**APPENDIX-G**

**AMEC GEOTECHNICAL INSPECTION REPORT TO P-LAKE SEWAGE LAGOON, 2008**

# APPENDIX-E:

# AMEC GEOTECHNICAL ENGINEER'S INSPECTION REPORT TO THE NEW P-LAKE SEWAGE LAGOON, 2008

October 24, 2008

YX00748.100

Dillon Consulting Limited
334 – 11th Avenue SE
Suite 200
Calgary, AB, T2G 0Y2

Attn: Keith Barnes, P.Eng.

Dear Sir:

**Re: Sewage Lagoon Berm Inspection**
**Cape Dorset, NU**

## 1.0 INTRODUCTION

At the request of Mr. Keith Barnes, on behalf of Dillon Consulting Ltd (DCL), AMEC Earth & Environmental, a Division of AMEC Americas Limited (AMEC), carried out a sewage lagoon berm inspection in Cape Dorset, NU.

Mr. Barnes with DCL, contacted AMEC via phone on September 25, 2008 and informed AMEC that community personnel had noticed leaks occurring at sewage lagoon facility. Mr. Dmitry Dumsky, P. Eng. with AMEC, contacted Mr. Matthew Price, a community support project officer, and following a phone conversation, it was understood that the lagoon had accumulated a significant volume of run-off water which was able to build in volume due to the closing of the valve controlling the lagoon drainage pipe. It is understood that valve was closed near the end of July and the leak from the main berm was noticed near the end of August.

The purpose of the field visit was to assess the current condition of the berm, and determine possible causes of the berm leak(s).

## 2.0 FIELD PROGRAM

The berm inspection was conducted on September 30th and October 1st, 2008, by Mr. Dumsky, a permafrost engineer with AMEC. The drainage control valve located within the manhole was still closed on September 30th, and the water level in the lagoon was at about 2.0 m in depth. Mr. Price assisted Mr. Dumsky by accompanying him to the areas of the leaks, and by providing some background information. Following discussion with Mr. Price, two main leak concerns were identified: run-off water was seeping through the road embankment into the lagoon



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impoundment in two areas, and water was leaking out of the lagoon impoundment within a limited area along the down slope toe of the m ain berm.

Run-off water seeping through the road way embankment into the lagoon impoundment was identified in two locations along the south roadway connecting the main west berm to the smaller north berm. The first run-off seepage was located about 100 m to 120 m south from the smaller north berm, while the second run-off seepage location was located about 20 m to 40 m south of the main berm. At these locations, water freely seeps through the road embankment, consisting of sandy crushed rock with some fines. The inflow seepage originates as run-off water from the mountain slope which is situated immediately south of the roadway. Both seepage locations are shown on Figure 1, and Photographs 1 and 2, Appendix A.

Water leaking from the lagoon impoundment was identified along the toe of the main berm, about 20 to 30 meters south of the emergency spillway (Photograph 3, Appendix A). It is believed that the water is leaking through or underneath the unfrozen larger main berm. It was demonstrated by the geothermal analysis, that at the end of the first summer, the majority of the berm and subgrade remain at temperature just below 0 °C. Thus, by allowing the run-off water to accumulate, premature thermal degradation began to occur within the berm allowing the water to leak under a considerable hydraulic gradient through the berm and around or through the liner. It is believed that the liner could be damaged (torn), or improperly sealed off within the cut-off trench.

On September 30, 2008 at about 1:30 pm, the valve controlling the lagoon drainage pipe was re-opened allowing run-off water to drain into P-lake (Photograph 4, Appendix A). The water level near the area of the leak dropped down about 20 mm after 3 hours of water flowing through the drainage pipe (Photograph 5, Appendix A). On October 1, 2008, the water flow from the drainage pipe dropped considerably (Photograph 6, Appendix A).

## 3.0 RECOMMENDATIONS

No immediate actions are required to reduce the water leaking through the main berm. It is expected that a frozen core will be re-created within the berm after a second winter season (2008/2009) which will significantly reduce or eliminate the water seeping through the main berm.

It is recommended that snow be removed from the crest and sideslopes of the main berm, at least twice per month during 2008/2009 winter season.

The run-off water that seeps through the road embankment into the lagoon should be diverted away from the lagoon impoundment.

