Smith Dow & Associates Ltd.

- Foundation and Geotechnical Engineering
- Soil Investigation, Site Assessment
- Testing — Soil, Asphalt, Concrete, Groundwater
- Building Inspections, Indoor Air Testing
- Environment — Audit, Contamination, Radon, Asbestos

4632 - 62 Street, Red Deer, Alta T4N 6T3
Phone: (403) 343-6888 Fax: (403) 341-4710

RCMP Dog Training Center
Part of Lot A, Plan 1779 N.Y. &
Lot 1, Blk. 1, Plan 022 1570, inthe
N 1/2 Section 6, Twp. 35, Rge. 20 W of 4th M
County of Red Deer, AB.

Smith Dow & Associates Ltd.

- Foundation and Geotechnical Engineering
- Soil Investigation, Site Assessment
- Testing — Soil, Asphalt, Concrete, Groundwater
- Building Inspections, Indoor Air Testing
- Environment — Audit, Contamination, Radon, Asbestos

4632 - 62 Street, Red Deer, Alta. T4N 5T3
Phone: (403) 343-6888 Fax: (403) 341-4710

March 19, 2003

Public Works & Government Services Canada
Edmonton, Alberta

File No: RCMP Dog:

Attn: Maria Dumitrescu:

Re: RCMP Dog Training Center
Part of Lot A, Plan 1779 N.Y. &
Lot 1, Blk. 1, Plan 022 1570, inthe
N 1/2 Section 6, Twp. 35, Rge. 20 W of 4th M
County of Red Deer, Alberta

At your request, we conducted a preliminary geotechnical investigation at the above referenced location on March 3, 2003.

It is our understanding that the proposed development consists of a single storey administration building, a kennel building, three whelping pods and a rearing run. Slab-on-grade construction is contemplated.

The purpose of this investigation was to determine the general extent and nature of the subsurface materials encountered along with some basic engineering properties of the subsurface soil. Environmental studies are beyond the scope of this report.

Field Investigation

Five test holes were required at this site. The test holes were drilled nearby the specified areas with the exception of test hole #3 & #4. Test holes #3 & #4 had to be relocated due to gas line locations and the presence of an existing fenced kennel area. A standard drilling rig was employed using continuous flight augers. The approximate locations of the test holes are shown on the attached site plan.

The sampling procedures consisted of recovering disturbed bag samples of the subsurface materials from regular depth intervals. All samples retained were carefully sealed to prevent moisture loss and subsequently taken to our Soil Mechanics Laboratory for further analysis.

The in-situ strength of the soil was determined in the field by conducting a series of standard penetration tests and obtaining the corresponding blow count - N values. Where cohesive materials were encountered, pocket penetrometer tests were performed.

Subsurface Features

A) Subsoil Conditions

The soil profiles, as logged at the borehole locations, are shown on drawing No.'s 2 through 8 inclusive, Appendix A. Results of field and laboratory tests are shown on the borehole logs.

The soil profile at the site consisted of a layer of topsoil, a fill layer in borehole #4 area, an underlaying native silt stratum and a native clayey silt till deposit. The description of the following soil types encountered should be read in conjunction with a review of the borehole logs.

Topsoil

The topsoil was black to dark brown in color. It was slightly silty, and contained some organics / humus and rootlets. It was covered with snow and it was frozen at the time of our site investigation. This organic material ranged from 150 millimeters to 225 millimeters in thickness at the borehole locations. Thicker layers of such organic material could be encountered during site preparation and removal of the organic topsoil to expose the inorganic subgrade soil.

Fill

Fill material was encountered in the test hole #4 location only. It thickness was approximately 1.2 meter. It was a mixture of silt with some interspersed topsoil in varying degrees. Such organic fill material at test holes #4 area is deemed unacceptable as foundation material.

As test hole #4 could only be opened to the south, and outside the proposed kennels building area, the fill material thickness in the proposed building area may vary from our test hole location. Due to the proximity of underground gas lines, fill material may also be encountered in the whelping pod area nearby test hole #3. During site preparation, further verification of the fill material thickness and the underlying subgrade by our representative is advised.

Silt

Native silt was encountered in each of the test holes. Its thickness varied at each test hole location. The native silt was golden brown to toupe brown in color and frozen in the top 1.0 to 1.3 meters. This frost susceptible material was low to non-plastic and firm to medium dense in consistency. Trace of clay and rusting characterized this deposit in the lower region.

