NOI
373

WESTERN MINING CORPORATION LIMITED

(INCORPORATED IN VICTORIA)

(KAMBALDA NICKEL OPERATIONS)

NOTICE OF INTENT

FOR THE CONSTRUCTION OF

NO. 3 TAILINGS DAM

AT

WESTERN MINING CORPORATION LIMITED

KAMBALDA NICKEL OPERATIONS

30TH MARCH, 1989

KAMBALDA NICKEL OPERATIONS
TAILS DAM EXTENSTION

FILE NO: 557/89

NOTICE OF INTENT

FOR THE CONSTRUCTION OF

NO. 3 TAILINGS DAM

AT

WESTERN MINING CORPORATION LIMITED

KAMBALDA NICKEL OPERATIONS

30TH MARCH, 1989

TABLE OF CONTENTS

1.0 OBJECTIVE

Extension to Kambalda Nickel Operation's, Tailings Retention System including construction of a 1500m x 450m starter embankment and water recovery system for the purpose of disposing of nickel tailings.

The basic objectives for the dam are:-

(i) to provide a stable and safe storage of tailings to a height of not less than 45 metres;

(ii) to maximise water recovery from the tailings and to minimise contamination of tailings water from the natural groundwater;

(iii) to maintain environmentally sound conditions during construction, operation and decomissioning of the dam.

2.0 LOCATION

Kambalda is located 600 Km east of Perth, 300 Km north from the Southern Ocean and 60 Km's south of Kalgoorlie.

The tailings dam will be located on a portion of Exploration Licence 15/56 approximately 4 kilometres north of Kambalda Nickel Operation's main office. The dam will adjoin the north face of existing tailings dams and is bounded to the east by Lake Lefroy, and to the north and west by an extensive drainage system.

3.0 HISTORY

The absence of deep valleys has led to construction of tailings dams on flat to gently sloping land, with a low protective bund to retain any accidental spillage of tailings. The gold tailings dams are similar to those developed in South Africa. They are hydraulic fill structures which progressively rise to ensure that surplus tailings and water is completely retained within the discharge area. The dams are generally square or rectangular in plan, and the tailings slurry is discharged sub-aerially from a perimeter pipeline.

These old gold tailings dams have generally been stable structures during operation. Disused dams have suffered from wind and water erosion and much work is currently in progress to reduce the dust problem around Kalgoorlie.

4.0 EXISTING FACILITIES

The original tailings dam (No.1) has been operating since 1973 and is currently 30m high and has a surface area of approximately 24 hectares.

A geotechnical investigation was completed in October 1985 with the following conclusions and recommendations:-

(i) stability analyses indicated the dam wall could be raised to 45m vertical height;

(ii) tailings bunds should be constructed to 2m in height in 3 construction lifts;

(iii) borrowed tailings should first be scarified to enable better drying then removed from shallow trenches;

(iv) the central water pond should not be permitted to encroach within 100m of the dam perimeter for any extended period;

(v) dressing of external walls with course rock should continue.

In 1981 construction was completed on the (No.2) tailings dam to the east to provide for the introduction of gold mining/processing at Kambalda.

This dam provided a horizontal base of 43 hectares area and included a sophisticated water recovery system, including underdrainage and decant, to maximise water recovery and stabilise the dam.

Currently the No.2 dam is approximately 15m high with an available surface area of 33 hectares.

5.0 GEOLOGY

The site is underlain at depth by Archaean sediments that have been considerably altered and deeply weathered. These metasediments are overlain by a variable thickness of transported sandy loam with calcareous nodules that has been produced by insitu weathering. The type of metasedimentary rock appears to vary across the site with bands of shales, sandstones and arkoses with a north-northwesterly regional trend.

6.0 HYDROLOGY

1. Surface

The area of the dam contains several ephemeral stream courses that enter Lake Lefroy, and the edge of the lake impinges on the south east corner of the dam. Run off water in the stream is highly saline because of the large salt content stored in the beds and banks. The soil itself contains a significant salt content, which is becoming concentrated in the stream courses.

The lake itself is a basin of vast internal drainage that acts as a giant evaporating pan, and concentrates salt to the stage of saturation. However, following heavy rainfall in the catchment the lake floods with a maximum rise of some 3m. The process of evaporation and concentration then begins again, but as evaporation exceeds precipitation by a factor of 12, the usual state of the lake is dry with a salt crust.