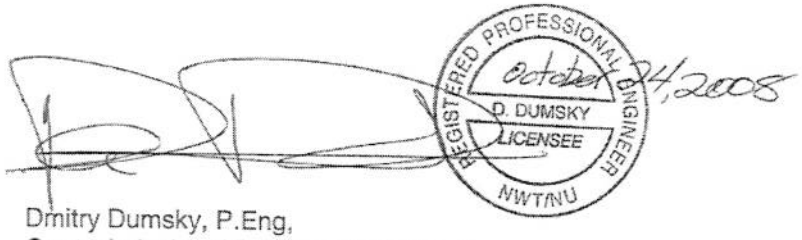
Thermistors should be installed in monitoring wells in accordance with AMEC's recommendations provided in a letter dated May 28, 2008, submitted to DCL titled "Technical Specifications for Thermistor String Installation in Berms of New Sewage Lagoon, Cape Dorset, NU".

## 4.0 CLOSURE

We trust the present information meets your current needs. Should you have any questions, please feel free to contact the undersigned.

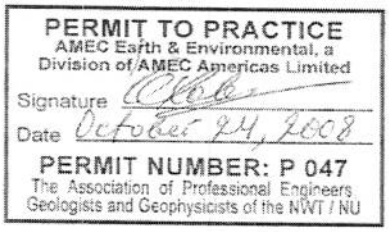
Respectfully submitted,

**AMEC Earth & Environmental,**
**a division of AMEC Americas Limited**

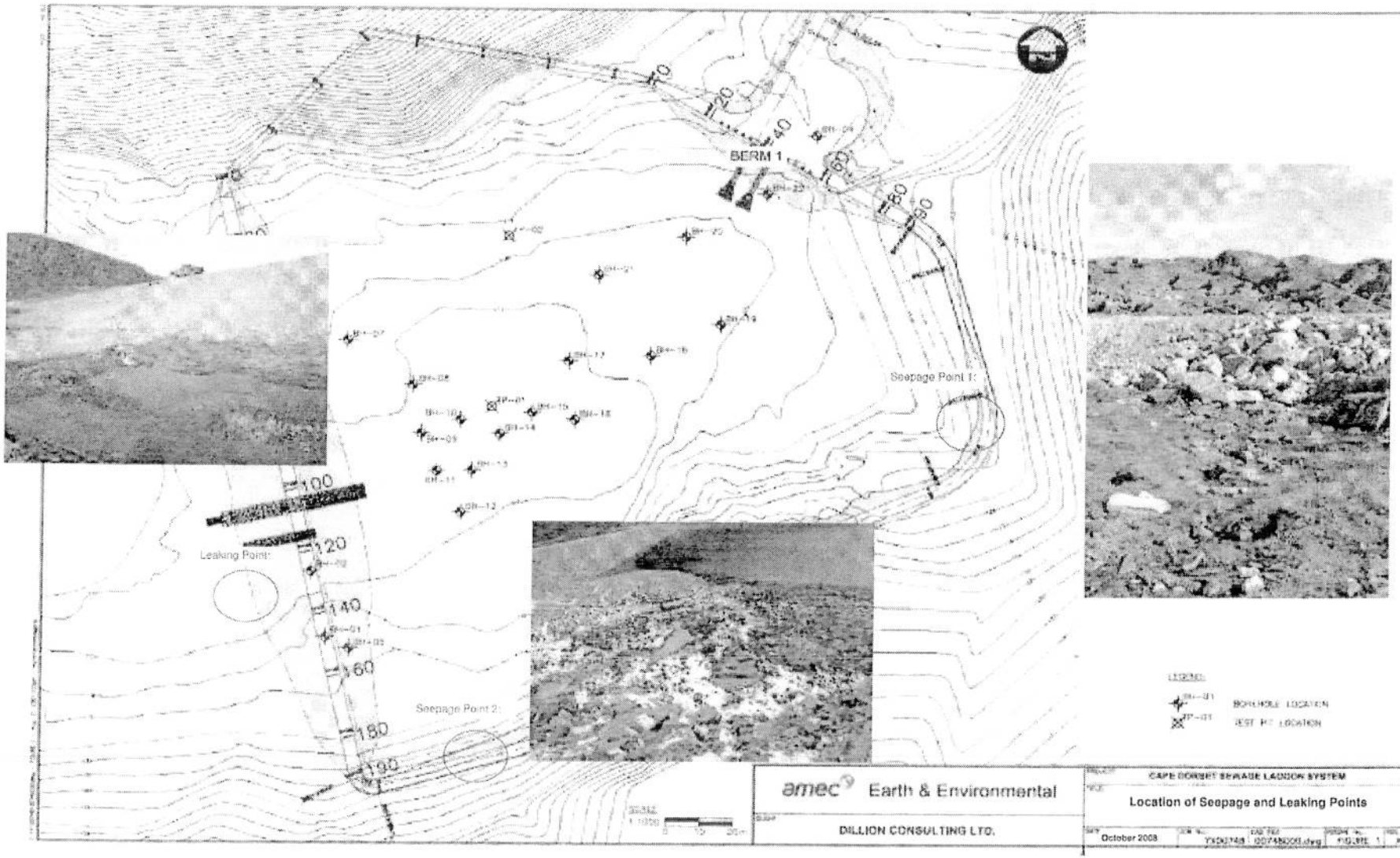


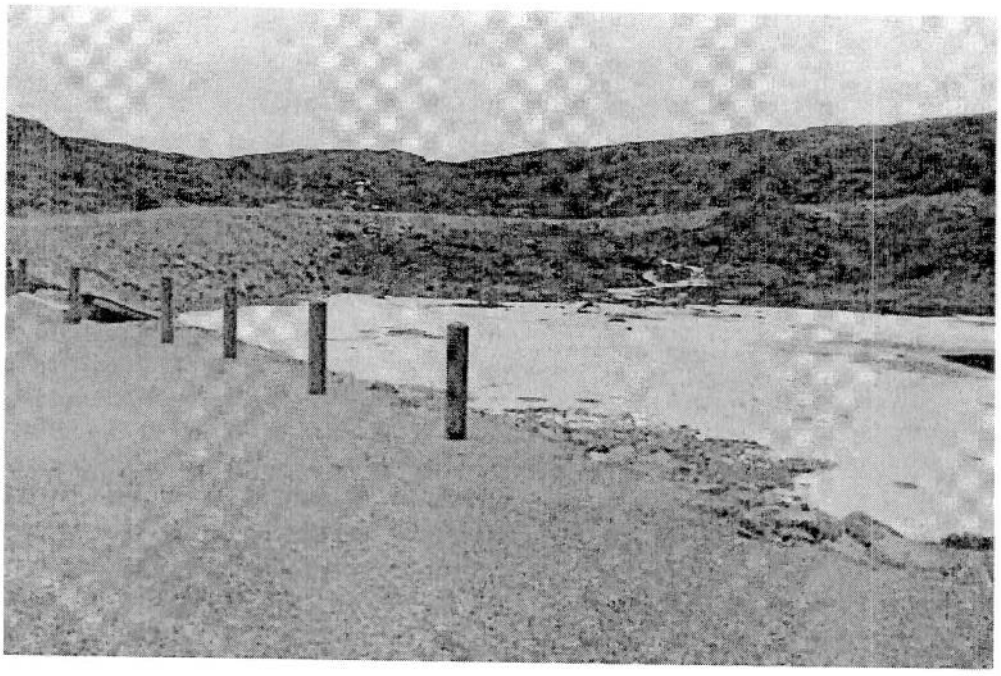

Dmitry Dumsky, P.Eng,
Geotechnical and Permafrost Engineer

Reviewed by: Alexandre Tchekhovski, Ph. D., P.Eng,
Associate Geotechnical and Permafrost Engineer