Clayey Silt Till

Native clayey silt till extended to the bottom of each drilled hole. This yellowish brown, natural deposit was mainly soft to firm in consistency. In localized areas, some medium dense sandy silt interlayers were noted. This clayey silt till was characterized by rusting, occasional coal specks, odd stones, sand lenses / seams. Occasional soil sloughing was only noted within the damp to wet sandy silt interlayers at the time of site testing. The wet, sandy silt interlayers can be easily disturbed by the pile drilling or excavation equipment.

If footings are considered, it is advisable that a backhoe be used during footing trench excavation to minimize disturbance of foundation soil. In the case of drilled piles, steel casing should be on hand during drilling to tightly seal off any water and soil sloughing entering the pile holes.

B) Groundwater

Underground water was detected at the time of site testing on March 3, 2003. The highest groundwater levels were detected at depths of 5.0 meters, 5.7 meters, 5.5 meters, 5.5 meters and 5.8 meters below the existing ground surface at borehole #1 to #5 locations, respectively.

A slotted PVC standpipe was installed in the borehole #1 and #4 locations for monitoring the groundwater levels. On March 11, 2003, the watertable measurement was recorded at 8.0 meters and 6.7 meters below the existing grade in boreholes #1 and #4, respectively.

Presently, we estimate the groundwater level is at its seasonal low. Fluctuations of groundwater levels could occur, especially during spring thaw and heavy precipitation.

Recommendations

A) Cast-In-Place Piles

Straight shafted concrete piles may be used as a foundation for heavy structural loading at this site. The piles can be designed on the basis of skin friction only.

The maximum allowable skin friction value is 17KPa. In the design of piles, the following should be adhered to:

1) All piles should extend at least 6.0 meters below the existing site grade and be embedded within the native glacial clayey silt till deposit.

2) In calculating skin friction, the upper 1.5 meters of the pile or fill depth, whichever is greater, must be neglected.

3) Some groundwater and occasional soil sloughing were detected within the test holes at the time of site testing. Steel casings should be on hand during drilling and used if necessary to seal off all water and sloughing soil from entering the pile holes.

4) All pile bases must be mechanically cleaned and free of water and sloughing. Immediate placement of concrete is required upon completion of pile base cleaning.

5) Styrofoam of 100 millimeter thickness or equivalent should be placed between the grade beams and the ground surface to facilitate any soil movement.

6) All concrete pile installations must be inspected by our representative to verify the soil conditions and the recommended soil bearing pressure.

B) Footings

1) Spread or strip footings are feasible for use as a foundation for the proposed building.

2) Footings directly supported by the native, undisturbed glacial clay till may be designed with an allowable soil bearing pressure of 72 KPa.

3) Any disturbed or fill material detected within the footing zone must be removed to expose the native stratum. This is especially imperative in test hole #3 &#4 area. Replacement material must be pitrun gravel, compacted to 95 percent Standard Proctor Dry Density.

4) The native silt or clayey silt till is sensitive to vibration. It can be easily disturbed by construction equipment. Footing trench excavation should be carried out with a backhoe to minimize disturbance of foundation soil.

5) The footing subgrade must be protected from rain, snow, excessive drying and the ingress of free water, during and after the construction to prevent any foundation movement.

6) If construction is carried out during the winter, the foundation excavation must be protected against freezing of the subsoil at the footing grade. Under no circumstances shall concrete be placed on frozen soil.

7) Footings beneath exterior walls of heated portions of the building should have a minimum of 1.5 meters of soil cover, while footings in any unheated areas should have at least 2.2 meters of soil cover.

8) All sideslopes of temporary excavations must be braced or cutback to conform with the Occupational Health & Safety Regulations.

9) All footing excavations must be inspected by our representative to verify the continuity of soil and the recommended soil bearing capacity.

C) Concrete Floor Slab

1) A reinforced grade-supported slab should be received by a prepared subgrade soil and base gravel.

2) Proper preparation of the subgrade soil for the floor slab includes the following:

   - removal of all vegetation, organic soil and fill material from the building and construction area to expose the inorganic subgrade soil. The exposed inorganic subgrade must be inspected by our representative for approval prior to proofrolling.

   - proofrolling the exposed and approved inorganic subgrade soil to provide a good base for compacting the first lift of material to the specified density. Any soft subgrade soil encountered should be sub-excavated and replaced with free draining pitrun gravel. The extent of over-excavation has to be determined by our representative during site preparation.

