

GRANULAR RESOURCES MANAGEMENT STRATEGY - SOUTH SLAVE REGION VOLUME 2: APPENDICES

Prepared for

SUPPLY AND SERVICES CANADA (DSS FILE: 38ST.A0632-6-5023)

on behalf of

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS

Thurber Consultants Ltd. Calgary, Alberta

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APPENDIX A

SUPPLY/DEMAND TABLES

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AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA I

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Conments
1-1	l km E of high- way (km 9); no access	Glaciofluvial riðge; gravelly sand	Close to Hay River channel	Class 4: 75,000 m3 (prospective)	None projected	None proposed	Development not recom- mended at this time
1-2	2 km SW of high- way (km 10); winter access	Glaciofluvial ridge; gravelly sand	-	-	-	-	Pit area (now deplet- ed) should be rehab- ilitated
1-3	1.5 km W of highway (km 18 - 22); no access	Glaciofluvial ridge; gravelly sand	None identified	Class 4: 110,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
1-4	Along highway (km 19 - 20); access from highway	Glaciofluvial ridge; sandy gravel	-	-	-	-	Deposit is depleted; pit area should be rehabilitated
1-5	Up to 3 km W of highway, km 28 - 34; some access from highway	Glaciofluvial plain; gravelly sand	None identified	Class 4: 800,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
1-6	2 to 5 km E of highway, km 24 - 35; no access	Glaciofluvial plain; gravelly sand	None identified	Class 4: 4,500,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
1-7	2 to 3 km E of highway, km 40 - 50; no access	Glaciofluvial plain; gravelly sand	None identified	Class 4: 1,200,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
1-8	Along highway (km 40 - 43); access from highway	Glaciofluvial plain; sandy gravel	-	-	-	-	3 existing pits are depleted; rehabilita- tion recommended
1-9	E of highway (km 43 - 45) and river; no access	Glaciofluvial ridges; gravell sand	None identified Y	Class 4: 180,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA I

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
1-10	W of highway (km 45); poor access	Glaciofluvial ridges; gravell sand	None identified Y	Class 3: 4000 m ³ (probable)	None projected	None proposed	l existing pit; con- tinued development recommended to de- plete source prior to rehabilitation
1-11	E of highway (km 48); good access	Glaciofluvial ridge; sandy gravel	-	-	-	-	Deposit is depleted; continued use as crushing/stockpile site recommended
1-12	l - 3 km of highway (km 47 - 53); no access	Outwash plain; gravelly sand	None identified	Class 4: 1,000,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
1-13	Along highway (km 57 - 60); poor access	Outwash plain; gravelly sand	None identified	Class 4: 300,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
1-14	Along Hay River, 1.5 km E of highway (km 62); no access	Alluvial terrace; silty gravel	None identified	Class 3: 300,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
1-15 (km 66.6)	Along highway, km 66 - 67; access from highway	Limestone	None identified	Class 5: 1,500,000m ³ (probable)	52,000 to 212,000 m ³ Class 5 (processed)	None proposed	Prime aggregate source (when blended with sand from Deposit 1-16) in Management Area I; continued de- velopment recommended
1-16 (km 77.2)	Along highway (km 74.5 - 77.5); access from highway	Cutwash plain; clean sand	None identified	Class 4: 350,000 m ³ (probable)	13,000 to 53,000 m ³ Class 4	None proposed	Prime source of blend sand in management area; continued devel- opment recommended
1-17	E of Enterprise on E side of river; no access	Beach ridges; sandy gravel	None identified	Class 3: 1,500,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time; aggregate is likely shallow and sporad- ically distributed

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA I

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
1-18	Along Highway 1; W of Enterprise; access from highway	Beach ridges; sandy gravel	-	-	-	-	Deposit essentially depleted; rehabilita- tion recommended, with continued use as stockpile/crushing site

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AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA II

A. Highway 2

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Puture Work	Comments
2-1 (HR-100)	W of highway, 5 km N of Enterprise; access from highway	Beach ridges; sandy gravel	-	-	-	_	Deposit considered to be depleted; restora- tion of site and con- tinued use as Enter- prise nuisance grounds are recommended
2-2 (HR-118)	3 km W of high- way, 8 km NW of Enterprise; winter access via Deposit 2-1	Beach ridges; sandy gravel	None identified	Class 3: 610,000 m ³ (probable)	None projected	None proposed	Development not recom- mended at this time, pending large volume demand that would justify it
2-3 (HR-114 to 116)	3 km W of high- way, 10 km N of Enterprise; winter access via existing trails	Beach ridges; gravelly sand	None identified	Class 4: 340,000 m ³ (probable)	None projected	None proposed	Southernmost ridge is depleted; development of others recommended to meet demand
2-4	W of highway (km 7), 7.5 km N of Enterprise; access from highway	Beach ridges; gravelly sand	None identified	Class 4: 75,000 m ³ (prospective)	None projected	None proposeđ	Development not recom- mended at this time
2-5	E of highway (km 8.5), 6.5 km N of Enterprise; access from highway	Alluvial terrace (sandy gravel) and limestone quarry	-	-	-	-	Sandy gravel deposit is depleted; limestone quarry believed to be abandoned
2-6 (HR-120)	W of highway, 22 km S of Hay River; winter access	Beach ridges; sand	None identified	Class 4: 225,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA II

A. Highway 2

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
2-7	E of highway and river, about 15 km S of Hay River; no access	Beach ridges; silty gravel	None identified	Class 4: 150,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
2-8 (HR-117A)	E of highway, 15 km S of Hay River; access from highway	Alluvial terrace; silty sand	-	-	-	-	Deposit is depleted
2-9 (HR-104A)	5 km W of Hay River; access via sewage lagoon road	Beach ridges; silty sand	Close to Great Slave Lake; community recreation area	Class 4: 225,000 m ³ (probable)	None projected	None proposed	Development not recom- mended
2-10 (HR-103)	5 km W of Hay River; access via sewage lagoon road	Beach ridges; silty sand	Close to Great Slave Lake; community recreation area	Class 4: 300,000 m ³ (probable)	None projected	None proposed	Development not recom- mended
2-11 (HR-101, 105)	2 km W of Hay River; access via sewage lagoon road	Beach ridges; clean sand	Close to Great Slave Lake; community recreation area	Class 4: 1,000,000 m ³ (probable)	2,500 to 5,000m3 Class 4	None proposed	Existing Town of Hay River pit; continued development recom- mended

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AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA II

B. Highway 5

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-1	l km S of high- way (km 3), 8 km S of Hay River; trail into site	Beach ridge; gravelly sand	-	-	-	-	Deposit long depleted, with good natural re- vegetation
5-2	S of highway (km 7), 10 km SE of Hay River; no access	Beach ridges; gravelly sand	Close to Sandy River valley	Class 4: 35,000 m3 (prospective)	None projected	None proposed	Development not recom- mended at this time
5-3 (HR-106)	8 km N of high- way, 6 km E of Hay River; poor access through Indian reserve	Beach ridges; gravelly sand	On Hay River I.R., close to Sandy River and lake shore	Class 4: 1,000,000m ³ (prospective)	None projected	None proposed	Development not recommended
5-4	15 km S of high- way (km 10); 25 km NE of Enterprise; no access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 375,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-5	l4 km S of high- way, 25 km SE of Hay River; no access	Beach ridges; sandy gravel	None identified	Class 3: 2,400,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time; however, could be opened up after Deposit 5-6 is depleted
5-6 (HR-109A; Mile 12S)	6 km S of high- way (km 18), 22 km SE of Hay River; access via Fort Smith winter road	Glaciofluvial ridges; sandy gravel	None identified	Class 1: 70,000 m3 (proven); Class 2: 95,000 m3 (proven); Class 3: 130,000 m ³ (proven)	12,000 m ³ Class 1; 48,000 m ³ Class 2; 5,000 m ³ Class 3	Potential of ridges to SW of main deposit should be investigated; low priority	Source of good to ex- cellent aggregate in Management Area II; continued development recommended

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA II

B. Highway 5

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-7 (HR-108A; Mile 12S)	5 km S of high- way (km 18), 20 km SE of Hay River; access via Fort Smith winter road	Glaciofluvial ridge; sandy gravel	None identified	Class 3: 70,000 m ³ (proven)	None projecteđ	None proposed	Deposit is generally thin; development not recommended at this time
5-8 (HR-110A) Mile 12S)	6 km S of high- way (km 18), 21 km SE of Hay River; access via Fort Smith winter road	Glaciofluvial ridge; sandy gravel	None identified	Class 1: 100,000 m ³ ; Class 3: 105,000 m ³ ; Class 4: 8,000 m ³ (all proven)	None projected	None proposed	Source should be de- veloped as Deposit 5-6 is depleted (initially as a concrete aggre- gate source)
5-9 (HR-112A; Mile 12S)	6 km S of high- way (km 21), 21 km SE of Hay River; winter access	Glaciofluvial ridge; sandy gravel	None identified	Class 1: 55,000 m ³ ; Class 4: 85,000 m ³ (both proven)	None projected	None proposed	Development not recom- mended at this time
5-10 (HR-111A; Mile 12S)	5 km S of high- way (km 22), 20 km SE of Hay River; winter access	Glaciofluvial ridge; sandy gravel	None identified	Class 2: 120,000 m ³ ; Class 3: 40,000 m ³ ; Class 4: 25,000 m ³ (all proven)	None projected	None proposed	Development not recom- mended at this time
5-11 (HR-107A; Mile 12)	l.5 km S of highway (km 18), 17 km SE of Hay River; winter access	Glaciofluvial ridge (2 seg- ments); gravelly sand	None identified	Class 4: 75,000 m ³ (proven)	None projected	None proposed	E segment is depleted; W part to be reserved as source of good quality sand and fine gravel
5-12 (HR-125A; Mile 17S)	4.5 km S of highway (km 24), 23 km SE of Hay River; poor winter access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 165,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA II

8. Highway 5

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-13 (HR-123A; Mile 17S)	5 km S of high- way (km 24), 22 km SE of Hay River; winter access	Glaciofluvial riðges; sandy gravel	None identified	Class 1: 45,000 m ³ ; Class 2: 105,000 m ³ ; Class 4: 100,000 m ³ (all proven)	Up to 15,000 m ³ Class 1	None proposed	Investigated by High- ways as an asphalt aggregate source; should be developed as Deposit 5-14 re- sources are depleted
5-14 (HR-124A; Mile 17S)	3.5 km S of highway (km 24), 22 km SE of Hay River; winter access	Glaciofluvial ridges; sandy gravel	None identified	Class 1: 35,000 m ³ ; Class 2: 110,000 m ³ ; Class 3: 265,000 m ³ ; Class 4: 20,000 m ³ (all proven)	Up to 35,000 m ³ Class 1	None proposed	Investigated by High- ways as an asphalt aggregate source; pit opened up winter 1986- 1987; continued de- velopment is recom- mended
5-15	10 km S of high- way (km 30), 25 km SE of Hay River; no access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 4,250,000m ³ (prospective)	None projecteđ	None proposed	400 m E of Fort Smith winter road; not re- commended for devel- opment at this time
5-16	3.5 km S of highway (km 30), 27 km SE of Hay River; possible winter access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 165,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5–17	1.5 km S of high- way (km 28.5), 20 km SE of Hay River; winter access	Beach ridges; gravelly sand	None identified	Class 4: 85,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA II

B. Highway 5

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Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-18	2.5 km S of highway (km 33), 30 km SE of Hay River; possible winter access	Beach ridge complex; sandy gravel	None identified	Class 3: 1,200,000m ³ (prospective)	None projecteđ	None proposed	Development not recom- mended at this time
5-19 (HR-119, 121 & 122; Mile 21)	Along highway (km 32 - 38), 30 km SE of Hay River; access from highway	Glaciofluvial ridges; sandy gravel	None identified	Class 2: 1,500,000m ³ (proven)	16,000 m ³ Class 1; 36,000 m ³ Class 2; 80,000 m ³ Class 3; 20,000 m ³ Class 4	None proposed	Large areas to S of railway depleted; de- velopment of N part is recommended, with rehabilitation of depleted areas
5-20	4 km S of high- way (km 37), 35 km SE of Hay River; possible winter access	Glaciofluvial ridge; sandy gravel	None identified	Class 3: 375,000 m3 (prospective)	None projected	None proposed	Development not recom- mended at this time
5-21	4 km S of high- way (km 40 - 45), 37 km SE of Hay River; poor access	Glaciofluvial ridge; sandy gravel	None identified	Class 3: 630,000 m3 (prospective)	None projected	None proposed	Development not recom- mended at this time
5-22	3 km S of high- way (km 45), 40 km SE of Hay River; possible winter access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 450,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-23 (Mile 26)	N of highway (km 41 - 43), 37 km SE of Hay River; access from highway	Outwash plain and ridges; sandy gravel	None identified	Class 3: 950,000 m ³ (prospective)	None projected	Additional testing is re- guired to prove up reserves, prior to depletion of Deposits 5-19 and 5-29	Development not recom- mended at this time

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA II

B. Highway 5

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-24	7 km N of high- way (km 44), 35 km E of Hay River; no access	Beach ridges on bedrock high; sandy gravel	None identified	Class 3: 650,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-25	4 km N of high- way (km 50), 40 km E of Hay River; access via trail from Polar Lake	Beach ridges and spits; sandy gravel	None identified	Class 3: 1,300,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-26	8 km N of high- way (km 53), 30 km W of Pine Point; no access	Beach ridges and spits; sandy gravel	None identified	Class 3: 400,000 m ³ ; Class 4: 35,000 m ³ (both prospective)	None projected	None proposed	Development not recom- mended at this time
5-27	Along highway (km 43 - 47), 37 km W of Pine Point; access from highway	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 850,000 m ³ (prospective)	10,000 m ³ Class 1; 40,000 m ³ Class 2; 45,000 m ³ Class 3; 10,000 m ³ Class 4	Testing to identify material types and distri- bution should be undertaken	Continued development is recommended, to- gether with rehabili- tation of depleted areas
5–28	l km S of high- way (km 48), 35 km SW of Pine Point; no access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 210,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-29 (Mile 31)	Along and N of highway (km 48 - 53), 32 km W of Pine Point; access from highway	Glaciofluvial ridges; sandy gravel	None identified	Class 2: 1,250,000m ³ ; Class 3: 140,000 m ³ (both proven)	25,000 m ³ Class 2; 30,000 m ³ Class 3	None proposeč	Continued development is recommended, together with rehabil- itation of depleted areas

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA II

B. Highway 5

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-30	1 - 3 km N of highway (km 54 - 58), 30 km SW of Pine Point; poor access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 225,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-31	3 km S of high- way (km 52), 35 km SW of Pine Point; no access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 18,500 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-32	l km S of high- way (km 55), 30 km SW of Pine Point; no access	Glaciofluvial ridge; sandy gravel	None identified	Class 3: 22,500 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA III

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-33	Along highway (km 56 - 57.5), 27 km SW of Pine Point; access from highway	Glaciofluvial ridge; sandy gravel	None identified	Class 2: 55,000 m3 (probable)	Up to 20,000 m ³ Class 2	Limited program to delineate aggregate classes and distribution is recommended	3 existing pits; con- tinued development recommended
5-34	N and S of high- way, at junction with Highway 6; access from highway	Cutwash plain; sandy gravel	None identified	Class 3: 225,000 m ³ (prospective)	None projecteđ	None proposed	4 existing pits (2 used as DPW campsite); renewed development not recommended
5-35	7 km N of high- way, 25 km W of Pine Point; no good access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 575,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-36	E of highway (km 61), 22 km SW of Pine Point; access via bush trail	Glaciofluvial ridge; sandy gravel	None identified	Class 3: 390,000 m ³ (prospective)	None projecteđ	None proposed	Development not recom- mended at this time
5-37	l - 2 km W of highway (km 62), 25 km SW of Pine Point; no access	Outwash plain; gravelly sand	Aðjacent to sink hole	Class 4: 55,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5–38	2 km W of high- way (km 64), 28 km SW of Pine Point; no access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 240,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-39	E of highway (km 62.5), 15 - 20 km SW of Pine Point; access from highway	Glaciofluvial ridge; sandy gravel	None identified	Class 3: 1,050,000m ³ (prospective)	None projected	None proposed	l existing pit; renew- ed development not recommended at this time

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AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA III

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-40 (km 64.5)	E and W of high- way, 23 Km SW of Pine Point; access from highway	Beach ridge complex; sandy gravel	None identified	Class 2: 150,000 m ³ (proven), 750,000 m ³ (probable), & 3,250,000m ³ (prospective)	31,000 m ³ Class 2; up to 10,000 m ³ Class 3	None proposed	Primary source for DPW; continued devel- opment recommended
5–41	E of highway (km 67 - 71), 20 km SW of Pine Point; access from highway	Outwash plain; gravelly sand	None identified	Class 4: 1,100,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5–42	W of highway (km 72), 20 km SW of Pine Point; access from highway	Glaciofluvial ridge; sandy gravel	None identified	Class 3: 230,000 m ³ (prospective)	None projected	None proposed	l abandoned pit; de- velopment not recom- mended at this time
5-43	SW of highway (km 76), 21 km SW of Pine Point; poor access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 840,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
5-44	3 km N of high- way (km 80), 20 km S of Pine Point; poor access along power line	Eolian dune complex; silt and sand	None identified	-	-	-	Development not recom- mended; reserves not estimated
5-45 (km 83.5)	E and W of high- way, 23 km S of Pine Point; access from highway	Beach ridges; sandy gravel	None identified	Class 2: 60,000 m ³ (proven) and 390,000 m ³ (probable)	15,000 m ³ Class 2; possibly some Class 3	None proposed	Existing pit; con- tinued development recommended

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA III

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments		
5-46	l km W of high- way (km 84.5), 25 km S of Pine Point; no access	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 1,500,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time		
5-47 (km 89.1)	E of highway (km 89), 29 km S of Pine Point; access from highway	Glaciofluvial ridge; sandy gravel	None identified	Class 2: 62,500 m3 (proven)	15,000 m ³ Class 2; possibly some Class 3	None proposed	Existing Highways pit; continued development recommended		
5-48	8 km W of high- way (km 93), 36 km SW of Pine Point; access via Sandy Lake road	Eolian dunes and ridges; silt and sand	Adjacent to Sandy Lake recreation area and boundary of Wood Buffalo National Park	-	-	-	Development not recom- mended; reserves not estimated		

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA IV

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Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
5-68 (Hill 2)	Along highway (km 214.5 - 216), 45 km W of Fort Smith; access from highway	Beach ridges on limestone high	300 m from Little Buffalo River	Class 3: 1,750,000m ³ (prospective)	None projecteĉ	None proposed	Development not recom- mended at this time, pending depletion of Deposits 5-69 and 5-70
5-69 (Hill 1)	Along and N of highway (km 229- 232), 34 km W of Fort Smith; access from highway and Foxhole Road	Beach ridges on limestone high	None identified	Class 3: 9,000,000m ³ (probable)	23,000 to 37,000 m ³ Classes 3 and 4	Additional testing recom- mended, to prove up reserves in future pit areas	Primary source for community of Fort Smith (four existing pits); continued development is recom- mended
5-70 (Salt Mountain; km 232.5)	Along highway (km 232.5 - 234.5), 32 km W of Fort Smith; access from highway	Beach ridges on limestone high	None identified	Class 3: 2,000,000m ³ (probable)	62,000 m ³ Class 2	Additional testing recom- mended, to prove up reserves in future pit areas	Highways maintenance source; continued de- velopment recommended

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA V

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Puture Work	Comments
6-1	2 to 3 km N of highway (km 2), 22 km SW of Pine Point; possible access via trail along railway	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 350,000 m ³ (prospective)	None projected	None proposed	2 abandoned pits; further development not recommended at this time
6–2	3.5 km N of high- way (km 4), 20 km SW of Pine Point; possible access via bush trails	Beach ridges on limestone high; gravelly sand	None identified	Class 4: 350,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
6-3	Along highway, 12 to 20 km W of Pine Point; access from highway	Outwash plain and ridges; sandy gravel and gravelly sand	None identified	Class 3 7,500,000m ³ (prospective)	None projected	Field testing recommended to determine material types and distri- bution	Development not recom- mended at this time
6-4	3 km N of high- way, 12 km W of Pine Point; access via mine haul roads	Beach ridges on limestone highs; gravelly sand	None identified	Class 4: 400,000 m ³ (prospective)	None projecteđ	None proposed	Development not recom- mended at this time
6-5	2 km N of high- way (km 13), 10 km W of Pine Point; access via mine haul roads	Glaciofluvial ridge; sandy gravel	None identified	Class 3: 375,000 m ³ (probable)	None projected	None proposed	l existing pit; con- tinued development, following mine closure, not recom- mended
6–6	l km N of high- way, 8 km W of Pine Point; no existing access	Beach ridges and spits; sandy gravel	None identified	Class 3: 650,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time

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AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA V

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
6-7	3 km N of high- way, 7 km W of Pine Point; access via mine haul roads and bush trails	Glaciofluvial ridges; sandy gravel	None identified	Class 3: 225,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
6-8	2 km N of high- way; 1.5 km W of Pine Point; access via bush trails	Glaciofluvial riðge; sandy gravel	None identified	Class 3: 400,000 m ³ (prospective)	None projected	None pr <i>o</i> posed	Development not recom- mended at this time
6-9	Along highway, 1 km W of Pine Point; access from highway	Beach ridge complex; sandy gravel	None identified	Class 2: 450,000 m ³ (prospective)	Up to 30,000 m ³ Class 1; possibly Class 2 for Town use	Field testing recommended to de- lineate aggregate distribution	Source of concrete aggregate for Manage- ment Areas II and V
6-10	l km S of Pine Point, along highway; access from highway	Beach ridges; sandy gravel	-	-	-	-	Deposit is long de- pleted; rehabilitation proposed
6-11	l km E of Pine Point; access from airport road	Beach ridges; sandy gravel	None identified	Class 2: 170,000 m ³ ; Class 3: 170,000 m ³ (both probable)	7,500 to 10,000 m ³ Class 2; 2,000 to 4,000 m ³ Class 3	Field testing recommended to outline distribu- tion of aggregate types and reserves	Aggregate source for Town of Pine Point; one of two pits is de- pleted (rehabilitation recommended)
6-12	N of highway, 4 to 13 km NW of Pine Point; some access from Dawson Landing road	Glaciofluvial plain and ridges; sandy gravel, some sand	None identified	Class 3: 2,700,000m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time

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AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA V

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
6-13	NW of highway, 15 to 20 km NE of Pine Point; access via bush trails	Beach ridges on limestone high; sandy gravel and and gravelly sand	Close to Great Slave Lake shoreline	Class 3: 1,950,000m ³ ; Class 4: 1,950,000m ³ (both pro- spective)	None projected	None proposed	Development not recom- mended at this time; distribution of material classes uncertain
6-14	W of highway, 20 to 25 km NE of Pine Point; access via bush trails	Beach ridges and lag deposits on limestone high; sandy	None identified	Class 3: 675,000 m ³ ; Class 4: 675,000 m ³ (both pro- spective)	None projecteđ	None proposed	Development not recom- mended at this time; distribution of material classes uncertain
6-15	Along highway (km 48.5 - 50.5) 25 km NE of Pine Point; access from highway	Lag deposit on limestone high; bouldery gravel	-	-	-	-	Development not recom- mended, since aggre- gate is expected to be very shallow and of poor quality
6-16	l - 2 km S of highway, 28 km SW of Fort Resolution; no access	Beach ridges; gravelly sand	None identified	Class 4: 190,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
6-17	<pre>1.5 km N of highway (km 59), 25 km SW of Fort Resolution; no access</pre>	Beach ridge and lag deposits on limestone high; sandy to bouldery gravel	Close to Great Slave Lake shoreline	Class 3: 280,000 m ³ (prospective)	None projected	None proposed	Development not recom- mended at this time
6-18 (km 62.4)	Along highway (km 61 - 63), 27 km S of Fort Resolution; access from highway	Lag deposits on limestone high; sandy gravel and limestone bedrock	None identified	Class 3: 500,000 m ³ (probable); 1,115,000 m ³ m ³ (prospec- tive Class 5: 2,250,000m ³ (probable)	25,000 m ³ Class 2	None proposed	l existing Highways Department pit (Class 2 aggregate produced by processing of bed- rock); continued de- velopment is recom- mended; prospective Class 2 and 4 reserves not delineated

AGGREGATE SUPPLY AND DEMAND MANAGEMENT AREA V

Deposit	Location/Access	Landform and Material	Environment and Development Concerns	Aggregate Supply	Aggregate Demand (1988-1992)	Future Work	Comments
6-19 (km 65.8)	Along highway (km 65 - 68), 20 km SW of Fort Resolution; access from highway	Beach ridge and lag deposits on limestone high; sandy to bouldery gravel	None identified	Class 2: 65,000 m3 (probable); Class 3: 280,000 m ³ , Class 4: 280,000 m ³ (both prospective)	7,500 m ³ Class 2	None proposed	Existing source of good quality aggre- gate; continued de- velopment is recom- mended
6-20 (km 74.5)	Along highway (km 72 - 75), 14 km S of Fort Resolution; access from highway	Lag deposit on limestone high; sandy to bouldery gravel	None identified	Class 3: 250,000 m ³ (probable)	None projecteđ	None proposed	2 existing pits; con- tinued development recommended
6-21	Along highway (km 83 - 84), 7 km S of Fort Resolution; access from highway	Beach ridge; silty sand	None identified	Class 4: 19,000 m ³ (probable)	None projected	None proposed	l existing small pit, now abandoned; renewed development not recom- mended at this time
6-22	N end of air- strip, Fort Resolution; good access	Beach ridge and lag deposit on limestone high; sandy to bouldery gravel and limestone bedrock	None identified s	Class 3: 380,000 m ³ (probable)	10,000 m ³ Class 3	None proposed	Existing pit is prim- ary source of Class 3 material; continued development is recom- mended
6-23	Mission Island, 3 km W of Fort Resolution; access along bush trails	Beach ridge and lag deposits on limestone high; sandy to bouldery gravel	Primary community recreation area	Class 3: 500,000 m ³ ; Class 4: 500,000 m ³ (both prospective)	None projected	None proposed	Development not recom- mended at this time
6-24	E of airstrip, Fort Resolution; good access	Beach ridge; silty sand	None identified	Class 4: 50,000 m ³ (probable)	20,000 m ³ Class 4	None proposed	Several pits (includ- ing depleted area used as nuisance grounds); continued development is recommended

APPENDIX B

BACKGROUND INFORMATION - MANAGEMENT AREA I



APPENDIX B

BACKGROUND INFORMATION - MANAGEMENT AREA I

General

Management Area I includes the areas to the east and west of Highway 1, between the Alberta border and the community of Enterprise. A total of 18 deposits have been identified, designated as Deposits 1-1 to 1-18; locations are shown on Drawing H2, Appendix H. Developed sources are situated on the west side of the Hay River.

