

MEMORANDUM

TO Dr. J. C. Foweraker

Head

Groundwater Section

FROM A. P. Kohut  
Senior Geological Engineer  
Groundwater Section

February 7, 1977

SUBJECT Comox Drainage Problem, D.L. 244, Plan 29089

OUR FILE 0239013

YOUR FILE

Further to the December 23, 1976 request from the British Columbia Land Commission for an investigation of drainage conditions on the above area, a review was completed of existing hydrogeologic data on the area and a field check was carried out January 27 and 28 to investigate local geologic and hydrologic conditions. The initial office review was completed by Mr. Hodge under my supervision and a copy of his comprehensive report is attached. This memorandum briefly reviews the regional background information on the area and the results of the field investigation.

Geology and Groundwater Conditions

Lots A and E of District Lot 244 are underlain by very permeable sand and gravel deposits of variable thickness overlying clay. Shallow groundwater occurs under water-table conditions in these areas at depths generally less than 10 feet below ground surface. The water table appears to be progressively higher towards the northeast with seepages observed in shallow gravel pits east of Lazo Road and upslope of the swampy lowland. Although high water-table conditions are evident in the winter months, it is not known if these conditions persist throughout the summer months. Seasonal fluctuations, for example, in the water table may occur in this area. The water level in the lakes northeast of the lots, meanwhile, probably corresponds closely with the local water table.

Lot D is underlain by permeable dune sand deposits. The dunes vary in height from 10 to 15 feet above the surrounding terrain and are generally longitudinal in a northwest to southeast direction. Locally small depressions occur amongst the dunes. The dunes appear well-drained with the water table probably occurring from 10 to 30 feet below ground surface.

Groundwater Movement

Available water level data indicates the natural gradient of the water table generally coincides with the topographic gradient. Shallow groundwater flow is directed from the southwest, west and northeast into the low-lying region northwest of the dune area (Figure 1). Water table contours run parallel to the topographic contours on the upland areas, but within the low-lying region the water table is relatively flat. Minor groundwater discharge along the beach east

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of the dune field, however, suggests a slight gradient towards the east exists and groundwater is probably moving eastward. A slight mounding of the water table under the dune region may also occur due to local recharge from rainfall over the dunes.

#### Surface Water Movement

In general, surface water moves downslope from the upland areas into the lowland northeast of the dune area from the southwest, west and northeast (Figure 1). The only surface outlet for this region is a drainage ditch which has been constructed parallel to Knight Road south of the airfield. On January 27, 1977 a flow of 5 cubic feet per second was observed discharging into the sea from this ditch. North of Knight Road several tributary drains have been constructed to drain the upland. Flow was observed in most of these ditches and relatively high conductivity of the discharging waters (165 umhos/cm) indicates a significant groundwater component in the flow. Seepage areas and high water-table conditions, moreover, are prevalent along Knight Road.

Surface drainage from the small lakes which occur east of Lots A and E is impeded by the dunes to the east. Overflow from these lakes may move either northwest or south but the lakes probably drain through the subsurface toward the east. No surface drainage was observed southeast of these lakes where a former drainage channel occurs. This channel was found to be dry and the outlet to the sea has been blocked by large dunes. Surface flow from the upland south of this channel disappears in this low-lying region suggesting the channel is underlain by very permeable sands and gravels.

#### Conclusions

With residential land development, surface runoff on Lot D should not be a major problem because of the permeable and well-drained nature of the dune deposits. Standard septic field installations should pose no problem in this area as the soils are well suited for this purpose and the water table is generally not exceptionally close to the surface. Care should be taken in the siting of these fields, however, with respect to any wells or neighbouring field. Similarly, the development of the 70-lot subdivision in District Lot 245 should not alter the present runoff characteristics of the area to any great extent. Much of this subdivision is sited on the dune areas. Where individual lots extend on the lowland to the east, construction problems may arise because of the high water-table conditions, making septic-field construction and/or foundation construction impractical.

Due to the high water-table conditions in Lots A and E, drainage problems may arise during construction of foundations and septic fields. Percolation tests should be conducted during the winter months when conditions are most adverse. Although

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permeability of the soils is good, the effect of the high water table could make the site unsuitable. If the high water table conditions persist throughout the year, construction activities, ditching, etc., may increase surface flow from this area to the lakes downslope. Considering the very permeable nature of the sand and gravel underlying these areas and the groundwater gradient, septic effluent may migrate into the lakes downslope over a relatively short period of time.

The overall impact of residential development in these areas upon the quantity of surface drainage on adjacent lands, however, would not be large in consideration of the natural and controlled drainage conditions already developed. Much of the drainage problems south of Knight Road, for example, are derived from the high water-table conditions and surface flow from the upland to the north. Water quality problems such as accelerated eutrophication of the lakes downslope of Lots A and E, however, may develop with installation of septic fields upslope.

#### Recommendations

Since no seasonal water level data is available specifically within Lots A and E on the water table, it would be advisable for the developer to install a series of monitor wells (well points for example) to determine the actual depth to the water table and the magnitude of any seasonal fluctuations which may occur.

