

**Updating of the
Northern Granular Resources
Information Mapping System**

PROJECT REPORT

DSS file 038ST.A7134-1-0039

**Submitted to: Robert Gowan
Geotechnical Advisor
Land Management Division
Natural Resources and Economics Branch
Indian and Northern Affairs Canada**

**Submitted by: John Peters
Project Manager
Earth & Ocean Research Limited**

March 31, 1992



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Earth & Ocean Research Ltd.

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INTRODUCTION

This report describes work done under the abovementioned contract in support of the Northern Granular Resources Mapping System.

The system has been developed around Earth & Ocean Research Ltd's inFOcus geographic data management software that interfaces to AXYS Software Ltd's QUIKMap mapping engine. Work under previous contracts has involved the compilation, digitizing and integration of seismic navigation data, borehole data, borrow deposit locations and geological maps. The objectives under this contract are the following:

- a) import the Yukon Shelf borrow study maps produced by Earth & Ocean Research Ltd under separate contracts
- b) upgrade existing maps to eliminate deficiencies in the text display
- c) refine the presentation of the data through enhanced legends and the addition of accreditation information
- d) provide borehole database management capability from within inFOcus.
- e) import various borehole database applications to be accessible to inFOcus for general database enquiry and display on maps.

Details on the results of this effort are provided below. An atlas of selected maps is provided in Appendix I.

YUKON SHELF BORROW STUDY MAPS

Geological maps resulting from the Yukon Shelf borrow study conducted by Earth & Ocean Research and finalized by Lewis Geophysical Consulting were imported into inFOcus. The 18 maps were constructed in AUTOCAD and are translated into QUIKMap format basemaps using the DXF2ESL utility. This is normally a straightforward procedure. However, 14 of the drawings were contour maps with contour labels inserted as "AUTOCAD attributed blocks". The translator ignores block attributes. In order to maintain this important text component, an "AUTOLISP" program

was written to replace the attributed blocks with a simple text label of the same value, size and orientation. Various other pre-editing operations were performed on some of the maps to simplify the layering for easier end user manipulation in QUIKMap.

Our experience with these translations underscores the reality of importing digital information into any mapping system or GIS. The procedures and protocols developed by individual operators at the time of map construction, although logical at the time for the then intended purpose, may be inappropriate for new applications. Often the amount of pre-conditioning required of source digital information may be greater than the effort needed to redigitize the map. Fortunately, this was not the case for the Yukon Shelf data. However, significant additional effort was required to complete the translation.

UPDATE EXISTING MAPS

Versions earlier than 1992 of the DXF2ESL translator exhibited problems with the translation of text layers in AUTOCAD drawings. The size of the text changed as a function of orientation. This problem was particularly serious for high latitudes where the size typically increased by as much as 10 times for a 90 degree orientation. The rate of enlargement also increased rapidly with increasing latitude.

With the arrival of the new, corrected translator, all of the maps for the Isserk, Erksak borrow sites were reconverted with good results.

New features in inFOcus and QUIKMap permit the development of improved legends. Legends for all of the basemaps without legend definitions were created.

It should be understood that the two QUIKMap graphic formats treat hatch patterns differently, and this has an effect on how the legends are interpreted. Basemap format data is entirely imported from sources external to QUIKMap (eg AUTOCAD). All graphic elements, including hatch patterns, are georeferenced. Thus, when zooming into an area with hatching the pattern becomes broader according to the change of scale. On the other hand, polygon (database) format hatching is an attribute of the database record in which the polygon is stored. The hatch pattern is scaled in screen coordinates and therefore retains a constant visual scale irrespective

of zoom factor.

Legends describing both basemap and polygon elements are constructed using "screen scale" hatching. Therefore, for database polygons the hatching in the polygon appears identical to the hatch pattern in the legend. For basemaps, however, the map and legend hatches is retain identical colour and orientation, but not scale. Judicious choices of colours and patterns can usually ensure adequate correlation.

BOREHOLE DATABASE MANAGEMENT SYSTEM

An extensive body of subsurface information has already been compiled in ESEBASE, a geotechnical borehole management system developed by ESE Software, Edmonton. It is a CLIPPER database application which performs customized queries and produces reports, borehole cross-sections and graphs.

A logical extension of the existing functions is the ability to map and symbolize borehole locations. Further, a number of the functions and user interface features that are characteristic of FOXPRO and used in inFOcus would be beneficial to ESEBASE.

In conjunction with this study a prototype, limited functionality version of ESEBASE has been developed under FOXPRO that is intended to run standalone, or as a module under inFOcus. In the latter case, functions are present to permit the display of the boreholes in QUIKMap.

Our approach has been to retain the formal file and data structures of the ESEBASE system since they are well conceived and, looking to future customer acceptance, will retain compatibility with existing datasets. An additional table, associated with and using the same name as an ESEBASE data directory, has been created for maintaining QUIKMap display attributes. Appendix I is a brief description of the program installation, structure and operation.

The prototype features a startup dialog box through which the user may choose from a list of existing databases (English titles), in addition to adding or removing databases. Views are set for the chosen database and a main function menu appears which accesses various submenus. DATA ENTRY/EDIT permits the display of the standard ESEBASE data views in either BROWSE or formatted

mode. In the prototype (and ESEBASE for that matter) format screens only exist for the INDEX view. Further, for the Mackenzie database which does not conform to standard ESEBASE, browse mode on a subset of the fields is all that is available.

[Not yet implemented is a QUERY capability. To follow the ESEBASE lead a query builder would be invoked when a view is selected. The user would be led through a canned procedure that would result in the selection of a subset of records for browsing. In addition to this a general query capability such as is available in inFOcus may also be provided.]

The BROWSE is very flexible, permitting "field dragging and sizing" through mouse operations, plus efficient navigation features.

The ESEBASE format screens have been decomposed into a series of windows comprising:

- a MAIN window showing borehole name and owner etc.

plus "hotkey" access to

- NOTES - general information about the hole
- TECHNICAL - depth and horizon information
- LOCATIONS - location

All screens can be independantly accessed, updated and moved around the screen. Any one of the screens is active at a time, and paging through the database causes all windows to be updated synchronously.

Choosing DISPLAY provides a menu of the ESEBASE output options. None of these is yet implemented in the prototype.

UTILITIES provides the same set of functions that this menu item provides under ESEBASE. At present, only "Reindex the database" is activated.

The VIEWS submenu allows the user to set the view environment for inFOcus to any of those listed. Switching to inFOcus at this point will permit general queries, reporting, exporting and mapping

of the fields defined by the view.

In summary, we have prepared a limited function prototype of ESEBASE under FOXPRO. The basic data model has been retained, although special versions of the model (eg. Mackenzie) cannot be accommodated easily within this rigid framework. A new table (using the database directory name) provides the required linkage to inFOcus for generalized query and mapping functions.

The prototype is intended to provoke and focus further design suggestions for a production version of ESEBASE under FOXPRO.

SUGGESTIONS FOR FURTHER WORK

The following tasks have been identified, in addition to inventory expansion, for further development in support of the Northern Granular Resources Information Mapping System:

1. Resource Management Areas (RMA) and other sub-regions

Data is being compiled in other initiatives on the basis of RMA's.

