#870 ~~#869~~

CROWS NEST RESOURCES LTD.

TELKWA COAL PROJECT

GEOTECHNICAL, HYDROGEOLOGICAL & HYDROLOGICAL DESIGN REPORT

SUMMARY & RECOMMENDATIONS FOR WORK SYSTEMS APPROVAL

JANUARY 1985

PA 1692 OH

KLOHN LEONOFF
CONSULTING ENGINEERS

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

To: All Inspector's of Mines and Resident Engineers Date: November 28, 1983

#869 D.F. Our File:

Subject: Guidelines for Approval of Main Surface Haul Roads Regularly Used for the Transportation of Mineral or Waste at Mines

Blue File 1.
Xref. 1-1.

The following guidelines have been prepared in order to give Inspectors of Mines and companies operating or developing mines an indication of the type of main surface haul road which will require the approval of the Chief Inspector. Access roads, not used for main haulage, may be considered to be part of the general mine plan and do not require any specific approval of this sort.

Details shall be sent to the Chief Inspector and his approval shall be obtained before commencement of construction of any haul road regularly used for the transportation of mineral or waste and having one or more of the following features.

1. Fill

   A haul road to be constructed with a maximum depth of fill in excess of 15 metres or a height in excess of 50 metres between crest and toe.

2. Cut Depth

   A haul road to be established with a cut face exceeding 15 metres in height.

3. Avalanches and Landslides

   A haul road which is located in the path of known avalanches or landslides.

4. Watercourse Crossings

   A haul road crossing either a perpetual stream or any intermittent water course in which the maximum flow rate could exceed one cubic metre per second.

An application for the Chief Inspector's approval must include the following details:

(a) Plans and sections showing topographical and stratigraphical details.
(b) The cut and fill of the road, both in section and centreline profile.
(c) Surface watercourses (including estimated flow rates).
(d) Proposals for diversion ditches, drains, culverts, and bridges.
(e) An engineering report on the stability of high cuts, deep fills, and steep cross slopes.
(f) Means of protecting against avalanches and activated landslides.

W. C. Robinson

W. C. Robinson, P.Eng.,
Chief Inspector of Mines

WCR:RTM:kw

Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources

Parliament Buildings
Victoria
British Columbia
V8V 1X4

Rm. 105 - 525 Superior Street, Victoria, B.C. V8V 1T7

#870

November 30, 1984

Mr. H. G. Rushton
Vice-President Development
c/o Crows Nest Resources
P. O. Box 2699 - Station M
Calgary, Alberta
T2P 3Y9

Telkwa
Crowsnest Res

Dear Mr. Rushton:

Re: Telkwa Coal Project

As I had promised at the meeting convened yesterday to consider Telkwa, I am enclosing herewith one copy each of:

(1) "Guidelines for the Design, Construction, Operation, and Abandonment of Tailings Impoundments," issued by the Chief Inspector of Mines on December 30, 1983; and

(2) "Guidelines for Approval of Main Surface Haul Roads Regularly Used for Transportation of Mineral or Waste", issued November 28, 1983, by the Chief Inspector of Mines.

These documents are commonly known as the Tailings Guidelines and the Surface Haul Road Guidelines, respectively. They are now generally distributed to proponents within the guidelines approvals process, but you might not have received them for some reason. Enclosure (1) will assist you at both Stage II (See Section I.1.) and III, and enclousre (2) will be useful in your subsequent application for approval of the mine plan. I hope that you and your consultants will find these guidelines helpful, and if you have any questions on their interpretation you may contact me directly.

Thank you very much for arranging the meeting yesterday. I am sure that much good will come from it. I shall look forward to receiving the minutes from Malcolm Ross.

Yours very truly,

R. T. Martin, P.Eng.
Senior Geotechnical Inspector

RTM:blh
Encl: (2)

cc: T. Vaughan-Thomas, Inspector of Mines & Resident Engineer, Pr.George

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

#870

TO: Participants
Mine Development
Review Process

December 27, 1984

Re: Telkwa Coal Project

Attached please find the following documents:

(i) letter, H.G. Rushton (Vice-President of Development, Crows Nest Resources Ltd.) to myself, 84-12-04;

(ii) a three-page "Summary of Changes in Project from Stage I Submission"; and

(iii) a map entitled "Mine Infrastructure Map".

The purpose of the documents is to update MDRP participants on some changes in project design since the Stage I report was reviewed.

If, after reviewing the update, you feel that it is necessary to revise your Stage II information requirements, please notify me of any changes as soon as possible. It is our understanding that the company will be visiting key MDRP contacts early in the New Year to obtain some feedback directly. The Stage II submission is currently scheduled for completion by March of 1985.

Yours truly,

Raymond L. Crook

Raymond L. Crook
Secretary
Mine Development Steering Committee
c/o Mineral Policy & Evaluation Branch

Attachments: see memo.

Distribution: see attached list

RLC:ljg

DISTRIBUTION LIST

All items, including map.

J. Dick (6 copies)
Earle Warnock (4 copies)
Jake McDonald (2 copies)
V. Dawson (4 copies for: ✓
- R. Bone
- M. Galbraith/B. Gordon
- T. Vaughan Thomas/D. Turner
- R. McGinn)
T. Carter
M. Ito (2 copies)
Alec Matheson
Cynthia Hawksworth
Harvey Sasaki
Roy Addison
J. Bones/W. Hubbard
Roger Norrish
M. Kent
Brian Apland
Paul Pallan
F. Boyd (2 copies)

Items (i) and (ii), but not map.

L.E. Sivertson
Bruce Garrison
J. Schuyff
E. Pietrasek
M. Sakamoto
J. Bones/K. Koncohrada

Crows Nest Resources
LIMITED
Eau Claire Place, 525 - 3rd Avenue S.W., Calgary, Alberta (403) 232-4355
P.O. Box 2699, Station M, Calgary, Alberta T2P 2M7 Telex 03-822505

December 4, 1984

Mr. R.L. Crook, Secretary
Coal Guidelines Steering Committee
Mineral Policy & Evaluation Branch
Mineral Resources Division
Ministry of Energy, Mines & Petroleum Resources
Parliament Buildings
Victoria, B.C.
V8V 1X4

Dear Sir:

Subject: Telkwa Project

We are now at a point in design of this project that certain changes from our Stage I project size and in layout will be included in our Stage II submission.

In order that you and the other members of the Committee are aware of these changes, we have prepared the attached summary. Along with this summary, we are also including an up-to-date site plan. Needless to say, all of these items will be dealt with in greater detail in the actual Stage II submission, but we felt that this present material would provide a useful basis for ongoing discussions with the various agencies involved as preparation of Stage II continues.

Yours very truly

H.G. Rushton
Vice President - Development

Enclosures

C2/dd.1

TELKWA PROJECT

SUMMARY OF CHANGES IN PROJECT FROM STAGE I SUBMISSION

1. Coal Markets

At the time that Stage I was submitted, it was still anticipated that market demand would be sufficient to absorb Telkwa coal in the latter half of the 1980's. During the first half of 1984, a review of likely demand and of available surplus supply, particularly in the Pacific Rim, indicated that prices for thermal coal were likely to remain depressed for the next several years. Accordingly, it was concluded that commitment of the Telkwa Project for construction was likely to be delayed until the later 1980's or early 1990's, despite the relative competitive advantages. However, the company has elected to proceed with submission of its Stage II approval, in order that the project will be in a position to proceed, when appropriate, in as rapid a time frame as possible.

2. Public Information Programs

The public contact and information programs continued throughout 1984. However, the open house scheduled for 1984 will be delayed into early 1985, prior to submission of the Stage II documents.

3. Project Schedule

It is now intended to submit Stage II near the end of the first quarter of 1985. While some permitting can be done following government approval, detailed design and project commitment timing are dependant on the market considerations set out in 1 above.

4. Contact Person

This should be amended to M.K. Ross, at the same address.

5. Geology

The 1984 drilling program was successful in locating additional reserves of coal in Seam #1 north of the East Goathorn pit.

6. Mining Locations

In essence, mining both east and west of Goathorn Creek will take place as in Stage I. However, mining will proceed in a total of six pits, three (1,2 and 3) located east of the creek, and three (4,5 and 6) located west of the creek.

Pit #3 will be mined continuously through the 20 year life of the project, initially in conjunction with Pits #1 and #2 and later in conjunction with Pits #4, #5 and #6. Consequently, there will be no need to cross Goathorn Creek at the initiation of the project. Pit #3 will be developed across its full width at its northern end and will advance in a southerly direction.

7. Mine Plan

Detailed review of the costs of mining the multi-seam, faulted Telkwa deposit indicated that coal which dips east and also thins down-dip adjacent to Pit #3 was not economic. The annual production has thus been finalized at 750,000 tonnes of clean coal. The overall strip ratio (bcm per tonne clean coal) is 8.2. This apparent large increase in ratio from the 5.6 figure given in Stage I is caused by more detailed mine design, pit ends and ramps, and better definition of plant recovery including dilution material.

8. Mining Method

There is no basic change in the proposed mining method. Loaders and trucks, with auxiliary equipment, will handle the overburden, and only minor blasting is anticipated. Pits will be backfilled as space becomes available.

9. Preparation Plant

The plant location indicated in Stage I has been changed. Two factors influenced this choice, namely the delineation of additional coal in Pits #1 and #2, north of the previously indicated mining area and difficulty in attaining suitable railway grades from the main line to the previous plant site.

Detailed work on bulk samples indicated several changes in the plant flow sheet from that outlined in Stage I. The coarse coal will be cleaned by a heavy media cyclone rather than a heavy media vessel, while fine coal cleaning will take place in water only cyclones without use of heavy media. All dewatering of product coal will be accomplished mechanically, and it has been confirmed that no thermal dryer will be required. The clean coal product will be stored in a silo while awaiting shipment.

Refuse from the plant coarse circuit and from the thickener will be disposed of either in the external waste dumps or within pits as these are backfilled with overburden. While it had been hoped to use pressure filters to recover the remaining fine refuse in a semi-dry form, detailed work indicates that this equipment is not efficient on the materials encountered at Telkwa, and would result in excessive re-circulation of fine material back to the thickener. The end result would be that the circuit would need to be purged frequently to a tailings pond. Accordingly, the final design discharges the thickener underflow directly to a tailings pond, with appropriate flocculation treatment and recycling of properly clarified water to the plant.

10. Transportation

As noted in 9 above, the railway spur has been moved to the north side of the eastern transportation corridor to achieve acceptable grades. This route also minimizes potential conflicts with Hubert Creek and with moose habitat. Vehicle and personnel access will be from Coal Mine Road.

11. Utilities

The gas line to the plant site is 1 km now instead of the 4 km indicated in Stage I.

Water supply from wells is not feasible, following the detailed groundwater and geotechnical studies. All water will be obtained from an infiltration gallery adjacent to the Telkwa River and pumped to a storage tank at sufficient elevation to provide adequate service and fire protection pressures at the plant site.

Sewage treatment for both the construction camp and the plant site will be by means of a tile field. This will be installed in conjunction with the camp.

12. Land

Arrangements with all affected land owners are essentially complete, apart from small areas affected by the tailings pond, utility and railway easements, and necessary surface leases on unalienated Crown land. All facilities are located on coal licences held by the company.

Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

To: R. T. Martin, P. Eng. 369 January 31, 1985
Senior Geotechnical Inspector

Re: Application Submitted by Crows Nest Resources Limited January 18, 1985 Requesting Approval of their Proposed Mining Work System Under Section 6 of the Mines Act

The attached report entitled "Crows Nest Resources Limited, Telkwa Project, Work Systems Approval, January 22, 1985" has been submitted for a Section 6 approval by the Chief Inspector.

Will you please review this insofar as your work is concerned and let me have your recommendations not later than March 15, 1985.

It may be a good idea to consult with Terry Vaughan-Thomas on this during your review as he will be preparing the final reply to Crows Nest.

V. E. Dawson, P. Eng.
Deputy Chief Inspector of Mines

VED:lr

Attach.

cc: T. Vaughan-Thomas
W. C. Robinson

5/2/85

Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

To: J. C. Errington, P. Ag.
Senior Reclamation Inspector

#869 January 31, 1985

Re: Application Submitted by Crows Nest Resources Limited January 18, 1985 Requesting Approval of their Proposed Mining Work System Under Section 6 of the Mines Act

The attached report entitled "Crows Nest Resources Limited Telkwa Project, Work Systems Approval, January 22, 1985" has been submitted for a Section 6 approval by the Chief Inspector.

Will you please review this insofar as your work is concerned and let me have your recommendations not later than March 15, 1985.

It may be a good idea to consult with Terry Vaughan-Thomas on this during your review as he will be preparing the final reply to Crows Nest.

V. E. Dawson, P. Eng.
Deputy Chief Inspector of Mines

VED:lr

Attach.

cc: T. Vaughan-Thomas
W. C. Robinson

5/2/85

Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

TO: T. Vaughan-Thomas, P. Eng. January 31, 1985
Inspector of Mines & Resident Engineer
Prince George

Re: Application Submitted by Crows Nest Resources Limited January 18, 1985 Requesting Approval of their Proposed Mining Work System Under Section 6 of the Mines Act

The attached report entitled "Crows Nest Resources Limited, Telkwa Project, Work Systems Approval, January 22, 1985" has been submitted for approval under Section 6 of the Mines Act by the Chief Inspector.

Will you please review this and let me have your recommendations by March 15, 1985.

Copies of the report have also been given to Terry Martin and John Errington for their review by this same date.

If you require any input or advice from any other specialist group, please contact the Section Head directly and a copy of the report will be made available to him.

V. E. Dawson

V. E. Dawson, P. Eng.
Deputy Chief Inspector of Mines

VED:lr

Attach.

cc: R. T. Martin
R. Bone
J. C. Errington
W. C. Robinson

Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

To: V. E. Dawson, P.Eng.
Deputy Chief Inspector of Mines

Date: March 14, 1985

File: Telkwa Project

#660

Subject: Review of Submission for Approval (January 22, 1985)

In the letter from H. G. Rushton of Crows Nest Resources to you on January 18th, which had accompanied this application, a request was made for a Section 6 approval. I delayed my response to your request (January 31, 1985) for comments on the application because I had fully expected that the requested approval would either be withdrawn or be modified. As it stands, this is a seriously deficient application for that approval and must be rejected as such. However, it does appear to be a satisfactory conceptual presentation for a Stage II application for approval in principle under the Mine Development Review Process. Therefore, I am treating this as a review of concept only, and no recommendation for approval by the Chief Inspector is inferred at this time.

Even as a conceptual presentation very little information has been given on the tailings impoundment. If storage requirements are given, they are buried somewhere in the text. Likewise, the data on geology and hydrology are not readily located. I suggest that Crows Nest must revise its submission to recognize the requirements of Section I.1 in the Tailings Guidelines a copy of which had been forwarded to Calgary by me on November 30, 1984.

Although details of the haul roads to either the waste dumps or the plant site are not required at Stage II, they will be required in the ensuing approval stage--especially on the crossing of Goathorn Creek. Therefore, we should remind Crows Nest to be prepared to submit to the Chief Inspector the necessary information required by the Surface Haul Road Guidelines, a copy of which I had also sent to Calgary last year.

I have no comment on the pit designs.

The waste rock dumps and in-pit spoiling seem to be fairly straightforward. However, by the time that the approval stage is reached by this proponent we will probably be applying the new Dump Guidelines. Therefore, I suggest that we prepare Crows Nest for this possibility by requesting that they submit as much of the Preliminary Information as possible during Stage II on their dumping requirements. Accordingly, I have attached a copy of that portion of those proposed guidelines.