Geological Setting

This section of the study area encompasses a portion of the lower Hay River valley and the terrain on either side. The upland areas consist of level to gently undulating ground moraine (till) plain underlain, generally at shallow depth, by Devonian carbonate bedrock. The till is overlain in places by glaciofluvial sand and gravel deposits and, close to Enterprise, by beach ridges and spits (again, consisting of sand and gravel). Permafrost is expected to occur beneath poorly drained areas of organic terrain. It is not anticipated to be present in the sand and gravel deposits, which have good surface drainage.

Environmental Concerns

Proximity to the Hay River appears to be the major environment related development concern. In the case of Deposit 1-16, located close to Louise Falls, the presence of Territorial Park facilities is a constraint to future expansion.

Organization of Appendix

Appendix B is organized in three parts. Firstly, a granular source description is presented for each deposit delineated in the area. Drawing Bl then shows the boundaries of and geological setting for Deposit 1-16. Finally, rehabilitation sketches plans are presented for the deposits that are considered to be depleted (or that are likely to be within the next 5 years). GRANULAR SOURCE DESCRIPTIONS, Deposits 1-1 to 1-18



Deposit 1-1 is a glaciofluvial ridge located, close to the Hay River, about 1 km east of Highway 1, at km 9 (Drawing H2). Prospective reserves are estimated at about $75,000 \text{ m}^3$ of Class 4 aggregate. Development is not recommended at this time.

Description

This source consists of a glaciofluvial ridge about 1000 m long and 200 m wide. It has not been investigated previously, but is expected to be composed of poorly graded gravelly sand (Class 4 aggregate). Its proximity to the Hay River channel may be a constraint to development from an environmental point of view. There is no existing access; development of access may be difficult since adjacent areas are cultivated.

Aggregate Supply

Prospective reserves are estimated at about 75,000 m^3 of Class 4 material, assuming an average recoverable thickness of 0.5 m. Test data are not available.

Aggregate Demand

No requirement to extract material from this source in the near future is anticipated.

Recommendation

Development of this deposit is not recommended at this time, due to the anticipated small reserves and relatively poor access.



This source was a glaciofluvial ridge deposit located about 2 km SW of Highway 2, at km 10 (Drawing H2). The deposit is now depleted and rehabilitation of the site is recommended.

Description

Deposit 1-2 was a glaciofluvial ridge, about 800 m long and up to 350 m wide, accessed in winter by means of a cut-line that intersects Highway 2 at about km 8.2. It lies about 200 m west of a large lake. The source apparently consisted of sandy gravel, and was developed by the Highways Department (likely following initial extraction related to development of a well site, to the southeast of the deposit). According to Highways personnel, this source is now depleted.

Aggregate Supply and Demand

Restoration and Rehabilitation

Field observations indicate that the granular materials at this site were extracted down to the underlying glacial till and, in some areas, below the seasonal water table. Since the topography of the pit floor is hummocky, some areas of ponded water have developed as a result. No stockpiles of topsoil and/or overburden (for use in restoration) were observed.

Restoration work at this site should consist primarily of grading and recontouring in the former pit area (Figure Bl shows a conceptual restoration plan). Objectives should be to eliminate pit floor depressions (that create ponding) and promote positive site drainage. If surface run off is discharged towards the lake, it will be necessary to construct a small settling pond, so that silt can settle out prior to discharge.

Recommendation

It is recommended that the Deposit 1-2 pit area should be rehabilitated. In view its distance from the highway, it is unlikely that this site will be developed for recreational or other uses; however, this should be discussed with interested parties.



Deposit 1-3 comprises a narrow glaciofluvial ridge, situated about 1.5 km west of Highway 2, between km 18 and 22 (Drawing H2). Prospective reserves are estimated at about 110,000 m³ of Class 4 aggregate. Development is not recommended at this time.

Description

This source consists of a low and narrow, esker-like glaciofluvial ridge, about 3500 m long and up to 200 m wide, located to the west of the highway, about 13 km north of the Alberta-N.W.T. border. Seismic lines in the area may provide winter access. Deposit 1-3 has not been investigated previously; it is expected to be composed of gravelly sand. No environment-related development constraints are identified.

Aggregate Supply

Assuming an average recoverable thickness of 0.5 m, prospective reserves are estimated at about $110,000 \text{ m}^3$ of Class 4 gravelly sand aggregate. Test data are not available.

Aggregate Demand

No demand for material from this deposit is expected in the near future.

Recommendation

Development of Deposit 1-3 is not recommended at this time. Field and laboratory testing are required prior to development, in the event it is considered.



Between km 19 and 20, Highway 1 traverses depleted Deposit 1-4 at Grumbler. It apparently consisted of a sandy gravel glaciofluvial ridge, and was worked out some considerable time ago (estimated in the order of 20 to 25 years). Since natural revegetation of the area is well advanced (and the former pit areas are flooded), additional rehabilitation work is not recommended.

Description

This deposit was a glaciofluvial ridge composed of sandy gravel that was originally developed in connection with railway and highway construction. As noted, it is now depleted, the former pit areas are flooded, and natural revegetation is well advanced. A homestead now occupies a portion of the site (close to the river bank).

Aggregate Supply and Demand

Restoration and Rehabilitation

Natural revegetation of the pit area is well advanced. It is not considered that additional work is warranted.

Recommendation

Further restoration and rehabilitation work is not recommended.



Deposit 1-5 comprises a number of sandy outwash plain areas located west of Highway 1 in the Goose Egg Lakes area (Drawing H2). Airphoto interpretation and field observations suggest that these deposits consist predominantly of gravelly sand; prospective reserves are estimated at about 800,000 m³ of Class 4 aggregate. Development is not recommended at this time.

Description

Deposit 1-5 consists of a series of outwash plain deposits located up to 3 km west of the highway, between km 28 and 34. Access is presently available only to those segments of the deposit that are close to the highway. Deposit 1-5 has not been investigated previously; it is expected to be composed predominantly of gravelly sand.

Aggregate Supply

Prospective reserves are estimated at in the order of $800,000 \text{ m}^3$ of Class 4 material. Test data are not available. It is assumed that the average recoverable thickness is about 0.5 m.

Aggregate Demand

No demand is identified for Class 4 material from this deposit at the present time.

Recommendation

Development of Deposit 1-5 is not recommended at this time. Field and laboratory testing will be required in the event it is considered.



This source comprises an extensive area of glaciofluvial outwash deposits, located on the east side of the Hay River and 2 to 5 km east of Highway 1, between km 24 and 35 (Drawing H2). Reserves are estimated at about $4,500,000 \text{ m}^3$ of Class 4 gravelly sand (prospective). Deposit 1-6 is not recommended for development at this time.

Description

Deposit 1-6 comprises an extensive group of sandy outwash plain deposits, distributed within an area about 10,000 m long and up to 5,000 m wide; individual segments are separated by organic bog terrain and access is poor. Although test data are not available, airphoto interpretation suggests that the deposit likely consists predominantly of gravelly sand. Deposit 1-6 has not been investigated previously.

Aggregate Supply

Prospective reserves are estimated in the order of $4,500,000 \text{ m}^3$ of Class 4 aggregate. This assumes an average recoverable thickness of 0.5 m. High water table conditions are expected to limit recoverable reserves.

Aggregate Demand

No demand for material from this source is anticipated in the near future.

Recommendation

Development of Deposit 1-6 is not recommended at this time. In the event it is considered, field and laboratory testing should be undertaken to confirm material type and distribution.



This source comprises a series of glaciofluvial outwash plain deposits, expected to consist of gravelly sand. It is located east of the Hay River and of Highway 1, between about km 40 and 50 (Drawing H2). Prospective reserves, of Class 4 aggregate, are estimated at about $1,200,000 \text{ m}^3$. At this time, development is not recommended.

Description

Deposit 1-7 consists of a series of outwash plain deposits, expected to be comprised predominantly of gravelly sand, that lies 2 to 3 km east of Highway 1. Access, in winter only, would be poor. No environmental concerns, that would preclude development, are identified. Deposit 1-7 has not been investigated previously.

Aggregate Supply

Assuming an average recoverable thickness of 0.5 m, prospective reserves are estimated in the order of 1,200,000 m³ of Class 4 material. Test data are not available.

Aggregate Demand

There is no demand for material from this deposit at the present time.

Recommendation

Development of Deposit 1-7 is not recommended at this time. In the event it is considered, field and laboratory testing will be required to confirm material type and prove up reserves.



Deposit 1-8 comprised a group of glaciofluvial outwash deposits situated along Highway 1 and the C.N.R. in the area of and north of Swede Creek (Drawing H2). This source is now considered to be depleted. Restoration and rehabilitation of the various pit areas is recommended.

Description

This source comprised a series of glaciofluvial outwash deposits, composed of sandy gravel, located along and to the west of the highway, between km 40 and 43. Three existing pit areas that were developed within the deposit are now depleted.

Aggregate Supply and Demand

Restoration and Rehabilitation

Surveys indicate that the granular material has been extracted down to the level of the surrounding terrain. Some ponded water is present where deeper excavations have been made. In one pit area, on the east side of the highway, a small windrow of stockpiled topsoil and/or overburden was observed.

A conceptual sketch showing restoration and reclamation recommendations is shown on Figure B2. Once possible end uses have been considered (the pit areas adjacent to Highway 1 may be suitable for a number of uses), restoration work should consist primarily of site grading and contouring. The objective would be to eliminate areas of ponded water (the deeper excavations will likely have to be retained) and promote positive drainage. Finally, the limited available stockpiled topsoil and/or overburden materials should be spread over the pit areas. It is anticipated that national revegetation should be relatively rapid.

Recommendation

Rehabilitation of the depleted pit areas is recommended.



Deposit 1-9 includes three glaciofluvial ridges located a short distance east of the Hay River and less than 1 km east of Highway 1 (between km 43 and 45), some 35 km southwest of Enterprise (Drawing H2). Reserves are estimated at $180,000 \text{ m}^3$ of gravelly sand (prospective). Development is not recommended at this time.

Description

This source comprises three southwest-northeast trending glaciofluvial ridges, each up to 700 m long and 250 m wide. Airphoto interpretation suggests that they are composed of gravelly sand; no other information is available, since Deposit 1-9 has not been investigated previously. One segment of the deposit is situated adjacent to the Hay River; no other environmental concerns are identified. Access is poor but may be feasible in winter along existing cut lines.

Aggregate Supply

Reserves are estimated at about $180,000 \text{ m}^3$ of Class 4 material (prospective), assuming an average recoverable thickness of 0.5 m.

Aggregate Demand

There is not likely to be a demand for material from this source in the near future.

Recommendation

Development of Deposit 1-9 is not recommended at this time. In the event it is considered, field and laboratory testing will be reguired to confirm material type and distribution.



Deposit 1-10 includes two small glaciofluvial ridges, from which aggregate has been extracted in the past. The ridges are located along the CNR, 400 m to 500 m west of the highway at about km 45 (Drawing H2). Remaining reserves are estimated at about 4,000 m³ of Class 3 material. Continued development is recommended, to deplete the deposit and permit rehabilitation to proceed.

Description

This source comprises two small outwash ridges that were opened up in connection with construction of the CNR, and have continued to be used for ongoing track maintenance and upgrading. The aggregate is expected to consist of sandy gravel and to be shallow; no test data are available. Presently, access from the highway is limited. Environmental constraints to development are not identified.

Aggregate Supply

Based on discussions with GNWT Highways personnel, it is estimated that only about 4000 m^3 of Class 3 material remains (in the western section of one of the ridges). These are considered to be "probable" reserves.

Aggregate Demand

No demand to extract material specifically from Deposit 1-10 is projected in the near future (based on discussions with users); however, it is recommended that the remaining material should be extracted as soon as possible so that the source may be rehabilitated.

Restoration and Rehabilitation

Materials extraction is recommended to continue until the deposits are depleted (i.e. until the seasonal water table is encountered). Topsoil and/or overburden should be stockpiled as the material is extracted; no existing topsoil or overburden stockpiles were observed.

Restoration and rehabilitation work should consist of site grading and contouring, to eliminate terrain depressions and ponding of surface water, and spreading of available topsoil and overburden materials. Figure B3 is a conceptual sketch illustrating these recommendations.

Recommendation

Continued extraction is recommended so that rehabilitation may take place, once the deposit is depleted.

This deposit was a small glaciofluvial ridge, now depleted, located about 600 m east of Highway 1 at km 48 (Drawing H2). The former pit area is now used by GNWT Highways as a crushing and stockpile site, with access from the highway. Continued utilization of the former pit area as a stockpile and crushing site is recommended.

Description

Deposit 1-11 was a small glaciofluvial ridge, likely comprised of sandy gravel. The former pit area is now used as a crushing and stockpiling site by the Highways Department.

Aggregate Supply and Demand

Restoration and Rehabilitation

Recent (October, 1987) observations indicate that surface drainage of the site is relatively poor, with a number of areas of ponded water (including areas where material was extracted below the water table). Several topsoil and/or overburden material stockpiles are also present; these are well vegetated and appear to be old.

The former pit area is being utilized by Highways as a crushing/ stockpile site, and any restoration measures should be undertaken in conjunction and co-operation with this department. A conceptual sketch, showing suggested restoration and rehabilitation procedures, is presented on Figure B4. These may include: site grading and to improve surface drainage (particularly in the stockpile areas) and spreading of stockpiled topsoil and/or overburden materials in areas that are not used for the crushing operation and stockpile sites.

Recommendation

Restoration of the pit area and continued utilization as a crushing/stockpiling site are recommended.


GRANULAR SOURCE DESCRIPTION DEPOSIT 1-12

Deposit 1-12 comprises a series of glaciofluvial outwash plain deposits on the east side of the Hay River, 1 to 3 km east of Highway 1, between km 47 and 53 (Drawing H2). Reserves are estimated at about 1,000,000 m³ of Class 4 aggregate (prospective). At this time, development is not recommended.

Description

This source includes a group of shallow glaciofluvial plain deposits, anticipated to consist predominantly of gravelly sand. At present, access across the river and into the area is poor; a number of seismic lines may provide winter access (individual segments of the deposit are surrounded by organic terrain). Deposit 1-12 has not been investigated previously. No environmental constraints to development are identified.

Aggregate Supply

Prospective reserves are estimated in the order of $1,000,000 \text{ m}^3$ of Class 4 aggregate, assuming an average recoverable thickness of 0.5 m (above till or bedrock and/or water table).

Aggregate Demand

No demand for material from this source is foreseen in the near future.

Recommendation

Development of Deposit 1-12 is not recommended at this time. However, if extraction is considered in the future, testing should be carried out to confirm material type and distribution.



GRANULAR SOURCE DESCRIPTION DEPOSIT 1-13

This deposit consists of three areas of sandy glaciofluvial outwash plain, located along Highway l between km 57 and 60 (Drawing H2). A number of pits were developed during railway construction; these are now abandoned. Remaining reserves are estimated at about $300,000 \text{ m}^3$ of Class 4 material (prospective). Renewed development is not recommended at this time.

Description

This source consists of a group of sandy glaciofluvial plain deposits that are traversed by the highway and CNR about 20 km south of Enterprise. Access is available from the highway and a number of small shallow pits (now abandoned) were developed during railway construction. Deposit 1-13 has not been investigated previously, so that testing data are not available. Environmental constraints to development are not identified.

Aggregate Supply

This deposit is expected to consist of gravelly sand; prospective remaining reserves are estimated at about $300,000 \text{ m}^3$ of Class 4 aggregate (assuming an average recoverable thickness of 0.5 m).

Aggregate Demand

No demand for material from this source is anticipated in the near future.

Recommendation

Renewed development of Deposit 1-13 is not recommended at this time.



GRANULAR SOURCE DESCRIPTION DEPOSIT 1-14

Deposit 1-14 is an alluvial terrace located adjacent to the Hay River about 1.5 km east of Highway 1 at km 62 (Drawing H2). Prospective reserves are estimated at $300,000 \text{ m}^3$, probably of Class 3 aggregate. Development is not recommended at this time.

Description

Deposit 1-14 consists of a large alluvial terrace located within a meander of the Hay River about 17 km southwest of Enterprise. At present, there is no access into the area and the deposit has not been investigated previously. It is expected to consist of silty to sandy gravel, likely overlain by relatively thick silty overburden. Proximity of the terrace to the Hay River may be a constraint to development, from the environmental point of view (requiring buffer zones, in the event development is considered).

Aggregate Supply

This source is expected to be comprised of silty and sandy gravel; reserves are estimated at about $300,000 \text{ m}^3$ of Class 3 material (prospective), assuming an average of 1 m is recoverable. Due to the lack of data on the characteristics of the deposit, this assessment is tentative.

Aggregate Demand

No requirement to extract material from this deposit is foreseen in the near future.

Recommendation

Development of Deposit 1-14 is not recommended at this time. Field and laboratory testing is required, if it is considered, to confirm material type and reserves, overburden thickness, etc.



GRANULAR SOURCE DESCRIPTION DEPOSIT 1-15 (DPW km 66.6)

Deposit 1-15, a former granular aggregate source that, on depletion, was developed as a limestone rock guarry, is located on the west side of Highway 1, between km 66 and 67 (Drawing A2). Reserves are estimated to be at least 1,500,000 m³ of Class 5 material (suitable for processing, and blending with sand, to produce Class 2 or 3 aggregate). Continued development is recommended.

Description

This source is the primary source of highway maintenance and construction material in Management Area I. It comprises a limestone bedrock quarry, developed on the site of a former gravel pit between Highway 1 and the CNR, about 14 km southwest of Enterprise. The limestone bedrock has been tested in the laboratory by Geocon (1986). Available airphoto coverage is not adequate to produce a mosaic site plan for the deposit. Deposit 1-15 is accessible directly from the highway. Recent observations (in October, 1987) indicate that the guarry is now flooded. No environmental constraints to continued development are identified.

Aggregate Supply

Testing to date indicates that the crushed limestone may be blended with sand (from Deposit 1-16) to produce Class 2 or 3 aggregate (at a ratio of 4 parts crushed limestone to 1 part sand). According to Geocon (1986), the crushed limestone has an L.A. Abrasion loss of 20 to 26 percent and Sulphate Soundness losses (for five cycles) of 4.1 percent (coarse) and 15.6 percent (fine). Probable reserves are difficult to estimate but anticipated to be at least 1,500,000 m³ of Class 5 material (assuming a 5 m deep quarry).

It is understood that the performance of trial highway sections surfaced with the blended product has not been entirely satisfactory to date (with some deterioration of the surface). In the event that this is the case, it will be necessary to search farther afield in the future for additional sources of naturally occurring granular aggregate. Areas of possible interest would include areas to the east of the Hay River (where deposits appear to consist primarily of sand) and to the west of Highway 1.

Aggregate Demand

Over the next five years, it is expected that limestone will be extracted from Deposit 1-15 for processing to produce up to 212,000 m^3 of highway construction and maintenance aggregate. It appears that all the Highways requirements in Management Area I will be met from this source.



Recommendation

Continued development of this deposit as the prime source of highway construction and maintenance material in Management Area I is recommended (provided that performance of the blended aggregate product proves to be satisfactory).



GRANULAR SOURCE DESCRIPTION DEPOSIT 1-16 (DPW km 77.2)

This is an extensive deposit of uniform clean sand, located along Highway 1 between km 74.5 and 77.5 (Drawing H2). A number of borrow pits have been developed, including a DPW sand pit at km 77.2; continued development is recommended. Remaining reserves are estimated in the order of 350,000 m³ of Class 4 aggregate.

Description

This source is located 5 to 8 km southwest of Enterprise. Drawing Bl shows the boundaries of the deposit and geological setting. It is the source of sand for blending with crushed limestone from Deposit 1-15 to produce aggregate for road maintenance and construction. Limited laboratory testing has been carried out by Geocon (1985). A GNWT Highways pit exists at km 77.2; it is accessible from the highway. Future development of this source is constrained on the south by the presence of the Louise Falls park facilities.

Aggregate Supply

Probable remaining reserves are estimated at about $350,000 \text{ m}^3$ of clean sand (Class 4) aggregate. Testing by Geocon indicates that the material is fine grained and poorly graded, with a fines content of 3 to 4 percent.

Aggregate Demand

Demand for blend sand from this source over the next five years is expected to range from about $13,000 \text{ m}^3$ to $53,000 \text{ m}^3$ (assuming it is blended in the ratio: 1 part sand to 4 parts crushed limestone).

Recommendation

Continued development of Deposit 1-16 as a source of blend sand is recommended.



GRANULAR SOURCE DESCRIPTION DEPOSIT 1-17

This deposit, comprising a complex of beach ridges, forms an eastward continuation of Deposit 1-18, across the Hay River valley from Enterprise (Drawing H2). Prospective reserves are estimated at about 1,500,000 m³ of shallow and sporadically distributed Class 3 aggregate. Development is not recommended at this time.

Description

This source consists of an extensive complex of northwest-southeast trending beach ridges, laid down close to the highest level of Glacial Lake McConnell. It extends eastward on the east side of the Hay River at Enterprise. Airphoto interpretation suggests that individual ridges are often narrow and discontinuous (similar to Deposit 1-18), and it is expected that the granular materials will be thin and sporadic. This source has not been investigated previously. There is no good existing access.

Aggregate Supply

The granular resources of Deposit 1-17 are expected to be thin and discontinuous. Prospective reserves are estimated at about 1,500,000 m^3 of sporadically distributed Class 3 material.

Aggregate Demand

No requirement to obtain aggregate from this source is identified at this time.

Recommendation

Development of Deposit 1-17 is not recommended at this time. Should it be considered in the future, field and laboratory testing will be required to determine material type and distribution within this shallow and discontinuous deposit.



GRANULAR SOURCE DESCRIPTION DEPOSIT 1-18

Deposit 1-18 is traversed by Highway 1 for a distance of about 7 km west of Enterprise (Drawing H2). It consists of sandy gravel beach ridges, within which the granular aggregates are thin and often sporadically distributed. The deposit is considered to be essentially depleted. Rehabilitation is recommended.

Description

Deposit 1-18 comprises a complex of beach ridges extending northwestwards from Enterprise. These deposits were laid down near to the highest level of Glacial Lake McConnell, and consist of shallow and discontinuous sandy gravel. Discussions with users indicate that the deposit is essentially depleted (of granular aggregate occurring in thicker accumulations that would warrant development).

Aggregate Supply and Demand

Restoration and Rehabilitation

Recent observations suggest that the existing main pit area along Highway 1 is essentially depleted. Some limited areas of ponded water are present. No stockpiles of topsoil or overburden material suitable for use in restoration were observed. The pit is being used as a crushing and stockpiling site by DPW.

Figure B5 presents a conceptual sketch showing suggested site restoration and rehabilitation measures. Since topsoil and overburden materials are apparently lacking, it is envisaged that rehabilitation will consist primarily of site grading and contouring. This should aim to eliminate areas of ponded water and promote positive site drainage, as well as blend the pit area boundaries into the surrounding terrain. Site rehabilitation should be carried out with continuing GNWT Highways involvement, so that utilization as a stockpile site continues.

Recommendation

It is recommended that existing pit areas should be rehabilitated. The existing crushing and stockpile site west of Enterprise should continue to be used for this purpose.