Basemaps would be prepared that display the boundaries of RMA's, and other significant sub-regions such as existing corridors in the Yukon, and districts and sub-districts in NWT. These would also be accessible through inFOcus from the AREAS sub-menu.

Appropriate maps would be supplied by the scientific authority.

2. Beaufort borrow prospects database

Existing basemaps for the Beaufort granular resource studies (Yukon Shelf, Isserk and Erksak) contain shaded polygons for PROVEN, PROBABLE and PROSPECTIVE deposits. A new database would be created that contains these polygons as individual records, coded and hatched and associated with accompanying area, perimeter and other attribute information. Basemap polygons would be traced in QUIKMap to create the database records.

A coding scheme like the following would be implemented:

For the ISSERK BLOCK, say

<u>Deposit</u>	<u>Code</u>
No. 1	
PROSPECTIVE	IS1
PROBABLE	IS1a
PROVEN	IS1a1
No. 2	
PROSPECTIVE	IS2
PROBABLE	IS2a
PROBABLE	IS2b
PROVEN	IS2b1
PROVEN	IS2b2
PROVEN	IS2b3
.	.
.	.
.	.

PROVEN deposits are contained within PROBABLE deposits, which in turn are contained within PROSPECTIVE deposits.

Since the coding schemes used to identify deposits in the above studies are not consistent, a field would be added to the database to cross-reference against individual study code designations.

3. Quality control (QC) of borehole databases georeferencing

With the mapping interface, the opportunity exists to easily detect gross errors in the large borehole inventories that

currently exist within the system. Questionable records would be flagged and submitted to the original compiler for validation.

4. Consolidate and normalise the Beaufort borehole inventory

The present Beaufort borehole inventory is fragmented on the basis of compilation study. It is desirable to devise and implement a new database design so that Beaufort-wide (regional scope) queries can be resolved. Additional fields would be added to link data records to their respective, original compilation.

APPENDIX I

ESE Program Specifications

Program Name : ESE.EXE

Installation :

1) The program \ data is currently in PCBACKUP v6.0 format. Restore to a root directory.

2) Add the EB and ESE application directories to the DOS environment variable QUIKPATH.

EG. SET QUIKPATH=c:\eb;c:\eb\mackenzi;c:\eb\inac etc.

3) The program may be activated in two modes :

A) Stand alone

1) Change to the EB directory

2) Type ESE < return >

ESE.bat will call the ESE.exe file using the Foxpro runtime loader.

B) Using inFOcus

1) Activate inFOcus and choose any application.

2) Add the ESE.exe program as a 'FOXPRO compatible program' to the Modules menu. Make sure the program is added as ESE.EXE.

3) Choose the ESE option.

Data Structures

The ESE program uses the same datafiles as regular ESEbase applications. New index (.cdx) files have been added for each of the databases in the sample directories. The system has the following architecture :

\EB

\EB\application 1
\EB\application 2 etc.

Where \EB is the home directory for the system and the subdirectories are the 'ESEbase Borehole Databases'.

A QUIKmap compatible Database has been added to each application. It has the same name as the directory (eg. BEAU1989.DBF) and contains the point locations for each of the Boreholes. These .DBF files must be added to an inFOcus application database menu in order to access them in inFOcus.

Program Architecture :

At entry level the user is prompted for the borehole database to use. The program will move to the selected application directory and open the necessary datafiles. The MainMenu is then activated.

The MainMenu has the following options :

1) Data Entry/Edit :

Access to database 'views' in both Browse and Format screen mode , depending on the application selected. The Format screens were designed for ESEbase 4.00. The applications MACKENZI and INAC contain databases designed for the 3.0 special version and no format screens are available for them.

The user will be able to query the data through the use of a user-friendly query module. Data is displayed in both Format mode or the more powerful Foxpro Browse windows.

Format Window Features (for the INDEX option) :

a) Activation : Additional windows may be accessed by clicking on the buttons "Locations", "Technical" and "Notes". Clicking inside of a window will activate it.

b) Movement : Windows may be closed by clicking on the top left hand corner. Windows may be 'dragged' about the screen by moving the mouse cursor to the top line of the window and holding the left button down. Then drag the window to it's new location.

c) Record Movement : The "Next" and "Last" buttons change the current record. The current record may also be moved by pressing PgUp or PgDn.

2) Display :

This option contains all the output formats for displaying Borehole data. The Query module will be used to access the desired data. Plot format files will be built for the desired option and the appropriate graphics program will be activated with a RUN command.

3) Utilities :

This options will contain most of the existing ESEbase utilities. Currently , only 'Re-index the Database' is supported.

4) Views :

This option presents the user with a menu of the various 'views' of the Borehole Database. These are the same as the views available in Data Entry/ Edit. This option is only useful when running the program out of inFOcus. Choosing one of the view options will set up the desired database relations for use in inFOcus.

EG. The user wishes to display (in QUIKmap) all the boreholes in the INAC application for which the Project Name is 'INAC project #3' (or whatever).

It is assumed the user has already added the INAC.dbf to the current inFOcus application.

1) Activate the ESEbase program in the Modules menu.

2) Choose the INAC borehole database.

3) Select 'Views' and then select 'Quikmap Compatible Database'. This will set up a relationship between the QUIKmap file and the WHO.dbf (among others) which contains information on the Project Name.

4) Return to inFOcus and select INAC from the Databases Menu in Map Display. Use the General Query option to build the query.

eg. WHO.proj_name = "INAC project #3"

This will tag all the relevent data for viewing in QUIKmap.