...../2

#370

The one aspect of the submission that I would question is the disposal of the coarse refuse. It is not clear how it could be incorporated into the waste rock dumps. Although it is likely to be less than one per cent of the waste dumps on the average, it is possible that it could be concentrated in critical locations. I wonder whether this is a practical means of disposal either in terms of conservation of the refuse for future use or in terms of safety in the operation of a dump which might be smoldering. Will the coarse refuse be dumped into the abandoned pits in later years? Would it not be better to pile it closer to the plant? I feel that a number of questions about coarse refuse are left begging in this submission.

Notwithstanding the preceding criticisms, I believe that this submission will form a successful Stage II presentation. It is clear that more detailed design studies are already in progress and, I trust, will be completed in time for a more detailed application for the approval by the Chief Inspector under Section 6 of the Mines Act.

RTM:blh
Encl:

R. T. Martin, P.Eng.
Senior Geotechncial Inspector

cc: T. Vaughan-Thomas, Inspector of Mines & Resident Engineer, Pr. George

GUIDELINES FOR MINE DUMPS

Waste Dumps are an integral part of a mine. Therefore, they must receive the approval of the Chief Inspector of Mines under Section 6 of the Mines Act. In certain underground mines, in which the waste rock is primarily used as backfill, and for some strip mines, in which the waste rock is replaced in the excavation after the extraction of the desired mineral, the dumps outside the mine itself tend to be rather small and can be approved without special consideration as a part of the general mine plan. However, large metal mines and most coal mines tend to generate major waste dumps outside the pit area. These might be waste rock dumps, overburden stockpiles, low grade stockpiles, spoil piles, or any other tipped material which could constitute a potential hazard to either the public or the workers--in addition to having a potentially significant impact upon the environment. As a result, these major waste dumps will normally be subjected to a geotechnical assessment before receiving the written approval of the Chief Inspector of Mines.

These guidelines outline the information that is usually required for the geotechnical assessment. They will also serve as a guide to be used during the final, or licensing, stage of the approval process as to what criteria differentiate minor and major dumps. If the proponent is in doubt about the status of his dumps, he should submit the preliminary information that is required on all dumps in order for the Chief Inspector to make an appraisal of their potential for hazard. Where a potential for hazard is perceived, a request will be made for the additional, detailed information which is usually required only for major dumps. However, some time can be saved by proponents with major waste dumps if they retain a professional geotechnical engineer at the outset to analyse the dumps and make appropriate recommendations in a report which can be presented in support of the application for the approval of the Chief Inspector.

Features of Major Dumps

A major dump generally has some of the following features:

i. a total volume exceeding one million cubic metres,

ii. a height after resloping for reclamation exceeding fifty (50) metres,

iii. a total area exceeding one hectare,

iv. a location on natural slopes which are often steeper than twenty degrees (20^{o}) from the horizontal plane,

v. filling, or interfering with, a stream (or collection of streams) having a potential peak flow greater than one cubic metre per second (1 m^3/s) and,

vi. situated above and close to buildings, roads, domiciles, important power lines or pipelines, and major rivers or streams.

In addition to the foregoing features defining major dumps, any minor dump which has been identified either as subject to spontaneous combustion or as a potential source of acid leachate, or some other contaminant, may be treated as a major dump at the discretion of the Chief Inspector.

Preliminary Information

When submitting an application to the Chief Inspector for approval of the mine plan—or alternatively for approval of any dump that is a substantial modification of a mine plan—the following preliminary information should be included.

1. A Plan showing:
   (a) the proposed dumping location(s),
   (b) other relevant mine features,
   (c) vegetation in the area,
   (d) the lease, or licence, boundaries,
   (e) existing, and proposed, drainage patterns,
   (f) locations of buildings, settlements, roads, streams, power and other lines,
   (g) locations of exploratory pits, trenches, or boreholes, and
   (h) any alternative locations that are being considered.

2. A Statement on the Dump Size giving:
   (a) volume and area required,
   (b) type of waste and sorting, if any, and
   (c) heights and depths of the dump at crucial points.

3. An Appraisal of Mineralization in the area including:
   (a) logs of deep boreholes and exploratory excavations,
   (b) appropriate geological sections, and
   (c) a statement on the viability of any observed enrichment beneath the proposed dumps.

4. A System of Dump Development with:
   (a) method of placing (tipped, dumped, or spread),
   (b) lift or layer thicknesses,
   (c) specified compaction or zoning,
   (d) stages of development, when appropriate, and
   (e) final condition after resloping and reshaping in preparation for the rehabilitation and revegetation in accordance with the Mine Reclamation Guidelines.

5. Other relevant details such as:
   (a) foundation preparation,
   (b) runoff and drainage management,
   (c) snow removal, and
   (d) relevant operational procedures.

KLOHN LEONOFF
CONSULTING ENGINEERS

OUR FILE: PA 1692.OH

January 18, 1985

Crows Nest Resources Ltd.
Eau Claire Place
525 - 3rd Avenue S.W.
Calgary, Alberta
T2P 0G4

Mr. H.G. Rushton
Vice President Development

Telkwa Coal Project
Work Systems Approval

Dear Mr. Rushton:

We are pleased to submit 6 copies of the geotechnical, hydrological and hydrogeological appendix for the 'Work Systems Approval' for the Telkwa Coal Project.

The document comprises the following items:

i) Executive Summary
ii) Recommendations
iii) Drawing D-0124 - Layout of Drainage System
iv) Drawing D-0125 - Diversion Ditches & Spillway Channels, Sections and Details
v) Drawing B-0135 - High Wall Stability - General Case

Yours very truly,

KLOHN LEONOFF LTD.

THOMAS G. HARPER, P.Eng.
Manager, Mining Services

TGH/sh
Enclosures

TELKWA COAL PROJECT

Geotechnical, Hydrogeological & Hydrological Design Report

Summary & Recommendations For Work Systems Approval

EXECUTIVE SUMMARY

The terms of reference for this assignment were to provide geotechnical, hydrogeological and hydrological consulting services and conceptual designs in support of a Stage II Permit Application for the Telkwa Coal Project.

The Assignment included the following:

- Review of geological, hydrological and hydrogeological data;
- supervision of drilling of 2 test holes;
- packer permeability testing and installation of piezometers;
- groundwater investigations;
- pit slope stability;
- waste dump design;
- design of tailings pond;
- design of drainage ditches and settling ponds;
- design of groundwater control measures;
- presentation of designs and recommendations.

Results of the data review and field investigations show that the property comprises variable thicknesses of glacial till and gravel, overlying a sequence of sandstones, siltstones, mudstones and coal. The bedrock materials range from strong to very weak rocks. The mudstones are low to medium plastic.

The bedrock dips at 15°-20° to the east and is structurally dominated by a number of north-south trending reverse faults and normal faults which trend north-south and east-west.

The bedrock is generally of low permeability and contains no stratigraphically definable aquifers. The groundwater table is at or close to ground surface over much of the eastern part of the project site. Open or breccia filled fault zones are expected to be the major conductors of groundwater.

The designs presented are as follows:

Pit Slopes

Pit Slopes have only been considered for #3 Pit. The highwall is located on the east side of the pit and will trend north-south. Conditions for highwall stability are favourable as the major structural discontinuities, the north-south trending faults and the bedding planes both dip east. Highwall slopes up to 100 m high may be cut at an overall 60° angle. Locally, secondary faults may require flatter high wall angles over short sections.

Horizontal drains will be required to reduce groundwater pressures where the highwall is more than 50 m high.

The footwall will be parallel to the bedding planes and will dip at 20° to the east. To prevent instability, no undercutting of the footwall strata should occur. Pressure relief wells will be required in the footwall to reduce the risk of floor heave.

Overburden slopes in glacial till may be cut at 2H:1V.

Waste dumps will be constructed in out-of-pit and in-pit locations. Out of pit dumps may be constructed with overall 2H:1V slopes. The dumps should be constructed in lifts and benched to suit operating conditions. Foundations should be stripped of topsoil and overwet materials. Uphill construction is recommended to minimize overburden stripping. Deleterious and sulphur rich materials may be placed in isolated cells within dumps to minimize the potential for acid drainage. These materials should be compacted in 1 m lifts.

In-pit dumps in #3 Pit should be constructed with north-south trending slopes dipping into the footwall at 1.6H:1V and east-west trending slopes at 2.25H:1V. All wetted and loose material should be removed from the foundation area before construction.

Pit Dewatering

Groundwater inflows into the pits will be small with normal flows of approximately 50 m^3/hour being expected. Short duration exceptional flows when fault zones are intersected may effectively double the inflow rate. Infiltration should be controlled by means of ditches and sumps. Pumping capacity requirements will be dictated by inflows from direct precipitation. Average pumping requirements will range from 95 m^3/hr in year 1 to a maximum of 126 m^3/hr in years 19 and 20. Emergency pumping capacity will be required to handle major precipitation events. Water from the pit will be pumped to drainage ditches and passed through settlement ponds prior to discharge.

Surface Water Management

Head water diversions will divert all uncontaminated surface runoff from the upstream side of the mine area. The diversions are designed in accordance with the Ministry of Environment Regulations.

Interceptor ditches will minimize the contamination of surface water in the mine area and prevent release of untreated water to natural water courses. All contaminated water will be held in settlement ponds with sufficient detention time for suspended matter to be removed. Discharge points will be monitored to ensure that clarified water meets water quality standards.

Tailings Pond

Fine tailings from the wash plant will be stored in a tailings pond. Clarified water will be recycled to the plant as make-up water.

The dam will be constructed by the downstream method and will have an ultimate height of 18 m. The dam will have 2.5H:1V slopes downstream and 2H:1V upstream with crest width of 4 m. Crest width for vehicles.

A 6 m high starter dam will be constructed of glacial till. This material will be continued up the upstream face of the main dam to provide an impervious facing to control seepage. The downstream section of the main dam will be constructed of select pit waste.

Tailings will be spigotted from the uphill end of the pond and clarified water will be reclaimed by a barge mounted pump.

Seepage through the pond floor will be minimized by the use of filters and wells will be installed to monitor seepage from the pond.

1.0 RECOMMENDATIONS

The designs presented in this report are appropriate to the present stage of the project. Further work will be required during the detailed design phase of the project and some additional data collection will be required to confirm assumptions made during the Stage II conceptual design.

1.1 Hydrology

The level of data available is adequate for detailed design with the exception of monitoring data for Hubert Creek. A considerable proportion of the project site lies within the Hubert Creek catchment. We recommend that concurrent precipitation and continuous stream flow monitoring be carried out for a minimum period of 1 year. The data will be used to determine the surface run off potential of the site and may result in more economic designs for the drainage system and settling ponds.

All existing stream gauging and climate monitoring should be continued.

1.2 Waste Dumps

The conceptual design for the proposed out-of-pit waste dumps are based on assumed foundation conditions. During the detailed design phase of the project site investigations should be carried out at the two out-of-pit waste dump sites to determine foundation conditions. The conceptual waste dump designs will be confirmed or modified as appropriate and the amount of overburden stripping determined.

1.3 Tailings Pond

Fine tailings from the wash plant will be stored in a tailings pond adjacent to the wash plant. The conceptual designs are based on assumed foundation conditions. The site is underlain by thick terrace gravel deposits which comprise the surficial aquifer from which local residents obtain domestic water.

Investigations should be carried out during the detailed design phase of the project to determine foundation conditions in order to confirm the conceptual tailings dam design.

In addition, design of a filter system will be required to control seepage from the pond and to prevent migration of fines into the aquifer.

1.4 Groundwater

The groundwater monitoring currently in progress should be continued. Water quality sampling and testing programs should also be continued. Field pH measurements should be made on all water samples collected.

1.5 Plantsite and Rail Spur Foundations

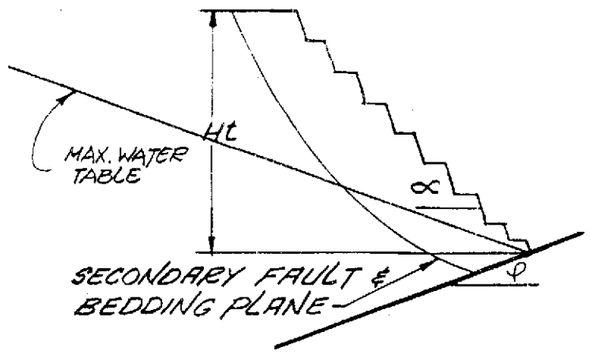
Site investigations will be required at the detailed design stage to determine foundations conditions for the plant site and rail spur.

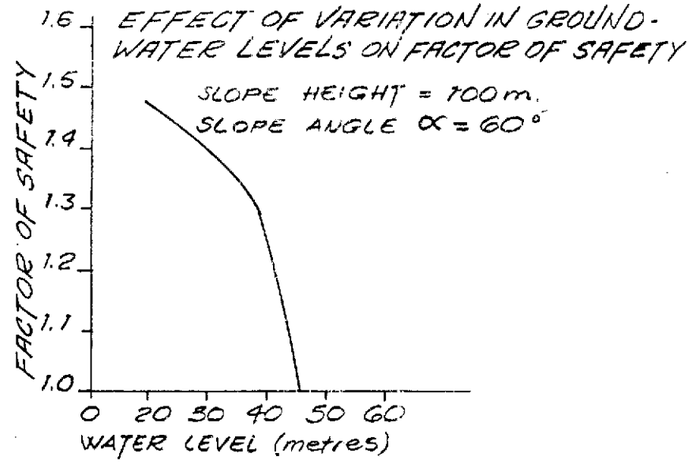
1.6 Make Up Water Intake

Site investigations will be required at the detailed design stage to determine design parameters for an infiltration gallery or well type make up water intake.

1.7 Haul Road Crossing for Goathorn Creek

Site investigations and hydraulic design will be required at the detailed design stage to provide a haul road crossing for Goathorn Creek which complies with all applicable regulations.



