



**DBARD for PARADOX:
Developments in DBARD, the
Database for Acid Rock Drainage**

MEND Project 1.12.1b

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March 1996

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A Report and User Guide prepared for:

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MINING AND MINERAL PROCESS ENGINEERING

UNIVERSITY OF BRITISH COLUMBIA

March 31, 1996

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SUMMARY

DBARD for Paradox has been developed as a repository for acid rock drainage prediction test data. The purpose of DBARD is to aid researchers, industry and regulators in assessing the prediction data obtained as part of evaluations required for waste management planning and permitting. The previous phase in the development of DBARD entailed the conversion of DBARD Version 2.0 from a dBASE III Plus platform to a Windows-based environment as well as updating and expanding the range of data entered. This report and user guide describes the design, organization and use of the latest version of DBARD which was designed to run within Paradox Version 5.0. *DBARD for Paradox* was designed to allow easier data viewing, entry and editing. New fields were added to the database to improve the extent of data, their quality and cross referencing. In addition, reporting capabilities were enhanced to allow a large number of report formats with many data combinations to be generated. Example reports are provided.

SOMMAIRE

DBARD pour Paradox a été développé afin d'être un registre de données d'essai de drainage minier acide. Le but de DBARD est de servir de support aux chercheurs, à l'industrie et aux législateurs pour l'évaluation des données de prédiction, obtenues dans le cadre d'estimation requise pour le permit et la planification de la gestion des résidus minier. La phase précédente du développement de DBARD comprend la conversion de dBASE III Plus à un environnement Windows comme soutien de DBARD version 2.0 aussi bien que la mise à jour et l'augmentation de l'éventail des données saisie. Ce rapport et le guide de l'utilisateur décrivent le design, l'organisation et l'utilisation de la nouvelle version de DBARD sous Paradox version 5.0. DBARD pour Paradox a été conçu pour permettre une meilleure visualisation, saisie et édition des données. De nouveaux champs ont été ajoutés à la banque de données pour améliorer l'étendue, la qualité et le retour des données. De plus, l'augmentation de la capacité à produire des rapports permet d'en générer en un grand nombre de formats avec plusieurs combinaisons de données. Des exemples de rapport sont fournis.

ACKNOWLEDGEMENTS

This report is a revised edition of the report released March 26, 1995. The assistance of Sherry Corvalan, Research Assistant for Mining Environment UBC, and Ralph Sayle, Database Consultant for the Faculty of Applied Science, UBC, in the revision and modifications made during this year are gratefully acknowledged. The financial support of Natural Resources Canada for the current phase of the work is also acknowledged.

The authors would like to repeat the following acknowledgement from the 1995 report.

The efforts of Peri Mehling, Environment Canada, in bringing this phase in the evolution of DBARD to fruition is gratefully acknowledged. The authors of this report would like to give sincere thanks to Ralph Sayle, Database Consultant for the Faculty of Applied Science, who completed the conversion of DBARD from a dBASE III Plus format to Paradox for Windows - an onerous task with excellent results. Peri Mehling and Robert McCandless of Environment Canada provided guidance and supplied necessary data. Sharon Ferris of the Geological Survey Branch library in Victoria was very helpful in providing access to the Mine Development Assessment Report collection and providing a photocopier and workspace. Thanks to John Errington, B.C. Ministry of Energy, Mines and Petroleum Resources for arranging for financial assistance from MEMPR for extensive photocopying. Providers of data included Tom Higgs of T.W. Higgs and Associates Ltd. and Bill Napier of Homestake Canada. Elizabeth Sherlock, graduate student in the Department of Mining and Mineral Process Engineering, University of British Columbia, provided valuable assistance in technical aspects of the database. We thank Sherry Corvalan, Research Assistant, Mining Environment UBC, for her assistance in the design and organization of the new database and for inputting data. Thanks also to Grant Feasby, Manager of MEND, for his continuing interest and support.

The work carried out by Morwijk Enterprises Limited of Vancouver to develop the original DOS-based versions of DBARD is recognized and acknowledged.

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1.0 INTRODUCTION

Acidic drainage is a widely recognized environmental concern at many minesites around the world. The oxidation of sulfide minerals in mine rock, ore, tailings and mine walls can generate acidic conditions with correspondingly high levels of leachable metals. Detailed studies of acidic drainage and metal leaching at minesites to predict potential for acidic drainage as well as to monitor ongoing situations have been conducted but in many cases the testwork and data are available only in the original reports, making retrieval and re-interpretation difficult and time consuming.

Data from past studies might provide an indication of future conditions for a proposed mine with similar mineralogy or geographical location. In some cases, the sum of relevant past work may exceed the work conducted at a proposed minesite and may thus represent a significant component of acidic drainage prediction by pointing to critical information such as ranges in the rates of sulfide oxidation and the highest observed metal concentrations recorded at a particular pH.

To address these interests and concerns, the construction of an acid-drainage database was authorized by the British Columbia Acid Mine Drainage Task Force, representing both the British Columbia mining industry and regulatory agencies. Funding was provided at that time from the Canada/British Columbia Mineral Development Agreement.

The function of this database, known by the acronym, DBARD, the *DataBase* for Acid Rock Drainage, is to accept, store, and retrieve relevant data from acid-drainage testwork, including data from one-time or repetitive laboratory experiments and field tests. The original DBARD, Version 1.0, developed by Morwijk Enterprises Ltd. of Vancouver, British Columbia, was never released. DBARD Version 2.0, released in June 1993, was a series of programs written in the dBASE III Plus programming language. This expanded database with improved data handling and editing was also developed by Morwijk Enterprises Ltd. As part of the development of Version 2.0, acidic-drainage data were entered for several proposed and operating mines in

British Columbia. Subsequently, data acquisition and entry has been carried out under the auspices of the Chair of Mining and the Environment, Dr. Rick Lawrence, at the University of British Columbia. An update of the manual released in June 1993, was produced and released in January 1994, together with updated program and database files (MEND Project 1.12.1, Report of January 4, 1994).

The most recent phases of DBARD reported upon herein, entailed the development of *DBARD for Paradox*. The principal task was the conversion of DBARD, previously operating in a dBASE III Plus platform to Paradox Version 5.0 for Windows. Additional data was entered using the new format. The change in software platform and its design also allowed for the addition of new fields to the database to improve the extent of data, their quality and cross referencing.

Further work continued on DBARD in 1995 to enter additional data and to promote the database and its use. This work also included the improvement of quality of previously entered data.

This report on the development of *DBARD for Paradox* also serves as a simple operating guide for the software. Being a Windows-based software, use of the database is considerably more self-evident than the previous version. The instructions contained herein also assume user familiarity with Windows-based software. For these reasons, the guide is brief in nature.

This report is not a primer on acid rock drainage. Information on terminology, test procedures, data and data interpretation related to acid rock drainage can be obtained from numerous references such as the BC AMD Task Force Technical Guide (1989).

For further information on DBARD, contact:

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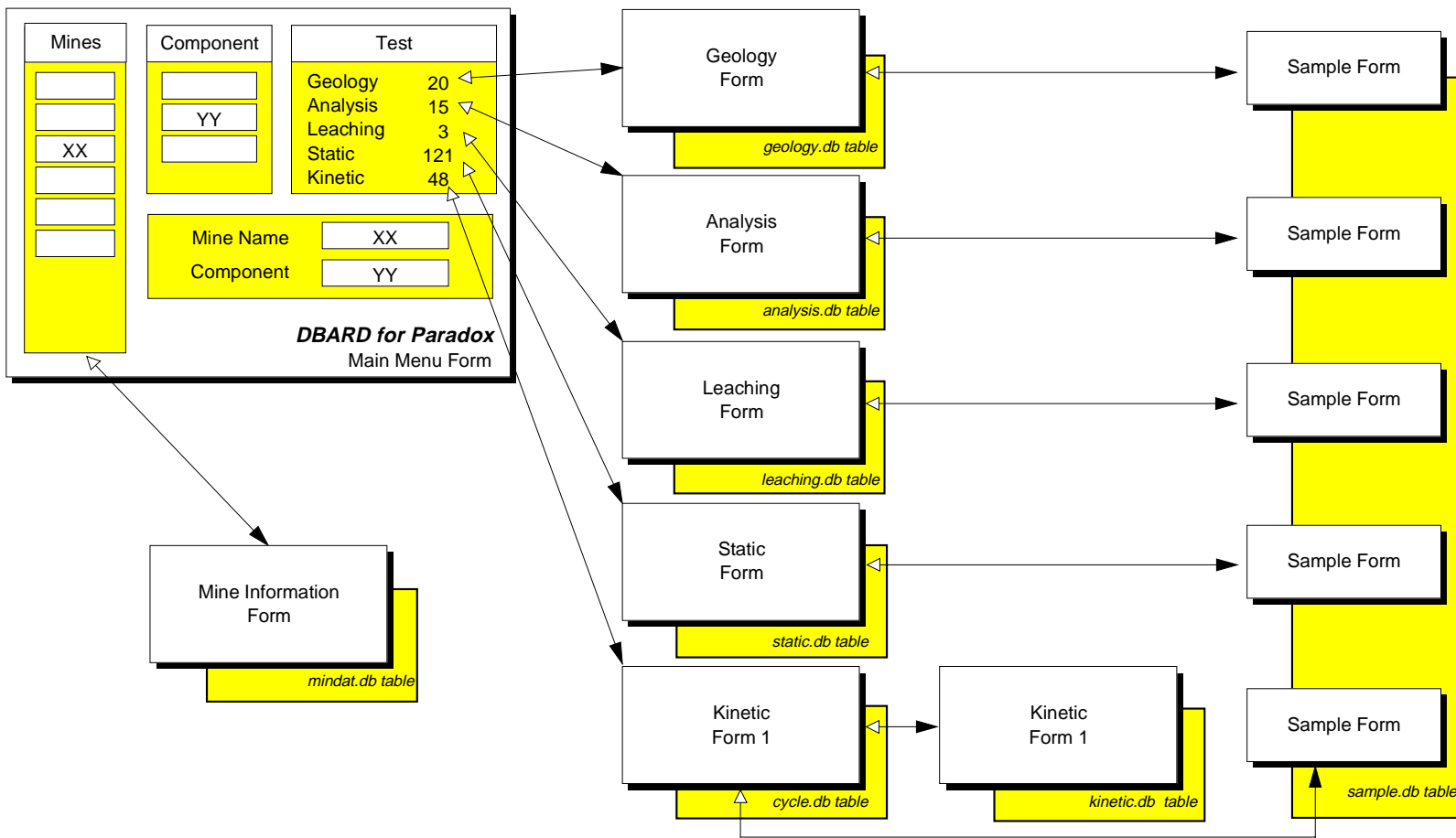


Figure 1. Structure of DBARD for Paradox

2.0 DEVELOPMENT OF DBARD FOR PARADOX

2.1 Choice of a Database System

Paradox for Windows was selected for the new DBARD platform due largely to the experience gained by the present workers with the development of *WasteDB*, the Database for ARD Research and Monitoring on Waste Rock Dumps (MEND Project No. 1.41.2, April 29, 1994). In that case, Paradox was selected on the criteria of relatively low cost, readily available software, creation of database files that can be used in a variety of software formats, and easy access to the data. An initial informal survey of potential users of the database indicated an equal interest in a database that could be used in a PC environment or could be accessed directly via Internet. In the former case, users would obtain data in a *.dbf* or equivalent format on disk or computer file transfer for use on their own PC using compatible software. In the latter case, users would be able to browse the database, perform non-Boolean searches, and execute text file transfers via the Internet. Although research into possible formats indicated that both interests could be satisfied within the contract budget, the focus of the project was the production of a PC-based product for greater simplicity and lower cost.

Following a review of software for PC applications, Paradox for Windows was selected for database development. Other popular commercially-available database software such as FoxPro, Superbase, and Access could have been selected and would have been as effective as Paradox. However, Paradox was selected on the basis of price and the availability of expertise in the software at UBC. In addition, Paradox was strongly recommended by programmers at the Noranda Research Centre, Pointe Claire, Québec, who have installed a network Paradox system for the company. Paradox satisfies the criterion of allowing the creation of the database files in readily usable formats by other software programs. Users will therefore be able to exercise considerable choice in database or spreadsheet selection for manipulating files.

2.2 Organization and Capabilities of DBARD

The general structure of the previous DOS version of DBARD has been largely retained. The database can accept, edit and store the information obtained during the testing of various mine components as part of required evaluations carried out for waste management planning and permitting. Information is stored on mines (including location, operators, deposit type, mining and milling method, general geology), samples of mine components (including ore, waste rock, tailings, underground walls, open pit walls) and test data (geology, metal analysis, leaching tests, static tests, kinetic tests).