SITE PLAN , DRAWING B1

,







- consider end uses
- grade site, to eliminate ponding and contour
- pit walls
- promote positive drainage
 encourage natural revegetation

	DEPARTMENT OF SUPPLY AND SERVICES	DRAWN IOJ/VV
	CONCEPTUAL RECLAMATION SKETCH	DATE NOVEMBER, 1987 APPROVED FMM
	DEPOSIT 1-2	SCALE N.T.S.
	SOUTH SLAVE GRANULAR STUDY	FILE No 16-5-38
THURBER	CONSULTANTS LTD., Geotechnical Engineers	DRAWING No B1



- consider end uses
- grade site, to eliminate ponding
- promote positive drainage
 encourage natural revegetation

DEPARTMENT OF SUPPLY AND SERVICES	DBAWN IGJ/VV
CONCEPTUAL RECLAMATION SKETCH	DATE NOVEMBER, 1987 APPROVED
DEPOSIT 1-8	SCALE N.T.S.
SOUTH SLAVE GRANULAR STUDY	FILE No 16-5-38
THURBER CONSULTANTS LTD., Geotechnical Engineers	DRAWING No B2



- consider end uses
- grade depleted area to eliminate ponding
- strip remaining reserves and replace topsoil/ overburden on depleted area and stockpile
- deplete remaining reserves
- replace stockpiled topsoil/overburden
- promote positive drainage
- encourage natural revegetation

	DEPARTMENT OF SUPPLY AND SERVICES	DBAWN IGJ/YY
	CONCEPTUAL RECLAMATION SKETCH	APPROVEDLINU
	DEPOSIT 1-10	SCALE N.T.S.
	SOUTH SLAVE GRANULAR STUDY	FILE No 16-5-38
THURBER	CONSULTANTS LTD., Geotechnical Engineers	DRAWING No B3



- grade site, to eliminate ponding and establish stockpile pads
- promote positive drainage
- -replace available topsoil and overburden
- encourage natural revegetation

DEPARTMENT OF SUPPLY AND SERVICES	DRAWN IGJ/VV
A Charles and a state of the st	NOVEMBER, 1987
	APPROVED INUL
n var var var seneral s Nordal seneral s	N.T.S.
SOUTH SLAVE GRANULAR STUDY	16-5-38
THURBER CONSULTANTS LTD., Geotechnical Engineers	DRAWING No B4



- grade site, to eliminate ponding promote positive drainage encourage natural revegetation

DEPARTMENT OF SUPPLY AND SERVICES	IGJ/YY
CONCEPTUAL RECLAMATION SKETCH	DATE NOVEMBER, 1987 APPROVED
DEPOSIT 1-18	SCALE N.T.S.
CONSULTANTS LTD., Geotechnical Engineers	16-5-38 DRAWING No B5

APPENDIX C

BACKGROUND INFORMATION - MANAGEMENT AREA II



APPENDIX C

BACKGROUND INFORMATION - MANAGEMENT AREA II

General

Management Area II includes the community of Hay River and areas adjacent to Highway 2 and Highway 5 (as far east as the Buffalo River crossing). In all, 43 deposits have been delineated; locations are shown on Drawings H2 and H3, Appendix H. The deposits are identified as Deposits 2-1 to 2-11 (along Highway 2) and 5-1 to 5-32 (along Highway 5).

Geological Setting

The northern section of the South Slave Region comprises a level to gently undulating plain, developed on glaciolacustrine silts and clays, deposited in Glacial Lake McConnell. The glaciolacustrine sediments are underlain by silty clay till. In general, surface drainage is fair to poor, particularly in organic-infilled terrain depressions, and permafrost is widespread.

The granular sources dominantly consist of sandy to bouldery gravel glaciofluvial ridges and beach ridge and lag deposits (on bedrock topographic highs). Generally, the aggregate sources rise above the surrounding terrain and have fair to good surface drainage. Permafrost is not expected to exist in the granular deposits.

Environmental Concerns

In a limited number of cases, proximity to surface drainage courses may be a concern from an environmental point of view. Development of a source located on the Hay River Indian Reserve and two others close to Great Slave Lake is not recommended.

Organization of Appendix

Organization of Appendix C is in three parts. Firstly, granular source descriptions are provided. Photomosaic plans are then presented on Drawings Cl to C8, showing the geological setting and deposit boundaries, for sources that are developed or likely to be developed within the next five years. Finally, sketch plans showing restoration and rehabilitation recommendations are provided.



A. HIGHWAY 2 (ENTERPRISE TO HAY RIVER)

GRANULAR SOURCE DESCRIPTIONS - DEPOSITS 2-1 TO 2-11



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-1 (HR-100)

Deposit 2-1 comprises a complex of beach ridges located, to the west of Highway 2, about 5 km north of Enterprise (Drawing H2). The source is considered to be essentially depleted, and a portion is utilized as the nuisance grounds for the community of Enterprise. It is recommended that this site be rehabilitated, and utilization for waste disposal should continue.

Description

This source consisted of a discontinuous series of beach ridges, forming a complex about 3200 m long and up to 1100 m wide, laid down in Glacial Lake McConnell close to its highest level. Good access is available from the highway. Field and laboratory testing were carried out previously by Ripley, Klohn & Leonoff (1974) and reserves of material, suitable for use as general fill or, with processing, as asphalt and concrete aggregate, were identified. Deposit 2-1 is now considered to be more or less depleted.

Aggregate Supply

Discussions with users and managers indicate that any remaining reserves are likely to consist of small volume pockets of (Class 4) gravelly and silty sand. Field observations, in October 1987, suggest that small volume extraction of this type of material is continuing in the western part of the deposit.

Aggregate Demand

Future demand for low quality material from Deposit 2-1 is expected to be very low to negligible.

Restoration and Rehabilitation

At the present time, pit floor areas of this deposit are uneven and some areas of ponded water are present (where extraction took place below the water table). No stockpiled topsoil and/or overburden materials are apparently present. An area in the eastern section is used for domestic waste disposal.

It is recommended that an area suitable to meet community waste disposal requirements should be identified and that the remaining pit areas should then be rehabilitated. Drawing Cl presents a conceptual sketch showing proposed restoration measures. In the absence of stockpiled topsoil and overburden materials, these should consist primarily of grading and recontouring, to eliminate depressions in the



pit floor (that may be subject to ponding) and blend the pit boundaries into the surrounding terrain. It is likely that the existing ponded areas will have to be retained. Natural revegetation of the rehabilitated areas is expected to be relatively rapid.

Recommendations

Since the source is essentially depleted, restoration and rehabilitation are recommended to proceed. Small volume local demands for low quality (Class 4) fill material continue to be met from the deposit. An area for waste disposal should be delineated.



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-2 (HR-118)

Situated about 8 km northwest of Enterprise, Deposit 2-2 forms a westward continuation (across the railway) of Deposit 2-1 (Drawing H2). It is estimated to contain reserves of about $610,000 \text{ m}^3$ of poorly graded sand and gravel (Class 3) aggregate. This source is undeveloped; development is not recommended until such time as/if large volumes of general fill material are required.

Description

This source, situated west of the CNR and about 8 km northwest of Enterprise, comprises a beach ridge complex, about 6200 m long and up to 500 m wide. The site is well drained and permafrost is expected to be absent. Field and laboratory testing by Ripley, Klohn & Leonoff (1974) identified reserves of poorly graded gravel and sand, suitable for use as general fill (Class 3). The deposit is thin, averaging about 1 m thick; it was noted that the underlying till might also be suitable for use as fill.

Aggregate Supply

Deposit 2-2 constitutes a source of low quality granular aggregate in the Enterprise area. It is presently undeveloped but could be accessed readily via a continuation of the Deposit 2-1 access trail (construction of a railway crossing would be required). Probable reserves were estimated, by Ripley, Klohn & Leonoff (1974), at 610,000 m^3 of Class 3 material.

Aggregate Demand

No requirement is identified to obtain material from this source at this time.

Recommendation

Development of Deposit 2-2 is not recommended at this time. Should future development be considered, additional field testing would be required to determine the detailed distribution of granular aggregate (which is erratic, based on testing to date).



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-3 (HR-114, HR-115, HR-116)

Deposit 2-3 consists of a group of beach ridges, located west of Highway 2 about 10 km north of Enterprise (Drawing H2). These deposits are composed of well to poorly graded sand, suitable for use as general fill. The southernmost ridge (HR-116) has been depleted; probable remaining reserves are estimated, in the source as a whole, at about 340,000 m³ of Class 4 aggregate.

Description

Deposit 2-3 comprises three narrow beach ridges (or glaciofluvial ridges, modified by beach formation), that are up to 2,000 m long and 200 m to 500 m wide. These sources are 2.5 km to 3 km west of Highway 2 (between kms 11 and 13), and accessible in winter along existing cleared trails. The deposit was investigated, as Sources HR-114 to 116, by Ripley, Klohn & Leonoff (1974), and found to consist of well to poorly graded sand, with minor gravel. The southernmost ridge, previously identified as Source HR-116, is now depleted. Environment constraints to development of the remaining ridges are not identified.

Aggregate Supply

Approximately 340,000 m³ of Class 4 material (gravelly sand) is estimated to remain. According to Ripley, Klohn & Leonoff, the material is suitable only for use as general fill; petrographic analyses indicated that it is unsuitable for use in concrete.

Aggregate Demand

Discussions with users and managers suggest that there will likely be no requirement to extract material from the undeveloped areas of this source over the next five years. However, GNWT Highways expected to renew extraction from Deposit 2-3 in the long term.

Restoration and Rehabilitation

Recent observations indicate that site grading and surface drainage improvements were carried out following depletion of the HR-116 portion of the deposit. It is not considered that additional restoration and rehabilitation work is requied at this time. Rather the former pit area should be permitted to revegetate naturally.

Recommendation

Deposit 2-3 should to be used as a source of Class 4 aggregate as future demand dictates (ie. when requirements are identified in the southern part of Management Area II).



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-4

This source comprises two small beach ridges, located west of Highway 2 (km 7), about 7.5 km north of Enterprise (Drawing H2). Prospective reserves are estimated at about 75,000 m³ of sand. Development is not recommended at this time.

Description

Deposit 2-4 consists of two beach ridges up to 1700 m long and 150 m wide, that are expected to be composed of shallow sand. The more southerly ridge is traversed by the highway at km 8.2 (where a small pit, now abandoned, was previously developed), while the other ridge is situated a short distance west of the highway. This deposit has not been investigated previously. No environmental constraints to development are identified.

Aggregate Supply

Prospective reserves are estimated at about 75,000 m³ of Class 4 aggregate, assuming a recoverable average thickness of 0.5 m.

Aggregate Demand

No demand for material from this source is anticipated in the near future.

Recommendation

Development of Deposit 2-4 is not recommended at this time.



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-5

Deposit 2-5 comprises a limestone bedrock quarry, apparently abandoned, and a sandy gravel alluvial terrace deposit, now depleted. These sources are located about 6.5 km north of Enterprise on the east side of Highway 2 (Drawing H2). Both areas are considered to be candidates for restoration and rehabilitation.

Description

As noted, Deposit 2-5 has two parts: a limestone quarry, excavated into the Hay River valley wall, and an alluvial terrace deposit. Neither area was investigated previously. The borrow pit is now essentially depleted and the quarry, it is understood, is abandoned due to environmental concerns.

Aggregate Supply and Demand

Restoration and Rehabilitation

Recent (October 1987) field observations indicate that:

- the rock quarry was cleaned up prior to abandonment but that the pit floor is uneven (resulting in some minor ponding), while
- . in the alluvial terrace pit, small volumes of material remain (in isolated pockets), the pit floor is uneven with some ponding of surface water, and stockpiles of topsoil and/or overburden materials are not available.

Experience has shown that rehabilitation of rock quarries in the north is very difficult unless large volumes of overburden and topsoil are available that can be replaced in the quarry area to promote revegetation. In this case, it is recommended that consideration be given only to grading of the pit floor, to eliminate ponding and promote positive site drainage. At the same time, the site has potential, due to its location (overlooking the Hay River Valley), to be developed as a scenic lookout, and possible end uses should be identified prior to rehabilitation.

Since reclamation materials are not available, rehabililitation of the borrow pit area should consist primarily of site grading and contouring. This should aim to eliminate low spots in the pit floor (and, thus, ponding of surface water) and blend the pit boundaries



into the surrounding terrain. Any remaining small volumes of material should be salvaged at that time. A conceptual sketch showing these measures is presented on Figure C2.

Recommendation

Restoration and rehabilitation of the two areas is recommended.



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-6 (HR-120)

This source comprises a series of beach ridges, situated close to Highway 2 about 22 km south of Hay River (Drawings H2 and H3). The ridges consist of poorly graded sand, suitable for use as general fill; prospective reserves are estimated at about 225,000 m³ of Class 4 aggregate. Development is not recommended at this time.

Description

Deposit 2-6 consists of a group of six east-west trending narrow beach ridge deposits, that are up to 2,000 m long and 150 m wide. These aggregate sources are accessible only in winter, via existing trails. Previous investigations indicate that the ridges consist of poorly graded sand (Ripley, Klohn & Leonoff, 1974), suitable only for use as general fill (Class 4). No environmental concerns are identified relative to future development of these deposits.

Aggregate Supply

Based on limited field testing, Ripley, Klohn & Leonoff (1974), estimated that some $225,000 \text{ m}^3$ of Class 4 material was available. This estimate assumed an average recoverable thickness of 0.9 m and minimal overburden, and is considered to be prospective.

Aggregate Demand

No requirement to obtain material from this source in the near future is identified.

Recommendation

In view of the extensive clearing and restoration that would be required to obtain a relatively small volume of material, development of Deposit 2-6 is not recommended at this time.



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-7

Deposit 2-7 includes a group of beach ridges, located east of the Hay River between 15 km and 19 km southwest of Hay River (Drawing H5). The ridges are expected to consist of sand, with prospective reserves estimated at about 150,000 m³ of Class 4 aggregate. Development is not recommended at this time.

Description

This source comprises a group of narrow beach ridges, situated on the east side of the Hay River. There is presently no access, although bush trails may provide winter access. Deposit 2-7 has not been investigated previously. It is expected to consist of sand, probably silty and of relatively poor guality for use as aggregate. No environmental constraints to development are identified.

Aggregate Supply

Assuming an average 0.5 m recoverable thickness above till and/or water table, prospective reserves are estimated in the order of 150,000 m³ of Class 4 aggregate.

Aggregate Demand

At this time, no requirement to extract material from this source in the near future is identified.

Recommendation

Development of Deposit 2-7 is not recommended at this time, due to poor access and likely difficulties in developing the narrow and widely distributed individual ridges.



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-8 (HR-117A)

Deposit 2-8 was a small volume source of silty alluvial sand, suitable for use as low quality fill. It was located, on an alluvial terrace of the Hay River, about 15 km south of the community on the east side of Highway 2 (Drawing H3). The deposit is now depleted.

Description

This source comprised part of a low-level alluvial terrace of the Hay River. Limited field testing indicated that the deposit consisted of silty sand and sandy silt (Ripley, Klohn & Leonoff, 1974). Deposit 2-8 is now depleted.

Aggregate Supply and Demand

Restoration and Rehabilitation

The former sand pit area was restored during development of a golf course at the site.

Recommendation

Deposit 2-8 has already been rehabilitated during golf course development; no further work is expected to be required.



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-9 (HR-104A)

Deposit 2-9 comprises a group of beach ridges, located 3 to 9 km west of the community of Hay River (Drawing H3). The deposits consist of silty fine sand, that is locally organic-rich; groundwater levels are high. Estimated reserves are 225,000 m³ of Class 4 material; development is not recommended.

Description

This source comprises a series of narrow beach ridges, situated from 3 to 9 km west of Hay River, that are accessible via an existing gravel trail past the Town sewage lagoon. The ridges consist of silty fine sand, typically have high groundwater table conditions and are separated by muskeg areas. Deposit 2-9 is located close to Great Slave Lake and within an area that is used intensively for recreation by the community. It is undeveloped, and was investigated previously by Ripley, Klohn & Leonoff (1974).

Aggregate Supply

Ripley, Klohn & Leonoff (1974) identified probable reserves of about 225,000 m³ of low quality general fill material (Class 4). Development was not recommended, due to the high silt content and limited material thickness above water table.

Aggregate Demand

No demand for material from this source is anticipated in the near future. There is a limited requirement for Class 4 material in the Hay River area and fine aggregate of superior quality can be obtained from the existing Town of Hay River sand pit (in Deposit 2-11).

Recommendation

Development of Deposit 2-9 is not recommended.



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-10 (HR-103)

This source comprises a series of beach ridges, located 6 to 11 km west of Hay River (Drawing H3). It consists of fine sand, with variable silt content, suitable for use as general fill; probable reserves are estimated at about $300,000 \text{ m}^3$ of Class 4 material. Development is not recommended at this time.

Description

Located between 6 and 11 km west of Hay River, Deposit 2-10 consists of a group of sub-parallel beach ridges and is accessible via an existing gravel trail past the Town sewage lagoon. The beach ridges are composed of fine silty sand, suitable for use as general fill (Class 4). In general, material thicknesses above water table are shallow (less than 1.2 m on average) and the depressions between ridges are infilled with organics. As with Deposits 2-9 and 2-11, this source is situated close to Great Slave Lake, in an area that is used for recreation. Presently, it is undeveloped.

Aggregate Supply

Previous field and laboratory testing, by Ripley, Klohn & Leonoff (1974), identified probable reserves of about 300,000 m³ of Class 4 aggregate. Development of this source was assigned a low priority.

Aggregate Demand

Although Deposit 2-10 has potential as a source of low quality fill, the present limited demand can readily be met from the Town pit in Deposit 2-11. For this reason, the demand for material from this source over the next five years is anticipated to be nil.

Recommendation

Development of Deposit 2-10 is not recommended.



GRANULAR SOURCE DESCRIPTION DEPOSIT 2-11 (HR-101, HR-105)

Deposit 2-11 comprises a series of beach ridges, located close to the lake shore 3 to 5 km west of Hay River (Drawing H3), consisting of fine sand, with a trace of silt and some organic laminations. Reserves are estimated at greater than $1,000,000 \text{ m}^3$ of Class 4 material (probable). A small pit is presently operated by the Town of Hay River; it is recommended that the limited community demands for sand fill material continue to be met from this pit.

Description

This source includes a group of narrow, sub-parallel, beach ridges, located within an area about 3250 m long and 1400 m wide. The deposit is 3 to 5 km west of Hay River and accessible via an existing gravel trail (a continuation of the sewage lagoon access road). Deposit 2-11 is composed of fine sand with a trace of silt and some organic laminations. Up to 2 m of material is present above water table.

Aggregate Supply

Previous investigations, by Ripley, Klohn & Leonoff (1974), identified probable reserves of in excess of $1,000,000 \text{ m}^3$ of Class 4 aggregate. Frost susceptibility was identified as a major constraint to utilization of this material.

Aggregate Demand

The supply/demand analysis indicates that the requirements for sandy general fill material for use as road sanding aggregate in the Hay River area are limited (in the order of 5,000 m³ maximum over the next five years). These needs should continue to be met from the existing Town of Hay River pit.

Pit Development

The Town pit should be developed eastwards from the access road as demand dictates. A buffer zone should be left adjacent to the road. Aggregate should be extracted down to, but not below, the water table.

Recommendation

Deposit 2-11 should continued to be developed as a source of sand fill (Class 4) material for use by the Town of Hay River.







THURBER CONSULTANTS LTD., Geotechnical Engineers

B. HIGHWAY 5 (HIGHWAY 2 JUNCTION TO BUFFALO RIVER)

GRANULAR SOURCE DESCRIPTIONS - DEPOSITS 5-1 TO 5-32



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-1

This source comprised a small beach ridge, situated south of Highway 5, about 8 km south of Hay River (Drawing H3). Deposit 5-1 is now depleted.

Description

Deposit 5-1 was a beach ridge, about 500 m long and 100 m wide, that likely consisted of gravelly sand. It has been depleted and abandoned for some years.

Aggregate Supply and Demand

Restoration and Rehabilitation

Field observations indicate that natural revegetation of the former pit area has been underway for many years. It is recommended that this process be allowed to continue without hindrance.

Recommendation

No restoration or rehabilitation work is recommended to be undertaken at this site.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-2

Deposit 5-2 comprises two beach ridges located south of Highway 5, at km 7, and about 10 km southeast of Hay River (Drawing H3). Prospective reserves are estimated at about 35,000 m³ of gravelly to silty sand (Class 4) material. This source is not recommended for development.

Description

The beach ridge deposits, each up to 1200 m long but only 50 m to 100 m wide, are located 500 to 1500 m south of Highway 5; at present, there is no existing access. This source has not been investigated previously. It lies about 150 m from the Sandy River channel. No other environmental constraints to development are identified.

Aggregate Supply

Prospective reserves are estimated at 35,000 m³ of Class 4 aggregate. Laboratory test data are not available.

Aggregate Demand

No requirement to utilize aggregate from Deposit 5-2 is identified over the next five years.

Recommendation

Deposit 5-2 is not recommended for development at this time.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-3 (HR-106)

Deposit 5-3 comprises a group of beach ridges, located on the Hay River Reserve about 5 to 7 km east of the community (Drawing H3). Prospective reserves are estimated in the order of 1,000,000 m³ of fine sand (Class 4 aggregate). Development of this source is not recommended.

Description

Deposit 5-3 covers an area about 4000 m long and up to 2000 m wide. It is about 6 km north of Highway 5 but would be accessible only via a circuitous route through the Reserve. Portions of the deposit lie close to the shoreline of Great Slave Lake and adjacent to the Sandy River. A portion of the deposit was investigated previously by Ripley, Klohn & Leonoff (1974). Its location on the Hay River Reserve is considered to be a major constraint to development.

Aggregate Supply

Previous testing by Ripley, Klohn & Leonoff (1974) indicated that Deposit 5-3 is composed primarily of fine sand, with traces of organics. Prospective reserves were estimated at about $1,000,000 \text{ m}^3$ of Class 4 material. The aggregate is suitable only for use as low quality general fill.

Aggregate Demand

There is no demand at present for material from Deposit 5-3.

Recommendation

Since Deposit 5-3 is comprised of low quality material, is relatively inaccessible and is situated on the Reserve, development is not recommended.


This source consists of a series of glaciofluvial ridges, located about 15 km south of Highway 5 (km 10) and 25 km northeast of Enterprise (Drawing H3). Prospective reserves are estimated at about 375,000 m³ of Class 3 material. Development is not recommended at this time.

Description

Deposit 5-4 comprises a group of east-west trending glaciofluvial ridges that occur within an area about 5000 m long and up to 1500 m wide. This source has not been investigated previously and there is no existing access. Environmental constraints to future development are not identified.

Aggregate Supply

No information is available on the distribution and characteristics of the granular aggregate in this deposit. Prospective reserves are estimated in the order of $375,000 \text{ m}^3$, likely of sandy gravel (Class 3) material. This estimate assumes an average recoverable thickness of 1 m.

Aggregate Demand

Due to its relative inaccessibility, it is unlikely there will be demand for material from Deposit 5-4 in the near future.

Recommendation

Development of Deposit 5-4 is not recommended at this time. In the event it is considered in the future, a program of field and laboratory testing would be required to confirm the material type and distribution.



Deposit 5-5 comprises a complex of beach ridges, located a short distance west of the old Fort Smith winter road and about 14 km south of Highway 5 (Drawing H3). Reserves are estimated at about 2,400,000 m^3 of Class 3 material (prospective). This source is undeveloped.

Description

Deposit 5-5 consists of an extensive complex of beach ridges developed on and around a topographic high. It lies less than 1 km west of the old Fort Smith winter road, about 14 km south of Highway 5. Presently, the area is inaccessible; however, access could be extended in the future from the Deposit 5-6 area. Previous testing data are not available. No environmental constraints to development are identified.

Aggregate Supply

Prospective reserves of Deposit 5-5 are estimated at in the order of $2,400,000 \text{ m}^3$ of sandy gravel (Class 3) aggregate, assuming an average of 1 m is recoverable. Information on material quality and quantities is not available.

Aggregate Demand

No demand for material from this deposit is identified in the near future.

Recommendation

Development of Deposit 5-5 is not recommended at this time. It is, however, a long-term, large volume, prospect for future development. In the event development is considered, a program of field and laboratory testing should be carried out.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-6 (HR-109A; Mile 12S)

Deposit 5-6 comprises a group of glaciofluvial ridges located, west of the old Fort Smith winter road, about 6.5 km south of Highway 5 (km 18) and 22 km southeast of Hay River (Drawing H3). Proven reserves total some 295,000 m³ of Class 1, 2 and 3 material. A pit was developed previously by the CNR and local contractors have recently reopened the area; continued development is recommended.

Description

This source consists of a series of southwest-northeast trending glaciofluvial ridges that occur within an area about 5,500 m long and up to 1500 m wide. Drawing H2 shows the geological setting and deposit boundaries. The main ridge (the only part of the deposit to be investigated to date) is accessible in winter along the old Fort Smith winter road. Development of this source began in the 1960's during construction of the railway and has recently recommenced. Deposit 5-6 has been investigated by Ripley, Klohn & Leonoff (1974), Bird and Hale (1978) and Underhill Engineering (1986a). Environmental constraints to continued development are not identified.

Aggregate Supply

Field testing indicates that the Deposit 5-6 granular aggregate is up to 4 m thick (above till and/or the groundwater table), and ranges from well graded sand and gravel, suitable for use in concrete, to silty and bouldery gravel (Class 3 material). Table Cl provides a summary of the results of previous laboratory testing.

TABLE Cl

SUMMARY OF LABORATORY TEST RESULTS DEPOSIT 5-6

Tes <u>Prc</u>	t cedure	No. of Tests	Range	Average	Comments	_
Gra	in Size	(원)				
• •	Gravel Sand Fines	33 33 33	35-82 15-63 1-8	64 32 4		
L.A	. Abrasi	on (% loss)				
•	Coarse	2	23-38	25.5		



Sulphate Soundness (% loss)

•	Coarse Fine	2 2	4.2-6.0 3.6-7.1	5.1 5.35	
Petr Anal	cographic Lysis (PN)	5	118-135	126	Petrographically suitable for use in concrete

Sources: Bird and Hale (1978); Underhill Engineering (1986a); this study

Estimates of remaining reserves have been developed by Bird and Hale (1978) and confirmed, in part, by Underhill Engineering (1986a). Proven reserves were estimated by Bird and Hale to total 315,000 m³, comprising 70,000 m³ Class 1, 95,000 m³ Class 2 and 150,000 m³ Class 3 aggregate (assuming winter extraction). About 20,000 m³ of Class 3 material was extracted during winter 1986-1987, reducing the reserves of this type of material to about 130,000 m³. The anticipated distribution of material types has been shown by Bird and Hale (1978, Drawing HRS-2).

