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Lands Division
P.O. Box 360, Kugluktuk,
Nunavut
X0E 0E0
Tel: 867-982-3310
Fax: 867-982-3311

Bathurst Inlet
Kingaok
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Bay Chimo
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Cambridge Bay
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Pelly Bay
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Taloyoak
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FASIMILE TRANSMISSION COVER SHEET

To: Dionne Filiatrault Date: January 9, 2002

Nunavut Water Board

Gjoa Haven, NU

Fax: 867-360-6369

☐ Jack Kaniak, KITIA Lands Manager - jkaniak@polarnet.ca
☐ Stanley Anablak, KITIA Lands Officer – sanablak@polarnet.ca
☐ Mona Tiktalek, Community Liaison Officer/Lands Clerk – monat@polarnet.ca
☐ Beatrice Bernhardt, Employment & Training Officer – bernn@polarnet.ca

INTERNAL Jan 10/02

Number of pages to follow this: 13

This fax sent by: _____. If you have not received all pages please call (867) 982-3310 or 4010

Comments: Re: Bryant Report - Boston Solid Waste Disposal Site

Dionne: Further to our telephone conversation on January 7, 2002, here is the copy of the report.

Regards

Jack

FAX

Bryant
ENVIRONMENTAL
CONSULTANTS LTD.

Date: August 22, 2001

Attention: Jack Kaniak

Company: Kitikmeot Inuit Association - Lands Division

Fax: 1-867-982-3311

From: Wayne Bryant
Bryant Environmental Consultants Ltd.
P.O. Box 1324, 5016 Franklin Avenue (50th Avenue)
Yellowknife, NT X1A 2N9
Fax: (867) 920-7931

Number of pages including cover - 13

Re: Assessment Report on Solid Waste Site at Boston Project

Jack,

Attached is my report minus the photos. I am sending by air courier two bound copies which have the photos. I would welcome your comments. Any questions give me a call.

Regards,

Wayne Bryant

ASSESSMENT REPORT

on

SOLID WASTE DISPOSAL SITE

at the

HOPE BAY JOINT VENTURE BOSTON PROJECT

Prepared for:

Lands Division
Kitikmeot Inuit Association
Kugluktuk, Nunavut

Prepared by:

Bryant Environmental Consultants Ltd.
Yellowknife, Northwest Territories

August 21, 2001

KIA Land Use Division-Hope Bay Joint Ventures
Boston-Solid Waste Site

Table of Contents

1 Background

The Boston Project is located in the southern portion of the Archean Hope Bay Greenstone belt within the Slave Geological Province. Early prospecting in the area began in the 1970s with the Boston gold mineralized zone discovered in 1988. BHP Minerals Canada Ltd. began exploration drilling in 1991 and in 1996 an underground decline was constructed followed by bulk sampling. BHP sold the Mineral rights to the property in 2000 to the Hope Bay Joint Venture (HBJV) who are continuing the exploration and development project at Boston and other nearby Hope Bay belt targets.

In accordance with the terms and conditions of the Nunavut Impact Review Board's Screening Decision of December 15, 2000 and the Land Use License issued by the Kitikmeot Inuit Association (KIA), the HBJV has been collecting solid waste materials from Boston and the nearby Windy Lake exploration camp and shipping the material by barge and aircraft to a disposal site in Yellowknife, N.W.T.. This year Yellowknife is unwilling to accept anymore solid waste from both Boston and Windy. Consequently, HBJV has applied to the Land Use Division of KIA for approval to use an existing unused solid waste site known as Settling Pond South(or # 2) and a proposed new site adjacent to the existing settling pond for the disposal of all non-hazardous wastes that are generated at Boston and other nearby exploration projects areas. Photo #1 shows the location of the settling pond and the proposed area for the proposed adjacent site.

KIA has retained Bryant Environmental Consultants Ltd. (BECL) to undertake the following tasks:

1. Conduct a site assessment of the proposed HBJV solid waste site to determine its acceptability;
2. Provide recommendations on solid waste site design and site operations;
3. Provide recommendations on terms and conditions for the operation and closure of a solid waste disposal facility at the Boston site.

On August 8 and 9, 2001, Wayne Bryant of BECL visited the Windy Lake and Boston areas to have a fist hand look at the proposed solid waste site and to examine the type of waste material that HBJV are proposing to dispose. Discussions on solid waste issues were held primarily with Hugh Wilson, Corporate Environmental Manager for Miramar Mining Corporation and Ted

Mahoney, Project Manager for the HBJV Boston Project.