2. Underground Water

There is a very shallow water table in the vicinity of the lake fringes. This is a perched table, running off on the weathered shales under the superficial soils. The water is highly saline - of the order of 200,000 T.D.S., and a pH of 7. The position of the perched water table is marked by a ferruginous cement. The true ground water is encountered in mining operations to the west and is also highly saline.

3. Recharge

Because of the low average rainfall experienced in the area and the depth to the water table, recharge to the groundwater at this site will be an extremely rare event. This is confirmed by the high salinity of the groundwater. In arid or semi-arid regions accretion to groundwater usually occurs at sites where run-off from surrounding areas is concentrated in stream channels and flood out areas.

7.0 CLIMATOLOGY

The climate is semi-arid to arid with an average annual rainfall of 250mm and class A pan evaporation of 2500mm per annum.

The Eastern Goldfields suffers from the great distance to the western coast, and by the time the westerly winds reach the area they have very little moisture left. As in the wheat belt there is a minor increase in the rainfall during February and March followed by a decrease until the winter rains become established in May.

The winter is cooler than in Perth, and frost occurs on about 7 days a year in the winter months, but hot days are frequent in summer. January has about 24 days over 30°C and 3 days over 40°C. The climate, being controlled by continental air, is dry, cool in winter and hot in summer. When maritime air is brought in by westerlies or when tropical or equatorial is brought in by tropical cyclones, conditions change and there is some himidity, but it does not last long.

8.0 FLORA

The vegetation is open sclerophll woodland with low scrub, and with saltbush on sandy stream courses and lake shores. Eucalypts are sparse with salmon gum, blackbutt, gimlet and morrel. Jam (a species of acacia) occurs on the marginal sand plain domain.

9.0 FAUNA

No native fauna except birdlife was sighted in the course of the site inspections but kangaroos and small native mammals could be expected here along with a diverse reptile fauna. A variety of birds have been seen in the area, including lorikeets, various honeyeaters, butcherbirds, Australian crows and white rumped miners.

10.0 DESIGN CONCEPT

The No.1 tailings dam has almost reached an inoperable stage due to the rapidly diminishing surface area. The No.2 dam is, alone, not sufficient to maintain Kambalda's production.

The construction of the No.3 dam will provide an additional surface area of 65 hectares. At current production rates the total storage area will be sufficient for 25 years.

The No.3 dam will be utilised such that it approaches the No.1 and No.2 dams in height, until an integrated area is available, approximately square in shape to ease management.

The starter embankment will be constructed to R.L. 293 metres which will provide 12 months storage of tailings. In this time the deposited tailings on No.2 dam will dry sufficiently to enable the next bund lift.

A cut-off into weathered sediments is required to prevent the loss of seepage water and the ingress of saline groundwater.

