

A-35155
GRANULAR DEVELOPMENT STUDY
SALT MOUNTAIN DEPOSITS
FORT SMITH, N.W.T. *draft*



THURBER CONSULTANTS LTD.,
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Submitted to
Department of Indian Affairs
and
Northern Development

DRAFT

FOR DISCUSSION
PURPOSES ONLY

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1. INTRODUCTION

This report presents the results of a study to determine a 10 year high/low demand projection for granular material from the Salt Mountain deposits for the Fort Smith, N.W.T. area. The demand study considered requirements from both the public and private sectors. For the 10 year high demand, the impact of major projects such as the Slave River Hydro Development were considered.

This report also includes recommendations for further test pitting prior to the preparation of a development plan and management strategy for granular deposits in the Salt Mountain area.

2. BACKGROUND

In November 1980, a brief report (Thurber, 1980) was prepared based on air photo interpretation and limited field checking which identified potentially large volumes of granular deposits in the Salt Mountain area, N.W.T. (see appended Dwg. 16-10-7-1). Between March 18 to 20, 1981, a limited reconnaissance field test pitting program (see appended Dwg. 16-10-7-2) was carried out to obtain a better indication of the quantity and quality of material to be expected in the two most promising areas identified from the initial study (Thurber, 1981).

On December 20, 1982, in response to an invitation from the Department of Indian Affairs and Northern Development, Thurber Consultants submitted a proposal, a) to carry out a ten year high/low granular material demand study for the Fort Smith area, and b) to prepare a management plan and development strategy for the Salt Mountain granular deposits. Background data and the proposed study terms of reference were reviewed with Mr. C.J. Cuddy and Mr. A.T. Cronk at a meeting held in Thurber's office on February 2, 1983. After discussion of the study objectives and the level of information currently available, Thurber recommended a reduced scope and budget to limit the current study to:

- a) Collecting information on demand versus time and making a ten year high/low projection of granular material requirements in the Fort Smith area.
- b) Collecting any additional test pit and lab test data for the established gravel pits and adjacent areas at Salt Mountain.
- c) Preparation of a report to present the results and to provide recommendations for a subsequent phase of work.

3. STUDY APPROACH

An effort was made to contact in person or by telephone, all users and potential users of gravel in the Fort Smith area. This included representatives from:

- a) D.I.A.N.D. (regional and district offices)
- b) Town of Fort Smith
- c) Government of the N.W.T. (local government, public works, highways)
- d) Transport Canada (airport agency)
- e) local operators and contractors

A list of those with whom contact was made is included in Appendix A. These contacts were asked for:

- a) information on past demands and sources of material,
- b) any test pit or lab test information they may have on file for developed pits in the Salt Mountain area, and
- c) projected maximum and minimum granular requirements for the next ten year period.

A three day visit was made to Fort Smith by Mr. B.N. Peterson, P.Geol. to carry out personal interviews. At this same time, a site visit was made to the Salt Mountain area, however, approximately 1 metre of snow covering all of the currently developed pits in the area hindered any mapping of the deposits.

Contact was made with Mr. L. Collins, Special Projects Manager, of Alberta Utilities and Telephones, with respect to the potential impact of the Slave River Hydro development on the Salt Mountain granular resources. Copies of relevant existing reports for the proposed Slave River Hydro Project were reviewed (Shawinigan, Stanley 1982).

Stanley Associates Engineering Ltd. recently carried out an economic development study for the Town of Fort Smith (Stanley, 1982) in which they examined five possible development scenarios and their impact on Fort Smith to the year 1992. A copy of this information was obtained and reviewed.

4. RESULTS

4.1 Past Demands and Sources of Granular Material

The population of Fort Smith and surrounding area is currently about 2,400 people and apparently has changed very little over the past 10 years. Town officials indicate that quantities of gravel used each year by the Town have been minimal and have generally been for maintenance and upgrading of streets. They purchased approximately 2,000 m³ of crushed gravel from Arrow Paving in 1982. They expect that this will meet their requirements for the next 3 to 4 years.

