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Brown and Johnston. From their camp, they roamed the vast expanse of the MacKenzie Delta and surrounding areas. They explored the maze of shifting channels, the drowning and emerging islands, the muskrat and mosquito country through which the seventh largest river in the world (in terms of flow) empties into the Beaufort Sea. They saw pingos, the most spectacular of permafrost's manifestations; more than 1 000 of these hills with cores of solid ice rise from the flood plain of the Mackenzie. But what they were looking for was not so visible. To probe the frozen ground on which foundations could be reliably constructed, they had to drill or dig test pits into the rock-hard, frozen soil.

It is not easy to load a drill rig, even a small, portable one, and all its equipment neatly on a dog-sled. "Dogs are good movers," Johnston says, "but they can be frustrating. They're so eager to pull it's hard to stop them when things get snagged on willows and start falling off."

When the ice broke up in early June, the site selection team could travel by water, using a tug and small barge, or canoes. More than once fog rolled in and the channel on which Hank and Roger were canoeing disappeared. Then they would pull to shore, make supper, and contend with the bugs in their tent.

Their most powerful though not most reliable mode of transport was a helicopter — the first ever flown during winter in the Canadian north. It was ferried up from Edmonton, stopping for fuel at every post and cache along its route. At Aklavik, a large cache of gas had been stashed during the war by the Air Force. But, fuel deteriorates when it is left standing in the Arctic for a number of years and many of the drums contained a lot of water. Though the chopper pilot experimented with many fuel mixtures and refuelled with great care, his spark plugs still had a disconcerting tendency to foul. At the team's base camp, he always took off and landed from a nice, deep snow bank — to soften the bump if his engine failed. Three times it failed in mid-air, away from camp, and he and his passengers had to crash land, the autorotating blades cushioning the descent <image>

to earth. Grounded, the pilot would fiddle with spark plugs, drain and strain gas while the others cut willows, clearing room for taking off again.

In their field work, the members of the site selection team were looking critically at possible townsites, narrowing the number of candidates until only one remained. This was a spot on the edge of the Delta some 50 km east of Aklavik. It was on a navigable waterway, had local sources for gravel, and stood on good ground. It has to be remembered that all types of soil, when frozen, are as hard as rock as long as they are *solidly frozen*. It is only after they thaw that these differences in soil type and water content become critical. What Brown and Johnston wanted to avoid were the finegrained soils like clays and river silts which are high in water content (up to 60 per cent by volume at Aklavik) and turn into soft, unstable mud on warming. They searched for coarser grained soil types, which contain less ice, and hence are much more stable on thawing. And, they were on the lookout for convenient sources of gravel, widely used in construction to guard against the effects of seasonal freeze-thaw cycles in the upper soil layers.

In 1955, construction began on the town called Inuvik, "the place of man."

Hank Johnston, Roger Brown, and others in the group looking for the new townsite of Inuvik spent a lot of time in tents. This is the Husky site on the western side of the Mackenzie Delta, at the foot of the Richardson Mountains.

Travels in the Frozen North

Inuvik is an exemplary model of how to build successfully on permafrost. The essence of the construction techniques pioneered here, and now used throughout the north, is to keep the ground frozen. For example, most of Inuvik stands on pilings. In the early years, the pilings were placed in holes thawed by steam jets, but since the late 1950's the holes have been drilled. Because the buildings are raised, heat from within them is dissipated to the air flowing below and not passed to the ground. Water and sewage pipes are raised aboveground too; they are enclosed in heated and insulated ducts called "utilidors."

Hank Johnston spent a good deal of time in Inuvik while it was being developed. He has studied the performance of its buildings, roads, wharves, and airfield, and through such studies has become expert in making detailed site surveys, and in appropriately tailoring foundations to building sites. In 1981, he pub-