   - the free draining pitrun gravel must be compacted to not less than 95 percent Standard Proctor Dry Density. (S.P.D.D.)

3) In bringing the site to grade, free draining pitrun gravel should be used. All acceptable engineered fill material must be compacted to at least 95 percent Standard Proctor Dry Density with sufficient moisture content.

4) A minimum of 150 millimeters of crushed gravel must be placed beneath the entire slab and above the prepared subgrade soil. The crushed gravel must be uniformly compacted to at least 95 percent Standard Proctor Dry Density with sufficient moisture content.

5) All utility trenches must be backfilled with inorganic suitable soil. The inorganic acceptable soil must be compacted to at least 95 percent Standard Proctor Dry Density.

6) The slab base gravel and subgrade soil must be protected from rain, snow, excessive drying and ingress of free water, during and after the construction to prevent any foundation movement.

7) Non-load bearing partitions should be designed to accommodate slight vertical movements. Service connections should be flexible enough to allow for small differential movements. Heating ducts beneath the floor should be insulated.

8) The above recommendations are for a continuously heated building with light floor loading. Unheated floor slabs without proper insulation could experience differential movement.

D) Foundation Concrete

Water soluble sulphate concentration tests were conducted on soil samples obtained at various elevations from test holes #1 to #5. The water soluble sulphate concentration indicated a negligible potential for chemical attack of subsurface concrete. Based on the test results, we deem Type 10 Portland Cement can be used.

The concrete should possess a minimum 28 day compressive strength of 25 MPa. As well, air entrainment should be provided in all concrete exposed to freeze-thaw cycles. The concrete should also be designed in accordance with CSA Standard A23.1-00, in conjunction with a maximum water to cement ratio of 0.45.

Closure

The report is based on the findings at the borehole locations. Should conditions encountered during construction appear to be different from those shown by the test holes, this office should be notified immediately in order that we may reassess our recommendations on the basis of the new findings.

Foundation inspections and verification of soil compaction must be performed as recommended in this report.

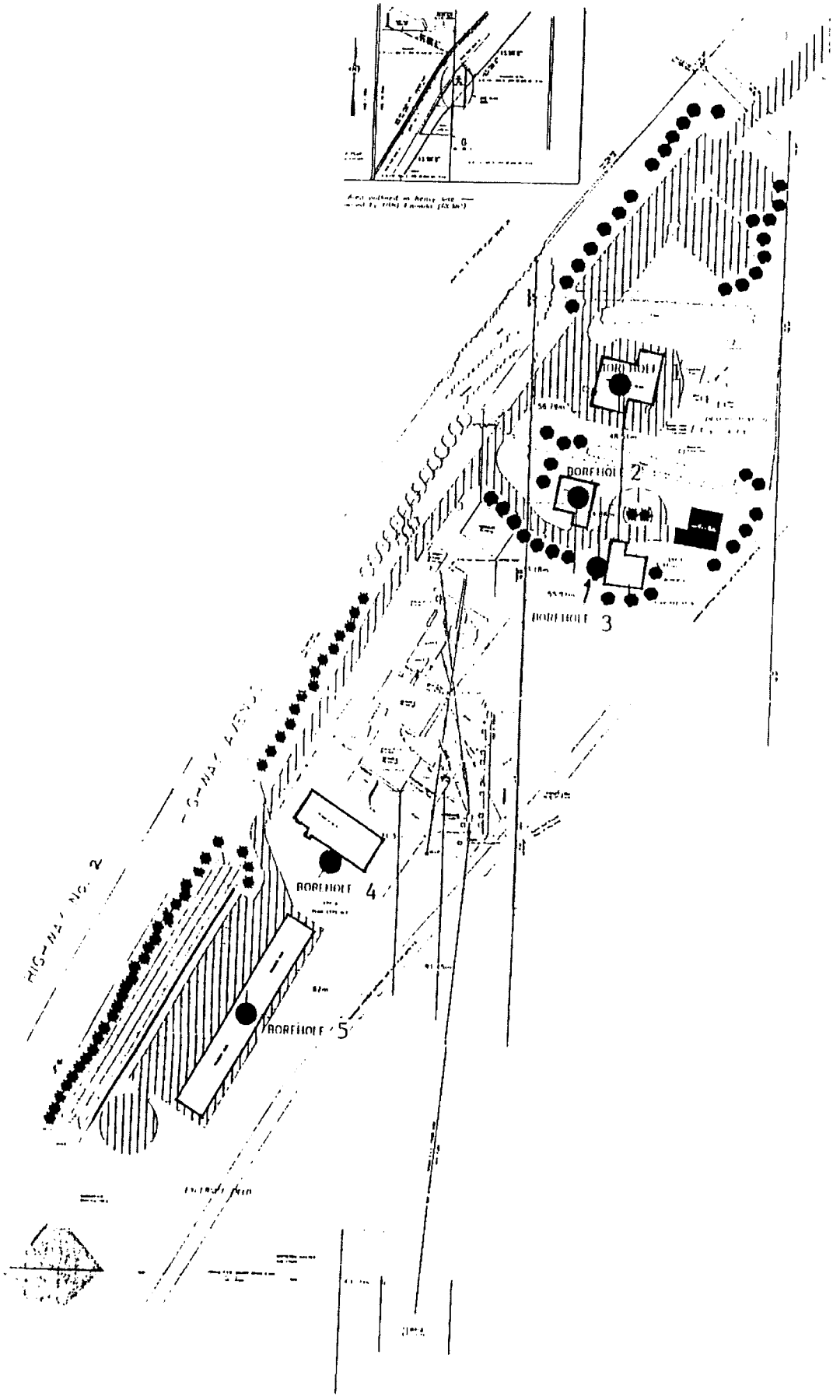
This report has been prepared for the exclusive use Public Works and Government Services Canada for specified application to the proposed RCMP Dog Training Center in the Red Deer County, Alberta. It has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