Aggregate Demand

It is expected that over the next five years, Deposit 5-6 will be developed as a prime winter source of aggregate in Management Area II. Total demand is projected at up to $75,000 \text{ m}^3$ of Class 1, 2 and 3 material. Users will include GNWT Highways and local contractors.

Pit Development

Currently, permits have been issued for extraction in the area of the old Fort Smith winter road. Development along the axis of the deposit and for its full width and depth should continue from this area.

Recommendations

It is recommended that Deposit 5-6 should continue to be developed as a prime source of aggregate in the Hay River area. Until such a time as all weather access is available, materials extraction will be confined to the winter season. Prior to depletion of the main ridge (currently under development), it is recommended that field testing of other portions of the deposit should be carried out.





Unified Soil Classification System & N.R.C. Field Description (Modified with clay size at 0.002 min)

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Rock Type	Classifications Weighted Percentages of Constituents In Each Sieve Fraction							Total Weighted Composition			
	•	+2 1/2"	+2"	+1 1/2"	+1"	+3/4"	+1/2"	+3/8"	+1/4"	+#4	
Granite, gneiss		-	0.9	5.0	2.7	3.1	3.0	1.6	3.7	1.2	21.2
Limestone, dolomit	e Good, strong	~	0.9	9.1	4.6	3.9	5.6	3.5	0.9	0.1	28.6
Sandstone, guartzi greywacke	e	-	0.9	-	8.9	4.0	4.6	5.0	8.7	4.7	36.8
Acid and basic volcanics	sic		-	-	0.8	1.0	1.5	1.0	0.9	0.3	5.5
Weathered granite, gneiss and volcani	cs	-	0.9	0.8	-	0.5	0.4	0.2	0.1	tr	2.9
Weathered sandston and guartzite	e Pair modoratolu	-	-	-	0.8	0.5	0.6	0.4	0,2	0.1	2.6
Weathered Carbonates	strong	-	-	-	0.5	0.3	0.7	0.1	tr	tr	1.6
Encrustations		-	-	-	-	-	-	tr	-	-	tr
Chert	Fair, potentially deleterious	-	-	-	-	-	tr	- <u></u>	-	-	tr
Limestone, highly weathered	Poor, weak	-	-	-	-	-	-	0.1	-	-	0.1
Shale, gypsum, clay balls	Deleterious	-	-	-	-	0,4	-	0.1	0.1	0.1	0.7
TOTALS	·····		3.6	14.9	18.3	13.7	16.4	12.0	14.6	6.5	100.0

SUMMARY OF ROCK TYPES, COARSE AGGREGATE DEPOSIT 5-6

Note: Bulk sample from Highways stockpile at Highway 5 - Old Fort Smith winter road junction, March, 1987 PN = 121

GRANULAR SOURCE DESCRIPTION DEPOSIT 5-7 (HR-108A; Mile 12S)

This source consists of two glaciofluvial ridges that are traversed by the old Fort Smith winter road about 5 km south of Highway 5 (at km l8). The deposit lies about 20 km southeast of Hay River (Drawing H3). Proven reserves are estimated in the order of $70,000 \text{ m}^3$ of Class 3 aggregate. Development is not recommended at this time.

Description

Deposit 5-7 comprises two low glaciofluvial ridge areas composed of gravelly sand. Access is by means of the old Fort Smith winter road, which traverses the deposit. This source has been investigated previously by Ripley, Klohn & Leonoff (1974) and Bird and Hale (1978). It is presently undeveloped; no environmental constraints to future development are identified. Drawings C2 and C3 show the geological setting for portions of the deposit.

Aggregate Supply

Field and laboratory testing, carried out previously, determined that the deposit is shallow and composed predominantly of poorly graded sandy gravel (Bird and Hale, 1978). Proven reserves are estimated at about 70,000 m³ of Class 3 aggregate in the smaller (eastern) segment of the deposit; the main ridge is shallow and is not considered economic to develop.

Aggregate Demand

At the present time, no requirement is identified to utilize material from Deposit 5-7 within the next 5 years.

Recommendation

Development of Deposit 5-7 is not recommended at this time. However, this source should be included in the overall (long term) strategy for the staged development of deposits in this section of Management Area II.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-8 (HR-110A; Mile 12S)

This deposit, a glaciofluvial ridge that has been modified by beach development, is located east of the Old Fort Smith winter road, 6 km south of Highway 5 (at km 18). It is about 21 km southeast of Hay River (Drawing H3). Proven reserves of Deposit 5-8 are estimated at about 213,000 m³ of Class 1, 3 and 4 aggregate. It is recommended that, once the reserves in Deposit 5-6 are depleted, this source should be developed, initially as a source of concrete aggregate.

Description

Deposit 5-8 comprises a glaciofluvial ridge that has been modified by beach development. The geological setting and deposit boundaries are shown on Drawing C3. It lies adjacent to, and is accessible from, the old Fort Smith winter road. This source has been investigated previously by Ripley, Klohn & Leonoff (1974), Bird and Hale (1978) and Underhill Engineering (1986a). It consists of granular aggregate of variable composition and distribution, ranging from well graded sand and gravel to gravelly sand. Test pit data indicate that recoverable material thickness ranges up to about 3 m (above till and/or water table). Deposit 5-8 is undeveloped; no environmental constraints to development in the future are identified.

Aggregate Supply

The results of previous laboratory testing are summarised on Table C2.

TABLE C2

Test Procedure	No. of Tests	Range	Average	Comments
Grain Size	e (%)			
. Gravel . Sand . Fines	. 9 9 9	45-75 19-53 2-10	58 38 4	
Petrograph Analysis (nic PN) 4	132-216	155	Material is of variable quality

SUMMARY OF LABORATORY TEST RESULTS DEPOSIT 5-8

Sources: Bird and Hale (1978); Underhill Engineering (1986a)



Reserve estimates have been developed by Bird and Hale (1978). Proven reserves are estimated at about 213,000 m³ of granular aggregate, consisting of 100,000 m³ Class 1, 105,000 m³ Class 3 and 8,000 m³ Class 4 aggregate (assuming winter extraction). The likely distribution of material classes is shown by Bird and Hale (1978, Drawing HRS-2).

Aggregate Demand

Demand projections indicate that development of this deposit will not be necessary within the next 5 years. However, in the medium term (ie. once the concrete aggregate reserves of Deposit 5-6 are depleted) it is recommended that this deposit should be opened up as a source of concrete aggregate in Management Area II.

Recommendation

It is recommended that Deposit 5-8 be developed once Deposit 5-6 is depleted. A limited amount of work is required to identify the optimum procedures for selective extraction of the Class 1 material.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-9 (HR-112A; Mile 12S)

This deposit is located east of the old Fort Smith winter road, about 6 km south of Highway 5 (at km 21). As shown on Drawing H3, it lies about 21 km southeast of Hay River. Reserves are estimated at about 140,000 m³ (proven), of Class 1 and 4 material. Development is not recommended at this time.

Description

This source comprises a "y-shaped" glaciofluvial ridge; the geological setting and deposit boundaries are shown on Drawing C3. Access from the old Fort Smith winter road can be gained via an exploratory access trail constructed by Underhill Engineering in 1986. Deposit 5-9 has been investigated previously by Ripley, Klohn & Leonoff (1974) and Bird and Hale (1978), as well as Underhill Engineering (1986a). It consists of up to about 2.5 m of well graded, concrete quality, aggregate and gravelly sand, suitable for use as general fill. Deposit 5-9 is undeveloped; no environmental constraints to future development are identified.

Aggregate Supply

Field testing data indicate that Deposit 5-9 consists predominantly of excellent and poor quality aggregate. The anticipated distribution is shown by Bird and Hale (1978, Drawing HRS-2), who estimated proven reserves at 55,000 m³ Class 1 and 85,000 m³ Class 4 material, assuming winter extraction. Laboratory test data are summarised on Table C3. It will be noted that the petrographic analysis results are not consistent with aggregate suitability for use in concrete (i.e. Class 1); consideration should be given to undertaking further testing.

TABLE C3

SUMMARY OF LABORATORY TEST RESULTS DEPOSIT 5-9

Test Procedure	No. of Tests	Range	Average	Comments
Grain Size	(원)			
. Gravel	7	46-76	61 37	
. Fines	7	1-3	2	
Petrograph Analysis (ic PN) 2	231-265	248	Unsuitable for use in concrete or asphalt



Accordingly to Bird and Hale, recoverable reserves are confined to the southern "limb" of the deposit (the northern part is shallow).

Aggregate Demand

No demand for material from this source is anticipated within the next five years.

Recommendation

Development of Deposit 5-9 is not recommended at this time (although it might be opened up, as an alternative to Deposit 5-8, once Deposit 5-6 is depleted of concrete aggregate). It should, however, form part of the long-term strategy for source development in Management Area II.

GRANULAR SOURCE DESCRIPTION DEPOSIT 5-10 (HR-111A; Mile 12S)

Deposit 5-10 is located east of the old Fort Smith winter road, some 5 km south of Highway 5 (at km 22) and 20 km southeast of Hay River (Drawing H3). Reserves (proven) total about 185,000 m³ of Class 2, 3 and 4 aggregate. At this time, development is not recommended.

Description

This source comprises a southwest-northeast trending glaciofluvial ridge, about 1800 m long and 200 m to 300 m wide. Drawing H3 shows the deposit outline and geological setting. It is accessible in winter along the access trail recently constructed by Underhill Engineering but not directly from the old Fort Smith winter road (which lies 1500 m to the west). Deposit 5-10 has been investigated by Ripley, Klohn & Leonoff (1974), Bird and Hale (1978) and Underhill Engineering (1986a). At present, it is undeveloped; no environmental constraints to future development are identified.

Aggregate Supply

Previous field testing indicates that Deposit 5-10 is composed of Class 2, 3 and 4 aggregate. The granular material is more than 3 m thick (above till and/or the water table). Laboratory test data are summarised on Table C4.

TABLE C4

Tesi Pro	t cedure	No. of Tests	Range	Average	Comments
Gra	in Size (9	b)			
•	Gravel Sand Fines	5 5 5	47-83 14-47 2-9	60 36 4	
Pet: Ana	rographic lysis (PN)) 1	-	126	Suitable for use in concrete or asphalt

SUMMARY OF LABORATORY TEST RESULTS DEPOSIT 5-10

Sources: Bird and Hale (1978); Underhill Engineering (1986a)



Proven reserves are estimated by Bird and Hale to total about 185,000 m³ of granular aggregate, consisting of 120,000 m³ Class 2, 40,000 m³ Class 3 and 25,000 m³ Class 4. These volume estimates assume that the material will be extracted in winter. The expected distribution of material classes is shown by Bird and Hale 1978, Drawing HRS-2).

Aggregate Demand

No demand for material from this source is projected at the present time.

Recommendation

Development of Deposit 5-10 is not recommended at this time. However, the source should form part of the long-term strategy for granular resources development in Management Area II.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-11 (HR-107A; Mile 12)

This source comprises a glaciofluvial ridge, located south of Highway 5 (between km 16 and 20), about 16 km southeast of Hay River (Drawing H3). The eastern section is depleted; remaining reserves, in the western part, are estimated at 75,000 m³ of Class 4 aggregate (proven). Rehabilitation of depleted areas is proposed but extraction of the remaining reserves is not recommended until such time as there is a requirement for good quality sand and fine aggregate.

Description

Deposit 5-11 consists of a narrow glaciofluvial ridge that has been modified by beach development. It is about 5000 m long and located 500 m to 1500 m south of Highway 5 in the vicinity of the old Fort Smith winter road. Drawing C4 shows the geological setting and deposit boundaries. It has two parts: one segment, to the east of the winter road, is depleted while the other, to the west, is undeveloped. No environmental constraints to renewed development are identified. Deposit 5-11 was investigated previously by Ripley, Klohn & Leonoff (1974) and Bird and Hale (1977), and found to consist predominantly of gravelly sand, with some fine sandy gravel. Bird and Hale recommended the material be reserved for use in ready-mix or concrete block manufacture (rather than as general fill).

Aggregate Supply

Remaining reserves in the western section of the deposit are estimated, after Bird and Hale (1977, Drawing HR-1), at about 75,000 m³ of Class 4 aggregate. On average, the material consists of about 26 percent gravel, 67 percent sand and 7 percent fines, and is well graded (Bird and Hale, 1977). These reserves are considered to be proven.

Aggregate Demand

No requirement to develop the western section of the deposit is identified at this time.

Restoration and Rehabilitation

Recommendations for restoration and rehabilitation of the depleted eastern section of Deposit 5-11, were provided previously by Bird and Hale (1977). Their recommendations, shown on a conceptual sketch on Figure C3, included site grading and salvaging of remaining small volumes of borrow material and promotion of positive site drainage. Promotion of natural revegetation was also proposed.

Recommendation

The depleted section of Deposit 5-11 should be rehabilitated, recovering any reserves as restoration proceeds. It is recommended that the western part be reserved as a source of good quality sand and fine aggregate for use in concrete or concrete block manufacture.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-12 (HR-125A; Mile 12S)

This deposit comprises two glaciofluvial outwash areas, situated south of Highway 5 (at about km 24), about 23 km southeast of Hay River (Drawing H3). Prospective reserves are estimated at some 165,000 m³ of Class 3 material. Deposit 5-12 is undeveloped; development is not recommended at this time.

Description

Deposit 5-12 consists of two glaciofluvial outwash areas (possibly kames, according to Bird and Hale) that have been modified by beach formation. Drawing C3 shows the geological setting and deposit boundaries. This source lies about 4.5 km south of Highway 5 and can be accessed in winter along a number of cut lines that traverse the deposit. Limited field testing was carried out by Bird and Hale (1978), when 2.1 m of silty sand and gravel (ie. Class 3 material) was encountered. Environmental constraints to development are not identified.

Aggregate Supply

Based on limited testing, Deposit 5-12 consists of Class 3 aggregate (Bird and Hale, 1978). One sample consisted of 58 percent gravel, 39 percent sand and 3 percent fines, with a PN value of 159. Prospective reserves were estimated, by Bird and Hale, at 165,000 m^3 , assuming extraction takes place in winter.

Aggregate Demand

No requirement is identified to develop this source within the next 5 years.

Recommendation

Development of Deposit 5-12 is not recommended at this time. However, the source should be included in the overall (long term) management strategy for Management Area II. Additional field and laboratory testing would be required prior to development, to prove up reserves and confirm the available classes of aggregate.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-13 (HR-123A; Mile 17S)

Deposit 5-13, located about 5 km south of Highway 5 (km 24) and 22 km southeast of Hay River (Drawing H3), comprises two glaciofluvial outwash areas. Estimated proven reserves total about 250,000 m³ of Class 1, 2 and 4 material. This source is being considered for development by the Highways Department as a source of asphalt aggregate; development as a source of Class 1 material is recommended once Deposit 5-14 approaches depletion.

Description

Deposit 5-13 comprises two kame-like glaciofluvial outwash areas that show evidence of surficial reworking during beach development. The geological setting and deposit boundaries are shown on Drawing C3. It lies south of Highway 5 and is presently accessible in winter along existing cut-lines and an access trail recently developed by Underhill Engineering. Deposit 5-13 was investigated previously by Bird and Hale (1978) as well as Underhill Engineering (1986a).

Aggregate Supply

Previous field investigations indicate that this deposit consists of granular aggregate up to 3 m thick, ranging from well graded sand and gravel to silty and bouldery gravel to sand. Results of laboratory testing completed to date, are summarised on Table C5.

TABLE C5

Test Procedure	No. of Tests	Range	Average	Comments
Grain Size ((&)			
• Gravel • Sand • Fines	18 18 18	33-78 17-65 2-17	61 33 6	
L.A. Abrasic	on (% loss)			
. Coarse	1	_	22.4	

SUMMARY OF LABORATORY TEST RESULTS

Sulphate Soundness (% loss)

•	Coarse	1	-	5.31
•	Fine	1	-	5.99



Petrographic Analysis (PN) 4

128-153

Petrographically suitable for use in asphalt but marginal to unsuitable for use in concrete

Sources: Bird and Hale (1978); Underhill Engineering (1986a)

Reserve estimates were developed for Deposit 5-13 by Bird and Hale (1978). Assuming winter development, proven reserves are estimated at: $45,000 \text{ m}^3$ Class 1, $105,000 \text{ m}^3$ Class 2 and $100,000 \text{ m}^3$ Class 4 aggregate. It is understood that the Highways Department proposes to extract some material in the future for use in asphalt. Bird and Hale (1978, Drawing HRS-3) have shown the likely distribution of different classes of aggregate.

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Aggregate Demand

Highways have proved up a total of $60,000 \text{ m}^3$ of aggregate to be used in asphalt (Underhill Engineering, 1986a). It is expected that in the order of 15,000 m³ of aggregate may be extracted over the next five years.

Recommendation

Development of Deposit 5-13 is not recommended to commence until adjacent Deposit 5-14 and/or its resources of different aggregate classes are depleted.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-14 (HR-124A; Mile 17S)

This source comprises a glaciofluvial outwash deposit located about 22 km southeast of Hay River (Drawing H3); it lies some 3.5 km south of Highway 5, at km 24. Proven reserves are estimated at about $430,000 \text{ m}^3$ of granular aggregate, of all aggregate classes. This deposit has recently been opened up as a source of asphalt aggregate for Highways use. Once this latter material is extracted, temporary abandonment is recommended, pending development of Deposits 5-6 to 5-10.

Description

Deposit 5-14 consists of two kame-like glaciofluvial deposits that exhibit evidence of surficial modification by beach development. Overall, the deposit is about 3500 m long and up to 1000 m wide. Drawing C3 shows the geological setting and deposit boundaries. Presently, access is by means of an existing cut line, in winter only. As noted, a borrow pit was developed at this site during winter 1986-1987. Deposit 5-14 has been investigated previously by Bird and Hale (1978) and Underhill Engineering (1986a); in addition, the existing pit was visited by Thurber Consultants personnel as part of the present study.

Aggregate Supply

Field investigations to date indicate that Deposit 5-14 is up to about 3 m thick, and consists of a variety of aggregate types, the distribution of which is quite complex. Table C6 provides a summary of available laboratory test data.

TABLE C6

SUMMARY OF LABORATORY TEST RESULTS DEPOSIT 5-14

Tes Pro	t cedure	No. of Tests	Range	Average	Comments	
Gra	in Size	(%)				
• •	Gravel Sand Fines	27 27 27	35-77 17-79 1-12	56 39 5		
L.A	. Abrasio	on (% loss)				
•	Coarse	2	22-23.5	22.8		



Sulphate Soundness (% loss) . Coarse 2 2.1-5.1 3.6 . Fine 2 4.7-7.1 5.9 Petrographic Analysis (PN) 7 108-261 148 Wide range in PN values

Sources: Bird and Hale (1978); Underhill Engineering (1986a); this study

In 1978, Bird and Hale estimated reserves for this deposit at a total of 490,000 m³ of granular aggregate, assuming winter extraction. The breakdown by material class was as follows: $35,000 \text{ m}^3$ Class 1, $170,000 \text{ m}^3$ Class 2, $265,000 \text{ m}^3$ Class 3 and $20,000 \text{ m}^3$ Class 4. In 1986, Underhill Engineering proved up reserves of 80,000 m³ of material for use in asphalt paving. It is understood that $55,000 \text{ m}^3$ to $60,000 \text{ m}^3$ of material was extracted in winter 1986-1987 for this purpose; remaining reserves of Class 2 material are, thus, about 110,000 m³. The likely distribution of material types has been shown by Bird and Hale (1978, Drawing HRS3).

Aggregate Demand

It is expected that up to $35,000 \text{ m}^3$ of Class 1 material may be extracted over the next five years.

Recommendation

Once the Highways material has been extracted, it is recommended that Deposit 5-14 be abandoned (temporarily), pending development and depletion of the group of deposits to the west (Deposits 5-6 to 5-10); that are closer to Hay River.



Unified Soil Classification System & N.R.C. Field Description [Modified with clay size at 0.002 mm]



THURBER CONSULTANTS LTD., Geotechnical Engineers

Rock Type	Classifications		Weighted Percentages of Constituents In Each Sieve Fraction						Total	Weighted Composition	
		+2 1/2"	+2"	+1 1/2"	+1"	+3/4"	+1/2"	+3/8"	+1/4"	+#4	
Granite, gneiss		-	1.7	6.6	5.5	2.8	2.0	1.8	2.8	0.9	24.1
Limestone, dolomit	e Good, strong	-	5.1	7.4	4.3	3.1	0.2	0.3	0.3	0.1	20.8
Sandstone, quartzi grey wacke	te,	-	-	-	7.4	7.0	11.5	7.7	8.4	3.8	45.8
Acid and basic volcanics		-	-	-	4.6	0.5	0.2	0.2	0.3	-	5.8
Weathered granite, gneiss and volcani	c	_	-	0.8	0.3	0.5	~	0.2	tr	0.1	1.9
Weathered sand- stone & guartzite	Fair, moderately strong	-	-	-	-	-	0.1	_ *	0.1	0.1	0.3
Weathered carbonat	es	-	-	-	0.6	0.1	-		-		0.7
Encrustations		-	-	-	-	-	-	-	0.1	-	0.1
Chert	Fair, potentially deleterious	-	_	-	-	-	0.1	-	0.2		0.3
Unweathered sandstone	Poor, weak	-	-	-	-	-	-	-	0.1	-	0.1
Ochreous volcanics	Deleterious	-	-	-	-	-	0.1	-	tr	tr	0.1
TOTALS	<u></u>		6.8	14.8	22.7	14.0	14.2	10.2	12.3	5.0	100.0

SUMMARY OF ROCK TYPES, COARSE AOGREGATE DEPOSIT 5-14

NOTE: Bulk samples from Highways stockpile on west side of Hay River bridge (on Highway 5), March, 1987. PN = 108

Deposit 5-15 comprises a group of glaciofluvial deposits, located about 25 km southeast of Hay River and 10 km south of Highway 5, at km 30 (Drawing H3). Prospective reserves are estimated in the order of $4,250,000 \text{ m}^3$ of Class 3 aggregate. This source is not recommended for development at this time.

Description

This source consists of a group of southwest-northeast trending glaciofluvial ridges and outwash plain deposits that show evidence of modification by beach formation. They occur within an area that is about 8000 m long and up to 2000 m wide. Deposit 5-15 is located a short distance (400 m minimum) east of the old Fort Smith winter road and 10 km south of Highway 5. No environment-related development concerns are identified at this time. Deposit 5-15 has not been investigated previously, and is undeveloped.

Aggregate Supply

It is estimated the prospective reserves of Deposit 5-15 are about $4,250,000 \text{ m}^3$ of sandy gravel (Class 3) aggregate, assuming an average of 1 m of material is recoverable. It is likely that other (superior) classes of material may be present also; however, no field or laboratory test data are available.

Aggregate Demand

No demand for aggregate from this source in the near future is foreseen.

Recommendation

Development of Deposit 5-15 is not recommended at this time. In view of its proximity to the Fort Smith winter road, however, it does constitute a long term, large volume, prospect in the Hay River area (Management Area II). In the event development is considered, field and laboratory testing should be carried out to investigate available reserves and material quality and distribution.



As shown on Drawing H3, this glaciofluvial ridge deposit is located about 27 km southeast of Hay River and 3.5 km south of Highway 5 (at km 30). Prospective reserves are estimated at about 165,000 m³ of Class 3 material. Development of this deposit is not recommended at this time.

Description

Deposit 5-16 comprises a 1700 m long and 150 to 300 m wide glaciofluvial ridge, located 3.5 km south of Highway 5 and possibly accessible in winter via existing cut lines. Data on material guality and distribution are not available. No environmental constraints to development are identified.

Aggregate Supply

It is estimated that Deposit 5-16 has prospective reserves of about 165,000 m³, assuming a recoverable material thickness of 1 m. Information on material guality is not available. In the absence of confirmatory laboratory test data, these reserves have been considered as Class 3 sandy gravel material.

Aggregate Demand

No requirement to obtain material from this deposit is identified at this time.

Recommendation

Development of Deposit 5-16 is not recommended at this time. However, it should be considered as a prospect (together with Deposits 5-18 and 5-20) in the long term. Field and laboratory testing are required prior to development to establish reserves, quality and distribution of aggregate, etc.



Deposit 5-17 consists of two narrow beach ridges located south of Highway 5, between kms 26 and 30, and about 20 km southeast of Hay River (Drawing H3). Reserves are estimated at about $85,000 \text{ m}^3$ (prospective) of Class 4 aggregate. Development is not recommended at this time.

Description

The two beach ridges have a total length of about 4700 m and are both less than 100 m wide. They are located 500 m to 2500 m south of Highway 5, and are accessible (in winter) along existing cutlines. Deposit 5-17 has not been investigated previously and is undeveloped. No environmental constraints to development are identified, other than the proximity to Sandy Creek.

Aggregate Supply

Prospective reserves are estimated at about $85,000 \text{ m}^3$ of Class 4 fine sand aggregate. Test data are not available.

Aggregate Demand

Alternative sources of Class 4 material are available considerably closer to Hay River (eg. Deposit 2-11). Thus, no demand for material from this source is anticipated in the near future.

Recommendation

Development of Deposit 5-17 is not recommended at this time.



Located about 30 km southeast of Hay River and south of Highway 5 at km 32.5, this source comprises a complex of beach ridges (Drawing H3). Prospective reserves are estimated at about $1,200,000 \text{ m}^3$ of Class 3 material. Development is not recommended at this time.

Description

Deposit 5-18 consists of a complex of beach ridges, covering an area about 2000 m long and 700 to 800 m wide, situated about 3 km south of Highway 5. Access could be gained along existing winter trails. No environment-related development concerns are identified. Deposit 5-18 has not been investigated previously, and is undeveloped.