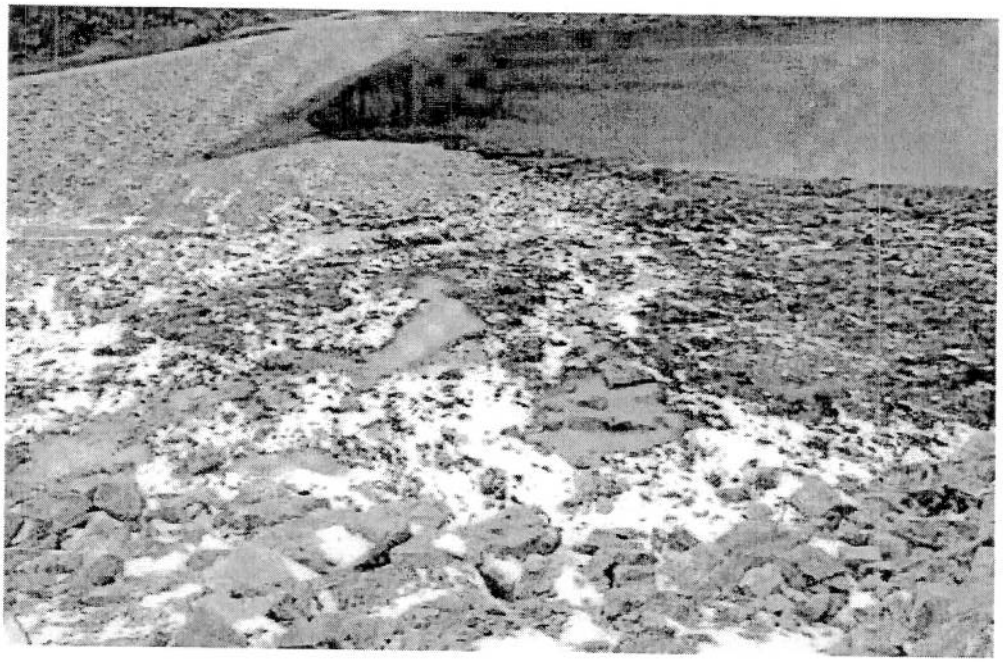


# APPENDIX A

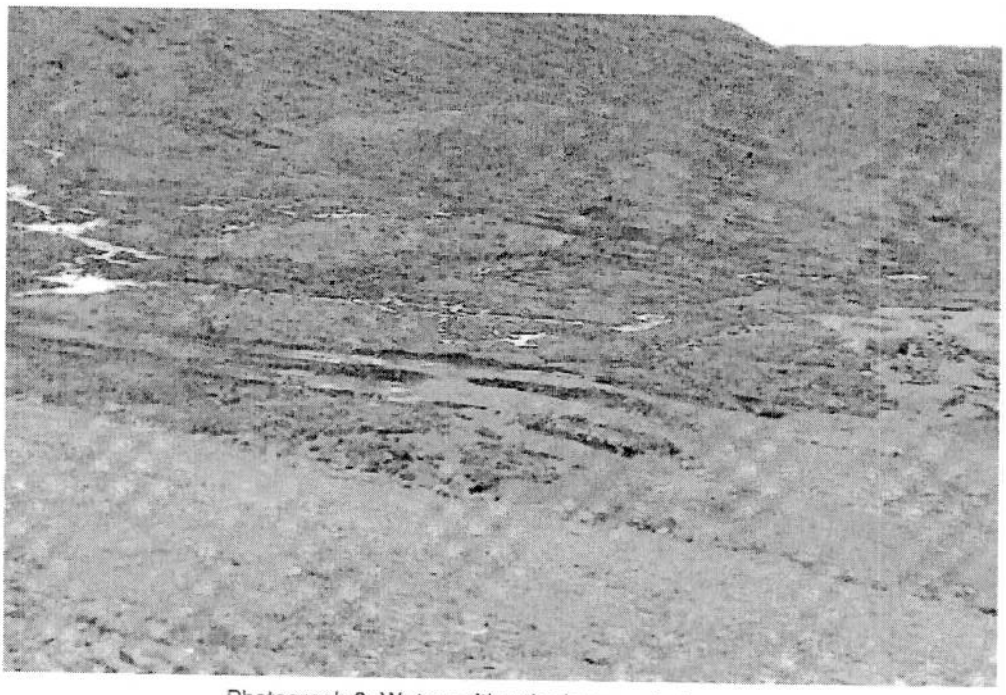

BERM 1
Seepage Point 1:
Leaking Point:
Seepage Point 2:
100
120
140
160
180
200
LEGEND:
BOREHOLE LOCATION
TEST PIT LOCATION
amec Earth & Environmental
DILLION CONSULTING LTD.
CAPE DORSET SEWAGE LAGOON SYSTEM
Location of Seepage and Leaking Points
October 2008