Sincerely,
Smith Dow And Associates Ltd. (Red Deer)

Philip Kwong

Philip Kwong (P.Eng)

APPENDIX


BOREHOLE 2
BOREHOLE 1
BOREHOLE 3
BOREHOLE 4
BOREHOLE 5

SMITH DOW & ASSOCIATES LTD.

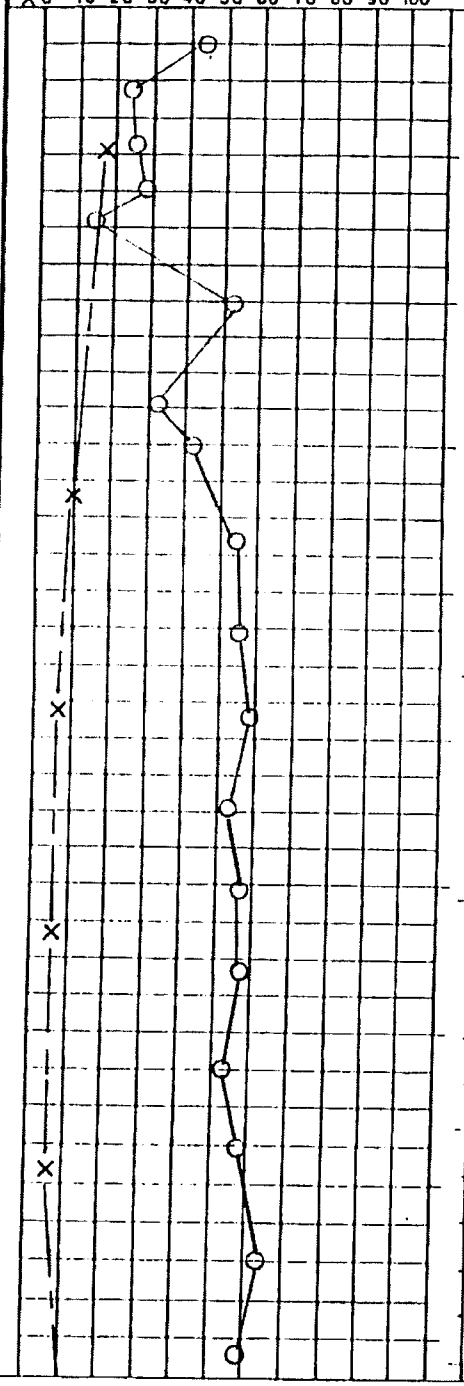
Engineering Consultants

RCMP Dog Training Center
South of Innisfail, Alberta

DWN M.K.	CKD P.K.	DATE March, 2003	FILE NO.	HOLE NO. 1a

STRENGTH Δ
MOISTURE O
PENETRATION X

Δ O 100 200 300 400 500
O O 10 20 30 40 50
X O 10 20 30 40 50 60 70 80 90 100



DATUM-
GROUND ELEV-

CLASSIFICATION	SYMBOL	TEST DATA	SAMPLE	feet DEPTH meters
Topsoil- grass, black, 225m.m				
Silt - brown - frozen - low plastic to non-plastic - frost susceptible - compact - silty - compact		N=6/9/9		1 - 5 2
Clayey Silt Till - medium plastic to low plastic - medium stiff - non-plastic to low plastic - sandy silt interbedded - laminated, firm - slightly clayey - soft - silty, coal fragments - clayey - soft - silty, soft to firm - damp, sloughing - medium brown - coal specks - damp to wet, sandy - damp to wet - silty - damp to wet - soft, sloughing - rusting - soft to firm - silty - soft, wet to damp		N=4/4/6 N=2/3/3 N=2/3/3 N=3/3/3		10 3 4 15 5 20 6 7 25 8 30 9

FILL, TOPSOIL, SAND, SILT, CLAY, PEAT, GRAVEL, BEDROCK, TILL, WATER, LIMITS

Q - Unconfined Strength, kN/m²
d - Dry Unit Weight, kN/m³
S - Sulphate Concentration, %
N - Penetration Resistance, blows

- Tube
- Penetrometer
- No recovery

TEST HOLE LOG AND LAB TEST DATA

DWG No 2

SMITH DOW & ASSOCIATES LTD.

Engineering Consultants

RCMP Dog Training Center
South of Innisfail, Alberta

DWN	CKD	DATE	FILE NO.	HOLE NO.
M.K.	P.K.	March, 2003		1b

STRENGTH — Δ
MOISTURE — O
PENETRATION — ×

Δ 0 100 200 300 400 500
O 0 10 20 30 40 50
× 0 10 20 30 40 50 60 70 80 90 100

DATUM-
GROUND ELEV-

CLASSIFICATION	SYMBOL	TEST DATA	SAMPLE
Silty Clay- firm		N=4/5/6	
END OF HOLE			

feet DEPTH meters

1 — 5 — 2 — 10 3 — 4 — 15 — 5 — 20 6 — 7 — 25 — 8 — 9 — 30

FILL, TOPSOIL, SAND, SILT, CLAY, PEAT, GRAVEL, BEDROCK, TILL, WATER, LIMITS

Q – Unconfined Strength, kN/m²
d – Dry Unit Weight, kN/m³
S – Sulphate Concentration, %
N – Penetration Resistance, blows

– Tube
– Penetrometer
– No recovery

TEST HOLE LOG AND LAB TEST DATA

DWG No 3

SMITH DOW & ASSOCIATES LTD.

