SAND AND GRAVEL RESOURCES OF THE ATHABASCA AREA, ALBERTA (83P west and of 83I northwest)

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W.A.D. Edwards
D.R. Boisvert
J.G. Pawlowicz
L.D. Andriashek
M.M. Fenton
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ABSTRACT

A reconnaissance sand and gravel study was conducted in the Athabasca region. A literature review and airphoto interpretation identified 639 areas with potential for sand and gravel. As many sites as possible were then described on the ground. Access to sites was gained through a combination of truck, ATV, helicopter and jet boat. After fieldwork 100 areas retained potential. Eighty-seven of these were ground checked. The types of deposits with the greatest potential for gravel are Athabasca Valley terraces, preglacial deposits on the Pelican Mountains, outwash and alluvial deposits derived from these preglacial deposits, and thrust deposits in the area of the AlPac mill site. Gravel is in short supply in many areas but there is potential for the discovery of new deposits.

INTRODUCTION

The study area was identified by Alberta Forestry, Lands and Wildlife (AFLW) and Alberta Transportation and Utilities (AT&U) because gravel resources are in short supply in some parts of the area and because of anticipated new road and building construction in the region. The study forms part of an on-going program initiated in 1976 by AFLW and the Alberta Research Council (ARC) to locate and assess the aggregate resources of the Province of Alberta.

The study area is outlined in figure 1. It is bounded on the north by latitude 56°00', on the west by longitude 114°00', on the east by the west bank of the Athabasca River (from 56°00'N to 55°00'N) and Highway 63 (55°00'N to the south boundary of T63 R20 W4M) and on the south by the south boundary of T63 W4M. The total area is approximately 13,600 km^2 or 146 townships. The town of Athabasca Valley is the largest population center in the area and formed the base for field operations. The Athabasca River is the major geographic feature in the area. It forms a major impediment to the movement of aggregate across the region and is a focus of exploration efforts. In this study the river was employed as an access corridor through the use of a jet boat.

The study was completed at a reconnaissance level north of 55°15'N and at an enhanced reconnaissance level south of 55°15'N (Categories 4 and 5, table 1). The data produced is intended for use in regional planning and land-use management. It provides a base from which additional and more detailed aggregate exploration can proceed. This information is not intended for use in estimation of reserves for specific projects nor is it of sufficient detail to support land-use decisions which would exclude potential aggregate resources from exploitation.

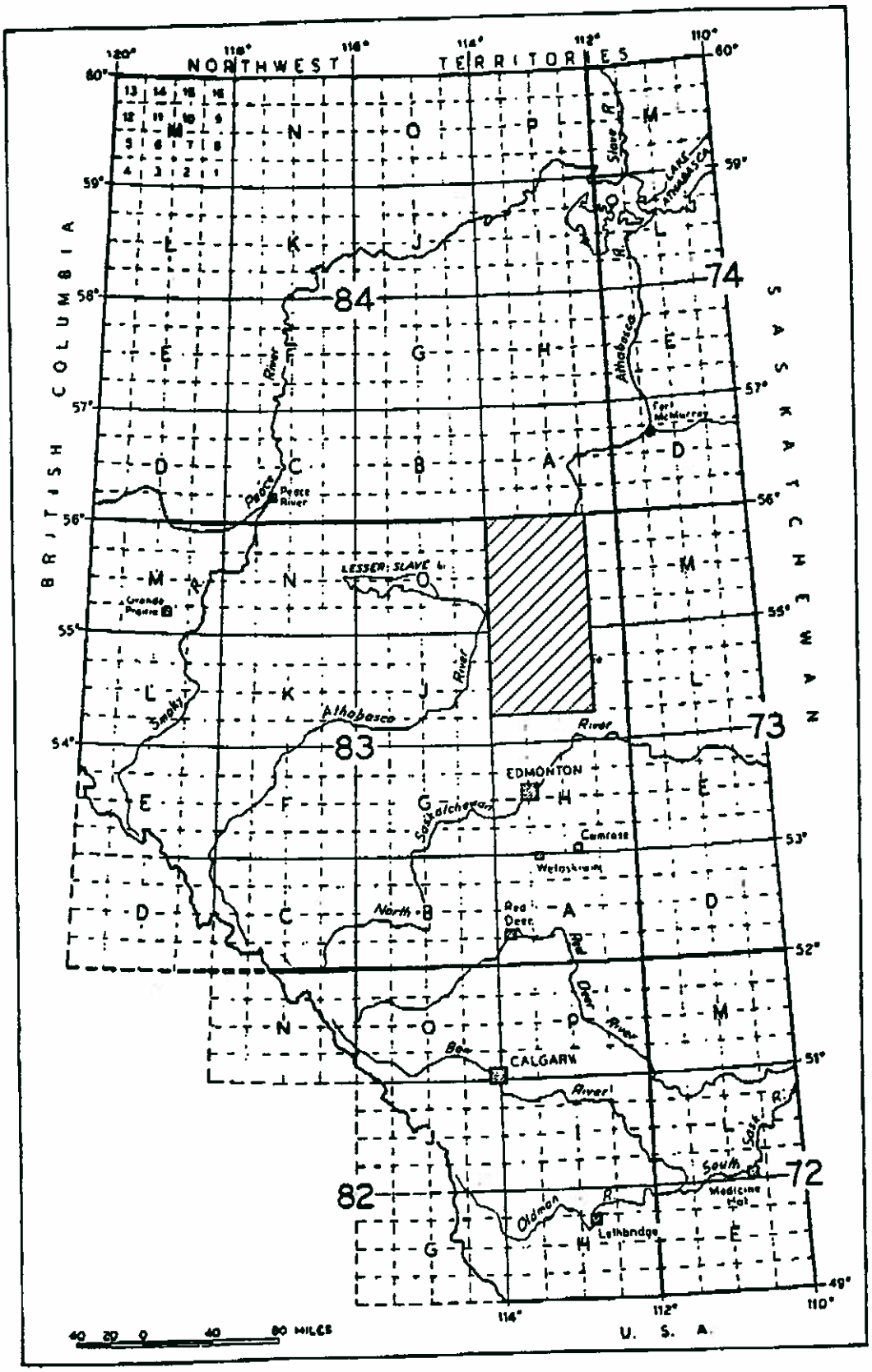

Figure 1. Location of the study area.

Table 1. AGGREGATE INVENTORY MAPPING LEVELS

Format	Reconnaissance Study 5	Enhanced Reconnaissance Study 4	Regional Mapping 3	Detailed Mapping 2	Deposit Evaluation 1
Scale (Common)	1:250,000 (approx. 11x14 townships)	1:250,000 (approx. 11x14 townships)	1:50,000 (approx. 3x3 townships)	1:10,000	1:10,000 or larger
Mapping Methodology	Derived from existing surficial geology information. Aerial photograph interpretation.	Derived from existing surficial geology information. Aerial photograph interpretation. Some field traverses and site examination.	Aerial photograph interpretation Field traverses. Site examinations. Selected deposit testing. Laboratory testing.	Sedimentological studies. Site examination. Deposit testing. Laboratory testing.	Test pitting on an established grid. Hole logging. Materials analysis.
Uses	Broad scale planning. Preliminary aggregate exploration.	Broad scale planning. Preliminary aggregate exploration. Preliminary resource assessment.	Land use planning. Resource management. Resource estimates.	Land management. Reserve estimates. Deposit management.	Deposit evaluation. Development plan preparation.
	Only potential areas suitable for finding deposits shown.	Potential areas suitable for finding deposits are shown. Some deposits are examined.	Estimates deposit boundaries and gives quality and quantity estimations.	Establishes deposit boundaries. Refines quantity/quality information.	Precise quality and quantity estimates. Deposit variations identified.

ACKNOWLEDGEMENTS

Selection of the area and the level of study was determined in consultation with a Technical Committee composed of AFLW and AT&U staff. Funds for the project were provided by AFLW. The help of both AFLW (especially Dan Slaught) and AT&U field staff is much appreciated. Helicopter support by AFLW was critical in evaluating many inaccessible sites. Thanks are due to Mr. Bernie Trevor for running the ARC jet boat and Mr Don Kvill (Athabasca University) for his insight into the geology of the region.

METHODS

The study area is very large and both time and funds were limited. The process began with the identification of ARC staff availability and abilities and the listing of project tasks. The following tasks and personnel were identified: project planning and management (D. Edwards), compilation of existing data (D. Boisvert), airphoto interpretation (L. Andriashek and M. Fenton), fieldwork planning (D. Edwards, D. Boisvert, J. Pawlowicz), fieldwork (D. Boisvert, J. Pawlowicz), review of data (D. Edwards), interpretation and preparation of report (D. Edwards, D. Boisvert).

Existing information sources included ARC sand and gravel reports, AT&U information and Alberta Environment water well logs. Fieldwork was conducted in August and September 1991. Access was gained through the use of truck, all-terrain vehicles, helicopter and jet boat. Sites were described at surface and probed by hand auger. A limited number of Geonics EM-31 traverses were made.

This report is based on surface geological observation and limited field checking. No subsurface testing was possible within the scope of the project. Data has been tabulated and presented in the report in such a way as to assist the reader in reaching his own conclusions or developing his own approach to further exploration. Results and data are reconnaissance in nature however and this

limitation should always be kept in mind.

GEOLOGY

Physiography

The southern portion of the study area (Tp 63 through Tp 75) is dominated by the Eastern Alberta Plains physiographic subdivision (Pettapiece, 1984). This subdivision has two sections: the Tawatinaw Plain covering the west and central portions and the Lac La Biche Plain to the east. The Tawatinaw Plain section is composed of the Cross Lake Plain, the Fawcett Plain and the Thorhild Plain (Figure 4). The Lac La Biche section is represented by the Wandering River Plain (Figure 4). The Athabasca River flows through both sections. The Tawatinaw Valley is the main feature running north/south through the central area of the Tawatinaw Plain. The Amadou Hills cover a small portion in the northern area northeast of Calling Lake.

The northern portion of the study area (Figure 4, Tp 73 through 82) is described in Sand and Gravel Resources of the Pelican Map Area (Scafe, Sham and Ray, 1987) and Sand and Gravel Resources of the Wandering River Area (Scafe, Edwards and Boisvert, 1989). The most important district from the mineral aggregate point of view are the Pelican Mountains (Figure 4).