Figure 1 is a schematic of *DBARD for Paradox* to show the organization of the database and the relationship of the various data entry/edit forms that can be accessed from the main screen form. Each of the forms, designed to facilitate easy viewing, entry and editing of data, is coupled with its corresponding data table which is not accessed during normal operation. An additional table contains information for all of the samples stored in the database. The fields, the number of which have been increased in this new version, are listed in Appendix I.

3.0 DBARD FOR PARADOX AND ITS OPERATION

3.1 Technical Overview

The data (both test and other information) in DBARD are stored in eight tables: *mindat.db*, *geology.db*, *analysis.db*, *leaching.db*, *static.db*, *cycles.db* (part of the kinetic data), *kinetic.db*, and *sample.db*. Two tables are global to the rest of the DBARD system, *mindat.db* and *sample.db*. Each *mindat.db* record has a minekey field which uniquely identifies that mine throughout the DBARD system. The *sample.db* table has two key fields: the minekey and the samplekey. These two keys provide a unique way to identify the sample record and link it to its mine.

For the five test data tables: *geology.db*, *analysis.db*, *leaching.db*, *static.db*, and *cycles.db*, each sample record with its accompanying data entered into the test table is linked in two ways to other data:

- 1) the minekey links the sample directly with the *mindat.db* table
- 2) the samplekey (automatically created every time a new sample record is entered) links the sample to the *sample.db* table which also contains the minekey.

An additional data table to store specific kinetic test details, *kinetic.db*, is accessed from the kinetic form.

A secondary table, called the *drivetab.db* table, links the five test tables. Every time the user selects a mine and/or a new component, the *drivetab.db* table is updated to reflect the current choice. This table completes the linkages between all the tables by enabling the user to view how many samples have been entered into a test table for the currently chosen mine and component combination.

3.2 System Requirements and Loading the Database

This version of DBARD requires that Paradox Version 5.0 be loaded onto the hard drive. Paradox, a registered trademark of Borland International Inc., is not supplied with the DBARD disks.

The system requirements to run *DBARD for Paradox* are determined by the requirements for Paradox as follows:

Microprocessor	80386 or higher
RAM	6MB (8MB is recommended)
Hard Disk	A hard disk is required. You need at least 20MB of free disk space to run Paradox 5.0. The DBARD program and data files require an additional 5.5 MB.
Video Monitor	EGA or higher
Microsoft Windows	Version 3.1x
Mouse	Not required but recommended
Network	A network is not required but Paradox supports several networks (see Paradox manual)

Paradox 5.0 does not run under Windows 95. DBARD, therefore, would need to be installed in Paradox 7.0x. Please consult your Paradox manual for details.

The seven 3½ inch disks supplied with this report contain all the files necessary to run DBARD within Paradox. These files should be copied into a sub-directory named \DBARD3 of the directory which contains the Paradox program files (usually C:\PDOXWIN).

3.3 Starting up DBARD for Paradox

DBARD for Paradox is opened by executing a file named *dbard3.fdl* from within Paradox. This file is accessed and executed as follows:

1. Open Paradox for Windows in the normal way.
2. If the Project Viewer is not open, open it from the Tools menu.
3. Change the working directory to DBARD3. If this is the first time you have used DBARD, you will have to first select the sub-directory DBARD3 by *left-clicking once* on the file

folder icon in the Project Viewer, *double left-clicking* PDOXWIN, and then selecting DBARD3.

4. Select Forms from the list in the Project Viewer.
5. Select *dbard3.fdl* from the file list and *double left-click* to open the Main Screen of DBARD.

3.4 Viewing Data, Data Entry and Editing

Opening DBARD by executing *dbard3.fdl* brings up the Main Screen form, from which all other forms in the database can be accessed. In this form, a combination of mine - component - test can be selected so that data in the corresponding test form can be viewed or modified.

The following steps should be carried out to view data, edit data or enter new data. Refer to the structure diagram, Figure 1, as needed.

Step 1 Selecting a Mine

Left-click once on a *mine name* to highlight it. To select a mine that is not on the screen, you may use the vertical alphabetical index on the left of the mine list to highlight the first letter of the mine you are looking for. If you just want to browse the list of mines or if you are not sure of the exact mine name, use the vertical scroll bar on the right of the mine list to move through the mine names. Once you have highlighted a mine name, you can access the mine information screen by *right-clicking once* on the highlighted mine name.

Step 2 Selecting a Component

Left-click once on a *component name* to select it.

Step 3 Selecting a Test

This is the final step before moving to another screen to view data and information. When you select a mine name combined with a mine component, the numbers of samples in the database corresponding to that combination appear beside the test buttons: *GEOLOGY*, *METAL ANALYSIS*, *METAL LEACHING*, *STATIC*, and *KINETIC*. To switch to a specific test form to view or modify data, *left-click once* on the appropriate *test* button.

In each form, data can be simply viewed or edited. To edit data, place the cursor in the appropriate data box and ***left-click once*** on the edit icon (or press the F9 key) to enter edit mode. The Status Bar at the bottom of the screen informs you if you are in edit mode or not. Edits made in a form are saved when you exit the form.

Copies of each of the database forms, showing examples of data entered, are presented in Appendix II.

3.5 Importing Data

Importing data into DBARD from software such as Excel or Lotus is possible. Due to the table and key structures of DBARD, however, it is not possible to provide a simple set of instructions to facilitate data import. It is recommended that users consult the respective software manuals for details.

3.6 Reports

DBARD for Paradox offers a variety of methods for manipulating, viewing, and printing data, including a tool to convert data to a spreadsheet-type structure. Depending on the complexity of the task at hand, users may utilize one or more methods employing the default methods offered by Paradox 5.0 or by customizing these methods. Some suggestions are offered below but these descriptions and possibilities are by no means exhaustive. For more details and helpful tutorials, users should consult the Paradox 5.0 User's Manual.

Reports are generated in Paradox from tables. The tables in DBARD that contain data and can be opened for reports are as follows: *mindat.db*, *geology.db*, *analysis.db*, *leaching.db*, *static.db*, *cycles.db*, *kinetic.db*, and *sample.db*.

To generate a simple report that draws on information contained in one table, return to the Project Viewer after exiting DBARD by ***left-clicking once*** on the Quit button on the Main Screen. To open a table before generating a Quick Report, select TABLES from the list at the

left of the Project Viewer. All tables in *DBARD for Paradox* will be listed to the right of the Project Viewer. After selecting the required table from the file list, open it by **double left-clicking**. When the table is open, select Quick Report from the Tools menu. A simple report will be generated that can be modified to suit individual requirements.

The Paradox 5.0 Report Expert guides the user step-by-step through designing a report involving one or more tables. To access the Report Expert, open File - New - Report, and choose Report Expert. This report can be modified and expanded using a Query (see User's Manual for instructions). The Query function enables the user to insert, delete or change multiple records. New tables, called Answer tables, can be created from existing tables. Records can be joined (see Join Table menu item) in the Query and then selected items from the various joined tables are copied to the new Answer table.

Tables can be exported to other software, for example Excel or Lotus, with the Export tool. This enables users who may be more comfortable using a spreadsheet format to view and manipulate the data.

An example report (Mine/Test) is accessible from the Main Screen. When the Mine/Test Report button is **left-clicked once**, a complete list of all mines entered into DBARD and the number of samples for each mine that have data entered into specific tests, will be printed to the screen. Printing is accomplished by choosing File - Print. A myriad of other reporting possibilities exist for DBARD. Two unnamed buttons are provided on the Main Screen that could be linked to the printing of other custom reports which the user may require on a regular basis. Other buttons could be created and programmed to operate from the Main Screen to perform other functions which are routinely performed for custom purposes.

Three examples of reports, including the Mine/Test report, are provided in Appendix III. The corresponding *.rsl* files, are included with the disks supplied and can be accessed via the Project Viewer - Reports.

4.0 DATA IN THE DATABASE

As of March 31, 1996, *DBARD for Paradox* contained data from 138 mines, with test results for 4,661 samples. The majority of mines are in British Columbia. Table 1 lists all the mines in the database. Those mines for which new data have been entered during the current phase of development are marked with an asterisk. Complete conversion of data from the previous DOS version of *DBARD* to the new version was completed in this phase of work.

Table 1. Current List of All Mines in DBARD (March 31, 1996)

(those with an asterisk have had new data entered since March 1995)

Adanac Mine	Erickson Gold Mine	Premier Gold Project
Afton Mine	Eskay Creek Project*	Pride of Emory
Afton Mine Expansion / Ajax	Esperanza Gold Property	Queen Charlotte Gold Project
Al Project	Florence Property	Quesnel River Project
Anyox Project	Fording Coal Mine	Quill Creek
Arctic Property	Galkeno Property	Quinsam Coal Project
Ashlu Gold Mine	Giant Nickel Project	Quintette Mine
BC Nickel Property	Gibraltar Mine	Quinto Property
Baker Mine	Golden Bear Project	Red Dog Project
Balmer Mine	Golden Crown Project	Reg Property
Baymag Mine	Goldstream	Rosland Project
Beaverdell Mine	Goldwedge Property	Sage Creek Exploration Project
Belcourt Exploration Project	Granisle Mine	Samatosum Project
Bell Mine	Greenhills Mine	Saxon Exploration Project
Benson Lake	HB Mine	Scottie Gold Mines Ltd.
Blackdome Mountain Project	Hat Creek Exploration Project	Sherwood Gold Project
Bolivar Project	Hedley Gold Tailings Project	Shikano Development
Boss Mountain	Highland Valley Copper	Silvana Mine
Bralorne Mine	Highmont Mine	Silver Queen Project
Brenda Mine	Island Copper Mine*	Similco
Britannia Mine	Island Mountain	Similkameen Division
Bullmoose Project	Johnny Mountain Project	Snip Project
Burnt River Exploration Project	Keno Property	Spud Valley Project
Byron Creek Mine	Kindrat	St Honore Columbian Project
Canamax Property	Kitsault Mine	Stibnite Gold Mine
Canty Gold Project	Kutcho Creek Project*	Stronsay Project (was Cirque)
Carbon Creek Coal Development	Ladner Creek Development	Sukunka Coal Mine Project
Cariboo Gold Quartz Mine	Lara Property	Sullivan Mine
Carolin Mine	Lawyers Project	Sulphurets Property
Carmacks Property*	Line Creek Mine	Sunbeam Gold Project
Cassiar Mine	Macktush Creek Property	Surf Inlet Project
Churchill Copper Mine	Mactung Project	Swift Creek Rock Drain Project
Cinola Gold Project	McIvor Lake Coal Project	Taurus Project
Congress Project	Monkman Project	Telkwa Coal Project
Cork-Province Mine	Mosquito Creek Mine	Treasure Mountain
Cry Lake Mine	Mount Klappan Project	Tulsequah Chief Project
Crystal Property	Mount Polley Project	Venus Property
Dankoe Property	Mt. Milligan Project	Vollaug Mine / Table Mountain
Deer Horn Mine Project	Mt. Spieker Coal Project	Whitehorse Property
Dolly Varden	Mt. Washington	Willa Project
Dome Mountain Project	Myra Falls	Willow Creek Project
Duthie Project	Nanaimo Coal Project	Windflower Project
Eagle Mountain Project	Nansen Property*	Windy Craggy
Elk River Coal Project	Nickel Plate Mine Project	Wolf Mountain Coal Project
Endako Mines Division	Phoenix Granby Mine	Yellow Giant
Equity Mine	Pinchi Lake Operations	Zeballos Mines

APPENDIX I

The Database Fields

DBARD Fields: Mine Information (*mindat.db*)

Mine Name
Date Mine Entered
Current Operator
Previous Operators
Latitude/Longitude
Country
Province/State
Region/County
Locale/Town
Contact Person
Phone
Fax

Deposit Type/Ore-Zone Model
General Mineralogy/Rock Types
Types of Sulfide Minerals
Types of Carbonate Minerals

Operating Status
Closing Date
Production Rate/Year
Total Production
Reserves
Mining Method
Milling Method
Elements of Interest
Report References
Comments

Geology (*geology.db*)

Mine Name

Component Name

Sample ID

Lithology/Relative Abundance

Mineralogy/Relative Abundance

Method of Analysis

Comments

Sample Information (*sample.db*)

Mine Name

Sample ID

Sample Type

Sample Location

Sample Interval

Sample Comments

Metal Analysis (*analysis.db*)

Mine Name

Mine Component

Sample ID

Analytical Method

Digestion Procedure

Analytical Laboratory

Elements (40 fields)