There are presently about five contractors and suppliers in the Fort Smith area that have periodic requirements for granular materials from the Salt Mountain deposits. Material has been used for concrete, asphalt, road work and general fill. Better quality concrete aggregate has been hauled by one contractor on winter roads from a pit on the east side of the Slave River in Alberta, some 60 km from Fort Smith. This contractor noted that he had produced about 450 m³ of concrete last year.

The district office of D.I.A.N.D. is responsible for approving and issuing permits to contractors for granular extraction. Their records indicate that fifteen permits (excluding Highways and Transport Canada) were issued in the Salt Mountain area over the past ten years. These have been for the removal of gravel in or near Areas 3, 5, 6 and 7 shown on appended Dwg. 16-10-7-2. A total of approximately 21,000 m³ of granular material was extracted during the ten year period.

Transport Canada is responsible for the airport at Fort Smith. There are currently two runways and one of these was paved last year. Approximately 15,000 m³ of granular material was hauled from Area 4 (Dwg. 16-10-7-2) to a location near the airport for processing to 12.5 mm crush.

The Highways Division of the N.W.T. Department of Public Works has developed a gravel pit at Salt Mountain in the area designated as Area 1 on the appended Dwg. 16-10-7-2. They have been using material from this pit for road work from approximately km 196 to km 267 (Fort Smith) on Highway #5 from Hay River. Their past requirements have been in the order of 10,000 m³ per year.

4.2 Test Pit and Lab Test Data for Developed Pit Areas at Salt Mountain

Over the past years, pits have been opened up in Areas 1, 3, 4, 5, 6 and 7 as shown on Dwg. 16-10-7-2. A small area has been stripped in Area 2. Examination of low level air photos for the area shows a number of cut lines adjacent to several of these pit areas. Along some of these, it appears that test pitting has been carried out.

During our discussions with the various users and suppliers, we were able to obtain very little information regarding the existing developed pit areas. Pits in Areas 5 and 6 were developed prior to the completion of Highway #5 when access to Fort Smith was via Foxhole Road. The whereabouts or existence of any test pit logs for the dozer pits in the vicinity of these areas could not be determined.

Area 1 is a N.W.T. Highways pit. Over the years, an estimated 120,000 m³ to 150,000 m³ of granular material has been removed. Highway officials plan to carry out a test pitting program in the next year or so to confirm an adequate quantity of suitable gravel for a five year plan which is in preparation. Present estimates indicate a reserve of 115,000 m³ is present in the area. However, three test pits dug on the east side of the existing pit by Transport Canada indicate that the entire area is not underlain by granular material.

Test pits were also dug in Area 4 by Transport Canada, but only in the immediate area that was recently excavated for the airport runway servicing.

Available laboratory test data indicates the Salt Mountain granular material can be used (with adequate processing) for most common construction uses, including the production of asphalt. It is not recommended for use as concrete aggregate however.

4.3 Projected Granular Requirements

The amount of granular material needed from the Salt Mountain deposits over the next ten years will be influenced to a large extent by the type and scale of development in the Fort Smith area. The recent study by Stanley Associates Engineering Ltd., entitled Fort Smith Economic Development Study, presents five possible scenarios of development. The five scenarios are as follows:

- a) Scenario 1: Existing trends, no major external impacts.
- b) Scenario 2: Active development with no major external impacts.
- c) Scenario 3: Construction of a Fort Vermilion - Peace Point highway link coupled with Scenario 2.
- d) Scenario 4: Construction of a Slave River hydro dam and a Fort McMurray - Fort Smith highway link.
- e) Scenario 5: Construction of a Slave River hydro dam, a Fort McMurray - Fort Smith highway link and a Fort Smith area mining development.

The ten year projected population for Fort Smith and area ranges from a low of 2,400 (i.e. no growth) for Scenario 1 to a high of 4,200 for Scenario 5.

Scenario 5 (high demand) and Scenario 1 (low demand) have been used to project high/low granular demand figures for the Salt Mountain area deposit.

