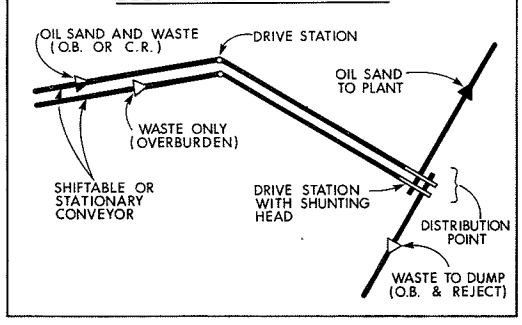



METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: GENERAL MINE LAYOUT<br>IMPROVED LEVEL OF RECLAMATION<br>3 B.W.E. MINING SCHEME<br>ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D. C. | TM DRAWING No. D22910-68-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 4 IMPROVED LEVEL OF RECLAMATION 3 B.W.E. MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☐ RC ☐ D.C. | TM DRAWING No. D22918-69-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

N

Firebag River

MUSKEG DUMP

PLANT SITE

TOP OF DYKE ELEV. 391.2 m

TAILINGS POND
ELEV. 387.5 m

WASTE DUMP
TOP ELEV. 385 m

SLUDGE TREATMENT PLANT

PREPARED SOIL BLENDING PILE

OVERBURDEN AND REJECT BACKFILL (SPREADER)
TOP ELEV. 308 m

BOTTOM BENCH B.W.E. - OIL SAND REMOVAL

MIDDLE BENCH B.W.E. - OIL SAND REMOVAL

TOP BENCH B.W.E. - OVERBURDEN AND SOME OIL SAND REMOVAL

TREATED - SLUDGE POND
ELEV. 260 m

RIVER DIVERTED

PIT LIMIT

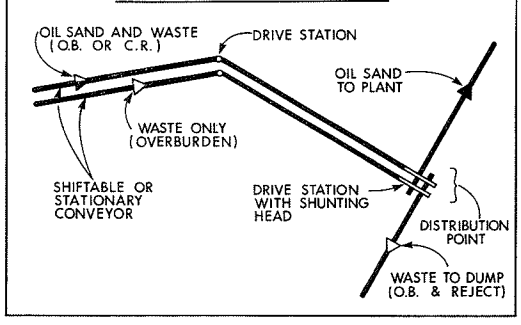
PREPARED SOIL BLENDING PILE

MUSKEG DUMP

MUSKEG DUMP

Muskeg River

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: MINING AND TAILINGS DISPOSAL - YEAR 13 IMPROVED LEVEL OF RECLAMATION 3 B.W.E. MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D. C. | TM DRAWING No. D22918-70-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

N

Firebag River

MUSKEG DUMP

PLANT SITE

WASTE DUMP
TOP ELEV. 385 m

BEACH
ELEV. 398.5m

TAILINGS POND

POND
ELEV. 396.5 m

SLUDGE TREATMENT PLANT

TOP BENCH B.W.E. - OVERBURDEN AND SOME OIL SAND REMOVAL

MIDDLE BENCH B.W.E. - OIL SAND REMOVAL

BOTTOM BENCH B.W.E. - OIL SAND REMOVAL

PIT LIMIT

OVERBURDEN AND REJECT BACKFILL (SPREADER)
AVE. TOP ELEV. 308 m

TREATED SLUDGE POND
ELEV. 298m

RIVER DIVERTED

PREPARED SOIL BLENDING PILE

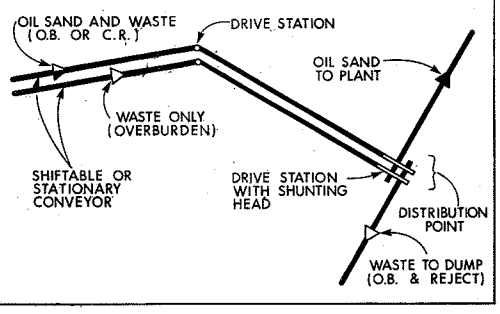
PREPARED SOIL BLENDING PILE

MUSKEG DUMP

MUSKEG DUMP

Muskeg River

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

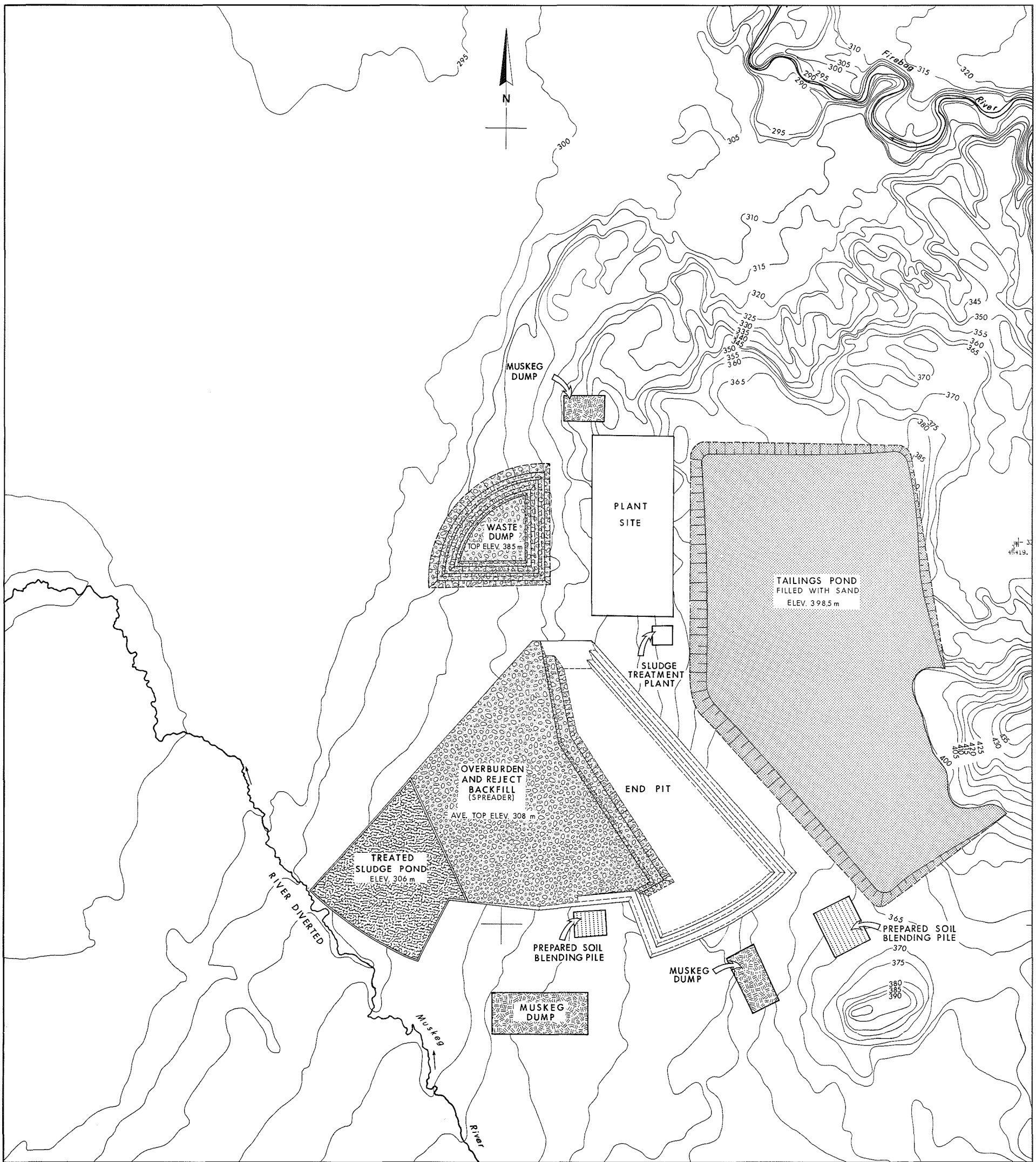
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MINING AND TAILINGS DISPOSAL - YEAR 22
IMPROVED LEVEL OF RECLAMATION
3-B.W.E. MINING SCHEME
ORE BODY No. 4 (60,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | APRIL, 1979 | | D22918-71-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

