

FIELD VISIT SITE REVIEW

FOR

MARCH 27, 1982

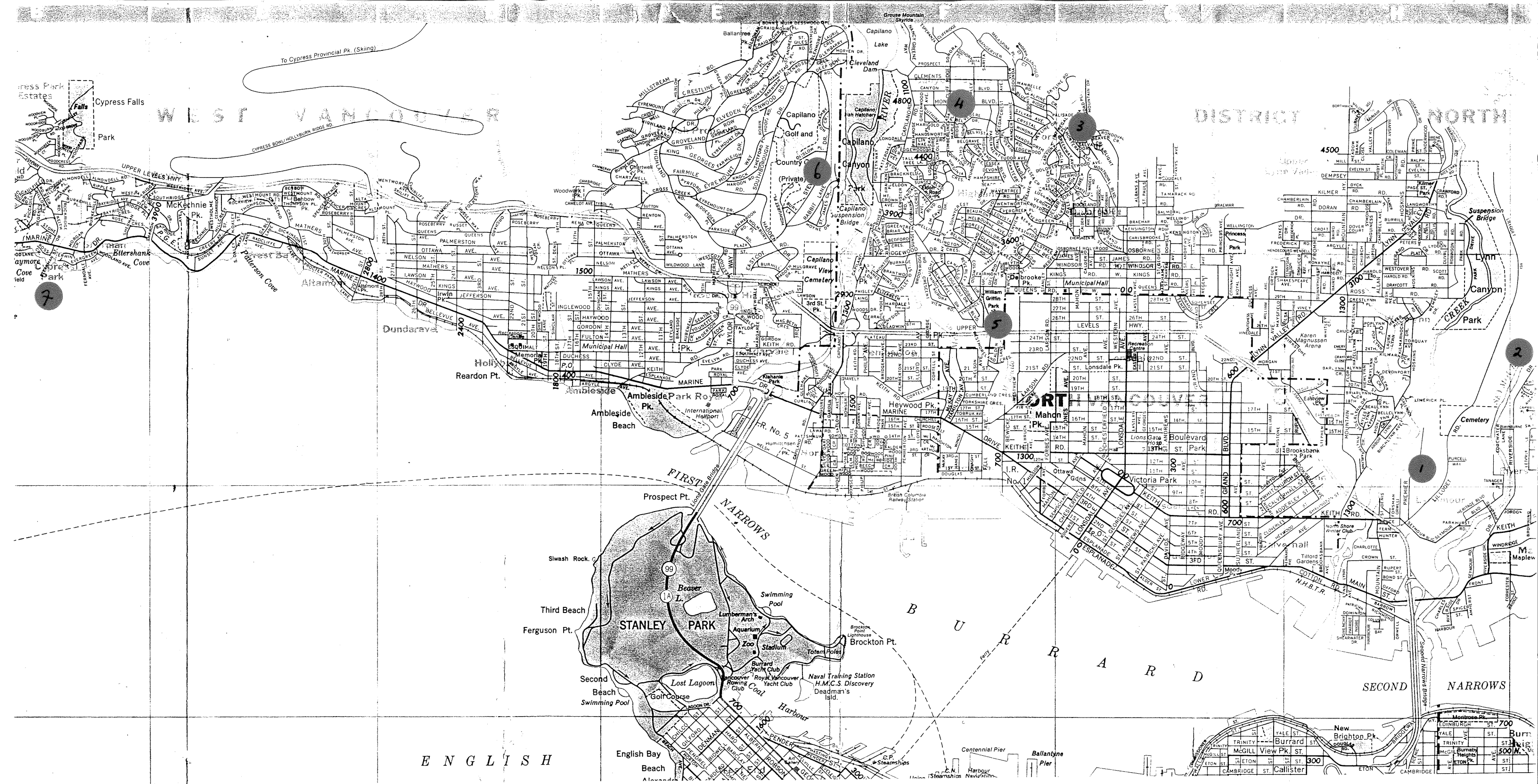
THE HYDROLOGY AND GEOMORPHOLOGY

OF DRAINAGE BASINS

A good effort

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By: M. R. Gardner
76290-0124

15
15



WEST VANCOUVER

DISTRICT NORTH

Cypress Falls
Park

Blithershank
Cove Park

7

6

4

3

5

2

1

ENGLISH

English Bay

Centennial Pier
Ballantyne Pier

Montrose St. 700
Edinburgh St. 700
Yale St. 700
Trinity St. 700
McGill View Pk. St. 700
Burrard St. 700
Trinity St. 500
McGill Heights St. 500
Eton St. 500
Cambridge St. 500
Callister St. 500

STANLEY PARK
Beaver Lagoon
Swimming Pool
Lumberman's Arch
Zoo
Stadium
Burrard Yacht Club
Royal Vancouver Yacht Club
Naval Training Station
H.M.C.S. Discovery
Deadman's Isld.

