Surficial Geology Map

LEGEND

Quaternary Holocene Deposits

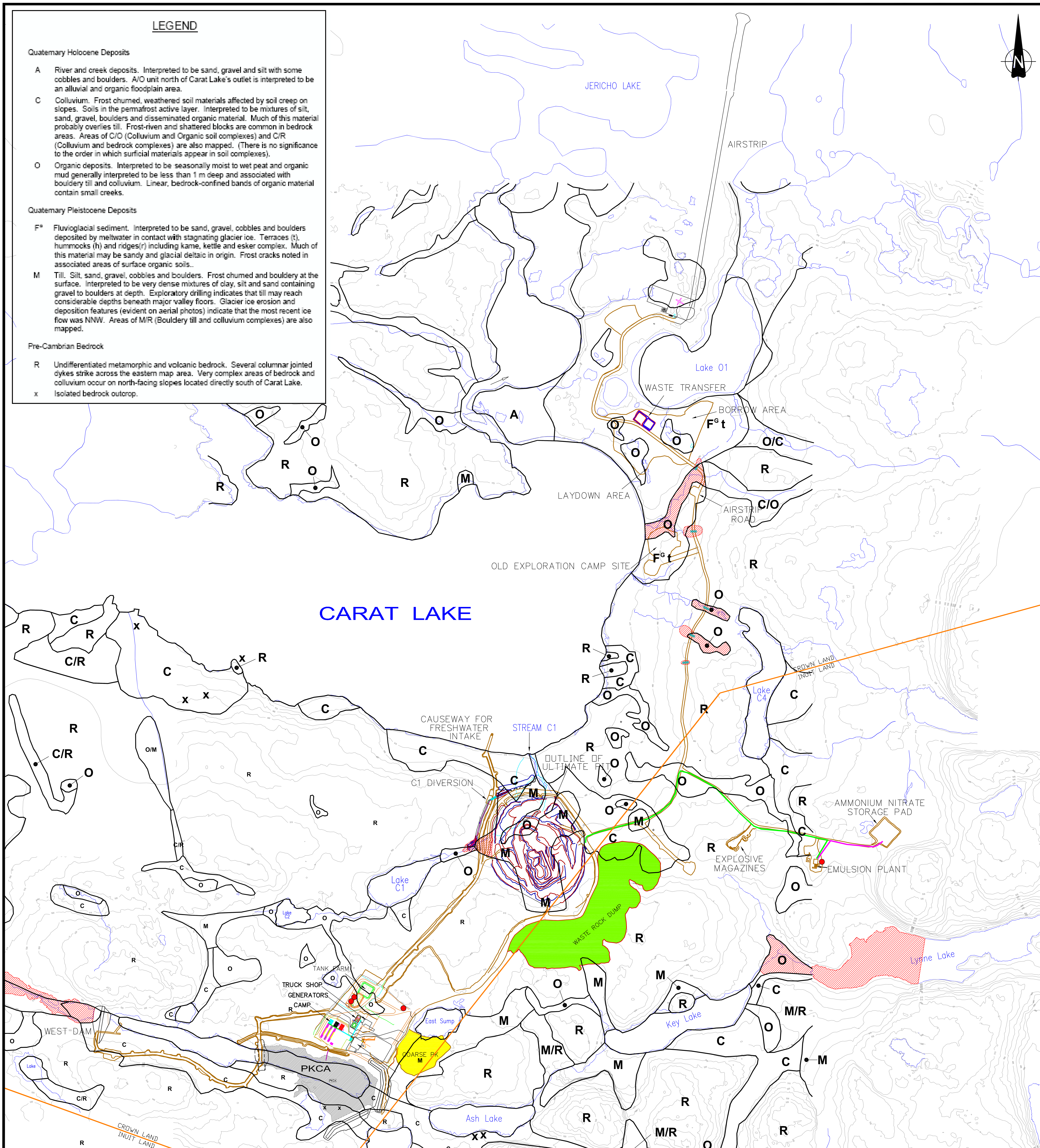
- A — River and creek deposits. Interpreted to be sand, gravel and silt with some cobbles and boulders. A/O unit north of Carat Lake's outlet is interpreted to be an alluvial and organic floodplain area.
- C — Colluvium. Frost churned, weathered soil materials affected by soil creep on slopes. Soils in the permafrost active layer. Interpreted to be mixtures of silt, sand, gravel, boulders and disseminated organic material. Much of this material probably overlies till. Frost-riven and shattered blocks are common in bedrock areas. Areas of C/O (Colluvium and Organic soil complexes) and C/R (Colluvium and bedrock complexes) are also mapped. (There is no significance to the order in which surficial materials appear in soil complexes).
- O — Organic deposits. Interpreted to be seasonally moist to wet peat and organic mud generally interpreted to be less than 1 m deep and associated with bouldery till and colluvium. Linear, bedrock-confined bands of organic material contain small creeks.