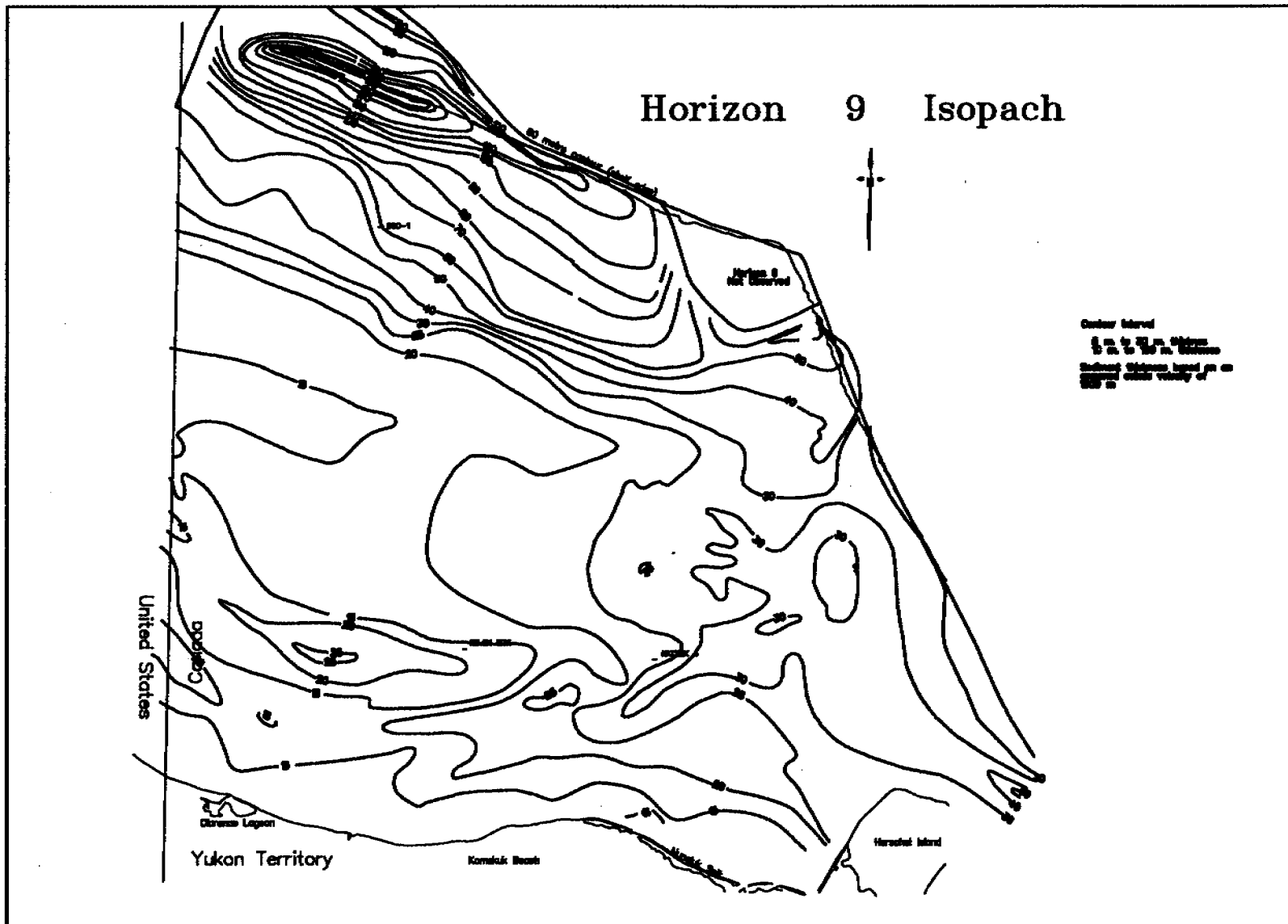
5) 25 lines : Switch to 25 line mode.

6) 50 lines : Switch to 50 line mode. This is especially useful for the Format screens as the windows may be moved around.

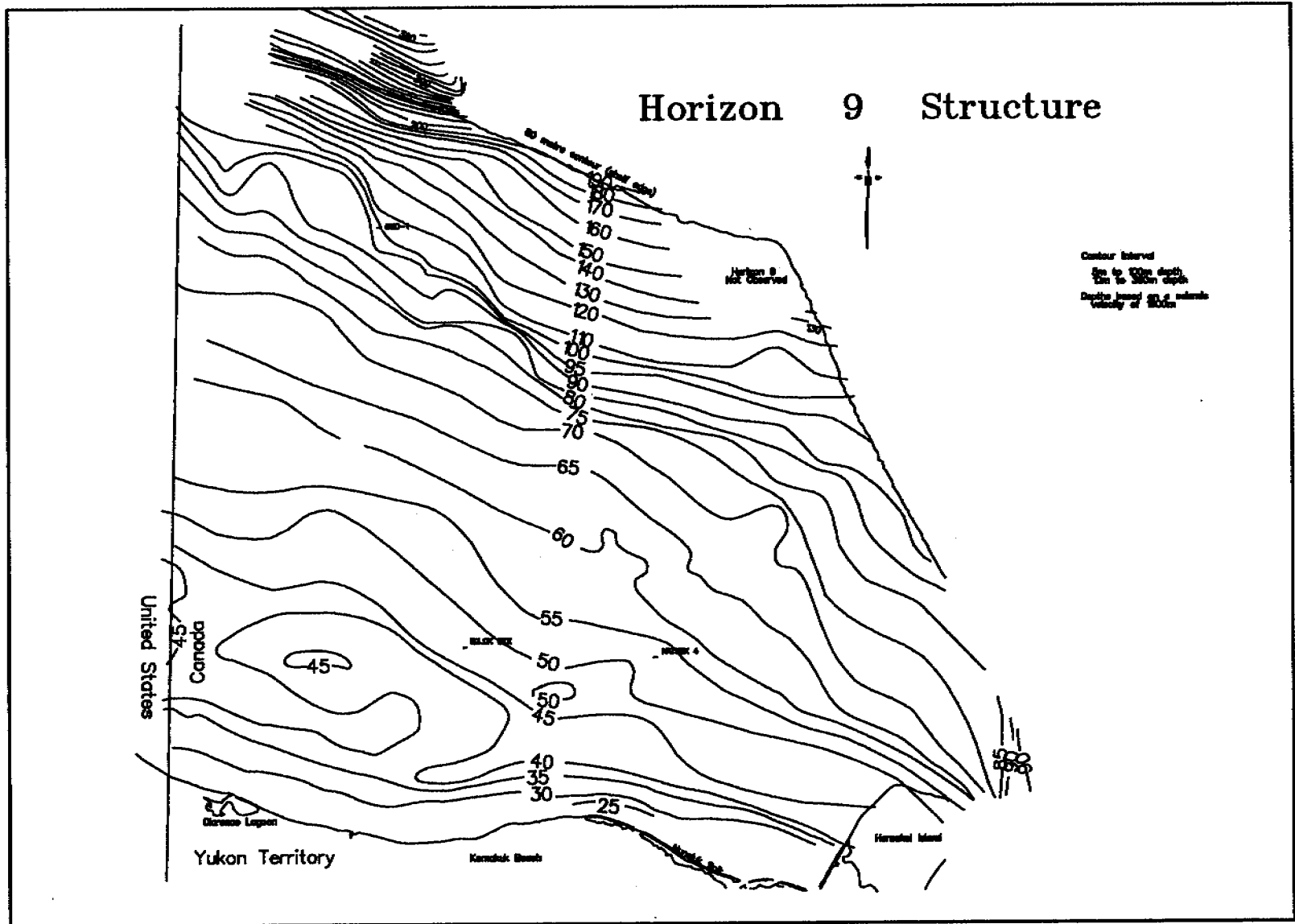
7) Exit : This returns the user to the entry level where a new database may be chosen or the program may be terminated