Comments

Metal Leaching (*leaching.db*)

Mine Name

Mine Component

Sample ID

Test Method

Particle Size

Weight of Sample

Volume of Leach Water

Initial pH of Leach Water

Final pH of Leach Water

Temperature

Eh

Total Alkalinity

Carbonate Alkalinity

Acidity to pH 4.5

Acidity to pH 8.3

Elements (40 fields)

Comments

Static Tests (*static.db*)

Mine Name

Mine Component

Sample ID

Test Laboratory

Test Method

Paste pH

Total %S

Sulfide %S

Sulfate %S

Organic %S

Other %S

Acid Potential AP

Neutralization Potential NP

Net Neutralization Potential NNP

Neutral. Potential/Acid Potential NP/AP

Sulfide Acid Potential SAP

Carbonate Neutralization Potential CaNP

CaNP/Sulfide Acid Potential CaNP/SAP

Refined Net Neutralization Potential RNNP

Interpretation

Comments

Kinetic Tests (*kinetic.db & cycles.db*)

Mine Name

Mine Component

Sample ID

Test Method/Apparatus

Test Laboratory

Cycle Duration

Cycle Number

Sample Weight

Analytical Procedures

Interpretation

Comments

Cycle

Days

Volume of Water Collected

pH

Eh

Conductivity

Total Alkalinity

Carbonate Alkalinity

Acidity to pH 4.5

Acidity to pH 8.3

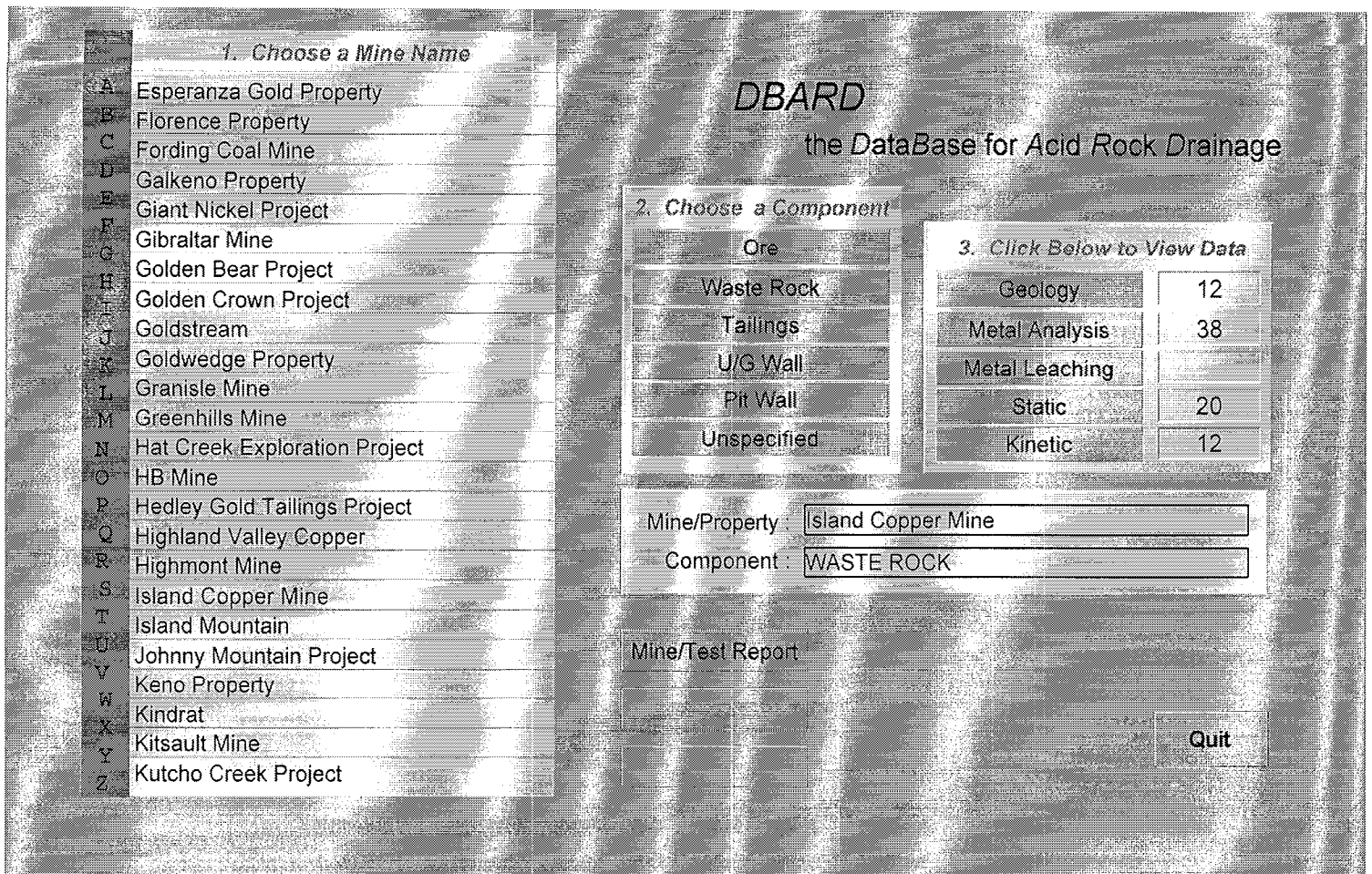
Sulfate

Elements (40 fields)

Comments

APPENDIX II

The Database Forms



DBARD for Paradox Main Screen

In this form, a mine - component - test combination can be selected to gain access to one of the other data forms. When a mine - component combination has been selected, the number of samples which have been evaluated by each of the test procedures are shown. Access to the mine information form is gained by right-clicking the highlighted name in the mine name list. An alphabetical key is provided for quick searches of mine names.

Mine Name : Stronsay Project (was Cirque Property)	<input type="button" value="Edit"/>	Deposit Type Ore-Zone Model :	
<i>date entered into DBARD :</i> 08/09/93	<input type="button" value="Delete"/>	Sedimentary exhalative processes - clast	
Current Operator :	Stronsay Corporation (owned by Curragh Inc. 70%)		
Previous Operators :	Curragh Resources Inc. (still the owner)		
Latitude/Longitude :	Lat 57° 30'/Long 125° 12'	General Mineralogy/Rock Types :	cherty argillite, shale - Gunsteel Forma
Country :	Canada	Sulfide Minerals :	barite, pyrite, sphalerite, galena
Province/State :	BC	Carbonate Minerals :	calcareous/dolomitic siltstone, limestone
Region/County :	Caribou, Akie	Operating Status :	advanced project
Locale/Town :	280km N of Mackenzie	Closing Date :	01/01/14
Contact Person :	G. Clow, Vice-President	Production Rate/Yr. :	1,260,000.00 projected
Phone :	416 363-7111	Fax :	416 363 1732
Comments :			
Report References :	<i>Environmental Impact Statement.</i> (Jan/91), Curragh Resources Inc. - Cirque Project (later renamed Stronsay). Rescan Environmental Services Ltd. <i>Status Report.</i> (Sept/90), Curragh Resources Inc. - Cirque		
	Mining Method :	underground - longitudinal longhole, updip or transverse longhole, panel & fill	
	Milling Method :	semi-bulk, Pb/Zn flotation in a conventional circuit	
	Elements of Interest :	(2.1%) Pb, (7.9%) Zn, (47.7 g/t) Ag	

Mine Information Form

This screen is accessed by executing a right-click on any mine name in the main menu listing. Relevant details about a specific mine's location, production characteristics and general geological information are stored in this form. Sulfide and carbonate mineral types are listed. Report references and contact persons are additional sources of information.

Mine Name : *Kutcho Creek Project* ↓

Component Name : *WASTE ROCK* ↓

Number of Geology Records :

Sample ID	Samples	Geology
HANGING WALL/9/META-GABBRO/17.6M/ABA 1990	Edit	New
Post Kinetic Test/88KA-13		Edit
Post Kinetic Test/88KA-17		
Post Kinetic Test/88KA-2		Delete

Lithology/Relative Abundance :

Shift-F2 to input & enter Memo View

Mineralogy/Relative Abundance :

Shift-F2 to input & enter Memo View

Method of Analysis :

Shift-F2 to input & enter Memo View

Comments :

Shift-F2 to input & enter Memo View

Geology Form

Information in this form provides details on a sample's lithology and mineralogy, and includes the method of analysis used.

Mine Name :	Island Copper Mine	↓	Comments :	
Component Name :	WASTE ROCK	↓		
Number of Analysis Records :		38		
Sample ID				
FEED TO MILL X ICM/SEPT/1974				
TYPICAL DISCHARGE/RUPERT INLET/1975				
0001				
0002				
Analytical Method :	ICP		Edit	New
Digestion Procedure :	Aqua regia			Edit
Analytical Laboratory :	Acme			Return
				Delete

Cu - ppm :	133.000	Mg - % :	1.100	Na - % :	0.030	Sr - ppm :	49.000
Zn - ppm :	413.000	Ag - ppm :	0.600	K - % :	0.120	Cl - % :	
Cd - ppm :	1.900	Cr - ppm :	26.000	V - ppm :	47.000	Br - % :	
Fe - % :	5.410	Se - ppm :		Sn - ppm :		F - % :	
Pb - ppm :	64.000	Hg - ppm :		Li - ppm :		I - % :	
Ni - ppm :	35.000	Mo - ppm :	10.000	B - ppm :	9.000	NO3 - mg/L :	
Co - ppm :	20.000	Mn - ppm :	827.000	P04 - % :		NO2 - mg/L :	
As - ppm :	25.000	Al - % :	2.020	U - ppm :		NH3 - mg/L :	
Sb - ppm :		Si - % :		Ra - pCi/L :		DO2 - mg/L :	
Ca - % :	0.640	Ba - % :	0.003	Th - ppm :		Dissolved solids - mg/L :	

Analysis Form

The total-metal content of a sample can be useful in the assessment of acid rock drainage. It confirms mineralogical observations, points to potential elements of environmental concern and can aid in the prediction of leach tests.

Mine Name : Britannia Mine

Component : TAILINGS

Number of Leaching Records : 3

Sample ID

880456-010 (Has #71 handwritten above it)

880456-011 (Has #72 handwritten above it)

880456-012 (Has #76 handwritten above it)

Test Method : Shake Flask

Particle Size :

Sample Wgt/gm :

Volume of Leach Water : 500.00

Initial pH of Leach Water :

Final pH of Leach Water :

Temperature :

Eh :

Total Alkalinity :

Carbonate Alkalinity :

Acidity to pH 4.5 :

Acidity to pH 8.3 :

Leaching

New

Edit

Delete

Samples

Edit

Return

Comments :

Cu - ug/L :	51	Mg - ug/L :	12,300.000	Na - mg/L :	181.000	Sr - ug/L :	79.000
Zn - ug/L :	23	Ag - ug/L :		K - mg/L :		Cl - mg/L :	
Cd - ug/L :		Cr - ug/L :		V - ug/L :		Br - mg/L :	
Fe - mg/L :	0.158	Se - ug/L :		Sn - ug/L :		F - mg/L :	
Pb - ug/L :		Hg - ug/L :		Li - ug/L :		I - mg/L :	
Ni - ug/L :		Mo - ug/L :	10	B - ug/L :	270	NO3 - mg/L :	
Co - ug/L :		Mn - ug/L :	31.000	P04 - mg/L :		NO2 - mg/L :	
As - ug/L :		Al - mg/L :	0.190	U - ug/L :		NH3 - mg/L :	
Sb - ug/L :		SI - mg/L :	1.98	Ra - pCi/L :		DO2 - mg/L :	
Ca - mg/L :	10.000	Ba - mg/L :	0.136	Th - pCi/L :		D.sol's - mg/L :	

Leaching Form

The short term leaching characteristics of a sample are important in waste planning. This form permits the entry of data from a number of leaching procedures.

