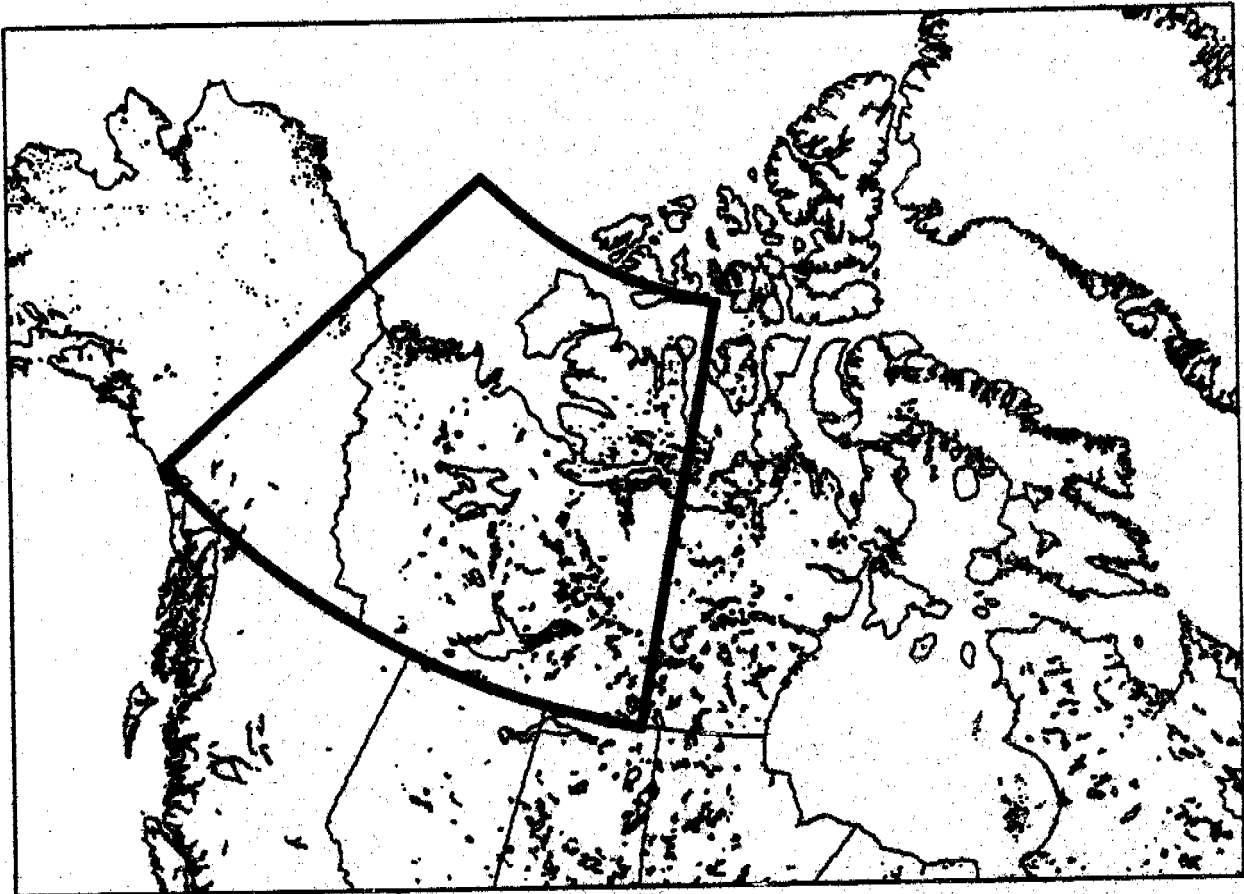


ATLAS OF GRANULAR RESOURCE INFORMATION PHASE II

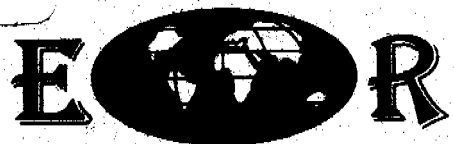
WEST CANADIAN ARCTIC



AN INFOCUS APPLICATION



D001662



Earth & Ocean Research Ltd.

ATLAS OF GRANULAR RESOURCE INFORMATION PHASE II WEST CANADIAN ARCTIC

This atlas contains a series of page size maps that were printed from an inFOcus application for granular resource and related information for the Northwest and Yukon Territories and the Beaufort Sea. InFOcus is a data management system that interfaces with a mapping engine (QUIKMap). The result is a desktop Geographic Information System (GIS) that enables the end-user to have rapid access to map information and hardcopy output.

The inFOcus system is designed with mapping and database management routines that allow for quick and easy access to a wide range of geographic information. The geographic location and associated attributes were provided for onshore and offshore granular resource deposits and bibliographic information for selected granular resource studies.

The data displayed in the enclosed maps were supplied in hardcopy from both hand-drawn and air-photo based sources. The data were digitized, compiled and converted to the required formats of the inFOcus system, that is FoxPro database files (.DBF), and QUIKMap basemaps. The Granular Resource Site Plan polylines have been stored as data base entries and thus possess associated attribute information.

Any combination of, or portion of these datafiles may be quickly displayed and printed or plotted in any common map projection at any scale, and in combination with a range of basemap information such as shorelines, lakes, rivers, bathymetry, and political boundaries. Published results from previous scientific studies were also included in basemap form such as proven, probable, and prospective granular resources, and isopach contours of granular resource deposits and associated units.

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1 SUMMARY

This report describes work undertaken to build two inFOcus applications for granular resource and related information. The first application includes offshore regional granular resource evaluations for two areas in the Beaufort Sea. The other contains site plans for numerous onshore granular deposits in the Yukon and North West Territories. These two applications will act as additions to the existing application described in an earlier report. inFOcus is a data management system that interfaces with a mapping engine (QUIKMap). The result is a desktop Geographic Information System (GIS) that enables the end-user to have rapid access to map information and hardcopy output.

2 INTRODUCTION

The purpose of this project was to build an addition to the existing inFOcus application of granular resource information for the Beaufort Sea described in the report preceding this volume. The new data are divided into two distinct groups; offshore regional surveys in the Herschel and Banks Island regions, and onshore granular deposit site plans covering an area from South Slave to the Tuktoyaktuk peninsula. The site survey maps were from previous scientific studies while the granular deposit site plans were supplied primarily as aerial photos and hand-drawn deposit site surveys.

The data were digitized and converted to the required formats of the inFOcus system, that is FoxPro database files (.dbf), and QUIKMap basemaps. The inFOcus system is designed with mapping and database management routines that allow for quick and easy access to a wide range of geographic information. Both of the applications described in this report were built, and therefore must operate on, the recent update of inFOcus to version 2.0. Previous applications built with version 1.0 will still function normally on this update.

Any combination of, or portion of these datafiles may be quickly displayed and printed or plotted in any common map projection at any scale, and in combination with a range of basemap information such as shorelines, lakes, rivers, bathymetry, and political boundaries.

3 DATA COMPILATION AND CONVERSION

3.1 BASEMAPS

The Herschel and Banks Island Site Surveys application consists of six basemaps. Four basemaps overlay the same offshore geographic region adjacent to Herschel Island while the remaining two describe adjacent areas offshore Banks Island. Basemap themes digitized and converted for inclusion in the application include bathymetry, recent laminated sediments, ripple marks, resource potential and site boundaries. A complete listing of basemaps and their corresponding selection titles is given in Appendix B.

The mylar source maps were digitized as AutoCAD drawing files (.DWG), converted to AutoCAD data exchange files (.DXF), and then converted to QUIKMap format using the DXF2ESL.EXE translator. This process translates all vector data (points, lines, polylines) from AutoCAD to QUIKMap while maintaining the integrity of the original AutoCAD layer structure, thus enabling the user to manipulate individual layers within a map theme. The file structure for the new basemap files (.BMF, .IDX, .PNT) is illustrated in Appendix A.

Some features transported from the AutoCAD drawings are represented as AutoCAD hatch patterns. These features include the granular resource potential and the ripple mark distribution. It is important to understand that hatch patterns from AutoCAD are registered in QUIKMap in "real world" coordinates, whereas hatch patterns associated with point and polygon data in the QUIKMap datafile format are registered in screen coordinates. This presents a limitation for adequate representation of hatched areas of the basemaps in the legends. Although hatch types and orientations are adequately matched, the hatch spacing in the legend cannot reproduce the viewed hatch spacing in some cases. The spacing of hatch patterns as seen in the legends is an estimation of the degree of magnification that will be utilized by a user to view a given set of themes. Therefore, for hatch patterns displayed on basemaps one must rely more on hatch types, colors, and line orientations for reference, rather than line spacing within hatch patterns. Each basemap has been designed carefully to optimize the effective overlaying of hatched themes.

3.2 **DBASE COMPATIBLE FILES (.DBF)**

Seven dBASE format files were created from the four hundred and twenty five (425) granular deposit site plans provided in page size maps. These files were combined to form the Granular Deposit Site Plan application. Six of these dBASE files contain database polylines defining the limits of deposits within specific geographic regions, eg. Mackenzie Valley Site Plans, while the seventh is a catalogue file containing bibliographic information.

The page size maps of granular deposit sites were initially digitized in AutoCAD as closed polylines using the posted UTM control. Each source deposit, whether it consisted of a single or several polylines, was then converted to a single AutoCAD "block" entity, with the block name representing the source number. As with standard basemaps this drawing was then converted to an AutoCAD data exchange file (.DXF) and then to basemap format using the DXF2ESL.EXE translator. The resulting .IDX and .PNT files were converted, on a layer specific basis, to a dBase data file using the ESL2DBT.EXE translator. The source number assigned as the AutoCAD block name is unfortunately not maintained through the conversion, thus manual entry of the database key is required.

Several site plans were not converted to database entities for three possible reasons; 1) they did not contain sufficient UTM coordinate information, 2) they were too faint to digitize or 3) they were duplicates of sites covered within other maps. The Granular Deposit Site Plan Catalogue database specifies the status and provides the reason for all omissions. A listing of the original database filenames and their corresponding selection titles is given in APPENDIX C.

The conversion process revealed a minor program bug within the ESL2DBT.EXE translator. All tests to date indicate that if the first AutoCAD "block" in a given data exchange file (.DXF) contains multiple polylines the ESL2DBT.EXE translator will generate two database entries and divide the first polyline of the block from all that follow. What this means for the user is that sites 0001_1L, 285, 1-16, 222, 150 and 450 have duplicate database entries with slightly different geographic information representing different polylines within the same site description. A solution to this problem is under review.

4 BUILDING THE APPLICATION

4.1 DIRECTORY STRUCTURE

One of the most important features of the inFOcus system is its menu-driven database management system. inFOcus was designed to minimize the effort involved in building and maintaining a complex geographic database. Data access, storage and conversion is all managed within inFOcus. All that the user needs to understand is where to place the imported data. In particular, it is important to understand that there are two types of information - basemap themes and database files, and each are stored within a different directory structure.