Quaternary Pleistocene Deposits

- F^G — Fluvioglacial sediment. Interpreted to be sand, gravel, cobbles and boulders deposited by meltwater in contact with stagnating glacier ice. Terraces (t), hummocks (h) and ridges(r) including kame, kettle and esker complex. Much of this material may be sandy and glacial deltaic in origin. Frost cracks noted in associated areas of surface organic soils..
- M — Till. Silt, sand, gravel, cobbles and boulders. Frost churned and bouldery at the surface. Interpreted to be very dense mixtures of clay, silt and sand containing gravel to boulders at depth. Exploratory drilling indicates that till may reach considerable depths beneath major valley floors. Glacier ice erosion and deposition features (evident on aerial photos) indicate that the most recent ice flow was NNW. Areas of M/R (Bouldery till and colluvium complexes) are also mapped.

Pre-Cambrian Bedrock

- R — Undifferentiated metamorphic and volcanic bedrock. Several columnar jointed dykes strike across the eastern map area. Very complex areas of bedrock and colluvium occur on north-facing slopes located directly south of Carat Lake.
- x — Isolated bedrock outcrop.



Legend

Waste Dump	Culvert
PKCA	Spill Kit
Stockpile Pad	AN Truck Route
Spill Sensitive Area	Explosives Truck Route

NOTE:
Base map provided by Tahera. Stockpiles and PKCA boundary provided by SRK Consulting.

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CLIENT
TAHERA DIAMOND CORPORATION

PROJECT: JERICHO DIAMOND PROJECT	DWN BY: BWS	DATUM: NAD27	DATE: MARCH 2007
TITLE: ENVIRONEMNTAL SITE MAP	CHK'D BY: BO	REV. NO.: A	PROJECT NO: VE51295
	PROJECTION: UTM Zone 12	SCALE: AS SHOWN	FIGURE No. DRAWING 4

N:\Projects\51000\51200\VE51295 – Tahera Jericho Final EIS\Jericho\Water Licence\Contingency Plan\Drawings\cad\Environmental-Site-MJericho_Contingency-Plan_Site-as-of-2006-Dec-31.dwg – 34x44 – Mar. 22, 2007 3:44pm – brad.sparks

APPENDIX B
JERICHO ECOLOGICAL ZONES DESCRIPTIONS

Appendix B
JERICHO DIAMOND PROJECT
Vegetation Baseline Report, 1999
Plant Community Classification

In this section, the plant communities and associations found in plots on the Jericho Diamond Project are described. These are based on observable species groupings in conjunction with terrain features or ecological conditions in the immediate area.

It is important to realize that in many cases, these plant communities or associations are almost like a mosaic. They overlay terrain features, making it possible to have more than one association in a given area. For example, glacial erratic boulders may be scattered throughout a sedge community, or perched on a ridge and surrounded by heath tundra. The boulders bear their own plant associations of lichens, and the surrounding community may be completely different. Conversely, an expanse of heath tundra may include within it small sedge meadows, birch seeps, and bedrock outcrops, each with its own typical plant associations. The very mosaic nature of the plant communities in the arctic point out the difficulty of vegetation mapping (especially by remote sensing); in this environment, it is almost impossible to include these tiny enclaves.

In this paper, we have used the term "plant community" to refer to the major groups, and the term "plant association" to refer to subgroups within each major community. For example, the Sedge Community includes emergent plant associations, non-tussock sedge associations, and tussock sedge associations.

In order to save space, we have used common names where possible, including the scientific name the first time the name is used, and omitting it thereafter.

1. Sedge Communities

Sedge communities typically occur in drainage basins, depressions, or at the edges of lakes and ponds. They are typically wetlands, with standing or slowly flowing water during enough of the growing season that the soil remains saturated.

Sedges (*Carex* sp.) or arctic cotton (*Eriophorum* sp.) make up the dominant vegetation in these communities. Arctic cotton is in the sedge family, but has such a distinctive flower that it has its own common name. It is also known as cottongrass.