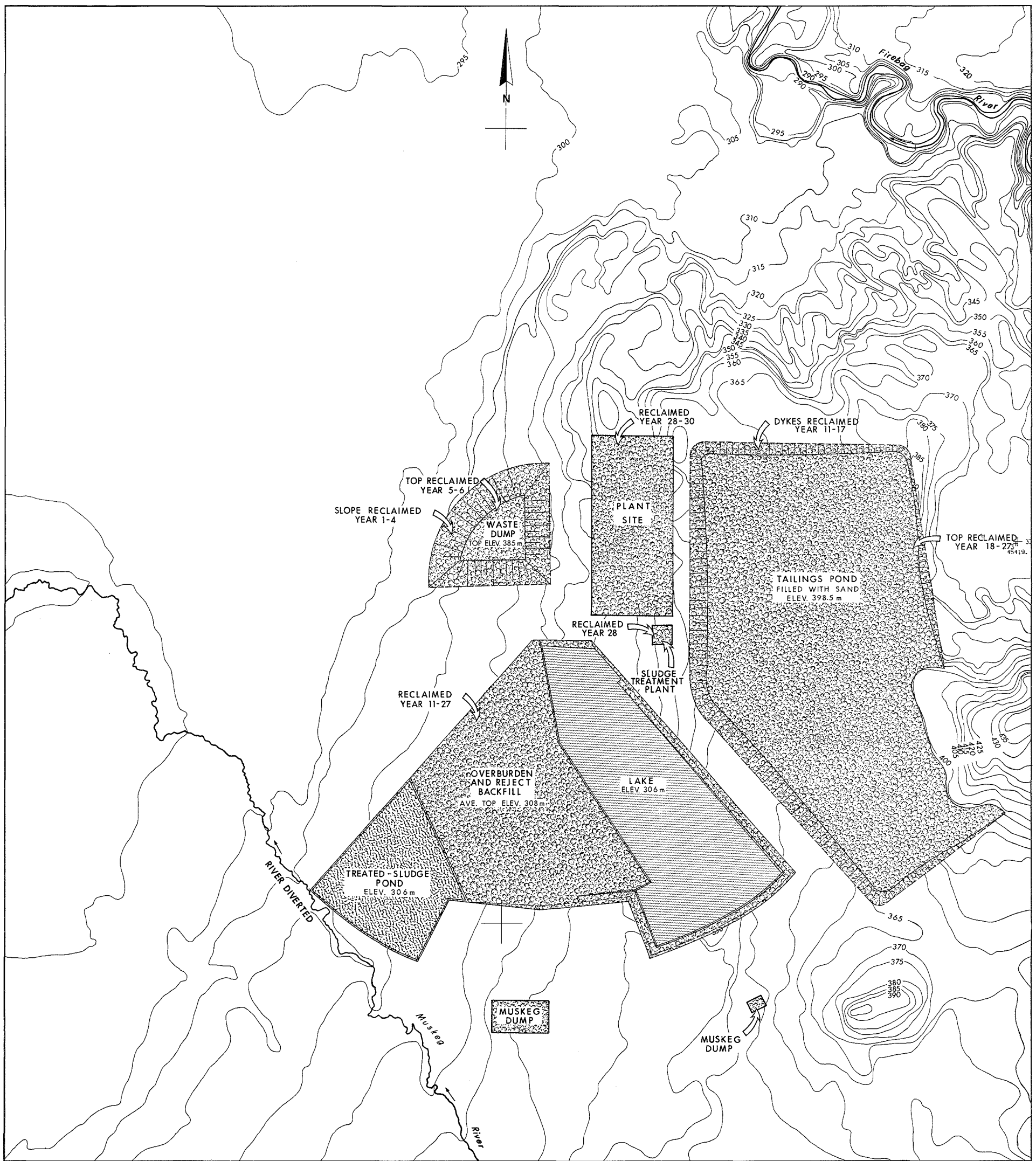
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: MATERIAL DISTRIBUTION PLAN (YEAR 25)
IMPROVED LEVEL OF RECLAMATION
3 B.W.E. MINING SCHEME
ORE BODY No. 4 (60,000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | APRIL, 1979 | D.C. | D22916-72-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: RECLAMATION PLAN IMPROVED LEVEL OF RECLAMATION 3 B.W.E. MINING SCHEME ORE BODY No. 4 (60,000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: APRIL, 1979 | DRAWN BY: TM ☒ RC ☐ D.C. | TM DRAWING No. D22980-73-00 |
| APPR. PROJ. ENGR. J. H. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

