Detailed Comments on Surface and Ground Water Movements

During the dry season observers have reported that no water flows out of "Bryant's Swamp". The swamp does not dry up, however, according to Mr. Heavenor. Rain and five inches of snow had fallen in the area immediately prior to the present field inspection, and a flow estimated in excess of 30 gpm was flowing out of the northeast corner of the swamp. (see figure 2). This water is confined to a trench 2½ feet wide and deep. The general direction of this surface water flow appears to be down the slope to the northeast.

A Kye or Dashwood soil is well to moderately well drained. In Dashwood soils, however, the underlying D horizon is very slowly permeable and this could induce, even in the early dry season, considerable lateral movement of seepage water down the gentle catchment slope towards the swamp.

This lateral movement could be assisted also by impermeable till beneath the marine deposits. Lenses of sand and gravel occurring in the till may be the explanation for the thickness of sand found at one point by Mr. Heavenor in "Bryant's Swamp".

Detailed Results of Water Quality Tests.

Chloride, iron, hardness and pH tests were made on the water at two locations on Bryant's Swamp. (see locations X, Y, figure 2). The results of these tests are given below.

Sample location X, standing water in "Bryant's Swamp".

Chloride	p.p.m.	.....	26
Iron	p.p.m.	..... less than	0.6
Hardness	p.p.m.	.....	17
pH		.....	5.0

Sample location Y, water moving through the outlet from "Bryant's Swamp".

Chloride	p.p.m.	.....	23
Iron	p.p.m.	..... less than	0.6
Hardness	p.p.m.	.....	17
pH		.....	5.7

In order to obtain some comparison with these results similar tests were run on the surface runoff and spring supply for Yaculta Village on #10 Indian Reservation south of "Bryant's Swamp"

Results showed:

Chloride	p.p.m.	.....	30
Iron	p.p.m.	.... less than	0.6
Hardness	p.p.m.	.....	17
pH		.....	8.0

Another surface runoff and spring supply further south again, which the Indians informed me the Health Department has condemned as a village water supply had a chloride content of 38 p.p.m. The village has barely enough water during the summer according to local reports. (On file with the Indian Affairs Department in Vancouver are reports by Fyles and Armstrong (1950) and W.M. Watkins (1961) on water supply possibilities for Yaculta Village).

J.C. Foweraker,
Geologist

ADDITIONAL NOTES

Detailed Comments on Geology and Soils

The geological map of B.C. (932A, second edition, scale 1 inch to 20 miles) shows "Bryant's Swamp" to lie near the boundary between a heavily drift covered area and an area composed predominantly of volcanic rocks. Most of the geological literature on Quadra Island refers to areas further to the north. A projected view of the sea cliff at the southernmost tip of Quadra Island, east of Cape Mudge, is included on the G.S.C. Map 49-1959, Oyster, Surficial Geology by J.G. Fyles 1956-57. A Dr. D. Carlisle, Geology Dept., University of California, has been taking parties of students to Quadra Island for several years and has mapped part of the Island. Quadra Island is included in the soil map of Vancouver Island, Courtenay - Campbell, Sheet 1958 (a part of this map is reproduced in figure 1).

The soils map shows much of "Bryant's Swamp" to be covered by the poorly drained Tolmie Series. The area immediately outside the swamp is designated as a Kye - Dashwood complex. According to Fyles, unmodified till soils are found only outside the areas of post glacial marine submergence, and in the Campbell River area, this would mean 400 to 600 feet above present sea level. At the south end of Quadra Island which only rises to 300 feet above sea level, till is evident along the entire bluff section overlying Quadra Sands. Therefore although till may be present over much of the lower part of the island, the soils would not however be developed on the till directly but on the overlying marine deposits which were formed (partly from the till) during past glacial submergence. According to Fyles, these marine deposits are a principal parent material of Dashwood soils. Soils of the Kye series can occur where such marine deposits thicken to form shoreline terraces, spits or bars, however such soils could also be formed if they were overlying Quadra interglacial sand and gravel instead of till. The cliff section at the southern end of Quadra Island also shows near the middle of this exposure, Quadra interglacial sands and gravels thickening towards the top of the section, while the till cover becomes correspondingly thinner. It is possible that the Quadra sands could be actually exposed along parts of the low ridge and from the parent material in certain areas under the Kye Dashwood complex. However it is thought that due to the perched water table along parts of the low ridge, there is a cover of till over the whole area and that soils similar to the Kye series are formed where there has been local thickening of the marine deposits described. On the floor of the "Bryant's Swamp" depression, clays apparently replace the gravelly granular marine deposits. These clays give rise to the Tolmie marine soils.