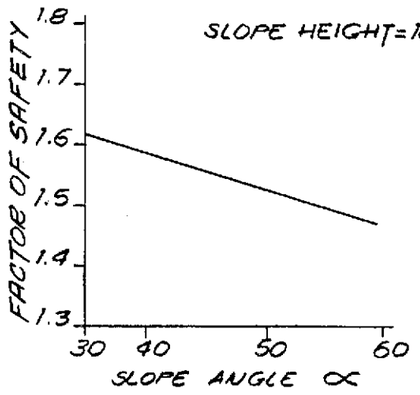


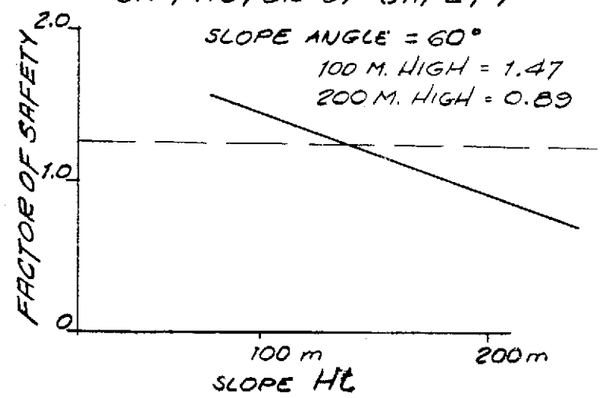
SLOPE GEOMETRY

- HEIGHT - 50m., 100m., 200m.
- SLOPE ANGLE ∝ - 30°, 45°, 50°, 60°
- WATER LEVEL 20° FROM TOE
- φ = 15°

MATERIAL PARAMETERS

- UNIT WEIGHT - 21 KN/m³
- SHEAR STRENGTH THROUGH ROCK — φ' = 30°, C' = 300 KPa
- SHEAR STRENGTH THROUGH MUDSTONE AT BASE OF PIT — φ' = 17°, C' = 0 KPa





DESCRIPTION OF SLOPE MODEL

1. FAILURE PLANE COMPRISES CURVED, STEPPED SURFACE CONSISTING OF SECONDARY FAULT PLANES & BEDDING PLANES WITH A SHORT SECTION OF THE FAILURE PLANE ALONG THE FOOT WALL MATERIAL.
2. FOOTWALL MATERIAL COMPRISES WEATHERED MUDSTONE

PRELIMINARY

TO BE READ WITH KLOHN LEONOFF REPORT DATED _____ SCALE

KLOHN LEONOFF LTD.
CONSULTING ENGINEERS

PROJECT: TELKWA PROJECT
TITLE: HIGHWALL SLOPE STABILITY - MODEL I
CLIENT: CROWS NEST RESOURCES LTD.
DATE OF ISSUE:
APPROVED:
PROJECT No.: PA 1692-03
DWG. No.: B-1692-03.004
REV.:

NCI-456-K.L

DESIGN DISCHARGES AND VELOCITIES

Location	Drainage Area km²	10 Year Flood Peak Discharge m³/s	10 Year Flood Peak Velocity m/s	200 Year Flood Peak Discharge m³/s	200 Year Flood Peak Velocity m/s
1	1.1	0.7	1.2	1.1	1.5
2	0.2	0.1	0.6	0.3	0.7
3	3.3	1.7	1.2	3.0	1.4
4	4.9	2.4	2.7	4.2	3.2
5	5.1	2.5	1.9	3.4	2.3
6	9.7	4.3	3.0	7.6	3.6
7	3.2	1.7	2.0	2.9	2.4
8	1.2	0.7	1.3	1.2	1.6
9	1.1	0.7	1.4	1.2	1.8
10	4.1	2.1	2.2	3.6	2.6
11	0.6	0.4	0.8	0.7	1.1
12	5.6	2.7	3.1	4.7	3.9
13	0.6	0.4	0.9	1.0	1.3
14	6.9	3.2	1.9	5.7	2.2
15	0.2	0.1	1.1	0.3	1.2
16	0.6	0.4	0.6	0.8	0.8
17	0.4	0.3	0.9	0.5	1.0
18	1.5	0.9	1.8	1.5	2.2
19	1.0	0.6	1.0	1.1	1.2
20	1.4	0.8	0.9	1.4	1.1
21	0.3	0.2	0.6	0.4	0.7
22	0.2	0.2	0.5	0.3	0.7

OUTLET DITCH FOR EMERGENCY SPILLWAY OF TAILINGS POND
TAILINGS POND
SPILLWAY CHANNEL
SETTLING POND No. 5
INITIAL DIVERSION DITCH TO BE RELOCATED UPHILL AS TAILINGS DAM IS RAISED
TAILINGS SLURRY PIPELINE
PLANT SITE
INTERCEPTOR DITCH No. 10
INTERCEPTOR DITCH No. 9
ROAD
SPILLWAY CHANNEL
SETTLING POND No. 1
EAST WASTE DUMP
HEADWATER DIVERSION No. 1
REFERENCE TO TABLE ABOVE (TYP.)
INTERCEPTOR DITCH No. 2
INTERCEPTOR DITCH No. 3
INTERCEPTOR DITCH No. 4
PIT No. 1
PIT No. 2
PIT No. 8
SETTLING POND No. 2
INTERCEPTOR DITCH No. 1
SPILLWAY CHANNEL
TELKWA River
GRATHORN CREEK
TEXAS CREEK
INTERCEPTOR DITCH No. 5
CULVERT
SETTLING POND No. 3
INTERCEPTOR DITCH No. 7
INTERCEPTOR DITCH No. 6
PIT No. 4
PIT No. 5
PIT No. 6
WEST WASTE DUMP
SETTLING POND No. 4
HEADWATER DIVERSION No. 2
INTERCEPTOR DITCH No. 8

NOTE THE DRAINAGE SYSTEM SHOWN HAS BEEN DESIGNED BASED ON 1:5000 TOPOGRAPHY WITH 5m CONTOUR INTERVALS. SEE DRAWINGS BY CROWS NEST RESOURCES LIMITED.

#870

PRELIMINARY

TO BE READ WITH KLOHN LEONOFF REPORT DATED

REV.	DATE	REVISION DETAILS

SCALE:

DESIGN	DRAWN	DATE	SCALES
L.F.S.	CICK	84-11-30	1:10 000

KLOHN LEONOFF LTD.
CONSULTING ENGINEERS

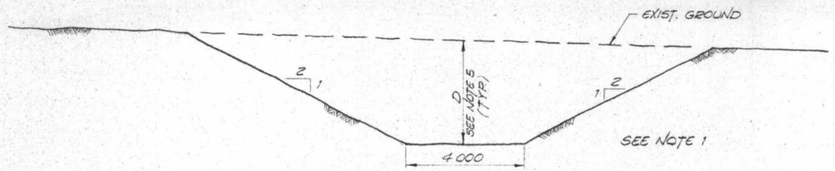
PROJECT: TELKWA COAL PROJECT

TITLE: LAYOUT OF DRAINAGE SYSTEM

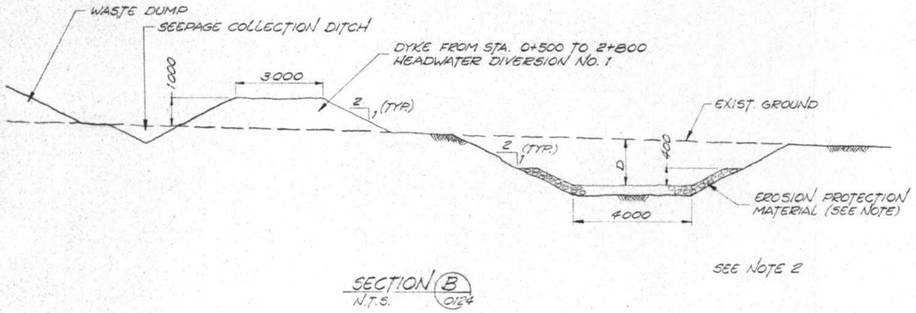
CLIENT: CROWS NEST RESOURCES LTD.

DATE OF ISSUE	PROJECT No.	DWG. No.	REV.
18-01-85	PA 1692	D-0124	0

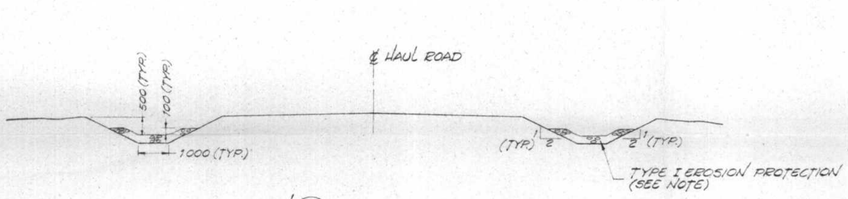
APPROVED



SECTION (A) 0124
N.T.S.



SECTION (B) 0124
N.T.S.



SECTION (D) 0124
N.T.S.

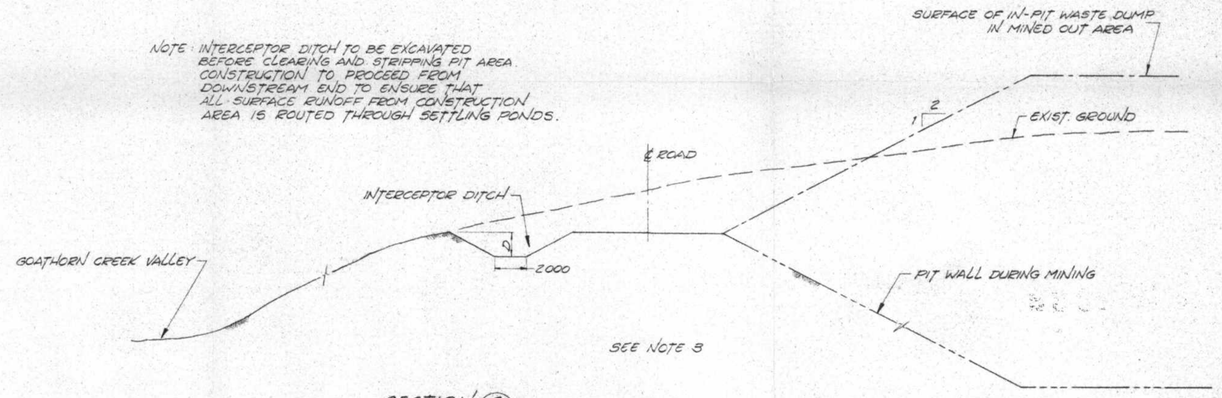
SEE NOTE 4

EROSION PROTECTION

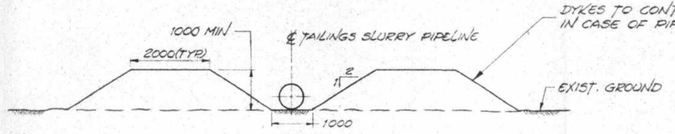
EROSION PROTECTION IS REQ'D. ON HEADWATER DIVERSION NO. 1 FROM STA. 0+000 TO 3+000, SPILLWAY CHANNELS OF SETTLING PONDS NO. 1 & 2 AND ROADSIDE DITCHES WITHIN GOATHORN CREEK VALLEY.
TYPE I IS REQ'D. WHERE CHANNEL GRADIENTS ARE LESS THAN 6%.
TYPE II IS REQ'D WHERE CHANNEL GRADIENTS EXCEED 6%.
GEOTEXTILE FILTER FABRIC TO BE PROVIDED BENEATH TYPE I & II EROSION PROTECTION MATERIAL.

	TYPE I	TYPE II
THICKNESS	200	300
D 100	200	300
D 50	100	200
D 25	25	50

NOTE: INTERCEPTOR DITCH TO BE EXCAVATED BEFORE CLEARING AND STRIPPING PIT AREA. CONSTRUCTION TO PROCEED FROM DOWNSTREAM END TO ENSURE THAT ALL SURFACE RUNOFF FROM CONSTRUCTION AREA IS ROUTED THROUGH SETTLING PONDS.



SECTION (C) 0124
N.T.S.



SECTION (E) 0124
N.T.S.

#870

NOTES

1. SECTION A IS TYPICAL OF :
   - INTERCEPTOR DITCH No. 1 FROM OUTLET TO POINT OF ENTRY INTO PIT No. 3.
   - INTERCEPTOR DITCHES No. 2, 3, 4, 5, 6, 7, 8, 9 & 10.
   - HEADWATER DIVERSION No. 1, STA. 3+000 - 5+850.
   - OUTLET DITCH FOR EMERGENCY SPILLWAY OF TAILINGS POND.
2. SECTION B IS TYPICAL OF
   - HEADWATER DIVERSION No. 1, STA. 0+000 - 3+000.
   - SPILLWAY CHANNELS FOR SETTLING PONDS No. 1 & 2.
3. SECTION C IS TYPICAL OF INTERCEPTOR DITCH No. 1 WITHIN LIMITS OF PIT No. 3.
4. ROADSIDE DITCHES TO BE CONSTRUCTED IN GOATHORN CREEK VALLEY AS SHOWN IN SECTION D.
5. MINIMUM DEPTHS OF HEADWATER DIVERSION & INTERCEPTOR DITCHES ARE AS FOLLOWS :

CHANNEL	STATION	'D'
HEADWATER DIVERSION No. 1	0+000 - 4+400	1.0m.
" " " 1	4+400 - END	0.6m.
" " " 2	FULL LENGTH	0.6m.
INTERCEPTOR DITCHES No. 1-8	FULL LENGTH	0.6m.
" " " 9 & 10	FULL LENGTH	0.8m.
SPILLWAY CHANNEL No. 1	FULL LENGTH	1.0m

PRELIMINARY

TO BE READ WITH KLOHN LEONOFF REPORT DATED _____

REV.	DATE	REVISION DETAILS

SCALE:	DESIGN	DRAWN	DATE	SCALES
	L.F.S.	Chick	DEC. '84	N.T.S.

KLOHN LEONOFF LTD.
CONSULTING ENGINEERS

PROJECT: TELKWA COAL PROJECT

TITLE: DIVERSIONS, DITCHES & SPILLWAY CHANNELS SECTIONS & DETAILS

CLIENT:	DATE OF ISSUE	PROJECT No.	DWG. No.	REV.
CROWS NEST RESOURCES LTD.	18-01-85	PA1692	D-0125	0
	APPROVED			

RAW COAL BLENDING STOCKPILE #2

RAW COAL BLENDING STOCKPILE #1

100 mm TOP SIZE

(1) PRIMARY CRUSHER STAMLER FEEDER BREAKER

(2) CRUSHER SCALPING SCREEN (50mm) 6'WIDE x 16' LONG

(3) SECONDARY CRUSHER ROLLS CRUSHER

(4) CRUSHED COAL CONVEYOR

(5) PLANT FEED SURGE BIN 200T

(6) PLANT FEED CONVEYOR

50mm TOP SIZE

OPTION TO PURGE HEAVY MEDIA CIRCUIT

PLANT FEED	50mmx0
195	28
1.3	10

(7) PLANT FEED DISTRIBUTOR

(8) 2 - DESLIME SIEVE BENDS 0.6mm

(9) 2 - DESLIME SCREENS 6'WIDE x 16' LONG.

0.6mmx0	FINE CIRCUIT FEED
35	36
1.0	640

(10) HEAVY MEDIA CYCLONE SUMP/PUMP

(19) DILUTE MEDIA SUMP / PUMP

(20) DILUTE MEDIA CYCLONE

(21) DOUBLE DRUM MAGNETIC SEPARATOR

(22) MAGNETITE DIVERTER

(27) MAGNETITE DIVERTER

(28) MAG. DIV.

(26) 2 - MAGNETITE SLURRY PUMPS

COARSE REFUSE	
30	73
2.1	8

REFUSE CONVEYOR (17)

80T (18) REFUSE BIN

TO DUMP

(11) 2-HEAVY MEDIA CYCLONES 26" DIA.

(15) 1 - REFUSE SIEVE BEND

(16) 1 - REFUSE DRAIN + RINSE SCREEN 8'WIDE x 16' LONG

COARSE CIRCUIT FEED	50x0.6mm
140	26
1.4	100

KEY	
SOLIDS FLOW TPH (adb)	% ASH
% S	WATER FLOW (FREE MOISTURE) M³/HR

(12) 2 - CLEAN COAL SIEVE BENDS

(13) 2 - CLEAN COAL DRAIN + RINSE SCREENS 8'WIDE x 16' LONG

BLEED

(14) 2 - COARSE CLEAN COAL CENTRIFUGES - WEMCO 1100

COARSE CIRCUIT CLEAN COAL	50x0.6mm
110	11
1.2	7

TOTAL MOISTURE 7.5%

MAGNASISC (44)

OPTION TO PURGE HEAVY MEDIA CIRCUIT

MISPLACED CLEAN COAL REPORTS TO FINE CIRCUIT VIA D.M. CYCLONE AND DESLIME SCREEN

MAGNETITE THICKENER - 20' DIA. (25)

(24) MAGNETITE SIEVE BEND

(23) MAGNETITE SUMP/PUMP

TOTAL CLEAN COAL	50x0.1mm
124	11
1.15	8

TOTAL MOISTURE 8%

(37) CLEAN COAL CONVEYOR

CLEAN COAL (38) SILO 6500 T

(39) CLEAN COAL SUPPLEMENTAL STOCKPILE

(40) CLEAN COAL RECLAIM CONVEYOR

(41) CLEAN COAL LOAD OUT FACILITY

CN UNIT TRAIN TO RIDLEY ISLAND PORT

FINE CLEAN COAL	0.6x0.1mm
14	12
0.9	2

TOTAL MOISTURE 10%

WATER ONLY CYCLONE CLEAN COAL	
28	33
0.9	630

(32) 2 - SECONDARY WATER ONLY CYCLONES 15" DIA.