1.1 Emergent association

PHOTO 3, Plot 243

Emergent associations occur where plants grow in standing water, usually at the edge of a lake or pond. Some ponds are so shallow that rooted vegetation can occur throughout the pond basin. The depth limit for rooted emergent vegetation in this area seems to be about 30 cm.

Plants in this association are mostly non-tussock sedges (*Carex* sp.) or large cottongrasses (*Eriophorum angustifolium*).

The emergent association is rare in the Local Study Area.

1.2 Sedge association, non-tussock

PHOTO 4, Plot 237
PHOTO 5, Plot 220

The non-tussock sedge association occurs in the center or deepest part of a drainage basin, and consists of non-tussock-forming sedges or cottongrasses. Some species of *Carex* and *Eriophorum* grow in tight clumps called tussocks; in other species, individual plants are connected by underground rhizomes, and are spaced evenly, not clumped.

Non-tussock formers typically grow in the wetter parts of a basin, where water tends to remain on the ground longer, or tends to flow in shallow channels, producing an intermittent flow of slowly moving water a few centimeters deep.

Characteristic species of this association in the Local Study Area include: *Carex aquatilis*, *C. bigelowii*, *C. membranacea, Eriophorum angustifolium,* and *E. scheuchzeri*.

Occasionally woody plants like willows *(Salix arctica*, *S. arctophila*, *S. glauca* ssp. *callicarpaea*, *S. fuscescens*, *S. planifolia*, and *S. tyrellii*) occur in this association, but usually are quite small. Moisture-tolerant forbs like marsh five-finger (*Potentilla palustris*), *Saxifraga foliolosa*, bulblet saxifrage (*S. cernua*), Sudetan lousewort (*Pedicularis sudetica*) also occur here. Occasionally legumes, including the arctic crazyweed (*Oxytropis arctica)* and (rarely*) O. bellii* were encountered, usually growing on mounds.

Grasses are uncommon in this association as it usually is too wet, but *Calamagrostis neglecta*, and *Luzula confusa* were occasionally found here.

The non-tussock association blends into the tussock association wherever the ground is higher or drier in the drainage basins. In places the two, plus hummocky tundra, form a mosaic of different associations, with any mound providing drier habitat that supports species more typical of the heath tundra communities. (See Photo 5, with non-tussock association in the foreground, and the tussock association in the background.)

1.3 Sedge association, tussock

PHOTO 6, Plot 249 (also Phenology Plot 7)
PHOTO 7, Plot 238
PHOTO 8, Plot 238 (close-up of cottongrass tussock)

The tussock sedge association occurs at the edges of a drainage basin, where water only occasionally flows in a thin sheet over the ground. Standing water may be present in the spring or after a rain, but does not persist long.

The sedges and cottongrasses of this association usually form durable "tussocks", clumps of stems and leaves attached to a network of roots and growing in a flexible clump like a tuft of hair. These tussocks form a visible tufted pattern. (See Photo 8 for illustration of a tussock of cottongrass.)

Tussock zone sedge and cottongrass species include: *Carex aquatilis*, *C. membranacea*, *Eriophorum brachyantherum*, and *E. callitrix*. Non-tussock species may occur here, amidst the tussocks.

Heath (and other) species invade the tussocks, and mosses become established in the interstices between the tussocks. Commonly, bog rosemary (*Andromeda polifolia*) and cloudberry (*Rubus chamaemorus*) become established in the sides of the tussocks, while blueberry (*Vaccinium uliginosum*), cranberry (*Vaccinium vitis-idaea*), and Labrador tea (*Ledum decumbens*) grow from the tops. Lapland lousewort (*Pedicularis lapponica*), and bistort (*Polygonum viviparum*) also often grow in and around tussocks.

Dwarf birch (*Betula glandulosa*) and willows (*Salix arctica*, *S. fuscescens*, *S. arctophila*, and occasionally *S. herbacea* or *S. reticulata*) also gain footholds in the tussocks. The birches can attain sizes of over 20 cm, but the willows seldom exceed 10 cm in this association.

The tussock association is often transitional between the non-tussock association and the surrounding heath tundra. As the drainage basin ages, it receives organic material, especially at the edges, which impedes the flow of water, and actually raises the level of the land. This causes the upper layers of the soil to be drier, which allows other species to become established.

As they age, the tussocks lose their tufted shapes due to the growth of non-sedge species. They eventually become rounded humps and the association blends into hummocky tundra.