Bedrock Geology

The bedrock geology in the study area is Cretaceous in age, oldest to youngest includes the Grand Rapids Formation, Joli Fou Formation, Pelican Formation, La Biche Formation and the Wapiti Formation (Figure 5). The bedrock in the area does not appear to have contributed to the sand or gravel in surficial deposits. These are composed of rock types from either the Canadian Shield to the north-northeast or formations in the mountains. None of the formations in the study area appear suitable for crushed stone.

Surficial Geology

The primary sources of surfical geology information are Richard, 1987 and Edwards and Richardson, 1983. Units shown on the maps that were investigated for sources of aggregate include, flutes, eolian deposits, outwash deposits, ice contact deposits and river terraces. The surficial geology information was used in concert with the airphoto interpretation to identify potential sites.

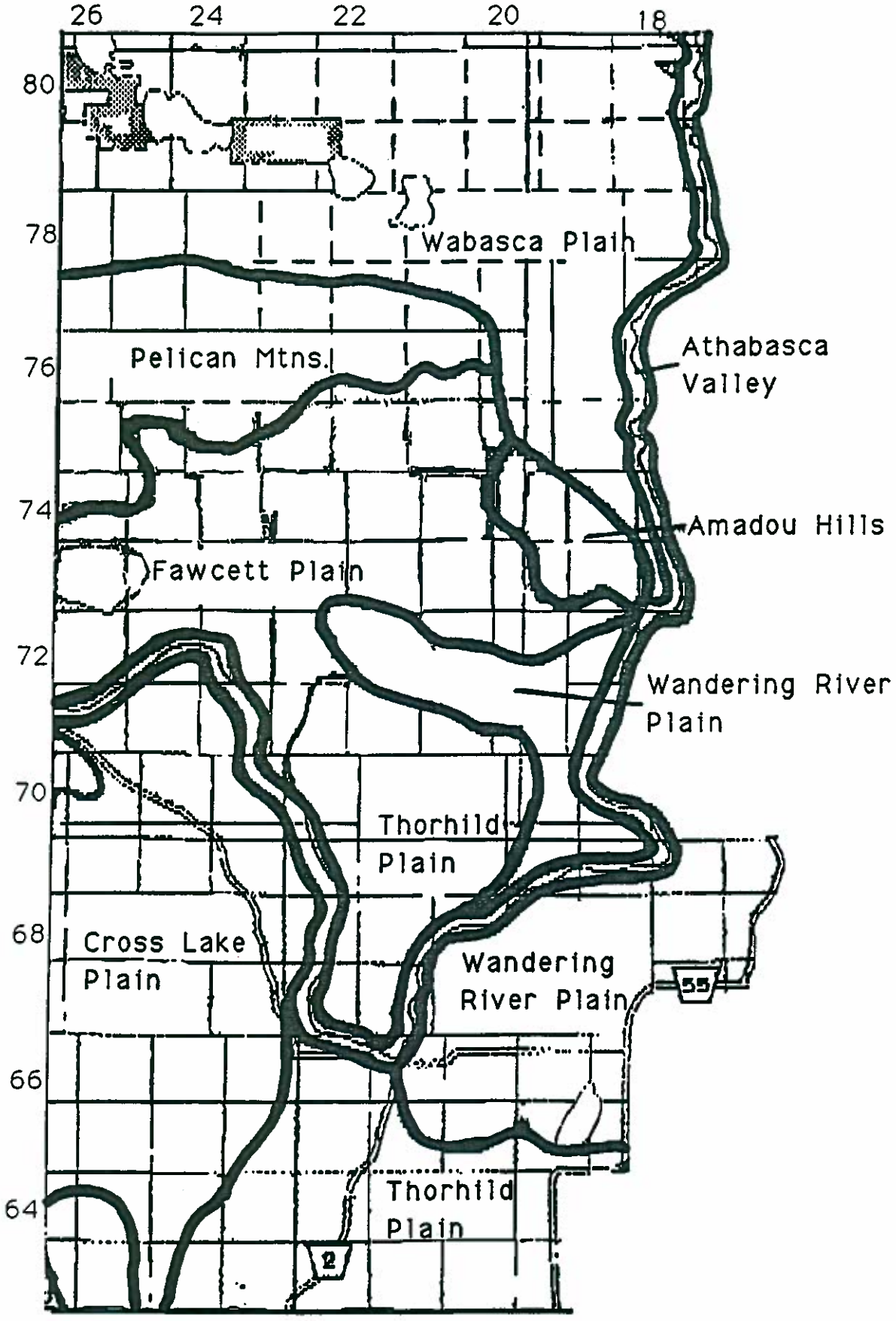

Figure. 4. Physiography of the study.

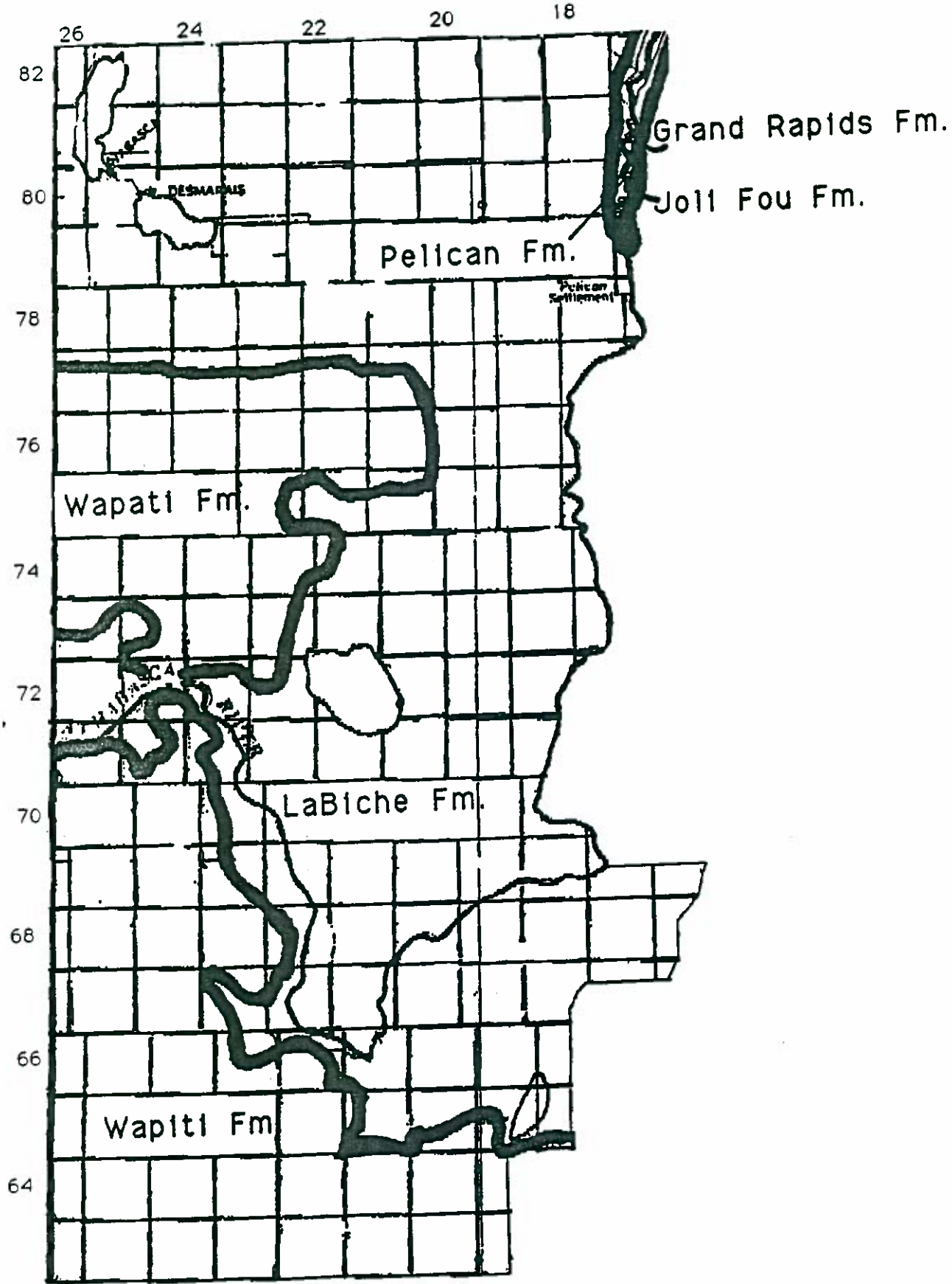

Figure 5. Bedrock geology of the study area.

SAND AND GRAVEL RESOURCES

Source and nature of the data

During this study 602 areas were interpreted from airphotos as having potential for sand and/or gravel, 486 sites were investigated on the ground and 37 deposits were recorded from previous ARC studies. Deposit and site data collected during this study are listed in Appendices A and B (respectively), references are given for deposits described in other reports (Appendix C).

Airphoto interpretation (API) is an excellent method for preliminary evaluation of the granular potential of large previously unstudied areas. It is independent of access and photos are available in varying scales for all of Alberta. API should be followed by other types of remote sensing or preferably by ground investigation: geology, geophysics and testing. If funding is limited a study may rest entirely on API. Such studies are termed reconnaissance and the probability is low that all deposits thus outlined will contain economic aggregate supplies. In northern Alberta the number of API sites retaining economic potential after initial gravel investigation can be expected to be 10% to 50% of the original number. For this reason every effort was made in this study to visit the API targets on the ground. In the Athabasca area the original 602 API sites were reduced to 59 sites retaining granular potential through ground visits. Level 5 deposits in Table 2 are those identified only through API and not visited on the ground.

It is also possible using API to suggest the genesis of the deposit and estimate the type of granular material to be found. The quality of these estimates is increased greatly by ground investigation. The soundness of the estimate of the granular material type (table 3) or the genesis (table 4) can be determined by cross checking with table 2.

The amount of information which could be gathered from a given deposit through a field visit depended upon the extent of natural or man-made exposure in

the deposit. Thus, if there were no stream cuts, slide scarps, road cuts or pits in the deposit only the surface to a depth of one meter could be examined. Often the upper part of a deposit is an unreliable indicator of what lies at depth. Deposits which were visited but had no man-made or natural exposure are listed as level 4A on table 2. Information in tables 3 and 4 is more reliable for deposits in class 4B (deposit with exposures) than for those in class 4A.