Mine Name:	Eskay Creek Project	↓												
Component Name:	WASTE ROCK	↓												
Sample ID														
Hum. Cell Comp 1/21B Zone/HW Andesite														
Hum. Cell Comp 2/21B Zone/HW Andesite														
Hum. Cell Comp 3/21B Zone/HW Argillite														
Hum. Cell Comp 5/21B Zone/Contact Zone														
										Number of Kinetic Samples :		17		
18 Cycles in :		Hum. Cell Comp 1/21B Zone/HW Andesite					Min Cycle :		0		Max Cycle :		17	
Cycle	Days	Vol. (ml)	pH	Eh	Cond. - us	Tot. Alk.	Carb. Alk.	Acid 4.5	Acid 8.3	SO4 mg/L	Cu - mg/L	Zn		
0	0.00	295.00	5.19	241.00	1,362.00	1.60			32.90	711.000	0.057			
1	7.00	423.00	5.98	291.00	1,021.00				13.40	556.000	0.029			
2	14.00	435.00	5.69	185.00	849.00	4.90			6.70	452.000	0.020			
3	21.00	408.00	5.86	270.00	709.00	6.00			5.20	371.000	0.014			
4	28.00	410.00	5.55	208.00	633.00	5.00			4.90	321.000	0.011			
5	35.00	429.00	5.26	227.00	632.00	4.30			6.40	307.000	0.018			
6	42.00	413.00	5.12	267.00	558.00				7.00	264.000				
7	49.00	402.00	4.94	239.00	591.00				8.90	274.000				
8	56.00	359.00	5.03	219.00	570.00				9.20	271.000				
9	63.00	430.00	4.70	241.00	485.00				9.90	227.000	0.048			

Kinetic Form 1

Kinetic data will aid in the prediction of long term weathering characteristics of a mine sample by using a repetitive test procedure. In this form, leaching data from humidity cells and other kinetic test procedures can be entered. Left-click on Test Details to view the specific details of the test.

Mine Property Name :	Eskay Creek Project
Sample ID :	Hum. Cell Comp 5/21B Zone/Contact Zone
Component :	WASTE ROCK
Test Method/Apparatus :	Hum cell EPA /2-78-054, crush/screen at minus one quarter inch, 500 ml dl/week.
Test Laboratory :	T.W. Higgs & Associates
Cycle Duration :	weekly
Cycle Number :	17.00
Sample Weight (kg) :	1.00
Analytical Procedures :	Metals by ICP. Others not specified. . . .
Shift-F2 to edit this Memo Field.	
Interpretation :	
Shift-F2 to edit this Memo Field.	
Comments :	This sample is from Drill Core Composite #5. Material: Contact Zone Worst Case Net NP. Sample innoc. with T. ferroxidans. Not analyzed: Se, K, V, Sn, Li, PO4, U, Ra, Th, Cl, Br, F, I, NO3, NO2, NH3, DO2 and Dissolved Solids. No entry for other metals indicates below detection.
Shift-F2 to edit this Memo Field.	

Kinetic Form 2

This screen, accessed from Kinetic Form 1, provides details on the specific kinetic test procedure used. Non-standard procedures can be noted and summary interpretations of data reported.

Mine Name : Eskay Creek Project

Sample ID : Hum. Cell Comp 1/21B Zone/HW Andesite

Sample Type : Drill core composite

Sample Location : 21B Zone/Section 9+75N/DDH 284

Sample Interval : Depth 45-55m

Sample Comments : Source: Report subm. by T.W. Higgs Associates Ltd., June 1993

Return

Sample Form

This form provides details of a particular sample contained in the database. The information allows precise identification of samples, their type and location.

Mine Name :	<i>Kutcho Creek Project</i>	↓
Component Name :	<i>WASTE ROCK</i>	↓
Number of Static Records :	<input type="text" value="84"/>	

Sample ID	Samples	Static
Pre Kinetic Test/88KA-2	<input type="button" value="Edit"/>	<input type="button" value="New"/>
Pre Kinetic Test/88KA-20		<input type="button" value="Edit"/>
Pre Kinetic Test/88KA-21		<input type="button" value="Delete"/>
Pre Kinetic Test/88KA-22		<input type="button" value="Return"/>
Pre Kinetic Test/88KA-3		
Pre Kinetic Test/88KA-4		
Pre Kinetic Test/88KA-5		
Pre Kinetic Test/88KA-6		
Pre Kinetic Test/88KA-7		
Pre Kinetic Test/88KA-8		

Paste pH :	<input type="text" value="9.72"/>	Acid Potential :	<input type="text" value="1.41"/>
Total %S :	<input type="text" value="0.05"/>	Sulfide Acid Potential :	<input type="text" value="1.00"/>
Sulfide %S :	<input type="text" value="0.03"/>	NNP, Net Neut. Pot :	<input type="text" value="65.09"/>
Sulfate %S :	<input type="text"/>	NP/AP :	<input type="text" value="47.29"/>
Organic %S :	<input type="text"/>	RNNP :	<input type="text"/>
Other %S :	<input type="text"/>	CaNP/SAP :	<input type="text"/>
Neutralization Potential :	<input type="text" value="66.50"/>		
Carbonate NP :	<input type="text"/>		

Interpretation :
<input type="text" value="Not a potential source of ARD."/>
Comments :
<input type="text"/>

Static Form

This form is specifically designed to facilitate input of acid base accounting data obtained from standard and modified test procedures. Several key parameters are automatically calculated.

APPENDIX III

Examples of Reports

Mine/Test Report (*listmine.rsl*)

Excerpts, Mine Information (*mindat.rsl*)

Excerpts, Static Summary (*static.rsl*)

Mine Test Report (*listmine.rs!*)

<u>Mine Key</u>	<u>Mine Property Name</u>	<u>Analysis</u>	<u>Geology</u>	<u>Kinetic</u>	<u>Leaching</u>	<u>Static</u>
1	Adanac Mine	4	1	1	0	5
2	Afton Mine	1	7	0	1	8
3	Afton Mine Expansion / Ajax Project	0	282	0	0	364
4	Al Project	0	43	0	0	62
69	Anyox Project	42	0	0	0	4
126	Arctic Property	4	0	0	0	2
5	Ashlu Gold Mine	0	0	0	0	2
138	BC Nickel Property	4	0	0	0	4
6	Baker Mine	0	0	0	0	9
84	Balmer Mine	0	0	0	0	0
54	Baymag Mine	0	0	0	0	0
7	Beaverdell Mine	0	0	0	0	0
86	Belcourt Exploration Project	0	0	0	0	0
57	Bell Mine	8	0	0	0	8
55	Benson Lake	0	0	0	0	0
8	Blackdome Mountain Project	19	0	0	0	2
70	Bolivar Project	0	0	0	0	0
81	Boss Mountain	4	0	0	0	3
109	Bralorne Mine	6	6	0	0	6
58	Brenda Mine	22	0	41	1	1
59	Britannia Mine	4	0	0	3	4
9	Bullmoose Project	0	0	0	0	18
87	Burnt River Exploration Project	0	0	0	0	0
130	Canamax Property	1	0	0	0	1
10	Canty Gold Project	0	0	0	0	9
11	Carbon Creek Coal Development	0	0	0	0	5
112	Cariboo Gold Quartz Mine	9	0	0	0	7
143	Carmacks Copper	25	0	0	0	34
60	Carolin Mine	6	0	0	0	7
76	Cassiar Mine	14	0	0	0	0
80	Churchill Copper Mine	0	0	0	0	0
12	Cinola Gold Project	8	208	2	0	239
88	Coal Mountain Operations	0	0	0	0	0
13	Congress Project	0	1	0	0	6
133	Cork-Province Mine	4	0	0	0	4
119	Cry Lake Mine	0	0	0	0	0
137	Crystal Property	2	0	0	0	2
125	Dankoe Property	4	0	0	0	2
14	Deer Horn Mine Project	0	0	0	0	15
15	Dolly Varden	0	9	0	0	3
16	Dome Mountain Project	5	0	0	0	17
77	Duthie Project	1	0	0	0	1
118	Eagle Mountain Project	0	0	0	0	0
117	Elk River Coal Project	0	0	0	0	0
61	Endako Mines Division	6	0	0	0	6
62	Equity Mine	17	2	0	0	15
17	Erickson Gold Mine	46	20	0	0	42
18	Eskay Creek Project	33	114	22	9	487
19	Esperanza Gold Property	0	0	0	0	1
134	Florence Property	4	0	0	0	4
89	Fording Coal Mine	0	0	0	0	0
136	Galkeno Property	4	0	0	0	4
63	Giant Nickel Project	37	0	0	0	0
64	Gibraltar Mine	17	0	0	0	7
20	Golden Bear Project	27	12	0	0	16
21	Golden Crown Project	0	5	0	0	5
22	Goldstream	1	0	0	0	3
23	Goldwedge Property	2	0	0	0	1
65	Granisle Mine	0	0	0	0	0
90	Greenhills Mine	0	0	0	0	0
129	HB Mine	8	0	1	0	9
83	Hat Creek Exploration Project	0	0	0	5	0
72	Hedley Gold Tailings Project	2	0	0	0	2
53	Highland Valley Copper	16	0	0	0	0
79	Highmont Mine	0	0	0	0	0
67	Island Copper Mine	68	12	12	0	20
113	Island Mountain	2	0	0	0	2
24	Johnny Mountain Project	10	0	0	0	19

<u>Mine Key</u>	<u>Mine Property Name</u>	<u>Analysis</u>	<u>Geology</u>	<u>Kinetic</u>	<u>Leaching</u>	<u>Static</u>
135	Keno Property	4	0	0	0	4
82	Kindrat	1	0	0	0	1
73	Kitsault Mine	15	8	0	0	17
26	Kutcho Creek Project	0	79	0	0	103
27	Ladner Creek Development	0	0	0	0	4
28	Lara Property	10	0	0	0	0
29	Lawyers Project	0	15	0	0	24
85	Line Creek Mine	0	0	0	0	0
116	Macktush Creek Property	0	0	0	0	0
30	Mactung Project	0	0	0	0	0
115	Mclvor Lake Coal Project	2	0	0	0	22
145	Mets Project	0	0	0	0	26
91	Monkman Project	0	0	0	0	0
114	Mosquito Creek Mine	10	0	0	0	10
31	Mount Klappan Project	11	0	0	1	126
144	Mount Nansen	0	0	0	0	37
123	Mount Polley Project	4	30	3	0	117
121	Mt. Milligan Project	51	7	6	34	129
92	Mt. Spieker Coal Project	0	0	0	0	0
32	Mt. Washington	3	0	0	0	46
33	Myra Falls	47	0	0	0	57
111	Nanaimo Coal Project	2	0	0	0	0
34	Nickel Plate Mine Project	3	9	0	0	16
75	Phoenix Granby Mine	0	0	0	0	0
74	Pinchi Lake Operations	14	0	0	0	0
35	Premier Gold Project	11	34	3	0	112
142	Pride of Emory	3	0	0	0	2
36	Quesnel River Project	13	39	0	3	51
141	Quill Creek	4	0	0	0	4
37	Quinsam Coal Project	13	0	0	1	399
95	Quintette Mine	0	0	0	16	16
139	Quinto Property	1	0	0	1	1
38	Red Dog Project	0	0	0	0	0
108	Reg Property	0	0	0	0	0
39	Rossland Project	6	3	0	0	6
93	Sage Creek Exploration Project	0	0	0	0	9
40	Samatosum Project	6	97	0	1	113
94	Saxon Exploration Project	0	0	0	0	0
41	Scottie Gold Mines Ltd	4	0	0	0	5
107	Sherwood Gold Project	0	0	0	0	0
106	Shikano Development	0	0	0	0	0
131	Silvana Mine	1	0	0	0	1
105	Silver Queen Project	0	0	0	0	0
140	Similco	2	0	0	0	1
66	Similkameen Division	0	0	0	0	0
42	Snip Project	3	20	6	5	46
103	Spud Valley Project	0	0	0	0	6
102	St Honore Columbiun Project	12	0	0	0	0
101	Stibnite Gold Mine	0	0	0	0	0
120	Stronsay Project (was Cirque Property)	20	0	6	0	101
43	Sukunka Coal Mine Project	0	0	0	0	6
68	Sullivan Mine	7	0	0	0	5
44	Sulphurets Property	17	7	13	1	56
99	Sunbeam Gold Project	0	0	0	0	0
45	Surf Inlet Project	6	0	0	0	6
98	Swift Creek Rock Drain Project	0	0	0	0	0
46	Taurus Project	4	0	0	0	5
47	Telkwa Coal Project	4	0	0	2	213
97	Treasure Mountain	0	0	0	0	0
56	Tulsequah Chief Project	16	0	0	0	0
128	Venus Property	4	0	0	0	2
48	Vollaug Mine / Table Mountain Project	0	0	0	0	1
127	Whitehorse Property	4	0	0	0	2
49	Willa Project	9	5	0	0	7
50	Willow Creek Project	0	0	0	0	145
51	Windflower Project	0	0	0	0	10
52	Windy Craggy	10	28	7	0	83
96	Wolf Mountain Coal Project	4	0	1	0	46

<u>Mine Key</u>	<u>Mine Property Name</u>	<u>Analysis</u>	<u>Geology</u>	<u>Kinetic</u>	<u>Leaching</u>	<u>Static</u>
71	Yellow Giant	0	0	0	0	3
124	Zeballos Mines	3	0	0	1	0