PROSPECT PT.
FIRST NARROWS

DOWNTOWN
MAYNARD PK.
Municipal Hall
Recreation Centre
Karen Magnusson Arena

REARDON PT.
Municipal Hall
P.O.
Clyde Ave.
Keith Esplanade

1500
LAWSON AVE.
KINGS AVE.
JEFFERSON AVE.

3600
WINDSOR RD.
KINGS RD.
WYNDSOR RD.

4500
MILL ST.
EVELYN ST.
ROBERT ST.

Capilano Canyon
Golf and Country (Private)

4800
CLEMENTS BLVD.
MONTELEONE BLVD.

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STOP #1

North Vancouver Disposal Site

This site was visited as an example of poor siting of a disposal facility. It is located on the easterly bank and floodplain area of Lynn Creek. The whole area was determined to be a large alluvial fan with old terrace levels visible. The creek is in fact a substantial and active river serving a fairly large mountainous watershed. In order to protect the site from river activity an armoured dyke has been constructed between the river and the site. This dyke has no apparent membrane to control leachate from the site reaching the creek nor any leachate treatment facilities. Some attempt was being made in new dyke sections to pipe surface water parallel to the river but no collection points were seen.

It was suggested that a 100-year flood could breach the dyke system particularly at the outside curve to the north of the site. It was apparent that the site is operated as a "dump and cover" method with solid refuse being sequentially dumped in layers which are then covered with trucked-in fill later spread with heavy construction equipment. This operation helps to compact and stabilize the dumped material. In portions of the site already filled, filling has reached a depth of approximately 150 metres. On more mature areas, where settling is largely complete, grass playing fields have been established. Methane generation is apparently accommodated with pipe collectors. Final cover depth seems to limit upworking of solid debris. The class of disposal site was not determined, however it is readily apparent that it is not suitable for liquid or toxic material disposal due to the site's proximity to Lynn Creek and the limited provision for collecting contaminated outflow from the dump.

STOP #2

Riverside Drive, North Vancouver

Which block

This site provided a view of two aspects of urban hydrology, namely, the problem of house building on floodplains and building at the toe or on top of silt terraces.

In the former case, houses have been constructed without municipal regulation on the flood area of the Seymour River. The river is incised some 6 feet below grade with properties backing onto the river edge. While some retaining walls have been constructed, the river bottom is predominantly large boulders which with sufficient water flow could move

dramatically, destroying protective measures. While the river is regulated with an upstream dam, this would have to spill in heavily, for example, an unpredictable 50-year flood where there was little previous drawdown. There is little doubt that some houses in the valley would be inundated.

In the second portion of the stop, a silt terrace typical of the lower mainland of British Columbia was examined. Here, housing had been constructed at the toe of the slope. Previous history of the site includes a debris flow from the terraces above. Inadequate water management from above was attributed as a partial cause, the flow being triggered at a time of intense and prolonged rain causing saturation of the silt. Hazard mapping was discussed as a measure to prevent building on high-risk sites. The use of down-slope engineering solutions such as retaining walls was discounted because of cost to produce a "safe" design.

STOP #3

Mount Royal Drive, North Vancouver

In this location the main stream of Mosquito Creek was examined. This creek has a near mountain stream form with pronounced fall and any floodplain hard to determine. The creek is incised deeply in a conglomerate of boulders, sand and gravel of glacial or fluvial origin. The riverbank is steep, almost vertical in some places with little slumping, giving great capacity at time of flood and little likelihood of overtopping banks, at least in the location viewed somewhat upstream from the river mouth. While the outside of bends were eroded with some deposition on the inside of curves as would be expected, scouring was generally sufficient to remove silt and leave only the larger rounded boulders in the river bottom. Some undercutting was evident as would be expected in a high energy stream of this type.

STOP #4

Maple Ridge Drive, North Vancouver

Here, a recent development had been constructed on a creek floodplain. It became evident from local owners that the original design of the subdivision had allowed the developer to relocate the original streambed, to fill some areas and to rockface the streambank in order to maximize lot layout. Relocation of the creek had included a fairly sharp bend to the north of the development. This had washed out in storm

conditions to the extent of undermining one house basement. This in turn precipitated Municipal action to retrain the stream channel. Elaborate gabion construction with cross-bed construction, low water channelling and stream widening had been undertaken with the cost passed on to the developer. The question of Municipal liability in allowing the design in the first place is apparent but without further background the circumstances are not fully known. There has apparently been new development above the site visited, possibly causing more rapid runoff and peaking flows in the creek than previously experienced.

Observations made concerning the new channel included the very narrow mouth below the site where the gabions finished, giving rise to a possible construction that could cause a backup into the subdivision, an apparent attempt to concentrate low flows for sanitary, aesthetic and silt removal purposes and the low level that the property driveway bridges were set at into the stream channel, where they would act as partial dams to river flow in flood conditions.