Overall distribution and character of sand and gravel

Only 100 areas are considered to have potential for sand and/or gravel in the entire area (table 3). If evenly distributed this would be one deposit for every 136 km^2. Only 16 of these 100 deposits are considered to contain more than 25% gravel and only 36 deposits are reported to have even 3% or more gravel. Only one deposit with more than 25% gravel is present for every 800 km^2 or eight and a half townships!

Unfortunately, only 4 deposits confirmed to carry >25% gravel occur within a 30 km radius of the most populated area, the town of Athabasca and only 4 deposits occur within a 30 km transport of the AlPac mill site (assuming current Athabasca River crossings). Some deposits in this area have potential for the discovery of gravel at depth. Studies of a more detailed nature will be required to determine this.

Table 2. Deposits outlined on the basis of air photo interpretation only are listed as level 5 (see table 1). Deposits visited and described geologically are listed as level 4A. Deposits with man-made or natural exposure allowing some description are listed as 4B.

LEVEL	DEPOSIT NUMBERS
5	10, 11, 65, 67, 68, 82, 90, 91, 92, 93, 94, 96, 97
4A	4, 9, 14, 15, 18, 25, 30, 31, 32, 38, 39, 40, 41, 42A, 45, 46, 54, 55, 61, 63, 70, 75, 76, 81, 86, 87, 88
4B	1, 2, 3, 5, 6, 7, 8, 12, 13, 16, 17, 19, 20, 21, 22, 23, 24, 26, 27A, 27B, 28, 29, 33, 34, 35, 36, 37, 42B, 43, 44, 47, 48, 49, 50, 51, 52, 53, 56, 57, 58, 59, 60, 62, 64, 66, 69, 71, 72, 73, 74, 77, 78, 79, 80, 83, 84, 85, 89, 95, 98, 99, 100,

Table 3. Deposits categorized by granular material type.

MATERIAL TYPE	DEPOSIT NUMBERS
Medium and fine sand	3*, 4*, 6, 7, 14*, 15*, 16, 17, 18, 19, 20, 21*, 22, 23*, 24, 25, 30, 31, 32, 36*, 38, 39, 40, 41, 42A, 45*, 46, 53*, 54, 55*, 57*, 61, 63*, 64*, 72, 74, 75, 76*, 81*, 88, 99
Coarse sand	8, 9, 10, 29
Sand with gravel<3%	1*, 2, 11, 12*, 13, 37*, 58, 60*, 98
Sand with gravel<15%, >3%	5, 26, 34, 35*, 42B, 49, 50*, 52, 56*, 62*, 70, 71,
Sand with gravel<25%, >15%	43*, 47, 51, 59, 85*, 86*, 87, 95*
Sand with gravel<50%, >25%	27A*, 27B*, 28, 48, 66, 69
Gravel>50%	33, 44, 73, 77, 78, 79, 80*, 82*, 83*, 84*, 89, 100
Unknown	65, 67, 68, 90, 91, 92, 93, 94, 96, 97

* - Dirty

Table 4. Deposits listed by genesis.

GENESIS	DEPOSIT NUMBER
Meltwater	1, 3, 17, 25, 59, 60, 73, 98, 99
Kame	2, 11, 12, 13, 65, 66, 69
Esker	97
Tawatinaw terrace	
- upper	4, 19
- middle	5, 6, 19
- lower	5, 6, 19, 20, 21
Athabasca Terrace	
- upper	34(?), 35(?), 39, 40, 55, 56
- middle	26(?), 27b, 37, 39, 42b, 48, 50, 54
- lower	27a, 28, 32, 37, 38, 41, 42a, 43, 45, 47, 52, 62
Outwash	7, 8, 10, 16, 30(?), 44, 46, 49, 51, 53, 58, 60, 67, 68, 74, 75, 76, 80, 81, 84, 85, 86, 87, 90, 91, 93, 94, 95, 96
- pitted	15
Dunes - eolian	7, 36, 64, 72, 88,
- beach	63, 70
Flute	18, 22, 23, 24
Alluvial	29, 71, 78, 92
Prelacial	77, 79, 82, 83, 89
Thrust	33
Unknown	9, 14, 31, 57, 100

TYPES OF DEPOSITS

Preglacial

Five deposits were identified as being of Preglacial origin (table 4). They formed from rivers running from the mountains before continental glaciation (hence the name 'preglacial'). These deposits characteristically contain rounded quartzites, but no rocks of Precambrian Shield origin.

All of the preglacial deposits occur in the Pelican Mountains area (figure 4). They are described in more detail in Scafe, Sham and Ray (1987). They are considered to be equivalent to the Hand Hills Formation of central Alberta (Edwards, 1988).

Preglacial deposits are usually coarse-grained gravels and the Pelican Mountain deposits are typical. All five deposits fell in the 'gravel >50%' category (table 3).

More deposits in the Pelican Mountains area could be found and those already identified could be defined much more precisely. But deposits of similar age and character will not be found outside the Pelican Mountains physiographic area. Erosion of the plains surface after their deposition has removed them.

Scafe, Edwards and Boisvert (1989) reported a Preglacial site in the Avenir area, just east of the Athabasca study area. This site is lower in elevation and is considered to be younger than the Pelican Mountains deposits by Edwards (1988). There may be potential for the discovery of buried deposits of this younger type of Preglacial deposit in the eastern part of the area. None were found in this study.

Glacial

Deposit 33 (table 4) is interpreted as a preglacial deposit which was glacially thrust. It is predominantly quartzite but Shield clasts have been introduced by thrusting and many of the clasts have been fractured by the movement. The deposit is covered by till. There is a high probability of other deposits of this origin occurring in the area.

Other granular deposits of glacial origin include flutes (table 4). These are outstanding on airphotos and many were identified as possible targets. None were found to contain gravel and the four retained on the map have only thin, medium to fine sand. Flutes are not considered a potential source of gravel.

Glaciofluvial

There are more sand and gravel deposits in the region of glaciofluvial origin than of any other type (table 4). Most of these are of outwash or meltwater channel origin. They formed from glacial meltwaters flowing away from the ablating ice front. Some ice-contact (kame and esker) deposits also occur. These formed in contact with the glacier.

Outwash deposits have a wide range of grain-size distributions (tables 3 and 4). About one-third (9 of 29) contain gravel (>3%). Many (14 of 29) contain only sand, at least as represented by the surface character. Most of the coarsest outwash deposits (80, 84, 85, 86, 87, 95 in tables 3 and 4) occur in proximity to the Pelican Mountain preglacial gravels. The preglacial deposits were the probable source of most pebbles and cobbles in these outwash deposits. The other three gravelly outwash deposits (44, 49 and 51 in tables 3 and 4) occur in a fairly small area north-northwest of Athabasca. Two occur on the edge of the Athabasca River valley. Perhaps these three outwash deposits mark a glacial standstill or major recessional point.

Meltwater channel deposits are also highly variable in grain-size distribution, ranging from more than 50% gravel to all sand. The coarsest deposits (73 and 59 in table 3 and 4) occur in the same areas as the coarse outwash: south of the Pelican Mountains (73) or on the edge of the Athabasca River valley.

All of the known kames contain some gravel. The coarsest (66 and 69 in tables 3 and 4) occur south of the Pelican Mountain preglacial deposits.

The outwash, meltwater channel and kame deposits all have potential as a source of coarse aggregate. All the coarse deposits of these types occur south of the Pelican Mountains or immediately north northwest of Athabasca near the Athabasca River.

Alluvial

Alluvial deposits in the region include the Athabasca and Tawatinaw River terraces and numerous smaller streams. This category is used for deposits which accumulated under fluvial river rather than glaciofluvial conditions.

Half of the Athabasca terraces outlined contained some gravel (12 of 24). Only one of six Tawatinaw River terraces contained gravel and that was only 3 to 15%. One of the four alluvial deposits associated with small streams contained gravel (number 78).

The gravelly Athabasca terraces occur in the vicinity of the town of Athabasca. All of them were described with the benefit of some natural or man-made exposure (level 4B in table 2). The other half of the Athabasca River valley terraces described as sandy are all listed in level 4A on table 2. This means that there were no exposures on these deposits (all are undeveloped). It is quite possible that some of the deposits will contain gravel at depth. The Tawatinaw River valley terraces do not appear to have had a source of coarse material. They

have little potential for gravel, even at depth. Deposit 78 occurs on a stream draining the Pelican Mountains. The source of coarse material is probably a preglacial deposit or glaciofluvial deposit formed from a preglacial source.

Dune and Beach

The dune deposits are all fine sand. They have potential for gravel only if masking a deposit of another origin. Two beach deposits were described. Neither has significant potential.

SUMMARY AND RECOMMENDATIONS

A region about 13,600 km^2 in size was evaluated for the occurrence of sand and gravel deposits. One hundred potential areas were outlined. Eighty-seven of these were visited on the ground. Twelve of the deposits areas contained more than 50% gravel and another thirty-four deposits contain some gravel.

The deposits that are the main gravel-bearing units are: the Pelican Mountain preglacial, outwash, the Athabasca terraces and the lone thrust deposit.

The Pelican Mountain deposits probably contain the greatest volume and coarsest material (predominantly quartzite). Athabasca terraces and thrust deposits are the types that have the greatest possibility for the discovery of more gravel and occur closest to the populated area.

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APPENDIX A

Deposit Descriptions

Deposit 1

Location: Sec N19, W29, 30 T63 R26 W4M
No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
A series of ridges that are mainly sand with minor clasts up to 10 cm.

Site Location: Sec NE19 T63 R26 W4M

Site Description:
Excavation near the top of a 2m ridge has 2m of sand exposed with minor clasts up to 10cm at the surface.

Site Location: Sec NW29 T63 R 26 W4M

Site Description:
3m exposure of sand in a road cut. The sand is fine to coarse and fairly dirty. There are minor clay stringers, organics and coally fragments throughout the section. No clasts were visable at this site.

Deposit 2

Location: Sec NW29, W30 T63 R25 W4M
Sec S5 T64 R25 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below

Site Location: Sec NW32 T63 R25 W4M

Site Description:
Kame or esker 15m high comprised of mainly fine sand. Some interbeds of coarser sand with <1% clasts to 5cm. The area has several smaller ridges (2-5m high) and those checked have similar material.