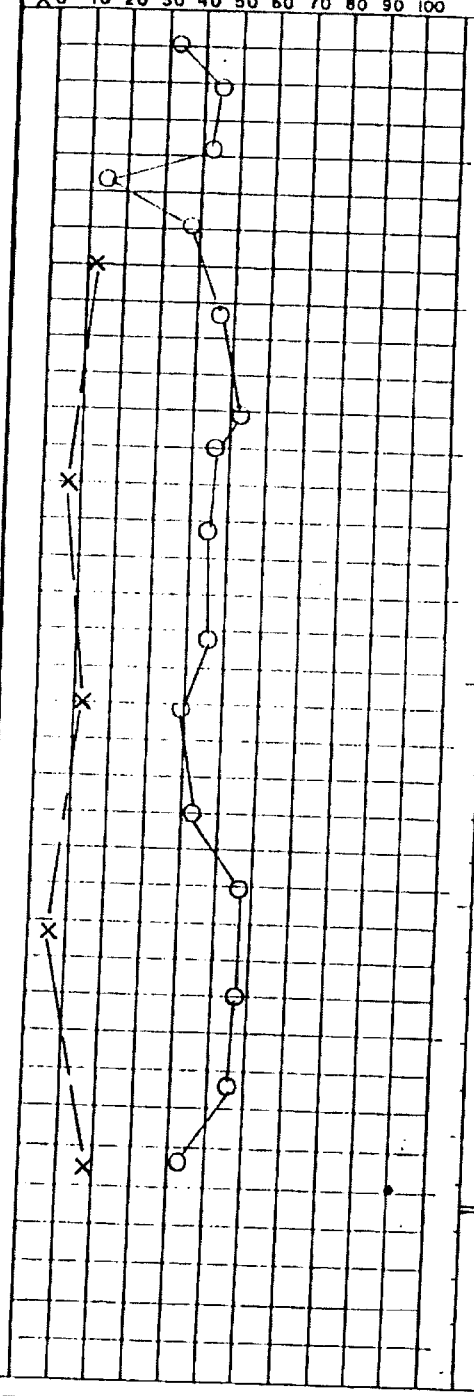
Engineering Consultants

RCMP Dog Training Center
South of Innisfail, Alberta

DWN	CKD	DATE	FILE NO.	HOLE NO.
M.K.	P.K.	March, 2003		2

STRENGTH — Δ
MOISTURE — O
PENETRATION — ×

Δ 0 100 200 300 400 500
O 0 10 20 30 40 50
× 0 10 20 30 40 50 60 70 80 90 100



DATUM-
GROUND ELEV-

CLASSIFICATION	SYMBOL	TEST DATA	SAMPLE	DEPTH feet / meters
Topsoil- black, 180 m.m.				
Silt - frozen - low plastic - non-plastic				1
- frozen - compact - white mineral - trace/rusting, medium dense		N=5/4/7		5 2
Clayey Silt Till - coal traces - clayey, brown - fissures, soft - interbedded sandy, silt - sandy lenses, soft		N=2/3/4		10 3
- rusting - coal traces - clayey - sandy silt interbedded - silty - medium dense		N=4/5/6		15 5
