BRITISH COLUMBIA

Columbia River Treaty
Kinbasket Reservoir Dam: Feasibility Overview

During the Columbia River Treaty Review public consultations during May and June 2012, the Columbia River Treaty Review team were made aware of Valemount residents' interest in maintaining a stable high water level in a small portion of the northwest end of the Kinbasket Reservoir, through the construction of a water retention structure (weir or dam).

BC Hydro agreed to investigate this potential structure at the "overview" level, without detailed geotechnical investigations and other costly engineering work. The purpose of the high-level estimate is to develop a range of possible construction costs to help inform discussions with residents of Valemount. The estimated cost can be extrapolated and used to help inform discussions with the residents of Golden who expressed an interest in a water retention structure in the southeast end of Kinbasket Reservoir.

Study

A number of potential sites were investigated. Only option 1A (see Fig 1) was selected for pricing. It had the shortest dam crest and the longer dam crests would be more expensive. The crest length of a dam is the length of the top of a dam from left abutment to right abutment, including the length of spillway, powerhouse, navigation lock, fish pass, etc. where these appurtenances form a structural part of the dam.

The estimate is based on very preliminary concept sketches by Roger Stilwell and Derek Sakamoto (Fig 4, 5 and 6). The drawings are not viable/buildable and are provided only as visual support aids for the estimate. No site visit was undertaken for the development of the estimate. A number of assumptions were made:

- The underlying soils can support a dam at the proposed slopes.
- Suitable accessible sources of dam building materials were available with five kilometers of the proposed dam axis (that is, the horizontal centerline of a dam in the longitudinal direction).
- Excavated materials could be disposed of within the existing Kinbasket Reservoir
- A construction camp would be set up near the site.

A number of uncertainties lay behind these assumptions:

- Geotechnical conditions may be present at the site that could make the project proposed infeasible.
- There may not be enough suitable dam construction materials within a reasonable distance or access to the proposed dam site.
- Excavated materials would not be permitted within Kinbasket Reservoir for environmental or other reasons and transportation would increase disposal costs.
- The labour and materials market condition may be materially different at the time the project is actually tendered and constructed.
- High / record inflows to the Kinbasket Reservoir during the construction phase could cause significant damage to the dam construction and or delay / frustrate the project.

Additional issues were noted that could impact the project:

- As a result of the low power potential at the site and the annual inundation of the downstream side of the dam (i.e. the filling of the Kinbasket Reservoir), it is not considered technically practical, safe or economical to install a powerhouse to take advantage of the head and flow available at the site.

- Since it is not considered safe or economic to install a powerhouse, the water release from the project will be spilled via a low level outlet or spillway. This water release can cause undesirable air entrainment and increased total gas pressure (TGP) in the Kinbasket Reservoir, resulting in potential negative impacts to fish.
- The project may impact First Nations' interests, environmental interests such as fish and fish habitat (in addition to the total gas pressure impacts), and socio-economic interests such as forestry, recreation, and transportation.

Estimated Project Costs

Total Project Cost, including loadings and reserves, are estimated to be roughly around 500 million dollars. The accuracy range of the estimate was not assessed, so the range of the estimate would have to exceed the standard overview range of +100% to -50%. That is the Total Project Cost estimate falls in the range of 250 million dollars to one billion dollars.

The estimate excludes any PST, GST, outage costs (e.g. energy revenue losses associated with Kinbasket Reservoir restrictions required during the work) and costs associated with spilling water. The estimate also excludes third party compensation from lost access, environmental mitigation and compensation, and First Nations benefits (if any).

Weir or Dam

The water retention structure described is, due to its size and complexity, a dam not a weir. Weirs are typically very simple structures with very straight-forward release mechanisms (overtopping). They are generally very low head, in-stream structures that back-up water to make a small pool a few feet or metres higher than the down-stream water level. In contrast, the water retention structures under consideration have much more complex release mechanisms that need to protect the non-over-topping portions of the structure from high inflow volumes. In addition the elevation differences between the forebay upstream of a dam and the tailwater downstream of a dam is generally much more than a few feet or metres. Given the size and complexity of the structures under discussion, the term "dam" is much more accurate.