2. Birch Communities

These associations occur where there is a consistent and reliable supply of water throughout the growing season, but where water does not pool or stand on the ground. They are characterized by the fact that the dwarf birch (*Betula glandulosa*) is the dominant species. They vary in their location due to the amount of water available throughout the growing season.

The birch communities provide nesting habitat for small passerine (perching) birds that usually nest in trees in the southern parts of their ranges, shelter for roosting ptarmigans, and cover for other mammals, like the tundra voles and lemmings. Short-tailed weasels also utilize their cover for hunting.

2.1 Birch riparian association (also birch/willow riparian)

PHOTO 9, Plot 214
PHOTO 10, near Plot 244
PHOTO 11, Plot 206
PHOTO 12, Plot 206, willow close-up with moth galls

A birch riparian association is characterized by a thick growth of dwarf birch in the vicinity of a stream channel, often with a substantial flow of water that is sustained throughout the growing season. These birches (usually 20 – 60 cm tall) often grow so thickly that the density of sedges, grasses, and heaths under their shade is drastically reduced. The ground underneath is often covered only with leaf litter from the birches.

Where enough sunlight penetrates to permit other plants to grow, the ground cover is often crowberry (*Empetrum nigrum*), blueberry, and cranberry, as well as a few mosses. In most cases, these individuals look quite different than individuals of the same species growing out on the open tundra in full sunlight. They are taller, with larger leaves – demonstrating an adaptation known as “shade leaves”, leaf adaptation to lower light levels.

In the larger stream channels, the birch riparian association often includes willows, some of which can attain fairly large sizes, trunks some 10 cm or more in diameter, and heights up to 100 cm. These willows include *Salix glauca*, *S. planifolia*, and *S. tyrellii*. *Salix arctophila* also occurs here, but most often is prostrate, growing among the other willows.

In places this birch riparian association with fairly large willows occurs where water collects at the base of a cliff, even if there is not a lot of standing water. (See Photo 11, Plot 206 for an example, and Photo 12 for a closeup of a willow with moth galls)

2.2 Birch "seeps"

PHOTO 13, Plot 219

Birch "seeps" are rarely associated with constantly flowing streams, but usually occur where water flows out of a boulder field, at the edge of an esker, on the margin of a slope, or where the active layer has slipped. The flow of water is not generally visible on the surface of the land, but is reliable. They are quite visible as a low but solid growth of dwarf birches, often in a crescent shape on a hillside. This plant association is often associated with large boulder groups or at the edges of boulder fields or areas of felsenmeer (shattered bedrock that has been somewhat rearranged by glaciation, but retains its angular forms).

Where the birch "grove" is thick enough, only leaf litter and a few scraggly mosses occur beneath the birches. If sunlight penetrates, however, birch seeps can support an understory of heaths (blueberry, Labrador tea, mountain cranberry) crowberry, mosses, buttercups (*Ranunculus lapponicus*), large-flowered wintergreen (*Pyrola grandiflora*), and bublet saxifrage (*Saxifraga cernua*). Several willows (*Salix glauca*, *S. arctophila, S. herbacea*, *S. tyrrellii*) occur here in this protected environment, as well as sedges (*Carex aquatilis*, *C. bigelowii*, *Eriophorum scheuchzeri*) and grasses (*Arctagrostis latifolia*, *Hierochloe alpina*, *Calamagrostis inexpansa, C. neglecta,* and *Poa arctica*).

3. Heath Tundra Community

The heath tundra is the climax community in the Contwoyto Lake area, and covers most of the upland where the soil is stable or deep enough to support rooted plants. The term "heath" refers to plants of the family Ericaceae, and is used as a general term to describe this group of plants, which often grow in association with each other in the tundra.

The heath tundra community is characterized by a mixture of heaths, forbs, small xeric sedges, and grasses. The composition of the vegetation of the heath tundra community is governed by the amount of water in the soil, soil amount and type, and exposure to wind.

Terrain features are the most important cause of variations in the heath tundra community, especially those that affect the amount of water available to plant roots or those that cause the soil to be more exposed to winds in winter than in surrounding areas.

3.1 Upland heath tundra

PHOTO 14, Plot 242
PHOTO 15, Plot 225
PHOTO 16, Plot 225 (Close-up of alpine azalea)

This association occurs on most slopes and fairly well-drained level ground which is covered by a blanket of snow in winter, preventing wind erosion of the vegetation.