(30) 8 - PRIMARY WATER ONLY CYCLONES 15" DIA.

PRIMARY FINE COAL (29) SUMP/PUMP

(33) CLASSIFYING CYCLONE SUMP/PUMP

(31) SECONDARY FINE COAL SUMP/PUMP

CLASSIFIED CLEAN COAL	
17	13
0.9	30

CLASSIFIED CLAYS	
11	65
0.7	600

(34) 1 - CLASSIFYING CYCLONE 10" DIA. TARGET CUT POINT 75 MICRONS

(35) FINE CLEAN COAL SIEVE BEND

0.1 mm

FINE COAL FEED	CYCLONE
15	12
0.9	16

(36) 2 - FINE CLEAN COAL CENTRIFUGES - WEMCO H900

MISPLACED CLAYS	
2	60
0.9	16

CENTRATE	
1	55
0.9	14

WATER ONLY CYCLONE REJECT	
7	50
2.2	7

THICKENER FEED	
21	60
2.1	637

(42) TAILINGS THICKENER

(43) THICKENER UNDERFLOW PUMP

MAKE UP WATER

CLARIFIED WATER (48) SUMP / PUMP

PROCESS WATER CLARIFIED + RECYCLED 600 m³/HR @ 200 ppm solids

WATER RECLAIMED FROM POND 30 m³/HR

(47) WATER RECOVERY BARGE / PUMP

(46) TAILINGS POND

TAILINGS POND SUMP/PUMP (45)

TAILINGS POND FEED	
21	60
1.2	37

#8340

NOTES :

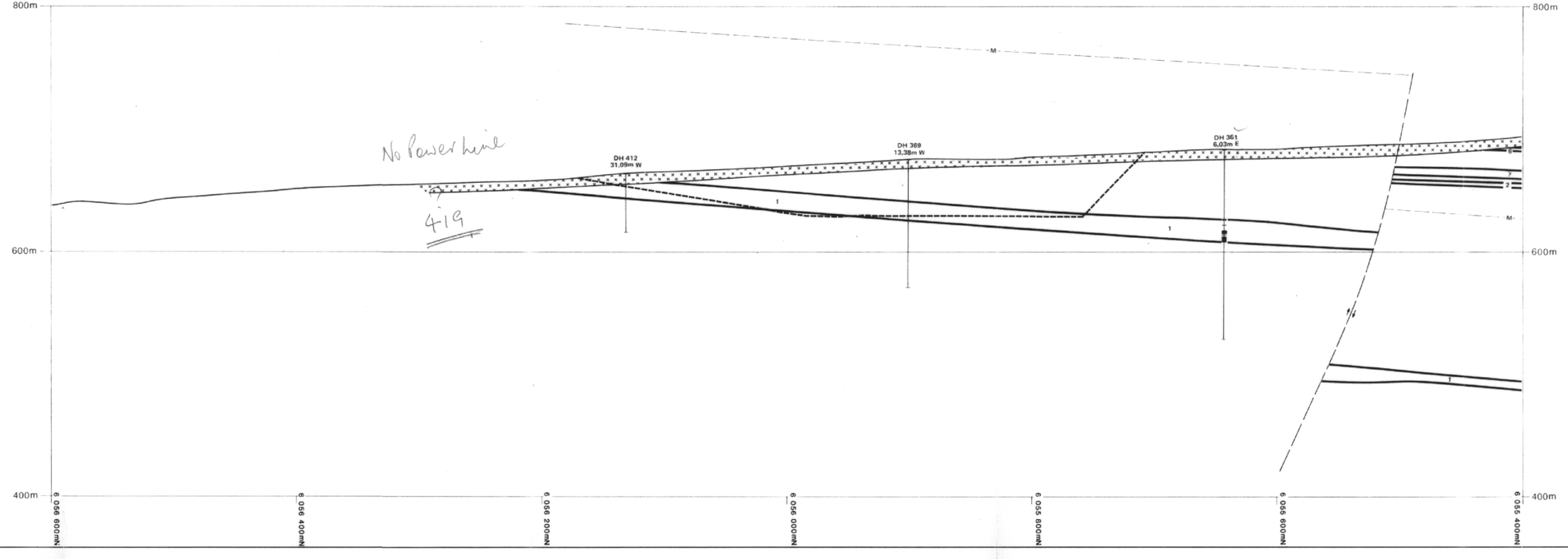
1. PLANT FEED IS A PROPORTIONED BLEND OF RAW COAL RELEASED DURING FIRST 5 YEARS. (BLEND 5)
2. PARTICLE SIZE DISTRIBUTION BY WET ATTRITION TESTING - 20% < 0.6 mm
3. PERFORMANCE REPRESENTS DILUTION INCLUDED BASIS. DILUTION ADDED @ 3IN. THICKNESS PER SEAM WHICH TRANSLATES TO 10 WT% OVERALL
4. PERFORMANCE ESTIMATED ACCORDINGLY :
   - COARSE CIRCUIT - COLWAS COMPUTER SIMULATION BASED ON BLEND 5 WASHABILITY STUDY, SG 1.8 AND EP 0.036
   - FINE CIRCUIT - BIRTLEY PILOT PLANT NO. 3 ACTUAL PERFORMANCE AND KREBS CLASSIFYING CYCLONE PROPOSAL.
5. AIR DRIED BASIS @ 1.5% RESIDUAL MOISTURE

Crows Nest Resources Limited

TELKWA
WEST CENTRAL B.C.

PREPARATION PLANT CONCEPTUAL FLOWSHEET

AUTHOR	A.McINTYRE	SCALE	NTS
DATE	84-10	REVISED	DRAWING No. CA-328

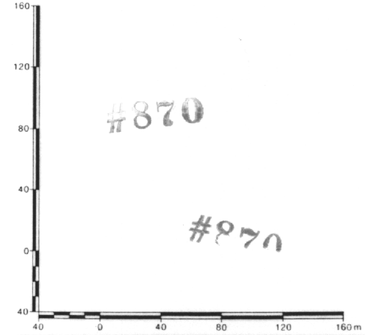


No Power line

419

LEGEND

- M — Marker Horizon picked from Gamma Logs
- DH 105 80.25m S — Drill hole 105 Projected 80.25 metres South to line of section
- Fault — arrows indicate relative sense of movement
- – 2 – Seam No.2
- Projected position of Coal Seam
- HAZELTON GROUP (Jurassic Volcanics)



#870

#870

Crows Nest Resources Limited
EXPLORATION

TELKWA
WEST CENTRAL B.C.

LONGITUDINAL SECTION 331E
621 889mE

NTS 93L/11 — UTM ZONE 9

AUTHOR: D.H./S.C.	SCALE: 1:2000	DRAWN BY: RGP
DATE: 84-10	REVISED:	DRAWING No: TW1X01
To Accompany		

LEGEND

--M--	Marker Horizon picked from Gamma Logs
DH 105 80.25m S	Drill hole 105 Projected 80.25 metres South to line of section
	Fault – arrows indicate relative sense of movement
– 2 –	Seam No.2
===8===	Projected position of Coal Seam
	HAZELTON GROUP (Jurassic Volcanics)

160 120 80 40 0 40
40 0 40 80 120 160m

#870

Crows Nest Resources Limited
EXPLORATION

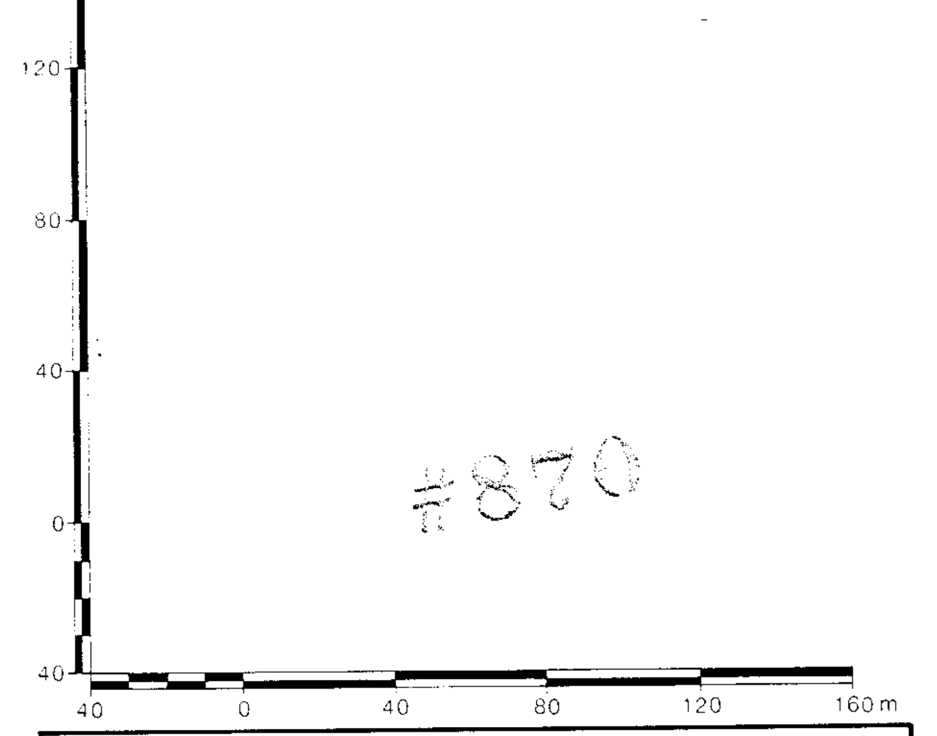
TELKWA

LONGITUDINAL SECTION 225E
621 252mE

NTS-93L/11		UTM ZONE 9
AUTHOR D.H./S.C	SCALE 1:2000	DRAWN BY RGP
DATE 84-10	REVISED	DRAWING No TW 1X02
To Accompany		

LEGEND

——M——	Marker Horizon picked from Gamma Logs
DH 105 80.25m S	Drill hole 105 Projected 80.25 metres South to line of section
	Fault – arrows indicate relative sense of movement
– 2 –	Seam No.2
===8===	Projected position of Coal Seam
	HAZELTON GROUP (Jurassic Volcanics)



#870

Crows Nest Resources Limited
EXPLORATION

TELKWA

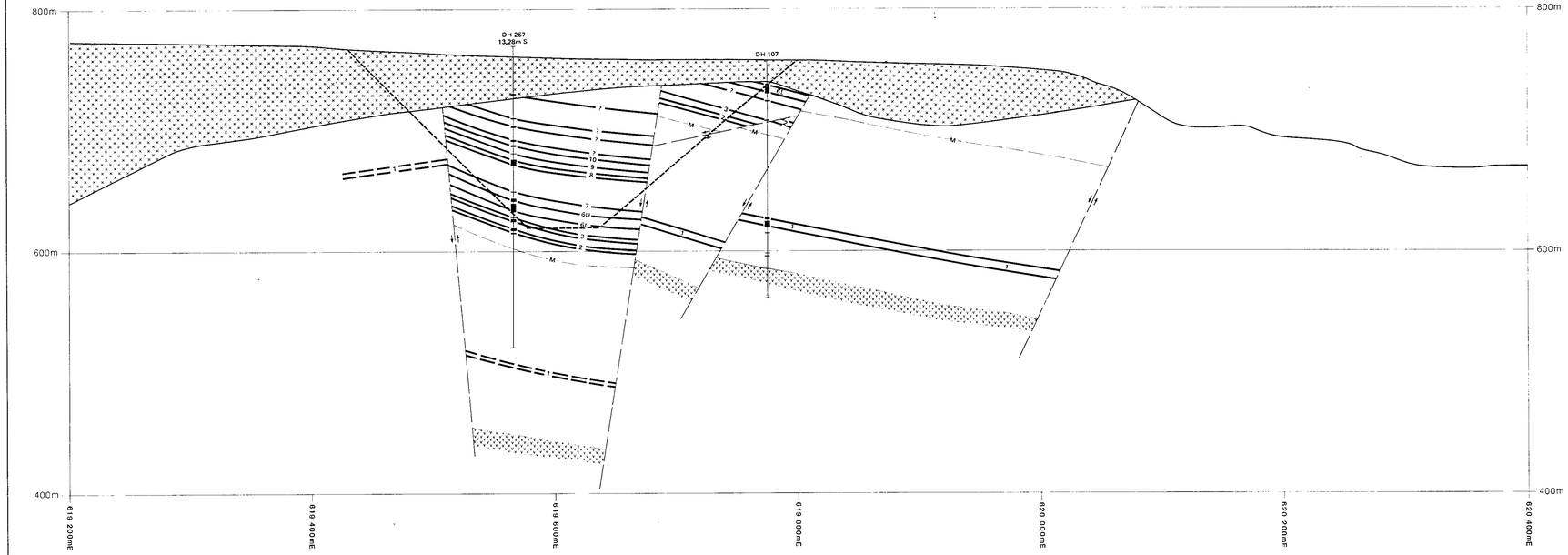
CROSS SECTION 262N
6 055 042mN

NTS-93L/11 **UTM ZONE 9**

AUTHOR D.H./S.C.	SCALE 1:2000	DRAWN BY RGP
DATE 84-10	REVISED	DRAWING No TW 1X03
To Accompany		

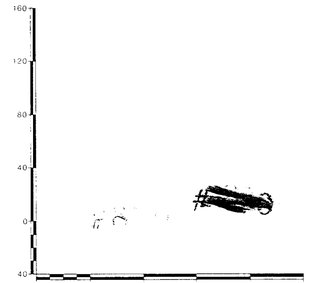
LEGEND
--M-- Marker Horizon picked from Gamma Logs
DH 105 80.25m S Drill hole 105 Projected 80.25 metres South to line of section
Fault— arrows indicate relative sense of movement
– 2 – Seam No.2
===8=== Projected position of Coal Seam
HAZELTON GROUP (Jurassic Volcanics)
800m
600m
400m
600m
400m
DH 1 22.7m N
DH 406 9.03m S
DH 369
DH 408 22.4m S
DH 356 15.73m N
DH 354 10.47m S
M
1
621 000mE
621 200mE
621 400mE
621 600mE
621 800mE
622 000mE
622 200mE
622 400mE
622 600mE
622 800mE
623 000mE
160
120
80
40
0
40
40
0
40
80
120
160 m
#870
Crows Nest Resources Limited
EXPLORATION
TELKWA
CROSS SECTION 369N
6 055 902mN
NTS-93L/11
UTM ZONE 9
AUTHOR D.H./S.C.
SCALE 1:2000
DRAWN BY RGP
DATE 84-10
REVISED
DRAWING No TW 1X04
To Accompany


LEGEND
--M-- Marker Horizon picked from Gamma Logs
DH 105 80.25m S Drill hole 105 Projected 80.25 metres South to line of section
Fault– arrows indicate relative sense of movement
– 2 – Seam No.2
===8=== Projected position of Coal Seam
HAZELTON GROUP (Jurassic Volcanics)
800m
600m
400m
DH 224 76.23m N
DH 305 22.5m S
DH 303 20.61m S
DH 304 17.99m S
DH 301 15.11m S
DH 309 13.59m S
DH 306 10.76m S
DH 311 6.85m S
DH 310 3.51m S
DH 307
DH 308 4.58m N
DH 219 24.72m N
DH 352 21.2m N
DH 204 20.27m N
620 400mE
620 600mE
620 800mE
621 000mE
621 200mE
621 400mE
621 600mE
621 800mE
622 000mE
622 200mE
622 400mE
622 600mE
#870
40 0 40 80 120 160m
Crows Nest Resources Limited
EXPLORATION
TELKWA
CROSS SECTION 307N
6 054 131mN
NTS-93L/11
UTM ZONE 9
AUTHOR D.H./S.C.
SCALE 1:2000
DRAWN BY RGP
DATE 84-10
REVISED
DRAWING No TW 1X05
To Accompany