2 Site Assessment

The Boston property was reached by helicopter from the Windy Lake exploration camp on August 8, 2001. The day was overcast, windy with some intermittent rain. Photos #1, #2 and #3 are aerial views of the Boston property which show the solid waste sites, bulk fuel storage area, the camp and piles of ore brought to surface from the adit.

Photos # 4 and #5 are at ground level showing the proposed location of the new solid waste area adjacent to the settling pond #2. A fairly large area (20 by 40 m) of stained vegetation was noted. This staining can likely be attributed to the release of salty drilling fluids and drill cuttings from boreholes drilled at the time of previous mine lease holders. The proposed area for the solid waste site is generally flat except for a humocky raised mound from the toe of the far end of the bulk fuel berm , about 15 m wide and extending towards the south settling basin for about 40 m. The average height of this mound is 2 m. The area gently slopes towards a lake to the east about 400 m away. With the assistance of Hugh Wilson, a tape measure was used to obtain estimates of the area that could be made available for the disposal of solid wastes. The measurements made are shown in Figure 1 both for the existing Settling Pond # 2 and the area adjacent.

The east berm wall of Settling Pond # 2 is severely slumped. This can be seen in Photo #1. For this site to be used as a solid waste disposal site, this slumped wall needs to be built up and compacted. Moreover, the other berm walls of the Settling Pond #2 need to be compacted and leveled in the same fashion as the berms were built for the bulk fuel site.. At the time of the visit there was a small quantity of solid waste within Settling Pond # 2.

Overall the Boston property appeared orderly and tidy with only a few scattered items of waste lying about. There were two piles of largely scrap metal on the property. (See Photos #6 and #7) According to HBJV, these piles of scrap metal wastes is typical of one of the principal waste streams which they want to dispose in a solid waste site on the property rather than shipping such material out at great expense.

There were several roles of geosynthetic material on the property which could possibly be used as a liner for a solid waste containment area (See Photo # 8). There is also on site an incinerator for burning trash.

Following a walk about of the Boston property, an examination of available topographic maps and review of available information, an assessment can be made on whether the existing settling basin and the adjacent area to the south and immediately east of the bulk fuel storage area berms would be the most acceptable location for a solid waste containment facility.

To the north and west of the Boston site, the lake is a lot closer than from the east side. As well the land slopes at a steeper gradient on the north and west side than at the east. This being the case any runoff or leachate from a solid waste facility will theoretically take less time to discharge into a surface receiving water if the solid waste site is located to the north or west. Therefore, from a drainage perspective a solid waste site on the east would be preferable.

To the south, there exists an access road leading to a storage area for winter road operations. A solid waste containment area could be built along this road but would utilize more granular construction material to build the necessary berm containment walls. The site on the east side has the advantage to utilize the already built berm for the bulk fuel storage area. that can serve as the containment wall for the west side. Therefore, structurally the east side is the most suitable location. Another advantage for the proposed east side location is that a good part of the land that would be used to contain solid wastes has already been negatively impacted as result of past drilling operations.

One possible limiting factor in having a solid waste containment facility at Boston is the availability of construction material to build the containment berms and for cover material. There are no nearby eskers that could be used for sand and granular material. As well there are no known extensive clay deposits. HPJV has advised that they are proposing to use low grade ore that is stockpiled on the surface and some that is still underground to build the solid waste site and for use as a cover material. Information on the total amount of low grade ore that is available for use in a solid waste site was not made available at the time of preparation of this report. Based on past investigations, HBJV has advised that the low grade ore is not acid generating but over time certain heavy metals such as nickel and arsenic may leach out with runoff water. This being the case a groundwater monitoring program should be implemented if a solid waste containment site is built at Boston using low grade ore materials.

Another available source of construction material would be to use some of the crushed rock material that currently serves as the foundation base for the entire Boston camp. There is a rock crusher on site which could also be used to produce additional aggregate from local rock services At the present time, this rock crusher is not serviceable and requires repairs.