Characteristic plants of the upland heath tundra include Labrador tea, blueberry, mountain cranberry, and bearberry, black bearberry (*Arctostaphylos alpina*) on the drier sites, and red bearberry (*A. rubra*) where there is more moisture. Crowberry is often intermingled in the mat of vegetation, and dwarf birch is also an important component of this community, but grows in a scattered fashion, not in dense "groves". Willows (*Salix glauca* ssp. *callicarpaea*, *S. arctica, S. tyrrellii)* also occur throughout the upland heath tundra, and are mostly small and prostrate due to the shallow snow cover in winter.

Arctic bluegrass (*Poa arctica*), alpine holygrass (*Hierochloe alpina*), wood rush (*Luzula confusa*), and dryland sedges like *Carex bigelowii, C. membranacea, C. rotundata, C. rupestris,* and *C. vaginata* grow scattered throughout the upland heath tundra, not in pure stands. Alpine holygrass occurred in almost every plot we studied, except where the ground was saturated.

In windswept areas where the snow cover is likely quite thin in winter, mat plants like alpine azalea (*Loiseleuria procumbens*) or *Diapensia lapponica* can become established. Mountain avens (*Dryas integrifolia*) also occurs in thin snow areas.

3.2 Heath tundra on frost scars

PHOTO 17, Plot 262
PHOTO 18, Plot 262 (Close-up of frost scar.)

The freeze-thaw cycle in arctic soils creates typical terrain features across the Arctic. One of the most common of these are "frost scars", described by Britton (1966) in a paper on the vegetation of the Alaskan arctic tundra. A type of frost scar, mud boils are defined as "nonsorted circles developed in fine-grained materials" (van Everdingen, 1998). These are common on many gentle slopes in the Contwoyto area.

Mud boils form where conditions allow the establishment of convection currents in the active layer (French and Slaymaker, 1993). Circular structures form, with a center disk composed of exposed mineral soil, rocks, or a combination of these, surrounded by a raised ridge usually covered with vegetation. Particles in the center disk may be moving too swiftly to allow the establishment of rooted vegetation.

The vegetation on frost scars creates a different type of mosaic, several different associations all mixed together, impossible to separate, as far as mapping is concerned.

Outside the circular mud or frost "boils", the plant association may be heath tundra or a sedge association. On the elevated ridges of the "boils", heath tundra predominates, with a mixture of species more typical of dry sites mixed with the heaths – legumes such as arctic crazyweed (*Oxytropis arctica*), and occasionally liquorice-root (*Hedysarum alpinum*). In addition, mountain avens (*Dryas integrifolia*) and grasses such as *Arctagrostis latifolia, Trisetum spicatum,* arctic bluegrass, alpine holygrass also occupy the ridges.

The center disk of the boil is composed of particles moving rapidly in relation to the outer ring. This prevents most vegetation from becoming established. In some cases, there is little vegetation here; in others, the center disk bears mats of alpine milkvetch (*Astragalus alpinus*), tiny gnarled plants of Lapland rosebay (*Rhododendron lapponicum*), or a sparse growth of sedges.

3.3 Heath tundra on solifluction slopes

In places, the active layer creeps downslope over the permafrost, forming a distinct layer that resembles frosting applied to a cake while the cake is still warm, a sort of "festooned" pattern where one layer creeps over another. From above, these lobes can be seen overlying the original ground.

The face of the moving layer is rotating, with soil particles moving in a wheel-like motion around the end of the layer. This movement carries rooted vegetation with it, creating a thicker growth of plants in the face of the slowly moving ridge.

Some of the plants often found in the face of a solifluction lobe are dwarf birch, small willows (several species), blueberry, Labrador tea, mountain cranberry, Calamagrostis neglecta, alpine holygrass, .

Solifluction slopes are uncommon in the local study area, and usually occur on a small scale where they do occur.

4. Snowbank Community

PHOTO 19, near Plot 228, showing profile of snowbank
PHOTO 20, Plot 228
PHOTO 21, Plot 229
PHOTO 22, Plot 229 (Close-up of mountain heather.)
PHOTO 23, Plot 229 (Close-up of Richardson's anemone)
PHOTO 24, near Plot 229, pellets from arctic hare

In the lee of a south or east-facing slope, deep snowbanks accumulate (Photo 19), and often do not disappear before July, drastically shortening the growing season for the plants beneath the snow. A characteristic plant association develops in these areas. Typical of most snowbank communities is the least willow (*Salix herbacea*), Labrador tea, and the white arctic heather. Mountain sorrel (*Oxyria digyna*), *Saxifraga punctata, S. nivalis*, and *Antennaria eckmaniana* are often also present.