Aggregate Supply

Estimated prospective reserves, of sandy gravel (Class 3) material, are in the order of 1,200,000 m³, assuming an average recoverable thickness of 1 m. No laboratory test data are available.

Aggregate Demand

No demand for material from this source is identified within the next 5 years.

Recommendation

Development of Deposit 5-18 is not recommended at this time. Should it be considered in the future, a program of field and laboratory testing should be carried out to determine the distribution of aggregate types and refine the volume estimate.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-19 (HR-119, HR-121 and HR-122; Mile 21)

Deposit 5-19 comprises a group of glaciofluvial ridges, located along Highway 5 about 30 km southeast of Hay River (Drawing H3). Extensive development has taken place to date, particularly in the southern part; remaining (proven) reserves are estimated at about $1,500,000 \text{ m}^3$ of sandy gravel (Class 2) material. Some lower quality aggregate is also present. Continued development is recommended, together with rehabilitation of depleted areas.

Description

Overall, Deposit 5-19 is about 5500 m long and 300 m to 1500 m wide. It consists of a series of glaciofluvial ridges, some modified by beach formation, located along and to the north of Highway 5 (between km 32 and 38). The geological setting and deposit boundaries are shown on Drawing C5. Areas of the deposit to the south of the railway are essentially depleted. This source was investigated previously by Ripley, Klohn & Leonoff (1974) and Bird and Hale (1977). No environmental constraints to continued development of the northern part are identified.

Aggregate Supply

Previous testing indicated that Deposit 5-19 is composed of generally well graded sandy, fine to medium, gravel which tends to become finer in the northern part of the deposit. On average, based on 16 gradation tests, the aggregate consisted of 54 percent gravel (with some cobbles), 41 percent sand and 5 percent fines (Bird and Hale, 1978). Petrographically, it appeared to be suitable for use in concrete. As noted, large areas of Deposit 5-19 are now depleted. Remaining (proven) reserves, estimated in the order of 1,500,000 m³ of Class 2 aggregate, lie to the north of the C.N.R..

Aggregate Demand

In the past, material has been extracted by C.N. Rail, the Highways Department and local contractors. Demand over the next five years from this source is projected to be about $150,000 \text{ m}^3$, of aggregate.

Restoration and Rehabilitation

Recent field observations (in October 1987) indicate that, in most depleted areas of the deposit, granular material has been extracted down to the underlying glacial till. Some areas of shallow ponded water are present. No stockpiles of topsoil or overburden materials were observed.



Restoration of the depleted sections should involve site grading and contouring (to eliminate areas of ponded water and blend the pit boundaries into the surrounding terrain). At an early stage, possible end uses for areas close to the highway should be considered. Bird and Hale (1977) recommended construction of a vegetated berm along the south side of the highway in the area of Deposit 5-19 to provide visual definition under poor visibility conditions. Figure C4 presents a conceptual sketch showing these recommendations.

Pit Development

Now that the southern section is essentially depleted, development of the reserves north of the C.N.R. should commence. This will necessitate construction of an upgraded railway crossing. Development should proceed from the crossing area in a generally northeasterly direction.

Recommendation

Continued development of Deposit 5-19 is recommended. Restoration and rehabilitation of depleted areas, particularly those close to the highway, should be undertaken.



Deposit 5-20 comprises a glaciofluvial ridge, located south of Highway 5 at km 37, and about 35 km southeast of Hay River (Drawing H3). Prospective reserves are estimated at $375,000 \text{ m}^3$ of Class 3 material. At this time, development is not recommended.

Description

This source, a 2500 m long and up to 500 m wide glaciofluvial ridge, is situated about 4 km south of Highway 5. It could likely be accessed via existing bush trails in winter. Deposit 5-20 is presently undeveloped and has not been investigated previously. No environmental constraints to future development are identified, however.

Aggregate Supply

Assuming a recoverable average thickness of 1 m, prospective reserves are estimated at some 375,000 m³ of Class 3 sandy gravel mat- erial. No test data are available.

Aggregate Demand

No demand for material from Deposit 5-20 is identified at this time.

Recommendation

Development of Deposit 5-20 is not recommended in the near future. In the event it is considered, field and laboratory testing should be carried out to identify material types and refine the volume estimate.



Deposit 5-21 comprises a group of glaciofluvial ridges, located south of Highway 5, about 37 km southeast of Hay River (Drawing H3). Prospective reserves are estimated in the order of $630,000 \text{ m}^3$ of sandy gravel (Class 3) aggregate. This deposit is not recommended for development at this time.

Description

Deposit 5-21 is situated 1 km to 4 km south of Highway 5, between km 40 and 45, and consists of a series of southwest-northeast trending glaciofluvial ridges. Individual ridges are up to 2500 m long and 200 to 300 m wide. The boundaries and geological setting for a part of the deposit are shown on Drawing C7. No environmental constraints to development are identified. The deposit has not been investigated previously, and access is poor (along a number of existing seismic trails).

Aggregate Supply

It is estimated that prospective reserves, of Class 3 aggregate, are in the order of $630,000 \text{ m}^3$ (assuming 1 m average recoverable thickness). Laboratory test data are not available.

Aggregate Demand

No demand for Deposit 5-21 material is foreseen in the near future.

Recommendation

This source is not recommended for development at this time. Field and laboratory testing should be carried out prior to development if it is considered in the future.



Deposit 5-22 consists of a group of glaciofluvial ridges located south of Highway 5, about 40 km southeast of Hay River (Drawing H3). It is estimated that prospective reserves are about $450,000 \text{ m}^3$ of Class 3 material. This source is not recommended for development at this time.

Description

This source comprises a series of glaciofluvial ridges, located about 3 km south of Highway 5 at km 45. The area is accessible in winter along existing trails. The deposit, expected to consist of sandy gravel, has not been investigated previously and is undeveloped. No environmental constraints to future development are identified.

Aggregate Supply

Assuming an average recoverable thickness of 1 m, prospective reserves are estimated in the order of $450,000 \text{ m}^3$ of Class 3 aggregate. No laboratory test data are available.

Aggregate Demand

There is no demand for aggregate from this source at present.

Recommendation

Development of Deposit 5-22 is not recommended at this time. In the event it is considered, field and laboratory testing should be carried out prior to development.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-23 (Mile 26)

Deposit 5-23 is a glaciofluvial outwash deposit, situated north of Highway 5 and the C.N.R. about 37 km southeast of Hay River (Drawing H3). Prospective reserves are estimated in the order of $950,000 \text{ m}^3$ of Class 3 material. No development is recommended at this time.

Description

Deposit 5-23 lies along and to the north of Highway 5, between km 41 and 43. Access across the railway has recently been opened up. The deposit consists of two areas of glaciofluvial outwash plain, parts of which have been modified by beach development. In total, it is about 3,000 m long and up to 1,700 m wide. The geological setting is shown, with deposit boundaries, on Drawing C6. One borrow pit, initially developed as a source of material for extending the Hay River airstrip, exists immediately north of the railway; environmental constraints to continuing development are not identified. Deposit 5-23 was investigated previously by Bird and Hale (1977).

Aggregate Supply

Bird and Hale (1977) carried out a limited program of field and laboratory testing as access conditions permitted (ten test pits were excavated). Up to about 2.5 m of silty and sandy coarse gravel, with some irregularly distributed till inclusions, was encountered. On average, the granular aggregate comprised 70 percent gravel, 24 percent sand and 6 percent fines (5 tests). Bird and Hale recommended additional testing to determine the distribution and quality of the granular materials.

Bird and Hale (1977) estimated the prospective reserves at about 950,000 m³ of Class 3 aggregate, assuming an average recoverable thickness of 2.25 m. Further testing may identify zones of superior guality material.

Aggregate Demand

Field observations in October 1987 indicate that some material is being extracted from Deposit 5-23 at this time.

Recommendation

Development of Deposit 5-23 is not recommended at this time, however, as Deposits 5-19, 5-27 and 5-29 are depleted, it should be considered. Prior to development, additional field testing should be carried out, to define the distribution of material types and confirm and refine the volume estimates.



Deposit 5-24 comprises a series of beach ridges deposited on and around two bedrock highs. It is located about 35 km east of Hay River and 7 km north of Highway 5, at km 44 (Drawing H3). Prospective reserves are estimated in the order of $650,000 \text{ m}^3$ of sandy gravel (Class 3). Development is not recommended at this time.

Description

This source is located about 7 km north of Highway 5, and has no ready access. It consists of beach ridge deposits, with some lag material, resting on two bedrock topographic highs. No environment-related development constraints are identified. Deposit 5-24 has not been investigated previously and is undeveloped.

Aggregate Supply

The deposit is expected to consist of sandy to bouldery gravel, of variable thickness. Prospective reserves are estimated at about $650,000 \text{ m}^3$ of Class 3 material (assuming 1 m average recoverable thickness). No test data are available.

Aggregate Demand

Demand for material from this source is anticipated to be nil in the near future.

Recommendation

Development of Deposit 5-24 is not recommended at this time and is unlikely in the near future due to the relative inaccessibility of this source. Field and laboratory testing would be required prior to any decision to develop the deposit (so as to confirm material types and refine the volume estimate).



Deposit 5-25 comprises a complex of beach ridge and spit deposits, located about 4 km north of Highway 5 and 40 km east of Hay River (Drawing H3). Prospective reserves, of sandy gravel (Class 3) aggregate, are estimated at about 1,300,000 m³. Development is not recommended at this time.

Description

This source lies about 4 km north of Highway 5, and is accessible by means of an existing trail from the Polar Lake (Deposit 5-29) area. It comprises a complex of beach ridges and spits, about 6000 m long and up to 500 m wide in total, which appears to rest on glaciofluvial outwash material. At this time, no environmental constraints to development are identified. Deposit 5-25 has not been investigated previously, and is undeveloped.

Aggregate Supply

Prospective reserves are estimated in the order of 1,300,000 m³ of Class 3 sandy gravel (assuming an average recoverable thickness of 1 m). No laboratory test data are available.

Aggregate Demand

No demand for material from this source is foreseen in the near future.

Recommendation

Development of Deposit 5-25 is not recommended at this time. In the event it is considered, field and laboratory testing should be carried out, to confirm material types and refine the volume estimate.



Deposit 5-26 comprises three beach ridge and spit areas located about 30 km west of Pine Point and 8 km north of Highway 5 (Drawing H3). Prospective reserves, of sandy gravel Class 3 material, are estimated in the order of $400,000 \text{ m}^3$; some sand is present also. Development is not recommended at this time.

Description

This source consists of three, southwest-northeast trending, beach ridge and spit deposits. These are located west of the Buffalo River about 8 km north of Highway 5 (km 53) and presently have no access. The eastern end of the deposit lies close to the Buffalo River valley; no other possible environment constraints to development are identified. Deposit 5-26 is undeveloped and has not been investigated previously.

Aggregate Supply

Reserves are estimated at about $400,000 \text{ m}^3$ of Class 3 sandy gravel aggregate. In the order of $35,000 \text{ m}^3$ of sand (Class 4) also appears to be present. The former estimate assumes an average recoverable thickness of 1 m and is considered to be prospective.

Aggregate Demand

No demand is anticipated for material from this source in the near future.

Recommendation

Development of Deposit 5-26 is not recommended at this time. In the event it is considered, field and laboratory testing should be carried out to confirm material types and refine the volume estimates.



Rock Type	Classifications	Weighted Percentages of Constituents In Each Sieve Fraction							Total Weighted Composition	
		+2"	+1 1/2"	+1"	+3/4"	+1/2"	+3/8"	+1/4"	+#4	
Granite, gneiss		-	2.7	2.1	0.8	2.4	2.8	2.0	2.3	15,1
Limestone, dolomite		5.2	5.3	5.3	3.2	4.7	6.3	9.3	6.0	45.3
Good, Basic igneous, trap Strong		-	-	-	0.4	0.4	0.7	0.9	0.8	3.2
Meta sediments		-	-	1.0	0.8	-	-	-	-	1.8
Carbonates, weather and pitted	ed Fair, moderately strong	-	2.7	5.3	2.4	4.8	5.8	8.0	4.4	33.4
Weathered igneous		-	-	-	-	0.2	-	tr	-	0.2
Weathered meta sedi	ments	-	-	-	-	0.7	-	-	-	0.7
Schist		-	-	-	-	0.1	0.1	0.1	tr.	0.3
TOTALS		5.2	10.7	13.7	7.6	13.3	15.7	20.3	13.5	100.0

SUMMARY OF ROCK TYPES, COARSE AGGREGATE DEPOSIT 5-27

NCTE: Sampled from roadside pit along Highway 5 on October 14, 1987.

PN = 169

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Unified Soil Classification System & N.R.C. Field Description (Modified with clay size at 0.002 mm)



THURBER CONSULTANTS LTD., Geotechnical Engineers

Deposit 5-27 lies along Highway 5, between km 43 and 46, about 37 km southwest of Pine Point (Drawing H3). A number of small pits have been opened up in the past; prospective reserves are estimated at about $850,000 \text{ m}^3$ of Class 3 material. Continued development is recommended.

Description

This source comprises a group of glaciofluvial outwash deposits, veneered by beach ridges, situated along and to the north of Highway 5. Drawing C7 shows the deposit boundaries and geological setting. Data are not available relative to material quantities, quality or distribution. Environment-related constraints to development are not identified.

Aggregate Supply

Limited laboratory testing, on a single sample from one of the roadside borrow pits, gave the following gradation: 40 percent gravel, 50 percent sand and 4 percent fines. A petrographic number (PN) of 169 was determined for the sample.

Assuming an average recoverable thickness of 1 m, prospective reserves are estimated at in the order of 850,000 m³ of sand and gravel (Class 3) aggregate.

Aggregate Demand

Material is currently being extracted by the Highways Department and Hay River area contractors. Projected 5 year demand is estimated at 105,000 m³ of all aggregate classes.

Recommendation

Continued development of Deposit 5-27 is recommended at this time. Some field and laboratory testing is required to identify material types and their distribution and to refine the reserves estimate.



This source comprises several glaciofluvial ridges situated, south of Highway 5, about 35 km southwest of Pine Point (Drawing H3). Prospective reserves are estimated at about $210,000 \text{ m}^3$ of sandy gravel. Development is not recommended at this time.

Description

Deposit 5-28 consists of a number of narrow glaciofluvial ridges, located 1 to 2 km south of Highway 5 at km 48. There is no existing access to this source. No environment-related development constraints are identified. Deposit 5-28 has not been investigated previously and is undeveloped.

Aggregate Supply

Prospective reserves, assuming an average of 1 m of material is recoverable, are estimated in the order of $210,000 \text{ m}^3$ of Class 3 aggregate (some sand may be present also). Test data are not available.

Aggregate Demand

No demand for material from this source is anticipated in the near future.

Recommendation

Deposit 5-28 is not recommended for development at this time; however, in the event it is considered, field and laboratory testing should be carried out, to confirm material type and refine the volume estimate.



GRANULAR SOURCE DESCRIPTION DEPOSIT 5-29 (Mile 31)

This deposit lies along Highway 5, about 3 km west of the Buffalo River and 32 km southwest of Pine Point, as shown on Drawing H3. It has been extensively developed in the past; probable remaining reserves, mostly to the north of the C.N. Rail, are estimated at about 1,250,000 m³ of Class 2 and 140,000 m³ of Class 3 aggregate. Continued development and rehabilitation of depleted areas are recommended.

Description

Deposit 5-29 is located along and to the north of Highway 5, between km 48 and 53. It comprises a group of, mostly southwestnortheast trending, glaciofluvial ridges; Drawing C8 shows the geological setting and deposit boundaries. This source was investigated previously by Bird and Hale (1977), and found to consist of moderately to well graded sand and gravel (Class 2 aggregate); some poorly graded material exists also. Polar Lake, a recreational area, constitutes a constraint to development of the northern edge of the deposit, from an environmental point of view.

Aggregate Supply

Bird and Hale (1977) excavated 27 test pits and carried out a program of laboratory testing. The deposit was found to consist of fine to medium well graded sandy gravel, averaging 60.5 percent gravel, 33.5 percent sand and 6 percent fines (based on 17 gradation tests). Three petrographic analyses were completed, suggesting that the material is suitable for use in concrete.

Remaining reserves are estimated at about $1,250,000 \text{ m}^3$ of Class 2 aggregate, and about $140,000 \text{ m}^3$ of Class 3 material. These volumes are considered to be proven, and primarily exists to the north of the railway.

Aggregate Demand

It is projected that about 55,000 m³ of material will be extracted from this source over the next five years.

Restoration and Rehabilitation

Restoration of depleted pit areas, notably these adjacent to Highway 5 and south of Polar Lake, is recommended. Recent field observations indicate that these areas are well drained but that stockpiles of topsoil and/or overburden materials are not present.



Figure C5 presents a conceptual sketch showing proposed restoration procedures. Once possible end uses, for areas close to the highway, have been considered, rehabilitation should involve site grading and contouring. Any remaining small volumes of borrow material should be salvaged.

Recommendation

Continued development of Deposit 5-29 is recommended. At the same time, restoration and rehabilitation of depleted areas (notably those close to the highway) should be undertaken.



Three glaciofluvial ridges, comprising Deposit 5-30, are located to the east and west of the Buffalo River valley about 30 km southwest of Pine Point (Drawing H3). Reserves are estimated in the order of 225,000 m3 (prospective). An abandoned pit exists in the easternmost ridge; renewed development is not recommended at this time.

Description

Deposit 5-30 comprises a group of three glaciofluvial ridges located 1 to 3.5 km north of Highway 5, on either side of the Buffalo River. The easternmost ridge has an existing (disused or abandoned) borrow pit that is accessible via existing bush trails; however, the other two ridges (west of the river) are not readily accessible. From an environmental view point, no constraints to development are identified. This deposit has not been investigated previously.

Aggregate Supply

It is estimated that prospective reserves are about 225,000 m³, assuming an average recoverable material thickness of 0.5 m. Test data are not available.

Aggregate Demand

No demand for material extraction from Deposit 5-30 in the near future is anticipated.

Recommendation

Development of Deposit 5-30 is not recommended at this time. Field and laboratory testing should be carried out if future development is considered.



This deposit comprises a glaciofluvial ridge, located south of Highway 5 about 35 km southwest of Pine Point (Drawing H3). Prospective reserves are estimated at about 18,500 m³ of sandy gravel. Development is not recommended at this time.

Description

Deposit 5-31 consists of a north-south trending glaciofluvial ridge that is veneered by beach ridge material. It is located about 2 km south of Highway 5 (at km 53); there is no existing access. No environment-related constraints to development are identified. This source has not been investigated previously.

Aggregate Supply

It is estimated that prospective reserves are about $18,500 \text{ m}^3$ of Class 3 aggregate. This assumes an average recoverable thickness of 0.5 m. No test data are available.

Aggregate Demand

No near-term demand for aggregate from this source is identified.

Recommendation

Development of Deposit 5-31 is not recommended at this time, due to its small volume and poor access. Field and laboratory testing is recommended prior to development in the future.



Deposit 5-32 is a small glaciofluvial ridge located about 30 km southwest of Pine Point on the south side of Highway 5 (Drawing H3). Reserves are estimated at about $22,500 \text{ m}^3$ (prospective) of sandy gravel. Development is not recommended at this time.

Description

This source comprises a small glaciofluvial ridge deposit, some 1300 m long and 250 m wide, situated about 700 m south of Highway 5, at km 55. There is no existing access; however, some cut lines cross the deposit. Deposit 5-32 is situated close to the Buffalo River valley. It has not been investigated previously, and is undeveloped.

Aggregate Supply

Estimated prospective reserves are about $22,500 \text{ m}^3$ of sandy gravel (Class 3) material, assuming an average recoverable thickness of 0.5 m. No test data are available.

Aggregate Demand

No requirement to utilize material from this source in the near future is identified.

Recommendation

Source 5-32 is not recommended for development at this time, in view of its poor access and small volume. Field and laboratory testing are recommended prior to development in the future.



SITE PLANS, DRAWINGS C1 to C8

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Granular Aggregate Deposit



Existing Pit (Active, Abandoned or Depleted)























REHABILITATION SKETCHES, FIGURES C1 TO C5



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- delineate waste disposal area
- clean up site
- grade site, to eliminate ponding and contour pit walls
- encourage natural revegetation

	DEPARTMENT OF SUPPLY AND SERVICES	DRAWN IGJ/VY
	CONCEPTUAL RECLAMATION SKETCH	DATE NOVEMBER, 1987 APPROVED
	DEPOSIT 2-1	SCALE N.T.S.
	SOUTH SLAVE GRANULAR STUDY	FILE No 16-5-38
THURBER	CONSULTANTS LTD., Geotechnical Engineers	DRAWING No C1



- consider end uses
- grade site, to eliminate ponding and contour pit walls
- promote positive drainage
- encourage natural revegetation

	DEPARTMENT OF SUPPLY AND SERVICES	DRAWN IGJ/YY
	CONCEPTUAL RECLAMATION SKETCH	APPHOVED DIN
	DEPOSIT 2-5(GRAVEL PIT) SOUTH SLAVE GRANULAR STUDY	SCALE N.T.S. FILE NO 16-5-38
THURBER	CONSULTANTS LTD., Geotechnical Engineers	DRAWING No C2a

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- consider end uses
- grade site, to eliminate ponding and salvage remaining material
- promote positive drainage
- replace topsoil/over burden
- encourage natural revegetation

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- consider end uses
- grade site, to eliminate ponding
- consider tree screen, south side of highway
- promote positive drainage
- encourage natural revegetation

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Polar Lake CNR Site gradin e arading Ponding (due to entravation betow water table)

- consider end uses
- grade site, to eliminate ponding and contour pit walls
- promote positive drainage
  encourage natural revegetation

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# APPENDIX D

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BACKGROUND INFORMATION - MANAGEMENT AREA III

Granular Source Descriptions: Deposits 5-33 to 5-48



#### APPENDIX D

#### BACKGROUND INFORMATION - MANAGEMENT AREA III

#### General

This management area includes the area along Highway 5, between the Buffalo River crossing and north boundary of Wood Buffalo National Park. As shown on Drawing H3, Appendix H, a total of 16 sources, identified as Deposits 5-33 to 5-48, have been delineated.

# Geological Setting

Geologically, the terrain in this area is quite similar to that in Management Area II, consisting of level to undulating glaciolacustrine silt and clay and till plain. Drainage is generally fair to poor, with abundant poorly-drainage organic-infilled depressions. Deposits 5-33 to 5-48 consist predominantly of glaciofluvial ridges and beach ridge and spit complexes. In addition, some areas of eolian (windblown) sand, with very low aggregate potential, have been identified. The granular sources have good surface drainage and permafrost is expected to be absent.

#### Environmental Concerns

No major environmental constraints to development are identified within Management Area III. Deposits located within Wood Buffalo National Park are not included.

# Organization of Appendix

Appendix D has two parts. Firstly, granular source descriptions are presented for Deposits 5-33 to 5-48. Next, Drawing Dl to D4 present photomosaic plans showing the boundaries of and geological setting for Deposits 5-33, 5-40, 5-45 and 5-47.



# GRANULAR SOURCE DESCRIPTIONS, DEPOSITS 5-33 TO 5-48



Deposit 5-33 is traversed by Highway 5, between km 56 and 57.5, about 27 km southwest of Pine Point (Drawing H3). It comprises a glaciofluvial ridge, with prospective reserves estimated at about 55,000 m³ of Class 2 material. Three pits have been opened up to date; continued development is recommended.

#### Description

This source comprises a glaciofluvial ridge, about 1700 m long and 100 to 200 m wide, located along and to the north of Highway 5. Drawing Dl shows the boundaries of and geological setting for the deposit. Three small borrow pits have been opened up within the deposit; no environmental constraints are identified to preclude continued development. Deposit 5-33 has not been investigated previously.

#### Aggregate Supply

Discussions with users indicated that this deposit is shallow and consists predominately of well graded sand and gravel. In one pit (at the east end of the source), material suitable for use in concrete is apparently present; laboratory testing of a single sample from this pit gave the following gradation: 41 percent gravel, 56 percent sand and 3 percent fines. Petrographic analysis determined a PN for the sample of 158 (suggesting that the material is petrographically unsuitable for use in concrete). Since testing of material from other sources indicates that petrographic numbers may be quite variable, however, additional testing is recommended to evaluate suitability for use in concrete.

Probable remaining reserves are estimated at about 55,000 m³ of Class 2 aggregate, assuming an average recoverable thickness of 0.5 m.

## Aggregate Demand

It is projected that up to 20,000 m³ of material may be extracted over the next five years (primarily for use in Management Area II).

## Pit Development

Depending on the results of the recommended program of field and laboratory testing, this deposit should be developed (with a buffer zone along the highway), as a source of Class 1 and 2 material.



# Recommendation

Continued development of Deposit 5-33 is recommended. A program of field testing is proposed, to prove up reserves, determine the occurrence of different material classes (in particular, Class 1 material) and provide a basis for developing a site-specific management plan.





Unified Soil Classification System & N.R.C. Field Description (Modified with clay size at 0.002 mm)

Rock Type Classificati	ons	Weighted Percentages of Constituents In Each Sieve Fraction						Total Weighted Composition	
	+2"	+1 1/2"	+1"	+3/4"	+1/2"	+3/8"	+1/4"	+#4	
Granite, gneiss	-	-	2.4	2.3	2.5	1.6	3.3	2.1	14.2
Limestone, dolomite Good Strong	-	11.1	7.8	3.8	8.0	5.0	7.5	6.3	49.5
Quartzite	-	2.2	-	-	-	-	-	-	2.2
Basic igneous, trap	-	2.2	-	-	0.7	0.6	1.1	0.4	5.0
Carbonates, weathered and pitted Fair, mod strong	_ kerately	4.4	4.8	4.7	5.6	3.9	3.4	1.8	28.6
Weathered igneous	-	-	-	0.3	0.2	-	-	-	0.5
TOTALS	-	19.9	15.0	11.1	17.0	11.1	15.3	10.6	100.0

## SUMMARY OF ROCK TYPES, COARSE AGGREGATE DEPOSIT 5-33

NOTE: Sampled from roadside pit along Highway 5 on October 15, 1987.