Deposit 3

Location: Sec N10, S15 T63 R25 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: Sec NW10 T63 R25 W4M

SITE DESCRIPTION:
Middle terrace of a meltwater channel comprised of a dirty, medium grained sand. This exposure is a 2m road cut with similar material in the adjoining field.

Deposit 4

Location: Sec6 T63 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below

Site Location: Sec SW6 T63 R23 W4M

SITE DESCRIPTION:
2m hole dug for AGT line shows a very dirty, fine sand with clay stringers. Boulders to .5m but void of pebbles and cobbles. Coarser sand veneer to 10 cm.

Deposit 5

Location: Sec N8, E16, SE17 T63 R23 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
Abandoned pits on the lower and middle terraces of the west side of the Tawatinaw Valley. Material varies throughout the area from zones of clast free, fine to coarse sand through bouldery sandy gravel.

Site Location: Sec SE17 T63 R23 W4M

SITE DESCRIPTION:
Middle terrace on west side of Tawatinaw Valley. Material is mainly sand with minor amounts, <5%, of clasts. There are some concentrations on the southern end of the excavation that have a greater concentration of clasts grading to a sandy gravel. This more gravelly area has clasts to .5m and small zones of sandy gravel. But the greastest concentration here is pebbly sand to gravelly sand. The gravel is very discontinuous in this area. It is hard to determine if this is a result of mining or deposition. A great deal of material is not in place as a result of mining.

Site Location: Sec SW16 T63 R23 W4M

SITE DESCRIPTION:
Lower terrace on west side of Tawatinaw Valley. Gravel material in this area is finer than that of the middle terrace and the sand is coarser. Generally the material is very similar to the middle terrace, mostly sand with discontinuous areas of pebbly to gravelly sand.

Deposit 6

Location: Sec5, SE Sec8, W Sec4, NW Sec9, SE Sec16, NW Sec15, SE Sec22, NW Sec23, SW Sec23 Sec26 T63 R23 W4M

No. of associated pits/sites: 8

Site Location: NW Sec23 T63 R23 W4M

DEPOSIT DESCRIPTION:
The area is lower and middle terraces on the east side of the Tawatinaw Valley. This deposit is comprised mainly of fine to medium sand with minor clasts throughout. In some areas sand up to 7m is exposed.

Site Location: NW Sec15 T63 R23 W4M

SITE DESCRIPTION:
1.5m road cut exposes fine to medium, clean sand. Minor quartzite and granitic clasts to 3 cm. present.

Site Location: NW Sec15 T63 R23 W4M

SITE DESCRIPTION:
7m ridge cut by a rail line exposes sand with iron and organic rich stringers. The sand is void of clasts, however, minor clasts to 2cm are present in the silty overburden.

Site Location: NE Sec8 T63 R23 W4M

SITE DESCRIPTION:
Exploited deposit of fine to medium sand with minor clasts less than 2 cm on the middle terrace of the Tawatinaw Valley.

SITE Location: SE Sec5 T63 R23 W4M

SITE DESCRIPTION:
Cut line up to plateau of the Valley exposes fine sand to 1m on the first terrace. Further investigation of the ridge, at higher elevations, exposes only till.

Site Location: N Sec5 T63 R23 W4M

SITE DESCRIPTION:
A gravel pit identified on the topographic map is predominantly fine to medium sand with minor clasts to 5cm. The pit is adjacent to the railway track and is well overgrown. The excavation is into the side of a ridge with two small stockpiles of sand at the south end of the pit.

Site Location: N Sec9 T63 R23 W4M

SITE DESCRIPTION:
Cleared area east of land fill exposes disturbed areas of fine to medium sand. The sand seems relatively thin over till. Clearing equipment has disturbed the area making it difficult to determine if the granular material is in place.

Deposit 7

Location: Sec1, 2, 3, 12, 11, 10, 13, 14, 15, 22, 23, W Sec24, 26, 27, W Sec25, T65 R25 W4M; Sec34, 35, 36, N Sec27, N Sec 26, N Sec25, T65 R27 W4M; Sec31, NW Sec32, NE Sec35, Sec34, NW Sec35, NW Sec30 T64 R26 W4M; W Sec2, Sec3,4, 5, 6, 7, 8 9, 10 W Sec15, 16, 17 18 T65 R26 W4M

No. of associated pits/sites: 6

DEPOSIT DESCRIPTION:
Large outwash deposit that has areas of dunes and zones of a fine to medium sand veneer over till.

Site Location: SW Sec35 T64 R27 W4M

SITE DESCRIPTION:
1 to 3m ridges of fine sand. The lower ridges are typically dirty fine sand while the higher ridges have a cleaner fine sand. The sand overlies till.

Site Location: W Sec36 T64 R27 W4M

SITE DESCRIPTION:
Undulating ridges probed to 1m show very fine sand.

Site Location: W Sec31 T64 R26 W4M

SITE DESCRIPTION:
2m road cut exposes fine sand with intermingling coarse to slightly pebbly sand lenses up to 20 cm. thick.

Site Location: SW Sec18 T65 R26 W4M

SITE DESCRIPTION:
3m road cut exposes a medium sand with minor amounts of coarse sand intermixed. There is less than 1% clasts up to 5 cm with organics and iron staining throughout sand.

Site Location: NW Sec18 T65 R26 W4M

SITE DESCRIPTION:
Small excavation of dirty, medium to coarse sand with minor clasts to 5 cm.

Site Location: W Sec3 T65 R26 W4M

SITE DESCRIPTION:
2.5m road cut exposes fine sand with minor clasts to 4 cm.

Deposit 8

Location: NE Sec11, NW Sec12, SW Sec13, Sec14, N Sec15, NE Sec16, SE21, SW Sec22, T65 R26 W4M

No. of associated pits/sites: 3

DEPOSIT DESCRIPTION:
Series of 1 to 5m ridges east of the dune area. The material ranges from fine through coarse sand with some concentrations of pebbly to gravelly sand.

Site Location: SW Sec16 T65 R26 WM4

SITE DESCRIPTION:
Large outwash area with excavations throughout. The sand is fine to medium and fairly clean. There are clay stringers and balls in some zones. Iron staining occurs throughout the deposit. There are several small, 3m high, sand stockpiles throughout the excavated area. The material is dug out of the 5m high ridge. The clasts are mainly quartzite and granites up to 5 cm.

Site Location: W Sec11 T65 R26 WM4

SITE DESCRIPTION:
Large excavated area mostly sand to pebbly sand. Some small stockpiles used infrequently throughout the excavated area. Sand is fine to medium with some coarse stringers. There 2% clasts up to 7 cm.

Site Location: SW Sec1 T65 R26 WM4

SITE DESCRIPTION:
Pit located in farmer's field has coarse to pebbly sand. Material and genesis is similar to other excavated areas in deposit except that the sand is coarser.

Deposit 9

Location: E Sec20 T65 R25 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec20 T65 R25 W4M

SITE DESCRIPTION:
Cut block for oil/gas well exposes on of several 2m high ridges in area. Material medium to coarse pebbly sand veneer over till. The thickness of the aggregate varies with the location on the ridge; anywhere from 0 at the base to 2m at the top.

Deposit 10

Location: W Sec17, E Sec18, T65 R25 W4M

No. of associated pits/sites: 0

DEPOSIT DESCRIPTION:
Possible outwash deposit similar to that of Deposit 9. No field check was performed on this site. Potential is based on air photo interpretation.

Deposit 11

Location: NW Sec3, Sec10, SE Sec15, SW Sec14, E Sec22, NW Sec23, E Sec35, NW Sec36, T64 R25 W4M; Sec1, SE Sec12, T6 R25 W4M; N Sec18, SE Sec19, W Sec20, T65 R24 W4M

No. of associated pits/sites: 0

DEPOSIT DESCRIPTION:
Potential for some aggregate sand and/or gravel is high in this deposit as it seems to be a series of kames or eskers along the west side of Narrow Lake, Long Lake and Bolloque Lake. Two other deposits have been identified through field checks in the vicinity. They contain material ranging from a very dirty pebbly sand to clean, medium to coarse sand. No field checks were performed in this deposit. Potential is based on air photo interpretation.

Deposit 12

Location: NE Sec12, T65 R25 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See Description below.

Site Location: SE Sec12, T65 R25 W4M

SITE DESCRIPTION:
Abandoned pit along side of abandoned airstrip exposes a dirty pebbly sand. Till is mixed with some of the aggregate indicating material may not be in place. Pit was likely exploited to build and maintain airpstrip.

Deposit 13

Location: Sec 26, NW Sec25, T64 R25 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: W Sec26, T64 R25 W4M

SITE DESCRIPTION:
This deposit is part of the esker/kame area. This particular site was an old fire lookout station. The material is fairly consistant throughout the ridge; medium to coarse pebbly sand. The potential is good for similar material in surrounding ridges.

Deposit 14

Location: NE Sec12, SE Sec 13, T66 R25 W4M; NW Sec7, Sec 18, T66 R24 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:

See Description below.

Site Location: E Sec18, T66 R24 W4M

SITE DESCRIPTION:
Undulating ridges up to 30m above creek running into Baptiste Lake. The material is a fine to medium, dirty sand with minor clasts to 5 cm.

Deposit 15

Location: NE Sec16, Sec21, E Sec20, T66 R24 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:

See description below

Site Location: E Sec20, T66 R24 W4M

SITE DESCRIPTION:
Similar material as described in Deposit 14. 30m ridge south of Baptiste Lake with dirty fine to medium sand with minor clasts to 10cm. Ridges may be pitted outwash.

Deposit 16

Location: E Sec29, W Sec28, SE Sec32, SW Sec33 T66 R24 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below

Site Location: E Sec29, T66 R24 W4M

SITE DESCRIPTION:
Outwash deposit with seldom used pit. Material is fine to medium grained sand with minor clasts to 10 cm.

Deposit 17

Location: S Sec4, T66 R24 W4M; E Sec23, W Sec 34, T65 R24 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: S Sec4, T66 R24 W4M

SITE DESCRIPTION:
Excavation near road intersection has fine to medium grained sand, with no visible clasts, overlying till. Discussions with the farmer that was working the pit for his own road maintenance informed us there was very little gravel in the area.