The higher the bank or cliff which causes the snowbank to form, the deeper the snowbank, and more pronounced its effect on the local vegetation. We found particularly distinct snowbank communities at the west end of Long Lake, which is located to the southwest of the portal. Here, steep cliffs some 10 m tall cause snow accumulation and distinct local microclimates.

Wind turbulence in these valleys causes snowbanks to develop on both south and north-facing slopes. However, due to longer exposure to direct sunlight, the south-facing cliff bases (Photo 21) tend to become snow free earlier than those facing north (Photos 19 and 20). These south-facing slopes are protected from drying winds, and have a reliable source of moisture throughout most of the growing season. The plant community that develops here consists of a number of species that are much more common further south, near Lac de Gras, Jolly Lake, and Courageous Lake.

Among the normal snowbank indicator species, we found bog-laurel (*Kalmia polifolia*), mountain heather (*Phyllodoce coerula*) (Photo 22), Richardson's anemone (*Anemone richardsonii*) (Photo 23), *Sibbaldia procumbens*, and in places a species of violet tentatively identified as *Viola epipsala* ssp. *repens*.

Arctic hares and ptarmigans apparently use the shelter of these cliffs in harsh weather. Here, we found many fecal deposits of both species, as well as unusual fecal pellets of arctic hares. These pellets seem to be covered with a fine mud veneer, and are composed of much finer plant material than are the typical pellets. Each pellet we opened also contained one to three small pieces of gravel. The reason for the formation of these atypical pellets is unknown, and a cursory search of the literature revealed no descriptions that fit (Photo 24).

5. Avens Association

PHOTO 25, Plot 239

A fairly uncommon plant association occurs in "saddles" and on slopes where there is little soil, and a base of gravel ranging in particle size from 5 mm to 1 cm. (Since the mountain avens seems to dominate this association, we called it the "Avens association". It does not seem to fit clearly into the designation of "heath tundra", and is not a sedge association, but seems to have its own characteristics.)

Although mountain avens (*Dryas integrifolia*) is dominant in this association, but the least willow, reticulated willow (*Salix reticulata*), Lapland rosebay, alpine milkvetch (*Astragalus alpinus*) and arctic oxytrope (*Oxytropis arctica*) also occur. Arctic bluegrass (*Poa arctica*), *Deschampsia caespitos*a, and *Carex scirpoidea* are present. Several species of small willows occur here, including *Salix reticulata*, *S. herbacea*, *S. glauca*, and *S. arbusculoides*. Black bearberry (*Arctostaphylos alpina*), purple mountain saxifrage (*Saxifraga oppositifolia*), star chickweed (*Stellaria* sp.), and false asphodel (*Tofieldia pusilla* and *T. coccinea*) are sometimes present in small numbers.

Frost boils are common in this area, and these plants often arrange themselves typically on the frost boils, with the legumes, small sedges, and Lapland rosebay on the center disks, and heaths and avens on the surrounding ridges.

We found only two examples of this type of association. The best example is on the south-facing slope above the east end of Long Lake.

6. Lichen-rock Communities

Where there is a high percentage of boulders or fractured bedrock in the substrate, rooted vascular plants are uncommon, and the plant association is made up of lichens growing on and around the rocks. In the Jericho Project area, most rocks are about 80% covered with crustose lichens.

The species of lichen inhabiting the rock usually depends on the chemical composition of the rock, the amount of weathering or fracturing, and the exposure to wind abrasion. The lichen flora of rocks in the Jericho area is generally a flora typical of "acidic" rocks rather than calcareous rocks.

The following lichens constitute the "typical" lichen flora of local rocks, and can be found on boulders, felsenmeer and bedrock outcrops: rock tripe (*Umbilicaria* sp.), map lichen (*Rhizocarpon geographicum, R. geminatum*), sunburst (*Arctoparmelia centrifuga, A. incurvata*), bloodspot (*Haematomma lapponicum*), *Pseudophebe minuscula* and *P. pubescens* (which we called "brush-cut lichens"), Tremolecia atrata ("Halloween lichen") and grey and black crustose lichens.

The orange jewel lichen (*Xanthoria elegans*), occurs where siksiks use the boulders for lookouts; it is characteristic of calcareous rocks and places high in nitrogen, growing here on the urine and feces of the ground squirrels.