To build a map of selected datafiles and basemaps, the steps taken by the user are quite similar to those taken if the task were done manually with hard copy information. With hard copy information the user would acquire data from a shelf in one part of the office, then select a basemap from the map cabinet to use to display the data. In inFOcus, the databases (.DBF files) are stored in one directory, and basemaps (.BMF files) in another directory. Appendices A, B, and C show the directory structure and contents of the database and basemap directories.

All database files are stored either in the application directory below the inFOcus "home" directory or within any directory specified in the QUIKPATH environment (see QUIKMap users guide V 2.50). When the user builds a new application, the process opens a new subdirectory under the inFOcus "home" directory. For the Herschel and Banks Island site surveys application that subdirectory is called "SSURVEYS" and for the granular resource site plan application it is called "GRSPLANS". All files necessary for the application are instantly copied into that directory. The user's database files (.DBF) must then be copied into the same directory, and are then ready to be added to the database menu selection.

The basemaps for any application can be stored anywhere on the harddisk as long as the proper directory sub-structure is maintained. (Refer to QUIKMap users guide version 2.50). For these applications the directories for the basemaps have been given the same name as the inFOcus application subdirectory, eg. "GRSPLANS". Under both of these directories is a subdirectory called "MAPS". The directories for each basemap in the application reside under the "MAPS" sub-directory. When the basemap files (.BMF, .PNT, and .IDX) are stored within this structure they are ready to be added to the basemaps menu selection.

4.2 DATAFILE MANAGEMENT

It is important to keep in mind while working in any application that all files created or manipulated will remain in the application (or QUIKPATH locatable) sub-directory. inFOcus requires 600k storage in order to write temporary files to disk while making a map. Therefore, poor house keeping habits may cause problems such as creating numerous temporary database files while working with the application. It is suggested that one person be responsible for maintaining the application to see that it is in proper working order.

4.3 BASEMAP MANAGEMENT

The basemaps in the Herschel and Banks Island Site Surveys application are stored under the sub-directory "MAPS" in a directory called "SSURVEYS". Each basemap is associated with a basemap control file (.BMF) and several file pairs (.IDX & .PNT) which contain the vector information for the various map layers. It is important to remember that each basemap in the system has a filename for its basemap control file (.BMF) that has the same name as the basemap directory. For example, with the selection of 'Granular Resource Distribution', inFOcus reads a basemap control file called "GRANRES.BMF". This file is stored in a directory that bears an identical name "GRANRES", under the sub-directory "MAPS", in the main directory "SSURVEYS". The same structural and naming conventions are true for all other basemaps presently in the system.

5 USES AND LIMITATIONS

5.1 QUERY AND DISPLAY

The inFOcus system is designed mainly as a geographic database query and display system. The most common mapping routines are embedded at the heart of the system, such as enabling the user to select a database file and display that data on a selected basemap. This operation ranges from as little as three menu selections to approximately ten, for any given selection of datafiles, map areas, and basemaps. A final map with grid, north arrow, scale bar and legend can be created within minutes. Once existing maps are created, they may be saved within QUIKMap for later retrieval under the CHOOSE SAVED MAPS option under MAP DISPLAY. This allows for instant access to previously created maps.

5.2 INTERROGATION AND UPDATE

Database information may be accessed from the menu system or from the map once it is displayed. inFOcus allows for full database creation, modification, and updating through the menu driven interface. Database records accessed from within the map display may be updated by changing any value in the listed fields, and then pressing 'Ctrl-End' to save. It is important not to change attributes for critical fields related to location, or sample number, etc. Although these fields are not write-protected in the current application, it is possible to make some fields 'read-only', so that they may not be modified by casual users.

5.3 REPORTING

The inFOcus system offers a comprehensive reporting capability. The user may create custom reports, or modify existing reports, and query the database simultaneously. The only limitation within the system with this operation, is that printouts cannot be run directly from within inFOcus. The report is written to an ASCII file which can be printed using the DOS PRINT command, or word processing software.

5.4 *HARDCOPY MAP OUTPUT*

The inFOcus system supports a wide range of printers and plotters for hard copy output. The quality of output will depend on several factors relating to the amount of information displayed and the dependability of the plotting and printing facility. The user should refer to the QUIKMap users guide for full instruction on map output.

One of the limitations of hardcopy output, as with any map, is the amount and detail of information that is readable in hard copy form. The QUIKMap users guide provides information on how to finalize a readable map such as moving labels, adding text, changing line and hatch types, and colors and so on. With some practice, publishable quality maps can be accomplished. Should the user need to modify the map display, then exporting to AutoCAD through DXF is an effective means of achieving these results.

5.5 *CLASSIFICATION AND ANALYSIS*

Although inFOcus is built mainly for display and access to geographic information, the system supports substantial classification and analytical potential. For example, under the BROWSE/EDIT menu the user can replace fields based on a search criterion. (eg. all samples with greater than 50 % gravel, replace symbol type with a triangle.)

However, if the classification or analytical process is a task which is done on a routine basis, then the routine may be written as a hardwire operation and added as a module. One example of such a routine is to tag all sample records in one database file within a geographic area defined by a polygon in another database file. The bounding polygon may be a mineral claim, a bibliographic area, or a user defined polygon. Another developed routine allows for the calculation of water volumes in a series of harbours within user defined boundaries using CHS hydrographic data.

5.6 *DATA EXCHANGE*

Perhaps the most important concept in the design of inFOcus is the ability to exchange data with other systems. The greatest demand for inFOcus applications lies in the need for quick and easy access to of geographic information. The effective use of such technology requires minimal effort in exchange of information from other GIS and CAD systems, and mainframe database networks.

The present version of inFOcus uses dBASE compatible (.dbf) and QUIKMap basemap (.bmf, .idx, .pnt) file formats. Therefore whenever data is to be imported into the system, or exported from the system, it must be subject to the necessary conversion process. The QUIKMap mapping engine supports direct exchange with CARIS (.NTX), INTERGRAPH (.DGN), and AutoCAD (.DXF). Other GIS or CAD systems usually require a secondary conversion process for exchange such as from ARC/INFO to AutoCAD to QUIKMap.

6 CONCLUSIONS AND RECOMMENDATIONS

The new inFOcus applications of granular resource information for the West Canadian Arctic expands on the existing application with the addition of two site surveys as well as six database files of granular resource site plans. The Herschel and Banks Island Site Surveys application was digitized from published maps of a previous scientific study and converted to QUIKMap basemap files. The database files of the Granular Deposit Site Plans application make use of a new capability to assign database attributes to polyline information. PAMAP files which were also supplied were not converted due to the unavailability of the PAMAP to AutoCAD conversion routine.

In the interest of maintaining a fully functioning system, and expanding on this application, the following recommendations are addressed:

- 1) It is important to understand that the fundamental philosophy behind an inFOcus application is to provide rapid and easy access to a large amount of geographic information for non-technical users. The inFOcus system allows for the expansion and creation of new applications, and query, display and manipulation of data within the applications. The system is fully functional for dBASE compatible files and QUIKMap basemaps, and the user should have little or no difficulty in expanding applications or building new ones if the data is already in the required format. However, in the event that new data is to be added such as data from other GIS or CAD systems, or other database management systems (DBMS), it is recommended that this task be left to qualified individuals. Although the process of converting data from other systems into the required format of the inFOcus system is fairly straight forward, unforeseen problems are often encountered that require the consultation of a digital mapping or GIS expert.
- 2) The database files for all granular resource information in the system is now easily accessible. The ramification of this is that certain critical attributes of the data may be mistakenly, or intentionally changed by casual users. Such critical attributes would be the latitude and longitude position, sample number, author, etc. A solution to this problem is to make certain fields in each database 'read only' fields. This limits the editing capability of the user, but for good reasons.
- 3) Other recommendations are directed toward further customization of the interface. Further customization would minimize time spent by users in interrogation and manipulation of data. An example would be to create a standard symbology for the various types of data that will be included in the system. Or, to include search routines on the basis of user defined radius, one polygon against a point file, etc. In most cases further customization of inFOcus to suit in-house operations requires very minimal effort and cost compared to the amount of time and money that would be spent by users of the system without further customization.

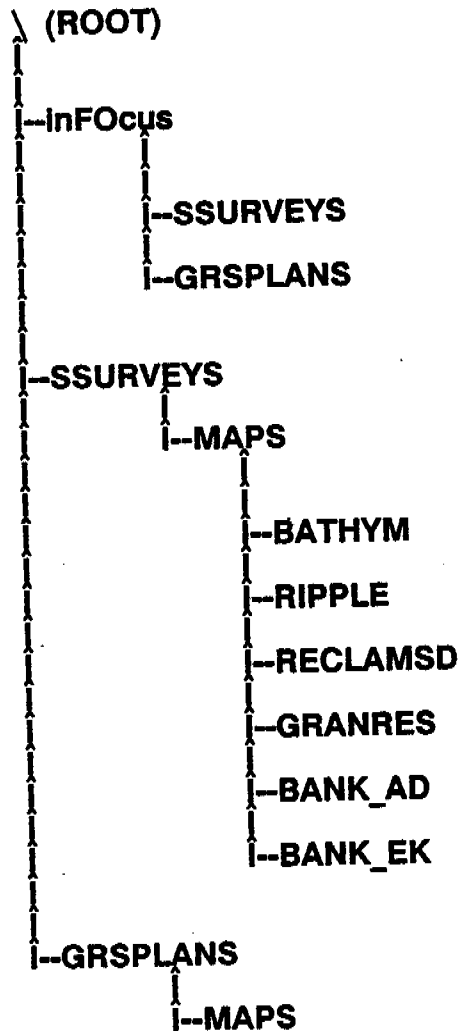
7 **REFERENCES**

Earth & Ocean Research Ltd., 1990. "Atlas of Granular Resource Information for the West Canadian Arctic - an inFOCUS Application". (EOR Project 89-51), Submitted to DEPARTMENT OF INDIAN AND NORTHERN DEVELOPMENT.

Earth & Ocean Research Ltd., 1988. "Synthesis and Interpretation of Bathymetric, Geophysical, Geological and Geotechnical Data: Issek Borow Block - South Central Beaufort Sea". Part of the Northern Oil and Gas Action Program (NOGAP Project M-20), Submitted to DEPARTMENT OF INDIAN AND NORTHERN DEVELOPMENT.

Earth & Ocean Research Ltd., 1988. "Synthesis and Interpretation of Bathymetric, Geophysical, Geological and Geotechnical Data: Eriksak Borow Block - South Central Beaufort Sea". Part of the Northern Oil and Gas Action Program (NOGAP Project M-21), Submitted to DEPARTMENT OF INDIAN AND NORTHERN DEVELOPMENT.