Deposit 18

Location: W Sec2, E Sec3, SE Sec10, W Sec11, Sec14, E Sec23, W Sec24, W Sec25, E Sec26, SW Sec36, T64 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: N Sec24, T64 R23 W4M

SITE DESCRIPTION:
Probe down to 1m showed 20 cm of silt over fine sand.

Deposit 19

Location: E Sec2, E Sec11, W Sec12, SE Sec 14, W Sec13, E Sec24, SE Sec25, T64, R23 W4M

No. of associated pits/sites: 3

DEPOSIT DESCRIPTION:
Following a trail from upper down to the lower terrace on the west side of the Tawatinaw Valley. This entire area is a deposit of fine to medium, clean sand with a minor amount of clasts scattered throughout. The vegetation is mainly scrub pine with intermittent groves of Jack pine.

Site Location: SE Sec2, T64 R23 W4M

SITE DESCRIPTION:
A road cut on the upper terrace exposes 1.5m of fine sand with minor clasts to 10 cm present.

Site Location: SE Sec11, T64 R23 W4M

SITE DESCRIPTION:
Road cut in the middle terrace exposes similar material as the upper terrace with fine sand and less than 2% clasts to 3 cm.

Site Location: NE Sec11, T64 R23 W4M

SITE DESCRIPTION:
Ditch along road that runs through upper, middle and lower terraces shows fine sand with no clasts at surface.

Deposit 20

Location: NE Sec26, E Sec35, NW Sec36, T63 R23 W4M; W Sec1, E Sec12, SE Sec13, T64 R23 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
250m cleared area adjacent to railway tracks exposes a 30m ridge of fine to medium, clean sand is the main feature of this deposit. The area to the northeast of this sand outcrop is an eroded terrace containing fine, clean sand ridges to 1m.

Site Location: NE Sec12, T64 R23 W4M

SITE DESCRIPTION:
Disected lower terrace with fine, clean sand in ridges up to 1m.

Site Location: NE Sec12, T64 R23 W4M

SITE DESCRIPTION:
Dug down 1m in cleared sand area and found that sand was uniform throughout. Fine to medium sand with no clasts present. At the base of this exposure we dug another hole .5m and found a dirty fine sand with minor clasts to 5 cm. This site was on the lower terrace of the east band of the Tawatinaw River.

Deposit 21

Location: NE Sec31, T64 R22 W4M; SE Sec6, NW Sec5, SE Sec8, Sec9, W Sec10, T65 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec10, T65 R22 W4M

SITE DESCRIPTION:
Railway cut exposes a fine dirty sand with horizontal clay and silt lenses throughout.

Deposit 22

Location: NE Sec25, E Sec36, T64 R23 W4M; NW Sec31, T64 R22 W4M; Sec6, SE Sec7, NW Sec8, SE Sec17, SE Sec16, T65 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec17, T65 R22 W4M

SITE DESCRIPTION:
Top of 15m flute has 20 cm of fine sand over fine to medium sand with minor amounts of coarse sand. There is less than 2% clasts to 10 cm present. The flanks of the flute are till.

Deposit 23

Location: SW Sec6, T65 R21 W4M; Sec1, E Sec2, T65 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: W Sec1, T65 R22 W4M

SITE DESCRIPTION:
On the top of a flute a pit has been dug for the farm's use. The exploited material is a dirty, coarse sand to fine gravel bed approximately 30 to 50 cm thick overlain by a fine to medium sand. These units lie over a metre of fine to medium, dirty sand.

Deposit 24

Location: E Sec19 NE Sec20, NW 21, W Sec31, W Sec28, NE Sec29 SE Sec32 W Sec33, T65 R22 W4M; SW Sec4, T66 R22 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
Flute with similar material as Deposit 22.

Site Location: NW Sec21, T65 R22 W4M

SITE DESCRIPTION:
Small excavations 20 by 20 metres have fine to medium sand with minor clasts to 10 cm.

Site Location: NE Sec29, T65 R22 W4M

SITE DESCRIPTION:
Excavation on a ridge of the west side of the Tawatinaw Valley has fine to medium pebbly sand with 5% clasts to 10 cm. Farmer has worked this for internal road use.

Deposit 25

Location: N Sec15, Sec22, W Sec23, S Sec27, SW Sec26, T66 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec23, T66 R23 W4M

SITE DESCRIPTION:
Several probes to 1m on an upper terrace of a meltwater channel indicate fine to medium, fairly clean sand.

Deposit 26

Location: NW Sec19, SW Sec30, T66 R22 W4M; Sec25, T66, R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec25, T66 R23 W4M

SITE DESCRIPTION:
Small pit, 50m^2 on terrace of the Athabasca Valley. Fine sand with 20% clasts to 10 cm. The bulk of the gravel is less than 2 cm the larger clasts are being crushed. The pit is being exploited by Lupiezowiec Trucking. No representatives of this company were present at the time of investigation so we were unable to determine for what purposes the material was being manufactured or where it was being distributed.

Deposit 27

Location: N Sec20, NW Sec21, E Sec30, Sec29, W Sec28, SE Sec32, NW Sec33, T66 R22 W4M; W Sec2, E Sec3, SE Sec10, SW Sec11, T67 R22 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
Lower and middle terraces on the Athabasca River across from the Town of Athabasca. Granular material is seen throughout this deposit ranging from fine sand to gravelly sand.

Site Location: NW Sec21 T66 R22 W4M

SITE DESCRIPTION: 27a
Stel-Marr's only active pit in the area. The lowest terrace has been partially mined and presently holds several large stockpiles. A 2.5m section of the terrace above is being mined at present. Stel-Marr's representative Ed Jones indicated once the stockpiles are removed from the lowest terrace they would continue mining up to 14 feet below the present base.

The material is quite dirty, clay stringers and clay balls are seen throughout the deposit. The sand is fine to medium with some small lenses and pockets of coarse sand. There is a large amount of silt intermixed with the sand. The clasts range from fine gravel, less than 1 cm to 50 cm. The bulk of the clasts ranging from .5 cm to 7.5 cm.

The pit covers an area 400m parallel to the river and 50m from the bank. The two lower terraces contain the coarser material the upper terraces contain mostly fine to medium sand.

Site Location: SW of Sec2, T67 R22 W4M

SITE DESCRIPTION: 27b
Excavation along Highway 63 next to Stel-Marr's cement plant exposes similar material to that in their active pit. The material is quite dirty, with a high concentration of fines and clay stringers. This area may have been the old airport. There has been no recent exploitation of this pit.

Deposit 28

Location: NE Sec21, NW Sec27, E Sec28, SE Sec33, S Sec34, T66 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NE Sec28, T66 R22 W4M

SITE DESCRIPTION:
County of Athabasca pit on lower terrace of the Athabasca River. The excavation is 200m long parallel to the river and extends 30m from the bank. The material is very dirty, with a large concentration of fines. The sand is fine to medium with lenses of course sand. There is greater than 25% clasts some ranging in size to .75 cm, with most up to 3 cm. The base of the pit and 1m below shows a much coarser sand present with less fines apparent.

The lower terraces along this side of the river have shown as indicated good potential for granular material as indicated from air photo interpretation and field checking several sites.

Deposit 29

Location: N Sec25, T66 R20 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec25, T66 R20 W4M

SITE DESCRIPTION:
Gravel pit indicated on 1:50000 topographic map exposes fine through coarse, clean sand with minor clasts to 10 cm. Very little material has been exploited from this 2m ridge with the water table apparent at 1m below the base.

Deposit 30

Location: NW Sec2, N Sec3, N Sec4, NE Sec5, E Sec9, Sec10, W Sec11, W Sec14, Sec15, SE Sec16, T68 R18 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
This deposit is comprised of mainly fine sand. The are few clasts apparent and some zones of medium sand. The sand is extensive as identified though field checks.

Site Location: NW Sec4, T68 R18 W4M

SITE DESCRIPTION:
Road cuts and ditches exposes fine sand with zones of medium sand. Very few clasts are present, those seen are less than 4 cm.

Site Location: N Sec10, T68 R18 W4M

SITE DESCRIPTION:
Probe in farmers field has fine sand to 1m.

Deposit 31

Location: NW Sec28, NE Sec29, Sec32, W Sec33, T68 R19 W4M; SW Sec4, SE Sec5, T69 R19 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: S Sec32, T68 R19 W4M

SITE DESCRIPTION:
Gravel pits are identified on 1:50000 topographic map but it appears these sites are only stockpiles. Investigation of area shows fine sand to 1m below 10 cm silt drape.

Deposit 32

Location: W Sec20, E Sec19, SE Sec30, SW Sec29, T69 R18 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: W Sec20, T69 R18 W4M

SITE DESCRIPTION:
Lower terrace of Athabasca River on west bank has fine sand to 1m. Proceeding up the bank 100m has similar sand to 1m very few clasts are apparent in this deposit.

Deposit 33

Location: NW Sec25, NE Sec26, SE Sec35, SW Sec36 T68 R20 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
Two sites were described in this pit. The area is owned by Albert Stewart and the material has been purchased by Consolidated Concrete. There is more than 50% gravel exposed and there are two 10m stockpiles of crushed material on site. The pit is approximately 100m by 400m running northwest to southeast. The pit runs to 15m deep in some locations and material varies from fine to medium sand with minor clasts to a cemented section of quartzites. The pit was found while digging a water well and was opened up last year.

Site Location: SW Sec 36, T68 R20 W4M

SITE DESCRIPTION:
This site investigation was on the south side of the pit at a 15m exposure. This exposure runs 30m parallel to the road. The base has 2m of standing water, used as a swimming hole by the Stewarts. The material is a gravel with 40% fine to medium sand, some coarse sand lenses and clasts up to 25 cm. The gravel constitutes 50% of the deposit with the bulk ranging in size up to 7.5 cm. The deposit is quite dirty with major clay zones creating false bottoms throughout. Bedrock is seen outcroping near the base of the pit which may suggest thrusting. Clay stringers are intermixed in various zones and iron staining is present on much of the sand and clasts in this exposure.