6.1 Boulders in heath tundra

PHOTO 26, Plot 233

This is a transitional association, scattered boulders (usually about 80% covered with lichens) surrounded by heath tundra. It is very common in the Local Study Area. The boulders are covered with the typical lichen association listed above, and the surrounding heath tundra is typical of the general heath tundra for the area.

Occasionally, a local effect can be observed around the boulders – a small increase in nutrients and water may occur due to runoff from the boulder and from fecal material deposited on it by birds and mammals. This may cause an increase in the lushness of the plants around the base of the boulder, and in a higher percentage of grasses immediately surrounding the boulder.

Scattered glacial erratic boulders also occur in sedge communities. When they do, the coverage of lichens on the boulders is about 60%, significantly less than those in heath tundra.

The microhabitats on these erratic boulders is likely not particularly important to any species of wildlife, with the possible exception of some insects or spiders.

6.2 Boulder field associations

PHOTO 27, Plot 223
PHOTO 28, Plot 223 (Close-up of boulders, lichens.)

The plant communities on boulder fields, boulder streams, and felsenmeer* are all similar, with the species of lichens determined primarily by the chemical composition of the rocks. Boulders are covered by a mosaic of crustose lichens (see list above) and the interstices between boulders, if small enough to provide protection, support an assemblage of foliose and fruticose lichens. Typical species between boulders include: *Cetraria* sp., *Cladina stellaris, Alectoria* sp. ("hair lichens"), and *Cladonia cervicornis, C. cornuta, C. coccifera,* and *C. uncialis.*.

As the mats of lichens webbing the boulders together become denser, dust and organic debris accumulate, and form a substrate that can support rooted plants. Mats of tundra slowly become established in the midst of the boulders. The fragrant shield fern (*Dryopteris fragrans*) often becomes established in protected niches. Crowberry and mountain cranberry are also common species in these mats. Prickly saxifrage often becomes established, rooting in cracks on the boulders.

6.3 Bedrock associations

PHOTO 29, Plot 204
PHOTO 30, Plot 204 (Close-up of lichens.)

Bedrock outcrops rounded and polished by the continental ice sheets are common in the local study area of the Jericho Project. These provide a substrate that is not only lacking in nutrients, but often exposed to the wind and subjected to great variations in temperature. Few rooted vascular plants can become established here, so the rock outcrops are left to the lichens. Most outcrops are approximately 80% covered with crustose lichens (See Photo 30). A few vascular plants like prickly saxifrage (*Saxifraga tricuspidata*) and some of the grasses find footholds in cracks in the rocks.

Cliff faces usually support a flora similar to rounded outcrops, with rooted plants clinging to crevices and mats of tundra established on ledges. Grasses (*Poa* sp., *Hierochloe* sp.) are common, as is prickly saxifrage, and sometimes *Saxifraga nivalis*.

Cliff faces usually funnel or concentrate the flow of water (either over the surface or through the active layer), creating a moist microclimate at their base. If they are too small to form snowbank communities, the base of cliffs often supports a lush growth of grasses (*Poa* sp., and *Luzula confusa*) or sedges (*Carex bigelowii, C. aquatilis,* and *C. podocarpa*) (See Photos 11 and 12).

* Felsenmeer is a"surficial layer of angular shattered rocks formed in either modern or Pleistocene periglacial environments (Van Everdingen, 1998), literally "frost-riven debris", often slightly modified by ice (Bird, 1967).

Taller cliff faces may provide nesting sites for raptors. “Whitewash” (fecal material) from the birds and decaying organic matter from nest material and prey items creates small pockets of enrichment around the nest sites. These areas may have sufficient nitrogen compounds and calcium to support growths of bright orange jewel lichens (*Xanthoria* elegans).

7. Ridge Complex

Eskers and kame deltas are common in the Jericho area; the airstrip is built on a large esker that runs north from Carat Camp. These large systems encompass a number of plant communities, but some (such as the ridge crest communities) are characteristic only of the esker/drumlin/kame complexes, as they occur on the less stable sand/gravel substrates exposed to wind erosion.