APPENDIX A - INFOCUS DIRECTORY STRUCTURE AND CONTENTS



APPENDIX B - LIST OF DATABASE FILES AND SELECTION TITLES

FILENAME	SELECTION TITLE
MACVALGR	<i>Mackenzie Valley Granular Dep. Sites</i>
COMINVGR	<i>Community Materials Inventory</i>
ALSKHYGR	<i>Alaska Highway Deposit Sites</i>
DEMPHYGR	<i>Dempster Highway Deposit Sites</i>
SSLAVEGR	<i>South Slave Granular Study</i>
INUVRGGR	<i>Inuvialuit Set. Area Deposit Sites</i>
SITE_CAT	<i>Granular Deposit Site Plan Catalogue</i>

APPENDIX C - LIST OF BASEMAPS AND SELECTION TITLES

DIRECTORY

SELECTION TITLE

BATHYM

Bathymetry

RIPPLE

Ripple Mark Distribution

RECLAMSD

Recent Laminated Sediments

GRANRES

Granular Resource Distribution

BANK_AD

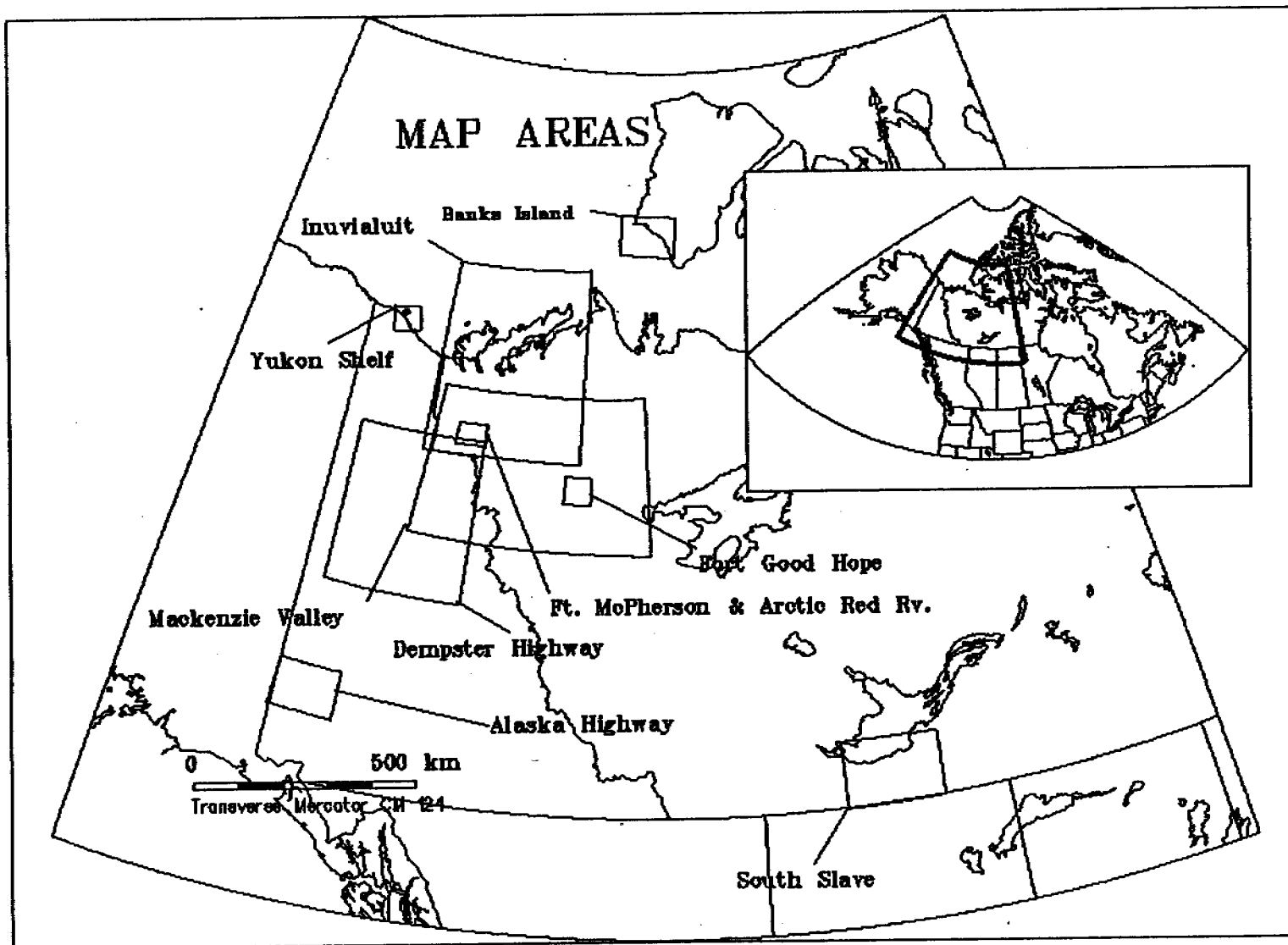
Site Locations: A - D

BANK_EK

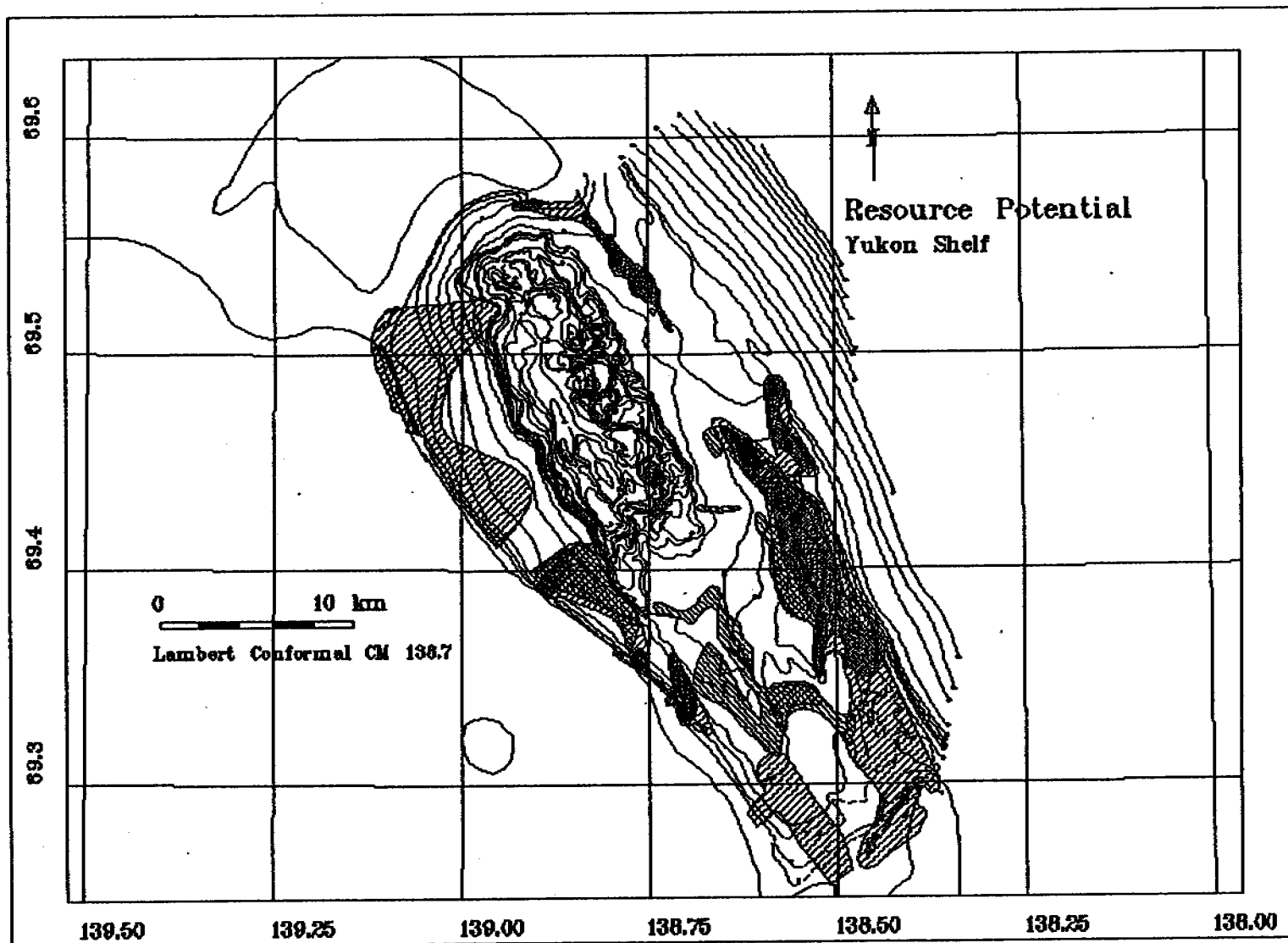
Site Locations: E - K

APPENDIX D - ATLAS OF SELECTED MAPS

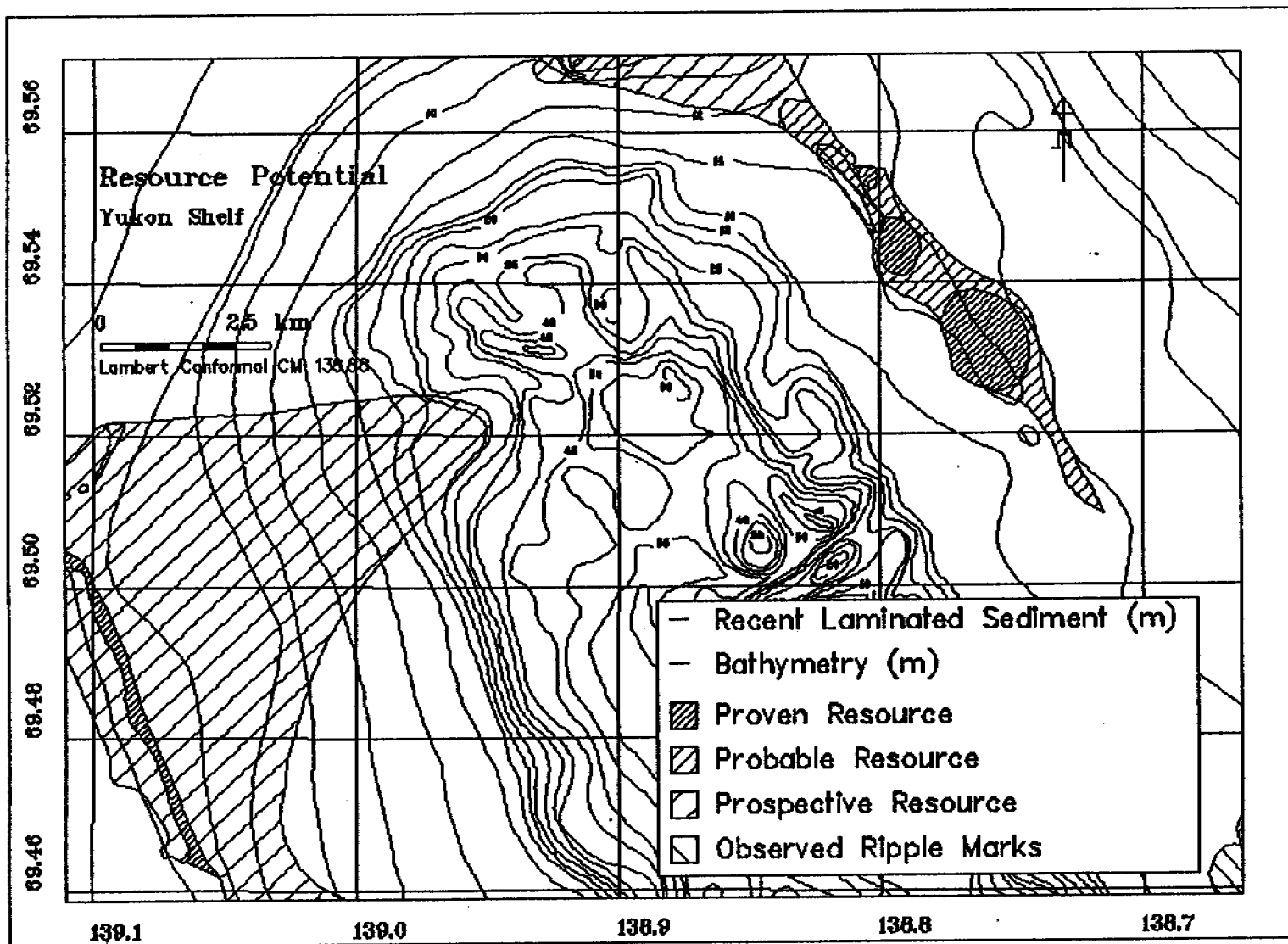
- Map 1:** *Index Map.*
- Map 2:** *Granular Resource Potential - Yukon Shelf / Herschel Island.*