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PN = 158

This source comprises three areas of glaciofluvial outwash plain situated close to the junction of Highways 5 and 6, about 23 km southwest of Pine Point (Drawing H3). Portions of the deposit are now used as a Highways Department maintenance camp site. Prospective reserves (excluding the camp areas) are estimated at about 225,000 m³ of sandy gravel. Further development is not recommended at this time.

## Description

Deposit 5-34 consists of a group of glaciofluvial outwash plain deposits, located within an area with an overall length of about 4000 m and width of up to 1500 m. The geological setting for and boundaries of the deposit are shown on Drawing Dl. As noted, the Highways Department camp takes up a significant part of the deposit. No environmental constraints to development are identified. This source has not been investigated previously.

#### Aggregate Supply

Reserves (prospective) of aggregate are estimated in the order of 225,000 m³ of sandy gravel (Class 3) material, assuming an average recoverable thickness of 1 m. Test data are not available.

# Aggregate Demand

It is not anticipated that there will be a demand for material from this source in the near future.

#### Recommendation

Development of the remaining areas of Deposit 5-34 is not recommended at this time. In the event it is considered, field and laboratory testing should be carried out to confirm material types and refine the volume estimate.



This source comprises a series of southwest-northeast trending glaciofluvial ridges, located north of Highways 5 and 6, about 25 km west of Pine Point (Drawing H3). Prospective reserves, of sandy gravel (Class 3) material, are estimated at 575,000 m³. At this time, development is not recommended.

## Description

Deposit 5-35 consists of a group of five glaciofluvial ridges, some of which are veneered by beach ridge material. It is located 6 to 7 km north of the Highway 5 and 6 junction, and is not readily accessible (bush trails appear to traverse parts of the deposit). No environmental constraints to development are identified. Deposit 5-35 has not been investigated previously.

# Aggregate Supply

It is estimated that the reserves of Deposit 5-35 (prospective) are in the order of  $575,000 \text{ m}^3$  of sandy gravel (Class 3) material. This assumes that an average of 0.5 m of aggregate is recoverable.

#### Aggregate Demand

No demand for material from this source is anticipated in the near future.

# Recommendation

Development of Deposit 5-35 is not recommended at this time. In the event it is considered, field and laboratory testing should be undertaken.



Deposit 5-36, a glaciofluvial ridge, is located east of Highway 5 about 22 km southwest of Pine Point (Drawing H3). Estimated prospective reserves are about  $390,000 \text{ m}^3$  of Class 3 sandy gravel. Development is not recommended at this time.

# Description

Deposit 5-36 comprises a 2600 m long and 200 to 300 m wide glaciofluvial ridge, the west end of which is located 250 m east of Highway 5 at km 61. It is expected to consist of sandy gravel aggregate but has not been investigated previously. No environmental development constraints are identified.

## Aggregate Supply

Assuming an average recoverable thickness of 1 m, prospective reserves are estimated at  $390,000 \text{ m}^3$  of Class 3 material. No test data are available.

#### Aggregate Demand

No requirement to utilize material from this source in the near future is identified.

# Recommendation

Development of Deposit 5-36 is not recommended at this time. A program of field and laboratory testing should be carried out in the event it is considered.



This source comprises two small areas of glaciofluvial outwash plain situated, west of Highway 5, about 25 km southwest of Pine Point (Drawing H3). Prospective reserves are estimated at about  $55,000 \text{ m}^3$  of Class 4 material. Development is not recommended at this time.

## Description

Deposit 5-37 consists of two small outwash plain areas located 1 to 2 km west of Highway 5, at km 62. There is no existing access, other than a number of cut lines that cross the area. The occurrence of a sink hole adjacent to the deposit is viewed as a development constraint from the environmental point of view. Deposit 5-37 has not been investigated previously.

## Aggregate Supply

Assuming an average 0.5 m of material is recoverable, prospective reserves are estimated in the order of 55,000 m³ of Class 4 gravelly sand.

# Aggregate Demand

There is no apparent demand at this time to obtain granular material from this source.

# Recommendation

Development of Deposit 5-37 is not recommended at this time.


Deposit 5-38 consists of a series of glaciofluvial ridges located about 28 km southwest of Pine Point and west of Highway 5 (Drawing H3). It is estimated that reserves are in the order of 240,000  $m^3$ of sandy gravel (prospective). Development is not recommended at this time.

## Description

This source comprises a group of seven small glaciofluvial ridges, located 2 to 7 km west of Highway 5 at about km 64. No access presently exists, other than a number of cut lines that may provide winter access. Environmental constraints to development are not identified. Deposit 5-38 has not been investigated previously.

## Aggregate Supply

Prospective reserves are estimated at about  $240,000 \text{ m}^3$  (assuming an average of 0.5 m of material is recoverable). Deposit 5-38 is expected to consist of sandy gravel (Class 3) aggregate.

## Aggregate Demand

No requirement to extract material from this source is anticipated in the near future.

#### Recommendation

Development of Deposit 5-38 is not recommended at this time. In the event it is considered, a program of field and laboratory testing should be carried out.



Deposit 5-39 is a long and narrow beach ridge complex located to the east of Highway 5, about 15 to 20 km southwest of Pine Point (Drawing H3). Prospective reserves are estimated at  $1,050,000 \text{ m}^3$  of Class 3 sandy gravel aggregate. Renewed development (in the area of an existing abandoned pit) is not recommended at this time.

## Description

This source comprises a beach ridge complex, about 7000 m long and ranging from 50 m to 500 m wide. Drawing D2 shows the deposit boundaries and geological setting. The western end of the deposit, where a borrow pit (now abandoned) was previously developed, is about 300 m east of Highway 5 at km 62.5, and accessible by means of an existing trail. No environmental constraints are identified to hinder renewed development. As far as is known, Deposit 5-39 has not been investigated in the past.

## Aggregate Supply

Reserves are estimated to be in the order of  $1,050,000 \text{ m}^3$  of Class 3 sandy gravel, assuming an average recoverable thickness of 2 m. This volume estimate is considered to be prospective.

## Aggregate Demand

There appears to be no demand for material from Deposit 5-39 in the near future.

## Recommendation

Renewed development of Deposit 5-39 is not recommended at this time. In the event it is considered, field and laboratory testing should be undertaken to confirm reserve estimates and investigate aggregate quality.



## GRANULAR SOURCE DESCRIPTION DEPOSIT 5-40 (D.P.W. km 64.5)

Deposit 5-40 consists of an extensive complex of beach ridges and spits, located to the east and west of Highway 5 at about km 64.5. It lies about 23 km southwest of Pine Point (Drawing H3). Proven, probable and prospective reserves are estimated at about 150,000 m³, 750,000 m³ and 3,250,000 m³ of Class 2 material. Considerable volumes of material were extracted during winter 1986-1987 for crushing to produce aggregate to be used in asphalt; continued development is recommended.

#### Description

This source comprises a series of beach ridge and spit deposits that trend, in different sections, both north-south and east-west. The geological setting and deposit boundaries are shown on Drawing D2.

Overall, the beach ridge complex is in the order of 10,000 m long and up to 1,500 m wide. It is traversed by Highway 5 between kms 64 and 65; there is an abandoned DPW pit on the west and newly opened-up Highways Department pit on the east. The deposit was previously investigated by Underhill Engineering (1986b). No environment-related constraints to continued development are identified.

#### Aggregate Supply

Recent testing by Underhill Engineering (1986b) indicates that portions of Deposit 5-40 (close to the highway) consist of up to about 4.5 m of well graded sand and gravel. The granular aggregate is underlain by clay till and/or the water table.

Laboratory testing has been carried out by Underhill Engineering, as well as on samples collected during the present study. The laboratory test results are summarised on Table D1. Deposits 5-40 (in the areas sampled) consists predominantly of Class 2 aggregate. The petrographic analyses suggest that the material may be suitable for use in concrete; additional testing is required to confirm this.

Allowing for utilization of some material in 1987 (for asphalt paving) by the Highways Department, proven, probable and prospective reserves are estimated at  $150,000 \text{ m}^3$ ,  $750,000 \text{ m}^3$  and  $3,250,000 \text{ m}^3$  respectively. These volume estimates assume an overall average recoverable thickness of 2.0 m.



## TABLE D1

Tes Pro	t cedure	No. of Tests	Range	Average	Comment
Gra	in Size (%)				
• •	Gravel Sand Fines	22 22 22	37-81 10-56 2-24	64 28 8	
L.A	. Abrasion (% loss)				
•	coarse	2	24–29	27	
Sul	phate Soundness (% 1	oss)			
•	coarse fine	1 1		2.0 3.8	
Pet Ana	rographic lysis (PN)	1	-	115	Petrographi- cally suit- able for use in concrete

## SUMMARY OF LABORATORY TEST RESULTS DEPOSIT 5-40

Sources: Underhill Engineering (1986a); this study

## Aggregate Demand

Projected requirements for aggregate for Highways use in Management Area III (including a portion of Wood Buffalo National Park) are about  $61,000 \text{ m}^3$  over the next 5 years. It is assumed that about half of the Class 2 material (31,000 m³) and all of the Class 3 aggregate would be obtained from Deposit 5-40.

## Pit Development

Deposit 5-40 should be developed by extending the existing pit area to the east along the axis of the main beach ridge. As sections of the deposit close to Highway 5 are depleted, topsoil and overburden materials that have been stockpiled should be used for site restoration and rehabiliatation.



## Recommendation

Development of this source is recommended to continue. In the event areas of the deposit away from the existing pit are to be developed, additional field and laboratory testing should be carried out to confirm material types and distribution, and refine the volume estimates.







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Rock Type	Classifications	ns Weighted Percentages of Constituents In Each Sieve Fraction							Total Weighted Composition		
		+2 1/2"	+2"	+1 1/2"	+1"	+3/4"	+1/2"	+3/8"	+1/4"	+#4	
Granite, gneiss		-	-	-	1.5	1.5	2.8	2.0	2.4	1.0	11.2
Limestone, dolomi	te Good, strong	-	2.1	7.2	3.0	11.7	6.2	5.1	4.1	0.2	39.6
Sandstone, quartz greywacke	- ite,	· –	2.1	-	6.3	0.6	9.2	6.1	7.9	6.2	38.4
Acid and basic vol	- lcanics	-	-	-	0.7	0.8	0.4	0.3	0.9	0.1	3.2
Weathered igneous and volcanics		-	-	-	-	-	0.2	0.1	0.2	tr	0.5
Weathered sandston and siltstone	- De Fair modoratoly	-	-	0.9	-	-	0.5	0.1	0.2	0.1	1.8
weathered carbonates	-	-	-	0.4	0.7	0.2	0.1	0.1	-	1.5	
Encrustrations		-	-	0.9	0.9	1.0	0.8	0.1	0.1	-	3.8
TOTALS		-	4.2	9.0	12.8	16.3	20.3	13.9	15.7	7.6	100.0

# SUMMARY OF ROCK TYPES, COARSE AGGREGATE

NOTE: From Highways pit at km 64.5, Highway 5, March, 1987.

PN = 115

This deposit comprises two outwash plain areas, located adjacent to Highway 5 about 20 km southwest of Pine Point (Drawing H3). Prospective reserves, of gravelly sand, are estimated at about 1,100,000  $m^3$ . Development is not recommended at this time.

#### Description

Deposit 5-41 consists of two areas of sandy outwash plain situated along and to the east of Highway 5 between km 67 and km 71. Drawing Dl shows the geological setting and boundaries of a portion of the deposit. No environmental constraints to development are identified; however, due to the generally low aggregate quality, development is not recommended. Deposit 5-41 has not been investigated previously.

#### Aggregate Supply

Assuming an average of 0.5 m of gravelly sand is recoverable (above water table), prospective reserves are estimated to be in the order of  $1,100,000 \text{ m}^3$  of Class 4 aggregate.

## Aggregate Demand

No demand is anticipated in the near future for material from this deposit.

## Recommendation

Development of Deposit 5-41 is not recommended at this time.



This source, comprising a glaciofluvial ridge deposit, is situated west of Highway 5 and about 20 km southwest of Pine Point, as shown on Drawing H3. Prospective reserves are estimated at about 230,000  $m^3$  of sandy gravel. A pit, now abandoned, was developed during construction of the highway; renewed extraction is not recommended at this time.

#### Description

Deposit 5-42 is a glaciofluvial ridge, about 3000 m long and up to 200 m wide, located to the southwest of Highway 5 at km 72. A borrow pit was developed adjacent to the highway during construction but is now abandoned. No environmental constraints to renewed development are identified. Field and laboratory test data are not available.

## Aggregate Supply

Remaining reserves (prospective) are estimated in the order of 230,000 m³ of sandy gravel (Class 3 aggregate), assuming an average recoverable thickness of 1 m.

## Aggregate Demand

No demand for material from this source is anticipated in the near future.

## Recommendation

Renewed development of the Deposit 5-42 is not recommended at this time. In the event it is considered, available material types and volumes should be determined by means of a program of field and laboratory testing.



Deposit 5-43 consists of two glaciofluvial ridges, located southwest of Highway 5 about 21 km southwest of Pine Point (Drawing H3). Estimated reserves (prospective) are about  $840,000 \text{ m}^3$  of Class 3 sandy gravel aggregate. Development is not recommended at this time.

#### Description

Deposit 5-43 comprises two southwest-northeast trending, glaciofluvial ridges situated to the southwest of Highway 5 at km 76. The ridges are up to 5,500 m long and 400 m wide. At present, access to the deposit is poor (along bush trails) to non-existent. It has not been investigated previously. No environment-related development constraints are identified.

## Aggregate Supply

Prospective reserves are estimated in the order of  $840,000 \text{ m}^3$  of sandy gravel (Class 3) material. Laboratory testing data are not available.

## Aggregate Demand

No demand for material from this source is anticipated in the near future.

## Recommendation

It is recommended that no development of Deposit 5-43 not be considered at this time. A program of field and laboratory testing should precede any decision to develop this source.



This source comprises a complex of eolian ridge and dune deposits situated to the east of Highway 5 about 20 km south of Pine Point (Drawing H3). Development is not recommended, and reserves have not been computed.

## Description

Overall, Deposit 5-44 covers an area about 5000 m long and is up to 1500 m wide. It comprises a complex of eolian (windblown) sand ridges and dunes, located 3 to 4 km east of Highway 5 at km 80. Access via the existing power line right-of-way would be relatively poor. This source has not been investigated previously.

## Aggregate Supply

Deposit 5-44 is anticipated to consist of silty fine sand and silt, suitable only for use as low quality (Class 4) general fill, where frost susceptibility is not a concern. Since development is not recommended, reserves have not been estimated.

#### Aggregate Demand

No demand for material from this site is anticipated in the future.

## Recommendation

Development of Deposit 5-44 is not recommended.



## GRANULAR SOURCE DESCRIPTION DEPOSIT 5-45 (D.P.W. km 83.5)

A beach ridge deposit, this source is traversed by Highway 5, between km 83 and 84, about 23 km south of Pine Point (Drawing H3). Proven and probable reserves are estimated at 60,000 m³ and 390,000 m³ respectively, of Class 2 aggregate. Continued development of the Highways Department pit at km 83.5 is recommended.

#### Description

Deposit 5-45 comprises a 2,000 m long and 200 m to 300 m wide area of beach ridges; Drawing D3 shows the deposit boundaries and geological setting. The section to the east of the highway has been investigated by Underhill Engineering (1986b), and found to consist of up to 3 m of well graded sand and gravel (Class 2 aggregate), overlying shale bedrock. Suitability of the material for use in concrete was not established. A pit was developed to the east of Highway 5 during road construction; it was apparently abandoned until recently. No environmental constraints to renewed development of the deposit are identified.

#### Aggregate Supply

Deposit 5-45 is composed of well graded sand and gravel. Table D2 summarises the results of laboratory testing to date.

		TABLE D2	
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DEPOSIT 5-45									
Test Procedure	No. of Tests	Range	Average	Comment					
Grain Size (%)									
<ul><li>Gravel</li><li>Sand</li><li>Fines</li></ul>	11 11 11	43–78 15–40 5–12	62 30 8						
L.A. Abrasion (% loss)	1	-	26	crushed sample					

Source: Underhill Engineering (1986a)



Remaining reserves are estimated at about  $60,000 \text{ m}^3$  (proven) and  $390,000 \text{ m}^3$  (probable), of well-graded sand and gravel (Class 2) material. Approximately  $30,000 \text{ m}^3$  of aggregate appears to have been extracted from the existing pit.

## Aggregate Demand

The demand for Class 2 material from this source for highways use over the next five years is projected at about  $15,000 \text{ m}^3$  (ie. in the order of 25 percent of the total requirement in Management Area III); some Class 3 aggregate may also be extracted.

#### Pit Development

This source should be developed by extending the existing pit towards the east for the full width of the deposit. Aggregate should be extracted down to till or bedrock. Site restoration and rehabilitation should be undertaken, on a continuing basis, as pit development proceeds, using topsoil and/or overburden materials that were stockpiled previously.

## Recommendation

It is recommended that Deposit 5-45 should continue to be used as a source of highways maintenance material in Management Area III.



Deposit 5-46 consists of a group of glaciofluvial ridges, located west of Highway 5 and about 25 km south of Pine Point (Drawing H3). Prospective reserves are estimated at some 1,500,000 m³ of sandy gravel (Class 3) aggregate. Development is not recommended at this time.

#### Description

This source comprises four, east-west trending, glaciofluvial ridges, situated 1 to 4 km west of Highway 5 at about km 84.5. Access is relatively poor. The deposit has not been investigated previously.

## Aggregate Supply

Reserves (prospective) are estimated in the order of 1,500,000  $\rm m^3$  of Class 3 material. This assumes an average recoverable thickness of 1 m.

## Aggregate Demand

No demand for material from Deposit 5-46 is anticipated in the near future.

## Recommendation

Development is not recommended at this time. In the event it is considered in the future, a program of field and laboratory testing should be carried out.



## GRANULAR SOURCE DESCRIPTION DEPOSIT 5-47 (D.P.W. km 89.1)

Deposit 5-47 is a glaciofluvial ridge deposit, situated east of Highway 5 and some 29 km south of Pine Point (Drawing H3). Proven reserves of Class 2 material are estimated at about  $62,500 \text{ m}^3$ . A Highways Department pit exists at km 89.1; continued development is recommended.

#### Description

This source comprises a narrow glaciofluvial ridge, composed of moderately to well graded sand and gravel. It is about 1,300 m long and up to 150 m wide, and is accessible directly from the highway. The boundaries of the deposit and geological setting are shown on Drawing D4. A small pit, now abandoned and depleted, was developed previously in connection with highway construction; recent testing, by Underhill Engineering (1986b) was aimed at proving up additional reserves further to the east. No environmental concerns are identified that would preclude renewed development.

#### Aggregate Supply

Deposit 5-47 consists of moderately to well graded sand and gravel, varying in thickness up to about 3.8 m (Underhill Engineering, 1986b). Results of laboratory testing to date are summarised on Table D3.

#### TABLE D3

## SUMMARY OF LABORATORY TEST RESULTS DEPOSIT 5-47

Test Procedure	No. of Tests	Range	Average	Comment
Grain Size (%)				
<ul><li>Gravel</li><li>Sand</li><li>Fines</li></ul>	16 16 16	53-79 12-31 7-31	67 20 13	
L.A. Abrasion (% loss)				
. coarse	1	-	28	crush sample

Source: Underhill Engineering (1986a)



Remaining reserves (prior to possible extraction of material in connection with the planned D.P.W. asphalt paving program) are estimated at about  $62,500 \text{ m}^3$  (proven).

## Aggregate Demand

Over the next five years, projected demand is expected to be in the order of  $15,000 \text{ m}^3$  of Class 2 aggregate (ie. about 25 percent of the total management area demand). It is possible some Class 3 material may also be extracted.

## Pit Development

Deposit 5-47 should be developed by extending the existing (depleted) pit to the east, for the full width and depth of the deposit. Site restoration and rehabiliatation measures should be implemented, on a continuing basis, as development proceeds.

## Recommendation

Deposit 5-47 should continue to be developed as a source of aggregate for highway maintenance and construction material.



This source comprises a complex of silty fine sand eolian dunes and ridges. The north end of the deposit is situated adjacent to Sandy Lake, about 36 km south of Pine Point, while the remainder extends southeastwards for some distance into Wood Buffalo National Park (Drawing H3). For environmental reasons (ie. proximity to the Park and also to the Sandy Lake recreation area), development is not recommended. Reserves, of poor quality Class 4 aggregate, have not been estimated.

4096



## SITE PLANS, DRAWINGS D1 TO D4



.







Granular Aggregate Deposit



Existing Pit (Active, Abandoned or Depleted)

+ 629520E UTM (Unified Transverse Mercator) 6735625N Grid Reference Point (Grid 11)





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	DEPOSIT 5-47	NOVEMBER, 1987
	SOUTH SLAVE GRANULAR STUDY	SCALE 1 20,000
THURBER	CONSULTANTS LTD., Geotechnical Engineers	DRAWING NO. D4

APPENDIX E

BACKGROUND INFORMATION - MANAGEMENT AREA IV



#### APPENDIX E

#### BACKGROUND INFORMATION - MANAGEMENT AREA IV

Management Area IV includes the area between the east boundary of Wood Buffalo National Park and the community of Fort Smith. Three deposits, Deposits 5-68 to 5-70 (locations of which are shown on Drawing H5, Appendix H), have been identified.

#### Geological Setting

The western part of Management Area IV (where the three sources are located) comprises a moraine-veneered bedrock upland; the area to the east consists mostly of alluvial deposits of the Slave River. The upland area has undulating terrain, with locally abundant karst depressions, and good surface drainage. Permafrost is expected to be absent (except in isolated organic bog deposits). Deposits 5-68 to 5-70 comprise complexes of beach ridges deposited on topographic high areas.

## Environmental Concerns

No major concerns are identified from an environmental point of view. Deposit 5-68 extends to within 300 m of the Little Buffalo River valley.

## Organization of Appendix

Appendix E has three parts. Firstly, granular source descriptions are presented. Drawing El then show the boundaries of, and geological settings for, Deposit 5-69 and 5-70. Finally, sketches illustrating the restoration and rehabilitation recommendations are presented.



GRANULAR SOURCE DESCRIPTIONS Deposits 5-68 to 5-70



## GRANULAR SOURCE DESCRIPTION Deposit 5-68 (Hill 2)

Deposit 5-68 comprises a complex of beach ridge deposits, located about 4 km east of the Park gates and 45 km west of Fort Smith (Drawing H5). Prospective reserves are estimated at about  $1,750,000 \text{ m}^3$  of Class 3 material. Development is not recommended at this time.

## Description

This source is traversed by Highway 5 between km 214.5 and 216. The beach ridges cover an area that is about 2600 m long and up to 1300 m wide. Deposit 5-68 was identified previously (as Hill 2) but not investigated in detail by Thurber Consultants (1980). The western boundary of the deposit lies about 300 m east of the Little Buffalo River valley; no other environmental constraints to development are identified.

#### Aggregate Supply

Assuming an average recoverable thickness of 1 m, prospective reserves are estimated at about  $1,750,000 \text{ m}^3$  of Class 3 material. Field and laboratory testing would be required to confirm this assessment, prior to any decision to commence development of this source.

## Aggregate Demand

Until such time as Deposits 5-69 and 5-70 are depleted, it is not foreseen that there will be any demand for material from this source.

## Recommendation

Development of Deposit 5-68 is not recommended until the other Salt Mountain area deposits are depleted. Prior to development, field and laboratory testing should be undertaken to confirm material types and refine the volume estimate.



## GRANULAR SOURCE DESCRIPTION DEPOSIT 5-69 (Hill 1)

This deposit lies adjacent to Highway 5, about 34 km west of Fort Smith (Drawing H5). It comprises a complex of beach ridges, with some lag material, that has been deposited on a bedrock high. Probable remaining reserves (four borrow pits have been developed to date but are now abandoned or close to depletion) are estimated at in the order of  $9,000,000 \text{ m}^3$  of Class 3 material. Continued development of this source is recommended.

#### Description

Located along and mostly to the north of Highway 5, between km 229 and 232, Deposit 5-69 consists predominantly of sandy gravel beach ridges, with some lag materials, deposited on a broad bedrock high. The geological setting and deposit boundaries are shown on Drawing El.

To date, four borrow pits have been opened up, accessible either directly from the highway or via Foxhole Road; these are identified by Indian and Northern Affairs as the Foxhole N and S and Salt Mountain N and S pits (locations are shown on Drawing El). The Salt Mountain pits are nearly depleted, while the Foxhole pits are expected to be close to depletion within the next five years. No environmental constraints to continued extraction from the Deposit 5-69 pits, nor development of new pits within the deposit, are identified.

## Aggregate Supply

Field and laboratory testing was carried out previously by Thurber Consultants (1981a) and Hardy Associates (1984). In addition, Transport Canada undertook a limited program of testing to prove up material in the Salt Mountain N pit area. Testing of material from existing pits (samples from stockpiles in Fort Smith) was also carried out as part of this study. Available test results are summarized on Table El.

Deposit 5-69 consists of well to poorly graded sandy gravel (Class 3 aggregate), that may be processed to produce Class 2 material; some gravelly sand is present also. Petrographic analyses indicate that it is not suitable for use in concrete and experience (for example, that of Transport Canada) has shown that it is marginally suitable to unsuitable for use in asphalt.