STOP #5

William Griffen Park and 3000 Block Del Rio Road

A lower section of Mosquito Creek with at least westerly evidence of the original floodplain extent was observed in the Park. Rip-rap, streambank edging, active deciduous vegetation control and on-going debris removal were evident in the location to ensure minimum impediment to high flows.

On Del Rio Road, an engineering solution, that of a large 1/2 mile tunnel, to stop a previous condition of substantial stream cutting and bank erosion, was viewed. While this very expensive solution had reduced backyard loss and created new property rights, the nature of which are unclear, first order streams with no apparent entry to the tunnel are now cutting down onto the tunnel from above. This type of property loss and costly solution could have been avoided with zoning controls to limit lot sizes or building locations. However, with the ever increasing cost of building land and the trend toward undergrounding many streams and creeks in new subdivisions, it is apparent that the benefit cost may, on the surface at least, favour this type of engineering solution to urban water management.

STOP #6

Rabbit Lane and Brothers Creek

Two aspects of urban hydrology were evident on this stop. The first was a recently cleared steep bank intended for construction. Substantial slumping, silt generation, gullyng and rill scoring were evident on the slope. No effective provision to reduce the slope erosion were evident except some gabions at the slump toe to prevent outflow onto the Rabbit Lane turnaround. Housing immediately above the active area may, in the future, be endangered if further erosion continues.

The second aspect viewed was that of Brothers Creek, a tributary to the Capilano River. Since this river is continuing to lower its channel bed, feeder streams are being rejuvenated. In turn, these are becoming steep and, where the sinuosity, bank or bed conditions allow, are cutting rapidly. In the most apparent reflection of this, an outside bend below a large swimming pool had been eroded. Some rip-rap armouring had been undertaken in concert with rechanneling the river. The previously eroding bank below the swimming pool was now stable but no attempt had been made in revegetation. The height of flood was evident from debarking of streambank trees and would indicate very substantial flows in peak conditions, suggesting the measures taken so far will provide only temporary and possibly misleading security.

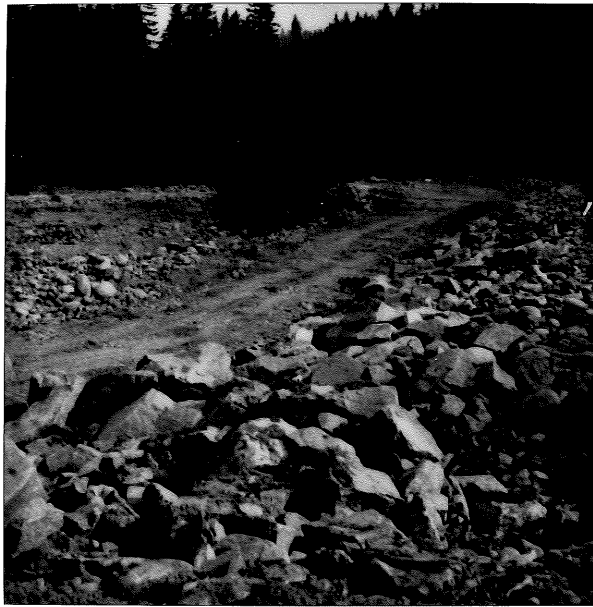
STOP #7

Stearman and Ross Crescent, West Vancouver

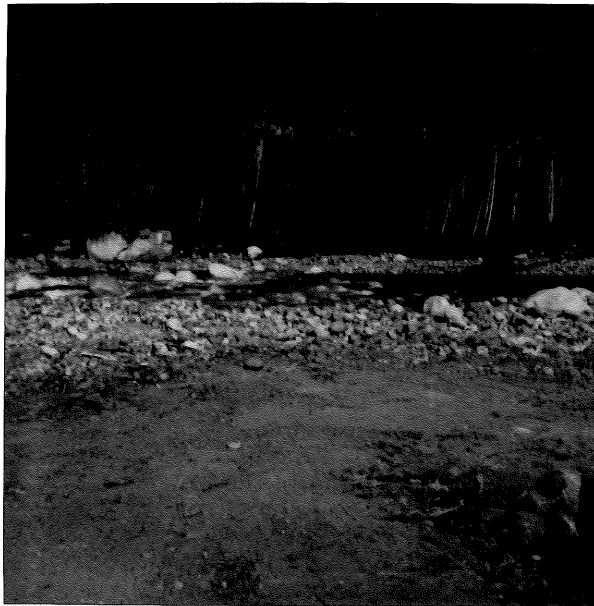
This alluvial fan of Cypress Creek has been completely built up, covering up the typical cone relief and, from the ground, disguising the flood area. Lyons Bay area was discussed as being a similar situation. The outfall of the river was examined. While the fan provided good drainage and the river channel was cleared on a regular basis by the municipality, it was noted that the combination of high spring tides and spring runoff could readily provide conditions where water would back up the channel, soon overcoming the 1.5 to 2 metre freeboard of the riverbank, causing inundation of the adjacent housing. Since this might be only a 25-year event, new house buyers in the area would be unaware of the problem.