4.3.1 High Demand Projection (Scenario 5)

Feasibility studies for the Slave River Hydro Project have identified large reserves of granular material on the east side of the Slave River and south of Fort Smith which will meet the construction requirements of the project. Similarly it is expected that any new highway construction requirements will be met by existing reserves to the south of Fort Smith.

The Salt Mountain granular material is generally unsuitable for the production of concrete aggregate. An alternate source on the east side of the Slave River is of acceptable quality and although the distance is greater it is expected that the bulk of the concrete aggregate used in the Town of Fort Smith will come from this source. An estimated 15,000m³ of concrete aggregate will be required for Scenario 5 development over the next ten years.

As a result of the foregoing information, in assessing the granular requirements from the Salt Mountain area deposits for a Scenario 5 type of development the following two assumptions were made:

1. Granular material required for new highway construction and a Slave River hydro dam as well as any mining development would be obtained from other sources, and
2. Concrete aggregate used in the Town of Fort Smith would be obtained from other sources.

The major granular needs in the Town of Fort Smith will be for additional serviced residential and industrial land required for Scenario 5 development. An estimated 55ha of residential land (546 residential units) and 17ha of industrial land will be required to meet the needs of the community over the next ten years (Stanley, 1982). Granular requirements from the Salt Mountain deposits over the next ten year period to meet these needs of the town are estimated to be approximately 100,000m³. Included in this figure are the estimated needs for new subdivision servicing including roads, housing construction, industrial land development and building, commercial and public building and maintenance needs. Approximately 60% of the ten year demand would be required in the first four years of development.

The main runway at the Fort Smith airport was surfaced with asphaltic concrete in 1982. This required approximately $15,000\text{m}^3$ of granular material from the Salt Mountain deposit and has a design life of about 15 years. It is not known if the second runway, which is used very little at the present, will need to be upgraded to meet Scenario 5 development. A projected $10,000\text{m}^3$ will be needed if the second runway is surfaced with asphaltic concrete. Yearly maintenance requirements are minimal.

The Highways Division of the Territorial Department of Public Works presently utilizes granular material from the Salt Mountain deposits to meet the demands for about 70 kilometers of Highway #5 from Fort Smith towards Hay River. Scheduled maintenance programs and localized maintenance requires approximately $700\text{m}^3/\text{km}$ every five years. This is approximately $10,000\text{m}^3/\text{year}$ for the 70 km length.

Upgrading of the highway over the next 10 years to an asphalt or chip seal surface is not expected to increase the amount of granular material required as it would likely be done in place of the scheduled re-gravelling and future maintenance requirements would be significantly less.

One factor which could increase the amount of granular material required from the Salt Mountain deposit is a need for Salt Mountain material to be utilized for a farther distance to the west. Present proven reserves west of the Salt Mountain deposit appear to be limited. For the purposes of this study the length of highway to be serviced from the Salt Mountain deposits has been adjusted to 100km to provide an appropriate high demand estimate for highway requirements. This results in a demand of $14,000\text{m}^3/\text{yr}$ for a total of $140,000\text{m}^3$ over the next ten years. The combined highway and airport high demand over the next ten years is thus estimated to be $150,000\text{m}^3$. Slave River Hydro Feasibility studies indicate that granular material required for roads from a construction camp or from Fort Smith to the dam site would be provided from sources other than Salt Mountain.

In summary, the estimated high demand for granular material from the Salt Mountain deposits over the next 10 years is $100,000\text{m}^3$ for use within the town of Fort Smith and $150,000\text{m}^3$ for highway and airport uses for a total of $250,000\text{m}^3$.

4.3.2. Low Demand Projection (Scenario 1)

The low granular demand for the town of Fort Smith is based on a scenario of zero population growth and no development within the town over the next ten years. Past

usage of granular material from Salt Mountain and interviews with town officials and local contractors indicates a requirement of approximately 2,500m³ per year to meet the needs of this maintenance type of scenario. This would amount to only 25,000m³ over the next ten years.

For a scenario of zero population growth there would be no airport requirement for granular material within the next ten years. Highway consumption would remain virtually similar to the high demand situation except that for a low demand situation it has been assumed that the Salt Mountain deposits will continue to service only 70 km of highway. This would result in a requirement of 100,000m³ of granular material over the next ten years.