Excerpts, Mine Information (*mindat.rs!*)

MineKey : 35
Mine Property Name : Premier Gold Project
Current Operator : Westmin Resources Ltd.
 /Tenajon Resources Corp.
Previous Operators :

Latitude/Longitude : Lat 56° 04'/Long 130° 02'
Country : Canada
Province/State : BC
Region/County : North Coast
Locale/Town : *(15,25) km N of Stewart

Contact Person : G H Montgomery
Phone : 604-681-2253
Fax :

Current Operating Status : Indeterminate Shutdown
Proj./Actual Closing Date : 01/01/92
Production Rate and Year : 662,110.00
Total Production : 768,939.00
Reserves : 8,844,755.00
Mining Method : Conventional Open Pit (Loader & Trucks), Underground (Avoca, Cut & Fill)
Milling Method : Conventional Flotation, Leaching Cyanidation
Elements of Interest : Au, Ag, Pb, Zn
Report References :

Comments :
 Big Missouri - half year operation; Silbak Premier - full year operation

Deposit Type Ore-Zone Mod :
 30-60 M Wide Epithermal Stockwork Quartz-Veined Porphyry
General Mineralogy :
 (Host) Hazelton Group: Marine/Non-Marine Calc-Alkaline Volcanics, (Jurassic Age)
Types of Sulfide Minerals : (3%)Pyrite; Lesser Sphalerite, Galena; Minor Argentite, Ruby Ag, Native Ag, Electrum
Types of Carb. Minerals : CALCITE

MineKey : 36
Mine Property Name : Quesnel River Project
Current Operator : Qpx Minerals Inc./Placer Dome Inc.
Previous Operators :

Latitude/Longitude :
Country : Canada
Province/State : BC
Region/County : Cariboo
Locale/Town : 58 km SE of Quesnel

Contact Person : Robert Longe, Vice President
 Qpx
Phone : 604-669-2251
Fax :

Current Operating Status : Proposed
Proj./Actual Closing Date : 01/01/98
Production Rate and Year : 150,000.00
Total Production : 0.00
Reserves : 1,507,000.00
Mining Method : Open Pit, Underground (Mechanized Cut & Fill)
Milling Method : Gravity, Conventional Cyanide Mill
Elements of Interest : AU
Report References :

Comments :
 Open pit - four year life; Underground

Deposit Type Ore-Zone Mod :
 Propylitized Carbonate Altered Fragmental Basalt (Qr Stock). Porphyry
General Mineralogy :
 (Host) Quesnel Trough: Volcanics, Glacial Seds (Jurassic Age)
Types of Sulfide Minerals : (2-5%)Pyrite, Pyrrhotite, Iron Sulphides, (0-5%)Chalcopyrite, Galena, Arsenopyrite
Types of Carb. Minerals : CALCITE

MineKey : 37

Current Operating Status : Operating

Deposit Type Ore-Zone Mod :

Volcanogenic massive sulphide copper deposit, veins, irregular stringer formations.

General Mineralogy :

(Host) quartz - chlorite - sericite schists

development took place until 1902. The first mining was done in what came to be known as the Jane orebody, and some production was obtained from this in 1905. Underground exploration led to the discovery of several other orebodies...The property has been in almost continuous operation since its original exploitation in 1905. Until the end of 1944, 732,414,420 pounds of copper and 261,125 ounces of gold had been produced from the mine..."

copied from *Structural Geology of Canadian Ore Deposits*, a symposium arranged by a Committee of the Geology Division, Canadian Institute of Mining and Metallurgy, 1948

MINFILE information (1992)

Waste Rock: Very little, lots of natural slide, acid generating

Tailings: Howe Sound, small spill pond, acid generating

Seepage Data: Data available through recent studies, little flow data

Receiving Water Data: Some available for Britannia Creek and Howe Sound

Types of Sulfide Minerals : FeS₂, CuFeS₂, ZnS, PbS, (Cu,Fe)₁₂As₄S₁₃, (Cu,Fe)₁₂Sb₄S₁₃, Fe_{1-x}S, Ag₂S

Types of Carb. Minerals : CaCO₃, FeCO₃ (associated mineral)

MineKey : 60

Mine Property Name : Carolin Mine

Current Operator : Carolin Mines Ltd.

Previous Operators :

Current Operating Status : Temporary Shutdown

Proj./Actual Closing Date :

Production Rate and Year : 0.00

Total Production : 0.00

Reserves : 0.00

Mining Method : Underground

Milling Method :

Latitude/Longitude :

Country : Canada

Province/State : BC

Region/County : Vancouver Island/Coast

Locale/Town : 20 km NE of Hope

Elements of Interest : AU

Report References :

Contact Person :

Phone :

Fax :

Comments :

Deposit Type Ore-Zone Mod :

Mesothermal Quartz And Calcite Veins

General Mineralogy :

(Host) Turbidities

(Greywackes, Argillites), Siltstones, Conglomerates

Types of Sulfide Minerals : Pyrite, Pyrrhotite, Arsenopyrite, Chalcopyrite

Types of Carb. Minerals : CALCITE

MineKey : 61

Mine Property Name : Endako Mines Division

Current Operator : Placer Dome Inc.

Previous Operators :

Current Operating Status : operating 1986 -

Proj./Actual Closing Date :

Production Rate and Year : 9,933,621.00

Total Production : 0.00

Reserves : 132,716,000 tons (1992)

Mining Method : Open pit (Truck & shovel)

MineKey : 67
Mine Property Name : Island Copper Mine
Current Operator : BHP Minerals Canada Ltd.
Previous Operators : Utah Mines Ltd.

Latitude/Longitude : Lat 50° 36'/Long 127° 28'
Country : Canada
Province/State : BC
Region/County : Vancouver Island/Coast
Locale/Town : 16 km S of Port Hardy

Contact Person : E A Pettigrew - Mine Manager
Phone : 604-949-6326
Fax : 604 949 6060

Deposit Type Ore-Zone Mod :

Porphyry copper - quartz veins associated with intrusives

General Mineralogy :

(Host) Andesite : qtz. porphyry intruding volcanics and sediments (?? age). Three main lithological units: upper member Bonanza Group Volcanic, Rhyodacite Porphyry, Hydrothermal Breccia.

Current Operating Status : Operating
Proj./Actual Closing Date : 01/01/98
Production Rate and Year : 18,200,000.00
Total Production : 530,000,000.00
Reserves : 65 million tons
Mining Method : Open Pit (Conventional Truck & Shovel)
Milling Method : Cu Flotation
Elements of Interest : (0.43%)Cu, (0.016%)Mo, Ag, Au, Re

Report References :

1994 Mining Sourcebook, 103rd edition. Southam Mining Group
 1993-94 Canadian Mines Handbook. Southam Magazine Group
 1987 BC Acid Mine Drainage Task Force Questionnaires, #1019, stored in Mining Environment UBC, Rm. 506A
 Assessment of Acid Rock Drainage Potential of Waste Rock and Implications for Long Term Weathering of the North Dump at Island Copper Mine, Diane Lister (graduate thesis), 1994

Comments :

Types of Sulfide Minerals : CuFeS₂, MoS₂, ZnS, PbS, FeS₂

Types of Carb. Minerals : CaCO₃ veining, most common in silicified host rock and in Haida mudstone

MineKey : 68
Mine Property Name : Sullivan Mine
Current Operator : Cominco Metals, Kimberley Operations
Previous Operators :

Latitude/Longitude : Lat 49° 42'/Long 116° 00'
Country : Canada
Province/State : BC
Region/County : Kootenay
Locale/Town : Kimberley

Contact Person : R M Henningson - Mine Manager
Phone : 604-427-8211
Fax :

Deposit Type Ore-Zone Mod :

Massive Sulphide. Hydrothermal Syn-Sedimentary Sulphide Lens. Sedimentary exhalative processes.

General Mineralogy :

(Host) Argillaceous quartzwacke. Metamorphosed Clastic Sedimentary

Types of Sulfide Minerals : Pyrite, Pyrrhotite, Sphalerite, Galena (75% Sulphides)

Types of Carb. Minerals : (15%) CALCITE, CARBONATE ROCKS

Current Operating Status : Operating
Proj./Actual Closing Date : 01/01/03
Production Rate and Year : 3,311,207.00
Total Production : 111,600,000.00
Reserves : 160,000,000.00
Mining Method : Room & pillar open, slusher slot & shell, longhole, mech slot & shell longhole
Milling Method : Pb/Zn Flotation
Elements of Interest : Zn, Pb, Ag, Cd

Report References :**Comments :**

MineKey : 69
Mine Property Name : Anyox Project
Current Operator : Cominco Exploration
Previous Operators :

Latitude/Longitude : Lt 55 26 12/Lg 129 49 23

Country : Canada
Province/State : BC
Region/County : North Coast, Skeena
Locale/Town : 100 km S of Stewart

Contact Person : not known - Cominco Exploration

Phone : 604 682-0611

Fax : 604 685-3041

Deposit Type Ore-Zone Mod :

Massive sulphide (Beshi Type) - eight distinct massive sulphide bodies, numbered 1 to 8, and a quartz vein stockwork containing disseminated sulphides. Two types of massive sulphide bodies are distinguished at Anyox - the more common type, which includes numbers 1, 4 - 8, consists of stratiform tabular to elongate massive sulphide orebodies interbedded with cherty metasediments on the volcanic/sediment contact. The number 2,3 orebodies characterize the second type which consists of massive stratabound layers and lenses of sulphides in basaltic tuff. This information has been summarized from Minfile. For more information, consult Minfile 103P-021.

BCAMD Task Force Report 1.6, *Survey of Closed and Abandoned Mines in British Columbia for Acid Mine Drainage* information:

Ore Type/Mineralogy: Massive stratabound and disseminated stock work

General Mineralogy :

(Host) volcanics (basalts, siliciclastic sediments). According to Minfile 103P 021, the dominant host rock is metasedimentary, of either the Hazelton Group or the Karmutsen Formation.

BCAMD Task Force Report 1.6, *Survey of Closed and Abandoned Mines in British Columbia for Acid Mine Drainage* information:

Ore Type/Mineralogy: Massive stratabound and disseminated stock work

Types of Sulfide Minerals : pyrite, pyrrhotite, (1-10%) chalcopyrite, sphalerite

Types of Carb. Minerals : Limestone, calcite

Current Operating Status : abandoned
Proj./Actual Closing Date : July 31, 1935
Production Rate and Year : 0.00

Total Production : 24,000,000 total tons

Reserves : 0.00

Mining Method : open pit, underground

Milling Method : Mill built 1924. From 1930 - 1935, all ore milled and concentrate smelted.

Elements of Interest : Cu

Report References :

Some geological and historical information obtained from *Structural Geology of Canadian Ore Deposits*, "proceedings" (special institute volume) published by the Canadian Institute of Mining and Metallurgy, Geology Division in 1948.

BCAMD Task Force Report 1.6, *Survey of Closed and Abandoned Mines in British Columbia for Acid Mine Drainage* (1992) includes information about Anyox, some of which is included in this mine data file.

BCAMD Task Force *State of the Art Review Questionnaires* (1987) provided much information for this mine data file, also analysis database data.

Comments :

Also known as Hidden Creek Mine. cont...

BCAMD Task Force Report 1.6, *Survey of Closed and Abandoned Mines in British Columbia for Acid Mine Drainage* (1992) information not included in this mine data file:

Waste Rock: Little data, Slag piles being reworked by True Grit Abrasives.

Tailings: Sizeable dam, some ABA's done, acid potential uncertain.

Seepage Data: Natural oxidized rocks. These and workings generate acid drainage.

Receiving Water Data: Water and aquatic sampling studies done.

Other Remarks: Has un-quantified ARD problem.