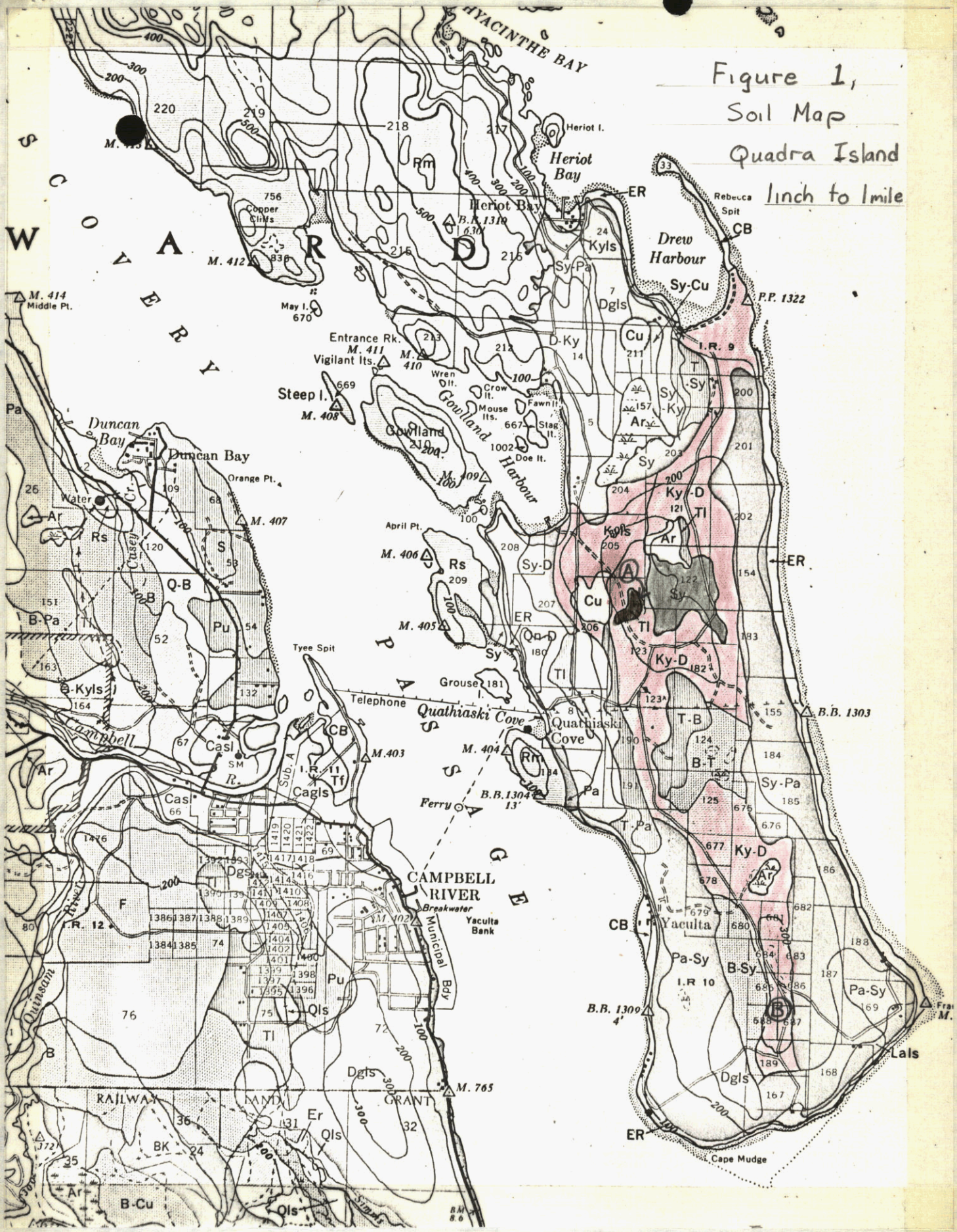


Figure 1,
Soil Map
Quadra Island
1 inch to 1 mile
HYACINTHE BAY
Heriot I.
Heriot Bay
Rebecca Spit
CB
Drew Harbour
ER
Sy-Cu
P.P. 1322
I.R. 9
Kyls
Sy-Pa
Dgls
Cu
D-Ky
Ky-D
Tl
Sy
Ar
Rm
Rs
Q-B
B-Pa
Pu
S
Qu-D
Pa
T-B
B-T
Sy-Pa
Pa-Sy
B-Sy
Ky-D
Yaculta
Yaculta Bank
I.R. 10
I.R. 12
I.R. 11
Lals
Cape Mudge
B.B. 1303
B.B. 1309
B.B. 1304
M. 765
M. 414 Middle Pt.
M. 412
M. 411 Vigilant Its.
M. 410
M. 409
M. 408
M. 407
M. 406
M. 405
M. 404
M. 403
Entrance Rk.
Steep I.
Wren Olt.
Crow It.
Mouse Its.
Fawn It.
Stag It.
Doe It.
Gowland Harbour
Gowland
May I.
Copper Cliffs
Duncan Bay
Orange Pt.
Water
Casey Cr.
April Pt.
Tyee Spit
Grouse I.
Telephone
Quathiaski Cove
Ferry
Campbell River
Breakwater
Municipal Bdy
Campbell R.
Quinsam R.
Sub. A
RAILWAY LAND
GRANT
SCOVERY
PASSAGE

LEGEND

SERIES	KYE	BOWSER	DASHWOOD	SAYWARD	TOLMIE
TYPE AND SYMBOL	Loamy sand Gravelly loamy sand Ky	Loamy sand B	Loamy sand Gravelly loamy sand D	Loamy sand Sy	Fine sandy loam Sandy loam Loam Sandy clay loam
SOIL GROUP	Podzol	Brown Podzolic	Brown Podzolic	Podzol	Dark Grey Gleisolic
DRAINAGE	Well drained	Imperfectly drained	Well to moderately well drained	Imperfectly drained	Poorly drained
DOMINANT TOPOGRAPHY	Level to gently sloping	Gently Sloping	Sloping to gently sloping	Gently sloping	Level to depressional
STONINESS	Stone free	Stone free	Frequently cobbly and stony	Stone free	Stone free