In summary, the estimated low demand for granular material from the Salt Mountain deposits over the next ten years is 25,000 m³ for use within the town and 100,000m³ for highway and airport uses for a total of 125,000 m³.

5. CONCLUSIONS AND RECOMMENDATIONS

The projected total granular requirements from the Salt Mountain Area for the next ten year period, even for the high demand scenario, are relatively low at approximately 250,000 m³. Of the projected demand, well over half is related to highway requirements. As a consequence, it is recommended that an area with an adequate ten year supply be designated strictly for highway use. The Highways Division of D.P.W. have a developed pit in Area 1 (Dwg. 16-10-7-2) and should continue to operate in this area. A test pitting and laboratory testing program should be undertaken (by D.I.A.N.D. or the Highways Division) to determine if there is an adequate supply of suitable quality granular material in the area surrounding the existing pit.

It is recommended that separate areas be identified and designated as sources for the balance of the demand for granular material from the Salt Mountain deposits. More than one area is recommended in order to provide users with some choice as to area and material available and to facilitate management of the resource in terms of permits versus longer term licenses. If possible, the selected areas should extend existing pit development and as such, Areas 2, 4, 6 and 7 are recommended for consideration for detailed test pitting to prove up and delineate an adequate supply of granular material to meet the projected demands over the next 10 years.

The actual selection of areas for detailed test pitting should be based on a one day field reconnaissance of the areas and perhaps a day of test pitting along existing

cutlines. The extent and location of detailed test pitting within each area should be based on results of the test pitting as the field program progresses. It is expected that 200,000 to 500,000 m³ of granular material could be delineated in detail (50 to 100 m grid test pitting) by a one week field test pitting program.

Based on the results of a detailed test pitting program and associated laboratory work, a workable development and management plan for the Salt Mountain area could be prepared to meet the needs of the area over the next ten years.

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..... Slave River Hydro Feasibility Study (1982), Appendix E
- Construction Materials

..... Slave River Hydro Feasibility Study (1982), Appendix H
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Local Government, N.W.T.

..... Granular Material Resource Inventory Fort Smith (1981),
Letter Report to Dept. of Local Government, N.W.T.