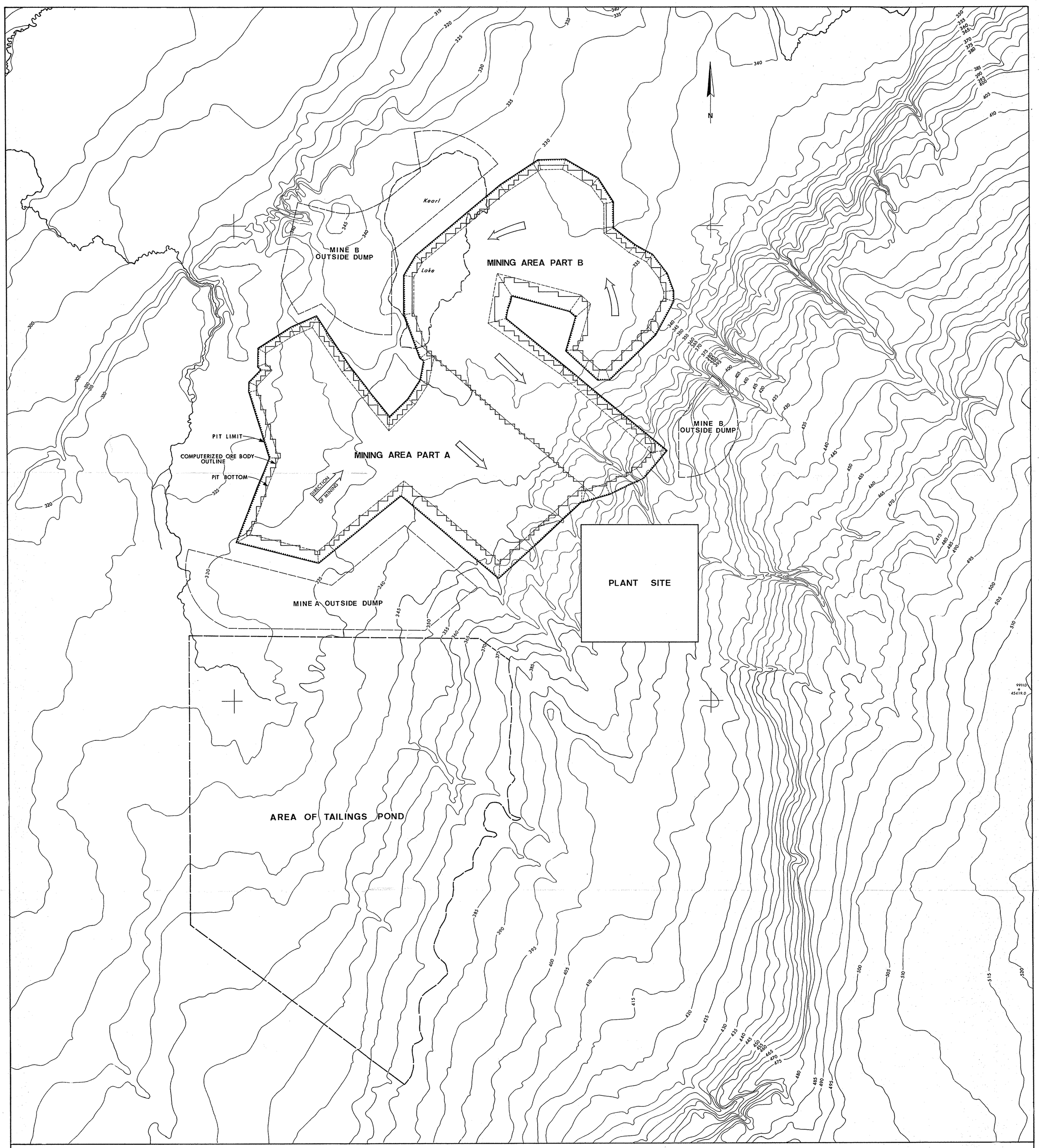
# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 1

(240,000 BPCD)

BWE – Minimum

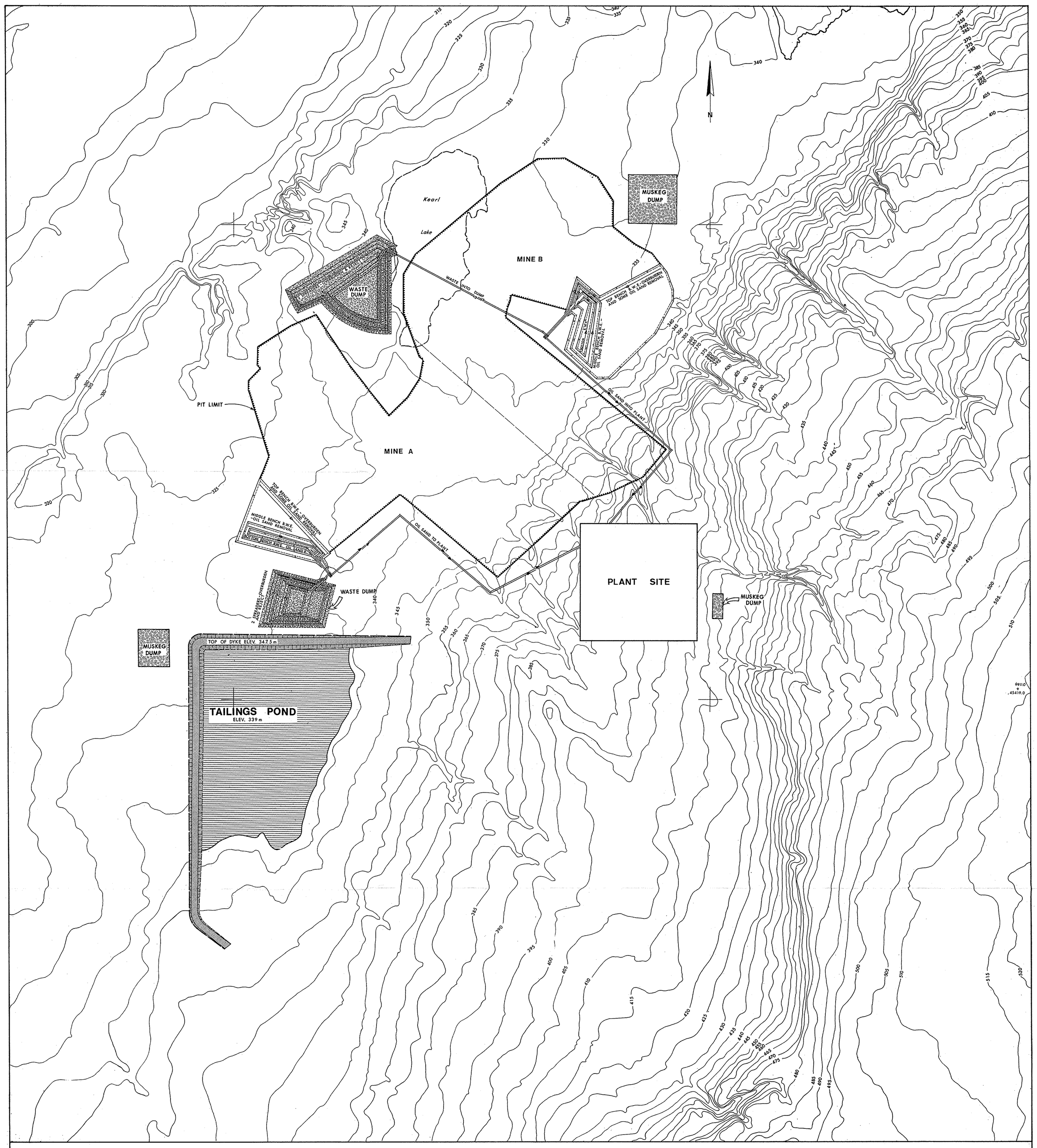



CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

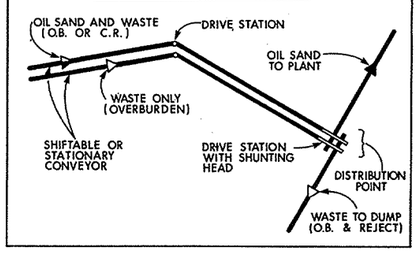
PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: General Mine Layout
Minimum Level of Reclamation
6 B.W.E. Mining Scheme
Ore Body No. 1 (240 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☒ RC ☐ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | D. C. | E22910-74-00 |
| APPR PROJ. ENGR. J. H. | APPR PROJ. MNGR. TM. RC. | PROJECT No: TM ☐ RC ☐ | RC DRAWING No. |




**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: Mining and Tailings Disposal - Year 1 Minimum Level of Reclamation 6 BWE Mining Scheme Ore Body No.1 (240 000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. E22918-75-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