Appendix 2

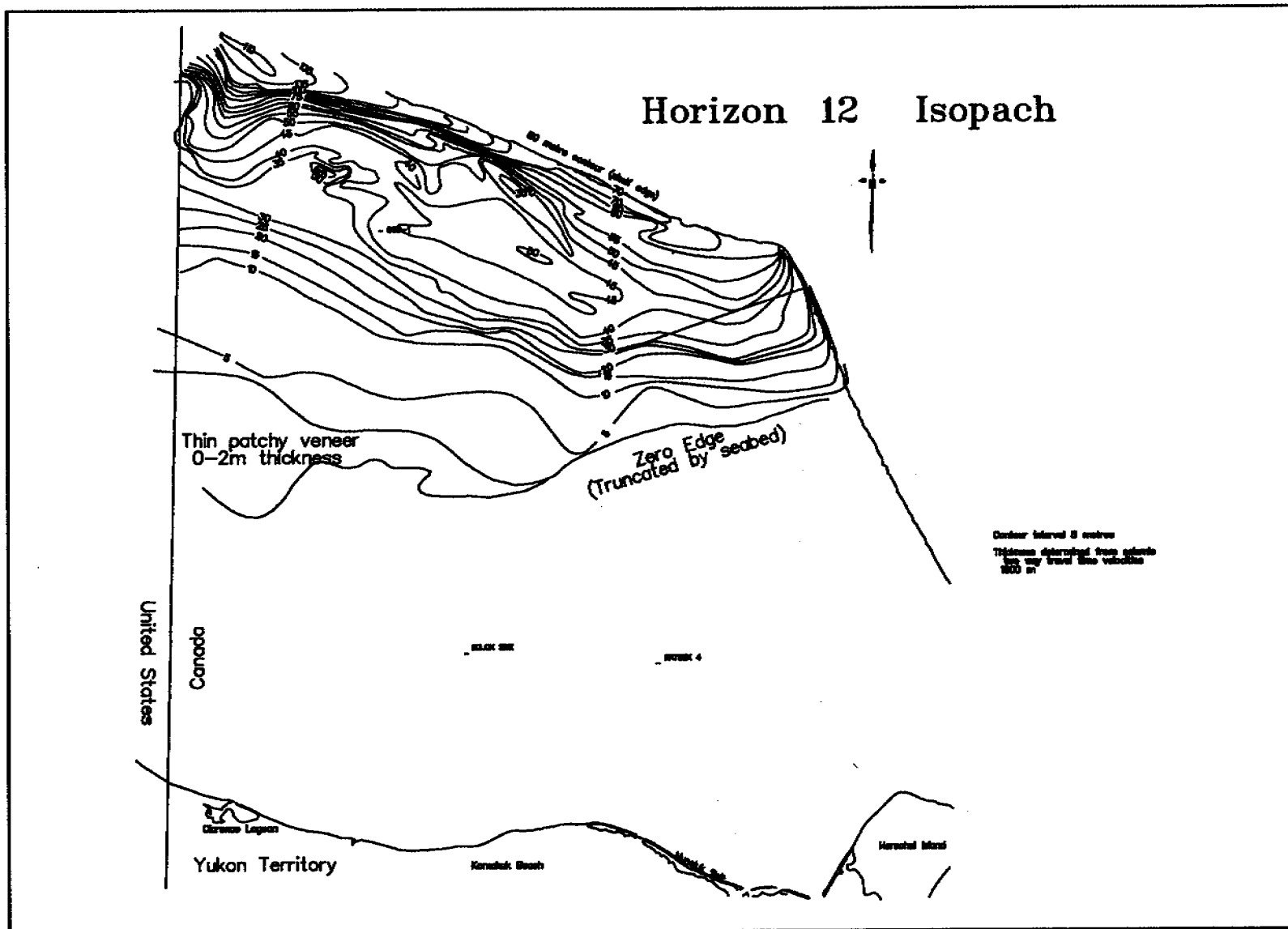
- Map 1: Yukon Shelf Horizon 9 Isopach*
- Map 2: Yukon Shelf Horizon 9 Structure*
- Map 3: Yukon Shelf Horizon 12 Isopach*
- Map 4: Yukon Shelf Horizon 12 Structure*
- Map 5: Yukon Shelf Horizon 35 Total Isopach*
- Map 6: Yukon Shelf Horizon 35 Structure*
- Map 7: Yukon Shelf Surficial Geology*
- Map 8: Yukon Shelf Granular Resource Potential
Herschel Island to Mackenzie Delta*
- Map 9: Mackenzie Valley Granular Resource Deposit Sites*
- Map 10: South Slave Granular Resource Deposit Sites*
- Map 11: Community Granular Materials Inventory
Shown are Fort McPherson, Arctic Red River
and Fort Good Hope*