- Map 3:** *Detail of Map 2 - North.*
- Map 4:** *Detail of Map 2 - South.*
- Map 5:** *Recent Laminated Sediments - Yukon Shelf / Herschel Island.*
- Map 6:** *Detail of Map 5.*
- Map 7:** *Borrow Study Site Locations - Banks Island.*
- Map 8:** *Detail of Map 7.*
- Map 9:** *Granular Resource Sites - Mackenzie Valley.*
- Map 10:** *Granular Resource Sites - Fort Good Hope.*
- Map 11:** *Granular Resource Sites - Ft. McPherson & Arctic Red River.*
- Map 12:** *Granular Resource Sites - Alaska Highway.*
- Map 13:** *Granular Resource Sites - Dempster Highway.*
- Map 14:** *Granular Resource Sites - South Slave Region.*
- Map 15:** *Granular Resource Sites - Inuvialuit Settlement Region.*
- Map 16:** *Detail of Map 15 - Tuktoyaktuk Area.*



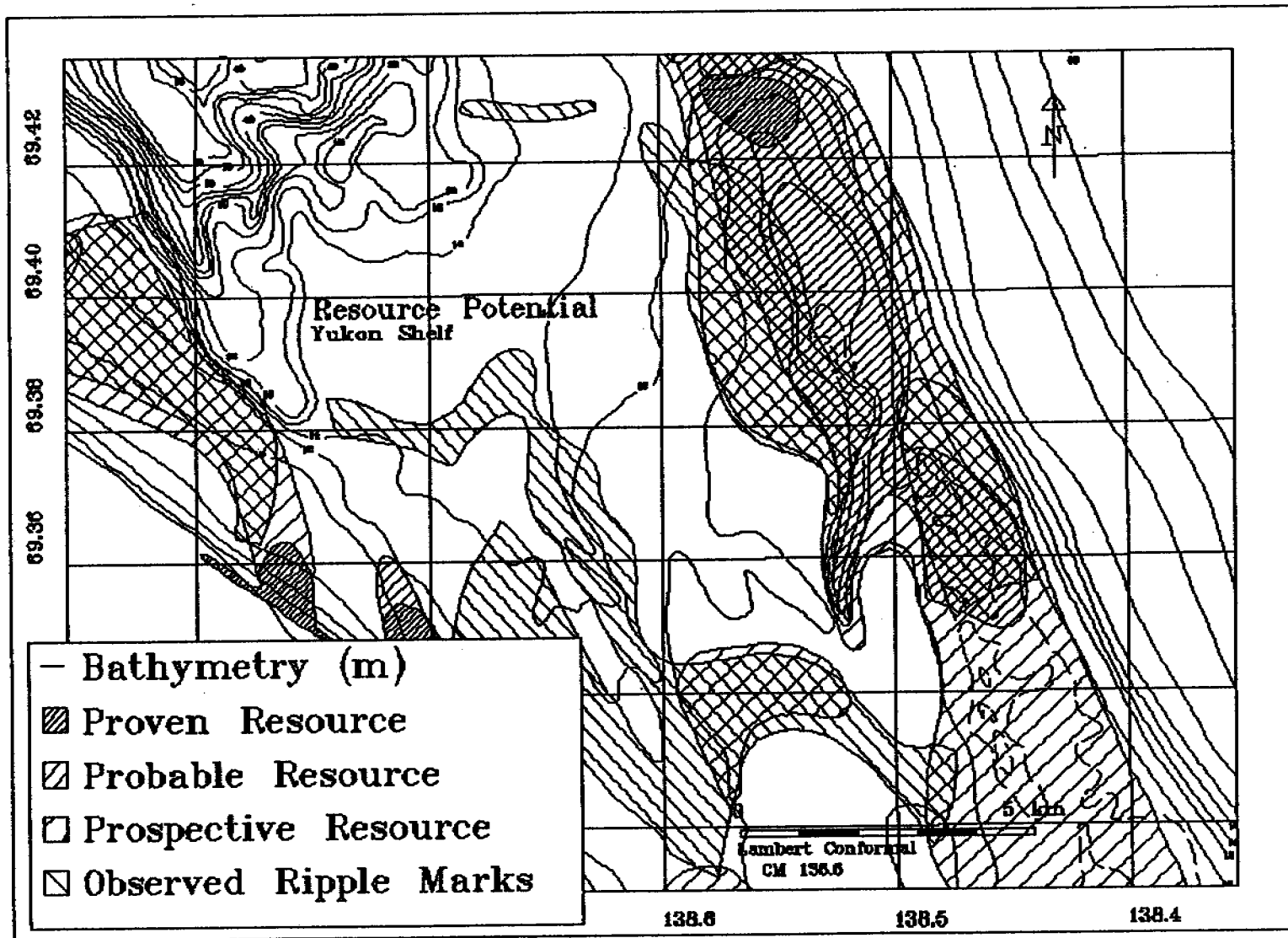
Map 1: Index Map. Outlined areas are described in subsequent maps.



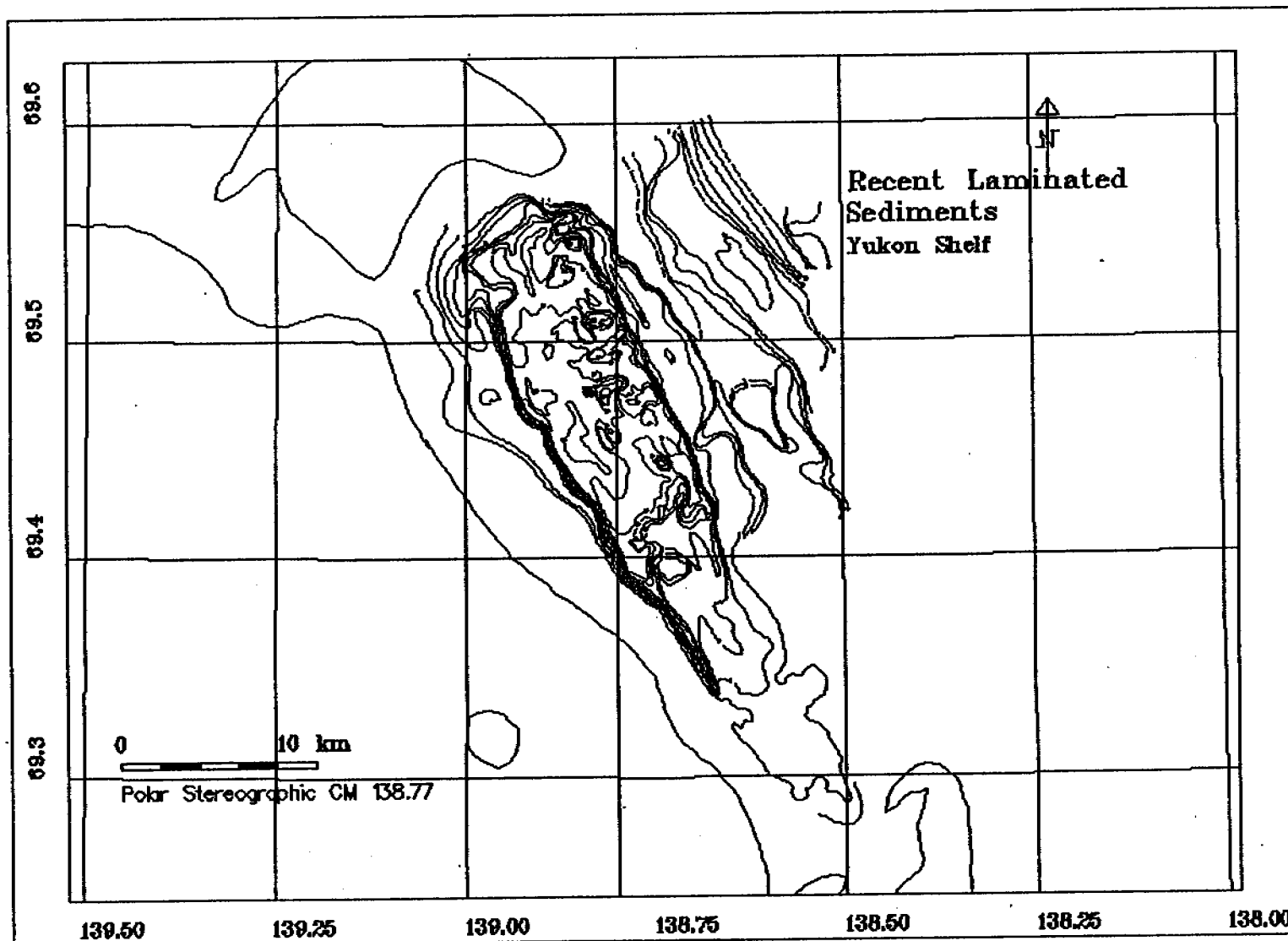
Map 2: Gravel Resource Potential and Gravel Ripples overlain on bathymetry. Yukon Shelf Near Herschel Island.