Study Conclusions: Valemount Dam

Dues to the high cost of the dam, the impracticality of power generation at the site and the potential impacts of the dam on other interests, the construction of a water retention structure (weir/dam) at the northwest end of the Kinbasket Reservoir does not appear to be viable. BC Hydro has no current plans to investigate the Valemount dam project further.

Study Conclusions: Extrapolation to Golden Dam

While no engineering analysis has been performed, a similar dam on the southeast end of the Kinbasket reservoir (the "Golden dam") is expected to be at least as large as the Valemount dam and likely much larger. The dam would need to pass significantly higher flows, and would alter the operating regime of a larger area of land. For these reasons, the Golden dam is expected to be more costly than the Valemount dam. BC Hydro has no current plans to investigate the potential Golden dam project further.

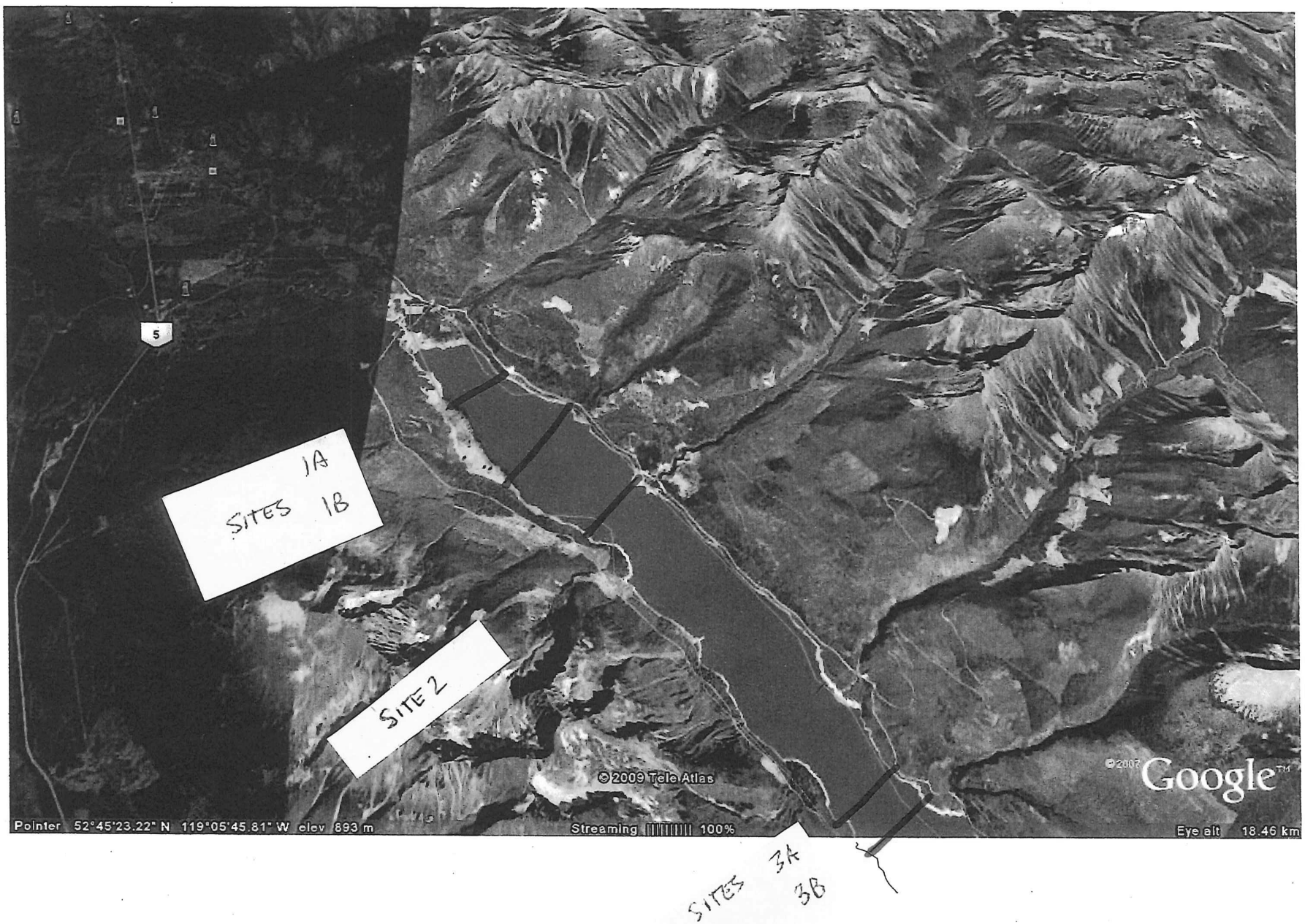
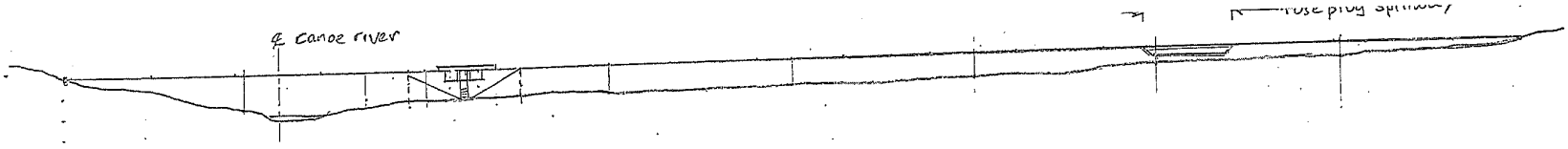