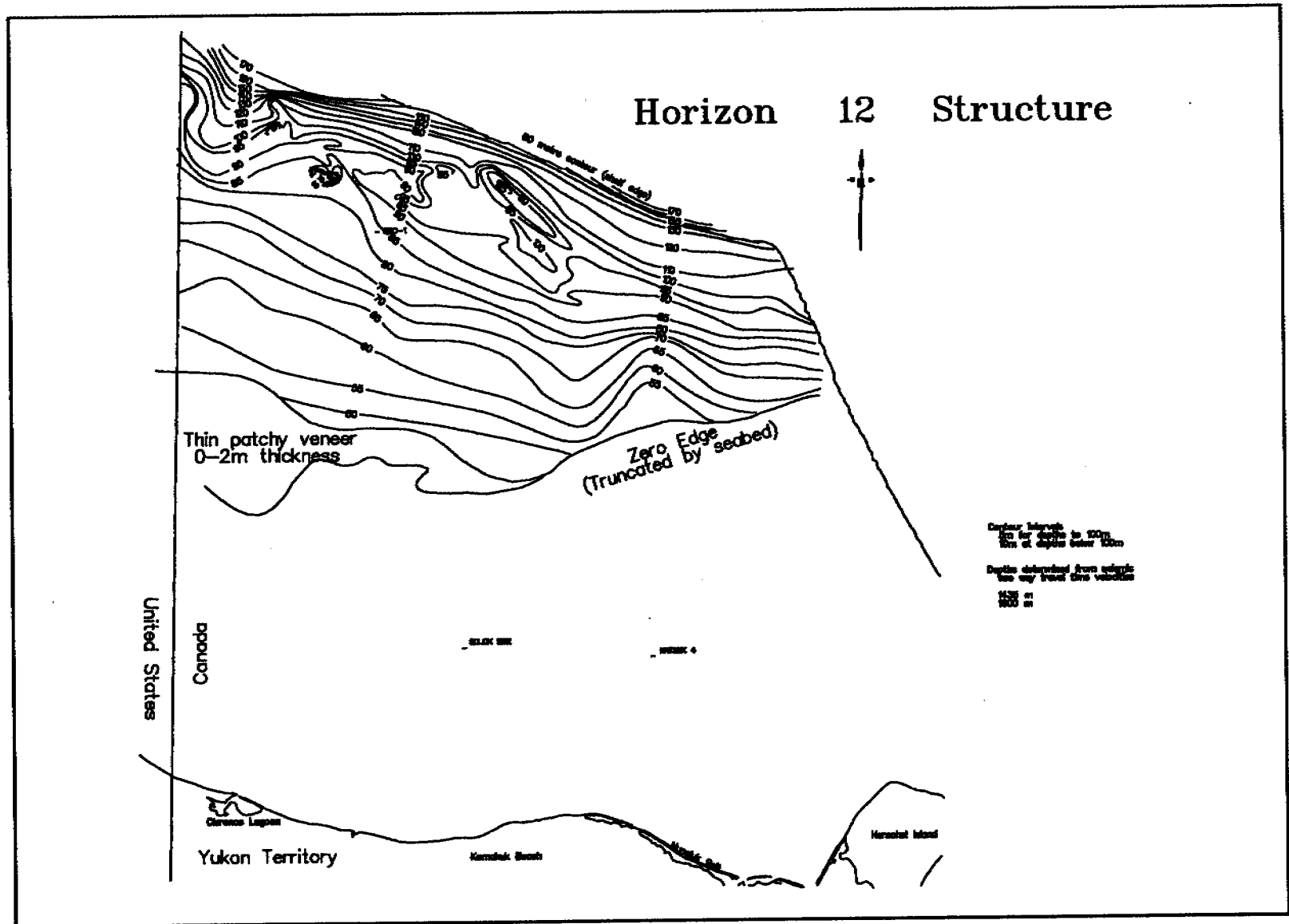
Map 1



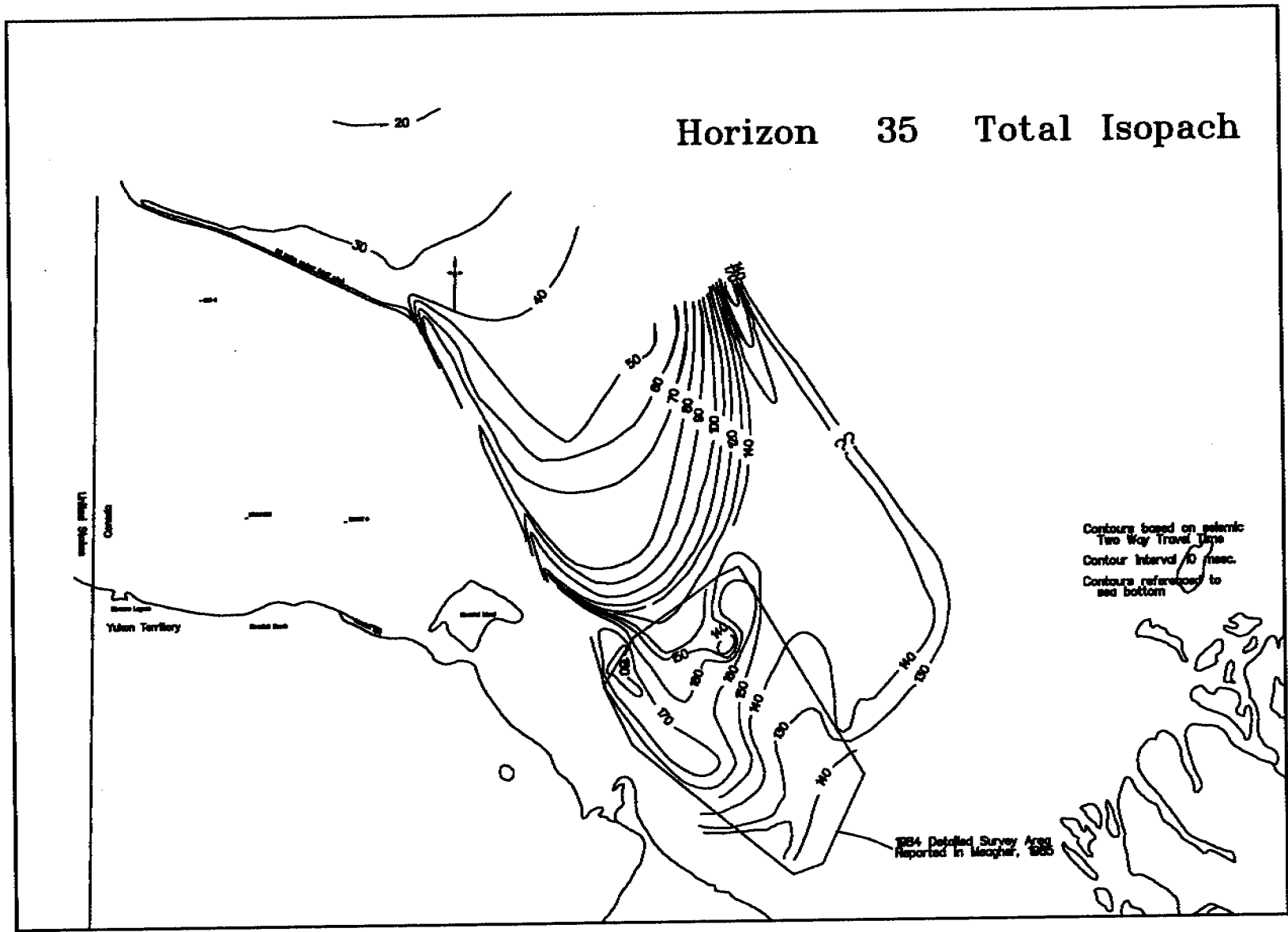
Map 2



Map 3

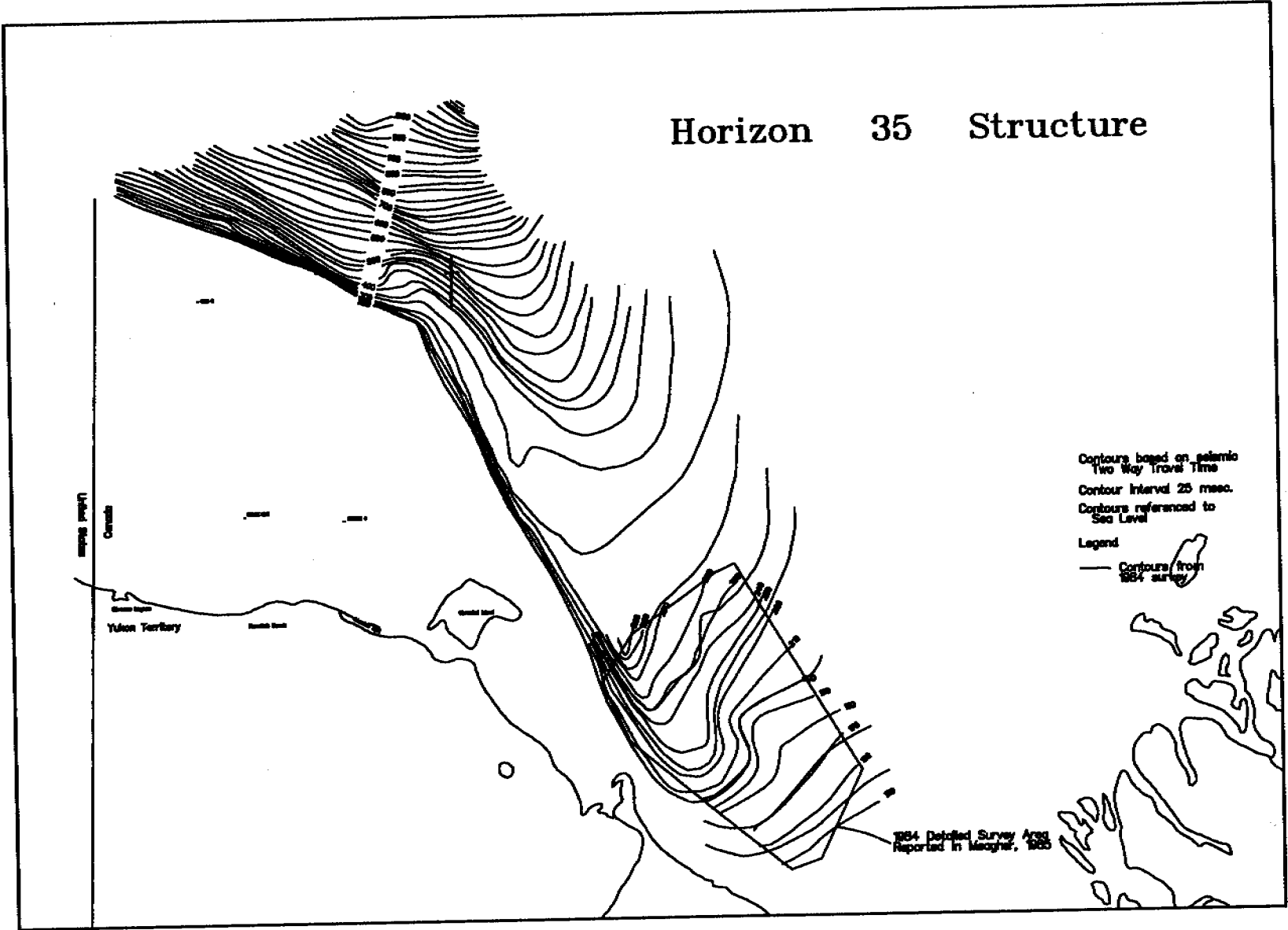


Map 4

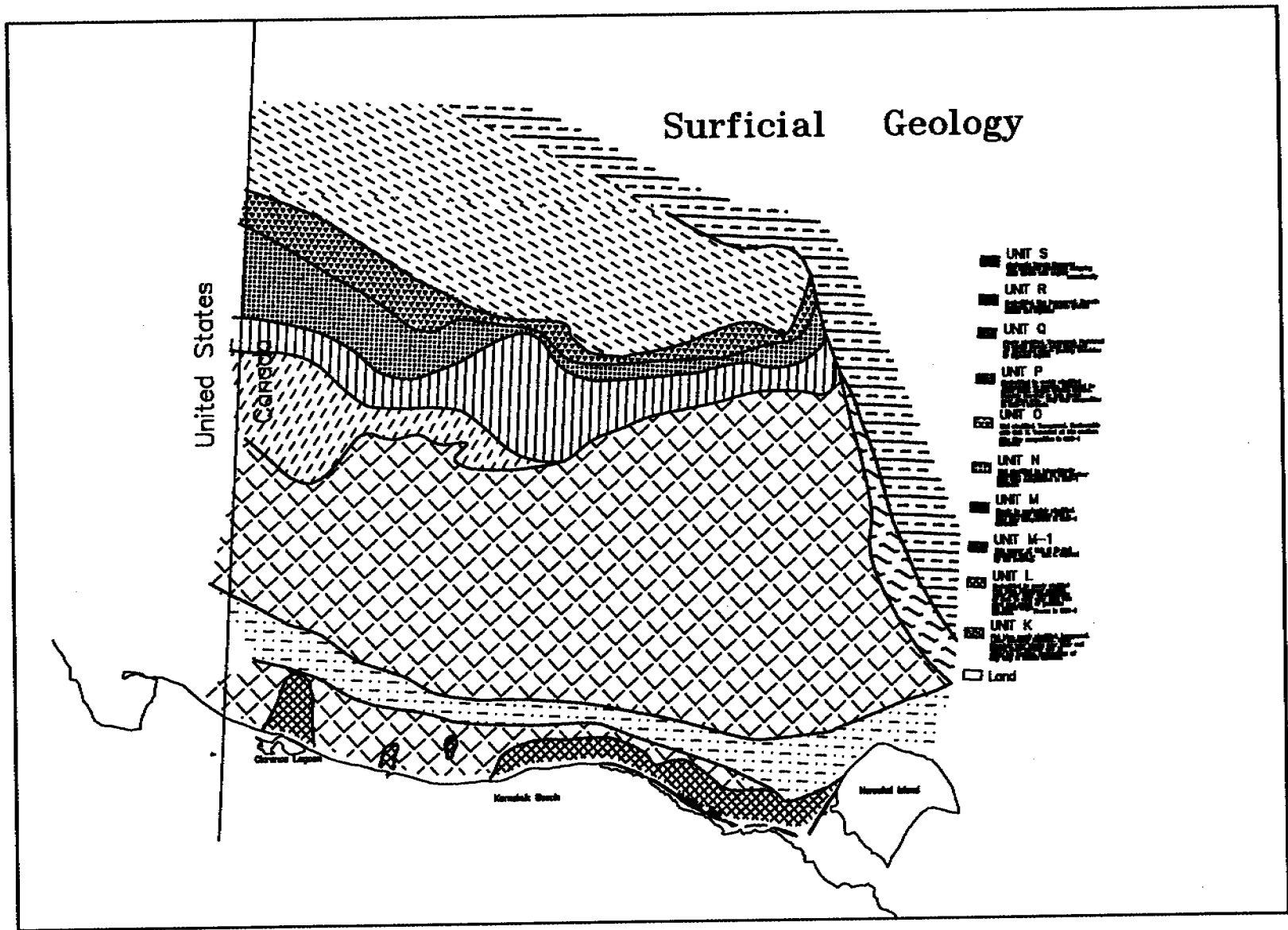


Map 5

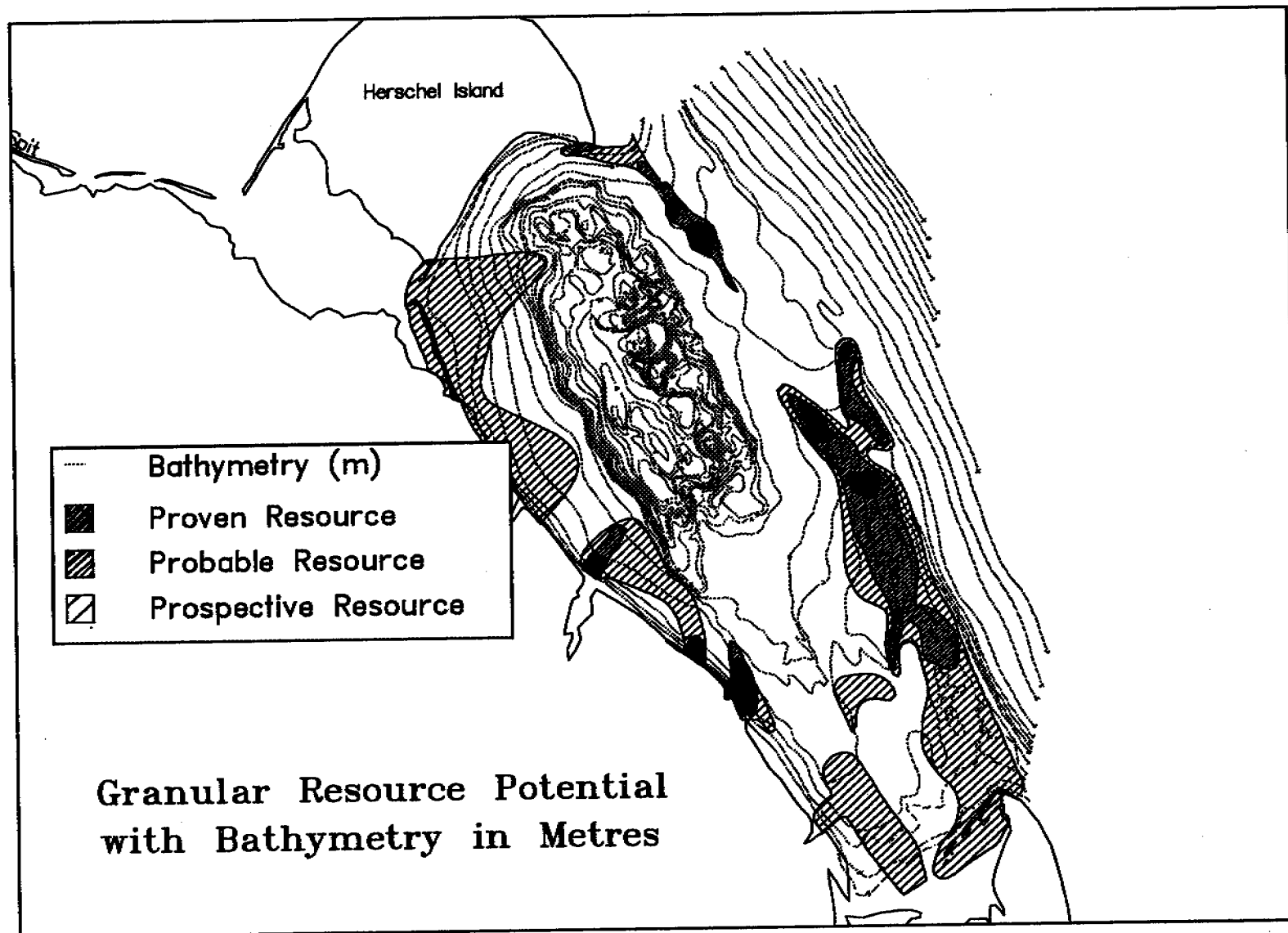
Horizon 35 Structure



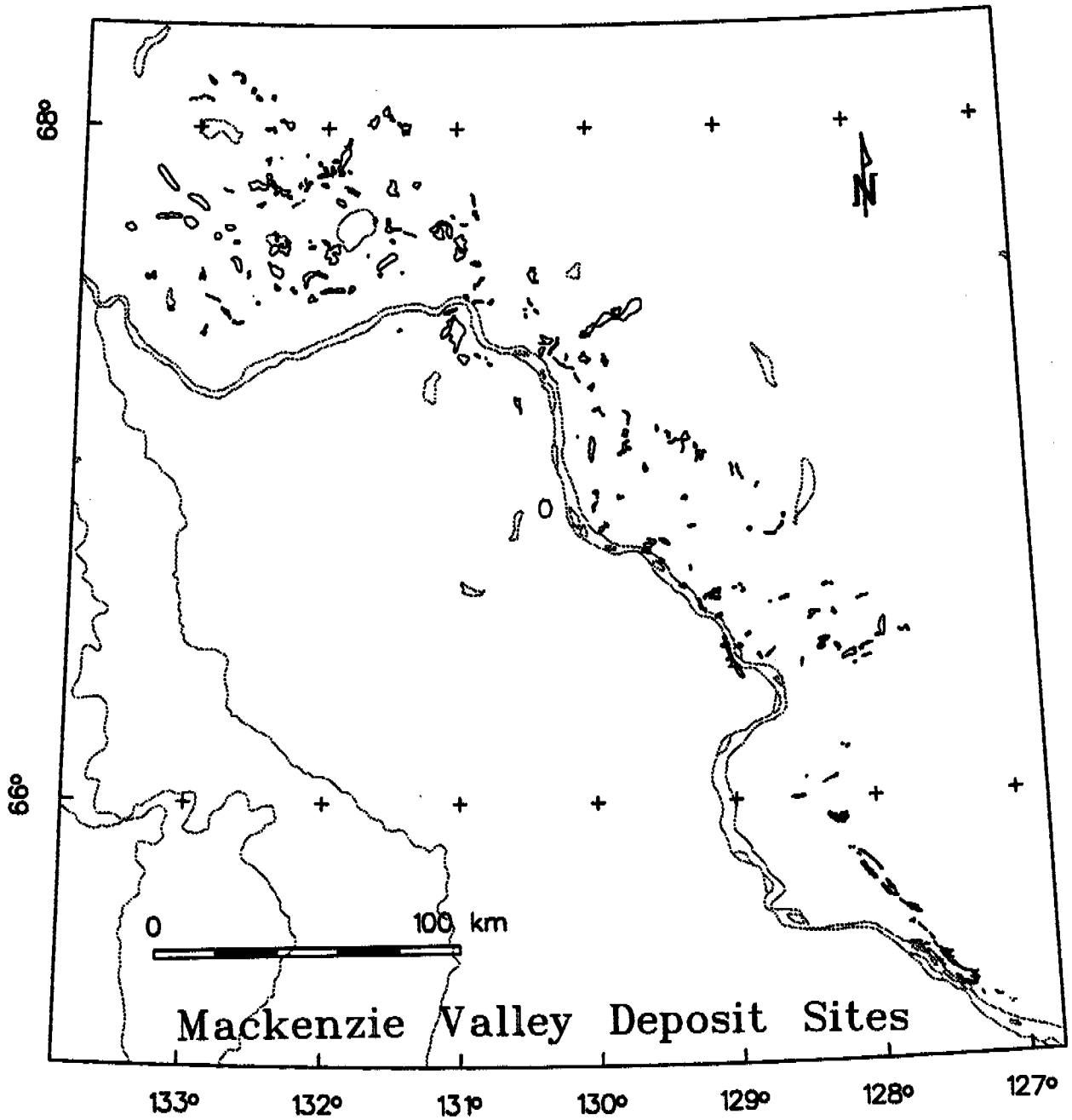