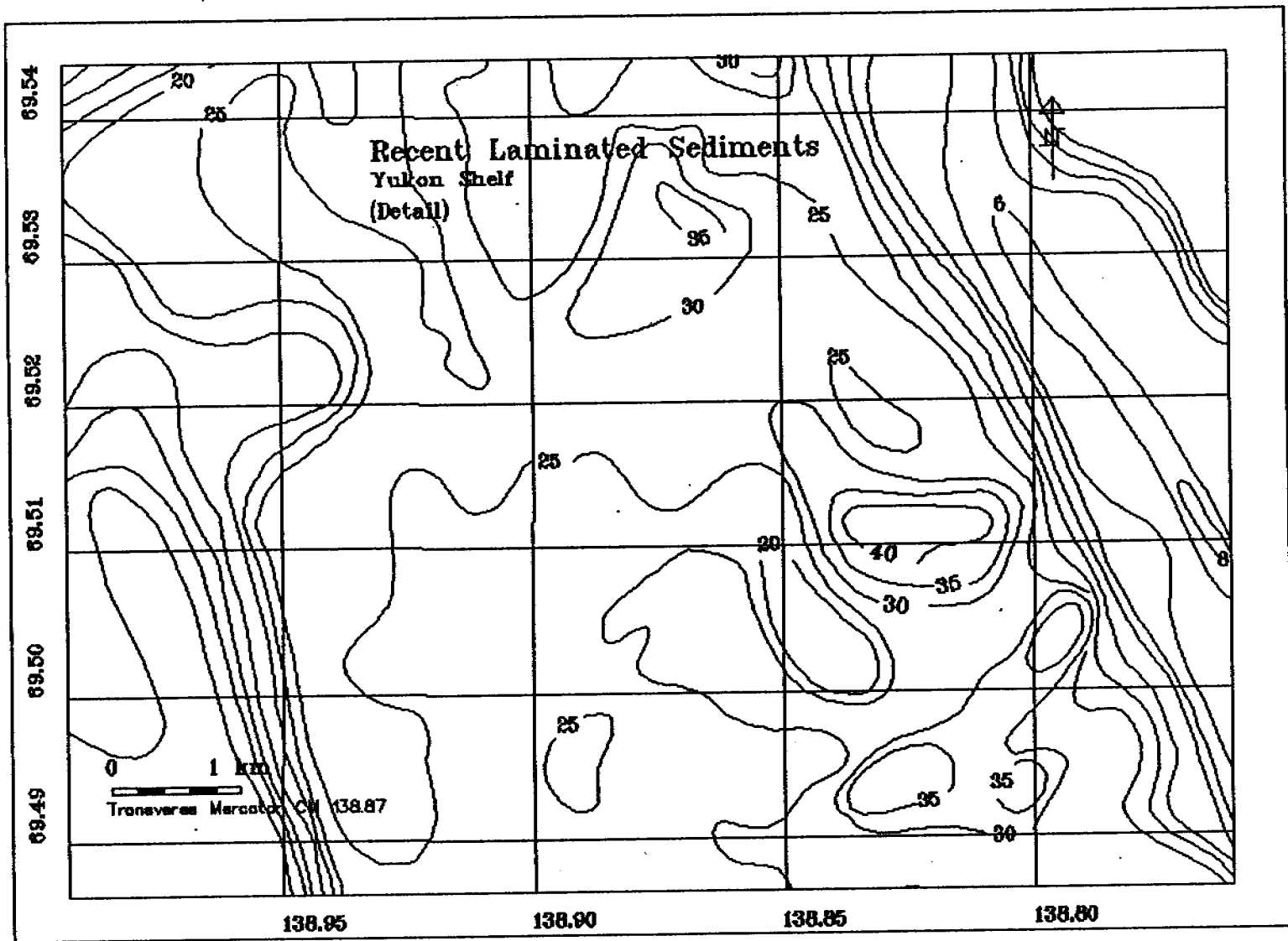
Map 3: Detail of Map 2, north of the area of high relief, showing the close correlation between map themes which is clearly evident in on-screen overlays.



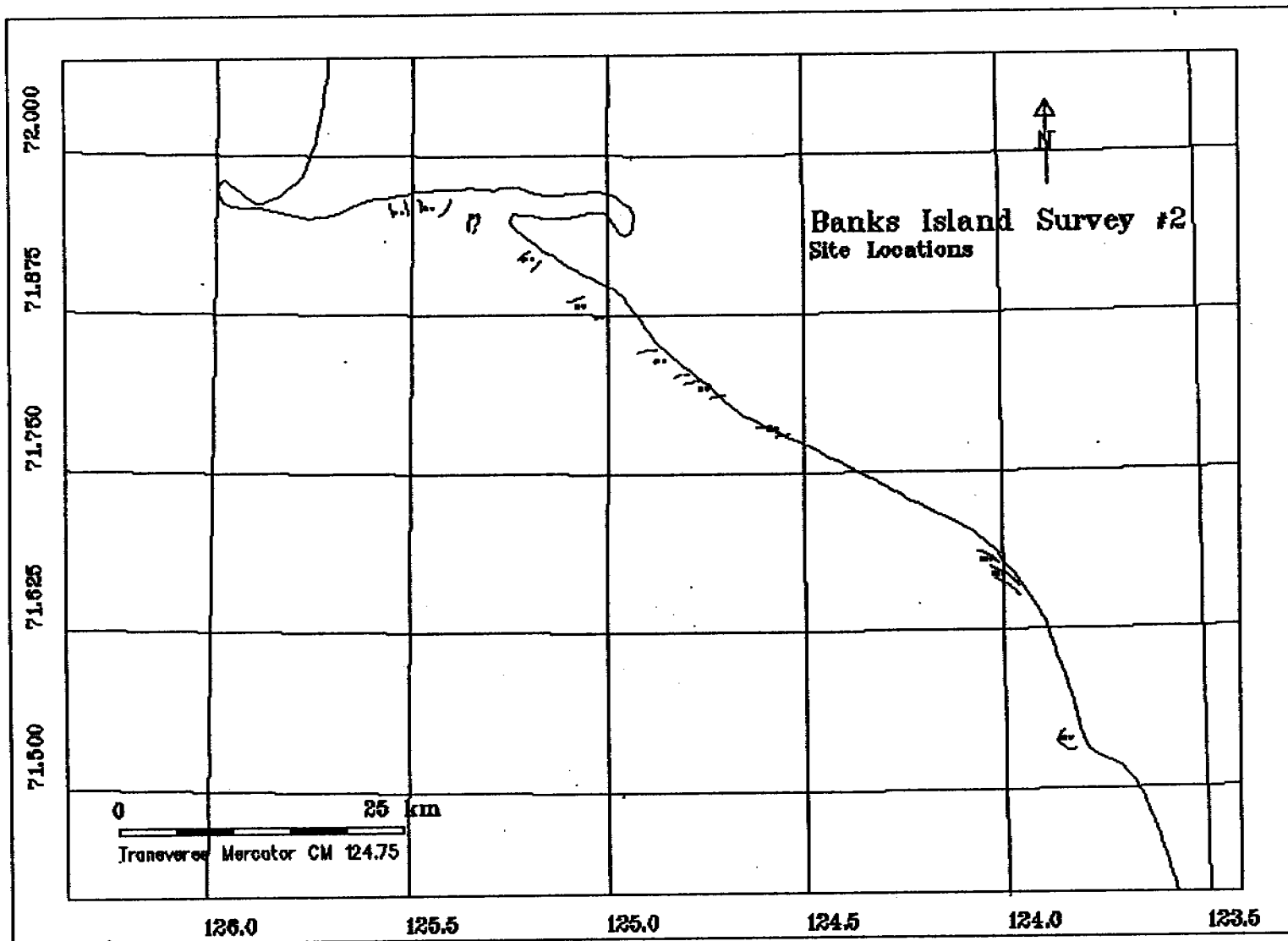
Map 4: Detail of Map 2 to the south of the area of high relief.



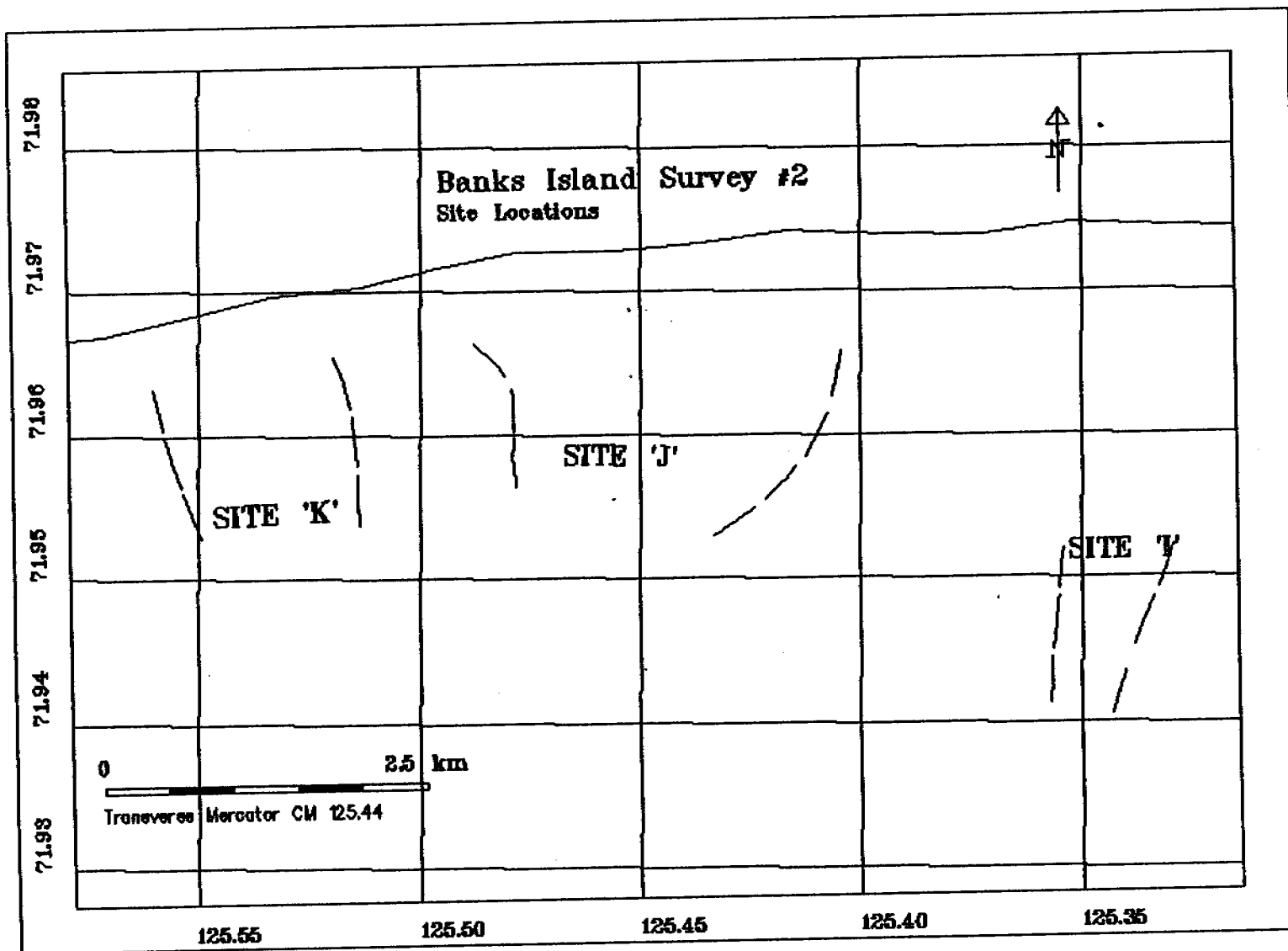
Map 5: Recent Laminated Sediment Isopach on the Yukon Shelf near Herschel Island.