At the time of the visit, there was no work crew on the property. The exploration workforce (about 50 people) are now located at the Windy Lake camp which is about 50 km north of Boston. At Windy there is also several accumulations of waste material (See Photos # 9 and #10). This material consists of scrap metal, drums filled with incinerator ash, rubber tires, wooden crates and bits of plastic material. It is the intent of HBJV to transport by winter road the waste material from Windy to an approved solid waste site at Boston.

[redacted] Bryant [redacted]

Like Boston, there is an incinerator at Windy (See Photo # 11). According to Ted Mahoney the incinerator produces one 45-gallon drum of ash per week.

HBJV are undertaking a number of recycling initiatives that is reducing the waste volume generated. These initiatives are:

1. Installation of a waste oil burner which will generate supplementary heat for the camp. This unit was being installed on August 9, 2001.

2. Utilize empty drums, cut in half, and use as drip catchment basins to prevent spills from fuel lines (See Photo # 12).

3. Reducing the amount of diesel barrels required on site by deploying bulk double walled tanks which will be filled using tankers brought in by winter road from fuel barges anchored off the coast.

4. Utilizing ceramic cups instead of Styrofoam containers.

3 Recommendations on Solid Waste Site Disposal Design and Operations

In considering a solid waste disposal site at Boston, the first recommendation is that owing to the permeable nature of the available berm construction material (crushed ore and rock), the site should only be used for the disposal of inert material. Inert Waste is defined in the Waste Control Regulations of Alberta (June 2001) as:

(a) A waste that is solid; and
(b) A waste that, on disposal in a landfill, is not reasonably expected to undergo physical, chemical, or biological changes to such an extent as to produce substances that may cause an adverse affect, and includes, but is not limited to demolition debris, concrete, asphalt, glass, ceramic materials, scrap metal and dry timber or wood that has not been chemically treated, but does not include hazardous wastes.

The type of waste that is generated at Boston and Windy that fits the inert waste definition in the opinion of BECL includes material such as: scrap metal, tires, incinerator ash, plastics, crushed fuel drums that have had all fuel residues completely removed, glass, concrete and wood. Material that should not be disposed at a solid waste facility at Boston would include: wet garbage, drilling fluids, spent geological lab chemicals, batteries, waste oils, plastic containers containing residual greases, hydraulic fluids and specialty oils, any liquids such as spent glycols, paints, containers containing any residues of cleaning, solvent products and any aerosol

containers. All of the aforementioned could be considered hazardous waste material.

There are no established standards, regulations or guidelines in the N.W.T. and Nunavut with respect to the design and operation of landfill or solid waste disposal sites other than the Guidelines for the Planning, Design, Operation & Maintenance of Solid Waste Modified Landfill Sites in the Northwest Territories (March 1990) published by the Department of Municipal and Community Affairs, GNWT. These guidelines do not differentiate between inert and hazardous wastes and are applicable to only northern municipalities. There are proposed standards and guidelines for landfills in Alberta which has classified landfills by the waste it can receive. The required design elements for each Class of landfill is described in these Alberta standards. A Class III landfill can only accept inert waste and is designed to provide for total containment of the waste disposed. In comparison Class I and II Landfills are designed with liners and leachate control and treatment systems in place. A Class I Landfill can receive both hazardous and non-hazardous wastes. BECL is recommending that the Class III design standard be adopted for receiving inert waste at a Boston solid waste site.

The primary factor in designing a solid waste disposal facility is in determining future capacity requirements. In an interview with Ted Mahoney of HBJV, he suggested that to forecast future generation rates for Boston and Windy assume that in the future Windy would operate a 50 person camp for a period of 180 days per year and at Boston there would be a 50 man camp for 120 days per year. While it is very difficult to forecast how long a time an advanced exploration project would take, Mr. Mahoney suggested that for forecasting purposes using five years from now as the duration of the exploration at Boston and Windy would be a reasonable time frame.

A detailed study by Heinke and Wong (1989) of the composition and generation rates for solid wastes at three Nunavut communities, Iqaluit, Pangnirtung and Broughton Island recommends that a figure of 0.014 m^3/person/day should be used as a typical waste production rate. For lack of a better number BECL has elected to use this value in estimating capacity requirements for a solid waste site at Boston.

The estimated total capacity for a solid waste site at Boston is calculated as follows:

Boston	0.014 m^3/person/day x 50 persons x 120 days/year x 5 years = 420 m^3
Windy	0.014 m^3/person/day x 50 persons x 180 days/year x 5 years = 630 m^3

An estimate of the amount of inert waste that is currently at both sites is 256 m^3 (four piles of scrap 8 m by 4 m by 2 m). Owing to the bulky nature of the waste, a 15% void factor should be added for determining total capacity.