Map 6



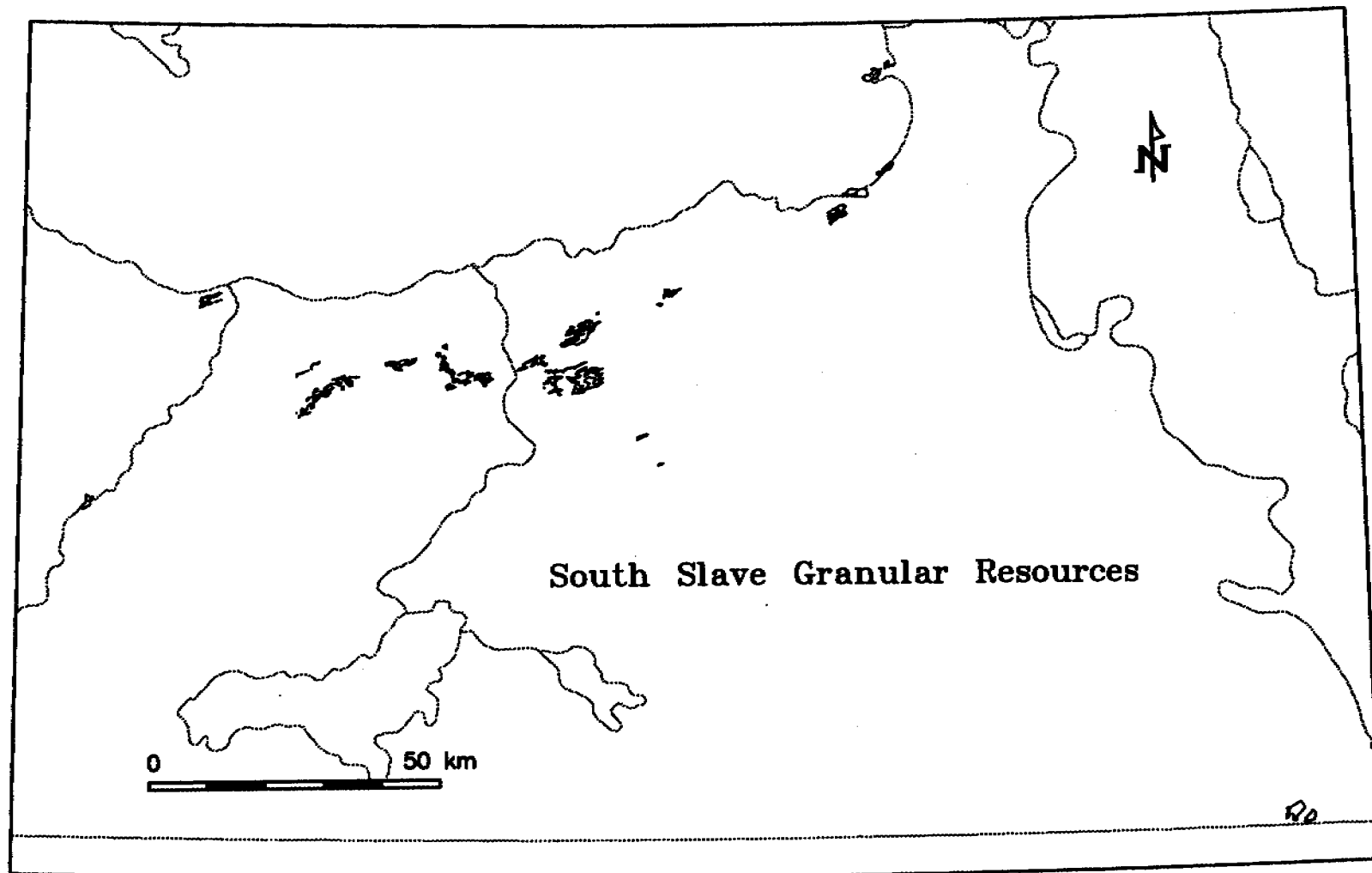
Map 7



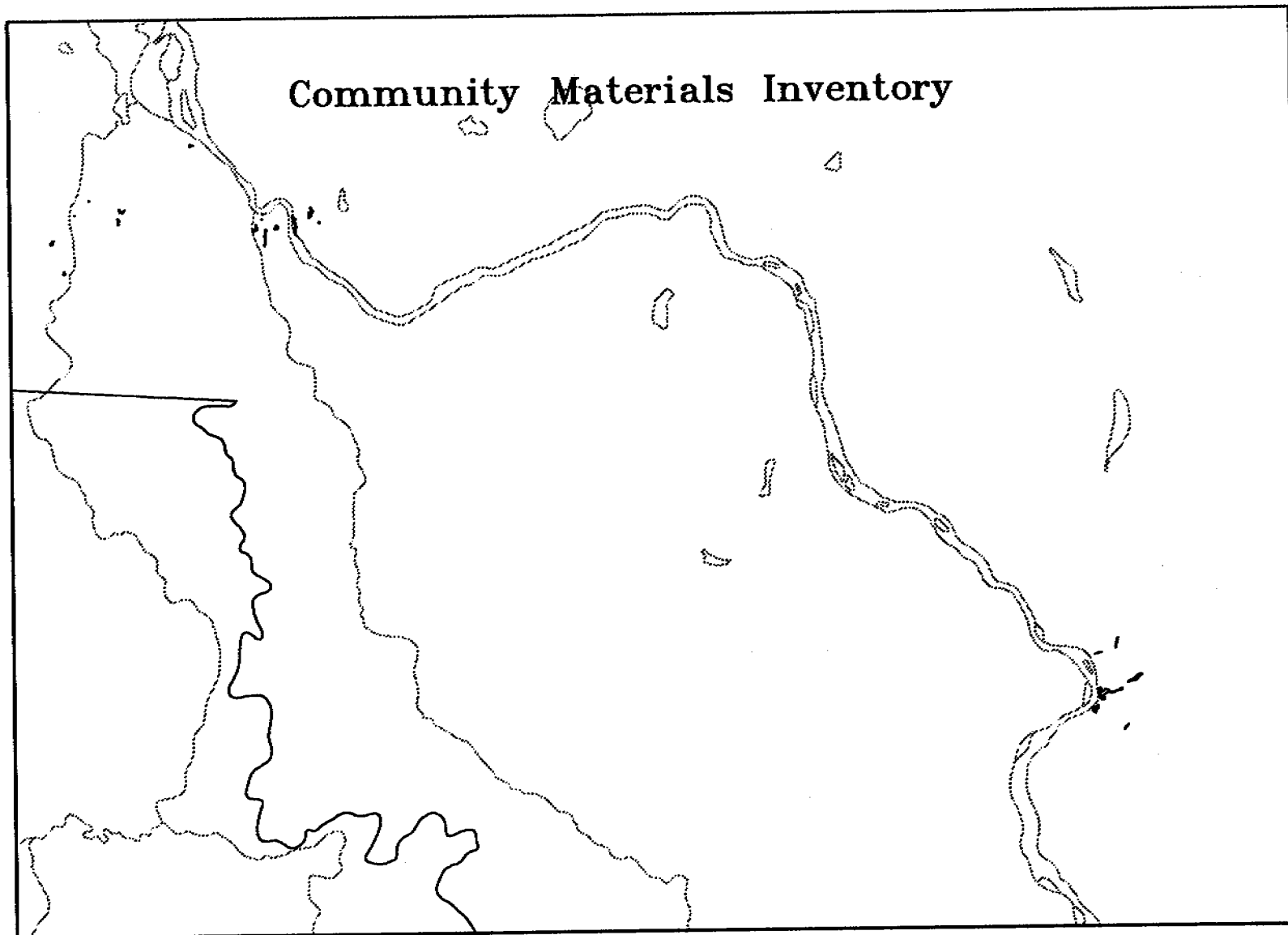
Map 8



Map 9



Map 10



Map 11

Appendix 3

Application and Database Files

```
:\INFOCUS
|
|--- BEAUDATA
|
|--- NWT
|
|--- YUKON
```

Basemap Directories

```
:\ERK_ISS
|
|--- MAPS
|   |--- BANKS_IS
|   |--- ERKABC
|   |--- ERKBATH
|   |--- ERKCONT
|   |--- ERKISOC
|   |--- ERKPROS
|   |--- ERKSAND
|   |--- ERKSURF
|   |--- ERKZONE
|   |--- ISSBATH
|   |--- ISSCONT
|   |--- ISSLWSND
|   |--- ISSSURF
|   |--- ISSUNITC
|   |--- ISSUPSND
```

:\YUK_EOR

|--- MAPS

- |--- ARCTIC
- |--- H9STRUC
- |--- H9ISOP
- |--- H11STRUC
- |--- H11ISOP
- |--- H12STRUC
- |--- H12ISOP
- |--- H15STRUC
- |--- H15ISOP
- |--- H33STRUC
- |--- H33ISOP
- |--- H34STRUC
- |--- H35STRUC
- |--- H35TISOP
- |--- HSURFGEOL
- |--- YUKBASE1
- |--- YUKBASE2

:\YUK_OCON

|--- MAPS

- |--- GRANRES
- |--- RECLAMSD
- |--- YUKBATH
- |--- RIPPLE