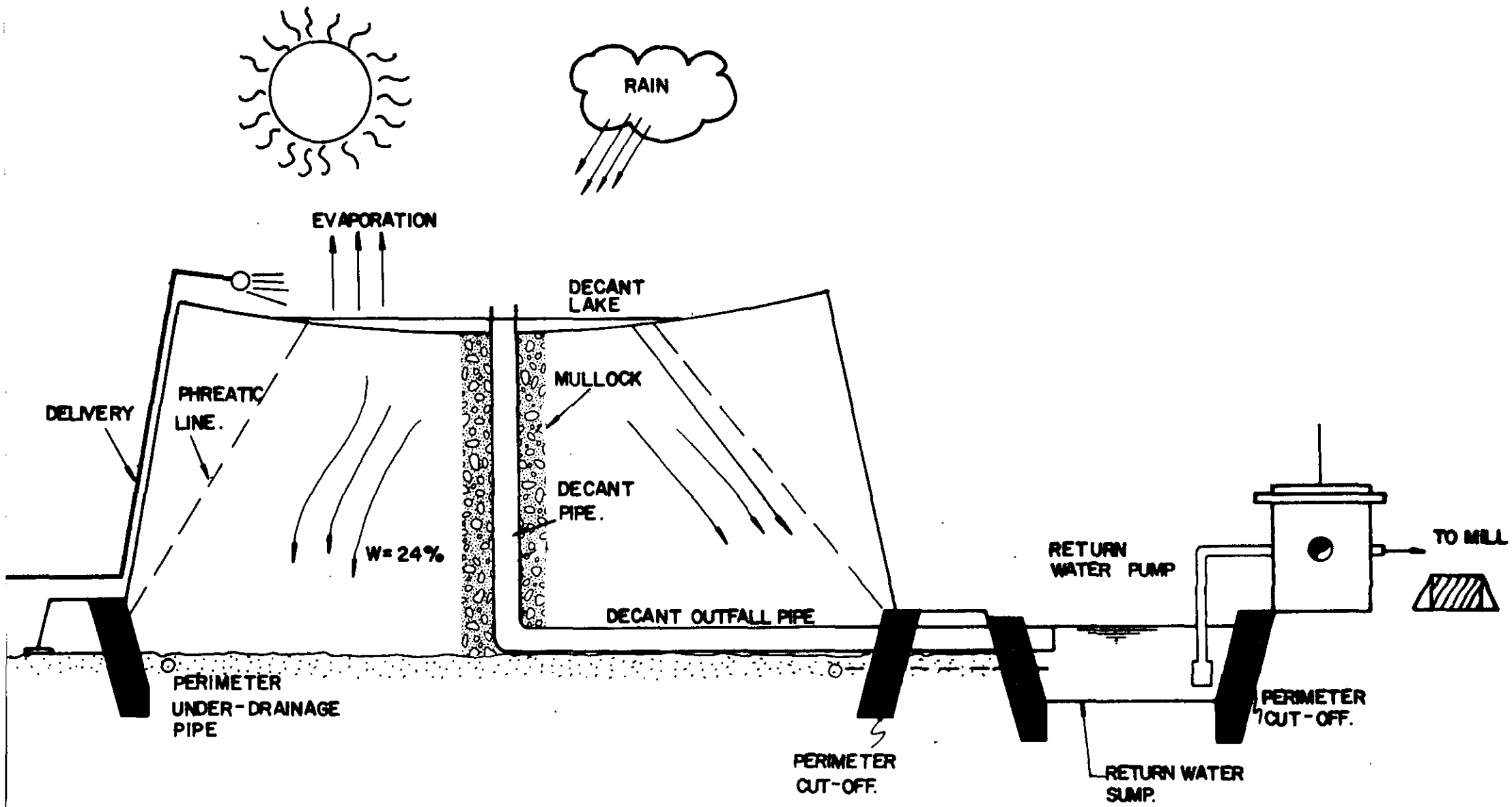
The upstream method of tailings construction will be utilised whereby deposited tailings will be used for ongoing lifts.

The water recovery system comprises of 3 basic components.

(i) an underdrainage collection pipe connected hydraulically with the natural sand blanket over the site;

(ii) a decant system to withdraw surface water from the settled tailings;

(iii) a collection sump and pump installation for the controlled return of water to the milling operation.



WATER RECOVERY

FIGURE 1.

11.0 SITE CONDITIONS

North of the dam there is a well developed ephemeral stream system draining into Lake Lefroy at the southeast corner of the site. The whole site slopes generally southward to the lake except for a northerly trending spine (which rises to R.L. 291) that divides the site so that drainage is towards the southwest corner and also towards the southeast corner. The site is covered intermittently by low trees, scrub and spinifex.

The topsoil, 0-200mm, is a loosely packed wind-blown sand (unsuitable for re-growth) existing over the whole site area except for small clay pans. The underlying soils consist of a red-brown sandy gravelly loam with a variable component of calcareous (calcrete) gravel nodules. In the north-eastern quadrant the sandy gravelly loam is overlain by a lateritic sandy gravel. A very hard cemented ferruginous sand (ferricrete) is encountered at some 2.5 to 4 metre depth. Below the ferricrete is the top of weathered Archaean sediments. This material is in the form of a micaceous clay and silty clay. The weathering decreases at depths of 20 metres and greater. This clay is saturated at its upper surface. Intermittent pockets of ferruginous material are encountered within the top 3 metres of residual clay. Fresh rock was located at a depth of 30 metres.

X-ray diffraction analysis confirmed the clay to be a quartz kaolinite with muscovite and sodium chloride. In some sample hematite was present also. Felspars occurred only from samples taken at depths of 20 metres or greater.

There is a perched water table of highly saline groundwater (200,000 mg/L of total dissolved salts) on top of the weathered sediments. The water table slopes from north to south with the southern boundary condition controlled by Lake Lefroy.

Flooding of Lake Lefroy could, on rare occasions, innundate part of the site. Detailed hydrometeorological studies, supported by botanical and erosional evidence, indicated a maximum flood level of R.L. 290, with a return period in excess of 1000 years.

The risk os seismic shaking and rock burst from mining at Kambalda was considered in detail by F.R. Gordon who recommended that a seismic co-efficient of 5% g should be adopted for design purposes for this site.