Site Location: SW Sec36, T68 R20 W4M

SITE DESCRIPTION:
This site is located on the north face of the pit and is a compacted zone of material. A till zone cuts the west side of this zone and a dam has been built on the east side. This material appears cleaner than the exposure on the south side of the pit. There is little clay present and material is compacted making it very hard to dig. The sand is fine to medium with small lenses of coarser material. The gravel comprises 55% of the zone and in size to 7.5 cm with some clasts to 30 cm. The clasts are mainly white, hard quartzites, many are shattered. This zone is approximately 40m long and 3m above the water table.

Deposit 34

Location: N Sec35, T68 R20 W4M; Sec2, T69 R20 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: W Sec2, T69 R20 W4M

SITE DESCRIPTION:
This pit is also owned by Albert Stewart and is located a mile northwest of the pit described in Deposit 33. This material is much dirtier and is not as extensive or deep as Deposit 33. This excavation has a 2m exposure of fine through coarse sand with minor clasts to 10 cm. The sand is quite clean there is little clay or organics present. The water table is visible at the base of the pit. Also, bedrock is present in some areas of the pit suggesting thrusting in the area. This deposit is likely glaciofluvial or fluvial.

Deposit 35

Location: NW Sec5, NE Sec6, T69 R19 W4M

No. of associated pits/sites:
DEPOSIT DESCRIPTION:
See description below.

Site Location: NE Sec6, T69 R19 W4M

SITE DESCRIPTION:
Excavation on the upper terrace on the south side of the Athbasca River. The material is a fine sand with minor clasts up to 10 cm. There is a 30 cm zone of coarse sand in the 4m exposure. The entire deposit is quite dirty with clay balls and stringers throughout. The base of the deposit is silt to 1m.

Deposit 36

Location: NE Sec4, E Sec9, Sec10, NW Sec11, SE Sec15, SW Sec14, T 69 R19 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
This deposit is mainly dirty, fine sand. Dune features are seen in the upper portion of the deposit located above the Athabasca Valley. Fine sand is seen throughout the terraces of the valley itself.

Site Location: NE Sec9, T69 R19 W4M

SITE DESCRIPTION:
Large area of dune features predominantly silt to fine sand.

Site Location: NE Sec10, T69 R19 W4M

SITE DESCRIPTION:
20m from the south bank of the Athabasca River we probed to 1m and found silt to fine sand. 40m above on the middle terrace a probe to 1m shows dirty, fine sand. EM-31 readings indicate granular material to 7m but we were unable to determine the size fraction of the material.

Deposit 37

Location: N Sec7, SW Sec18, T69 R19 W4M; N Sec12, SE Sec13, T69 R20 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec7, T69 R19 W4M

SITE DESCRIPTION:
Lower and middle terrace on south bank of Athabasca River. Probe to 1m on both terraces shows dirty, fine sand. EM-31 readings indicate granular material to 7m; we were unable to determine size fraction at depth. Two small excavations were located on the middle terrace. These pits consist of dirty, fine sand with minor clasts to 5 cm.

Deposit 38

Location: SW Sec16, S Sec17, SE Sec18, T69 R 19 W4M

No. of associated pits/sites:

DEPOSIT DESCRIPTION: 1

Site Location: SW Sec17, T69 R19 W4M

SITE DESCRIPTION:
Lower terrace on north bank of Athabasca River. Probe to 1m shows fine sand.

Deposit 39

Location: Sec9, S Sec10, SW Sec15, Sec 23, SW Sec 25, SE Sec26, T69 R19 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
Large area of predominantly fine sand. Dunes are present on top of the valley and similar material is found on terraces of the Athabasca River.

Site Location: SW Sec23, T69 R20 W4M

SITE DESCRIPTION:
Dune area probed to 1m in several locations shows fine sand.

Site Location: E Sec9 T69 R20 W4M

SITE DESCRIPTION:
Middle terrace on north bank of Athbasca River shows fine sand to 1m under 20 cm silt drape.

Deposit 40

Location: NE Sec24, E Sec25, T67 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec25, T67 R 22 W4M

SITE DESCRIPTION:
2m road cut exposes fine sand with minor clasts to 2 cm. This area has dune features.

Deposit 41

Location: W Sec25, E Sec26, SE Sec35, NW Sec36, T67 R22 W4M; S Sec1, T68 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec35, T67 R22 W4M

SITE DESCRIPTION:
Lower terrace on the Athabasca River has fine sand from bank to 80m up the terraces. 20m from the bank an isolated section of fine sand with minor clasts to 5 cm was identified to 1m by probe.

Deposit 42

Location: NE Sec2, Sec11, Sec14, NW Sec 13, SE Sec23, W Sec24, T67 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec11, T67, R22 W4M

SITE DESCRIPTION:
Lower and middle terrace on Athabasca River is predominantly fine sand. Lower terrace has fine sand throughout. The middle terrace has a new road built and surrounding material is fine to medium sand with minor clasts to 5 cm. A backhoe test on the middle terrace exposes fine to medium sand with minor clasts to 7 cm.

Deposit 43

Location: NW Sec14, Sec23, T67 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec23, T67 R22 W4M

SITE DESCRIPTION:
Lower terrace on the Athabasca River. A 3m excavation has been abandoned for several years. The material is fine to medium sand with 20% clasts. There is a 25 cm zone of coarse sand to fine gravel 50 cm above the base of the pit. The material is quite dirty, clay stringers are seen throughout the deposit. The pit area is approximately 300m by 100m.

Deposit 44

Location: S 29, SW Sec31, T66 R22 W4M; Sec36, T66 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec29, T66, R22 W4M

SITE DESCRIPTION:
API has developed a pit on an outwash plain at the top of the Athabasca Valley. The gravel in the pit increases to the northwest. The pit varies from 4 to 8m. There is a 30 cm silt overburden on top of a 50 cm pebbly sand unit. The material is clean fine to medium sand with 15% clasts to 10cm. The section overlies 50 cm clean, medium sand unit. Underlying the sand is a 4m unit of fine to medium, clean sand with 50% gravel with clasts to 10 cm. This unit overlies a fine through coarse, clean sand unit that is exposed for 1m to the base of the pit.

API's representative, Noel Major, informed us there was approximately 500,000 tonnes of material present. This does not include any material that may be in the terrace systems below.

Deposit 45

Location: SW Sec3, SE Sec4, T67 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SW Sec3, T67 R23 W4M

SITE DESCRIPTION:
Lower terrace of the Athabasca River. Probes to 1m at 100m and 200m from bank show dirty fine sand.

Deposit 46

Location: Sec31, W Sec32, T66 R22 W4M; NE Sec36, T66 R23 W4M; SW Sec4, S Sec5, S Sec6, T67 R22 W4M; Sec1, E Sec2, T67 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: S Sec5, T67 R22 W4M

SITE DESCRIPTION:
Cleared farmland on an outwash deposit. Probe to 1m in several locations shows medium sand under 30 cm of soil.

Deposit 47

Location: W Sec4, E Sec5, SE Sec8, SW Sec9, T67 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: E Sec5, T67 R23 W4M

SITE DESCRIPTION:
This pit runs parallel to the Athabasca River and is located on the lower terrace on the west side of the river. The pit is approximately 500m long and 100m wide. The north part of the excavation is owned by Ken Stafford and is mostly overgrown. Mr. Stafford exploits the material for internal farm use.

Sections of the southern portion of the excavation are operated by the County of Athabasca and Alberta Transportation. The material is a clean, fine to medium sand with approximately 25% gravel with clasts to 10 cm. The pit is generally 5m deep but has sections up to 7m. The county has stockpiles of crushed material while Alberta Transporation is hauling their material for road construction near Chain lakes.

Deposit 48

Location: NW Sec16, W Sec21, 67 R 23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec16, T67 R23 W4M

SITE DESCRIPTION:
Newly opened pit of Alberta Transportation. The pit is located on a middle terrace of the Athabasca River. The material is a clean, fine and coarse sand with approximately 40% gravel. The bulk of the gravel ranges in size to 3 cm with 10% up to 10 cm. Probes to 1m through the base of the pit shows local bedrock. The material in the upper terrace is fine to medium sand.

Deposit 49

Location: N Sec15, Sec22, NW Sec23, SW Sec26, SE Sec27, T67 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NE Sec22 T67 R23 W4M

SITE DESCRIPTION:
Stockpile at bend in road consists of very dirty, fine to medium to coarse sand with 15% gravel in an outwash deposit. A probe to 1m in the adjacent field shows similar material. The deposit may be thin as till outcrops in surrounding area.

Deposit 50

Location: NW SEC13, NE Sec14, SE Sec23, T68 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NE Sec14, T68 R3 W4M

SITE DESCRIPTION:
Middle terrace of the Athabasca River shows dirty, pebbly sand with clasts to 5 cm. The lower terrace is cleared for farming and has a very dirty sand with minor pebbles to 5 cm.

Deposit 51

Location: NW Sec17, NE Sec18, E Sec19, W Sec29, SE Sec30, T67 R23 W4M

No. of associated pits/sites:1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec19, T67 R23 W4M

SITE DESCRIPTION:
Outwash deposit that has been cleared for farming. Excavation has well sorted material ranging from fine sand with pebbles to beds of coarse sand, fine gravel and pebbles. The deposit must be classed as dirty as a result of clay stringers throughout. The pit averages 6m in depth and has little to no overburden.

The section investigated, on the north side of the pit, has 1m of clean, fine sand with 15% clasts to 5 cm. This section overlies 25 cm of clay stringers above 2m of dirty coarse sand and 25% gravel to 3 cm. The material below, to the base of the pit, is interchanging layers of fine sand and coarse sand beds with 20 to 30% gravel with clasts to 8 cm.

The pit is more sandy towards the south end, gravel is less than 15%. Clay stringers are still present throughout.

Deposit 52

Location: NE Sec28, E Sec33, W Sec34, T67 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec33, T67 R23 W4M

SITE DESCRIPTION:
Small excavation on the lower terrace of the Athabasca River. Fine to medium, clean sand with minor clasts to 5 cm. There is a 25 cm zone of coarse sand with 15% clasts to 5 cm. Two stockpiles in the excavation are coarse sand and gravel.

Deposit 53

Location: NW Sec17, NE Sec18, E Sec19, W Sec20 SE Sec30, SW Sec29. T68 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SW Sec29, T68 R23 W4M

SITE DESCRIPTION:
Glaciofluvial deposit has borrow pit exposing fine to medium, dirty sand with minor clasts to 5 cm.