- low plastic to non-plastic - compact to medium dense - rusting				4
- soft to firm, damp - yellow brown - clayey, medium plastic to low plastic - soft, rusting - wet, silty, slightly sandy		N=1/2/4		20 6 7
- water, sloughing - clay interlayers - wet - sandy		N=5/8/10		25 8
END OF HOLE				30 9

FILL, TOPSOIL, SAND, SILT, CLAY, PEAT, GRAVEL, BEDROCK, TILL, WATER, LIMITS

Q – Unconfined Strength, kN/m²
d – Dry Unit Weight, kN/m³
S – Sulphate Concentration, %
N – Penetration Resistance, blows

– Tube
– Penetrometer
– No recovery

TEST HOLE LOG AND LAB TEST DATA

DWG No.

SMITH DOW & ASSOCIATES LTD.
Engineering Consultants

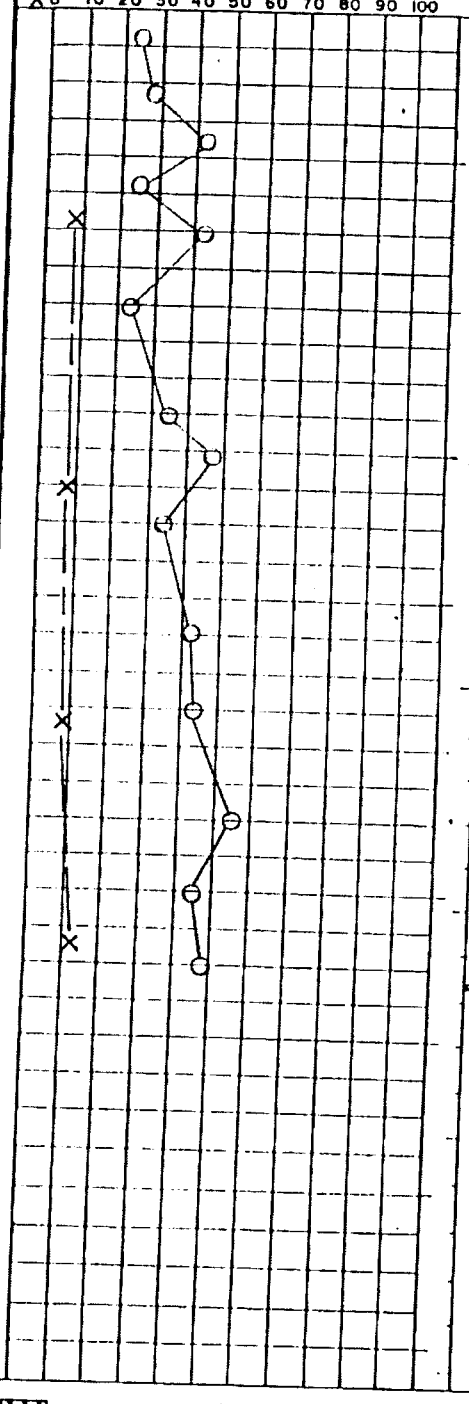
RCMP Dog Training Center
South of Innisfail, Alberta