5
SITES 1A
1B
SITE 2
SITES 3A
3B
©2009 Tele Atlas
©2007 Google™
Pointer 52°45'23.22" N 119°05'45.81" W elev 893 m
Streaming 100%
Eye alt 18.46 km

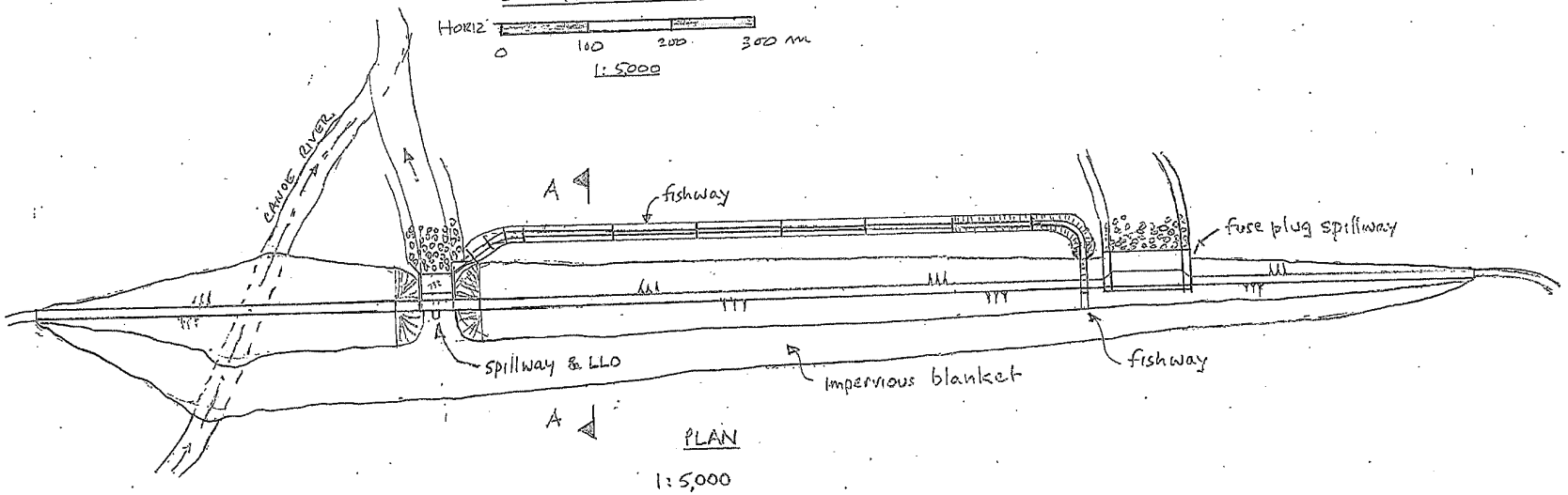
Figure 1

Figure 4



VERT 1:2000

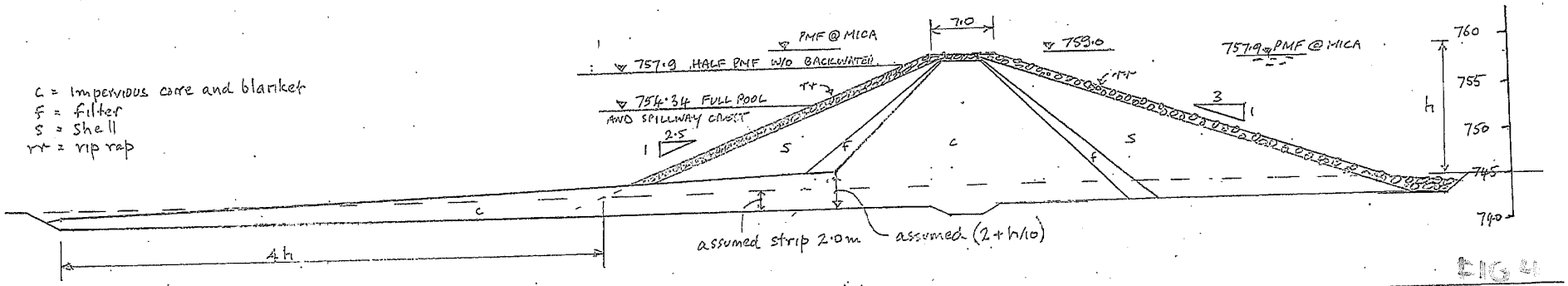
ELEVATION – VIEW FROM UPSTREAM