MUSKEG DUMP

MUSKEG DUMP

MUSKEG DUMP

N

Kearl Lake

2 SPREADERS - OVERBURDEN AND REJECT

WASTE DUMP
AVE. HEIGHT 75m

WASTE TO DUMP

TOP BENCH 8WE - OVERBURDEN AND SOME OIL SAND REMOVAL

MIDDLE BENCH 8WE - OIL SAND REMOVAL

BOTTOM BENCH 8WE - OIL SAND REMOVAL

MINE B

MINE A

TOP BENCH 8WE - OVERBURDEN AND SOME OIL SAND REMOVAL

MIDDLE BENCH 8WE - OIL SAND REMOVAL

BOTTOM BENCH 8WE - OIL SAND REMOVAL

OIL SAND TO PLANT

OIL SAND TO PLANT

PIT LIMIT

PLANT SITE

WASTE DUMP
AVE. HEIGHT 75m

SPREADER OR SKIP

MUSKEG DUMP

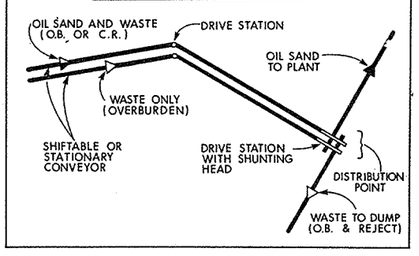
MUSKEG DUMP

TOP OF DYKE ELEV. 371.3 m

TAILINGS POND
POND ELEV. 367 m

9911.0
+
45419.0

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | |
|---|---|
| CLIENT | ALBERTA DEPARTMENT OF THE ENVIRONMENT |
| PREPARED BY | TECHMAN LTD. and RHEINBRAUN - Consulting GmbH |
| TITLE | Mining and Tailings Disposal - Year 7<br>Minimum Level of Reclamation<br>6 BWE Mining Scheme<br>Ore Body No.1 (240 000 BPCD) |
| SCALE: AS SHOWN | DATE: APRIL. 1979 |
| DRAWN BY: TM ☐ RC ☒ Bazaraa | TM DRAWING No. E22918-76-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. |
| PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

MUSKEG DUMP

MUSKEG DUMP

MUSKEG DUMP

TAILINGS POND
ELEV. 265m

TAILINGS SAND DYKE

TAILINGS SAND DYKE
TOP ELEV. 334m

WASTE DUMP
AVE. HEIGHT 75m

TOP BENCH B.W.E. - OVERBURDEN AND SOME OIL SAND REMOVAL

MIDDLE BENCH B.W.E. - OIL SAND REMOVAL

TAILINGS POND
ELEV. 332m

MUSKEG DUMP

TOP BENCH B.W.E. - OVERBURDEN AND SOME OIL SAND REMOVAL

MIDDLE BENCH B.W.E. - OIL SAND REMOVAL

MINE B

WASTE TO SPREADER

OIL SAND TO PLANT

WASTE DUMP
AVE. HEIGHT 75m

SLUDGE POND
(START YEAR 15)

MINE A

OVERBURDEN STARTER DYKE

MUSKEG DUMP

WASTE TO SPREADER

OIL SAND TO PLANT

PLANT SITE

WASTE DUMP
AVE HEIGHT 75m

WASTE DUMP
AVE HEIGHT 75m

MUSKEG DUMP

MUSKEG DUMP

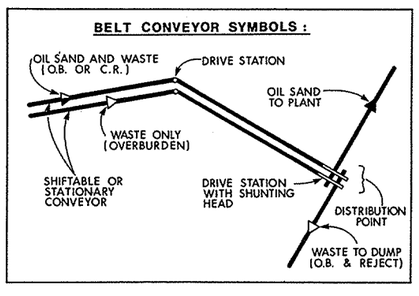
TOP OF DYKE ELEV. 380 m

MUSKEG DUMP

OUTSIDE
TAILINGS POND
POND ELEV. 378 m

9911.0
+
45419.0

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 14
Minimum Level of Reclamation
6 BWE Mining Scheme
Ore Body No 1 (240 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | Basaran | E22918-77-00 |
| APPR PROJ ENGR. J.H. | APPR PROJ MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