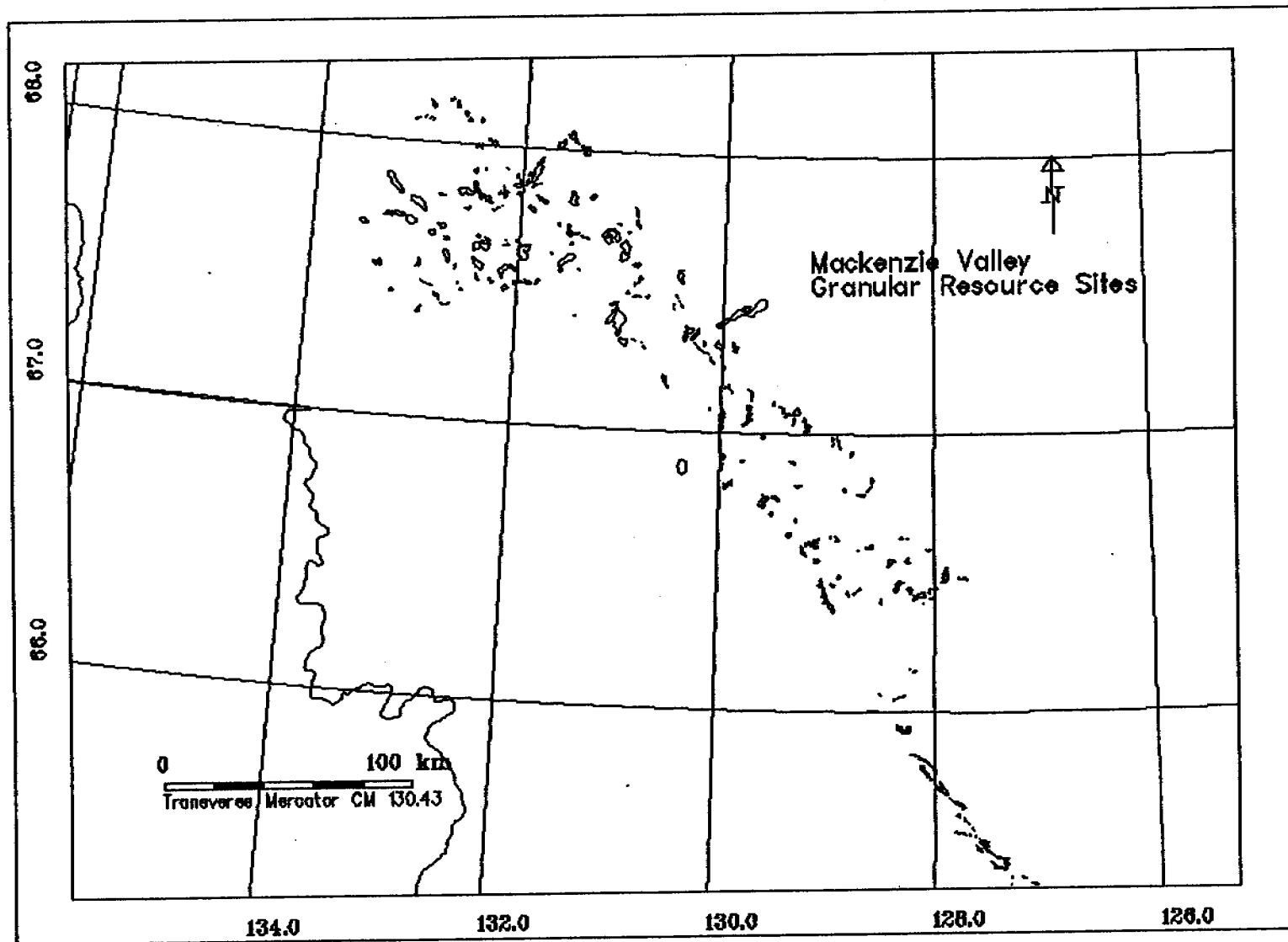
Map 6: Detail of the northern portion of Map 5.



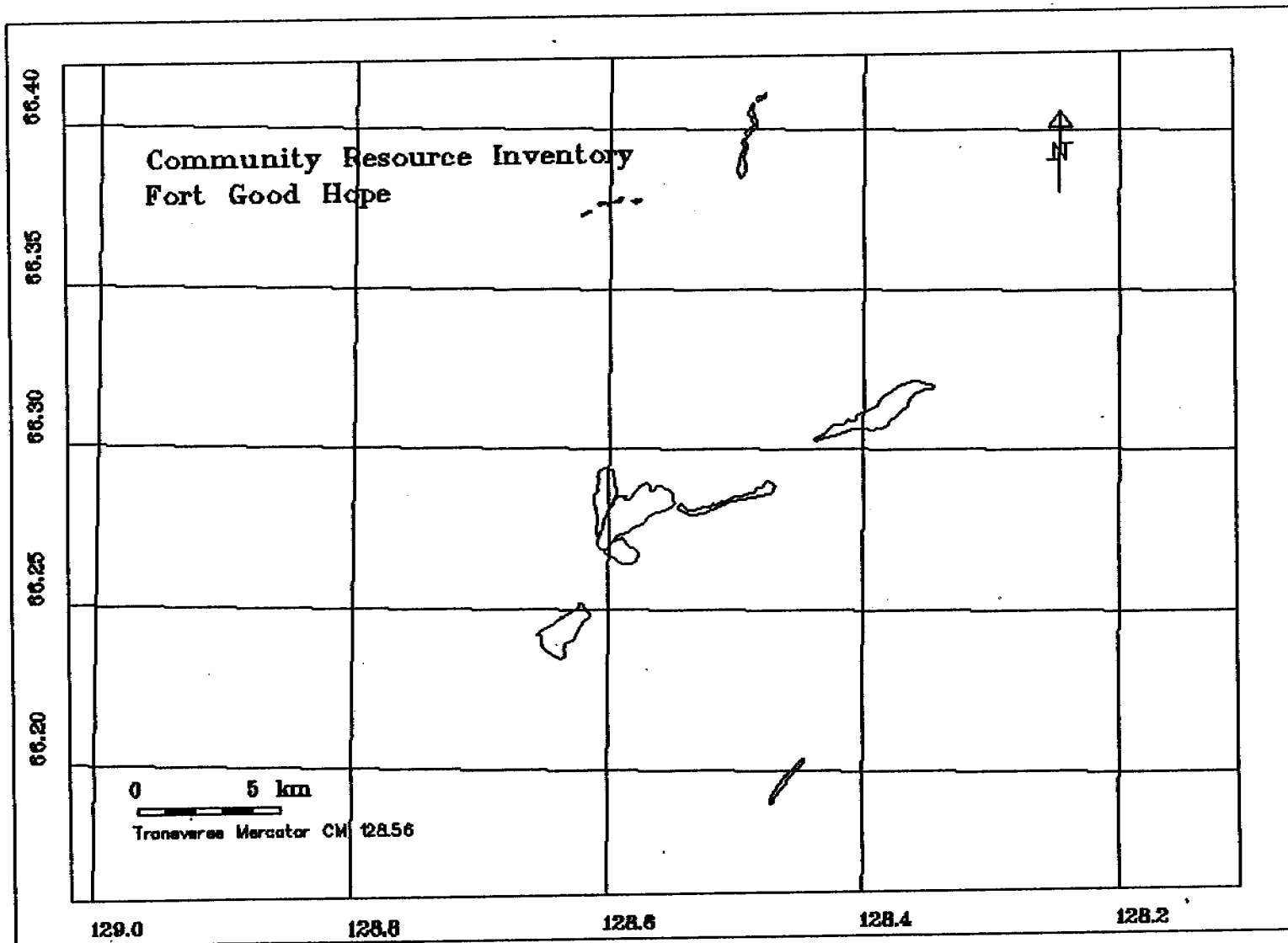
Map 7: Site Location Boundaries from the Banks Island borrow study.



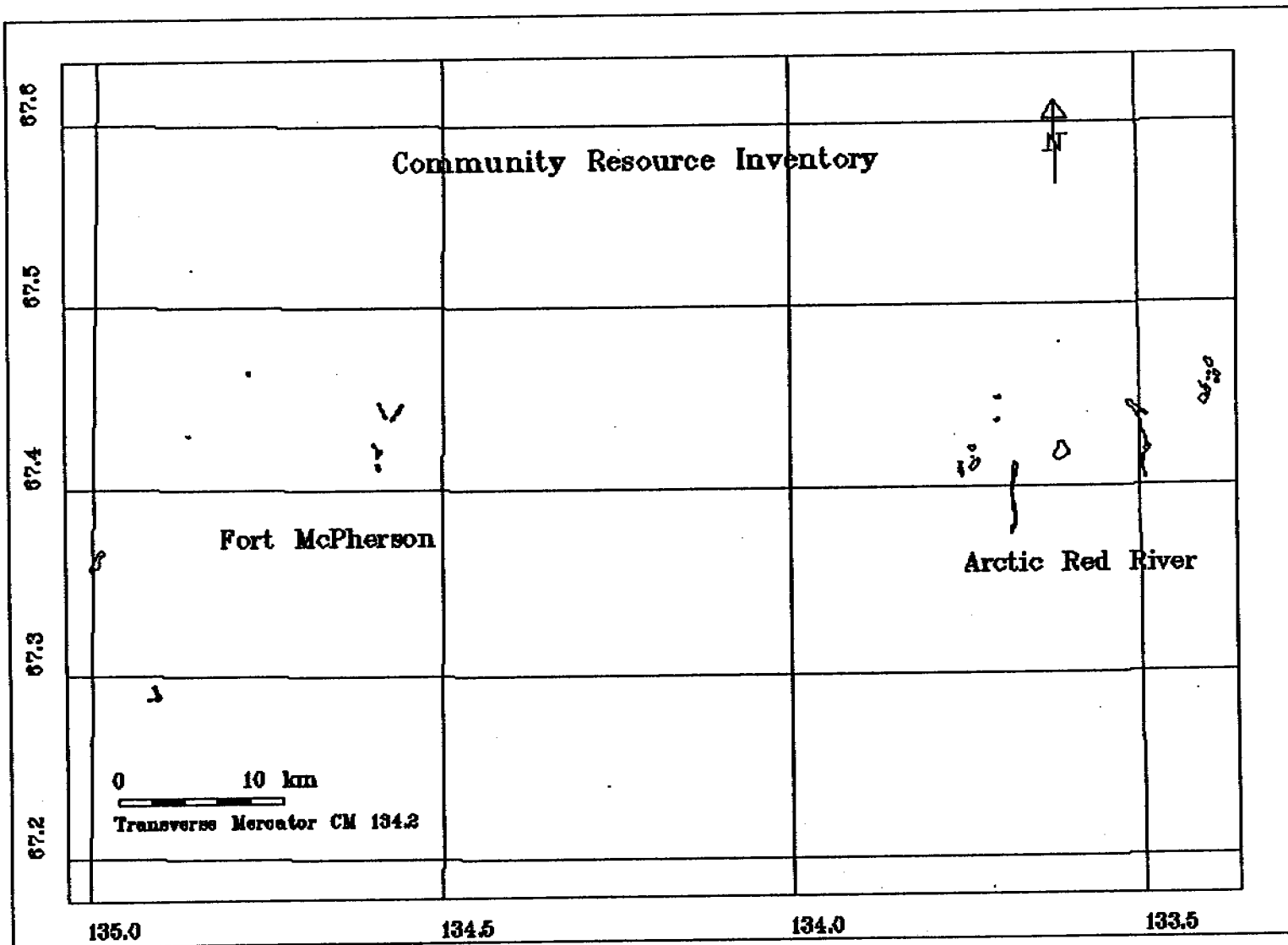
Map 8: Detail of Map 7.