In 1981, Thurber Consultants estimated (prospective) reserves at in the order of  $10,000,000 \text{ m}^3$  of Class 3 material, while Hardy Associates (1984) delineated proven and probable reserves totalling 130,000 m³, in the Foxhole S (Area B) and Salt Mountain S pit (Area C) areas, and in Area A (to the east of Foxhole N pit). Remaining reserves (probable) are still estimated in excess of 9,000,000 m³, taking into account the material that has been extracted since 1981. Area B (of Hardy Associates) is now approaching depletion, while extraction continues from Area C. Apparently, no extraction from Area A has taken place to date.

#### TABLE E1

Tes	t Procedure	No. of Tests	Range	Average	Comment
Gra	in Size (%)				
• • •	Gravel Sand Fines	23 23 23	46-95 2-47 3-12	62 32 6	
L.A	. Abrasion (%	less)			
•	coarse	3	31-42	35	One small sample was not to specification
Sul	phate Soundne	ess (% less)			
•	coarse fine	1 1	-	6.5 7.9	
Pet Ana	rographic lysis (PN)	8	209-294	248	Petrographically un- suitable for use in concrete or asphalt

SUMMARY OF LABORATORY TEST RESULTS DEPOSITS 5-69

Sources: Thurber Consultants (1981a); Hardy Associates (1984); Transport Canada; this study

## Aggregate Demand

Projected Fort Smith area demand for Class 3 and Class 4 material, to be met from Deposit 5-69 is estimated over the next 5 years at



23,000 m³ to 37,000 m³. Once the existing pits are depleted, additional material will need to be obtained from new pits developed in other parts of the deposit (for example, Area A of Hardy Associates and the higher central portion of the deposit, investigated previously by Thurber Consultants).

#### Deposit Development

The existing pits should be developed to depletion in acccordance with the management plans presented by Hardy Associates (1984). Within the next five years, consideration should be given to opening up Area A (Hardy Associates, 1984), located to the east of the Foxhole N Pit, as a source of additional material.

## Restoration and Rehabilitation

With the exception of the Foxhole N pit (that was already abandoned/depleted), it appears that granular aggregate extraction has been carried out in general accordance with the recommendations provided by Hardy Associates (1984). As a result, stockpiles of topsoil and/or overburden are available for pit restoration and rehabilitation.

Conceptual sketch showing the recommended procedures for restoration of depleted pit areas within Deposit 5-69 is presented on Figure El. Once it is verified that the area is depleted and possible end uses have been considered, site grading and contouring should be carried out, to eliminate areas of ponded water (if any) and blend the pit boundaries into the surrounding terrain. Available topsoil and overburden material should then be spread over the rehabilitated areas (as a source of seeds to promote natural revegetation).

## Recommendation

Continued development of Deposit 5-69 as the prime source of aggregate for Fort Smith users is recommended. Development of new pits will soon be required as proven reserves are depleted. Additional work is required to prove up available volumes and, on this basis, to identify optimum pit sites and develop site-specific management plans.





Unified Soit Classification System & N.R.C. Field Description (Modified with clay size at 0.002 mm)

THURBER CONSULTANTS LTD., Geotechnical Engineers

Rock Type	Classifications	Weighted Percentages of Constituents In Each Sieve Fraction									Total Weighted Composition
		+2 1/2"	+2"	+1 1/2"	+1"	+3/4"	4" +1/2"	+3/8"	+1/4"	+#4	
Granite, gneiss		-	-	-	11.9	2.8	6.1	5.0	10.2	8.2	44.2
Acid and basic volcanics	Good, strong	-	-	-	-	-	-	0.6	0.9	0.5	2.0
Weathered and pitt limestone and dolo	ed mite	-	-	-	10.3	5.8	11.3	7.9	10.3	6.3	51.9
Weathered granite and gneiss	Fair, moderately strong	-	-	-	-	-	0.7	0.2	0.3	0.2	1.4
Encrustations		-	-	-	-	-	0.2	-	-	-	0.2
Granite, highly weathered	Poor, weak	-	-	-	-	0.3	-	-	-	-	0.3
TOTALS		-	-	-	22,2	8.9	18.3	13.7	21,7	15.2	100.0

## SUMMARY OF ROCK TYPES, COARSE AGGREGATE DEPOSIT 5-69 (FOXHOLE S PIT)

NOTE: From pit-run stockpile in Fort Smith, March, 1987.

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PN = 209



Unified Soil Classification System B. N.R.C. Field Description (Modified with clay size at 0.002 mm)

THURBER CONSULTANTS LTD., Geotechnical Engineers

Rock Type	Classifications	ions Weighted Percentages of Constituents In Each Sieve Fraction								Total Weighted Composition	
		+2 1/2"	+2"	+1 1/2"	+1"	+3/4"	+1/2"	+3/8"	+1/4"	+#4	
Granite, gneiss	Good, strong	-	-	1.7	2.6	0.9	1.9	1.5	2.8	2.9	14.3
Acid and basic volcanics	-	-	-	-	-	-	0.8	0.3	0.3	0.1	1.5
Weathered and pitted limestone dolomite	Fair, moderately strong	16.0	6,9	7.0	11.8	6.9	11.0	7.9	10.0	6.4	83.9
Weathered granite and gneiss		-	-	-	-	-	0.1	tr	0.1	0.1	0.3
TOTALS		16.0	6.9	8.7	14.4	7.0	13.8	9.7	13.2	9.5	100.0

## SUMMARY OF ROCK TYPES, COARSE ACCREGATE DEPOSIT 5-69 (SALT MOUNTAIN N PIT)

NOTE: From pit-run stockpile in Fort Smith, March, 1987.

PN = 268

## GRANULAR SOURCE DESCRIPTION DEPOSIT 5-70 (Salt Mountain; DPW km 232.5)

Deposit 5-70 is located along Highway 5, about 32 km west of Fort Smith (Drawing H5). It consists of beach ridge deposits surrounding a bedrock high. Two pits have been developed to date; remaining (probable) reserves are estimated at in the order of 2,000,000 m³ of Class 3 material. Continued development, perhaps including opening up new pits on the north side of the highway, is recommended.

#### Description

This source lies along and mostly to the north of Highway 5, between km 232.5 and 234.5. It consists of sandy gravel beach ridge deposits. To date, two pits have been developed (identified as the Lookout and Highways pits), one on either side of the highway. Drawing El shows the geological setting, existing pit locations and deposit boundaries. It is possible that the GNWT Highways pit to the south of the highway may be approaching depletion by 1992 (although aggregate appears to be still available along the north and east sides of the pit). The Lookout pit appears to be abandoned at this time. Environmental constraints to continued extraction from this source are not identified.

## Aggregate Supply

In 1981, a program of field and laboratory testing was carried out in the northern part of Deposit 5-70 (ie. north of Highway 5) by Thurber Consultants (1981a). A limited amount of testing has since been carried out by the GNWT Highways Division. Laboratory test results are summarized on Table E2.

Testing indicates that the aggregate is a well to poorly graded sandy gravel (Class 3); with processing, Class 2 material can be produced. While the petrographic analyses suggest that it is unsuitable for use as concrete or asphalt aggregate, it is understand that Deposit 5-70 material has been used in asphalt by the Highways Department.

Probable reserves were estimated to be between 2 and 3 million  $m^3$  of Class 3 material by Thurber Consultants (1981a). Remaining reserves in this source are still estimated to exceed 2,000,000  $m^3$  (probable), assuming in the order of 120,000  $m^3$  per year has been extracted since 1981.



## Aggregate Demand

Projected requirements for aggregate from this source, for road maintenance primarily, over the next five years are about 62,000 m³ of Class 2 material (produced by processing of the Class 3 aggregate). Once the existing pit is depleted, consideration should be given to developing a new pit(s) to the north of the highway. This latter area was tested previously on a preliminary basis (along the power line right of way) by Thurber Consultants (1981a); additional testing would be required to prove up available volumes and develop a site-specific management plan.

## TABLE E2

## SUMMARY OF LABORATORY TEST RESULTS DEPOSITS 5-70

Tes	t Procedure	No. of Tests	Range	Average	Comment
Gra	in Size (%)				
• •	Gravel Sand Fines	7 7 7	64-93 3-30 2-10	74 21 5	
L.A	. Abrasion (%	less)			
•	coarse	1	-	26	
Sul	phate Soundne	ss (% less)			
•	coarse fine	1	-	0.9	
Pet Ana	rographic lysis (PN)	1	-	291	Petrographically un- suitable for use in concrete and asphalt

Sources: Thurber Consultants (1981a); Highways Division (1982)

## Recommendation

Continued utilization of Deposit 5-70 as a source of highway maintenance material is recommended. Consideration should soon be given to delineating additional reserves on the north side of Highway 5 (to be developed once the existing Highways pit is depleted).


SITE PLAN, DRAWING E1







Surficial Geology Boundary

TTTT Escarpment



Granular Aggregate Deposit



Existing Pit (Active, Abandoned or Depleted)

+ 421050E 6653195N

UTM (Unified Transverse Mercator) Grid Reference Point (Grid 12)



# REHABILIATATION SKETCHES

FIGURE El



Ş.



THURBER	CONSULTANTS	LTD.,	Geotechnical	Engineers	DRAWING No.		

E1

APPENDIX F

BACKGROUND INFORMATION - MANAGEMENT AREA V



### APPENDIX F

### BACKGROUND INFORMATION - MANAGEMENT AREA V

## General

Management Area V encompasses Highway 6 and the areas to the north and south of it, together with the communities of Pine Point and Fort Resolution. A total of 24 deposits have been delineated; locations of Deposits 6-1 to 6-25 are shown on Drawing H6, Appendix H.

#### <u>Geological</u> Setting

This part of the Region consists predominantly of a poorly drained, level to gently undulating, glaciolacustrine plain. Silts and clays, often veneered with organics and likely containing permafrost, are the dominant subsoils. Rising above the plain are a number of bedrock (limestone) topographic highs, upon which beach ridge and lag deposits have been laid down. These latter are the dominant type of aggregate source in Management Area V. In the western section, some gravelly glaciofluvial ridges are also present. Permafrost is not expected to exist within the granular deposits.

## Environmental Concerns

No major constraints to development are identified from the environmental point of view. However, a number of the deposits, not considered for development, are located close to the Great Slave Lake shoreline.

### Organization of Appendix

This appendix is organized in three parts. Firstly, granular resource descriptions are presented for Deposits 6-1 to 6-24. Drawings Fl to F6 then show deposit boundaries and geological settings for the sources that have been or may be developed. Finally, rehabilitation sketches are presented.



GRANULAR SOURCE DESCRIPTIONS Deposits 6-1 to 6-24



Deposit 6-1, located 2 to 3 km north of Highway 6 and about 22 km southwest of Pine Point (Drawing H6), comprises a group of glaciofluvial outwash ridges. Prospective reserves are estimated at about 350,000 m³ of sandy gravel (Class 3) aggregate. Development is not recommended at this time.

## Description

This source consists of three outwash ridges, ranging from 500 m to 2600 m long and up to 350 m wide. Access from the highway is along existing mine roads and exploration trails. Borrow pits (now abandoned) were developed, in connection with railway construction, in two of the ridges while the third (most northerly) ridge is undeveloped. No environmental/development concerns are identified. Deposit 6-1 has not been investigated previously.

#### Aggregate Supply

Prospective reserves of Deposit 6-1 are estimated to be approximately  $350,000 \text{ m}^3$  of sandy gravel (Class 3) material, assuming an average recoverable thickness of 1 m. Field and laboratory testing would be required to confirm this assessment.

### Aggregate Demand

No demand for granular aggregate from Deposit 6-1 is foreseen within the next 5 years.

## Recommendation

In view of its relative inaccessibility and projected lack of demand for the material, renewed development of Deposit 6-1 is not recommended at this time. Should it be considered in the future, field and laboratory testing should be carried out to confirm material type and refine the volume estimate.



Deposit 6-2 comprises a complex of beach ridges surrounding a bedrock high, located about 20 km southwest of Pine Point (Drawing H6). Prospective reserves are estimated at about  $350,000 \text{ m}^3$  of gravelly sand (Class 4) material. This source is not recommended for development at this time.

### Description

Deposit 6-2 consists of a bedrock high, approximately 1900 m long and an average of 500 m wide, veneered by shallow beach ridge deposits. It is situated about 3.5 km north of Highway 6 at km 4, and is accessible via existing exploration trails. No environmental constraints to development are identified. Field observations and discussions with Pine Point Mines personnel indicate that Deposit 6-2 consists predominantly of gravelly sand.

### Aggregate Supply

Prospective reserves are estimated in the order of  $350,000 \text{ m}^3$  of gravelly sand (Class 4) aggregate; this assumes an average recoverable thickness of about 0.5 m. Field and laboratory testing would be required to confirm this assessment.

### Aggregate Demand

No demand in the near future for aggregate from Deposit 6-2 is projected.

## Recommendation

Due to the anticipated low quality of the aggregate and fairly lengthy haul distance, development is not recommended at this time.



Deposit 6-3 is a glaciofluvial outwash and ridge deposit located 12 to 20 km southwest of Pine Point (Drawing H6). Prospective reserves are conservatively estimated at about 7,500,000 m³ of granular aggregate. This source is readily accessible from Highway 6 and apparently contains aggregate of most classes. Some exploratory work is recommended.

#### <u>Description</u>

This deposit, an extensive southwest-northeast trending outwash plain and ridge deposit, is in the order of 8000 m long overall and up to 3000 m wide. Its location and geological setting are shown on Drawing Fl.

Deposit 6-3 is readily accessible from both Highway 6 and the C.N.R., which traverse the deposit; however, development to date has been limited to a number of small pits along the highway and railway. Little or no information exists with respect to aggregate characteristics and distribution, since the deposit has not been investigated previously. No environment-related development concerns are identified.

#### Aggregate Supply

Deposit 6-3 is extensive, with prospective aggregate reserves estimated at approximately  $7,500,000 \text{ m}^3$  (assuming an average recoverable material thickness of 1 m). In the absence of data to the contrary, it has been considered to consist of Class 3 aggregate.

#### Aggregate Demand

No requirement to extract material from Deposit 6-3 is identified in the near future.

## Recommendation

Site-specific information on the distribution and characteristics of the various aggregate types is very limited (material of different classes is apparently exposed in the various pits). It is recommended that consideration be given to carrying out a limited program of field and laboratory testing to obtain such data. In view of the projected lack of demand for material from this source, such a program should be assigned a relatively low priority.

Deposit 6-4 is situated 12 km west of Pine Point and 3 km north of the highway (Drawing H6). It consists of beach ridge and lag deposits that overlie and surround two bedrock highs. Based on existing exposures, gravelly sand is expected to be the dominant aggregate type; prospective reserves are estimated at 400,000 m³ of Class 4 material. Development is not recommended at this time.

#### Description

The two segments of this deposit have a total length of about 2500 m and average width of 500 m. Both were accessible via existing mine haul roads in Spring 1987. Gravelly sand is exposed in a borrow pit developed by Pine Point Mines in the western segment of the deposit, as well as in cuts along the mine access road. The eastern section is undeveloped. No environmental constraints to development are identified. Previous test data are not available for Deposit 6-4.

## Aggregate Supply

Assuming an average recoverable thickness of 0.5 m, prospective reserves are estimated in the order of 400,000 m³ of gravelly sand (Class 4) material.

### Aggregate Demand

No requirement for Class 4 material from this source is anticipated in the near future.

#### Recommendation

Due to the fairly long haul distance to Highway 6 and low aggregate quality, continued development of Deposit 6-4 is not recommended once Pine Point Mines closes down.



This source, located about 10 km west of Pine Point (Drawing H6), is a glaciofluvial ridge, composed of dirty sandy gravel. Probable reserves are estimated in the order of  $375,000 \text{ m}^3$  of Class 3 aggregate. Deposit 6-5 has been utilized by Pine Point Mines as a source of road surfacing material. Continued development, following closure of the mine operation, is not recommended.

#### Description

Deposit 6-5 comprises a narrow glaciofluvial ridge, approximately 2500 m long and 200 to 300 m wide. It is located about 2 km north of Highway 6 (at km 13 to 14). The deposit, which was accessible in early 1987 via the mine haul road system, has been developed as a source of road surfacing material for the Cominco operation. Field and laboratory test data are not available. No environment-related development concerns have been identified.

## Aggregate Supply

Probable remaining reserves for Deposit 6-5, assuming an average recoverable material thickness of 2 m, are estimated at about 375,000 m³ of Class 3 material.

#### Aggregate Demand

Once the mine closes down, there is unlikely to be a demand for aggregate from this source.

## Restoration and Rehabilitation

It is anticipated that restoration of this site will be carried out as part of the overall Pine Point mines reclamation program. Site-specific recommendations are not provided; however, it is anticipated that rehabilitation will involve site grading and contouring, topsoil and overburden replacement, and promotion of natural revegetation.

### Recommendation

Continued development of this source is not recommended. The existing pit area should be rehabilitated.



Located south of Highway 6 (between km 13.5 and 17) and about 8 km southwest of Pine Point (Drawing H6), this source comprises a complex of beach ridges and spit deposits. It is expected to consist of sandy gravel; estimated prospective reserves are about  $650,000 \text{ m}^3$  of Class 3 material. Development is not recommended at this time.

## Description

Deposit 6-6 comprises a beach and spit complex, in the order of 3500 m long and up to 800 m wide. At present, it is not accessible but could possibly be accessed via the mine haul road system. There are no existing borrow pits. No environmental constraints to development are identified.

### Aggregate Supply

Field or laboratory test data are not available; however, Deposit 6-6 is expected to consist predominantly of sandy gravel. Assuming an average recoverable thickness of 1 m, prospective reserves are estimated in the order of 650,000 m³ of Class 3 material.

#### Aggregate Demand

With the closing of the mine, no demand is likely, in the near future, for extraction of granular aggregate from Deposit 6-6.

## Recommendation

Development of Deposit 6-6 is not recommended at this time. In the event it is considered in the future, a program of field and laboratory testing should be carried out to confirm material type and refine the volume estimate.



Deposit 6-7 comprises a group of glaciofluvial ridges located north of Highway 6, about 7 km west of Pine Point (Drawing H6). Prospective reserves are estimated at about 225,000 m³ of Class 3 material. This source has not been investigated previously; a small pit was developed previously in one of the ridges.

#### Description

This deposit consists of three long and narrow glaciofluvial ridges, located 2 to 3.5 km north of Highway 6 (at about km 19). The deposit is accessible at present via the mine haul road system and existing bush trails. No environmental development concerns are identified.

### Aggregate Supply

Discussions with mine personnel suggest that this undeveloped deposit likely consists of sandy gravel. Prospective reserves are estimated in the order of 225,000 m³ of Class 3 material, assuming that an average of 1 m of material is recoverable. Neither field or laboratory test data are available.

## Aggregate Demand

No demand for aggregate from this source is identified in the near future.

## Recommendation

Development of Deposit 6-7 is not recommended at this time. In the event future extraction is considered, a program of field and laboratory testing should be carried out.



This source is a narrow glaciofluvial ridge, situated 1.5 km west of Pine Point and about 1 km north of Highway 6 (Drawing H6). It is estimated that prospective reserves are about  $400,000 \text{ m}^3$  of Class 3 material. Development of Deposit 6-8 is not recommended at this time.

#### Description

Deposit 6-8 is a glaciofluvial ridge, nearly 4000 m long and up to 300 m wide, that lies 1.5 km west of Pine Point. It is accessible along existing exploration trails. No environmental constraints to development are identified. The deposit has not been investigated previously.

## Aggregate Supply

It is estimated that the prospective reserves of Deposit 6-8 are in the order of  $400,000 \text{ m}^3$  of granular aggregate, assuming an average recoverable thickness of 1 m. Discussions with mine personnel indicate that the source is likely composed of sandy gravel (ie. Class 3 aggregate).

### Aggregate Demand

The demand for aggregate from this source over the next 5 years is expected to be nil.

#### Recommendation

Development of Deposit 6-8 is not recommended at this time. In the future, if development is considered, a program of field and laboratory testing should be carried out.



This deposit comprises a beach ridge complex that is traversed by Highway 6 immediately west of Pine Point (Drawing H6). Prospective reserves are estimated at about  $450,000 \text{ m}^3$  of Class 2 material. Three borrow pits, developed previously, are still in use. Continued development is recommended, together with field and laboratory testing to investigate the distribution of material types.

#### Description

Deposit 6-9 is the westward continuation of the beach ridge complex upon which the community of Pine Point was constructed. It is readily accessible from Highway 6, which traverses the deposit between km 17.5 and 22. There are three existing small borrow pits; no environmental constraints to continued extraction from these sites are identified. Deposit 6-9 has not been investigated previously, and the detailed distribution of aggregate types is not known.

# Aggregate Supply

Deposit 6-9 is expected to consist primarily of well graded gravel; site-specific information on the distribution and guality of aggregate materials is not available. It is understood that concrete quality aggregate has been extracted at one location. Prospective reserves are estimated at 450,000 m³ of Class 2 material.

#### Aggregate Demand

In the order of  $30,000 \text{ m}^3$  of Class 1 (concrete) aggregate is expected to be extracted over the next five years, for use by the Town of Pine Point and in Management Area II (by Aljohn Holdings).

#### Site Development

Plans for development should be based on the results of testing, with respect to distribution of aggregate types.

### Recommendation

It is recommended that Deposit 6-9 continue to be developed as a source of good to excellent quality aggregate in the Pine Point area. A program of field and laboratory testing should be considered to determine the distribution of aggregate types and volumes.

Deposit 6-10 comprised a shallow beach ridge deposit situated along Highway 6, immediately south of the Pine Point townsite (Drawing H6). It was previously developed as a source of aggregate for community use but has been depleted ond abandoned for some time. The northwest part of the site is occupied (by what appears to be a fur farm.

## Description

This source was a beach ridge deposit, that is traversed by Highway 6, between km 24 and 24.5, immediately to the south of Pine Point. The geological setting for the deposit and limits of the depleted pit area are shown on Drawing F2.

Deposit 6-10 was developed as a source of aggregate for use by the community of Pine Point. It was depleted some time ago, and has apparently since been abandoned.

### Aggregate Supply

It is understood that Deposit 6-10 consisted predominantly of poorly graded gravel (Class 3) material that was utilized as general and select fill material by the Town of Pine Point. It is now depleted.

#### Aggregate Demand

----

## Restoration and Rehabilitation

Field observations (in October 1987) indicate that the former pit area has not been rehabilitated but that natural revegetation is now reasonably well advanced. Some areas of ponded water were observed, in areas where material has been extracted from below the water table.

#### Recommendation

It is recommended that the existing depleted pit area should likely be left in its present condition, since natural revegetation is relatively well advanced. Some clean-up, of abandoned vehicles, may be in order.



This source comprises two beach ridge deposits situated between Pine Point and the community airport (Drawing H6). Three borrow pits have been developed to date, one of which is depleted. Remaining reserves are estimated at about 340,000 m³, of Class 2 and 3 material (probable). Continued development is recommended.

### Description

Deposit 6-11 comprises two beach ridge deposits, situated 1 to 2 km east of Pine Point and accessible via the airport road. The geological setting for the deposit and its boundaries are shown on Drawing F2, which also shows three borrow pits that have been developed to date. The pit closest to the community is depleted. No environmental constraints to continued development of the remaining pits are identified.

#### Aggregate Supply

Detailed information on the distribution and characteristics of the aggregate in Deposit 6-11 is not available; however, discussions with Town personnel indicate that fair to good quality gravel (Class 2 and 3) material is being extracted. Some sand is also present. The borrow pit located closest to the community is essentially depleted, while reserves remain in the vicinity of the more easterly pit.

Laboratory testing of a single sample from this pit gave the following gradation: 54 percent gravel, 43 percent sand and 3 percent fines, with a PN of 166. Probable reserves are estimated in the order of  $340,000 \text{ m}^3$ , assuming an average recoverable material thickness of 1.5 m. Since a detailed breakdown by aggregate class is not feasible, this material has been considered to consist of equal amounts of Class 2 and 3 aggregate.

#### Aggregate Demand

Estimated requirements over the next five years are 7,500 m³ to 10,000 m³ of Class 2 material and 2,000 m³ to 4,000 m³ of Class 3 material.

#### Pit Development

The existing pits should be expanded to the limits of the deposit, leaving a buffer zone along the airport access road.



## Reclamation and Rehabilitation

Field observations indicate that grading and recontouring of the depleted section of Deposit 6-11 has already been carried out. Due to the presence of a snow cover, it was not possible during the October 1987 site visit to confirm that topsoil/overburden replacement had taken place also. On this basis, it is likely that additional restoration and rehabilitation work is not required.

## Recommendation

It is anticipated that Deposit 6-11 will continue to be the prime source of aggregate for the Town of Pine Point. A limited program of field testing is recommended to determine the distribution of aggregate types, assess materials quality and refine volume estimates.