MUSKEG DUMP

MUSKEG DUMP

MUSKEG DUMP

TAILINGS SAND DYKE TOP ELEV. 329m

TAILINGS POND ELEV. 327m

TAILINGS SAND DYKE TOP ELEV. 334m

WASTE DUMP AVE. HEIGHT 75m

TAILINGS POND ELEV. 322m

OVERBURDEN AND REJECT BACKFILL AVE. ELEV. 330m

MUSKEG DUMP

TAILINGS SAND DYKE ELEV. 335m

OVERBURDEN AND REJECT BACKFILL AVE. ELEV. 338m

SLUDGE POND ELEV. 308m

BOTTOM BENCH B.W.E. OIL SAND REMOVAL

MIDDLE BENCH B.W.E. OIL SAND REMOVAL

TOP BENCH B.W.E. - OVERBURDEN AND SOME OIL SAND REMOVAL

BOTTOM BENCH B.W.E. - OIL SAND REMOVAL

MIDDLE BENCH B.W.E. - OIL SAND REMOVAL

TOP BENCH B.W.E. - OVERBURDEN AND SOME OIL SAND REMOVAL

OIL SAND TO PLANT

OIL SAND TO PLANT

PIT LIMIT

WASTE DUMP AVE. HEIGHT 75m

MUSKEG DUMP

MUSKEG DUMP

PLANT SITE

WASTE DUMP AVE HEIGHT 75m

WASTE DUMP AVE. HEIGHT 75m

TOP OF DYKE ELEV. 380m

MUSKEG DUMP

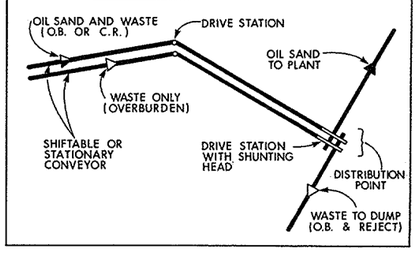
BEACHED SAND ELEV. 380m

POND ELEV. 377m

OUTSIDE TAILINGS POND

99110 + 45419.0

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

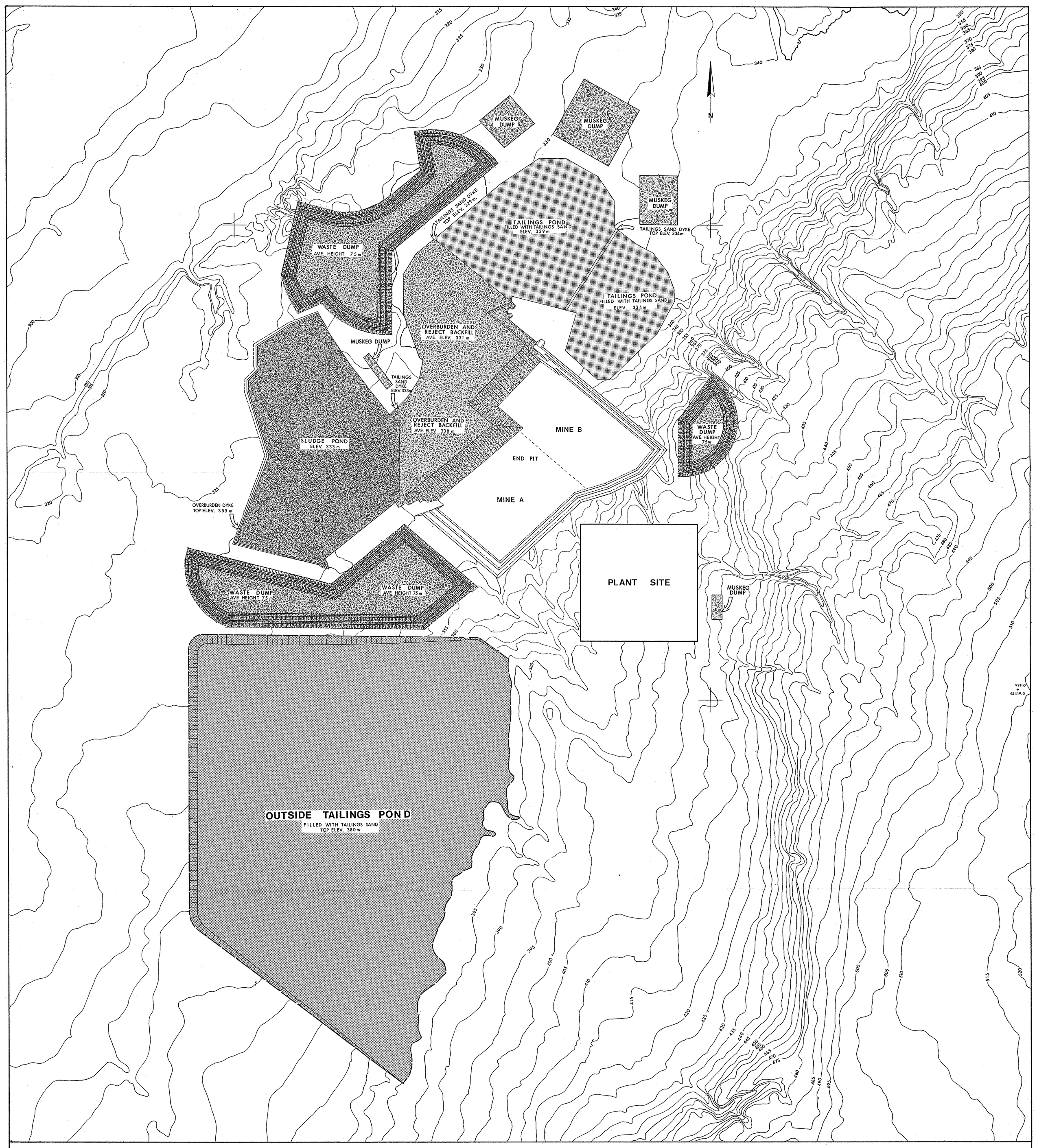
METERS 500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 22
Minimum Level of Reclamation
6 B.W.E. Mining Scheme
Ore Body No. 1 (240 000 BPCD)

| SCALE: | DATE: | DRAWN BY TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | Barton | E22918-78-00 |
| APPR PROJ ENGR. J H. | APPR PROJ MNGR. TM. RC | PROJECT No TM ☐ RC ☐ | RC DRAWING No. |




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

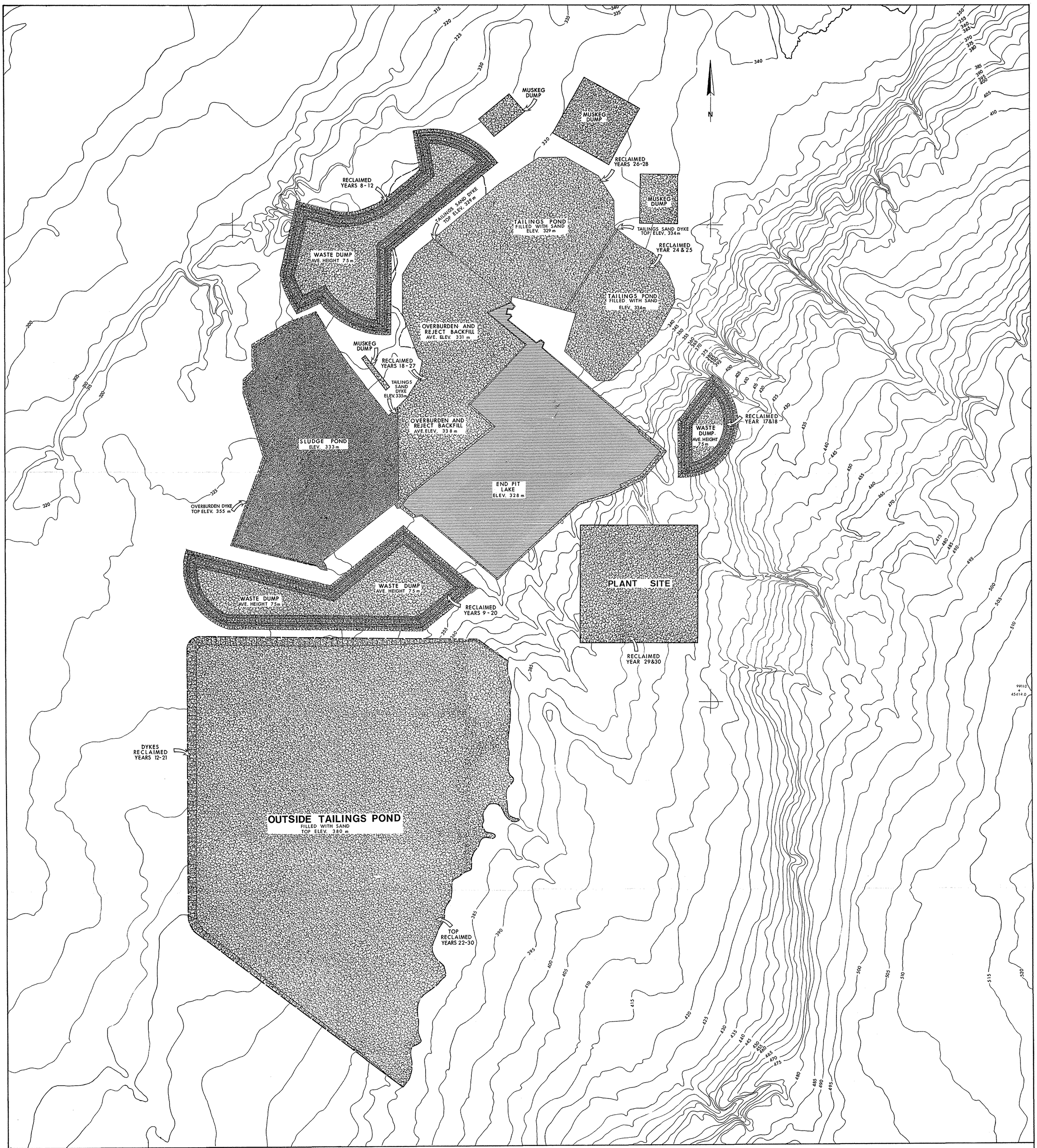
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Material Distribution Plan (Year 26)
Minimum Level of Reclamation
6 B.W.E. Mining Scheme
Ore Body No. 1 (240 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM RC | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | E22916-79-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM RC | RC DRAWING No. |




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Reclamation Plan
Minimum Level of Reclamation
6 B.W.E. Mining Scheme
Ore Body No. 1 (240 000 BPCD)

| SCALE | DATE | DRAWN BY TM RC | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | E22980-80-00 |
| APPR. PROJ. ENGR. J. G. | APPR. PROJ. MNGR. TM RC | PROJECT No. TM RC | RC DRAWING No. |