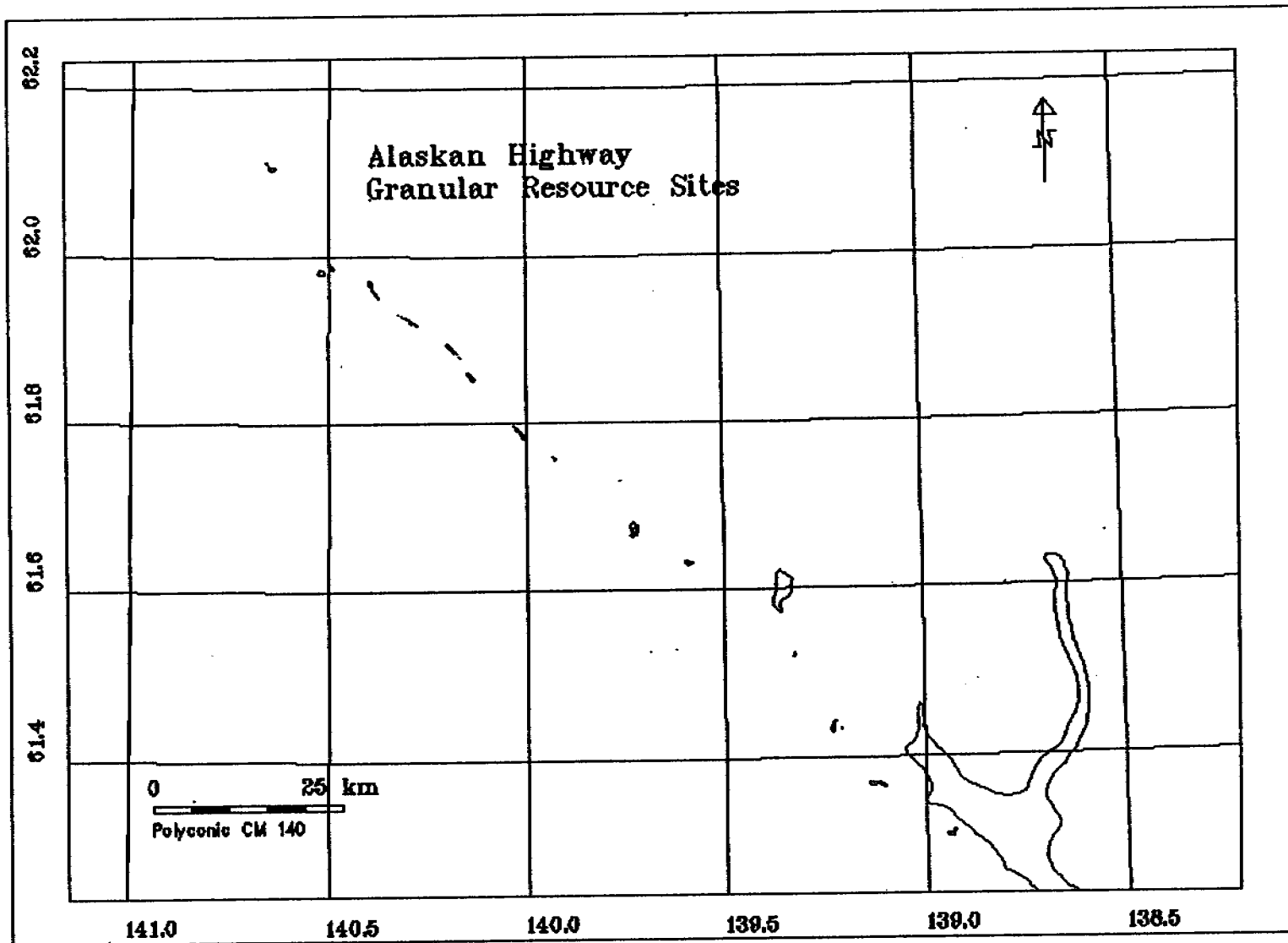
Map 9: Mackenzie Valley Granular Resource Sites. Each site is stored as an individual data base entry containing the site name and geographic location which can be interrogated directly from the map display.



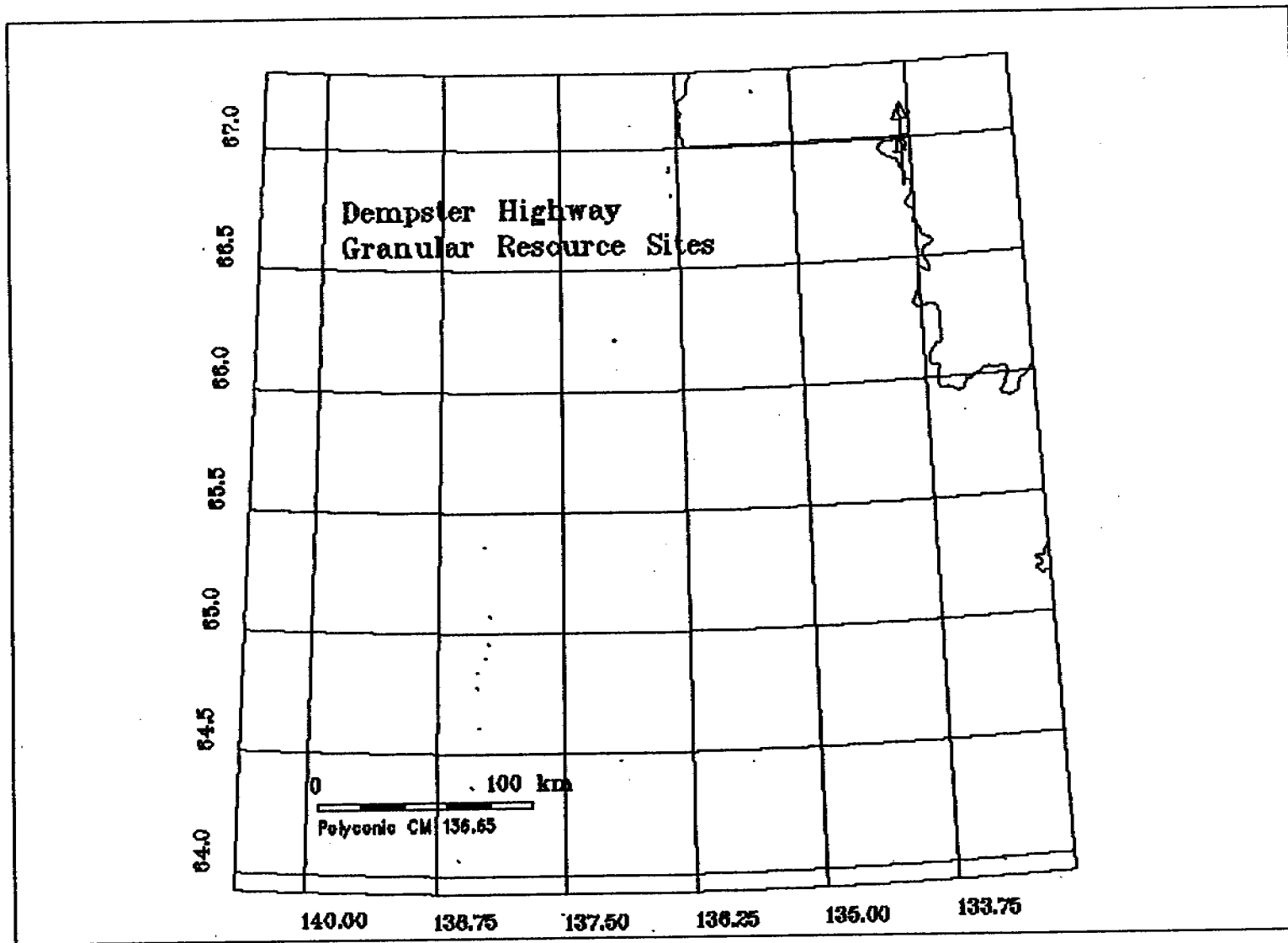
Map 10: The Community Granular Resource Inventory, Fort Good Hope.