LEGEND

- `--M--` Marker Horizon picked from Gamma Logs
- DH 105 80.25m S — Drill hole 105 Projected 80.25 metres South to line of section
- Fault– arrows indicate relative sense of movement
- `– 2 –` Seam No.2
- Projected position of Coal Seam
- HAZELTON GROUP (Jurassic Volcanics)



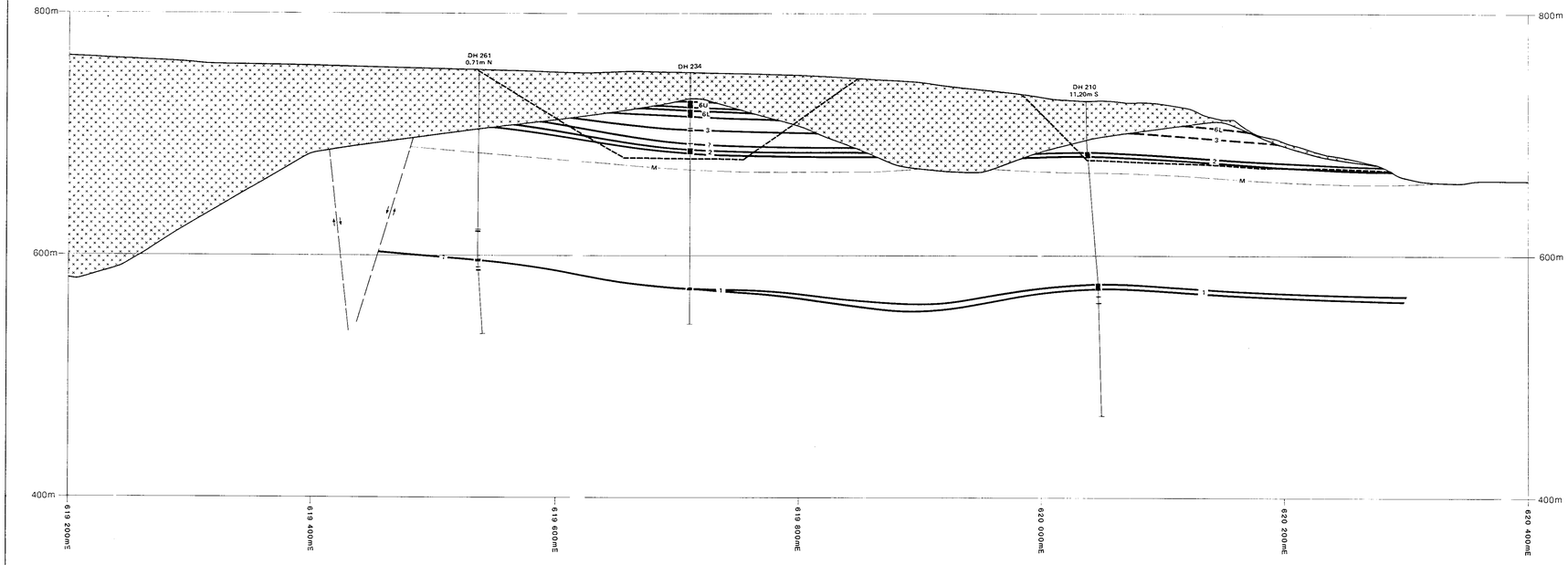
Crows Nest Resources Limited
EXPLORATION

TELKWA
WEST TERRAIN

CROSS SECTION 107N
6 054 078mN

NTS-93L/11 — UTM ZONE 9

AUTHOR D.H./S.C.	SCALE 1:2000	DRAWN BY RGP	
DATE 84-10	REVISED		
To Accompany		DRAWING No TW 1X06	



LEGEND

—M— Marker Horizon picked from Gamma Logs

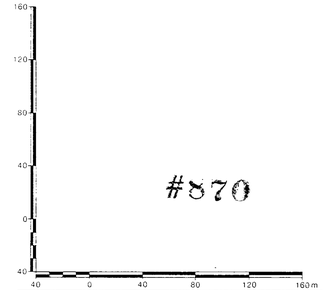
DH 105 80.25m S — Drill hole 105 Projected 80.25 metres South to line of section

Fault– arrows indicate relative sense of movement

– 2 – Seam No.2

Projected position of Coal Seam

HAZELTON GROUP (Jurassic Volcanics)



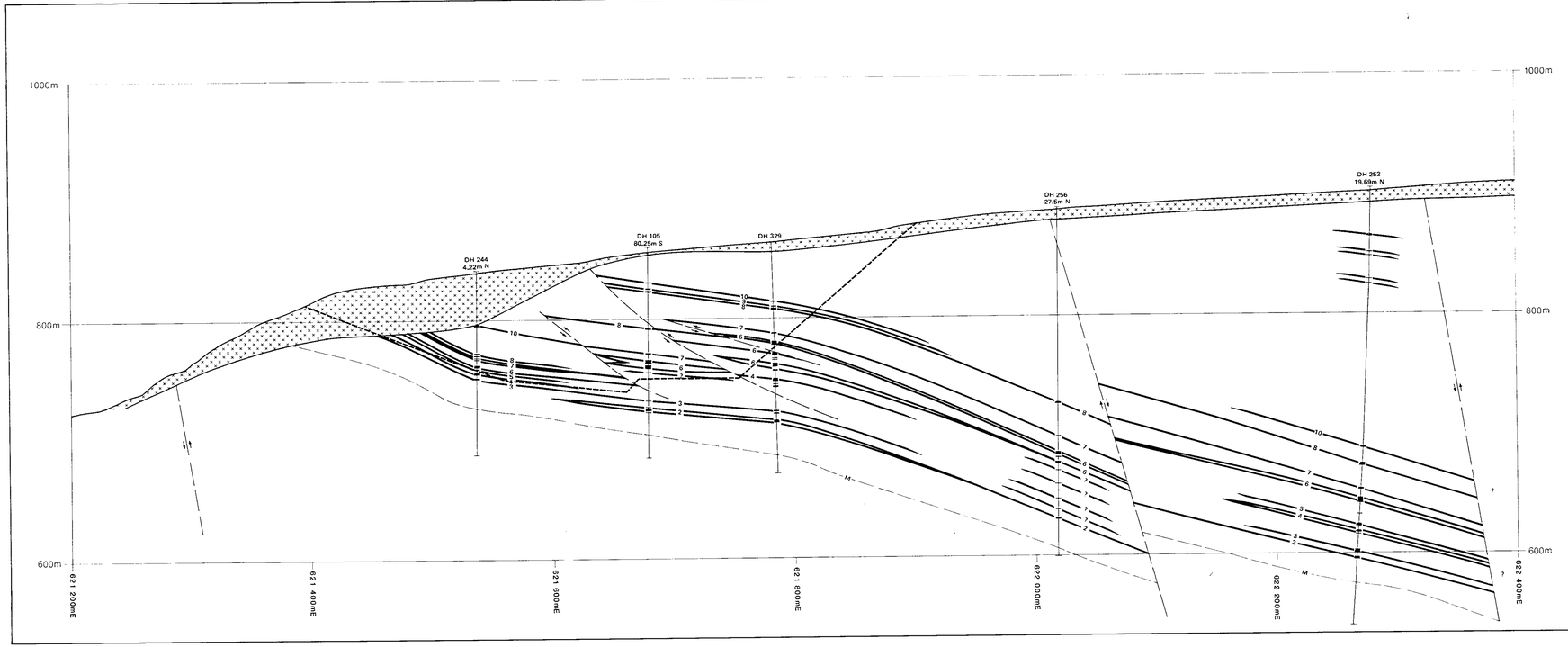
#870

Crows Nest Resources Limited
EXPLORATION
TELKWA
WEST CENTRAL B.C.

CROSS SECTION 234N
6 054 452mN

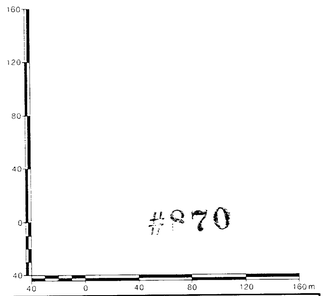
NTS-93L/11 UTM ZONE 9

AUTHOR D.H./S.C.	SCALE 1:2000	DRAWN BY RGP	
DATE 84-10	REVISED	DRAWING No TW 1X07	
To Accompany			



LEGEND

- --M-- Marker Horizon picked from Gamma Logs
- DH 105 80.25m S — Drill hole 105 Projected 80.25 metres South to line of section
- Fault— arrows indicate relative sense of movement
- – 2 – Seam No.2
- ===8=== Projected position of Coal Seam
- HAZELTON GROUP (Jurassic Volcanics)



#870

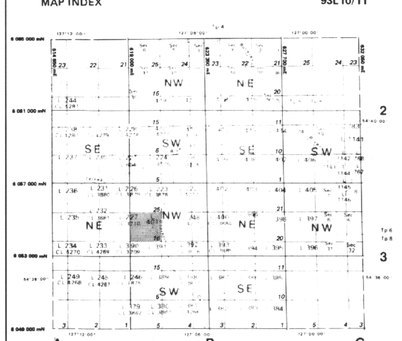
Crows Nest Resources Limited
EXPLORATION
TELKWA
WEST CENTRAL B.C.

CROSS SECTION 329N
6 052 612mN

NTS-93L/11 — UTM ZONE 9

AUTHOR D.H./S.C.	SCALE 1:2000	DRAWN BY RGP
DATE 84-10	REVISED	DRAWING No. TW 1X08
To Accompany		

MAP INDEX 93L 10/11



LEGEND

- MAIN ROAD
- SECONDARY ROAD
- BRIDGE, CULVERT
- TRACK or TRAIL
- BUILDING
- POLE, TOWER
- FENCE
- LOT LINE
- CUT LINE
- SPOT HEIGHT
- CONTOURS
- DEPRESSION
- RIVER
- INTERMITTENT STREAM
- LAKE
- SWAMP
- SAND
- SLIDE
- TREES
- PIT
- DRILL HOLE
- HORIZONTAL CONTROL
- VERTICAL CONTROL
- HORIZONTAL VERTICAL CONTROL

NOTE: LOT LINES APPROX. ONLY

MAP PROJECTION UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129 W. UTM ZONE 9

SURVEY NOTE:

Coordinates are on U.T.M. GRID (ZONE 9) and are derived from Government control stations BLITZEN, PADRE, TACK, AMIGO, BULKLEY, CREEK, MUCHO, PABLO, P.CON. 18, POWER.

ELEVATIONS ARE ON GEODETIC DATUM and are derived from 79HA369, 79HA362, 79HA364, 79HA366, 79HA372, 244H and 1852J by reciprocal trigonometric Levelling.

SURVEY was carried out by D. Watson BCLS.

METRES 40 20 0 40 80 120 160 200 METRES

SCALE 1:2000

CONTOUR INTERVAL: 2 METRES
DATE OF PHOTOGRAPHY: July 25,1982
PREPARED BY: Aero Geometrics Ltd.
PHOTOGRAPHY UPDATE: August 1983

#870

Crows Nest Resources Limited
EXPLORATION

TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

PITS 4,5&6

N.T.S. - 93L11 U.T.M. ZONE 9

AUTHOR: MONGARD,W-C	SCALE: 1 : 2000	DRAWN BY: RGP
DATE: 84-11	REVISED:	DRAWING No: TW1M02
To Accompany		

#870

TO PLANT SITE

TO PITS 4,5 & 6

TO PIT 3

Brush

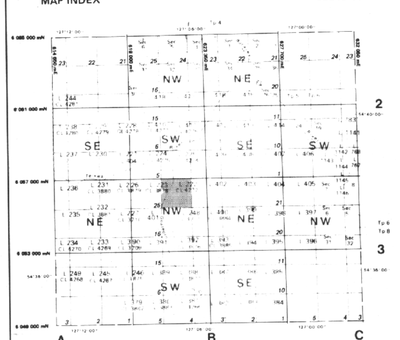
CREEK

Pit

Target

L 223 | L 222
CL 3878 | CL 4272
L 401 | L 246
CL 4271

MAP INDEX 93L 10/11



LEGEND

MAIN ROAD		RIVER	
SECONDARY ROAD		INTERMITTENT STREAM	
BRIDGE, CULVERT		LAKE	
TRACK or TRAIL		SWAMP	
BUILDING		SAND	
POLE, TOWER		SLIDE	
FENCE		TREES	
LOT LINE		PIT	PIT
CUT LINE		DRILL HOLE	
SPOT HEIGHT	602 2	HORIZONTAL CONTROL	
CONTOURS	100 / 90	VERTICAL CONTROL	
DEPRESSION		HORIZONTAL VERTICAL CONTROL	
		NOTE: LOT LINES APPROX. ONLY	

MAP PROJECTION UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129 W. UTM ZONE 9

SURVEY NOTE:

Coordinates are on U.T.M. GRID (ZONE 9) and are derived from Government control stations BLITZEN, PADRE, TACK, AMIGO, BULKLEY, CREEK, MUCHO, PABLO, P.CON. 18, POWER.

ELEVATIONS ARE ON GEODETIC DATUM and are derived from 79HA369, 79HA362, 79HA364, 79HA366, 79HA372, 244H and 1852J by reciprocal trigonometric Levelling.

SURVEY was carried out by D. Watson BCLS.

T.N. Grid North

METRES 40 20 0 40 80 120 160 200 METRES

SCALE 1:2000

CONTOUR INTERVAL: 2 METRES
DATE OF PHOTOGRAPHY: July 25,1982
PREPARED BY: Aero Geometrics Ltd.
PHOTOGRAPHY UPDATE: August 1983

Crows Nest Resources Limited
EXPLORATION

TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

PITS 1&2

#870

N.T.S. - 93L11 U.T.M. ZONE 9

AUTHOR: MONGARD, W-C	SCALE: 1 : 2000	DRAWN BY: RGP
DATE: 84-11	REVISED:	DRAWING No: TW1M03
To Accompany		

#869

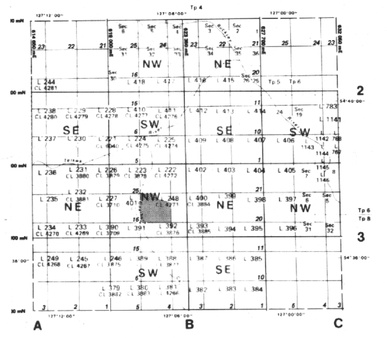
TO PLANT SITE

TO PLANT SITE

TO PITS 4,5 & 6

TO EAST WASTE DUMP

MAP INDEX 93L10/11



LEGEND

MAIN ROAD		RIVER	
SECONDARY ROAD		INTERMITTENT STREAM	
BRIDGE, CULVERT		LAKE	
TRACK or TRAIL		SWAMP	
BUILDING		SAND	
POLE, TOWER		SLIDE	
FENCE		TREES	
LOT LINE		PIT	PIT
CUT LINE		DRILL HOLE	
SPOT HEIGHT	602.2	HORIZONTAL CONTROL	
CONTOURS	100 / 90	VERTICAL CONTROL	
		HORIZONTAL VERTICAL CONTROL	
DEPRESSION		NOTE: LOT LINES APPROX. ONLY	

MAP PROJECTION UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129 W. UTM ZONE 9

SURVEY NOTE:

Coordinates are on U.T.M. GRID (ZONE 9) and are derived from Government control stations BLITZEN, PADRE, TACK, AMIGO, BULKLEY, CREEK, MUCHO, PABLO, P.CON. 18, POWER.

ELEVATIONS ARE ON GEODETIC DATUM and are derived from 79HA369, 79HA382, 79HA364, 79HA366, 79HA372, 244H and 1852J by reciprocal trigonometric Levelling.