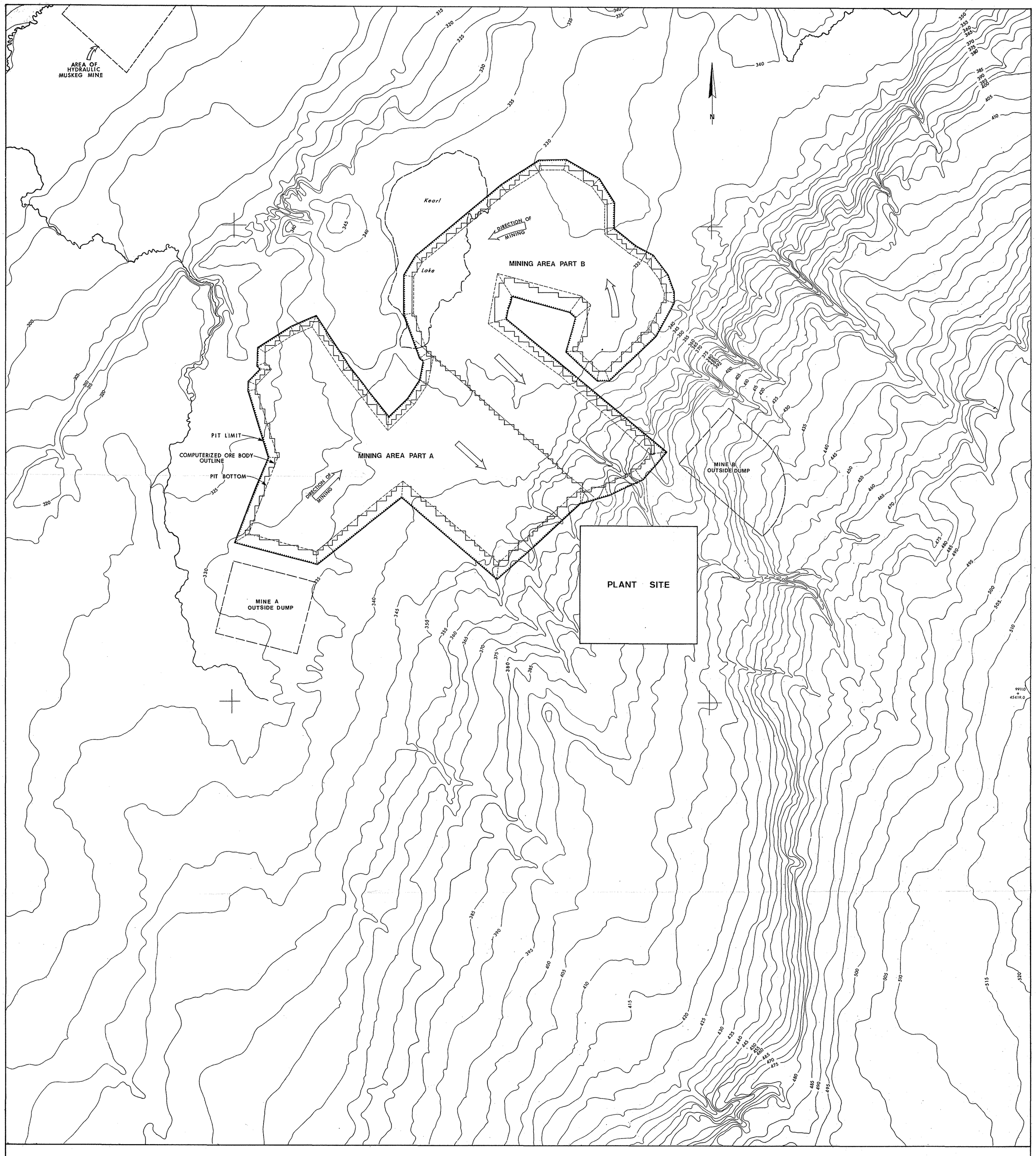
# OIL SAND RECLAMATION

# A Study Integrating Mining, Tailings Disposal and Reclamation

Ore Body No. 1

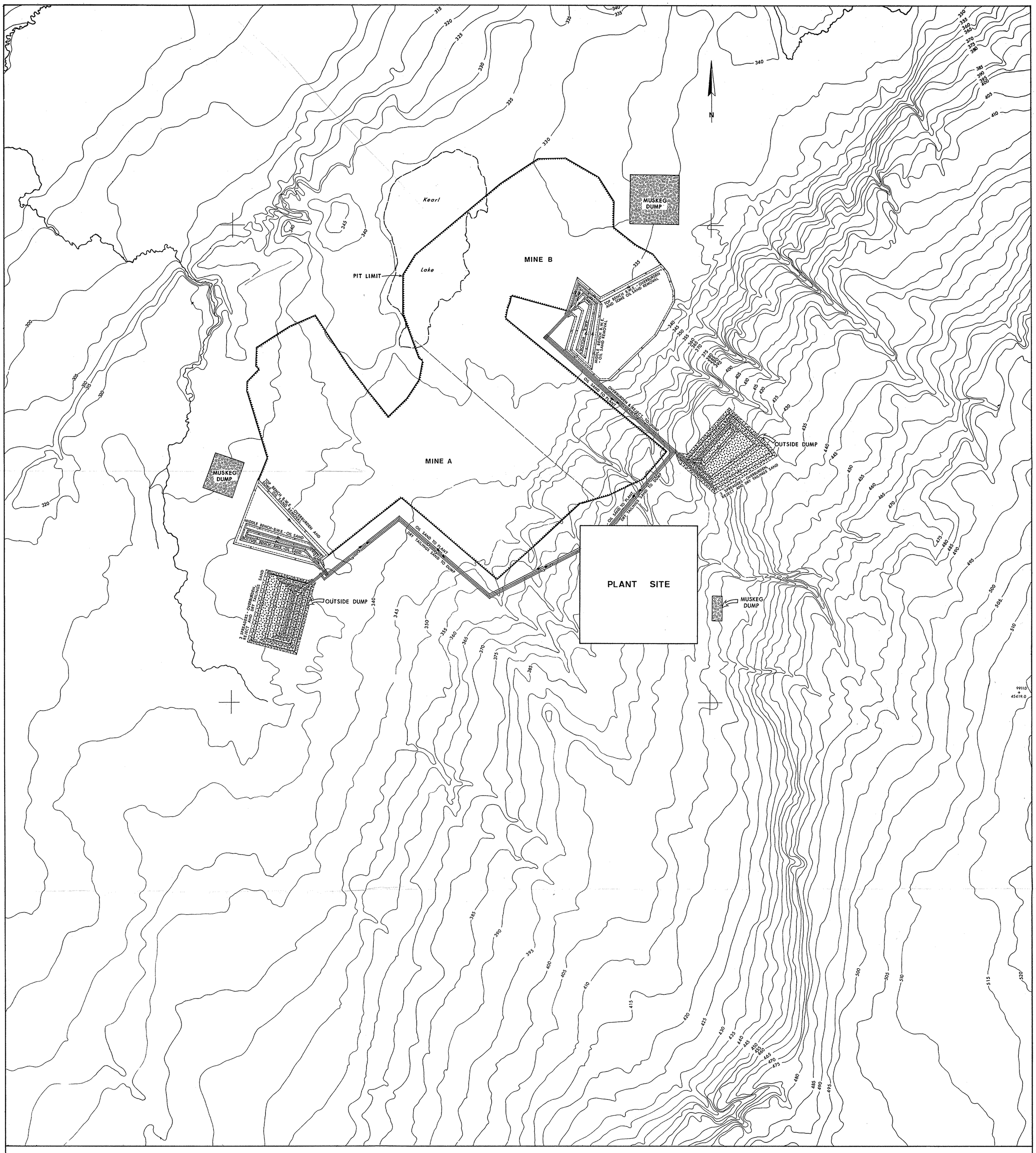
(240,000 BPCD)