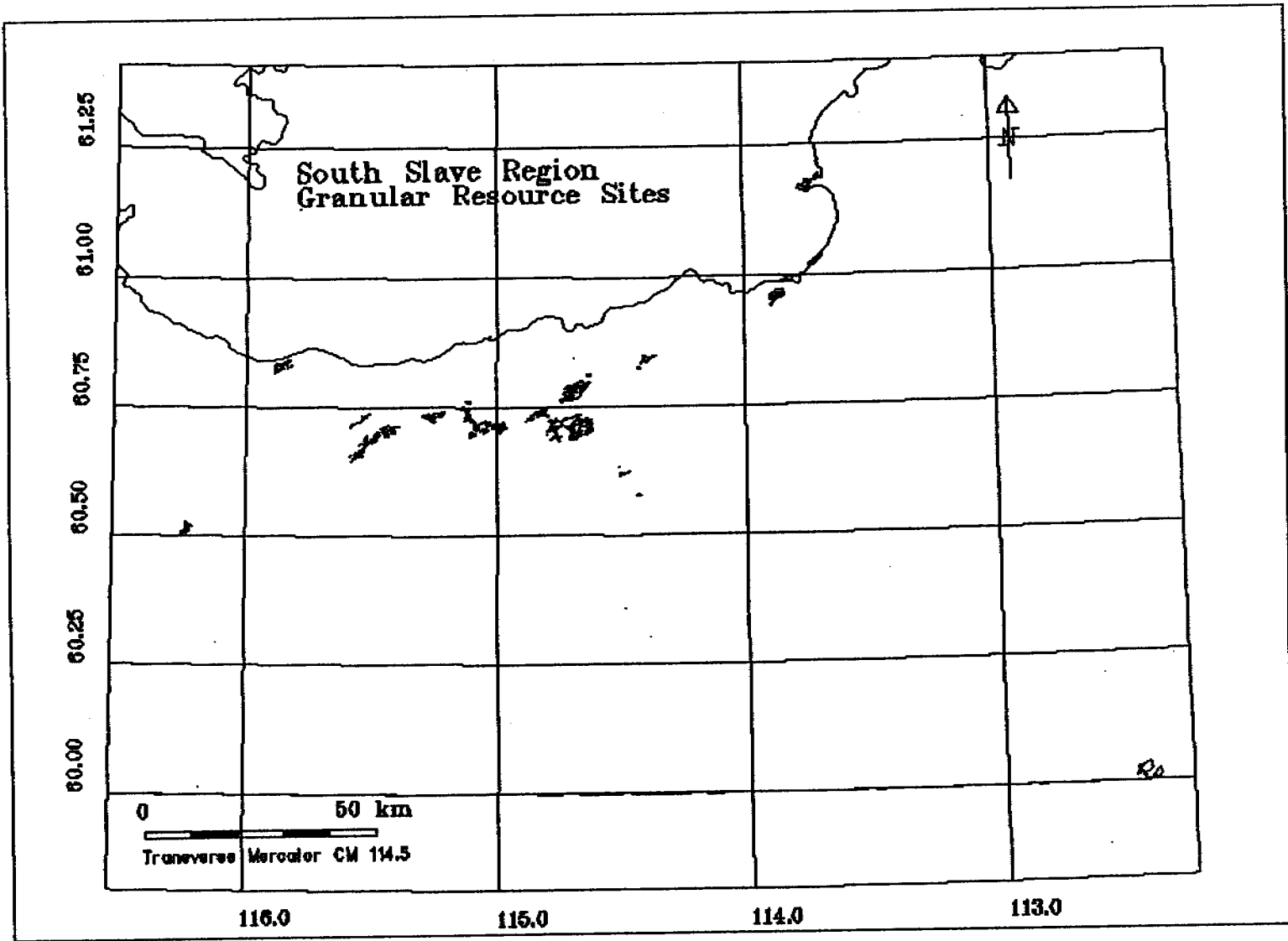
Map 11: The Community Granular Resource Inventory, Fort McPherson and Arctic Red River.



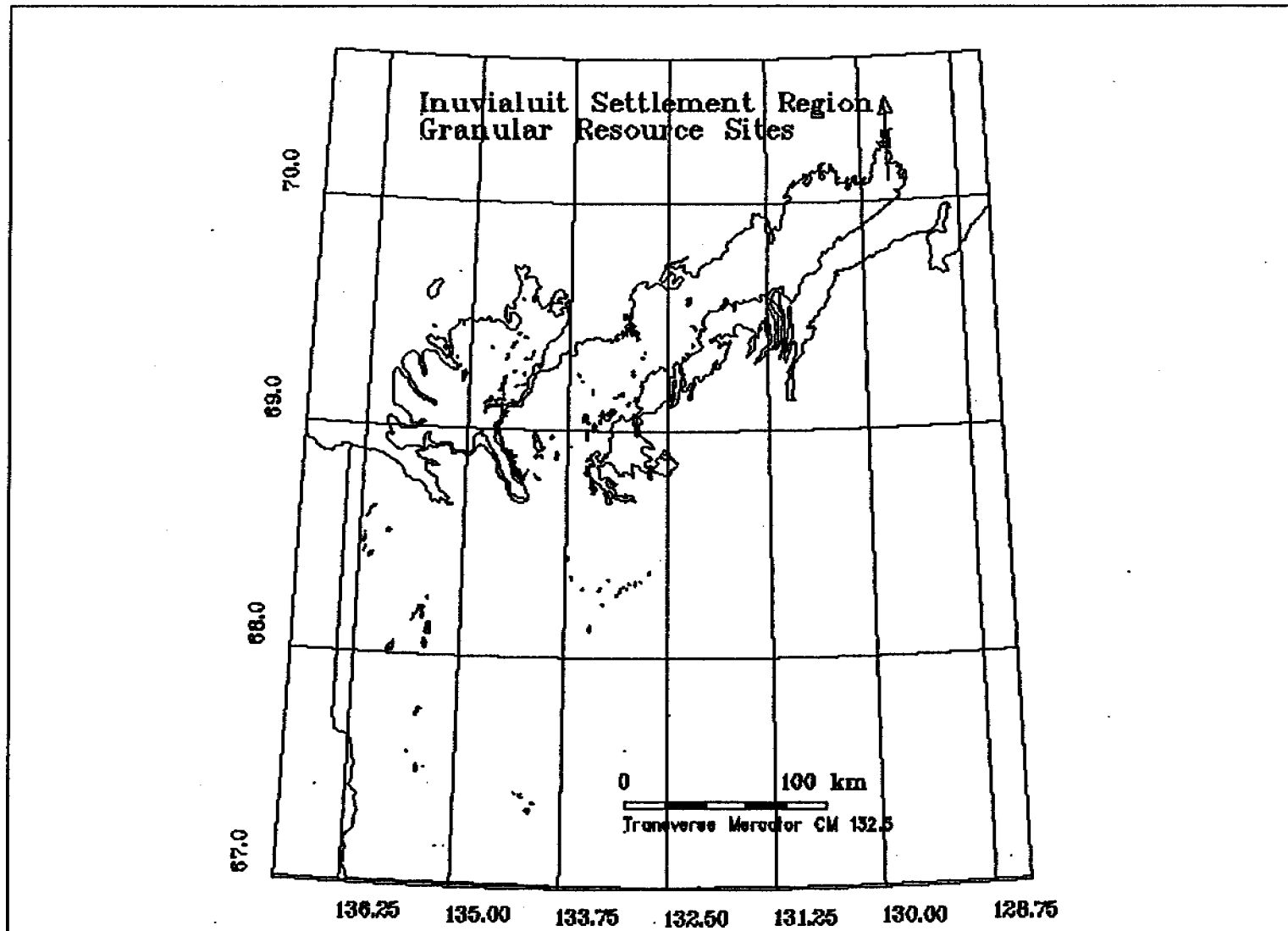
Map 12: Granular Resource Sites of the Alaska Highway corridor.



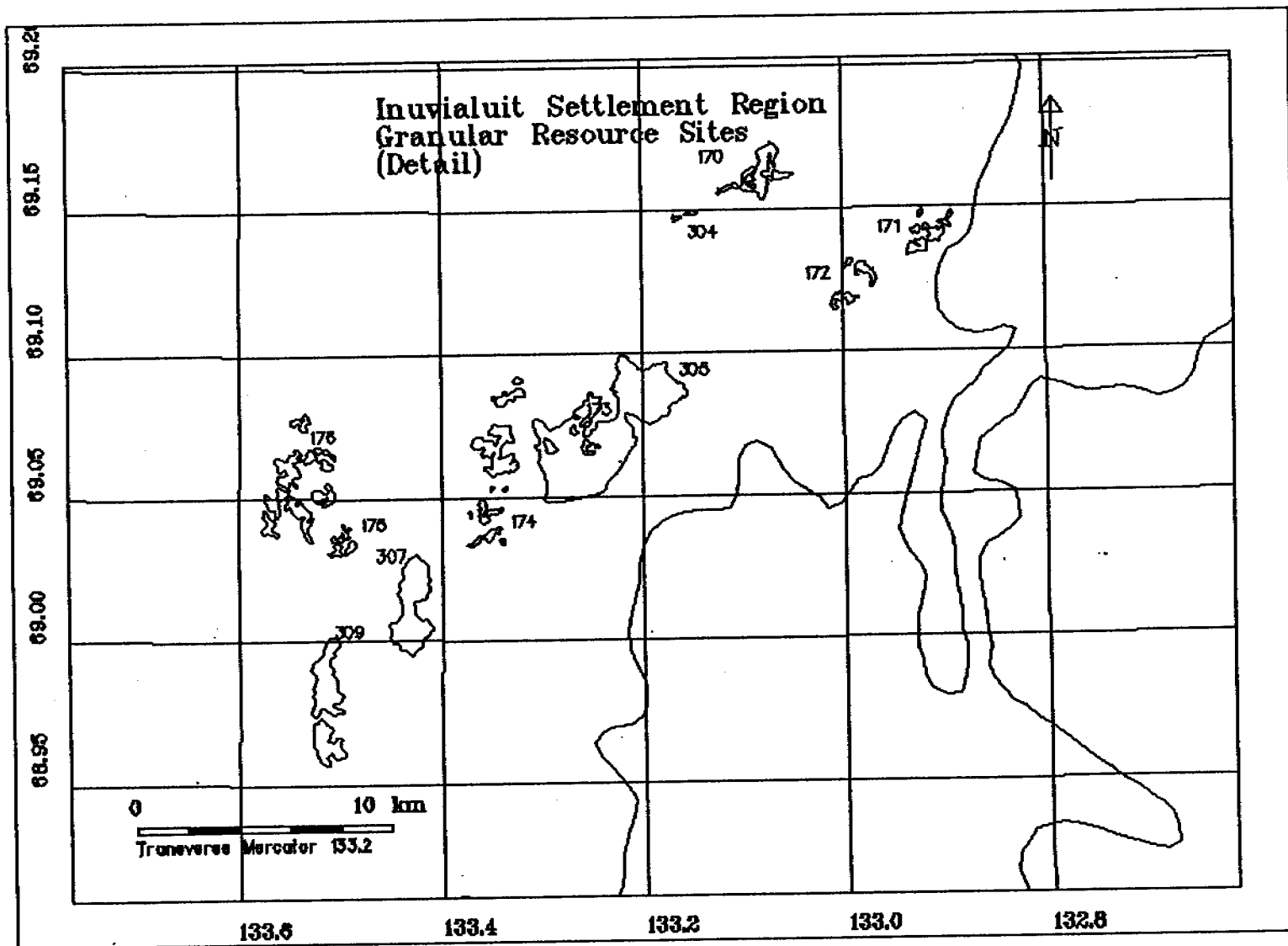
Map 13: Granular Resource Sites of the Dempster Highway corridor.



Map 14: Granular Resource Sites of the South Slave Region.



Map 15: Granular Resource Sites of the Inuvialuit Settlement Region.



Map 16: Detail of Map 15 in the area of Tuktoyaktuk. The site name of each data base entry has been activated as a label.