KIA Land Use Division-Hope Bay Joint Ventures
Boston-Solid Waste Site

Total waste volume capacity at Boston over the next five years is:

$$(420 + 630) \times 1.15 + 256 \times 1.15 = 1387\ m^3$$

In Figure 1, the total available volume for the Settling Pond #2 and the adjacent area to the south that was measured on August 8, 2001 was calculated. Total available volume in the settling pond is 532 m^3 and the volume for the addition if constructed in two cells is 1489 m^3. If one utilizes just the Settling Pond #2 and the first cell which goes as far as the mound area there is 1394 m^3, which is very close to the total estimated waste generated over a five year period.

In Figure 2 is the actual surveyed measurements conducted by HBJV this year for their proposed solid waste site at Boston. If we use these actual measurements the proposed volume capacity is 43 m x 11.5 m x 3 m = 1483.5 m^3 which is not too far off from that measured by BECL. It is recommended then that the area surveyed by HBJV should be used as the footprint for the solid waste site at Boston.

It is further recommended that the berms of the solid waste site should be constructed with the available crushed ore and rock material with outside and inside slopes of 3:1 H:V. The crest of the berms should be a minimum 3 m wide and the base of the berms 9 m. This will require a minimum of 1500 cubic meters of crush to construct the berms. The berms need to be compacted with the mobile heavy construction equipment that is on site. Failure to provide the recommended slopes and compaction may lead to slumping and erosion of the berms.

The recommended sequence of operations for the Boston solid waste site follows:

1. Repair the slumped east berm of the Settling Pond # 2;
2. Compact the berms of the Settling Pond.;
3. Dispose of accumulated inert waste material in 2001 and 2002;
4. Fill settling pond with inert waste until capacity is reached sometime in 2002;
5. Cap the settling pond with a minimum of 0.75 m of crush, then compact;
6. Begin construction of the adjacent addition to the south. The existing bulk fuel berm (the west side) should be incorporated into the final design of the landfill. As well, if feasible the crush material of the south berm of the settling pond could be partly removed and utilized to construct other berm walls.

7. Complete construction of the new solid waste containment area berms before any inert waste is deposited..

8. Once completed, deposit inert waste in new area. The waste material should be placed evenly and not dumped into one big pile. To minimize wind blown litter and dust, interim cover of .3 m should be periodically placed over the exposed waste.

9. Install groundwater monitoring wells.

10. Prepare Final Solid Waste Closure Plan for Review by KIA Land Division

4 Recommendations for Terms/Conditions

If the recommended solid waste site as described herein is found acceptable to KIA Land Use Division, some suggested terms/conditions with respect to the site operation for a land use permit amendment follows:

1. Only inert waste as defined herein is to be disposed at the site; Only fuel drums in which all residue has been removed by cleaning or burn off prior to crushing and then crushed will be considered an inert waste.

2. The operator must maintain side slopes of 3:1 for the containment walls of the facility;

3. To minimize wind blown litter and ash, exposed waste is to receive periodically an interim cover of crush 0.3 m thick;

4. Waste material deposited in the containment are shall be evenly spread and not allowed to build up in one location;

5. The following materials are not permitted for disposal at the solid waste site: wet garbage, drilling fluids, spent geological lab chemicals, batteries, waste oils, plastic containers containing residual greases, hydraulic fluids and specialty oils, any liquids such as spent glycols, paints, containers containing any residues of cleaning, solvent products and any aerosol containers.

6. Two groundwater wells are to be installed to the east of the solid waste site. One will be installed at the toe of outer east berm wall and the other installed 50 meters due east of the first monitoring well. Samples are to be collected twice a year: once during the spring melt and once prior to freeze up. Samples are to be analyzed for the following parameters: salinity, conductivity, pH, ammonia, total dissolved solids, total arsenic and dissolved metals.

7. Once full capacity of the solid waste containment site has been reached, a final cap of 0.75 m of crush will be placed over the area and compacted.