Unified Soil Classification System & N.R.C. Field Description (Modified with clay size at 0.002 mm)

Rock Type Classifications		Weighted Percentages of Constituents In Each Sieve Fraction						Total Weighted Composition	
	+2"	+1 1/2"	+1"	+3/4"	+1/2"	+3/8"	+1/4"	+#4	
Granite, gneiss	4.05	-	2.9	1.6	2.2	1.3	1.8	1.3	15.15
Limestone, dolomite Good Strong	8.1	12.0	8.6	4.7	6.9	4.0	4.8	2.7	51.8
Basic igneous, trap	-	2.0	-	0.8	0.6	0.4	0.6	0.2	4.6
Carbonates, weathered and pitted Fair, moderate strong	4.05 ly	2.0	7.1	4.2	4.3	2.4	1.8	0.8	26.65
Weathered igneous	-	-	-	-	0.2	0.2	0.2	-	0.6
Schist, weathered Poor, weak			0.7	0.3	-	-		tr.	1.0
Carbonate, highly weathered	-	-	-	-	0.2	-	-	-	0.2
TOTALS	16.2	16.0	19.3	11.6	14.4	8.3	9.2	5.0	100.0

## SUMMARY OF ROCK TYPES, COARSE AGGREGATE DEPOSIT 6-11

NOTE: Sampled from pit south of Pine Point airstrip on October 15, 1987. Most of material is quite weathered.

PN = 166

This source is a glaciofluvial outwash deposit, located 4 to 13 km northeast of Pine Point (Drawing H6). Deposit 6-12 is expected to consist predominantly of sandy gravel and is essentially undeveloped. Prospective reserves are estimated at about  $2,700,000 \text{ m}^3$  of Class 3 material. No development is recommended in the near future.

### Description

Deposit 6-12, a complex of glaciofluvial ridges and outwash plains, covers an area that is almost 9000 m long by up to 3000 m wide. As shown on Drawing H6, it is situated from 4 to 13 km northeast of Pine Point. Portions of the source are accessible via the Dawson Landing road (which traverses the deposit) as well as a number of mine access roads and exploration trails. Information is not available on material quality and quantities; environmental constraints to development are not identified.

#### Aggregate Supply

This deposit is expected to consist primarily of sandy gravel, with prospective reserves estimated at about  $2,700,000 \text{ m}^3$  of Class 3 material (a considerable volume of sand is also likely present). Neither field nor laboratory test data are available.

### Aggregate Demand

No demand for material from Deposit 6-12 is foreseen in the near future.

### Recommendation

In view of the relative inaccessibility of this source and presence of other developed deposits closer to Pine Point, development is not recommended at this time. Field and laboratory testing would be required, in the event it were decided to develop the deposit, to determine material types and distribution and refine the volume estimate.



Deposit 6-13 comprises beach ridge and lag deposits on a large bedrock high located about 15 to 20 km northeast of Pine Point (Drawing H6). Prospective reserves of sandy gravel and gravelly sand are estimated in the order of  $3,900,000 \text{ m}^3$ . Development is not recommended at this time.

### Description

Deposit 6-13 is situated a short distance south of Dawson Landing and 15 to 20 km northeast of Pine Point. It is accessible via the Dawson Landing road, and consists of beach ridges and lag material deposited on an extensive bedrock high (about 7500 m long and up to 4000 m wide). No previous information is available on this source, which is undeveloped at this time. Environment constraints to development are not identified; however, at some points, the deposit is located close to the shoreline of Great Slave Lake.

#### Aggregate Supply

The aggregate in this deposit is expected to consist predominantly of sandy gravel in the topographically higher areas and gravelly sand in the surrounding lower areas. Total prospective reserves are estimated to be in the order of  $3,900,000 \text{ m}^3$ , assuming a recoverable material thickness of 0.5 m. No data are available to provide a detailed breakdown by aggregate type; however, a preliminary estimate is about 1,950,000 m³ of Class 3 and 1,950,000 m³ of Class 4 aggregate.

## Aggregate Demand

It is not anticipated that there will be any demand in the near future for material from this source.

#### Recommendation

Development of Deposit 6-13 is not recommended at this time. In the event it is considered in the future, field and laboratory testing will be required to identify the distribution and quality of aggregate present, and refine reserve estimates.

This deposit comprises beach ridge and lag materials on a bedrock high, located 20 to 25 km northeast of Pine Point (Drawing H6). It is expected to consist of sandy gravel and gravelly sand, with prospective reserves estimated at about  $1,350,000 \text{ m}^3$ . Development of Deposit 6-14 is not recommended at this time.

# Description

The beach ridge and lag deposits comprising Deposit 6-14 rest on a bedrock topographic high that extends westwards from Highway 6, at about km 52, for a distance of almost 8000 m. It is accessible from the highway via an existing trail into Dawson Landing. Deposit 6-14 is unexplored and undeveloped. No environmental constraints to development are identified (other than the proximity to Great Slave Lake in some areas).

### Aggregate Supply

Although site-specific data are not available, Deposit 6-14 is expected to consist of sandy gravel in the higher areas and gravelly sand in the surrounding lower areas. A preliminary estimate of prospective reserves is in the order of 1,350,000 m³, assuming a recoverable material thickness of 0.5 m. A breakdown by material type is difficult; a preliminary estimate is about 675,000 m³ of Class 3 material and 675,000 m³ of Class 4 material.

## Aggregate Demand

No requirement is identified to obtain granular material from Deposit 6-14 in the near future.

## Recommendation

Development of this source is not recommended at this time. A program of field and laboratory testing would be required prior to any future development decision.



Deposit 6-15 comprises very thin lag material veneering a small bedrock high along Highway 6 about 25 km northeast of Pine Point (Drawing H6). Reserves have not been estimated. Development is not recommended.

## Description

This source is traversed by Highway 6 between km 48.5 and 50.5. It consists of lag material veneering a small bedrock high. Discussions with Pine Point Mines personnel indicate that the deposit is very shallow, and consists of sandy to bouldery gravel. No environmental concerns are identified. Deposit 6-15 has not been investigated previously, although the area has been drilled extensively in connection with mineral exploration.

#### Aggregate Supply

The aggregate is expected to be too shallow for economic extraction (bearing in mind stripping costs, etc.), and an estimate of reserves has not been developed.

## Aggregate Demand

### Recommendation

Due to the anticipated very shallow aggregate thickness and relatively poor quality material, development is not recommended.



Deposit 6-16 comprises a group of beach ridges (expected to consist primarily of gravelly sand), located south of Highway 6 about 28 km southwest of Fort Resolution (Drawing H6). Reserves (prospective) are estimated at about 190,000 m³. Development is not recommended at this time.

#### Description

This source consists of four beach ridges, 1000 m to 3000 m long and up to 200 m wide, situated 1 to 2 km south of Highway 6, between km 56 and km 59. There is no existing access from the highway. Deposit 6-16 has not been investigated previously but is expected to consist primarily of gravelly sand. No environmental constraints to development are identified.

### Aggregate Supply

It is estimated that the prospective reserves of Deposit 6-16 are in the order of 190,000 m³, assuming an average recoverable material thickness of 0.5 m. Although site-specific information is not available, Deposit 6-16 is expected to consist predominantly of Class 4 material.

### Aggregate Demand

No demand for aggregate from this source is identified in the near future.

## Recommendation

Due to its present inaccessibility and anticipated relatively low material quality, development of Deposit 6-16 is not recommended at this time.



This source comprises beach ridge and lag deposits resting on a bedrock high, about 25 km southwest of Fort Resolution (Drawing H6). Prospective reserves are estimated in the order of  $280,000 \text{ m}^3$ , of sandy to bouldery gravel (Class 3 material). Development is not recommended at this time.

## Description

Deposit 6-17 is situated close to the shoreline of Great Slave Lake and about 1.5 km north of Highway 6 (at km 59); there is no existing access from the highway. It consists of beach ridge and lag deposits, expected to be shallow, veneering a bedrock high. This source has not been investigated previously. The deposit lies close to the shoreline of Great Slave Lake.

### Aggregate Supply

Estimated prospective reserves are about  $280,000 \text{ m}^3$  of sandy to bouldery gravel (Class 3) material, assuming an average recoverable material thickness of 0.5 m. Data on materials quality and distribution are not available.

#### Aggregate Demand

It is not anticipated that there will be any demand for aggregate from Deposit 6-17 in the near future.

#### Recommendation

Due to the inaccessibility of the deposit and the anticipated shallow and relatively poor quality aggregate, development is not recommended at this time.



## GRANULAR SOURCE DESCRIPTION DEPOSIT 6-18 (DPW km 62.4)

This source comprises lag and gravel deposits that rest on two bedrock highs, located along Highway 6, about 27 km south of Fort Resolution (Drawing H6). Probable and prospective reserves are estimated at about 500,000 m³ and 1,115,000 m³ of Class 3 material; areas of higher quality aggregate and gravelly sand also surround the deposit. Reserves of bedrock (Class 5) are estimated to be at least 2,250,000 m³. A Highways Department pit has been developed in the lag gravels and underlying carbonate bedrock.

## Description

Deposit 6-18 consists of lag material, up to 2 m thick, deposited on two bedrock highs; the limestone and limey shale bedrock is also being extracted for processing to produce aggregate. Geological conditions in the area and the boundaries of the deposit, are shown on Drawing F3.

This source is traversed by Highway 6, between km 61 and 63, and lies about 27 km south of Fort Resolution. It was investigated previously by Thurber Consultants (1983b), who also identified (but did not delineate) areas of higher quality well graded sandy gravel (Class 2) and gravelly sand (Class 4) adjacent to the main deposit (as delineated on Drawing F3). No environmental concerns are identified.

### Aggregate Supply

The previous investigation by Thurber Consultants (1983b) suggested that Deposit 6-18 contains a variety of aggregate types, ranging from well graded sandy gravel (Class 2), to poorly graded sandy to bouldery gravel (Class 3), to gravelly sand (Class 4). Only the distribution of Class 3 material is readily delineated. It is estimated that probable and prospective reserves are in the order of 500,000 m³ and 1,115,000 m³ of Class 3 material. Large reserves of bedrock, potentially suitable for crushing and processing to produce granular aggregate, are also present (at least 2,250,000 m³ in the area of the existing pit, assuming a 3 to 4 m depth of extraction). Available data are not adequate to develop estimates of the reserves of Class 2 (gravel) and Class 4 (sand) materials.

#### Aggregate Demand

Discussions with DPW personnel indicate that it is proposed to use in the order of 25,000 m³ of material from Deposit 6-18 over the next five years (processed limestone and/or gravel). No requirement for Class 2 or 4 material is identified.



## Pit Development

It is envisaged that development of the gravel pit and existing bedrock quarry will continue.

## Recommendation

It is recommended that this deposit continue to be used as a source of Class 3 road construction and maintenance aggregate. In the event there is a requirement for better quality material from this source, a program of field and laboratory testing would be required, to determine the distribution, available reserves and characteristics of these materials.



## GRANULAR SOURCE DESCRIPTION DEPOSIT 6-19 (DPW km 65.8)

Deposit 6-19 consists of beach ridge and lag materials deposited on a bedrock high, located about 20 km southwest of Fort Resolution (Drawing H6). Estimated probable reserves are about 65,000 m³ of beach ridge material (Class 2), with additional reserves of lag (Classes 3 and 4) material (prospective). Deposit 6-19 is the primary source of fair to good quality aggregate in the Fort Resolution area.

#### Description

Highway 6 traverses Deposit 6-19, between km 65 and 67.7, about 23 km south of Fort Resolution. It has two parts: an area of beach ridge deposits in the southwest, and the remainder of the deposit, that consists of shallow lag material. Drawing F4 shows the geological setting, and deposit and material boundaries. Deposit 6-19 was investigated previously by Thurber Consultants (1983a). Two small borrow pits have been developed to date adjacent to the highway at km 66. No environment-related constraints to continued development are identified.

## Aggregate Supply

Previous investigations in the beach ridge area (ie. close to the existing borrow pits) identified at least 2 m of well graded sandy gravel, suitable for most uses, with some gravelly sand. Probable reserves of Class 2 material are estimated at about  $65,000 \text{ m}^3$ . The remainder of the deposit consists of lag material and has not been investigated to date. It is expected to be underlain by less than 1 m of sandy to bouldery, poorly graded, gravel and gravelly sand (Classes 3 and 4). Estimated prospective reserves, assuming 0.5 m average recoverable thickness, may total about 560,000 m³ (assumed to be distributed equally between the two material classes).

## Aggregate Demand

Deposit 6-19 is the primary source of Class 2 material in the Fort Resolution area (Class 3 aggregate is available from sources that are closer to the community). Projected demand for Class 2 material from Deposit 6-19 over the next 5 years is up to  $7,500 \text{ m}^3$ .

### Pit Development

Expansion of the existing road side pits is anticipated to continue. Buffer zones should be incorporated into the pit development in the future to screen the pits from the highway.



# Recommendation

Deposit 6-19 should continue to be utilized as a source of good quality granular aggregate for use in the community of Fort Resolution. Development of the lower quality, lag deposit, material is not recommended at this time, unless a local demand is identified.



## GRANULAR SOURCE DESCRIPTION DEPOSIT 6-20 (DPW km 74.5)

Deposit 6-20 comprise a shallow lag deposit resting on a bedrock high about 14 km south of Fort Resolution (Drawing H6). Estimated reserves are about 250,000 m³ of coarse sandy gravel (probable); additional reserves of gravelly sand are likely present also. Four small borrow pits were developed during highway construction. Aggregate is presently being extracted from a pit opened up at the east end of the deposit (Drawing F5).

#### Description

This source consists of shallow gravel and sand lag materials that veneer a bedrock high. It is traversed by Highway 6, between km's 72 and 75, 16 to 17 km south of Fort Resolution. The geological setting and deposit boundaries are shown on Drawing F5.

Deposit 6-20 was investigated previously by Thurber Consultants (1983b). Up to 1.5 m of sandy gravel was encountered over limestone bedrock. Airphoto interpretation suggests that other parts of the deposit may consist predominantly of gravelly sand.

### Aggregate Supply

Reserves are estimated at approximately  $250,000 \text{ m}^3$  of Class 3 sandy gravel (probable), assuming that an average 0.5 m of material is recoverable. This estimate could be increased in the event prospective gravelly sand reserves are developed or the underlying limestone bedrock is excavated and processed.

#### Aggregate Demand

Discussions with Highways personnel (and recent field observations) indicate that relatively small volumes of aggregate are being extracted from roadside pits for use in highways maintenance. Precise volume estimates are not available; however, the projected volume (over the next five years) is probably less than 10,000 m³.

### Recommendation

Development of Deposit 6-20 as a source of highways maintenance material is recommended to continue at this time.



Deposit 6-21 is a shallow beach ridge deposit located close to Highway 6 about 7 km south of Fort Resolution (Drawing H6). Probable reserves are estimated at about 19,000 m³ of fine sand, suitable for use as low quality general fill (Class 4). Unless a local requirement for low quality fill is identified, no further development of this deposit is recommended.

#### Description

This source comprises a shallow beach ridge deposit, about 1100 m long and up to 200 to 300 m wide, adjacent to Highway 6 between km 83 and 84. It is about 350 m from the shoreline of Great Slave Lake, and was investigated previously by Thurber Consultants (1983b). Fine sand, with some organic inclusions, was encountered, with an average aggregate thickness above the groundwater table of 0.6 m. The material was considered suitable for use only as general fill, where frost susceptibility was not a concern. Environmental constraints to development are not identified.

#### Aggregate Supply

Estimated probable reserves are about  $19,000 \text{ m}^3$  of Class 4 aggregate (assuming a recoverable thickness of 0.5 m and provision of a buffer zone along the highway).

## Aggregate Demand

No demand for aggregate from Deposit 6-20 is identified in the near future.

### Recommendation

Unless there is a requirement for low quality fill in the immediate area, further development is unlikely.



This source comprises beach ridge and lag materials deposited on a limestone bedrock high, situated at the north end of Fort Resolution airstrip (Drawing H6). Probable remaining reserves are estimated at about 380,000 m³ of Class 3 aggregate; additional reserves could be developed by extracting and processing the underlying limestone bedrock. It is recommended that Deposit 6-22 continue to be utilized as the main source of Class 3 fill material in the Fort Resolution area.

#### Description

Deposit 6-22 consists of a bedrock high, about 1300 m long and 200 m to 400 m wide, that is overlain by up to 4 m of fine to coarse bouldery limestone gravel, with very little sand. Drawing F6 shows the geological setting and deposit boundary.

The material in Deposit 6-22 is suitable in the pit run condition for use as subbase aggregate (Class 3) but would require processing for use as base course or surfacing material (Class 2). Deposit 6-22 was investigated previously by Thurber Consultants (1983b). No environmental constraints to continued development are identified.

### Aggregate Supply

Remaining probable reserves are estimated at about  $380,000 \text{ m}^3$  of Class 3 aggregate, assuming an average recoverable material thickness of 2 m. This estimate could be increased substantially if the in place limestone bedrock were to be excavated and processed.

### Aggregate Demand

It is anticipated that about  $10,000 \text{ m}^3$  of Class 3 material will be required over the next five years at Fort Resolution. It is expected that this will be obtained from Deposit 6-22. Material to be used in airstrip upgrading would also be obtained from this source.

#### Pit Development

Expansion of the existing pit area should take place to meet demand.

#### Recommendation

It is recommended that Deposit 6-22 continue to be utilized as the primary source of Class 3 aggregate in the Fort Resolution area.

## GRANULAR SOURCE DESCRIPTION DEPOSIT 6-23 (Mission Island)

Deposit 6-23 is a large beach ridge and lag deposit-veneered bedrock high located 3 km west of Fort Resolution (Drawing H6). Limited field testing indicates that the aggregate is shallow and of highly variable composition. Reserves are difficult to estimate but are likely in the order of 1,000,000 m³ of Class 3 and 4 aggregate. Development of this deposit in the near future is not recommended.

#### Description

Mission Island is a bedrock high about 3500 m long and up to 1200 m wide, that is veneered with sandy to bouldery beach ridge and lag material. It is located 3 km west of Fort Resolution; the geological setting and deposit boundaries are shown on Drawing F6. Deposit 6-23 was investigated previously, to a very limited degree, by Thurber Consultants (1983b); shallow granular material of variable gradation was encountered in a number of test pits.

#### Aggregate Supply

Total prospective reserves, assuming an average recoverable thickness of about 0.5 m, may be as much as about 1,000,000 m³. It is difficult to break down this volume estimate into different classes of material; however, on a preliminary basis, it has been assumed that it consists of roughly equivalent volumes of Class 3 and 4 aggregate.

#### Aggregate Demand

No demand for material from this source is foreseen over the next five years.

#### Recommendation

In view of the close proximity of Deposit 6-22 (which apparently contains superior aggregate) and fact the that Mission Island is extensively used as a recreation area for the community of Fort Resolution, development is not recommended at this time. In the event, development is considered in the future, a program of field and laboratory testing will be required.


## GRANULAR SOURCE DESCRIPTION DEPOSIT 6-24

This source is a narrow beach ridge deposit situated about 1.5 km north of Fort Resolution (Drawing H6). Several small pits have been developed; probable remaining reserves are estimated at about 50,000  $m^3$  of Class 4 (fine sand) aggregate. Continued extraction from this deposit is recommended.

### Description

Deposit 6-24 comprises a narrow beach ridge, extending eastwards from the north end of Fort Resolution airstrip. The geological setting and deposit boundaries are shown on Drawing F6. Previous investigations, by Thurber Consultants (1983b), indicate that the deposit consists of fine sand, suitable for use a low quality fill (Class 4). This source is accessed via the road to Deposit 6-22 (Drawing F6).

### Aggregate Supply

A number of small pits have been developed previously (now used as the community nuisance grounds). Probable remaining reserves are estimated at about  $50,000 \text{ m}^3$  of Class 4 material (assuming an average recoverable thickness of 1.0 m). Additional similar beach ridge deposits also exist further east.

#### Aggregate Demand

Some 20,000 m³ of Class 4 aggregate will be required over the next 5 years in the Fort Resolution area. It is proposed that this should be obtained from Deposit 6-24.

### Pit Development

Borrow material should be obtained by expanding the existing pits.

## Recommendation

This deposit should continue to be the primary source of Class 4 material in the Fort Resolution area.

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SITE PLANS, DRAWINGS F1 TO F6









Granular Aggregate Deposit

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Existing Pit (Active, Abandoned or Depleted)







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# APPENDIX G

GRANULAR SOURCES WOOD BUFFALO NATIONAL PARK



## APPENDIX G

## GRANULAR SOURCES, WOOD BUFFALO NATIONAL PARK

During the airphoto review, 20 previously developed or potential granular sources were identified close to Highway 5 within Wood Buffalo National Park. Locations of these sources, designated Deposits 5-49 to 5-68, are shown on Drawings H4 and H5, Appendix H. Future extraction of material from these areas is understood to be highly unlikely under current Parks Canada land use regulations and, for this reason, they have not been taken into account in developing the South Slave Region management strategy. For future reference, the sources are briefly described below.

## Deposit 5-49

This source comprises three southwest-northeast trending glaciofluvial ridges, situated to the east and west of Highway 5 between km 98.5 and 99.5. A portion of the northernmost ridge was developed previously, as an aggregate source for highways use, by means of a pit (now abandoned) adjacent to the highway at km 98.5.

## Deposit 5-50

Deposit 5-50 is a southwest-northeast trending glaciofluvial ridge extending westward from Highway 5 at about km 101. An abandoned gravel pit, formerly used as a highway construction and maintenance material source, exists on the east side of the highway.

#### Deposit 5-51

This source comprises a series of bedrock highs that are veneered by sand and gravel beach ridge and lag deposits and located 2 to 5 km west of the highway (at about km 105). Deposit 5-51 could be accessed in winter along an existing fireguard access trail; to date, it is undeveloped.

## Deposit 5-52

Deposit 5-52 consists of a discontinuous eolian dune ridge that extends southeastwards from the highway at km 106.8 for about 12 km, to the vicinity of the Nyarling River. The dune is expected to be composed of fine grained silty sand, with little potential for use as aggregate. It is undeveloped.

### Deposit 5-53

This source is traversed by the highway between km 112.8 and 114.6, and comprises two bedrock highs that are veneered by sandy gravel beach ridge and lag deposits. Three pits were developed previously for highways construction and maintenance purposes.

## Deposit 5-54

Deposit 5-54, situated about 6 km east of Highway 5 (at km 124) and a short distance south of the Nyarling River, consists of a longitudinal sand dune ridge. This deposit, expected to consist of silty fine windblown sand, has no existing access and has little potential as an aggregate source. It is undeveloped.

## Deposit 5-55

This deposit consists of a discontinuous eolian sand dune ridge, located about 3 km east of Highway 5, between km 122 and 133. The potential of this source, were development to be considered, is very low. Deposit 5-55 is presently inaccessible and undeveloped.

## Deposit 5-56

Highway 5 traverses this source between km 135.3 and 135.9. It comprises a southwest-northeast trending bedrock high, that is veneered by sandy gravel beach ridge and lag material. Deposit 5-56 was previously developed as a source of highways construction and maintenance material, by means of a pit (now abandoned) on the east side of the highway.

### Deposit 5-57

Deposit 5-57 comprises a discontinuous eolian dune ridge that is traversed by Highway 5 at about km 142. This source is expected to consist of silty fine sand, with little or no potential for use as aggregate. At present, it is undeveloped.

#### Deposit 5-58

This source comprises a small beach ridge or spit complex, likely consisting of sandy gravel, that extends eastwards from the highway at about km 147. The deposit was developed previously, by means of a pit (now abandoned) excavated on the east side of the highway, as a source of highways construction material.

#### Deposit 5-59

Deposit 5-59 consists of a series of glaciofluvial ridges, apparently modified by beach development, located 3 to 8 km west of Highway 5 at about km 145. There is no existing access to this source, which is expected to comprise interbedded sands and gravels. It is undeveloped.

#### Deposit 5-60

Highway 5 traverses this source, a north-south trending eolian dune ridge, at about km 159.7. The deposit is expected to consist of silty fine sand with little potential for use as aggregate. Deposit 5-60 is undeveloped.



## Deposit 5-61

This source comprises a gravelly beach lag deposit resting on a bedrock high. It is traversed by the highway between km 160.2 and 161. Deposit 5-61 was utilized in the past as a source of highway construction and maintenance material, extracted from a pit (now abandoned) on the south side of Highway 5.

## Deposit 5-62

Deposit 5-62 consists of a series of glaciofluvial ridges that have been modified by eolian dune and beach ridge development. It is approximately 4.5 km west of the highway at about km 170, and is expected to consist of sandy gravel, locally veneered by silty eolian fine sand. There is no existing access and the deposit is undeveloped.

### Deposit 5-63

This source, previously developed by four small borrow pits for road construction material, is traversed by Highway 5 between km 172.1 and 174.2. It comprises sandy gravel beach ridge materials that veneer a bedrock high. The Deposit 5-63 pits are now abandoned.

### Deposit 5-64

This deposit lies about 3 km west of the highway at km 179; there is no existing access and no development. It comprises a complex of glaciofluvial ridges, that are expected to consist of sandy gravel primarily.

#### Deposit 5-65

Deposit 5-65, a small glaciofluvial ridge, lies about 200 m south of Highway 5 between km 191 and 192. It was developed previously for road construction material, and likely consists of gravelly sand. There is one existing (abandoned) small pit.

#### Deposit 5-66

Highway 5 traverses this glaciofluvial outwash deposit between km 195.5 and 196. During highway construction, large volumes of borrow material were extracted from pits developed on both sides of Highway 5. At present, the pits are believed to be abandoned.

## Deposit 5-67

This is a sandy glaciofluvial plain deposit situated north of the Buffalo River and north of Highway 5 at about km 214. The site is presently undeveloped, and has poor access.

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## APPENDIX H

# LOCATION PLANS

Drawing	Hl -	Study Area Location Plan	
Drawing	Н2 -	Deposit Location Plan, Highways and 2 (part)	1
Drawing	нз -	Deposit Location Plan, Highways (part) and 5 (part)	2
Drawing	H4 —	Deposit Location Plan, Highway (part)	5
Drawing	Н5 —	Deposit Location Plan, Highway (part)	5
Drawing	Н6 —	Deposit Location Plan, Highway 6	







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