PLAN

1:5,000

c = impervious core and blanket
f = filter
s = shell
rr = rip rap



SECTION A-A

SCALE 1:400

VALEMOUNT DAM PROJECT – LAYOUT & SECTION EARTH-FILL DAM

AXIS 1A R.Stilwell SK-1

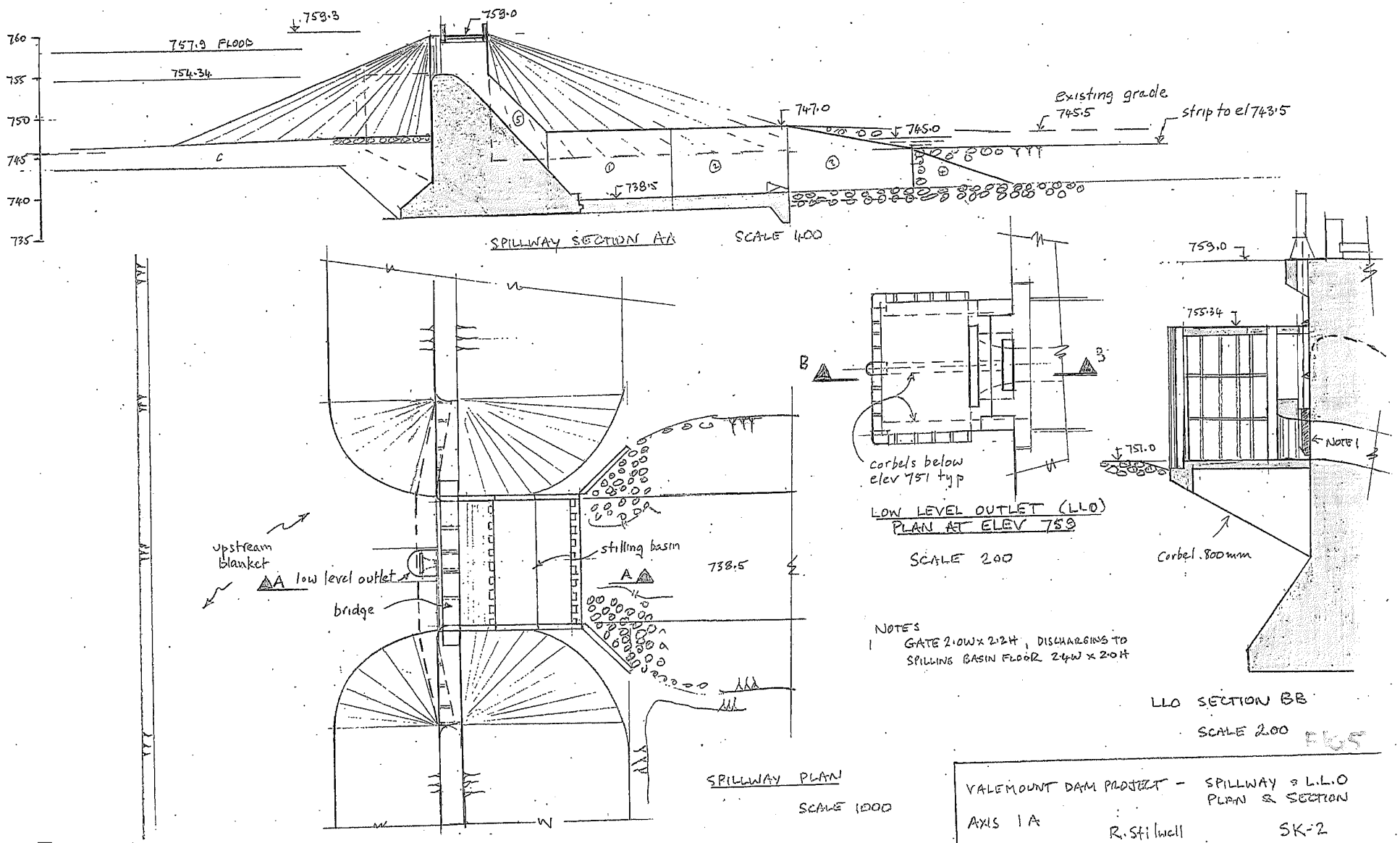
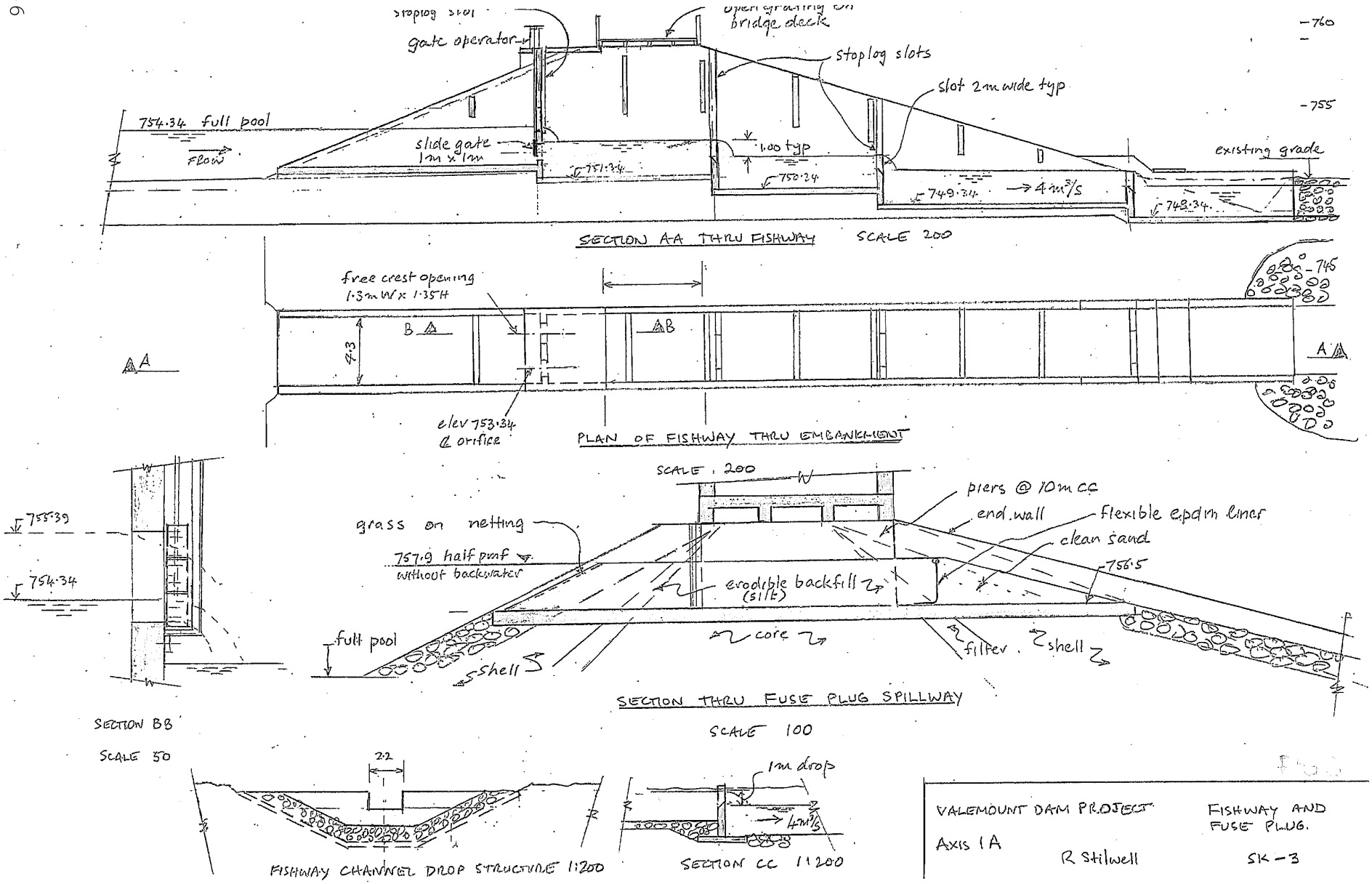

759.3
758.0
757.9 FLOOD
754.34
760
755
750
745
740
735
747.0
745.0
existing grade
745.5
strip to el 743.5
738.5
SPILLWAY SECTION AA
SCALE 1:100
upstream blanket
low level outlet
bridge
stilling basin
738.5
SPILLWAY PLAN
SCALE 1:100
corbels below elev 751 typ
LOW LEVEL OUTLET (LLO) PLAN AT ELEV 759
SCALE 2:00
759.0
755.34
751.0
NOTE 1
Corbel 800mm
NOTES
1 GATE 2.0W x 2.2H, DISCHARGING TO SPILLING BASIN FLOOR 2.4W x 2.0H
LLO SECTION BB
SCALE 2.00
VALEMOUNT DAM PROJECT - SPILLWAY & L.L.O PLAN & SECTION
AXIS 1A
R. Stilwell
SK-2

Figure 5

Figure 6



VALEMOUNT DAM PROJECT

AXIS 1A

R Stilwell

FISHWAY AND FUSE PLUG.

SK-3