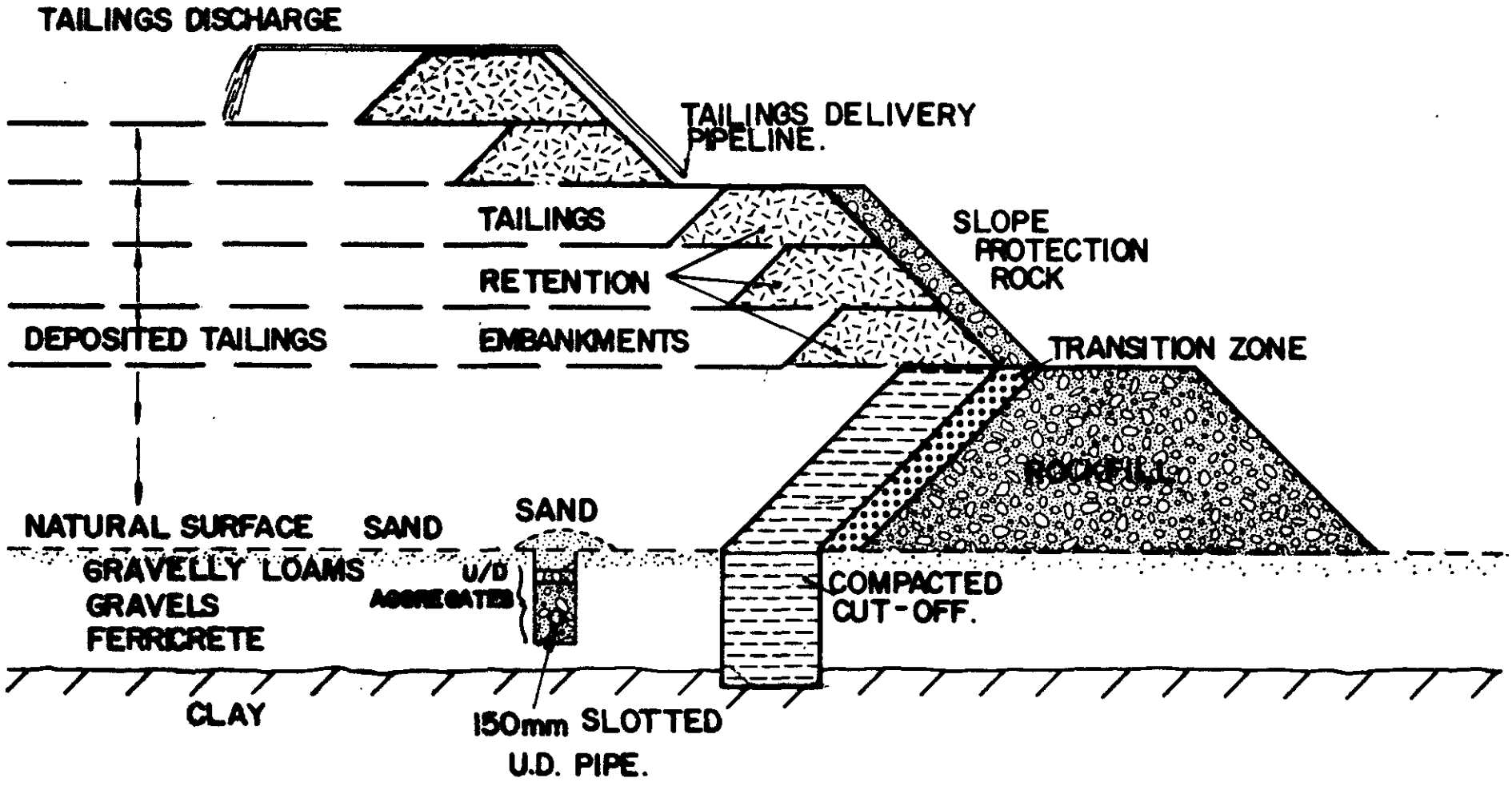
12.0 TAILINGS MANAGEMENT

The upstream method of construction will be employed so as to maintain an external slope of 26.5° to the horizontal by proceeding in the steps of 5 metres wide berms for every 5 metres of vertical rise.

The tailings will be pumped as a slurry of approximately 53% solids, and deposited sub-aerially and spirally in layers not exceeding 500mm. The tailings will then be allowed to drain and desiccate before it is covered with the next layer.