SURVEY was carried out by D. Watson BCLS.

T.N. Grid North

METRES 40 20 0 40 80 120 160 200 METRES

SCALE 1:2000

CONTOUR INTERVAL: 2 METRES
DATE OF PHOTOGRAPHY: July 25,1982
PREPARED BY: Aero Geometrics Ltd.
PHOTOGRAPHY UPDATE:August 1983

Crows Nest Resources Limited
EXPLORATION

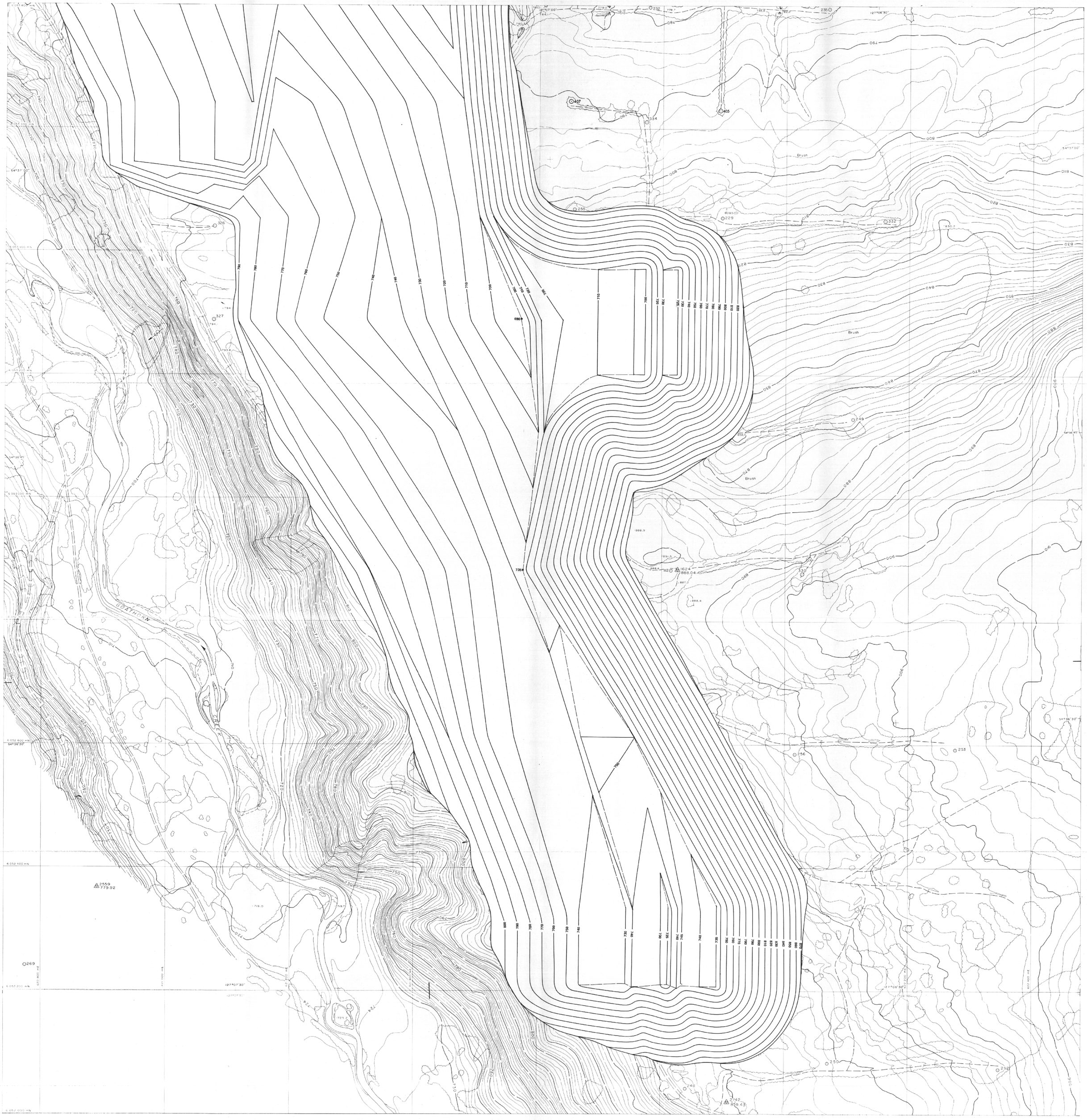
TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

#870

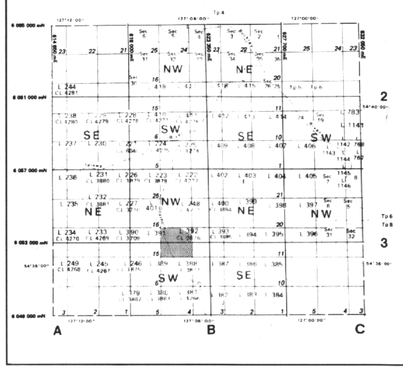
PIT 3 (NORTH)

N.T.S. - 93L11 U.T.M. ZONE 9

AUTHOR: MONGARD,W-C	SCALE:	DRAWN BY: RGP
DATE: 84-11	REVISED:	DRAWING No: TW1M04
To Accompany		



MAP INDEX 93L10/11



LEGEND

MAIN ROAD		RIVER	
SECONDARY ROAD		INTERMITTENT STREAM	
BRIDGE, CULVERT		LAKE	
TRACK or TRAIL		SWAMP	
BUILDING		SAND	
POLE, TOWER		SLIDE	
FENCE		TREES	
LOT LINE		PIT	
CUT LINE		DRILL HOLE	
SPOT HEIGHT	602.2	HORIZONTAL CONTROL	
CONTOURS	100 / 80	VERTICAL CONTROL	
		HORIZONTAL VERTICAL CONTROL	
DEPRESSION		NOTE: LOT LINES APPROX. ONLY	

MAP PROJECTION UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129 W. UTM ZONE 9

SURVEY NOTE:

Coordinates are on U.T.M. GRID (ZONE 9) and are derived from Government control stations BLITZEN, PADRE, TACK, AMIGO, BULKLEY, CREEK, MUCHO, PABLO, P.CON. 18, POWER.

ELEVATIONS ARE ON GEODETIC DATUM and are derived from 79HA369, 79HA362, 79HA364, 79HA366, 79HA372, 244H and 1852J by reciprocal trigonometric Levelling.

SURVEY was carried out by D. Watson BCLS.

T.N. GRID NORTH

METRES 40 20 0 40 80 120 160 200 METRES

SCALE 1:2000

CONTOUR INTERVAL: 2 METRES
DATE OF PHOTOGRAPHY: July 25,1982
PREPARED BY: Aero Geometrics Ltd.
PHOTOGRAPHY UPDATE: August 1983

#870

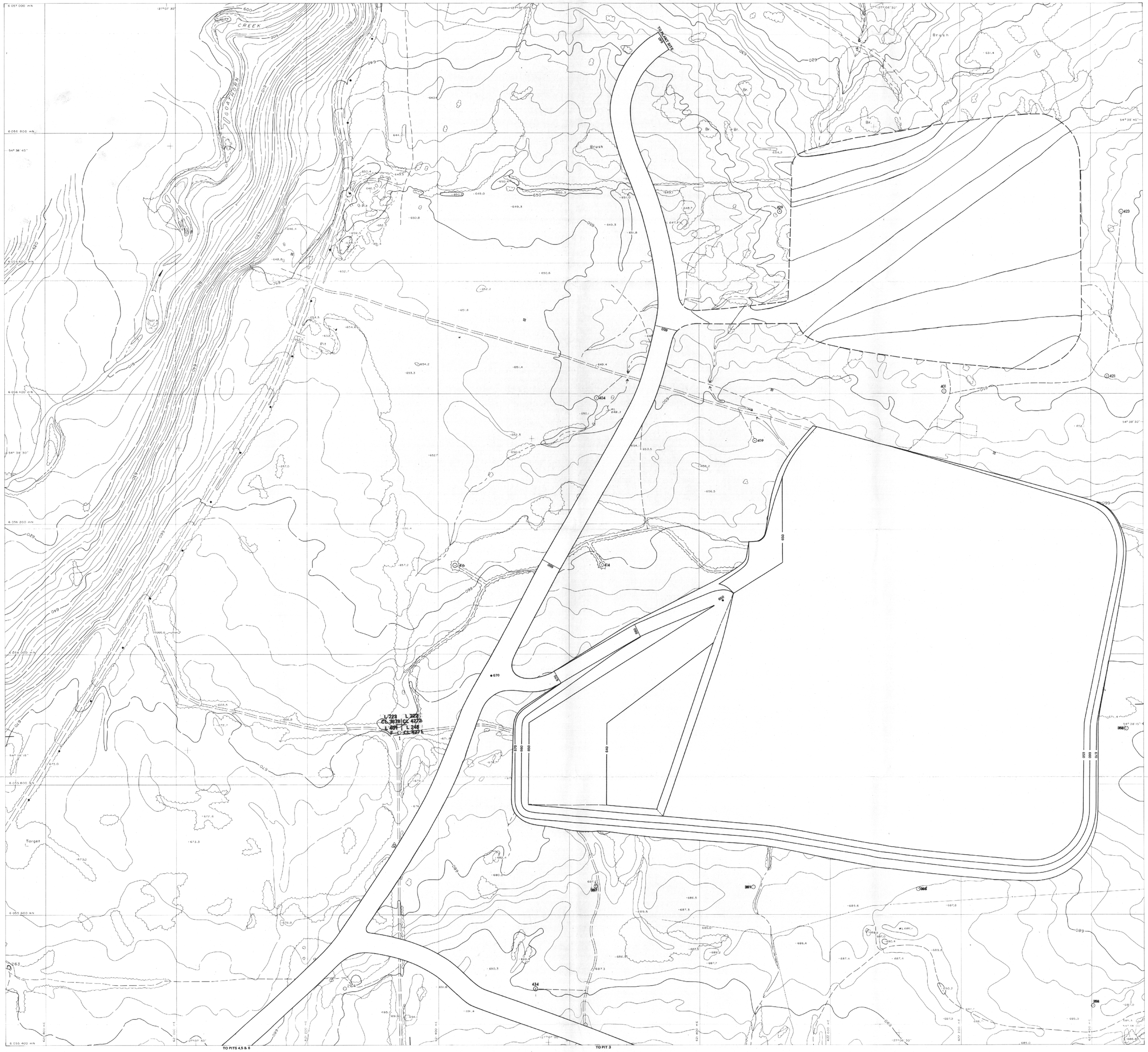
Crows Nest Resources Limited
EXPLORATION

TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

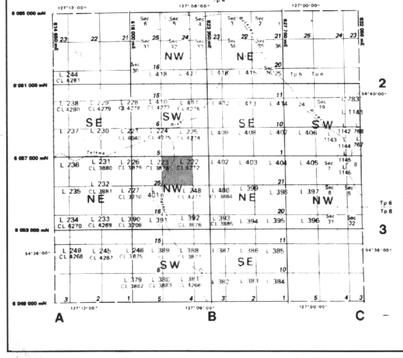
PIT 3 (SOUTH)

N.T.S. - 93L11 U.T.M. ZONE 9

AUTHOR: MONGARD, W-C	SCALE: 1 : 2000	DRAWN BY: RGP
DATE: 84-11	REVISED:	DRAWING No: TW1M05
To Accompany		



MAP INDEX 93L10/11



LEGEND

MAIN ROAD		RIVER	
SECONDARY ROAD		INTERMITTENT STREAM	
BRIDGE, CULVERT		LAKE	
TRACK or TRAIL		SWAMP	
BUILDING		SAND	
POLE, TOWER		SLIDE	
FENCE		TREES	
LOT LINE		PIT	
CUT LINE		DRILL HOLE	
SPOT HEIGHT	602.2	HORIZONTAL CONTROL	
CONTOURS	100 / 90	VERTICAL CONTROL	
DEPRESSION		HORIZONTAL VERTICAL CONTROL	
		NOTE: LOT LINES APPROX. ONLY	

MAP PROJECTION UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129 W. UTM ZONE 9

SURVEY NOTE:

Coordinates are on U.T.M. GRID (ZONE 9) and are derived from Government control stations BLITZEN, PADRE, TACK, AMIGO, BULKLEY, CREEK, MUCHO, PABLO, P.CON. 18, POWER.

ELEVATIONS ARE ON GEODETIC DATUM and are derived from 79HA369, 79HA362, 79HA364, 79HA366, 79HA372, 244H and 1852J by reciprocal trigonometric Levelling.

SURVEY was carried out by D. Watson BCLS.

METRES 40 20 0 40 80 120 160 200 METRES

SCALE 1:2000

CONTOUR INTERVAL: 2 METRES
DATE OF PHOTOGRAPHY: July 25,1982
PREPARED BY: Aero Geometrics Ltd.
PHOTOGRAPHY UPDATE: August 1983

T.N. Grid North

#870

Crows Nest Resources Limited
EXPLORATION

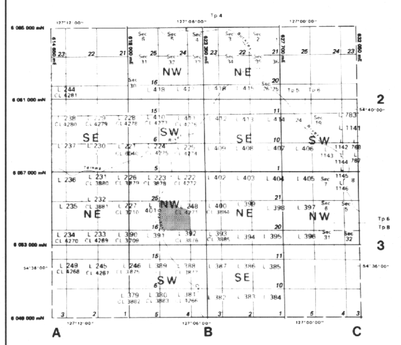
TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

PITS 1&2
END OF YEAR 3

N.T.S. - 93L11 U.T.M. ZONE 9

AUTHOR: WILTON-CLARK	SCALE: 1 : 2000	DRAWN BY: RGP
DATE: 84-12	REVISED	DRAWING No: TW1M06
To Accompany		

MAP INDEX 93L10/11



LEGEND

MAIN ROAD		RIVER	
SECONDARY ROAD		INTERMITTENT STREAM	
BRIDGE, CULVERT		LAKE	
TRACK or TRAIL		SWAMP	
BUILDING		SAND	
POLE, TOWER		SLIDE	
FENCE		TREES	
LOT LINE		PIT	
CUT LINE		DRILL HOLE	
SPOT HEIGHT	602.2	HORIZONTAL CONTROL	
CONTOURS	100 / 90	VERTICAL CONTROL	
		HORIZONTAL VERTICAL CONTROL	
DEPRESSION		NOTE: LOT LINES APPROX. ONLY	

MAP PROJECTION UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129 W. UTM ZONE 9

SURVEY NOTE:

Coordinates are on U.T.M. GRID (ZONE 9) and are derived from Government control stations BLITZEN, PADRE, TACK, AMIGO, BULKLEY, CREEK, MUCHO, PABLO, P.CON. 18, POWER.

ELEVATIONS ARE ON GEODETIC DATUM and are derived from 79HA369, 79HA362, 79HA364, 79HA366, 79HA372, 244H and 1852J by reciprocal trigonometric Levelling.

SURVEY was carried out by D. Watson BCLS.