Deposit 54

Location: E Sec35, W Sec36, T69 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: E Sec35, W Sec36, T69 R23 W4M

SITE DESCRIPTION:
Jack Pine Ridge as it is known to the locals is a middle terrace on the Athbasca River that is comprised of fine to medium sand with no clasts apparent. Vegetation consists of a large grove of Jack Pines.

Deposit 55

Location: E Sec3, T69 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SE Sec3, T69 R23 W4M

SITE DESCRIPTION:
Upper terrace of the Athabasca River exposes a ridge of dirty, fine sand.

Deposit 56

Location: N Sec2, NE Sec10, Sec11, SE Sec15, SW Sec14, T69 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NE Sec10, T69 R23 W4M

SITE DESCRIPTION:
3m excavation on upper terrace of the Athabasca River. This pit is exploited only in the winter months as there are no roads. Deposit area is about 250m^2. The material is fine to medium, dirty sand with 10% gravel with clasts to 10cm. A ridge 200m to the east is reported, by Alberta Transportation, to have similar material. Arriving at this excavation from the lower terraces we identified similar material within the terraces, the extent is unknown.

Deposit 57

Location: S Sec33, T68 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: S Sec33, T68 R22 W4M

SITE DESCRIPTION:
40m trench running parallel to the east/west road exposes a till ridge with small pockets of fine to medium, dirty sand with clasts to 7 cm. At the base of these pockets is a zone of fine sand void of clasts.

Deposit 58

Location: NW Sec15, NE Sec16, SE Sec21, Sec22, T67 R24 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
Series of 2 to 3m ridges likely an outwash deposit. Main use for granular material is for farming infrastructure.

Site Location: NW Sec15, T67 R24 W4M

SITE DESCRIPTION:
2m pit of fine sand with minor clasts to 3 cm. This is area is overgrown and likely not used for several years.

Site Location: N Sec22, T67 R24 W4M

SITE DESCRIPTION:
Small excavation at top of 3m ridge. Material is fine sand with minor clasts to 5 cm.

Deposit 59

Location: NE Sec10, N Sec11, N Sec12, Sec13, 14, 15, SE Sec22, SW Sec23, SW Sec24, T68 R24 W4M; NW Sec7, SW Sec18, T68 R23 W4M

No. of associated pits/sites: 3

DEPOSIT DESCRIPTION:
Meltwater channel has several ridges with granular material.

Site Location: NE Sec15, T68 R24 W4M

SITE DESCRIPTION:
5m ridge along Highway 2 has fine through coarse sand with minor clasts to 5 cm.

Site Location: SE Sec13, T68 R24 W4M

SITE DESCRIPTION:
Ridge of medium sand with minor coarse sand and fine gravel with clasts 7 cm. This site is 1/2 mile southeast of pit.

Site Location: NW Sec13, T68 R14 W4M

SITE DESCRIPTION:
Small excavation on 3m ridge has 2.5m of fine to medium sand with thin lenses of coarse sand. There is 25% gravels with clasts to 25 cm. The lower 50 cm of the exposure is fine to medium sand.

Deposit 60

Location: N Sec18, Sec19, T69 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec18, T69 R23 W4M

SITE DESCRIPTION:
2m borrow pit in a glaciofluvial deposit exposes medium, dirty sand with minor clasts to 3 cm.

Deposit 61

Location: NW Sec31, T69 R 22 W4M; NE Sec36, T69 R23 W4M; SE Sec1, E Sec12, T70 R23 W4M; Sec6, SW Sec7, T70 R22 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: NW Sec6, T70 R22 W4M

SITE DESCRIPTION:
50 cm cap of fine sand over till in a meltwater channel.

Deposit 62

Location: W Sec17, NE Sec18, T70 R23 W4M

No. of associated pits/sites: 1

DEPOSIT DESCRIPTION:
See description below.

Site Location: SW Sec17, T70 R23 W4M

3 m excavation on lower terrace of the Athabasca River. The material is dirty fine sand with some lenses of coarse sand, and 10% gravel with clasts to 10 cm. This pit has not been exploited for several years. The deposit is shallow as probe indicates clay at base of pit.

Deposit 63

Location: N Sec30, SE Sec31, NW Sec32, T71 R21 W4M; Sec5, E Sec8, S Sec17, T72 R21 W4M

No. of associated pits/sites: 2

DEPOSIT DESCRIPTION:
Southwest side of Calling Lake has remnant beaches with granular material present.

Site Location: S Sec17, T72 R21 W4M

SITE DESCRIPTION:
Remnant beach with dirty, fine sand and minor clasts to 10 cm.

Site Location: SE Sec31, T71 R21 W4M

SITE DESCRIPTION:
2m Borrow pit with dirty, fine sand.

APPENDIX B

Site Descriptions

Site Location: SW Sec12 T80 R23 W4M

Site Description:
Cut block for oil/gas well. Shovel to 1m through till and probe from base of hole an additional meter through till.

Site Location: SW Sec8 T79 T20 W4M

Site Description:

.5m high ridge running north-south is comprised of silt.

Site Location: SE Sec24 T78 R21 W4M

Site Description:

Till with clasts to 5 cm.

Site Location: NW Sec6 T68 R21 W4M

Site Description:

Flute that has been dissected by earthmoving equipment for study by Don Kvill of the University of Athbasca. The 8m face exposes till.

Site Location: SW Sec11 T63 R24 W4M

Site Description:

Ridge running NE-SW exposes silty till.

Site Location: SW Sec4 T63 R25 W4M

Site Description:

1m of sandy till exposed in ditch.

Site Location: SW Sec3 T63 R26 W4M

Site Description:

Probe to 1m in barley field shows silty peat.

Site Location: SE Sec15 T63 R27 W4M

Site Description:

Upper terrace of the Pembina River Valley exposes silty clay with no clasts visible.

Site Location: SW Sec5 T64 R26 W4M

Site Description:

Probed 1m on top of small ridge and at the base and found 30 cm silt over clay.

Site Location: SE Sec27 T63 R26 W4M

Site Description:

1m probe at top of hill shows fine silt over clay.

Site Location: SW Sec20 T63 R24 W4M

Site Description:

Road cut exposes a 10 cm layer of silt over till.

Site Location: NW Sec7 T64 R21 W4M

Site Description:

Probe on ridge running east-west has silt and clay to 1m.

Site Location: SE Sec25 T63 R22 W4M

Site Description:

Fine silty clay on a bank of Pine Creek.

Site Location: SE Sec26 T63 R23 W4M

Site Description:

Silt to 1m in the upper terrace of a meltwater channel.

Site Location: SW Sec8 T63 R23 W4M

Site Description:

Road cut exposes organic overburden to .5m over 1m till over 1.5m sandy till.

Site Location: SW Sec10 T65 R22 W4M

Site Description:

Road cut through ridge exposes 2m of till.

Site Location: NW Sec31 T64 R22 W4M

Site Description:

Lower terrace of a meltwater channel consists of interbedded silt and clay.

Site Location: NW Sec31 T64 R24 W4M

Site Description:

Fine sand veneer over stony till. There are minor sand and gravel lenses but they are extremely dirty.

Site Location: SE Sec29 T65 R24 W4M

Site Description:

20m ridge flanking large till are sandy till and clay to 1m.

Site Location: SE Sec27 T64 R23 W4M

Site Description:

Small ridges running east-west have a 20 cm overburden of silt over till.

Site Location: SE Sec28 T64 R22 W4M

Site Description:

Drainage ditch exposes 2m of till.

Site Location: NW Sec16 T65 R21 W4M

Site Description:

Probe to 1m exposes silt over clay.

Site Location: NW Sec23 T65 R22 W4M

Site Description:

Probe on lower terrace of meltwater channel shows silt and clay to 1m.

Site Location: SE Sec17 T72 R21 W4M

Site Description:

Till exposed in a 6m deep borrow pit across from the Alberta Foresty Services building in Calling Lake.

Site Location: SW Sec25 T70 R22 W4M

Site Description:

Till exposed in 2m borrow pit.

Site Location: SW Sec35 T70 R22 W4M

Site Description:

Till exposed in 3m borrow pit.

Site Location: NW Sec6 T72 R25 W4M

Site Description:

1m probe in small ridge finds silt.

Site Location: NW Sec23 T68 R19 W4M

Site Description:

Excavation for silage exposes 1.5m of till.

Site Location: NW Sec23 T68 R19 W4M

Site Description:

Bog to 1m.

Site Location: SW Sec11 T69 R19 W4M

Site Description:
Coolie exposes 6m of silt.

Site Location: NW Sec4 T69 R20 W4M

Site Description:

Middle terrace of the Athabasca River has silt to 1m.

Site Location: NW Sec9 T69 R21 W4M

Site Description:

1m road cut exposes till.

Site Location: NE Sec15 T68 R21 W4M

Site Description:

Bank of Athabasca River exposes 4m of silt. Lower terrace has similar material to 1m.

Site Location: NW Sec12 T71 R24 W4M

Site Description:

30m from bank of the Athabasca River probe to 1m finds silt. 100m from bank probe finds similar material.

Site Location: SW Sec28 T67 R23 W4M

Site Description:

Lower terrace of the Athabasca River probe finds silt to 1m.

Site Location: SW Sec23 T66 R25 W4M

Site Description:

10m exposure on ridge exposes of till.

Site Location: SE Sec32 T67 R26 W4M

Site Description:

Road cut in ridge exposes sandy till.

Site Location: NW Sec35 T68 R18 W4M

Site Description:

Adjacent field and cut bank in Pine Creek exposed till with no visible clasts.

Site Location: SW Sec12 T69 R19 W4M

Site Description:

Ridge consisting of till.

APPENDIX C

Correlation of deposit numbers in this report and the Wandering River and Pelican reports.