8. The operator is to provide a final closure and restoration plan for the solid waste site within four years.

5 Assessment Summary

The conclusions from this assessment are:

a) It is feasible to construct and operate a Class III solid waste site at Boston.

b) From an environmental and engineering perspective the preferred location for the site is on the east immediately adjacent to the bermed tank farm.

c) Only inert materials as defined herein should be allowed to be disposed at the site.

d) The preferred site at Boston has sufficient capacity to contain five years of inert waste material.

e) The principal limitation to the construction and operation of a solid waste containment facility at Boston may be the availability of suitable construction material.

Respectfully submitted,

Bryant Environmental Consultants Ltd.

Wayne Bryant, P.Eng.

REGISTERED PROFESSIONAL ENGINEER
W. J. BRYANT
N.W.T.

Figure 1. HOPE BAY JOINT VENTURE
Proposed Solid Waste Disposal Site

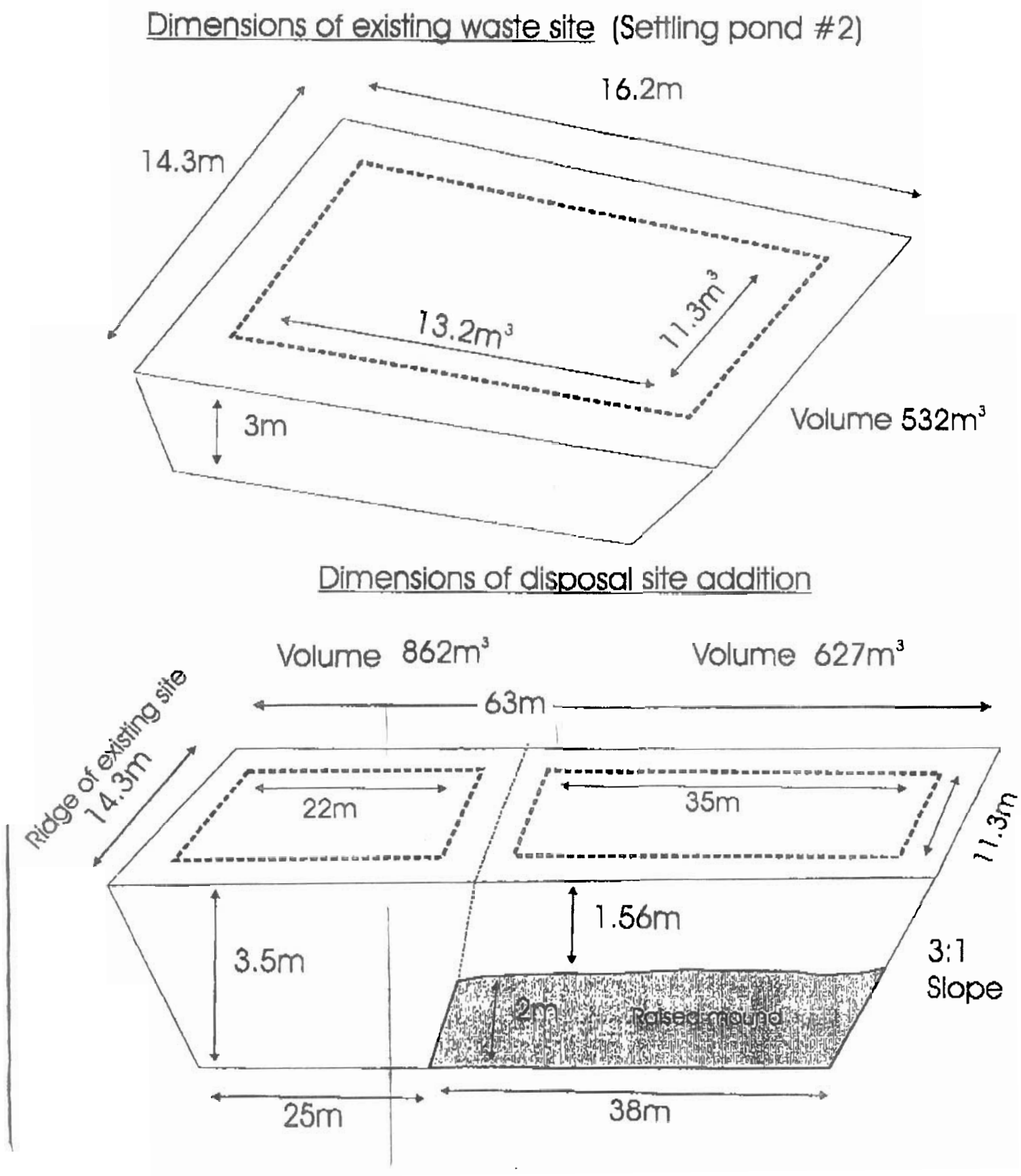
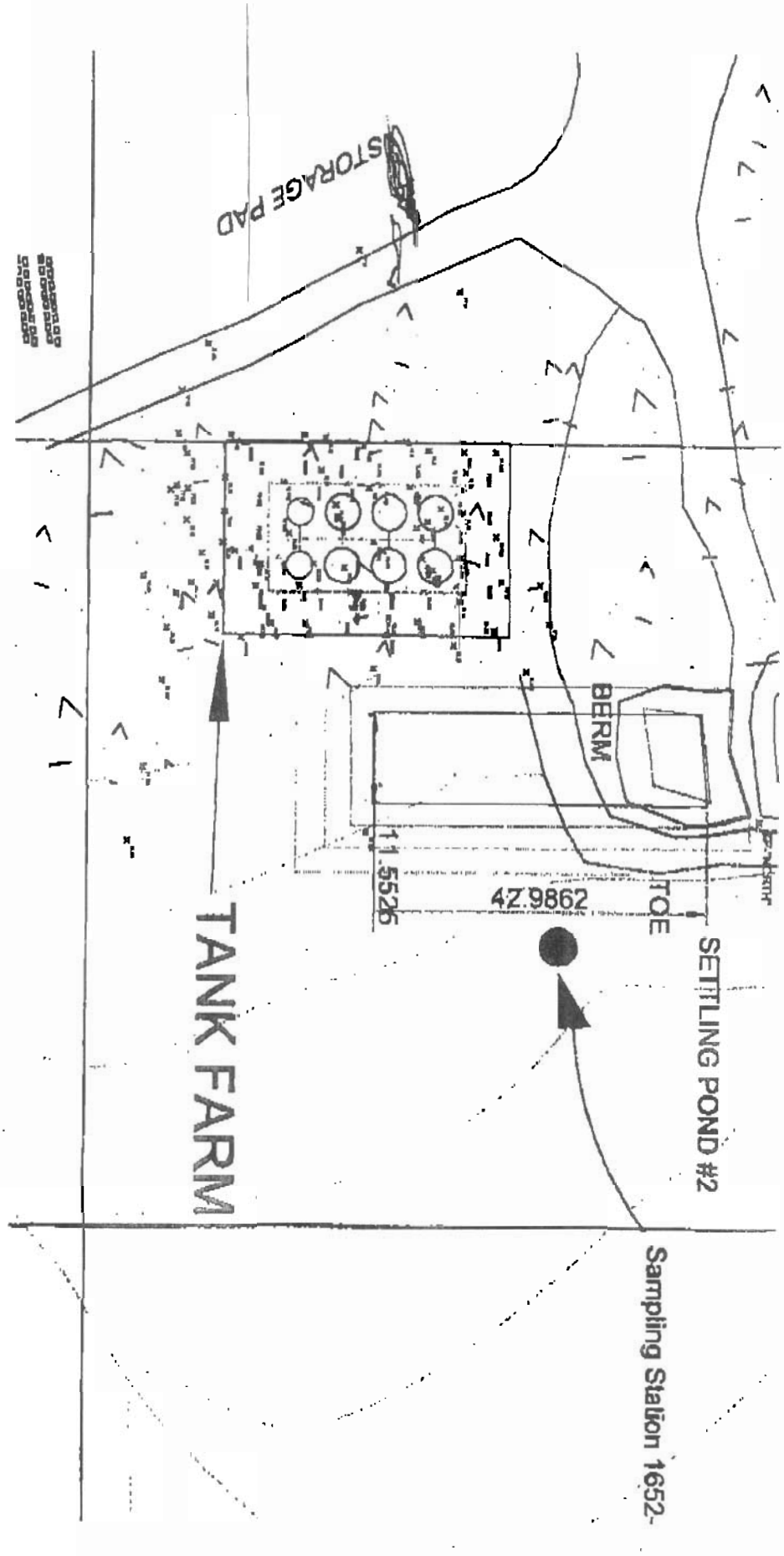


Figure # 2


STORAGE PAD
BERM
TOE
SETTLING POND #2
TANK FARM
Sampling Station 1652-