BWE – Enhanced

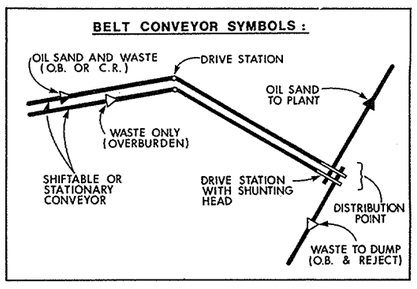



METERS
500 250 0 500 1000

| | |
|---|---|
| CLIENT: | ALBERTA DEPARTMENT OF THE ENVIRONMENT |
| PREPARED BY: | TECHMAN LTD. and RHEINBRAUN - Consulting GmbH |
| TITLE: | General Mine Layout<br>Enhanced Level of Reclamation<br>6 B.W.E. Mining Scheme<br>Ore Body No.1 (240 000BPCD) |
| SCALE: AS SHOWN | DATE: SEPT. 1978. |
| DRAWN BY: TM ☒ RC ☐ | D. C. |
| TM DRAWING No. | E22910-81-00 |
| APPR. PROJ. ENGR. | |
| APPR. PROJ. MNGR. TM. RC. | |
| PROJECT No. TM ☐ RC ☐ | |
| RC DRAWING No. | |




**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

| | | | |
|---|---|---|---|
| CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT | | | |
| PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH | | | |
| TITLE: Mining and Tailings Disposal - Year 1 Enhanced Level of Reclamation 6 BWE Mining Scheme Ore Body No. 1 (240 000 BPCD) | | | |
| SCALE: AS SHOWN | DATE: SEPT. 1978 | DRAWN BY TM ☐ RC ☒ | TM DRAWING No. E22918-52-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

AREA OF HYDRAULIC MUSKEG MINE

MUSKEG DUMP

MUSKEG DUMP

MUSKEG DUMP

Kearl Lake

PIT LIMIT

MINE B

MINE A

TOP BENCH B.W.E. - OVERBURDEN AND SONE OIL SAND REMOVAL

MIDDLE BENCH B.W.E. - OIL SAND REMOVAL

BOTTOM BENCH B.W.E. - OIL SAND REMOVAL

SPREADER OVERBURDEN REJECT AND DRY TAILINGS SAND

IN-PIT BACKFILL AVE. TOP ELEV. 350 m

OIL SAND TO PLANT

DRY TAILINGS SAND TO BACKFILL

OUTSIDE DUMP AVE. HEIGHT 75 m

PREP. SOIL

F.E.L. & TRUCKS TO RECLAMATION

PREPARED SOIL TO STOCKPILE

OIL SAND TO PLANT

DRY TAILINGS SAND TO BACKFILL

SELECT O.B. FOR PREP. SOIL

MUSKEG DUMP

IN-PIT BACKFILL AVE. TOP ELEV. 350m

MUSKEG DEWATERING PLANT

PREPARED SOIL BLENDING YARD

OUTSIDE DUMP AVE. HEIGHT 75 m

PLANT SITE

MUSKEG DUMP

N

99110
+
45419.0

**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)

DRIVE STATION

OIL SAND TO PLANT

WASTE ONLY (OVERBURDEN)

SHIFTABLE OR STATIONARY CONVEYOR

DRIVE STATION WITH SHUNTING HEAD

DISTRIBUTION POINT

WASTE TO DUMP (O.B. & REJECT)

**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT.
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 7
Enhanced Level of Reclamation
6 BWE Mining Scheme
Ore Body No. 1 (240 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | Basaran | E22918-83-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM. ☐ RC ☐ | RC DRAWING No. |

AREA OF HYDRAULIC MUSKEG MINE

MUSKEG DUMP

IN-PIT BACKFILL
AVE. TOP ELEV. 350m

3 SPREADERS - OVERBURDEN, REJECT AND DRY TAILINGS SAND

BOTTOM BENCH B.W.E. - OIL SAND REMOVAL

MIDDLE BENCH B.W.E. - OIL SAND REMOVAL

TOP BENCH B.W.E. - OVERBURDEN AND SOME OIL SAND REMOVAL

OIL SAND TO PLANT

DRY TAILINGS SAND TO BACKFILL

MINE B

MINE A

OUTSIDE DUMP
AVE. HEIGHT 75m

PIT LIMIT

PLANT SITE

F.E.L. & TRUCKS TO RECLAMATION

PREP. SOIL

PREPARED SOIL TO STOCKPILE

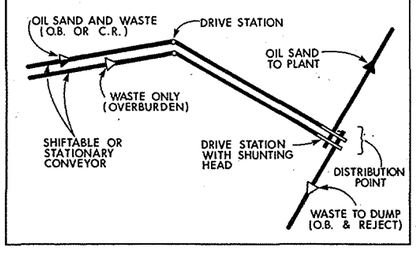
MUSKEG DEWATERING PLANT

PREPARED SOIL BLENDING PILE

N

99110
45419.0

**BELT CONVEYOR SYMBOLS :**




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 14
Enhanced Level of Reclamation
6 BWE Mining Scheme
Ore Body No.1 (240 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM RC | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | E 22918-84-0Q |
| APPR. PROJ. ENGR.: | APPR. DRAWINGS: TM RC | PROJECT No: TM RC | RC DRAWING No. |

AREA OF HYDRAULIC MUSKEG MINE

MUSKEG DUMP

IN-PIT BACKFILL
AVE. TOP ELEV 350m

IN PIT BACKFILL
AVE. TOP ELEV. 350 m

PREP SOIL
F.E.L. & TRUCKS TO RECLAMATION

PREPARED SOIL TO TOP PILE

3 BWE-DRY OVERBURDEN, REJECT AND DRY TAILINGS SAND

BOTTOM BENCH BWE - OIL SAND REMOVAL

MIDDLE BENCH BWE - OIL SAND REMOVAL

TOP BENCH BWE - OVERBURDEN AND SOME OIL SAND REMOVAL

BOTTOM BENCH BWE - OIL SAND REMOVAL

MIDDLE BENCH BWE - OIL SAND REMOVAL

TOP BENCH BWE - OVERBURDEN AND SOME OIL SAND REMOVAL

OIL SAND TO PLANT

DRY TAILINGS SAND TO BACKFILL

MINE A

MINE B

PIT LIMIT

PLANT SITE

OUTSIDE DUMP
AVE. HEIGHT 75 m

MUSKEG DEWATERING PLANT

PREPARED SOIL BLENDING PILE

N

99110
+
45419.0

**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)
DRIVE STATION
OIL SAND TO PLANT
WASTE ONLY (OVERBURDEN)
SHIFTABLE OR STATIONARY CONVEYOR
DRIVE STATION WITH SHUNTING HEAD
DISTRIBUTION POINT
WASTE TO DUMP (O.B. & REJECT)