DWN M.K.	CKD P.K.	DATE March, 2003	FILE NO.	HOLE NO. 3

STRENGTH — Δ
MOISTURE — O
PENETRATION — ×

Δ 0 100 200 300 400 500
O 0 10 20 30 40 50
× 0 10 20 30 40 50 60 70 80 90 100

DATUM-
GROUND ELEV-



CLASSIFICATION	SYMBOL	TEST DATA	SAMPLE	DEPTH feet / meters
Topsoil- black, 150 m.m.				
Silt - frozen - slightly clayey - frozen - yellowish brown - firm - tan		N=2/3/5		1 / 5 / 2
Clayey Silt Till - firm - low plastic - firm to soft - interbedded sandy silt - slightly sandy, laminated - clay interlayers, firm - medium plastic - low plastic to non-plastic - compact to medium dense - moist - rusting, non-plastic - some sloughing - moist to damp - coal specks - medium dense		N=1/4/4 N=3/5/4 N=4/4/7		10 3 / 4 / 15 5 / 20 6 / 7 / 25 8 / 30 9
END OF HOLE				

FILL, TOPSOIL, SAND, SILT, CLAY, PEAT, GRAVEL, BEDROCK, TILL, WATER, LIMITS

Q – Unconfined Strength, kN/m²
d – Dry Unit Weight, kN/m³
S – Sulphate Concentration, %
N – Penetration Resistance, blows

– Tube
– Penetrometer
– No recovery

TEST HOLE LOG AND LAB TEST DATA

DWG No 5

SMITH DOW & ASSOCIATES LTD.
Engineering Consultants

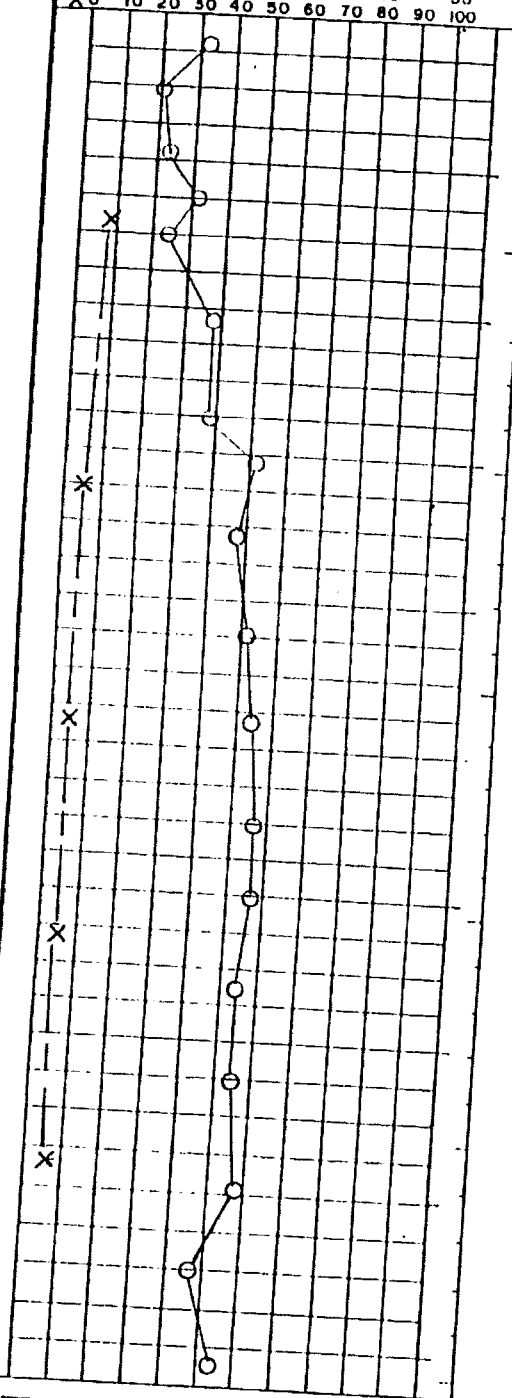
RCMP Dog Training Center
South of Innisfail, Alberta