Descriptions for Deposits 64 through 89 and 98 through 100 are available in the following publication:

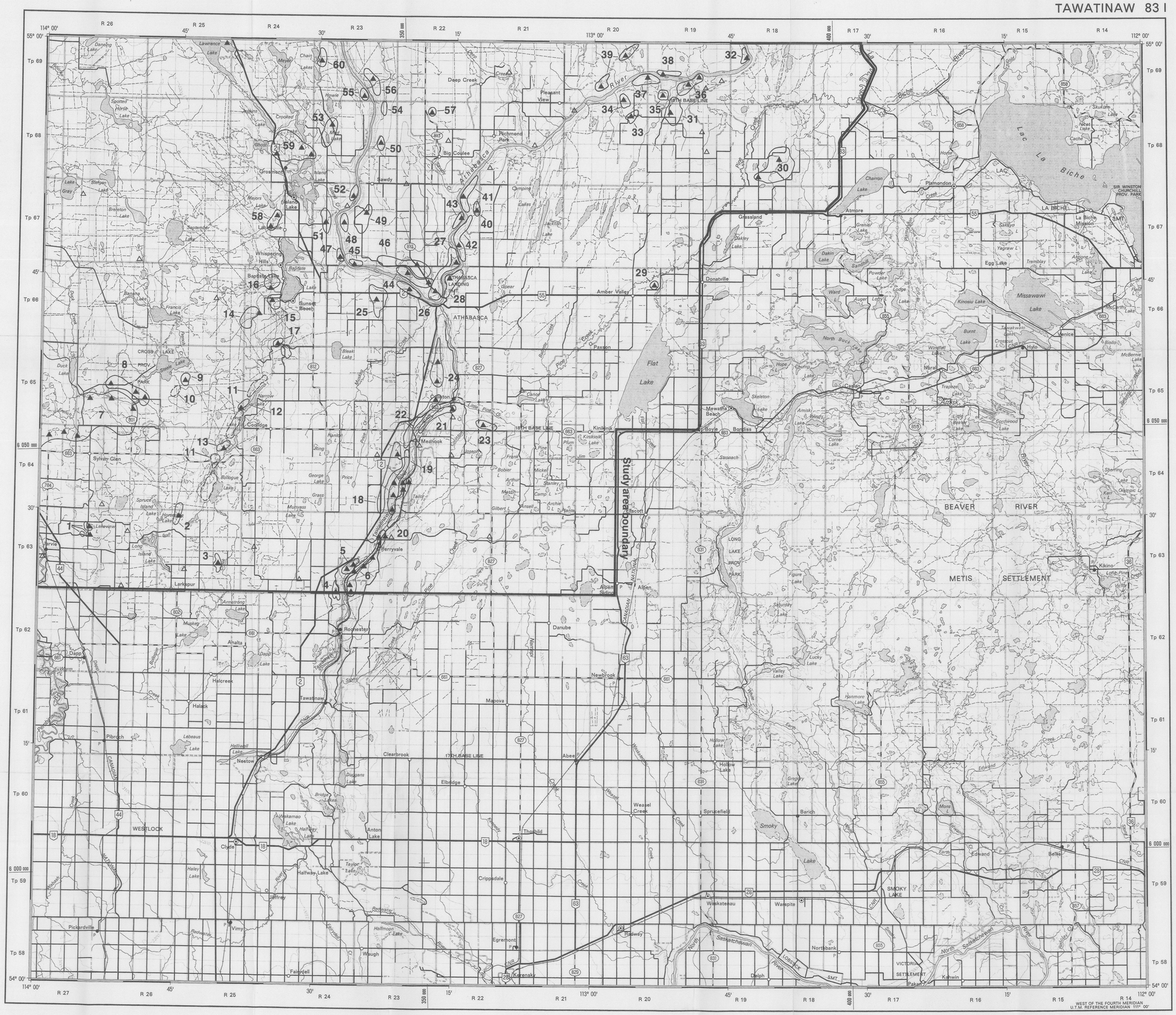
Scafe, D.W., Sham. P.C. and Ray, C.M. Sand and gravel resources of the Pelican (west central portion of 83P) Map area, Alberta.

Descriptions for Deposits 90 through 97 are available in the following publication:

Scafe, D.W., Edwards, W.A.D. and Boisvert, D.R. Sand and gravel resources of the Wandering River area.

The following cross references the deposit numbers of the Athabasca Report and those reports in which the deposits were first described:

Athabasca Report	Pelican Report	Athabasca Report	Wandering River Report
64	1	90	1
65	2	91	2
66	3	92	4
67	4	93	5
68	5	94	6
69	6	95	8
70	7	96	15
71	8	97	14
72	9		
73	10		
74	11		
75	12		
76	13		
77	14		
78	15		
79	16		
80	17		
81	18		
82	19		
83	20		
84	21		
85	22		
86	23		
87	24		
88	25		
89	26		
98	27		
99	28		
100	29		



Legend

- Deposit outline and number, assumed from limited field checking.
- Deposit outline and number, assumed from air photographs.
- ▲ Site, sand or gravel identified.
- △ Site, no sand or gravel identified.

1:250,000

0 5 10 15 km
0 5 10 miles

Figure 2. Sand and gravel deposits of the Tawatinaw map sheet (83 I).

Edwards, W.A.D., Boisvert, D.R., Pawlowicz, J.G., Andriashek, L.D., and Fenton, M.M.

Published 1991
Geology and compilation 1990-91

Sand and gravel resources of the Athabasca region; parts of map sheets 83 I and 83P. This sand and gravel resource map was prepared by the Alberta Geological Survey as part of an ongoing aggregate inventory of Alberta. This information shown on this map is intended for general land-use planning, land management and aggregate exploration until such time as more detailed maps or reports are available for the area. This reconnaissance-level, aggregate potential map is derived from published information, aerial photograph interpretation and limited field checking. As such, deposit outlines are assumed and material descriptions are either assumed or approximate.

Base map was produced by Alberta Bureau of Surveying and Mapping.
Cartography by Alberta Research Council

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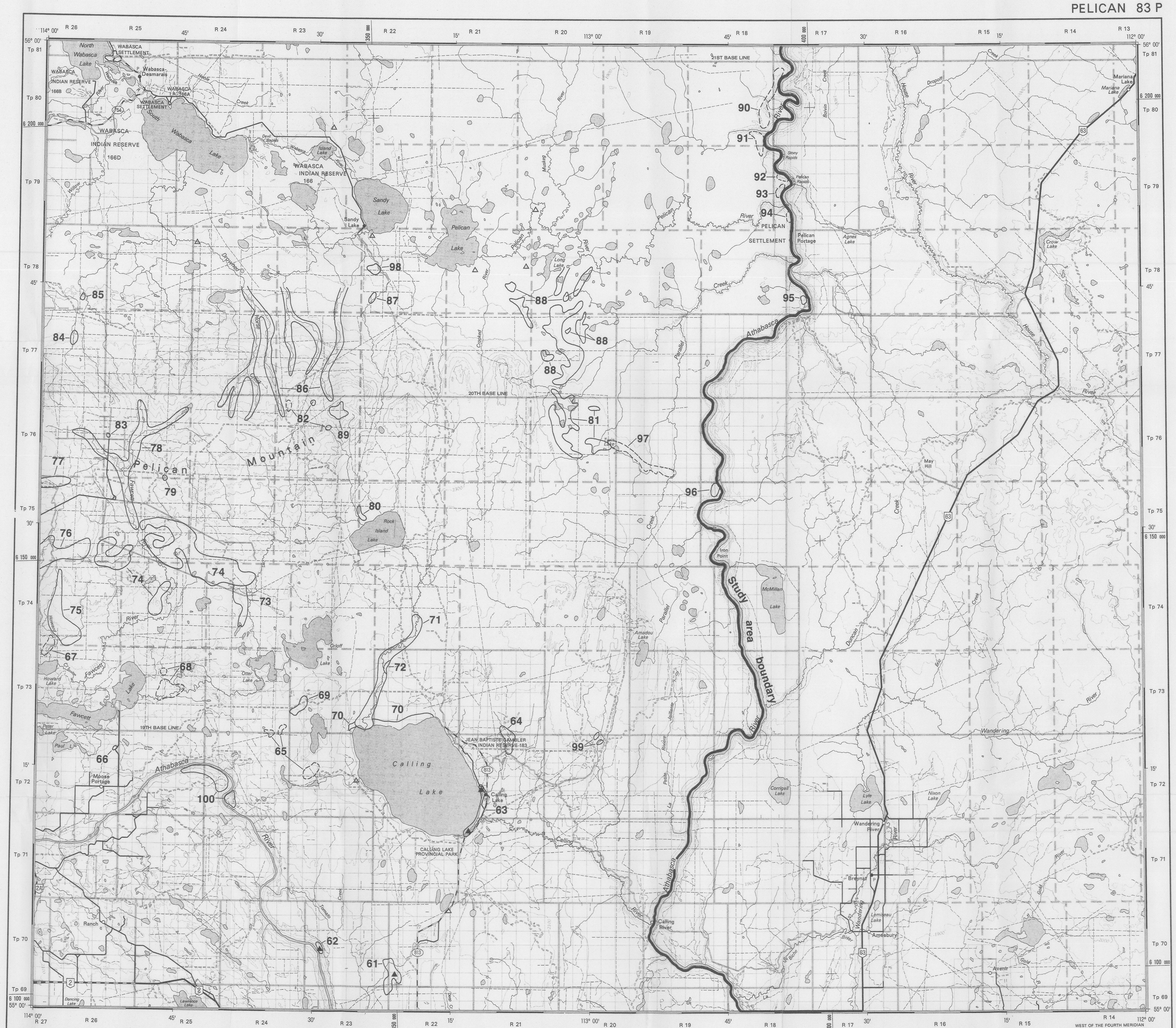
PELICAN 83 P



Legend

Deposit outline and number, assumed from limited field checking.

Deposit outline and number, assumed from air photographs.

▲ Site, sand or gravel identified.

△ Site, no sand or gravel identified.

1:250,000

0 5 10 15 km
0 5 10 miles

Figure 3. Sand and gravel deposits of the Pelican map sheet (83P).

Edwards, W.A.D., Boisvert, D.R., Pawlowicz, J.G., Andriashek, L.D., and Fenton, M.M.

Published 1991
Geology and compilation 1990-91

Sand and gravel resources of the Athabasca region; parts of map sheets 83 I and 83P. This sand and gravel resource map was prepared by the Alberta Geological Survey as part of an ongoing aggregate inventory of Alberta. This information shown on this map is intended for general land-use planning, land management and aggregate exploration until such time as more detailed maps or reports are available for the area. This reconnaissance-level, aggregate potential map is derived from published information, aerial photograph interpretation and limited field checking. As such, deposit outlines are assumed and material descriptions are either assumed or approximate.

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