DESCRIPTION OF VIRGIN SOIL	2 to 3 inches of light grey to white loamy sand (A_2), over 13 to 16 inches of yellowish brown, highly permeable loamy sand and gravelly loamy sand that grades through 12 to 14 inches of weakly iron cemented sand (B), over mottled loose sand and gravel (C)	20 to 30 inches of reddish brown loamy sand containing many iron cemented clods; over 4 to 6 inches of yellowish brown to reddish brown strongly cemented ortstein (B), over very slowly permeable gravelly sandy loam till or marine clay (D)	25 to 30 inches of yellowish brown, loose, permeable gravelly loamy sand or loamy sand (B), over grey, often mottled, very slowly permeable, gravelly sandy loam till or marine clay (D)	1 inch of grey leached loamy sand (A_2); over 18 to 20 inches dark reddish brown and reddish brown very permeable loamy sand, containing iron cemented clods (B); over 20 to 30 inches of dark grey brown permeable sand, showing iron cementation at lower limits; over very slowly permeable, gravelly sandy loam till or marine clay (D)	6 to 9 inches of very dark brown to black granular and permeable fine sandy loam to sandy clay loam (A_1); over 4 inches of grey to grey brown, slowly permeable, subangular blocky sandy clay loam (AB); over 8 to 10 inches of reddish brown to yellowish brown highly mottled and slowly permeable sandy clay (B_g), over grey, compact very slowly permeable marine clay (D)

Ky-D Complex

Figure 1 (continued)

CONVENTION

c — clay
cl — clay loam
scl — sandy clay loam
sil — silt loam
l — loam
fsl — fine sandy loam
sl — sandy loam
gsl — gravelly sandy loam
ls — loamy sand
gls — gravelly loamy sand
v — rock outcrop