APPENDIX A
LIST OF STUDY CONTACTS



THURSTON

LIST OF STUDY CONTACTS

Department of Indian Affairs and Northern Development

O. Vanderberg, District Manager, Fort Smith District

J. Hough, Resource Management Officer, Fort Smith District

Town of Fort Smith

J. Vogt, Mayor, Town of Fort Smith

G. McLean, Secretary Treasurer

D. Dragon, Superintendent

Government of the N.W.T./Dept. of Public Works

P. Levesque, Assistant Regional Engineer, Fort Smith

Highways Division/Dept. of Public Works

G. Barber, Deputy Minister, Yellowknife

J. Cruickshank, Head of Design and Construction, Yellowknife

K. Gaudry, Head of Maintenance, Hay River

Red McBryan, Superintendent, Hay River

Transport Canada, Construction Services Branch

H. Heimark, Edmonton

E. Shultz, Edmonton

Fort Smith Contractors

A. Berton, Berton Enterprises

L. Adamec, Territories Construction and Transit Mix

J. Vogt, Fort Smith Construction

C. Cairns, C & R Construction

Alberta Utilities and Telephones

L. Collins, Special Projects, Edmonton

Other

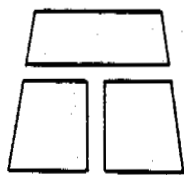
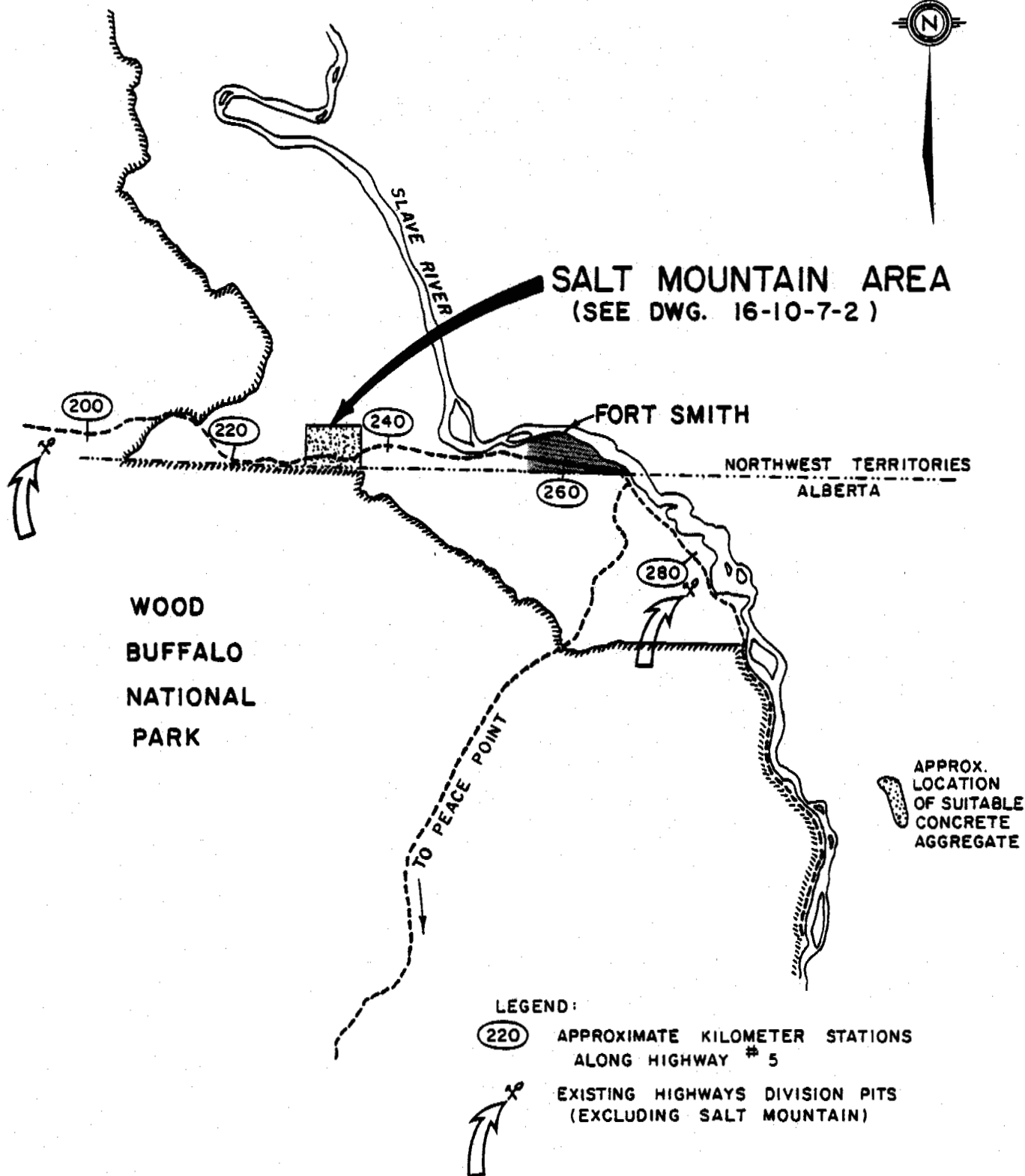
T. McDougal, Stanley Associates Engineering Ltd., Edmonton