North Vancouver disposal site with new dyke in foreground, refuse to be covered in midground and depth of piling and covering to date in the background.



North Vancouver disposal site dyke with rock protection from Lynn Creek on the left.



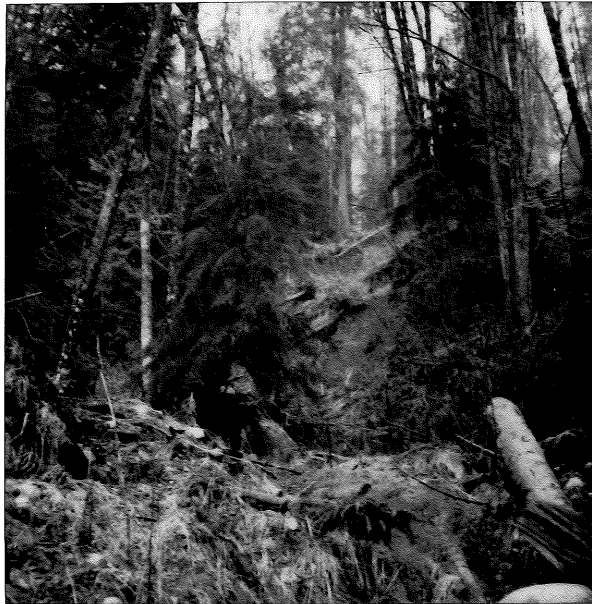
Lynn Creek river terraces from the new protective dyke.



Surface water, leachate and surface erosion at the North Vancouver disposal site.



Track of debris flow behind housing on Riverside Drive.



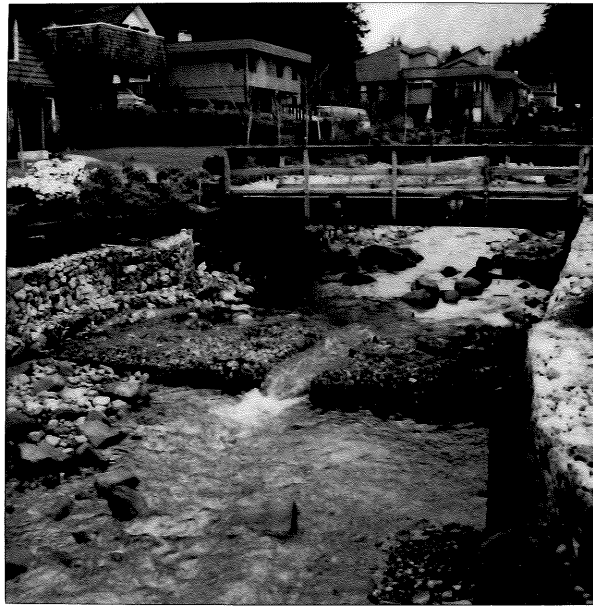
Track of small debris flow showing extent and size of trees moved toward Treetop Lane, where housing encompasses the toe of the slope.



Upper reach of Mosquito Creek showing deep incision and soil profile containing rounded boulders probably of glacial origin. High energy of stream soon removes debris generated by undercutting.



The westerly bank of Mosquito Creek, showing some undercutting and bank slippage. The river is deeply incised with little likelihood of flooding of this point.



New gabion construction with cross-bar concentrator to ensure self-cleaning and to minimize stagnant water at low flows.



Bridge construction for property access intrudes into stream channel and will act as a partial dam at high flows. Design could be improved fairly simply.



Outfall of lower Mosquito Creek tunnel shows wings, safety fence and energy dissipator. Stream banks are kept clean to provide unimpeded flow.



First order tributary streams with no access to Mosquito Creek are now cutting down the old channel toward the underground concrete casement.



New clearing on Rabbit Lane has been followed by slumping now kept back by gabions. Little extra protection is afforded but the angle of repose for the lower slope may have been reached although it can be recharged from above.



The proximity of housing to the edge on this silty terrace is becoming of concern particularly since no apparent measures have been made to protect the slope from erosion. New gullies can be seen caused by surface water from above.



The extent of the cleared area at Rabbit Lane is evident as too are the many rills and gullies caused by surface water movement.



The support columns and wall for the swimming pool adjacent to this house are seen above Brothers Creek. Continued undercutting by the creek has been temporarily prevented by rechanneling and armoury of the creek bank particularly on the outside of the curve top left.