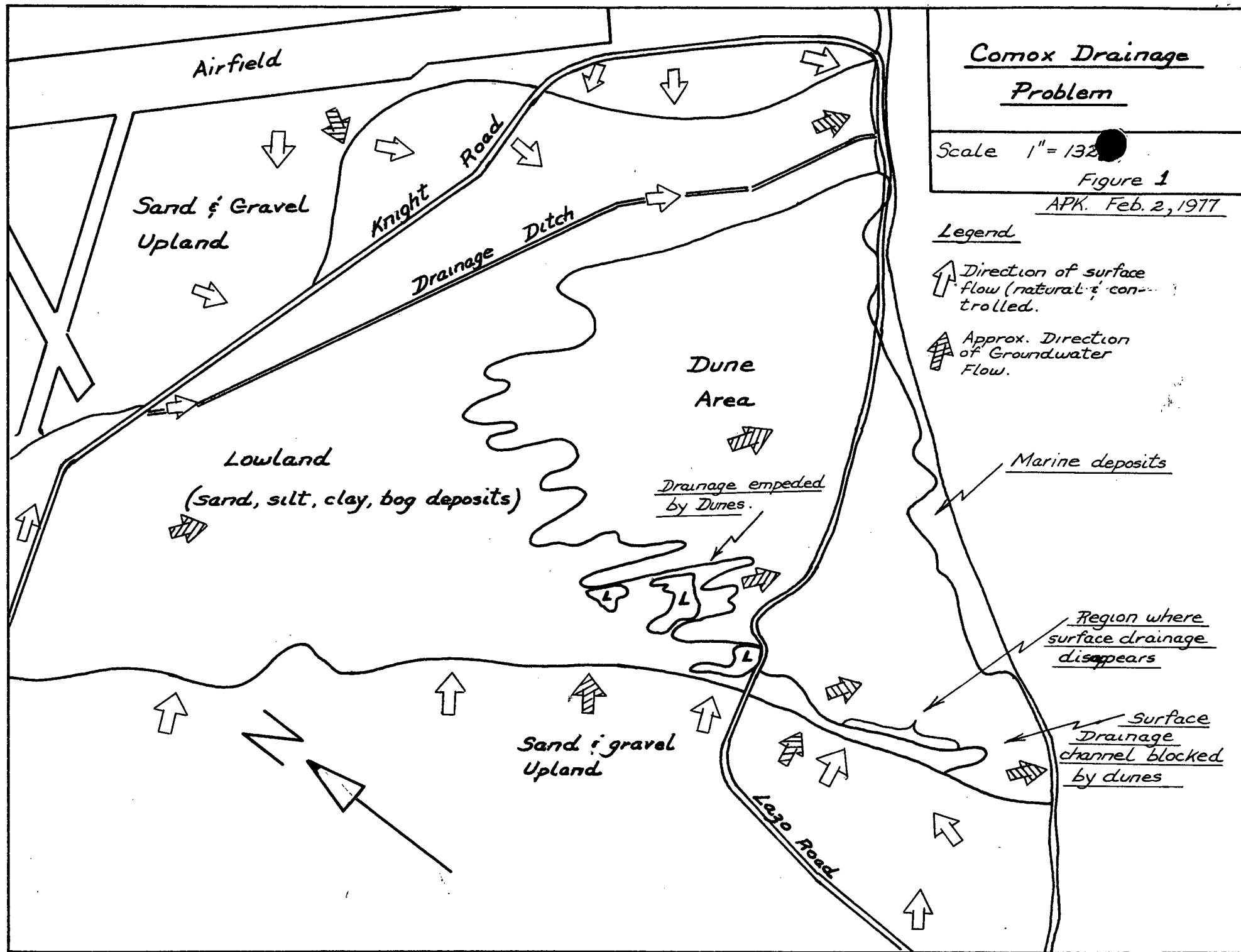
The results of this program could then be used to determine the actual site suitability for installation of septic fields. A groundwater consultant and/or civil engineer experienced in this field should be retained to supervise the work.



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Attachs.



## Comox Drainage Problem

Scale 1" = 132'

Figure 1

APK. Feb. 2, 1977

### Legend

↑ Direction of surface flow (natural & controlled).

⬮ Approx. Direction of Groundwater Flow.

Marine deposits

Drainage impeded by Dunes.

Region where surface drainage disappears

Surface Drainage channel blocked by dunes





1. COMOX DRAINAGE PROBLEM - Looking north from Lazo Road to swampy lake area. (January 1977)



2. COMOX DRAINAGE PROBLEM - Looking northwest from gravel uplands north of Lazo Road (January 1977)



3. COMOX DRAINAGE PROBLEM - Looking north from Lazo Road to swampy lake area (January 1977)





4. COMOX DRAINAGE PROBLEM - Looking north from dunes east of swamp south of Lazo Road (January 1977)



5. COMOX DRAINAGE PROBLEM - Sand pit north of Lazo Road in Dune area (January 1977)



6. COMOX DRAINAGE PROBLEM - Lake drainage impeded by Dunes north of Lazo Road (January 1977)





7. COMOX DRAINAGE PROBLEM - Seepage from gravels on Upland south of Lazo Road west of swamp (January 1977)



8. COMOX DRAINAGE PROBLEM - Flow to swamp from small gravel pits, same location as Photo 7 (January 1977)



9. COMOX DRAINAGE PROBLEM - Gravel pit with seepage south of Lazo Road west of swamp (January 1977)





10. COMOX DRAINAGE PROBLEM - Wet area, high water table on west upland north of Lazo Road (January 1977)



11. COMOX DRAINAGE PROBLEM - As Photo 10



12. COMOX DRAINAGE PROBLEM - Dunes empeding lake drainage north of Lazo Road (January 1977)





13. COMOX DRAINAGE PROBLEM - As Photo 12  
(January 1977)



14. COMOX DRAINAGE PROBLEM - Quadra and Dune  
sands overlying stoney clay till along coast  
(January 1977)



15. COMOX DRAINAGE PROBLEM - Marine gravel overlying stoney clay till  
and quadra (January 1977)





16. COMOX DRAINAGE PROBLEM - As Photo 15  
(January 1977)