T.N. Grid North

METRES 40 20 0 40 80 120 160 200 METRES

SCALE 1:2000

CONTOUR INTERVAL: 2 METRES
DATE OF PHOTOGRAPHY: July 25,1982
PREPARED BY: Aero Geometrics Ltd.
PHOTOGRAPHY UPDATE:August 1983

#870

Crows Nest Resources Limited
EXPLORATION

TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

PIT 3
END OF YEAR 3

N.T.S. - 93L11 U.T.M. ZONE 9

AUTHOR: WILTON-CLARK	SCALE: 1 : 2000	DRAWN BY: RGP
DATE: 84-12	REVISED:	DRAWING No: TW1M07
To Accompany		

L 402 CL 7692 | L 403 CL 7693

L 404

L 402

L 400 CL. 3884 | L. 399 CL. 7691

L 393 CL. 3885 | L. 394 CL. 7690

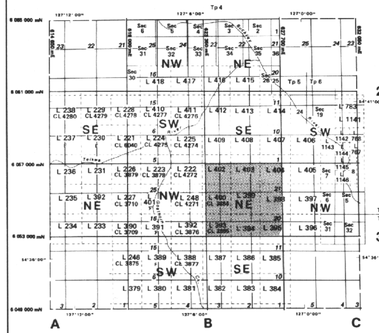
L. 400 CL. 3884

L. 393 CL. 3885

L. 398

L. 395

MAP INDEX 93L



LEGEND

MAIN ROAD
SECONDARY ROAD
BRIDGE, CULVERT
TRACK or TRAIL
BUILDING
POLE
FENCE
LOT LINE
CUT LINE
SPOT HEIGHT
CONTOURS
DEPRESSION

602.2

1000

975

RIVER
INTERMITTENT STREAM
LAKE
SWAMP
SAND
SLIDE
TREES
DRILL HOLE
HORIZONTAL CONTROL
VERTICAL CONTROL
HORIZONTAL VERTICAL CONTROL

NOTE: LOT LINES APPROXIMATE ONLY

T.N.

GRID NORTH

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129° W. U.T.M. Zone 9

SURVEY NOTE:
Coordinates are on U.T.M. Grid (Zone 9) and are derived from Government control stations Blitzen, Padre, and Tack. Elevations are on Geodetic Datum and are derived from BM 79HA369 : 538.922 metres via reciprocal trigonometric levelling.

NOTE: 5 Metre Contour interpolated from 1:2000 Mapping

PREPARED BY: Aero Geometrics Ltd.

METRES 100 50 0 100 200 300 400 500 METRES

SCALE: 1:5000

CONTOUR INTERVAL: 5 METRES

DATE OF PHOTOGRAPHY:

Topography 1972

Planimetry 1975 & 1978

Compilation 1981 Cartography 1982

Update: Photography 1982 & 1983

Compilation 1982 Cartography 1983

#870

Crows Nest Resources Limited
EXPLORATION

WEST CENTRAL B.C.
SMITHERS AREA

EAST WASTE DUMP END OF YEAR 20

AUTHOR: W-C	SCALE: 1:5000	ENCLOSURE No:
DATE: 85-01	REVISED:	DRAWING No: TW2M09
To Accompany		

L. 226
CL. 3879

L. 223
CL. 3878

L. 222
CL. 4272

L. 390
CL. 3709

L. 391
FREEHOLD

TENAS CREEK

QUATHIORN CREEK

GOLDHORN CREEK

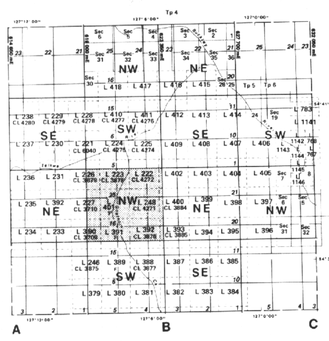
CUT LINE

BRUSH

Brush

MAP INDEX

93L



A B C

LEGEND

MAIN ROAD		RIVER	
SECONDARY ROAD		INTERMITTENT STREAM	
BRIDGE, CULVERT		LAKE	
TRACK or TRAIL		SWAMP	
BUILDING		SAND	
POLE		SLIDE	
FENCE		TREES	
LOT LINE		DRILL HOLE	
CUT LINE		HORIZONTAL CONTROL	
SPOT HEIGHT	602.2	VERTICAL CONTROL	
CONTOURS	1000	HORIZONTAL VERTICAL CONTROL	
DEPRESSION	975	NOTE: LOT LINES APPROXIMATE ONLY	

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129° W. UTM Zone 9

SURVEY NOTE:

Coordinates are on U.T.M. Grid (Zone 9) and are derived from Government control stations Blitzen, Padre, and Tack. Elevations are on Geodetic Datum and are derived from BM 79HA369 = 538.922 metres via reciprocal trigonometric levelling.

NOTE: 5 Metre Contour interpolated from 1:2000 Mapping

PREPARED BY: Aero Geometrics Ltd.

METRES 100 50 0 100 200 300 400 500 METRES

SCALE: 1:5000

CONTOUR INTERVAL: 5 METRES

DATE OF PHOTOGRAPHY:

Topography 1972

Planimetry 1975 & 1978

Compilation 1981 Cartography 1982

Update: Photography 1982 & 1983

Compilation 1982 Cartography 1983

#870

Crows Nest Resources Limited
EXPLORATION

WEST CENTRAL B.C.
SMITHERS AREA

PITS 1,2,3,4,5&6
END OF YEAR 20

AUTHOR: W-C	SCALE: 1:5000	ENCLOSURE No.:
DATE: 85-01	REVISED:	DRAWING No. TW2M10
To Accompany		

L. 416 L. 415

INFILTRATION GALLERY & WATER SUPPLY SYSTEM

L. 412 L. 409

L. 410 CL 4277 L. 411 CL. 4276

L. 224 CL. 4275 L. 225 CL. 4274

L. 412 L. 413 CL. 7696

L. 409 CL. 7695 L. 408 CL. 7694

EMERGENCY SPILLWAY

INTERCEPTOR DITCH

TANK FARM

SETTLING POND

PLANT & MINE SUPPORT FACILITIES

PREPARATION PLANT

TRUCK DUMP & BREAKER STATION

R.O.M. STOCKPILE

138kV POWER LINE

TAILINGS DAM

HEAD TANK

GAS LINE

L. 222 CL. 4272 L. 402

L. 402 CL. 7692 L. 403 CL. 7693

SETTLING POND

FROM MINE

TELKWA RIVER

TELKWA

PIPELINE

Bushes

PIT

PRONTO

PADRE

TW2

TW4

MAP INDEX 93L

LEGEND

MAIN ROAD
SECONDARY ROAD
BRIDGE, CULVERT
TRACK or TRAIL
BUILDING
POLE
FENCE
LOT LINE
CUT LINE
SPOT HEIGHT
CONTOURS
DEPRESSION

RIVER
INTERMITTENT STREAM
LAKE
SWAMP
SAND
SLIDE
TREES
DRILL HOLE
HORIZONTAL CONTROL
VERTICAL CONTROL
HORIZONTAL VERTICAL CONTROL

NOTE: LOT LINES APPROXIMATE ONLY

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129° W. U.T.M. Zone 9

SURVEY NOTE:
Coordinates are on U.T.M. Grid (Zone 9) and are derived from Government control stations Blitzen, Padre, and Tock. Elevations are on Geodetic Datum and are derived from BM 79HA369 at 538.922 metres via reciprocal trigonometric levelling.

NOTE: 5 Metre Contour interpolated from 1:2000 Mapping

PREPARED BY: Aero Geometrics Ltd.

METRES 100 50 0 100 200 300 400 500 METRES

SCALE: 1:5000

CONTOUR INTERVAL: 5 METRES

DATE OF PHOTOGRAPHY:
Topography 1972
Planimetry 1975 & 1978
Compilation 1981 Cartography 1982
Update: Photography 1982 & 1983
Compilation 1982 Cartography 1983

D28# #860

Crows Nest Resources Limited
EXPLORATION

WEST CENTRAL B.C.
SMITHERS AREA

SITE PLAN

AUTHOR MONGARD, W-C	SCALE: 1:5 000	ENCLOSURE No:
DATE: 84-12	REVISED:	DRAWING No: TW2M01
To Accompany		

#870

TO PLANTSITE

PIT 1

PIT 2

PIT 3

PIT 4

PIT 5

PIT 6

WEST WASTE DUMP

SETTLING POND

SETTLING POND

INTERCEPTOR DITCH

INTERCEPTOR DITCH

INTERCEPTOR DITCH

INTERCEPTOR DITCH

BULKLEY VALLEY COLLIERIES LTD. No. 4 MINE

GOATHORN CREEK

TENAS CREEK

SECTION 369N

SECTION 225E

SECTION 262N

SECTION 234N

SECTION 107N

SECTION 307N

L. 223 CL. 3878

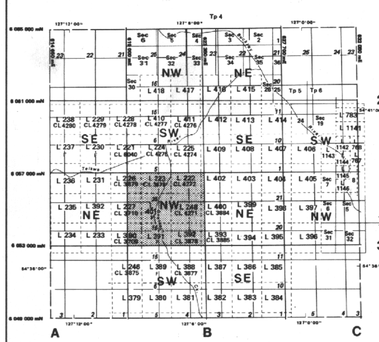
L. 226 CL. 3879

CUT LINE

BRUSH

Brush

MAP INDEX 93L



LEGEND

MAIN ROAD
SECONDARY ROAD
BRIDGE, CULVERT
TRACK or TRAIL
BUILDING
POLE
FENCE
LOT LINE
CUT LINE
SPOT HEIGHT
CONTOURS
DEPRESSION

RIVER
INTERMITTENT STREAM
LAKE
SWAMP
SAND
SLIDE
TREES
DRILL HOLE
HORIZONTAL CONTROL
VERTICAL CONTROL
HORIZONTAL VERTICAL CONTROL

NOTE: LOT LINES APPROXIMATE ONLY

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129° W. UTM Zone 9

SURVEY NOTE:
Coordinates are on U.T.M. Grid (Zone 9) and are derived from Government control stations Blitzen, Padre, and Tock. Elevations are on Geodetic Datum and are derived from BM 79HA369 = 538.922 metres via reciprocal trigonometric levelling.

NOTE: 5 Metre Contour interpolated from 1:2000 Mapping

PREPARED BY: Aero Geometrics Ltd.

METRES 100 50 0 100 200 300 400 500 METRES

SCALE: 1:5000

CONTOUR INTERVAL: 5 METRES

DATE OF PHOTOGRAPHY:
Topography 1972
Planimetry 1975 & 1978
Compilation 1981 Cartography 1982
Update: Photography 1982 & 1983
Compilation 1982 Cartography 1983

#869 #870

Crows Nest Resources Limited
EXPLORATION

WEST CENTRAL B.C.
SMITHERS AREA

SITE PLAN

AUTHOR: MONGARD, W-C	SCALE: 1:5 000	ENCLOSURE No:
DATE: 84-12	REVISED:	DRAWING No: TW2M02
To Accompany		

SECTION 329N

INTERCEPTOR DITCH

PIT 3

L. 390
CL. 3709

L. 391
FREEHOLD

L. 392
CL. 3876

L. 393
CL. 3885

L. 246
CL. 3875

L. 379
CL. 3882

L. 389
FREEHOLD

L. 388
CL. 3877

L. 380
CL. 3883

L. 624
CL. 4265

L. 625
CL. 4264

MAP INDEX 93L

LEGEND

MAIN ROAD
SECONDARY ROAD
BRIDGE, CULVERT
TRACK or TRAIL
BUILDING
POLE
FENCE
LOT LINE
CUT LINE
SPOT HEIGHT
CONTOURS
DEPRESSION

RIVER
INTERMITTENT STREAM
LAKE
SWAMP
SAND
SLIDE
TREES
DRILL HOLE
HORIZONTAL CONTROL
VERTICAL CONTROL
HORIZONTAL VERTICAL CONTROL

NOTE: LOT LINES APPROXIMATE ONLY

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129° W. U.T.M. Zone 9

SURVEY NOTE:
Coordinates are on U.T.M. Grid (Zone 9) and are derived from Government control stations Blitzen, Padre, and Tack. Elevations are on Geodetic Datum and are derived from BM 79HA369 = 538.922 metres via reciprocal trigonometric levelling.

NOTE: 5 Metre Contour interpolated from 1:2000 Mapping

PREPARED BY: Aero Geometrics Ltd.

METRES 100 50 0 100 200 300 400 500 METRES

SCALE: 1:5000

CONTOUR INTERVAL: 5 METRES

DATE OF PHOTOGRAPHY:
Topography 1972
Planimetry 1975 & 1978
Compilation 1981 Cartography 1982
Update: Photography 1982 & 1983
Compilation 1982 Cartography 1983

#870

Crows Nest Resources Limited
EXPLORATION

WEST CENTRAL B.C.
SMITHERS AREA

SITE PLAN

AUTHOR. MONGARD, W-C	SCALE: 1:5 000	ENCLOSURE No:
DATE: 84-12	REVISED:	DRAWING No: TW2M03
To Accompany		

SETTLING POND

INTERCEPTOR DITCH

SECTION 369N

L. 402

L. 402 CL. 7692 | L. 403 CL. 7693

L. 404

EAST WASTE DUMP

TOPSOIL STORAGE AREA

TO PLANTSITE

EXPLOSIVES MAGAZINE

L. 400 CL. 3884 | L. 399 CL. 7691

L. 393 CL. 3885 | L. 394 CL. 7690

L. 398

L. 395

L. 400 CL. 3884

L. 393 CL. 3885

LEGEND

MAIN ROAD
SECONDARY ROAD
BRIDGE, CULVERT
TRACK or TRAIL
BUILDING
POLE
FENCE
LOT LINE
CUT LINE
SPOT HEIGHT
CONTOURS
DEPRESSION

RIVER
INTERMITTENT STREAM
LAKE
SWAMP
SAND
SLIDE
TREES
DRILL HOLE
HORIZONTAL CONTROL
VERTICAL CONTROL
HORIZONTAL VERTICAL CONTROL

NOTE: LOT LINES APPROXIMATE ONLY

MAP INDEX 93L

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129° W. U.T.M. Zone 9

Tp 6
Tp 8

SURVEY NOTE:

3 Coordinates are on U.T.M. Grid (Zone 9) and are derived from Government control stations Blitzen, Padre, and Tack. Elevations are on Geodetic Datum and are derived from BM 79HA369 = 538.922 metres via reciprocal trigonometric levelling.

NOTE: 5 Metre Contour interpolated from 1:2000 Mapping

PREPARED BY: Aero Geometrics Ltd.

METRES 100 50 0 100 200 300 400 500 METRES

SCALE: 1:5000

CONTOUR INTERVAL: 5 METRES

DATE OF PHOTOGRAPHY:
Topography 1972
Planimetry 1975 & 1978

Compilation 1981 Cartography 1982

Update: Photography 1982 & 1983

Compilation 1982 Cartography 1983

#870

Crows Nest Resources Limited
EXPLORATION

WEST CENTRAL B.C.
SMITHERS AREA

SITE PLAN

AUTHOR: MONGARD, W-C	SCALE: 1:5 000	ENCLOSURE No:
DATE: 84-12	REVISED:	DRAWING No: TW2M04
To Accompany		

HAZELTON GROUP

HAZELTON GROUP

HAZELTON GROUP

SKEENA GROUP

SKEENA GROUP

HAZELTON GROUP

HAZELTON GROUP

COAL SEAMS 3.4m
MEAS. SEC. 1979

COAL SEAM 2.66m

OUTLINE OF PIT 1

D

D'

CROSS SECTION 429N

OUTLINE OF PIT 2

McNEIL MINE
PRE 1930 U/G
3.05m SEAM

E

E'

CROSS SECTION 369N

L. 223
CL. 3879

L. 222
CL. 4272

L. 226
CL. 3879

LUSCAR
MINING
AREA

1.83m SEAM

MEAS. SEC. 81-02
COAL SEAM 3.04m

B.V.C. NO. 4 MINE
U/G 1.8m SEAM

COAL SEAM 1.1m

GRAVEL PIT

COAL SEAM 0.70m

SURFACE MINE

DYKES

BULKLEY VALLEY
COLLIERIES LTD.