**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Mining and Tailings Disposal - Year 22
Enhanced Level of Reclamation
6 BWE Mining Scheme
Ore Body No. 1 (240 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | Conkeen | E22918-85-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM. RC. | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

AREA OF HYDRAULIC MUSKEG MINE

MUSKEG DUMP

IN-PIT BACKFILL
AVE. TOP ELEV. 350m

IN-PIT BACKFILL
AVE. TOP ELEV. 350 m

OUTSIDE DUMP
AVE. HEIGHT 75 m

MINE A

MINE B

END PIT

OVERBURDEN BEHANDLE FOR PLANT SITE RECLAMATION & F.E.L. ONTO CONVEYOR BELT

MUSKEG DEWATERING PLANT

PREPARED SOIL TO STOCKPILE

PREPARED SOIL BLENDING PILE

PREP. SOIL

F.E.L. & TRUCKS TO RECLAMATION

PLANT SITE

N

9911C
+
45419.0

**BELT CONVEYOR SYMBOLS :**

OIL SAND AND WASTE (O.B. OR C.R.)
DRIVE STATION
OIL SAND TO PLANT
WASTE ONLY (OVERBURDEN)
SHIFTABLE OR STATIONARY CONVEYOR
DRIVE STATION WITH SHUNTING HEAD
DISTRIBUTION POINT
WASTE TO DUMP (O.B. & REJECT)

**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

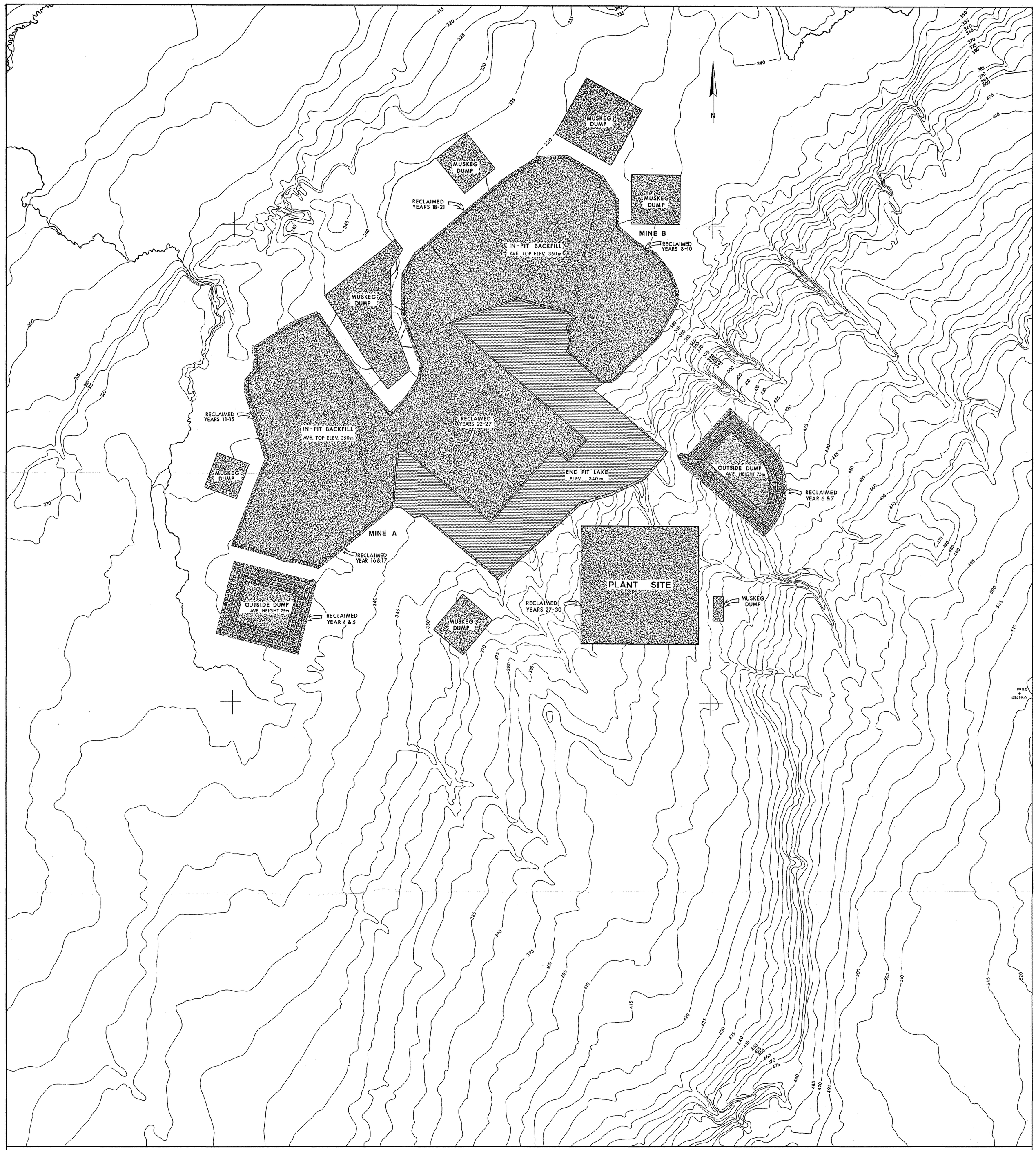
METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH.

TITLE: **Material Distribution Plan (Year 26)**
**Enhanced Level of Reclamation**
**6 B.W.E. Mining Scheme**
**Ore Body No. 1 (240 000 BPCD)**

| SCALE: | DATE: | DRAWN BY TM RC | TM DRAWING No |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | E22916-86-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM RC | PROJECT No TM RC | RC DRAWING No |




**LEGEND**

- WASTE DUMP OVERBURDEN & CENTRE REJECT
- LAKE, END PIT
- SLUDGE POND
- TREATED SLUDGE
- TAILINGS SAND
- PREPARED SOIL BLENDING PILE
- MIXTURE OF DRY TAILINGS SAND OVERBURDEN & CENTRE REJECT (ENHANCED LEVEL ONLY)
- MUSKEG DUMP
- TAILINGS POND
- RECLAIMED AREA

METERS
500 250 0 500 1000

CLIENT: ALBERTA DEPARTMENT OF THE ENVIRONMENT

PREPARED BY: TECHMAN LTD. and RHEINBRAUN - Consulting GmbH

TITLE: Reclamation Plan
Enhanced Level of Reclamation
6 B.W.E. Mining Scheme
Ore Body No. 1 (240 000 BPCD)

| SCALE: | DATE: | DRAWN BY: TM ☐ RC ☒ | TM DRAWING No. |
|---|---|---|---|
| AS SHOWN | SEPT. 1978 | | E22980-87-00 |
| APPR. PROJ. ENGR. | APPR. PROJ. MNGR. TM ☑ RC | PROJECT No. TM ☐ RC ☐ | RC DRAWING No. |

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