EXAMINATION PLAN

BRITISH COLUMBIA LAND SERVICE
SURVEYS AND MAPPING BRANCH
LEGAL SURVEYS DIVISION

025069G Victoria File
29499 Request No.
92K/3W (a-6.7) Reference Map

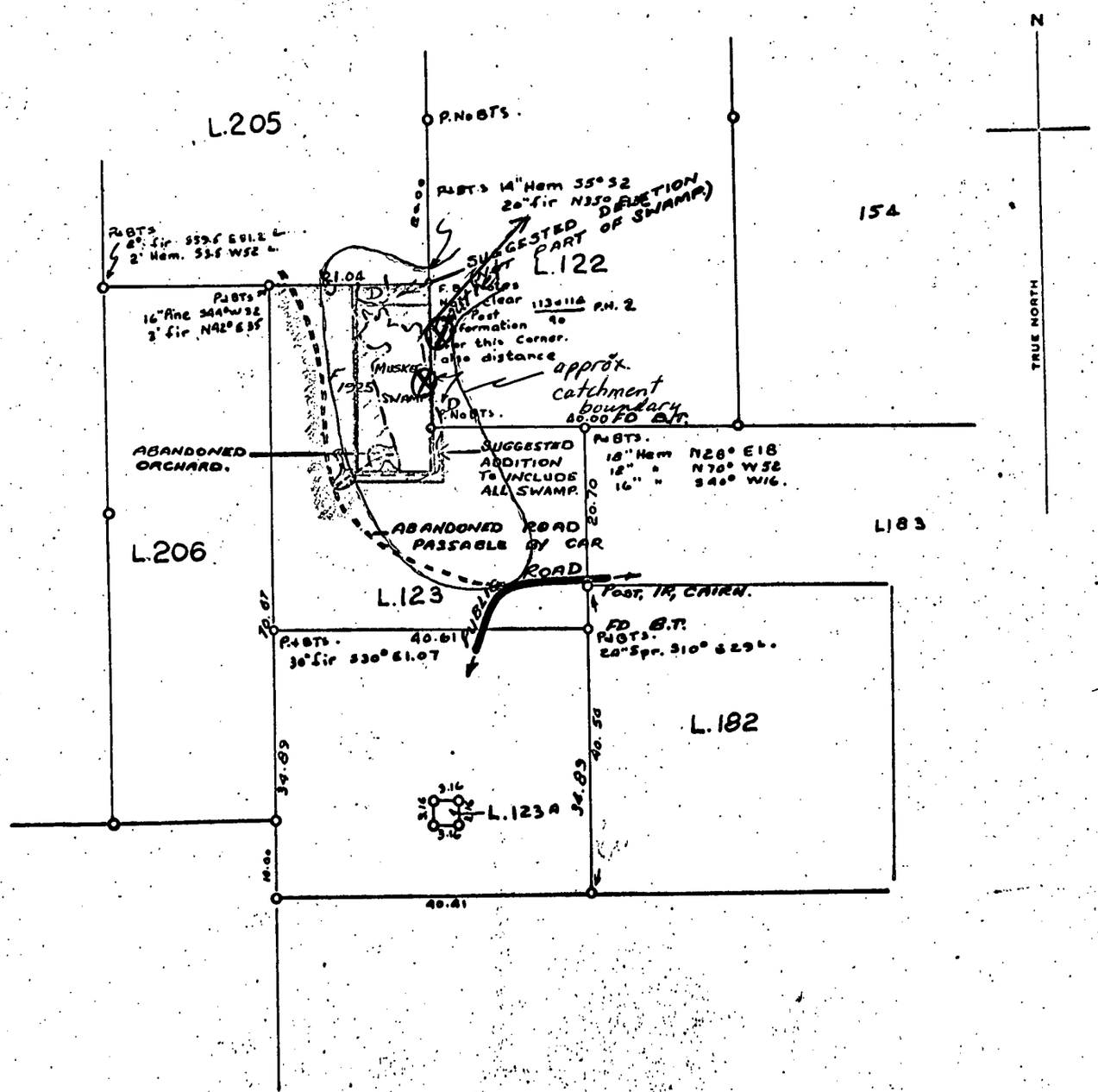
Description of Area: Unsurveyed portion of Lot 123 (Subject to Survey)

Location: Quadra Island (S½)

SAYWARD Land District
COMOX Assessment District

VICTORIA Land Registration District
Land Inspection District
Ranger District

Scale: 20 Chains — 1 inch



Lot No.	Field Book	P.H.	Surveyed By	Date Surveyed
S½ 123	2774/11	4	Coates	1911
123	1134 114/30	2		1890