BCAMD Task Force *State of the Art Review Questionnaires* (1987)

see for extra information, ie. monitoring information, AMD situation

MineKey : 70
Mine Property Name : Bolivar Project
Current Operator : Rhyolite Resources Ltd.
Previous Operators :

Latitude/Longitude :

Country :
Province/State :
Region/County :

Current Operating Status : Temporary Shutdown
Proj./Actual Closing Date :

Production Rate and Year : 0.00

Total Production : 1,000.00

Reserves : 0.00

Mining Method : Open Pit

Milling Method :

Elements of Interest : AU

Report References :

Metasedimentary (Cretaceous)

Types of Sulfide Minerals : Pyrite, Arsenopyrite, Scheelite, Stibnite, Marcasite, Pyrrhotite, Chalcopyrite

Types of Carb. Minerals : LIMESTONE, DOLOMITE, CALCITE

MineKey : 102
Mine Property Name : St Honore Columbium Project
Current Operator : Teck Corporation Ltd.
Previous Operators :

Current Operating Status : Proposed
Proj./Actual Closing Date : 01/01/08
Production Rate and Year : 496,681.00
Total Production : 0.00
Reserves : 54,991,437.00
Mining Method : Underground - Open Blast Hole Stopping
Milling Method :

Latitude/Longitude :
Country : Canada
Province/State : QUEBEC
Region/County : Dubuc County
Locale/Town : 8 Miles N Of Chicoutimi

Elements of Interest : NB
Report References :

Contact Person : M P Lipkewich -
Phone :
Fax :

Comments :
 Reserves - cut-off 0.40% Nb2O5

Deposit Type Ore-Zone Mod :
 Dolomitic Carbonatite (Intrusive Complex, Rift Features)

General Mineralogy :
 (Host) Saguenay Rift Zone:
 Anorthosite, Monzonite, Syenite, Gneiss (Paleozoic Age)

Types of Sulfide Minerals : Pyrite, Minor Pyrrhotite, Chalcopyrite, Huttonite, Molybdenite, Apatite, Sphalerite

Types of Carb. Minerals : LIMESTONE, DOLOMITE, CALCITE, MARINE CLAYS

MineKey : 103
Mine Property Name : Spud Valley Project
Current Operator : McAdam Resources Inc.
Previous Operators :

Current Operating Status : Proposed
Proj./Actual Closing Date : 01/01/97
Production Rate and Year : 32,850.00
Total Production : 0.00
Reserves : 224,144.00
Mining Method : Underground (Shrinkage, Open Stopping, Cut & Fill)
Milling Method : Jig, Flotation, Merrill-Crowe Cyanidation Process

Latitude/Longitude :
Country : Canada
Province/State : BC
Region/County : Vancouver Island Coast
Locale/Town : 80 Km W Of Campbell River

Elements of Interest : AU (SOME AG)
Report References :

Contact Person :
Phone :
Fax :

Comments :

Deposit Type Ore-Zone Mod :
 Mesothermal gold bearing quartz vein, Shear Zone

General Mineralogy :
 (Host) Catface Group: Zeballos Pluton (Jurassic Age)

Types of Sulfide Minerals : Pyrite, Sphalerite, Galena, Arsenic

Types of Carb. Minerals : Calcite (VUGS)

MINDAT.DB

Latitude/Longitude : Lat 57° 30'/Long 125° 12'
Country : Canada
Province/State : BC
Region/County : Caribou, Akie
Locale/Town : 280km N of Mackenzie

Contact Person : G. Clow, Vice-President
Phone : 416 363-7111
Fax : 416 363 1732

Deposit Type Ore-Zone Mod :

Sedimentary exhalative processes - clastic hosted, starved basin. Stratiform, Tabular, Wedge Shaped Lenticular Body, Thrust/Fold Belt

General Mineralogy :

cherty argillite, shale - Gunsteel Formation: syn-sed, minor volcanics (late Devonian-Mississipp Age)

Types of Sulfide Minerals : barite, pyrite, sphalerite, galena

Types of Carb. Minerals : calcareous/dolomitic siltstone, limestone

Elements of Interest : (2.1%) Pb, (7.9%) Zn, (47.7 g/t) Ag

Report References :

Environmental Impact Statement. (Jan/91), Curragh Resources Inc. - Cirque Project (later renamed Stronsay). Rescan Environmental Services Ltd.
Status Report. (Sept/90), Curragh Resources Inc. - Cirque Project (later renamed Stronsay). Rescan Environmental Services Ltd.

Comments :

MineKey : 121
Mine Property Name : Mt. Milligan Project
Current Operator : Continental Gold Corp./Sub. of Placer Dome Inc.
Previous Operators :

Latitude/Longitude :
Country : Canada
Province/State : BC
Region/County : Nechako
Locale/Town : 86 Km Sw Of Fort St James

Contact Person :
Phone :
Fax :

Deposit Type Ore-Zone Mod :

2Large Low Grade Porphyry, Extensive Hydrothermal Sulphide System, Monzonite Stock

General Mineralogy :

(Host) Quesnel Terrane Group: Overlying Sediments, Volcanic Intrusions (Mesozoic)

Types of Sulfide Minerals : Chalcopyrite, Pyrite, Magnetite, Bornite

Types of Carb. Minerals :

Current Operating Status : Proposal
Proj./Actual Closing Date : 01/01/07
Production Rate and Year : 21,900,000.00
Total Production : 0.00
Reserves : 300,000,000.00
Mining Method : Conventional Open Pit (Truck & Shovel)
Milling Method : Conventional Bulk Cu/Au Flotation
Elements of Interest : (0.23%)CU, (0.56 G/T)AU
Report References :

Comments :
Three ore zones: Wbx-West Breccia, Mbx-Magnetite Breccia, 66 Zone

MineKey : 123
Mine Property Name : Mount Polley Project
Current Operator : Imperial Metals Corp./Corona Corp.
Previous Operators :

Current Operating Status : Proposed
Proj./Actual Closing Date : 01/01/07
Production Rate and Year : 5,000,000.00
Total Production : 0.00
Reserves : 51,402,000.00
Mining Method : Year Round Conventional Open Pit
Milling Method : Flotation Of Cu-Au Conc (No

Excerpts, Static Summary (*static.rsl*)

Adanac Mine**ORE**

Sample ID	NP	AP	NP/AP	NNP
2/212-65039-65084/COMPOSITE	20.0	2.2	9.1	17.8

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
1/212-65789-65839/COMPOSITE	257.0 15.5 257.0	0.9 62.5	16.5 4.1	14.6 194.5

Afton Mine**TAILINGS**

Sample ID	NP	AP	NP/AP	NNP
880443-001	24.2			

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
1/FOOTAGE (73-36)/21-40M/NICOLA FORMATION/PY VEINLETS	15.3	14.1	1.1	1.2
2/FOOTAGE (72-12)/122-125M/FE MASK FORMATION/MARCASITE	7.7	6.6	1.2	1.1
3/FOOTAGE (73-7)/104-183M/GREYWACKE, TERTIARY SEDIMENT	10.2	8.1	1.3	2.1
4/FOOTAGE (73-37)/186-189M/NICOLA VOLCANICS/	75.0	75.0	1.0	0.0
5/FOOTAGE (73-01)/107-116M/CLAYEY WASTE	2.6	1.3	2.0	1.3
6/FOOTAGE (72-16)/40-58M/CHALCOPYRITE-PYRITE	25.0	24.7	1.0	0.3
7/FOOTAGE (72-16)/149-183M/SUB-ORE GRD,NATIVE COPPER	1.0	0.9	1.1	0.1

Afton Mine Expansion / Ajax Project**ORE**

Sample ID	NP	AP	NP/AP	NNP
87-69/890 M/SUGARLOAF BRECCIA	48.0	32.5	1.5	15.5
87-32/900 M/LOW GRADE/ALBITIZED BRECCIA	65.0	13.8	4.7	51.3
87-35/900 M/ALBITIZED ALBITITE	75.0	20.3	3.7	54.7
87-01/910 M/SUGARLOAF DIORITE	67.0	36.9	1.8	30.1
87-36/910 M/LOW GRADE/SUGARLOAF MONZONITE	81.0	3.4	23.6	77.6
87-37/910 M/LOW GRADE/SUGARLOAF DIORITE	32.0	48.8	0.7	-16.8
87-43/910 M/HYBRID BRECCIA	53.0	13.4	3.9	39.6
87-52/910 M/LOW GRADE/ALBITIZED BRECCIA	97.0	17.8	5.4	79.2
87-62/910 M/LOW GRADE/HYBRID DIORITE	51.0	40.6	1.3	10.4
87-02/920 M/LOW GRADE/SUGARLOAF DIORITE	25.0	38.8	0.6	-13.8
87-03/920 M/LOW GRADE/SUGARLOAF DIORITE	123.0	21.6	5.7	101.4
87-37/920 M/LOW GRADE/SUGARLOAF DIORITE	48.0	53.8	0.9	-5.8
87-40/920 M/SUGARLOAF DIORITE	73.0	32.5	2.2	40.5
87-42/920 M/SUGARLOAF DIORITE	72.0	25.6	2.8	46.4
87-52/920 M/LOW GRADE/ALBITIZED BRECCIA	66.0	1.6	42.2	64.4
01-02/930 M/LOW GRADE/SUGARLOAF DIORITE	25.0	21.6	1.2	3.4
87-44/930 M/LOW GRADE/NICOLA VOLCANICS	73.0	13.1	5.6	59.9
87-02/940 M/LOW GRADE/SUGARLOAF DIORITE	28.0	17.8	1.6	10.2
87-46/950 M/LOW GRADE/HYBRID DIORITE	51.0	22.2	2.3	28.8
87-39/960 M/LOW GRADE/HYBRID DIORITE	46.0	9.4	4.9	36.6
PIT BENCH 910E/LOW GRADE/AFTON NUMBERS	32.0	48.8	0.7	-16.8
PIT BENCH 920E/LOW GRADE/AFTON NUMBERS	25.0	38.8	0.6	-13.8
PIT BENCH 920E/LOW GRADE/AFTON NUMBERS/..	48.0	53.8	0.9	-5.8
PIT BENCH 770W/ORE/AFTON NUMBERS	152.0	9.2	16.5	142.8
PIT BENCH 840W/LOW GRADE/AFTON NUMBERS	93.0	8.9	10.4	84.1
PIT BENCH 860W/ORE/AFTON NUMBERS	46.0	63.1	0.7	-17.1
770 M/87-78HYBRID BRECCIA	152.0	9.4	16.2	142.6
780 M/87-05/ALBITIZED ALBITITE	106.0	11.3	9.4	94.8

Afton Mine Expansion / Ajax Project

ORE

Sample ID	NP	AP	NP/AP	NNP
790 M/87-68/NICOLA VOLCANICS	79.0	55.9	1.4	23.1
800 M/87-08/HYBRID DIORITE	55.0	2.8	19.6	52.2
800 M/87-14/LOW GRADE/ALBITIZED BRECCIA	77.0	13.4	5.7	63.6
810 M/87-74/HYBRID DIORITE	77.0	7.5	10.3	69.5
820 M/87-25/HYBRID DIORITE	66.0	35.0	1.9	31.0
830 M/87-10/HYBRID DIORITE	96.0	28.1	3.4	67.9
830 M/87-80/LOW GRADE/SUGARLOAF DIORITE	45.0	25.0	1.8	20.0
840 M/87-20/LOW GRADE/HYBRID DIORITE	36.0	10.3	3.5	25.7
840 M/87-24/LOW GRADE/SUGARLOAF DIORITE	98.0	4.7	20.9	93.3
840 M/87-26/LOW GRADE/SUGARLOAF ALBITITE	93.0	9.1	10.3	83.9
840 M/87-28/LOW GRADE/HYBRID BRECCIA	133.0	12.8	10.4	120.2
840 M/87-59/HYBRID BRECCIA	109.0	12.2	8.9	96.8
840 M/87-64/LOW GRADE/SUGARLOAF DIORITE	107.0	8.1	13.2	98.9
840 M/87-73/LOW GRADE/HYBRID HORN	50.0	15.3	3.3	34.7
840 M/87-85/LOW GRADE/NICOLA VOLCANICS	83.0	9.4	8.9	73.6
850 M/87-14/LOW GRADE/HYBRID DIORITE	52.0	10.6	4.9	41.4
WEST PIT/850 M/87-19/LOW GRADE/SUGARLOAF DIORITE	50.0	11.6	4.3	38.4
WEST PIT/850 M/87-64/LOW GRADE/SUGARLOAF DIORITE	109.0	4.4	24.9	104.6
WEST PIT/850 M/87-71/LOW GRADE/SUGARLOAF DIORITE	72.0	47.2	1.5	24.8
WEST PIT/860 M/87-09/SUGARLOAF DIORITE	46.0	63.1	0.7	-17.1
WEST PIT/860 M/87-19/LOW GRADE/SUGARLOAF DIORITE	39.0	18.4	2.1	20.6
WEST PIT/860 M/87-64/LOW GRADE/HYBRID BRECCIA	83.0	9.7	8.6	73.3
WEST PIT/860 M/87-82/LOW GRADE/SUGARLOAF DIORITE	85.0	7.2	11.8	77.8
WEST PIT/870 M/87-15/LOW GRADE/HYBRID DIORITE	44.0	12.2	3.6	31.8
WEST PIT/870 M/87-28/LOW GRADE/SUGARLOAF DIORITE	129.0	9.4	13.8	119.6
WEST PIT/870 M/87-70/LOW GRADE/SUGARLOAF DIORITE	68.0	3.1	21.8	64.9
WEST PIT/870 M/87-81/LOW GRADE/SUGARLOAF BRECCIA	70.0	10.9	6.4	59.1
WEST PIT/880 M/87-12/LOW GRADE/ALBITIZED ALBITITE	84.0	8.4	10.0	75.6
WEST PIT/880 M/87-17/LOW GRADE/ALBITIZED ALBITITE	91.0	14.4	6.3	76.6
WEST PIT/880 M/87-73/LOW GRADE/HYBRID DIORITE	87.0	23.1	3.8	63.9
WEST PIT/880 M/87-82/LOW GRADE/SUGARLOAF ALBITITE	109.0	16.9	6.5	92.1
WEST PIT/890 M/87-07/LOW GRADE/HYBRID BRECCIA	47.0	15.9	2.9	31.1
WEST PIT/900 M/87-18/LOW GRADE/SUGARLOAF DIORITE	98.0	16.3	6.0	81.8
WEST PIT/900 M/87-65/LOW GRADE/SUGARLOAF BRECCIA	104.0	14.1	7.4	89.9
WEST PIT/900 M/87-66/LOW GRADE/HYBRID BRECCIA	133.0	6.6	20.3	126.4
WEST PIT/900 M/LOW GRADE/87-60/900M/HYBRID ALBITITE	115.0	7.8	14.7	107.2
WEST PIT/910 M/87-79/LOW GRADE/SUGARLOAF DIORITE	50.0	9.4	5.3	40.6
WEST PIT/930 M/87-82/LOW GRADE/SUGARLOAF DIORITE	39.0	12.2	3.2	26.8
WEST PIT/850 M/87-77/LOW GRADE/HYBRID DIORITE	58.0	18.8	3.1	39.3