DWN M.K.	CKD P.K.	DATE March, 2003	FILE NO.	HOLE NO. 4a

STRENGTH Δ
MOISTURE O
PENETRATION ×

Δ 0 100 200 300 400 500
O 0 10 20 30 40 50
× 0 10 20 30 40 50 60 70 80 90 100

DATUM-
GROUND ELEV-



CLASSIFICATION	SYMBOL	TEST DATA	SAMPLE	feet DEPTH meters
Fill - silt with topsoil - silt, yellow to toupe brown - black/brown, slightly organic - frozen				
Silt - olive brown - compact, non-plastic - white mineral deposits - non-plastic to low plastic		N=4/5/4		1 5 2
Clayey Silt Till - olive brown - soft		N=2/3/2		10 3
- silty, soft, plastic - clayey, medium plastic, rusting - sand lenses - medium plastic to non-plastic		N=2/2/3		4 15 5
- soft - coal traces - soft, sand lenses - plastic - silty, damp		N=2/2/3		20 6
- soft, sloughing - rusting - low plastic to medium plastic - wet sloughing - soft - sandy - wet - low plastic to medium plastic - interbedded sand - rusting - silty		N=3/3/3		7 25 8 9 30

FILL TOPSOIL SAND SILT
CLAY PEAT GRAVEL BEDROCK
TILL WATER LIMITS

Q - Unconfined Strength, kN/m²
d - Dry Unit Weight, kN/m3
S - Sulphate Concentration, %
N - Penetration Resistance, blows

- Tube
- Penetrometer
- No recovery

TEST HOLE LOG AND LAB TEST DATA

SMITH DOW & ASSOCIATES LTD.

Engineering Consultants

RCMP Dog Training Center
South of Innisfail, Alberta

DWN	CKD	DATE	FILE NO.	HOLE NO.
M.K.	P.K.	March, 2003		4b

STRENGTH — Δ
MOISTURE — O
PENETRATION — ×

Δ 0 100 200 300 400 500
O 0 10 20 30 40 50
× 0 10 20 30 40 50 60 70 80 90 100

DATUM-
GROUND ELEV-

CLASSIFICATION	SYMBOL	TEST DATA	SAMPLE	feet DEPTH meters
Clayey Silt - brown to grey Till - soft		N=1/2/3		
END OF HOLE				

1 - 5
2 - 10 3
4 - 15
5 - 20 6
7 - 25
8 - 30 9

FILL, TOPSOIL, SAND, SILT, CLAY, PEAT, GRAVEL, BEDROCK, TILL, WATER, LIMITS

Q – Unconfined Strength, kN/m²
d – Dry Unit Weight, kN/m³
S – Sulphate Concentration, %
N – Penetration Resistance, blows

– Tube
– Penetrometer
– No recovery

TEST HOLE LOG AND LAB TEST DATA

SMITH DOW & ASSOCIATES LTD.
Engineering Consultants

RCMP Dog Training Center
South of Innisfail, Alberta

DWN	CKD	DATE	FILE NO.	HOLE NO.
M.K.	P.K.	March, 2003		5

STRENGTH Δ
MOISTURE O
PENETRATION ×

Δ O 100 200 300 400 500
O O 10 20 30 40 50
× O 10 20 30 40 50 60 70 80 90 100

DATUM-
GROUND ELEV-

CLASSIFICATION	SYMBOL	TEST DATA	SAMPLE	feet DEPTH meters
Topsoil - black, 150 m.m.				
Silt - frozen to 4' - low plastic to non-plastic - yellowish brown				
- low plastic to non-plastic - firm		N=4/4/3		1 - 5
Clayey Silt Till - low plastic to - brown - soft - silty - low plastic to non-plastic		N=2/3/2		2 - 10 3
- clayey - soft, medium plastic		N=2/3/3		4 - 15 5
- sloughing - silty, soft - damp to wet				
-clay interlayers - rusting - medium plastic to plastic - wet, silt, soft		N=3/2/3		6 - 20 7
END OF HOLE at 23.5'				25 8 30 9

FILL
TOPSOIL
SAND
SILT
CLAY
PEAT
GRAVEL
BEDROCK
TILL
WATER
LIMITS

Q - Unconfined Strength, kN/m²
d - Dry Unit Weight, kN/m3
S - Sulphate Concentration, %
N - Penetration Resistance, blows

- Tube
- Penetrometer
- No recovery

TEST HOLE LOG AND LAB TEST DATA