Plan 8T1 Air Photo

Made by J Smith Date 27/8/63

1M-1200-8195

FIGURE 2

GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

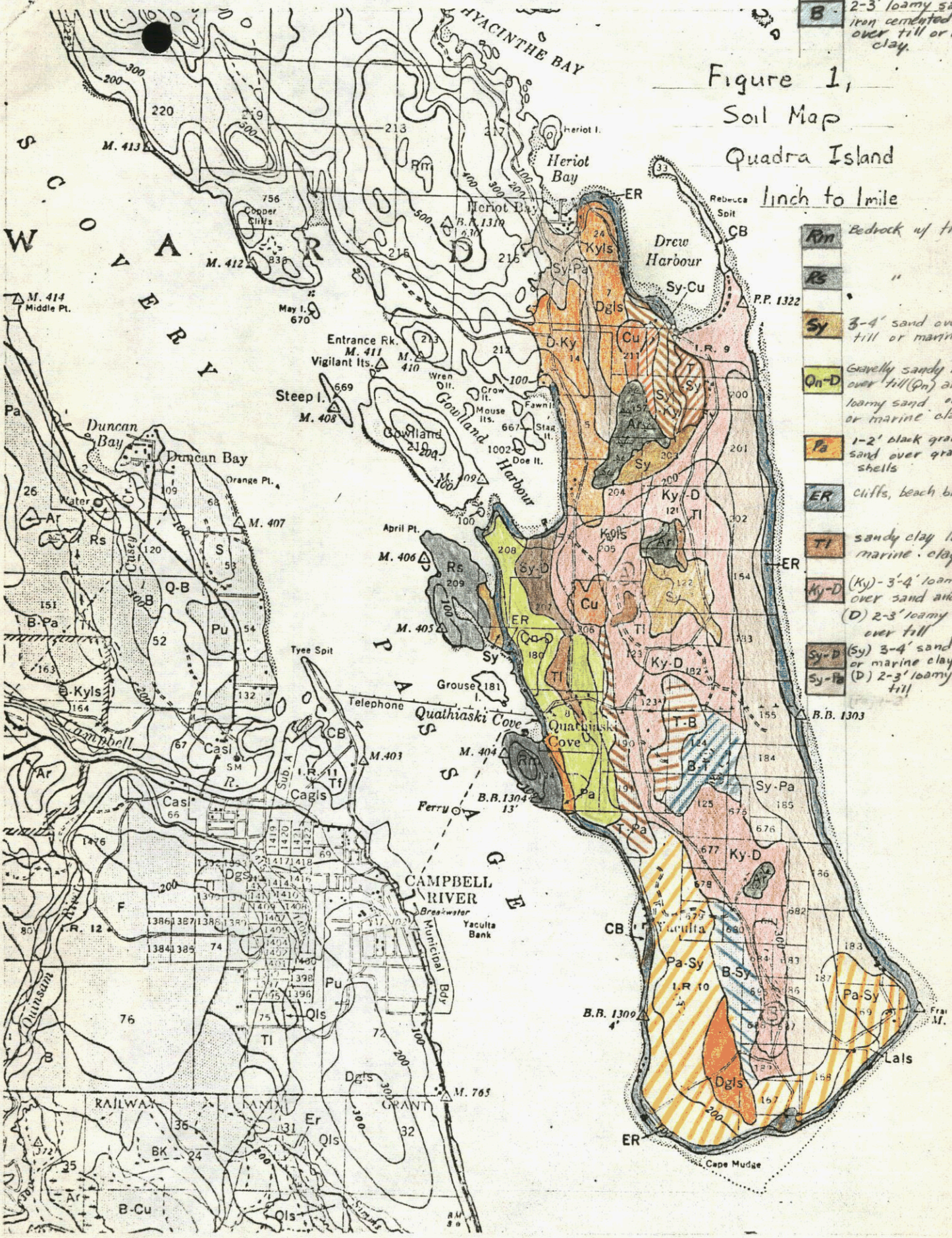


Figure 1,

Soil Map

Quadra Island

1 inch to 1 mile

D	gravelly loamy sand over till or marine clay.
Cu	loamy sand
Ar	Peat.
B	2-3' loamy sand w/ iron cemented clods over till or marine clay.
Rm	Bedrock w/ thin soil
Rs	"
Sy	3-4' sand over till or marine clay.
Qn-D	Gravelly sandy loam over till (Qn) and gravelly loamy sand over till or marine clay (D)
Pa	1-2' black gravelly loamy sand over gravel, sand, shells
ER	cliffs, beach bluffs.
Tl	sandy clay loam over marine clay.
Ky-D	(Ky) - 3-4' loamy sand over sand and gravel (D) 2-3' loamy sand over till
Sy-D	(Sy) 3-4' sand over till or marine clay
Sy-Pa	(D) 2-3' loamy sand over till