From experience it is expected to recover about 36% of the water in the slurry while 40% is lost through evaporation, and 24% remains in the tailings. Following decommission this will continue to drain through the underdrainage system to a stable mass.

Deposition will be fluctuated between No.1, No.2 and No.3 dams, with No.3 increasing at the fastest rate so as to integrate with No.1 and No.2 at a latter date.



TYPICAL SECTION

THROUGH PERIMETER EMBANKMENTS

FIGURE 2.

13.0 ENVIRONMENTAL MANAGEMENT

The location of tailings dams in Kambalda have been placed strategically to, inter alia, lessen the impact on the evironment and screen the structures from normal public thoroughfares. The following guidelines will be set for the construction, operation and decommissioning of the dam:-

(i) there is no disturbance of the vegetation and soils outside the limits of works;

(ii) maximum use is made of on-site and waste materials;

(iii) there is no discharge of tailings water to the groundwater or to Lake Lefroy;

(iv) external slope protection from wind and water erosion is to be provided by the placement of a layer of coarse waste rock;

(v) on decommissioning, the tailings should drain to a stable mass. The top surface will be stabilised as necessary to prevent wind erosion.

The tailings will also be protected from the environment, such that water recovery is optimised, by:

(i) dividing the extension to reduce the surface area to minimise water loss through evaporation;

(ii) ensuring recovering of underdrainage water without contamination from the highly saline groundwater.

14.0 SOCIAL IMPACTS

(i) The land has not been used for any particularly purpose in the past, and is subject to erosion and degradation from sheet flooding during rainstorms in the local stream basins.

(ii) The site of the tailings dam is not the scene of any known recreational activity. Lake Lefroy, to the south, is used for dry land sailing and this has been elevated to become a tourist attraction.

(iii) There are no known Aboriginal or Archaeology sites in the area.

(iv) There is no aesthetic or human interest attributes associated with the area.

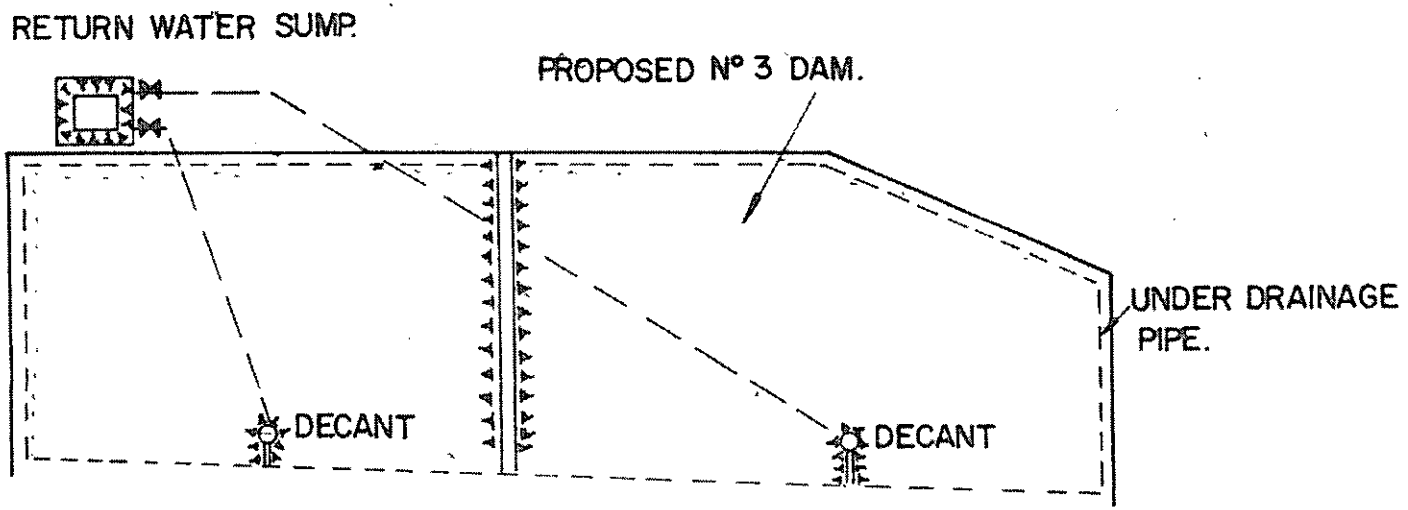


FIGURE N° 3

N° 3 TAILINGS DAM


UAG II 3126 153,76
6719-6722
31.12.87
RUN
6200' A.S.L.
RF 1:10,000
AERIAL SURVE