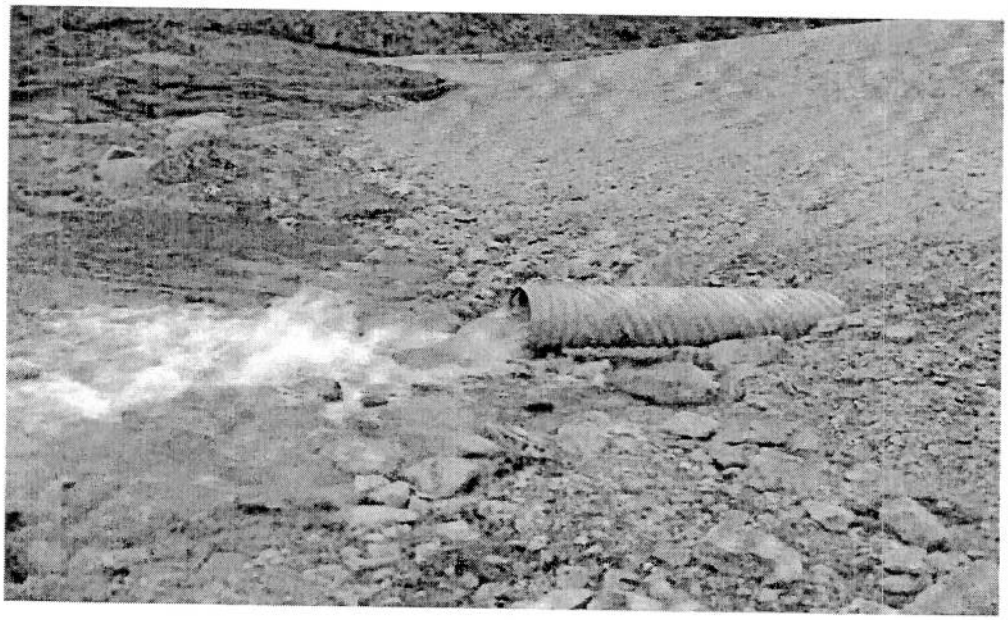
Photograph 1: First water entry area located about 100 to 120 m



Photograph 2: Second water entry located about 20 to 40 m



Photograph 3: Water exiting the large main berm



Photograph 4: Water flowing through drainage pipe

Indian and Northern Affairs Canada / Affaires indiennes et du Nord Canada

# MUNICIPAL WATER USE INSPECTION FORM

DATE: 16/8/18 COMPANY REP.: Fred Schell

LICENSEE: Municipality of Cape Dorset LICENCE #: 3BM-CAP0810

## WATER SUPPLY

Source(s): Tee Lake Quantity Used (to date): (estimate or actual): estimate

Owner/operator: Municipality of Cape Dorset

*Indicate: A - Acceptable U - Unacceptable N/A - Not Applicable*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intake Facilities | A | Storage Structures | A | Treatment Systems | A | Chem. Storage | U |
| Flow Meas. Device | A | Conveyance Lines | A | Pumping Stations | A | | |

Comments: Chlorine pails (2) nearly empty during period of Inspection. Intake records available and reviewed. chemical storage must be addressed.

## WASTE DISPOSAL

Sewage: Sewage Treatment System (primary, secondary or tertiary) primary

Natural Water body / Continuous Discharge (land or water) land

Seasonal Discharge / Wetlands Treatment / Trench /

Solid Waste: Owner/Operator: Hamlet of Cape Dorset

Landfill Burn & Landfill / Other

*Indicate: A - Acceptable U - Unacceptable N/A - Not Applicable*

| | | | | | |
|---|---|---|---|---|---|
| Disch. Quality | U | Decant Structure | / | Erosion | U |
| Disch. Meas. Dev. | N/A | Dyke Inspection | N/A | Seepages | U |
| Dams, Dykes | U | Freeboard | U | Spills | NI |
| Construction | / | O & M Plan | U | A & R Plan | U |
| Periods of Discharge | / | Effluent Discharge Rate: | U | | |

Comments: New lagoon full of water, water in Manhole, No thermistor installed, Emergency lagoon at capacity, 3 tier lagoon leaking and third Tier has failed in one place that threatens integrity of whole third cell.

## FUEL STORAGE

Owner Gov of Nu Operator Q.E.C Condition of Tanks A

Berms & Liners A Water within berm: / Evidence of Leaks: /

Drainage Pipes / Pump Station and Catchment Beam /

Pipeline Condition A Not Applicable:

## SURVEILLANCE NETWORK PROGRAM

Samples Collected: (Hamlet)

(DIAND) potable, Leachate, Effluent

Signs Posted: SNP Good Warning

Record & Reporting ~~Water~~ present for Review

Geotechnical Inspection:

Non-Compliance of Act or Licence: The municipality will be issued a direction to address the 3 cell lagoon, the road to water intake, new road, and new lagoon. The municipality will be provided 60 days to address these issues.