7.1 Ridge crest communities

PHOTO 31, Plot 252 (Phenology Plot #4)
PHOTO 32, Plot 252 (Close-up of *Potentilla nivalis*)

Due to exposure to winds and the instability of the sand or gravel material of the esker or ridge crests, very specific plant communities develop there. These typically consist mostly of mats of vegetation (blueberry, crowberry, black bearberry, Labrador tea, mountain avens), semi-succulent plants (*Antennaria* sp., prickly saxifrage, *Draba glabella* and *D. lactea*), deeply-rooted cushion plants like moss campion (*Silene acaulis*), or clumps of grass (*Poa* sp. , *Arctagrostis latifolia*, *Festuca brachyphylla*, or *Arctophila* sp.). The tiny sandwort, *Minuartia rubella*, can also be found in some of these very dry, very unstable sites. A few legumes also can find a foothold here, including *Oxytropis arctica* and *Astragalus alpinus*.

Where the winds are particularly severe, due to topographical features and funneling, the snow cover in winter may be nonexistent and the soil may be so eroded and unstable that it cannot support any kind of rooted vegetation. In these areas, sand “blowouts” occur, which do not have any visible vegetation at all. More stable crests with thin snow cover may develop a thin veneer of black lichens.

7.2 Ridge slope communities

PHOTO 33, Plot 251 (Phenology plot #5)

The slopes of eskers can vary in exposure, orientation, and steepness, and the plant communities occupying them vary also. Slopes facing away from the prevailing winds may support a fringe of dwarf birches with an understory of crowberry, blueberry, Labrador tea, arctic heather, mountain cranberry, and occasionally large-flowered wintergreen and *Antennaria* spp. These lee slopes usually face south or southeast.

Snowdrifts collect on these slopes and help protect the vegetation. They also ensure a more reliable supply of water, enabling the dwarf birches to survive there. Snowbank communities may occupy the lower portions of lee slopes that accumulate deep snowdrifts. Windward slopes usually are covered with heath tundra.

8. Transitional Associations; Hummock zone

PHOTO 34, Plot 216

In some cases, the transition zone between two plant communities is occupied by an association that contains elements of each but that is clearly definable on its own.

An example of this is the hummock zone, which occurs in the transition between the sedge community and heath tundra. This association, because of its diverse microclimates, is a complex mosaic, with a high number of plant species, each occupying a specific niche.

A turf hummock is defined (Van Everdingen, 1998), as a "hummock consisting of vegetation and organic matter with or without a core of mineral soil or stones". Occasionally, hummocks are ice-cored, especially in areas where there is considerable flow of water in the fall, when freezing and thawing occur each day.

Turf hummocks may originate as sedge tussocks are invaded by heaths. These are mounds developed initially from the tussocks of certain species of *Carex* and *Eriophorum* sedges, a tight but flexible mass of stalks, leaves, and roots. Bird (1967) states that this is the most common form of hummock in northern Canada.

Heath growth usually starts in the drier places on a tussock, with blueberry, Labrador tea, mountain cranberry, and occasionally red bearberry (*Arctostaphylos rubra*) rooting in the sides and top of the tussock, and gradually displacing the sedges. Mosses cover the ground between the tussocks, and add to their bulk by growing up the sides. Cloudberry (*Rubus chamaemorus*) and bog rosemary (*Andromeda polifolia*) become established in the moss, and gradually the structure ceases to resemble a tussock and becomes a mound of heaths and related species.

Moss mats that become established in sedge meadows may be an alternate source of hummocks (Pielou, 1994). The thickening growth of mosses insulate the ground in specific places, allowing ice lenses to develop when water percolates through the system in the fall. These enlarge each year, and, with the vegetation growth, cause the hummock size to increase. Plant species are similar, heaths, mosses, cloudberries, and a few forbs like bistort (*Polygonum viviparum*), Labrador lousewort and Lapland lousewort.

Toward the sides of the drainage basin or depression, there is less water in the soil, and colonization by heaths is more complete. Heaths fill the interstices between the mounds, and the surface becomes undulating, gradually merging with the surrounding heath tundra.

Photos

PHOTO 3. Plot 243
Sedge Community, emergent association, sedges in standing water.

PHOTO 4. Plot 237
Sedge Community, non-tussock association.

PHOTO 5. Plot 220
Sedge Community, non-tussock association with transition to tussock association in background.

PHOTO 6. Plot 249
(Phenology Plot #7) Sedge Community, tussock association.

PHOTO 7. Plot 238
Sedge Community, tussock association. (above)

PHOTO 8. Plot 238
Tussock association, single tussock of cottongrass. (left)

PHOTO 9. Plot 214
Birch Community, birch/willow riparian association.

PHOTO 10. Near Plot 244
Birch Community, birch/willow riparian association at natural rock "dam" in stream valley above Lake C-1.