TAILINGS

Sample ID	NP	AP	NP/AP	NNP
87-110	92.0	1.9	49.1	90.1
87-114	81.0	2.4	33.7	78.6
87-115	92.0	2.3	39.8	89.7
87-116	96.0	1.6	61.4	94.4
87-117	60.0	2.2	27.4	57.8
88-001	90.0	2.1	42.4	87.9
88-002	59.0	3.0	19.5	56.0

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
87-37/900 M/SUGARLOAF DIORITE	42.0	14.7	2.9	27.3
87-50/900 M/ALBITIZED BRECCIA	40.0	4.1	9.8	35.9
87-62/900 M/HYBRID BRECCIA	83.0	17.5	4.7	65.5
87-03/910 M/SUGARLOAF DIORITE	79.0	5.9	13.3	73.1
87-35/910 M/NICOLA HORN	53.0	8.8	6.1	44.3
87-67/910 M/HYBRID BRECCIA	80.0	8.4	9.5	71.6
87-04/920 M/SUGARLOAF ALBITITE	73.0	1.3	58.4	71.8
87-29/920 M/SUGARLOAF ALBITITE	65.0	6.3	10.4	58.8

Afton Mine Expansion / Ajax Project

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
820 M/87-07/SUGARLOAF DIORITE	28.0	46.6	0.6	-18.6
820 M/87-12/SUGARLOAF DIORITE	33.0	2.5	13.2	30.5
820 M/87-14/ALBITIZED BRECCIA	84.0	8.8	9.6	75.3
820 M/87-20/HYBRID HORN	54.0	30.3	1.8	23.7
820 M/87-22/SUGARLOAF DIORITE	56.0	4.4	12.8	51.6
820 M/87-68/SUGARLOAF DIORITE	43.0	4.7	9.2	38.3
820 M/87-82/SUGARLOAF DIORITE	54.0	11.3	4.8	42.8
830 M/87-06/HYBRID ALBITITE	55.0	2.8	19.6	52.2
830 M/87-07/HYBRID DIORITE	38.0	45.3	0.8	-7.3
830 M/87-12/ALBITIZED ALBITITE	61.0	6.6	9.3	54.4
830 M/87-14/ALBITIZED BRECCIA	71.0	3.4	20.7	67.6
830 M/87-20/SUGARLOAF DIORITE	74.0	12.2	6.1	61.8
830 M/87-63/HYBRID DIORITE	131.0	4.7	27.9	126.3
830 M/87-68/NICOLA VOLCANICS	43.0	8.4	5.1	34.6
830 M/87-79/SUGARLOAF DIORITE	66.0	24.4	2.7	41.6
830 M/87-80/LOW GRADE/SUGARLOAF/DIORITE	45.0	25.0	1.8	20.0
830 M/87-82/SUGARLOAF DIORITE	67.0	9.7	6.9	57.3
830 M/87-84/SUGARLOAF ALBITITE	58.0	4.7	12.4	53.3
840 M/87-07/SUGARLOAF ALBITITE	41.0	38.1	1.1	2.9
840 M/87-12/ALBITIZED ALBITITE	37.0	7.5	4.9	29.5
840 M/87-14/HYBRID DIORITE	54.0	14.4	3.8	39.6
840 M/87-20/LOW GRADE/HYBRID/DIORITE	36.0	10.3	3.5	25.7
840 M/87-24/LOW GRADE/SUGARLOAF/DIORITE	98.0	4.7	20.9	93.3
840 M/87-26/LOW GRADE/SUGARLOAF/ALBITITE	93.0	9.1	10.3	83.9
840 M/87-27/HYBRID DIORITE	83.0	3.1	26.6	79.9
840 M/87-28/LOW GRADE/HYBRID/BRECCIA	133.0	12.8	10.4	120.2
840 M/87-60/HYBRID DIORITE	69.0	1.9	36.8	67.1
840 M/87-63/HYBRID DIORITE	77.0	3.4	22.4	73.6
840 M/87-64/LOW GRADE/SUGARLOAF/DIORITE	107.0	8.1	13.2	98.9
840 M/87-65/HYBRID BRECCIA	75.0	5.6	13.3	69.4
840 M/87-68/SUGARLOAF DIORITE	45.0	8.4	5.3	36.6
840 M/87-73/LOW GRADE/HYBRID/HORN	50.0	15.3	3.3	34.7
840 M/87-76/HYBRID DIORITE	78.0	9.7	8.1	68.3
840 M/87-79/SUGARLOAF DIORITE	58.0	10.9	5.3	47.1
840 M/87-80/SUGARLOAF DIORITE	48.0	20.0	2.4	28.0
840 M/87-81/SUGARLOAF DIORITE	60.0	10.6	5.6	49.4
840 M/87-82/SUGARLOAF DIORITE	59.0	9.4	6.3	49.6
840 M/87-84/SUGARLOAF DIORITE	52.0	4.7	11.1	47.3
840 M/87-85/LOW GRADE/NICOLA/VOLCANICS	83.0	9.4	8.9	73.6
850 M/87-07/SUGARLOAF DIORITE	45.0	35.6	1.3	9.4
850 M/87-12/SUGARLOAF DIORITE	30.0	4.4	6.9	25.6
850 M/87-14/LOW GRADE/HYBRID/DIORITE	52.0	10.6	4.9	41.4
WEST PIT/850 M/87-19/LOW GRADE/SUGARLOAF/DIORITE	50.0	11.6	4.3	38.4
WEST PIT/850 M/87-24/ALBITIZED ALBITITE	107.0	6.9	15.6	100.1
WEST PIT/850 M/87-26/ALBITIZED ALBITITE	129.0	11.9	10.9	117.1
WEST PIT/850 M/87-27/HYBRID DIORITE	86.0	2.8	30.6	83.2
WEST PIT/850 M/87-28/ALBITIZED ALBITITE	105.0	4.4	24.0	100.6
WEST PIT/850 M/87-60/HYBRID DIORITE	83.0	1.3	66.4	81.8
WEST PIT/850 M/87-63/HYBRID DIORITE	96.0	2.8	34.1	93.2
WEST PIT/850 M/87-64/LOW GRADE/SUGARLOAF/DIORITE	109.0	4.4	24.9	104.6
WEST PIT/850 M/87-65/HYBRID VOLCANICS	61.0	6.9	8.9	54.1
WEST PIT/850 M/87-71/LOW GRADE/SUGARLOAF/DIORITE	72.0	47.2	1.5	24.8
WEST PIT/850 M/87-73/HYBRID HORN	62.0	8.4	7.3	53.6
WEST PIT/850 M/87-75/HYBRID BRECCIA	114.0	1.6	73.0	112.4
WEST PIT/850 M/87-77/LOW GRADE/HYBRID/DIORITE	58.0	18.8	3.1	39.3
WEST PIT/850 M/87-79/SUGARLOAF DIORITE	65.0	13.1	5.0	51.9
WEST PIT/850 M/87-80/HYBRID DIORITE	84.0	26.9	3.1	57.1
WEST PIT/850 M/87-81/SUGARLOAF DIORITE	42.0	16.3	2.6	25.8
WEST PIT/850 M/87-82/SUGARLOAF DIORITE	51.0	7.2	7.1	43.8
WEST PIT/850 M/87-84/SUGARLOAF DIORITE	48.0	4.1	11.8	43.9
WEST PIT/850 M/87-85/NICOLA VOLCANICS	94.0	7.5	12.5	86.5
WEST PIT/860 M/87-07/HYBRID BRECCIA	70.0	17.2	4.1	52.8
WEST PIT/860 M/87-17/SUGARLOAF DIORITE	42.0	2.2	19.2	39.8
WEST PIT/860 M/87-19/LOW GRADE/SUGARLOAF/DIORITE	39.0	18.4	2.1	20.6

Ashlu Gold Mine**TAILINGS**

Sample ID	NP	AP	NP/AP	NNP
1/FLOTATION TAILINGS/	33.0 45.0	13.1 3,125.0	2.5 0.0	19.8 -3,080.0

BC Nickel Property**TAILINGS**

Sample ID	NP	AP	NP/AP	NNP
911160-13/SURFACE	15.0	10.8	1.4	4.3
911160-14/WET SUB-SURFACE	41.0	3.4	12.0	37.6
911160-013/SURFACE(SECOND SAMPLE - SAME ID)	15.0	10.8	1.4	4.3
911160-014/SUB-SURFACE(SECOND SAMPLE - SAME ID)	41.0	3.4	12.0	37.6

Baker Mine**ORE**

Sample ID	NP	AP	NP/AP	NNP
INTERNATIONAL SHASTA ORE/	187.0	27.5	6.8	159.5

TAILINGS

Sample ID	NP	AP	NP/AP	NNP
EXISTING BAKER MINE TAILINGS/	37.0	126.6	0.3	-89.6
TAILINGS FROM PROCESSING MULTINATIONAL ORE/	68.0	64.1	1.1	3.9

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
W.R. FROM INTERNATIONAL SHASTA OPEN PITS/	58.0	0.0	1,856.0	58.0
W.R. FROM INTERNATIONAL SHASTA OPEN PITS/	48.0	0.0	1,536.0	48.0
W.R. FROM INTERNATIONAL SHASTA OPEN PITS/	58.0	0.2	265.1	57.8
W.R. FROM INTERNATIONAL SHASTA OPEN PITS/	32.0	0.0	1,024.0	32.0
W.R. FROM INTERNATIONAL SHASTA OPEN PITS/	76.0	22.4	3.4	53.6
W.R. FROM INTERNATIONAL SHASTA OPEN PITS/	47.0	3.8	12.2	43.2

Bell Mine**TAILINGS**

Sample ID	NP	AP	NP/AP	NNP
870234-010/SURFACE/	60.0	20.3	3.0	39.7
870234-011/SURFACE/	56.0	20.7	2.7	35.3
870234-012/SURFACE/	64.0	46.3	1.4	17.8
870234-013/SURFACE/1981/	59.0	17.1	3.5	41.9
870234-014/EXPERIMENTAL TAILINGS POND	-23.0	118.1	-0.2	-141.1
870234-015/EXPERIMENTAL TAILINGS POND	-23.0	58.4	-0.4	-81.4
BELL-09/870234-009/SURFACE/15M FROM SPIGOT	62.0	28.0	2.2	34.0
901938	25.0	150.9	0.2	-125.9