SURFACE MINE

OUTLINE OF PIT 3

OUTLINE OF PIT 4

F

F'

CROSS SECTION 351N

OUTLINE OF PIT 6

NO. 4 EXTENSION
U/G 5.12m SEAM
MEAS. SEC. 06-7

OUTLINE OF PIT 5

MDST - THIN BEDDED

L. 227
CL. 3710

L. 390
CL. 3709

MDST - / MINOR CONG.
NEARLY FLAT LYING

Ss/MDST.
FINELY LAMINATED

DYKE

B.V.C. NO. 2 MINE
1943 - 5
90,500T
3.7m SEAM

L. 401
FREEHOLD

L. 248
CL. 4271

L. 391
FREEHOLD

L. 392
CL. 3876

G

G'

CROSS SECTION 307N

L. 400
CL. 3884

L. 393
CL. 3885

H

H'

CROSS SECTION 324N

B.V.C. NO. 1 MINE
U/G
1930-43
60,000T

MDST w/CONG.

MDST w/Ss

A

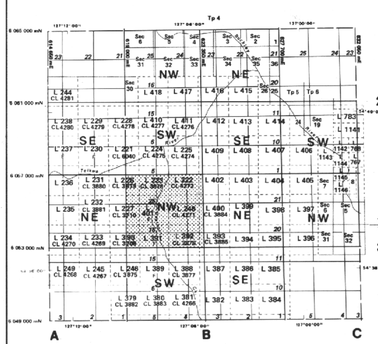
A

SEE SHEET NO. B3, DRAWING NO. TW3U06 (1:10,000)

6 057 000 mN
6 056 500 mN
6 056 000 mN
6 055 500 mN
54° 38' 00"
6 055 000 mN
6 054 500 mN
6 054 000 mN
6 053 500 mN
54° 37' 00"
6 053 000 mN
619 000 mE
127° 09' 00"
619 000 mE
620 000 mE
620 500 mE
127° 08' 00"
621 000 mE
621 500 mE
127° 07' 00"
622 000 mE
622 500 mE
126° 06' 00"
623 000 mE

MAP INDEX

93L10/11



LEGEND

MAIN ROAD
SECONDARY ROAD
BRIDGE, CULVERT
TRACK or TRAIL
BUILDING
POLE
FENCE
LOT LINE
CUT LINE
SPOT HEIGHT
CONTOURS
DEPRESSION

RIVER
INTERMITTENT STREAM
LAKE
SWAMP
SAND
SLIDE
TREES
DRILL HOLE
HORIZONTAL CONTROL
VERTICAL CONTROL
HORIZONTAL VERTICAL CONTROL

NOTE: LOT LINES APPROXIMATE ONLY

T.N.
GRID NORTH

METRES 100 50 0 100 200 300 400 500 METRES

SCALE: 1:5000

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129° W. U.T.M. Zone 9

SURVEY NOTE:
Coordinates are on U.T.M. Grid (Zone 9) and are derived from Government control stations Blitzen, Padre, and Tack. Elevations are on Geodetic Datum and are derived from BM 79HA369 = 538.922 metres via reciprocal trigonometric levelling.

NOTE: 5 Metre Contour interpolated from 1:2000 Mapping

PREPARED BY: Aero Geometrics Ltd.

LEGEND

HAZELTON GROUP (VOLCANICS) - (unconformable contacts) - Jurassic
SKEENA GROUP (SEDIMENTS) - (unconformable contacts) - Lower Cretaceous
TERTIARY INTRUSIVE - (unconformable contacts)
REVERSE FAULT (KNOWN) - (triangle indicates upthrown side)
REVERSE FAULT (APPROXIMATE) - (triangle indicates upthrown side)
FAULT (DEFINED) - (type unknown)
FAULT (UNDEFINED) - (type unknown)
NORMAL FAULT (KNOWN) - (tad poles indicate downthrown side)
NORMAL FAULT (APPROXIMATE) - (tad poles indicate downthrown side)
ALIGNMENT OF UNKNOWN GEOLOGICAL SIGNIFICANCE (air photo interpreted)
BEDDING ATTITUDE
OUTCROP
B.V.C. SURFACE MINE AREA AND BOUNDARIES OF PREVIOUS UNDERGROUND MINES
TW-8 ⊙213 DRILL HOLE (Crows Nest Resources Ltd.)
B.V.C. BULKLEY VALLEY COLLIERIES LTD.
PREVIOUS UNDERGROUND MINE
COAL LICENCE BOUNDARY (approx)
TRENCH
⊙ R-P-15 PLACER EXPLN' DRILL HOLE - 1970
SYNCLINE (arrow indicates direction of plunge)

#870

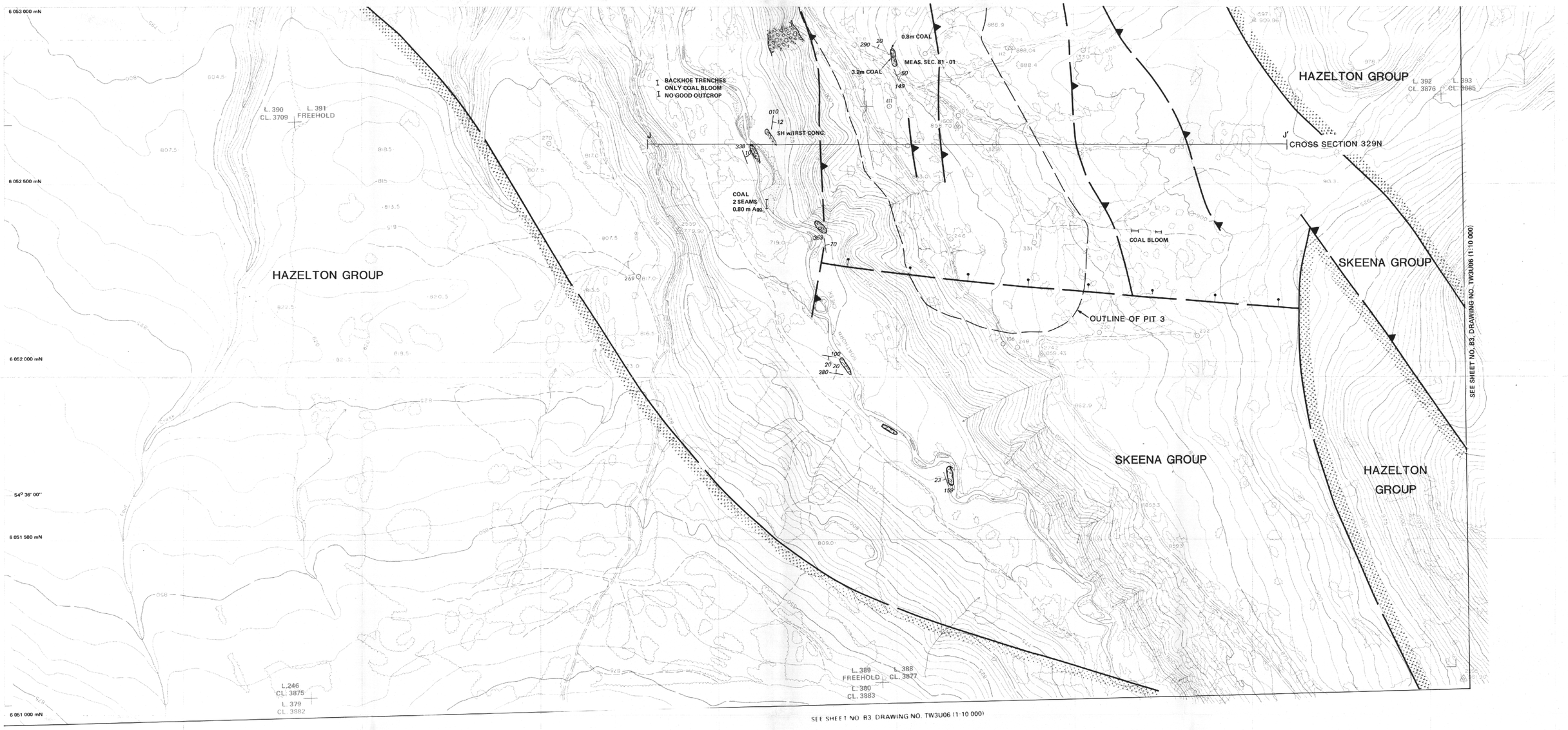
Crows Nest Resources Limited
EXPLORATION

TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

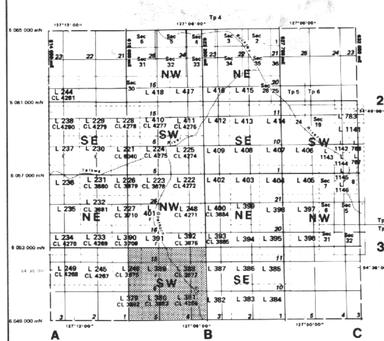
GEOLOGICAL MAP

N.T.S. 93L11 — UTM ZONE 9

AUTHOR: D. HANDY/S. CAMERON	SCALE: 1:5000	DRAWN BY:
DATE: 85-01	REVISED:	DRAWING No: TW2U16
To Accompany 1984 GEOLOGICAL REPORT		



MAP INDEX 93L10/11



LEGEND

- MAIN ROAD
- SECONDARY ROAD
- BRIDGE, CULVERT
- TRACK or TRAIL
- BUILDING
- POLE
- FENCE
- LOT LINE
- CUT LINE
- SPOT HEIGHT
- CONTOURS
- DEPRESSION
- RIVER
- INTERMITTENT STREAM
- LAKE
- SWAMP
- SAND
- SLIDE
- TREES
- DRILL HOLE
- HORIZONTAL CONTROL
- VERTICAL CONTROL
- HORIZONTAL VERTICAL CONTROL

NOTE: LOT LINES APPROXIMATE ONLY

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 129° W. U.T.M. Zone 9

SURVEY NOTE:
Coordinates are on U.T.M. Grid (Zone 9) and are derived from Government control stations Blitzen, Padre, and Tock. Elevations are on Geodetic Datum and are derived from BM 79HA369 = 538.922 metres via reciprocal trigonometric levelling.

PREPARED BY: Aero Geometrics Ltd.

METRES 100 50 0 100 200 300 400 500 METRES

SCALE: 1:5000

CONTOUR INTERVAL: 5 METRES

DATE OF PHOTOGRAPHY:
Topography 1972
Planimetry 1975 & 1978
Compilation 1981 Cartography 1982

LEGEND

- HAZELTON GROUP (VOLCANICS) - (unconformable contacts) - Jurassic
- SKEENA GROUP (SEDIMENTS) - (unconformable contacts) - Lower Cretaceous
- TERTIARY INTRUSIVE - (unconformable contacts)
- REVERSE FAULT (KNOWN) - (triangle indicates upthrown side)
- REVERSE FAULT (APPROXIMATE) - (triangle indicates upthrown side)
- FAULT (DEFINED) - (type unknown)
- FAULT (UNDEFINED) - (type unknown)
- NORMAL FAULT (KNOWN) - (tad poles indicate downthrown side)
- NORMAL FAULT (APPROXIMATE) - (tad poles indicate downthrown side)
- ALIGNMENT OF UNKNOWN GEOLOGICAL SIGNIFICANCE (air photo interpreted)
- BEDDING ATTITUDE
- OUTCROP
- B.V.C. SURFACE MINE AREA AND BOUNDARIES OF PREVIOUS UNDERGROUND MINES
- DRILL HOLE (Crows Nest Resources Ltd.)
- BULKLEY VALLEY COLLIERIES LTD.
- PREVIOUS UNDERGROUND MINE
- COAL LICENCE BOUNDARY (approx)
- TRENCH
- PLACER EXPLN' DRILL HOLE - 1970
- SYNCLINE (arrow indicates direction of plunge)

#870

Crows Nest Resources Limited
EXPLORATION

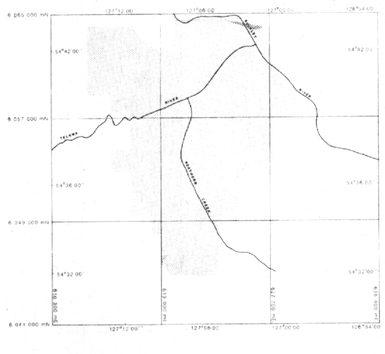
TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

GEOLOGICAL MAP

NTS: 93L11 UTM ZONE 9

AUTHOR: D. HANDY/S. CAMERON	SCALE: 1:5000	DRAWN BY:
DATE: 85-01	REVISED:	DRAWING No: TW2U19
To Accompany 1984 GEOLOGICAL REPORT		

MAP INDEX 93L10/11



LEGEND

MAIN ROAD		LAKE	
SECONDARY ROAD		SWAMP	
TRACK OR TRAIL		BUILDING	
RAILROAD		HORIZONTAL/VERTICAL CONTROL	1643 △
BRIDGE		GAS PIPELINE	
SPOT HEIGHT	1401	POWER LINE	
CONTOURS	1400	VILLAGE BOUNDARY	
RIVER, STREAM		LOT LINE*	

*Lot Lines approximate only.

NOTE: Photogrammetric mapping based on 1982 survey control and taken from NTS Map 93L/11.

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR CENTRAL MERIDIAN REFERENCE 129° W UTM ZONE 9.

METRES 250 0 250 500 750 1000 1250 1500 1750 2000 METRES

SCALE - 1:20 000

CONTOUR INTERVAL - 20 METRES

T.N. / G.N.

DATE OF PHOTOGRAPHY:

TOPOGRAPHY 1972, 1982, 1983

PLANIMETRY 1975, 1978, 1982, 1983

COMPILATION 1978, 1982, 1983 CARTOGRAPHY 1984

#870

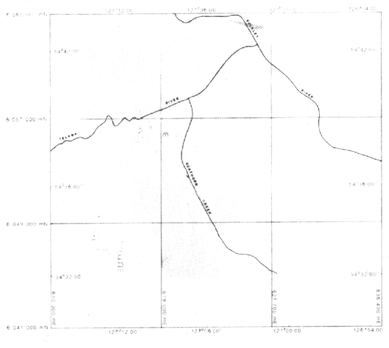
Crows Nest Resources Limited

TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

MINE INFRASTRUCTURE MAP

NTS-93L/11			UTM ZONE 9
AUTHOR: MONGARD		SCALE: 1:20000	DRAWN BY: RGP
DATE: 84-10		REVISED:	DRAWING No: TW4M01
To Accompany			

MAP INDEX 93L10/11



LEGEND

MAIN ROAD		LAKE	
SECONDARY ROAD		SWAMP	
TRACK OR TRAIL		BUILDING	
RAILROAD		HORIZONTAL/VERTICAL CONTROL	1643 △
BRIDGE		GAS PIPELINE	
SPOT HEIGHT	1463	POWER LINE	
CONTOURS		VILLAGE BOUNDARY	
RIVER, STREAM		LOT LINE*	

*Lot Lines approximate only.

NOTE: Photogrammetric mapping based on 1982 survey control and taken from NTS Map 93L/11.

MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR CENTRAL MERIDIAN REFERENCE 129° W UTM ZONE 9.

METRES 250 0 250 500 750 1000 1250 1500 1750 2000 METRES

SCALE - 1:20 000

CONTOUR INTERVAL - 20 METRES

T.N. G.N.

DATE OF PHOTOGRAPHY:

TOPOGRAPHY 1972, 1982, 1983

PLANIMETRY 1975, 1978, 1982, 1983

COMPILATION 1978, 1982, 1983 CARTOGRAPHY 1984

#870 [redacted]

Crows Nest Resources Limited

TELKWA PROJECT
SMITHERS AREA
WEST CENTRAL B.C.

MINE INFRASTRUCTURE MAP

NTS-93L/11 UTM ZONE 9

AUTHOR: MONGARD	SCALE: 1:20000	DRAWN BY: RGP
DATE: 84-10	REVISED:	DRAWING No: TW4M01
To Accompany		