APPENDIX B

DRAWINGS

Dwg. 16-10-7-1

Dwg. 16-10-7-2



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DEPARTMENT OF INDIAN AFFAIRS & NORTHERN DEVELOPMENT

KEY PLAN - SALT MOUNTAIN AREA AND VICINITY

GRANULAR DEVELOPMENT STUDY - SALT MOUNTAIN

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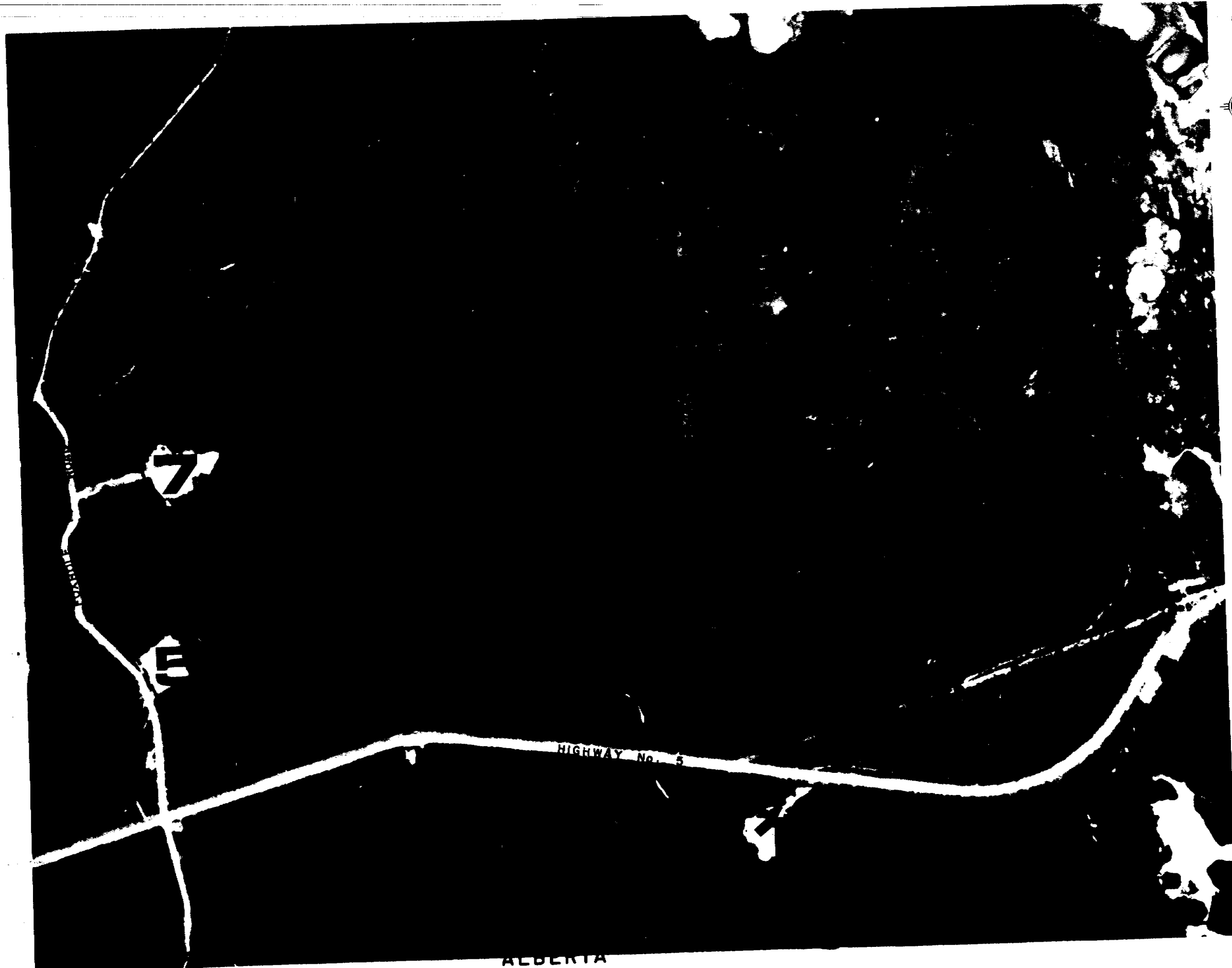
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DEPARTMENT OF INDIAN AFFAIRS & NORTHERN DEVELOPMENT

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SALT MOUNTAIN AREA

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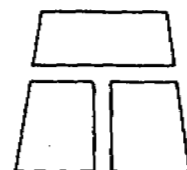
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GRANULAR DEVELOPMENT STUDY - SALT MOUNTAIN

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