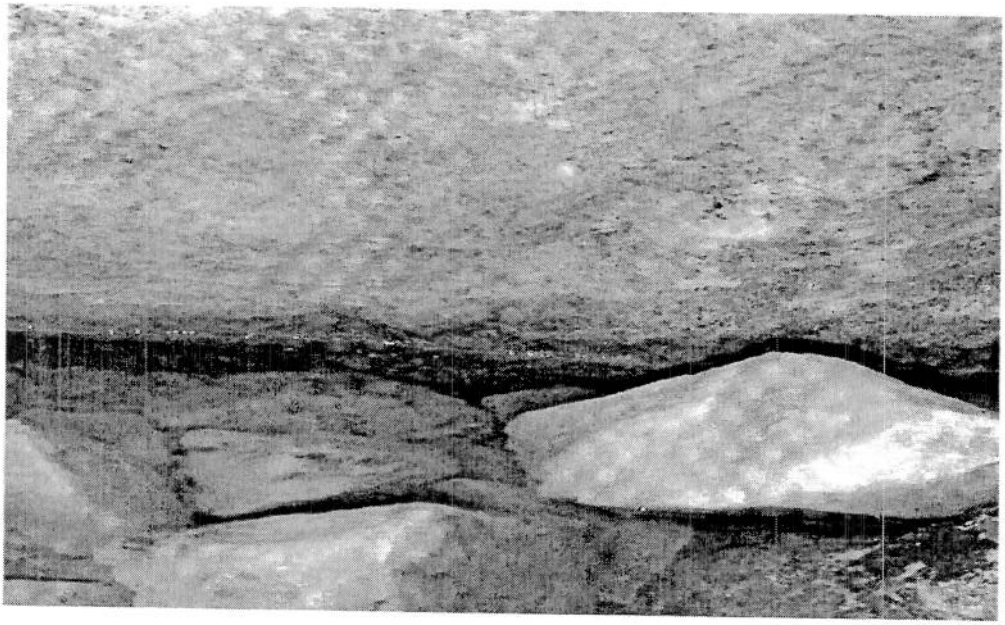
Page 2 attached ☐ Yes ☐ No

MAYOR OF CAPE DORSET
Licensee Representative's Title

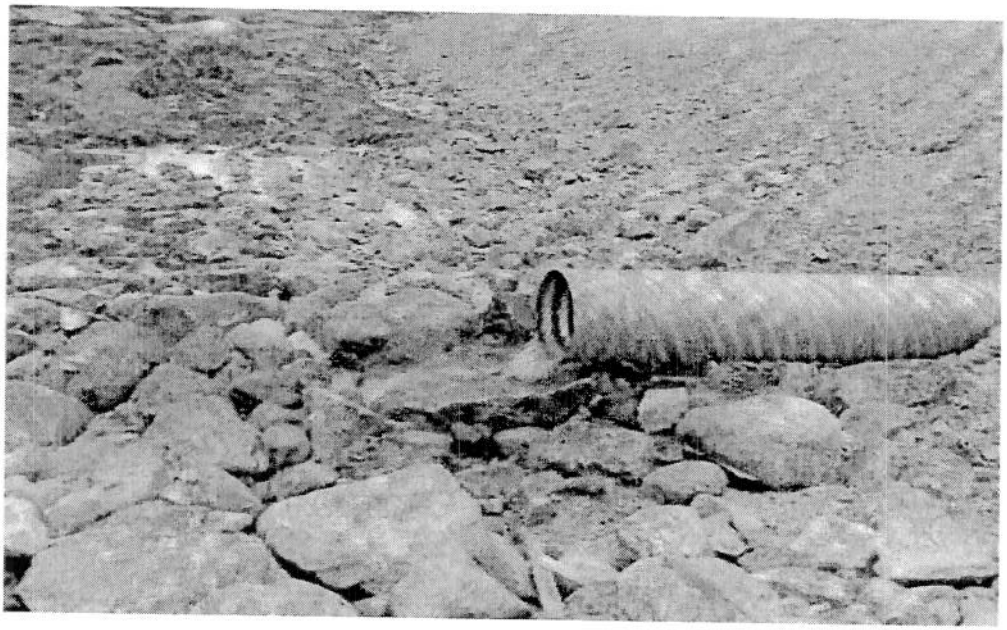
Fred Schell
Licensee Representative's Signature

A. Keim
Inspector's Name

Inspector's Signature



Photograph 5: Water level dropping



Photograph 6: Water level within drainage pipe dropping