Blackdome Mountain Project**TAILINGS**

Sample ID	NP	AP	NP/AP	NNP
TAILINGS FILTRATE	4.1	1.3	3.3	2.8
901739-001	8.0	1.8	4.4	6.2

Bullmoose Project**WASTE ROCK**

Sample ID	NP	AP	NP/AP	NNP
#1 SANDSTONE/BELOW A SEAM	8.5	10.0	0.8	-1.5
#2 SANDY SILTSTONE/ABOVE A SEAM	154.6	18.4	8.4	136.1
#3 MUDSTONE/BETWEEN B AND C SEAM	25.5	9.7	2.6	15.8
#4 SILTSTONE/BETWEEN B AND C SEAM	119.1	6.3	19.0	112.8
#5 SANDSTONE/BETWEEN C AND D SEAM	247.7	3.8	66.1	243.9
#6 MUDSTONE/BETWEEN C AND D SEAM	25.3	10.3	2.5	15.0
#7 COMP(#7-SILTS/#10-SAND/#13-MUDST)/BETWEEN D & E SEAM	228.6	8.8	26.1	219.9
#8 COMPOSITE(#8-SILTS/#9-MUDST/#10-MUDST)/ABOVE E SEAM	76.1	26.9	2.8	49.2

Canamax Property**TAILINGS**

Sample ID	NP	AP	NP/AP	NNP
911612-001/SURFACE	98.0	10.4	9.4	87.6

Canty Gold Project**ORE**

Sample ID	NP	AP	NP/AP	NNP
C-89-28/45-52M/	11.0	18.8	0.6	-7.7
C-89-46/59-75M/	25.5	27.5	0.9	-2.0
C-89-49/3-20M/	16.5	67.2	0.2	-50.7

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
C-89-33/29-59M/PYROXENE GARNET SKARN/	139.5	1.4	97.0	138.1
C-89-33/84-106M/PYROXENE GARNET SKARN/	87.1	9.3	9.3	77.7
C-89-34/13-51M/PYROXENE GARNET SKARN/	129.5	25.9	5.0	103.6
GN-88-13/22.6-62M/GRANODIORITE/	24.0	1.1	21.9	22.9
GN-88-13/4.3-22.6M/PYROXENE GARNET SKARN/	38.0	6.1	6.3	31.9
GN-88-14/50-63M/GRANODIORITE/	15.5	1.6	9.9	13.9

Carbon Creek Coal Development**ORE**

Sample ID	NP	AP	NP/AP	NNP
COAL COMPOSITE/	2.3	18.4	0.1	-16.2

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
MUDSTONE/	47.8	29.7	1.6	18.1
ROOF AND FLOOR COMPOSITE/	99.9	5.6	17.8	94.2
SANDSTONE/	158.4	4.4	36.2	154.0
SILTSTONE/	143.9	8.1	17.7	135.7

Cariboo Gold Quartz Mine**TAILINGS**

Sample ID	NP	AP	NP/AP	NNP
CGT-1/.15-.31M/20% PYRITE/	12.0	160.3	0.1	-148.3
CGT-1/.31-.61M/20% PYRITE/	62.0	197.2	0.3	-135.2
CGT-2/0-.31M/20% PYRITE/	42.0	425.0	0.1	-383.0

Island Copper Mine**WASTE ROCK**

Sample ID	NP	AP	NP/AP	NNP
7 - Site 3	21.8	18.4	1.2	3.4
8 - Site 3	17.8	29.4	0.6	-11.6
9 - Site 3	20.7	22.5	0.9	-1.8
10 - Site 4	21.9	40.6	0.5	-18.7
11 - Site 4	29.1	71.9	0.4	-42.8
12 - Site 4	22.9	50.0	0.5	-27.1
22 - Site 2	8.0	92.2	0.1	-84.2
23 - Site 4	32.8	59.4	0.6	-26.6
24 - Site 5	110.2	54.7	2.0	55.5
25 - Site 6	-11.9	278.1	-0.0	-290.0
26 - Site 7	9.5	134.4	0.1	-124.9
27 - Site 8	10.5	31.3	0.3	-20.8
28 - Till	44.6	9.4	4.8	35.2
29 - Till	44.1	15.0	2.9	29.1

Island Mountain**UNSPECIFIED**

Sample ID	NP	AP	NP/AP	NNP
IMR-3/SOURCE - APPENDIX E/	625.0	2.5	246.9	622.5

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
IMR-1/1% PYRITE/SOURCE - APPENDIX E/	139.0	10.1	13.8	128.9

Johnny Mountain Project**ORE**

Sample ID	NP	AP	NP/AP	NNP
1290/	60.8	38.8	1.6	22.0
1292/	80.6	30.0	2.7	50.6
1293/	74.7	24.4	3.1	50.4
16 ORE ZONE/R-16-1	36.9	335.6	0.1	-298.8
DISCOVERY ORE/STAGE I REPORT	37.2	412.5	0.1	-375.3
1290/ZEPHRIN ALTERATION	59.5	38.8	1.5	20.8
1291/	37.4	26.6	1.4	10.8
16 ORE ZONE/R-16-2	33.6	59.4	0.6	-25.8
16 ORE/STAGE I REPORT	36.1	334.4	0.1	-298.3
DISCOVERY ZONE/CL-1	38.0	411.3	0.1	-373.3
ZEPHRIN ORE ZONE/Z-1	33.4	66.3	0.5	-32.9
ZEPHRIN ORE/STAGE I REPORT	32.9	59.4	0.6	-26.5

U/G WALL

Sample ID	NP	AP	NP/AP	NNP
1291/DISCOVERY FOOTWALL	36.6	26.6	1.4	10.0
1292/16 ZONE FOOTWALL	78.9	30.0	2.6	48.9
1293/3700 X-CUT NORTH	73.2	24.4	3.0	48.8

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
1/RAISE ROUNDS/W.R. FROM RAISE ABOVE 11 LEVEL/	50.5	10.0	5.1	40.5
16 WASTE/	32.9	59.4	0.6	-26.5
2/ILLEGIBLE/W.R. FROM 16 VE/	39.5	9.1	4.4	30.4
3/WASTE/W.R. FROM DISCOVERY/	78.5	14.4	5.5	64.1

Telkwa Coal Project

WASTE ROCK

Sample ID	NP	AP	NP/AP	NNP
HOLE 140-814/FOOTWALL/59.9-60.06M/	12.0	3.8	3.2	8.3
HOLE 141-814/MUDSTONE/60.06-60.69M/	13.0	3.1	4.2	9.9
HOLE 142-814/HANGING WALL/60.69-60.85M/	15.0	4.7	3.2	10.3
HOLE 143-814/FOOTWALL/61.24-61.4M/	63.0	5.0	12.6	58.0
HOLE 144-814/MUDSTONE/61.4-63.4M/	16.0	34.1	0.5	-18.1
HOLE 145-814/MUDSTONE/63.4-65.1M/	23.0	22.5	1.0	0.5
HOLE 146-814/IRONSTONE/65.1-65.8M/	73.0	4.7	15.6	68.3
HOLE 147-814/MUDSTONE/65.8-67.8M/	36.0	15.6	2.3	20.4
HOLE 148-814/MUDSTONE/67.8-68.66M/	23.0	43.4	0.5	-20.4
HOLE 149-814/HANGING WALL/68.66-68.82M/	28.0	111.3	0.3	-83.3
HOLE 15-811/CARBONACEOUS MUDSTONE/39.65-40.3M/	20.0	114.4	0.2	-94.4
HOLE 150-814/FOOTWALL/69.06-69.22M/	13.0	5.9	2.2	7.1
HOLE 151-814/MUDSTONE/69.22-69.96M/	50.0	9.1	5.5	40.9
HOLE 152-814/HANGING WALL/69.96-70.12M/	11.0	5.6	2.0	5.4
HOLE 153-814/FOOTWALL/73.41-73.57M/	10.0	45.0	0.2	-35.0
HOLE 154-814/MUDSTONE/73.57-73.88M/	11.0	65.6	0.2	-54.6
HOLE 155-814/HANGING WALL/73.88-74.04M/	16.0	50.0	0.3	-34.0
HOLE 156-814/FOOTWALL/76.11-76.27M/	56.0	3.1	17.9	52.9
HOLE 157-814/MUDSTONE/76.27-77.08M/	77.0	5.0	15.4	72.0
HOLE 158-814/MUDSTONE/77.08-78.98M/	17.0	58.4	0.3	-41.4
HOLE 159-814/HANGING WALL/78.98-79.14M/	13.0	49.7	0.3	-36.7
HOLE 16-811/SANDSTONE/40.3-41.6M/	46.0	2.8	16.4	43.2
HOLE 160-814/FOOTWALL/80.2-80.36M/	14.0	22.2	0.6	-8.2
HOLE 161-814/SILTSTONE/80.36-80.7M/	15.0	18.8	0.8	-3.8
HOLE 162-814/HANGING WALL/80.7-80.86M/	8.0	24.4	0.3	-16.4
HOLE 163-814/FOOTWALL/81.98-82.14M/	15.0	4.4	3.4	10.6
HOLE 164-814/SILTSTONE/82.14-84.14M/	36.0	6.9	5.2	29.1
HOLE 165-814/SILTSTONE/84.14-86.14M/	44.0	5.6	7.8	38.4
HOLE 166-814/SILTSTONE/86.14-88.95M/	33.0	7.2	4.6	25.8
HOLE 167-814/MUDSTONE/88.95-89.16M/	21.0	75.9	0.3	-54.9
HOLE 168-814/HANGING WALL/89.16-89.32M/	9.0	157.5	0.1	-148.5
HOLE 169-814/FOOTWALL/92.99-93.15M/	15.0	4.7	3.2	10.3
HOLE 17-811/SILTSTONE/41.6-42.76M/	41.0	16.3	2.5	24.8
HOLE 170-814/SILTSTONE/93.15-95.0M/	32.0	9.4	3.4	22.6
HOLE 18-811/SILTSTONE/42.76-43.76M/	48.0	14.4	3.3	33.6
HOLE 19-811/HANGING WALL/43.76-43.92M/	26.0	29.4	0.9	-3.4
HOLE 2-811/MUDSTONE/20.66-22.66M/	73.0	6.6	11.1	66.4
HOLE 20-811/SILTSTONE/45.47-46.55M/	13.0	28.4	0.5	-15.4
HOLE 21-811/HANGING WALL/46.55-46.71M/	12.0	45.9	0.3	-33.9
HOLE 22-811/FOOTWALL/48.99-49.15M/	19.0	2.8	6.8	16.2
HOLE 23-811/SILTSTONE/49.15-49.51M/	15.0	9.7	1.5	5.3
HOLE 24-811/HANGING WALL/49.51-50.94M/	9.0	82.5	0.1	-73.5
HOLE 25-811/FOOTWALL/51.53-51.69M/	12.0	70.9	0.2	-58.9
HOLE 26-811/MUDSTONE/51.69-51.84M/	14.0	41.9	0.3	-27.9
HOLE 27-811/SILTSTONE/51.84-53.84M/	28.0	10.3	2.7	17.7
HOLE 28-811/SILTSTONE/53.84-55.84M/	20.0	7.2	2.8	12.8
HOLE 29-811/SILTSTONE/55.84-57.84M/	30.0	3.8	8.0	26.3
HOLE 3-811/MUDSTONE/22.66-24.66M/	41.0	8.8	4.7	32.3
HOLE 30-811/SILTSTONE/57.84-58.95M/	24.0	9.7	2.5	14.3
HOLE 31-811/SANDSTONE 2/58.95-60.0M/	41.0	3.1	13.1	37.9
HOLE 32-811/SANDSTONE 1/60.0-62.0M/	26.0	4.4	5.9	21.6
HOLE 33-811/SANDSTONE 1/62.0-63.89M/	34.0	4.7	7.3	29.3
HOLE 34-811/CARBONACEOUS MUDSTONE/63.89-65.05M/	17.0	35.0	0.5	-18.0
HOLE 35-811/HANGING WALL/65.05-65.21M/	17.0	19.1	0.9	-2.1
HOLE 36A-811/FOOTWALL/66.19-66.35M/	13.0	4.4	3.0	8.6
HOLE 36B-811/CARBONACEOUS MUDSTONE/66.35-67.45M/	12.0	3.8	3.2	8.3
HOLE 37-811/SANDSTONE 1/67.45-68.25M/	164.0	5.3	30.9	158.7
HOLE 38-811/CARBONACEOUS MUDSTONE/68.25-68.63M/	16.0	7.5	2.1	8.5
HOLE 39-811/HANGING WALL/68.63-68.79M/	72.0	15.3	4.7	56.7
HOLE 4-811/MUDSTONE/24.66-26.72M/	35.0	14.4	2.4	20.6
HOLE 40-811/FOOTWALL/69.0-69.16M/	22.0	5.3	4.1	16.7
HOLE 43-811/SANDSTONE 1/71.6-73.6M/	47.0	2.5	18.8	44.5
HOLE 45-811/HANGING WALL/75.23-75.39M/	35.0	5.3	6.6	29.7
HOLE 46-811/FOOTWALL/75.59-75.75M/	31.0	5.3	5.8	25.7