



Photo 6: Aerial view of moraine on the floor of the upper Long Burn. Most of this is ablation moraine, created by wasting in place of a stagnant ice tongue. Moraine ridges can be seen; kettle holes have been overgrown and modified by peat-filled string bogs. Note the old scree mantle on the valley walls. Schistosity in the bluffs is almost flat, in the axis of the Taieri-Wakatipu Synform. Photo: M. Floate.



Photo 7: Aerial view of a landslide complex in the head of the Short Burn. The lower slope east (right) of the creek shows hummocky topography and low scarps in the most recently active part, and smooth upper slopes reflecting older collapse over a west-dipping foliation surface. Smooth slopes left of the stream are mantled in old, stable scree below the rocky bluffs. Photo: M. Floate.



Photo 8: Aerial view of subdued, weathered greywacke ridges between the upper Mataura River and Eyre Creek. The ridges are also smoothed by a mantle of scree. Note aggradation on the stream bed (right), and interlocking spurs (left) indicating fluvial rather than glacial origins. Photo: M. Floate



Photo 9: Active and stable screes in the head of the Billy Burn. Red lichen covers the stable, blocky greywacke scree (foreground); active screes on Eyre Peak are grey (background). Schistosity in the semischist clips east (left), on the west limb of the synform. Smoother slopes below Billy Saddle (centre left) are ice-scoured bedrock. Photo: P.J. Forsyth

Appendix 4: GNS Immediate Report for QMAP

Unpublished technical file report F42/721, Dunedin Office of Institute of Geological & Nuclear Sciences (Thomson 1995). Note that this report is an informal recording of field observations only and is not a recognised GNS publication; information in it is proprietary to GNS.

Mataura Glacial Sequence

Fieldwork was conducted with Jane Forsyth on 27 November - 1 December inclusive (little mapping on stated days) and by myself on 4- 6 December. A central valley down-valley longitudinal section was prepared on 7 December.

So far 7 glacial advances have been clearly defined or are indicated in the reach between Kingston and the Athol Basin. Unique names are shown on the sections as well as the likely Upper Clutha correlatives. Improved intercatchment linkages can be attempted (via the Kawarau) using profiles at 1:50 000 (horiz.scale) and 1 :5 000 (vert. scale), i.e. a 10 x vertical exaggeration.

Top of glacier profiles, as shown, are based on:

- a) moraine/till remnants
- b) truncated spurs (i.e. topography)
- c) inferences based on down-valley profiles and valley width; note that there is a marked lateral dimension increase in the valley near Fairlight which must have some impact on glacier profiles.

Kingston Inner Advance (late Q2)

- i Wraps around the valley floor at RL 375-400. East of State Highway 6 it is a stand-alone terminal ridge but west of SH 6 it, in part, on-laps the earlier moraine.
- ii Three distributary outlets, the lowest (and last used) being along the west side of the valley floor.
- iii Beach deposits on inside of moraine have upper limit at RL 345±.

Kingston Outer Advance (Q2)

- i Prominent ridge in central valley with crest up to RL 405. Eliminated (terminal moraine) from east of SH 6.
- ii Wide fluvial front with tendency to concentrate into two, then one, melt water channels down valley.
- iii appears to have thrust over ablation/lodgement till from previous advance to some extent. Outwash also mantles older moraine.

Allandale Advance (Q4)

- i Patchy remnants of hummocky topography appear along and on both sides of SH 6 between the outer edge of Kingston Outer Advance moraine and the north edge of the deeply incised meltwater/river channel east of Allandale Station homestead. Interpreted as ablation moraine; where coarsely bouldery at surface some deflation accepted.
- ii Glacier meltout over an extensive areas at similar altitude. No distinctive terminal loop. Similar in part to Upper Clutha Albert Town Advance.
- iii Prominent, unique fluvioglacial surface trending downvalley from south margin of meltwater channel - grades well down towards Mataura R.floodplain in the Fairlight/Garston area.

Greenvale Advance (Q6)

- i Just west of Greenvale Station homestead there are 3 surfaces, interpreted as:
 - a) Lower, at RL 370±, being fluvial with a flat (locally channeled) tread.
 - b) Intermediate, at RL 390±, being moraine on the basis of hummocky (lightly) tread on the northern flank. An ablation moraine/till origin suggested.
 - c) Higher, at RL 450±, interpreted as a lateral moraine. No o/c observed but widespread, rounded float that is generally exotic.
- ii Profiling of all 3 surfaces reveals a very clear intermediate position between the Allandale Advance and the older Brightwater Advance (below).

Further work may define equivalent deposits/heights on Lorn Peak Station along the east margin of Trotters Plain (F43).

- iv Terminus position presently speculative but within the region of Trotters Plain.

Brightwater Advance (Q8 or Q10?)

- i Lateral moraine can be precisely identified at several localities on Lorn Peak Sth slopes, e.g. RL 540 on farm track to translator at F43/737267. Till exposed as well as morphological (bench) features.
- ii Terminus morphological defined on mid-valley terrace between SH 6 and Gordon Rd, and upvalley from Nevis Rd (coincides approx. with both Brightwater Spring and Brightwater Road (F43).

- iii Prominent to irregular fluvial surface can be visually traced and profiled downvalley.
- iv Probably called "Garston Advance" by Brockie but I don't have any literature on hand to confirm this. (Note that Garston lies between 2 termini - I've deliberately avoided using Garston for any advance name but if Bill Brockie is specific and geographically clear with a particular feature/event then 'we' may have to use pre-existing terminology. Sort of a "Lindis - type" fixation to suit the system.

McMillan Road Advance (Q12)

- i Reasonably well defined along the east side of the valley by morphology (truncated spurs, benches etc) and till remnants. On Lorn Peak Rd to translator, till can be followed up to a flat ridge crest at RL 790 (F43/732274). Subsequently defined a margin below the Nevis Rd at F43/762215 and lateral position can be (remotely) traced down-valley to the western end of McMillan Road.
- ii Outwash surfaces associated with this advance can be traced downvalley on the right bank then left banks.
- iii Not sure if this specific event has been given a pre-existing name.

Athol Advance (Q12+)

- i Plenty of detritus that tends to be moderately weathered (greywackes tend to be pervasively weathered/soft/med brn). Can't be of Northburn equivalent age, though.
- ii Extensive deposits on knob NE of Athol - to RL 506 by airstrip. Excellent farmtrack exposure at E43/661131. Also well preserved east and NE of Round Hill, with exotics on a flat plateau remnant at >RL 520/670 150.
- iii Highest exotics on downland terrain, eastern sector of Paddys Alley and above sluice workings could be till lag.
- iv Terminus position uncertain but assumed to be in vicinity of Athol township. Probably 2 tongues - one down Mataura Valley and the other down the Quoich Valley via the Fairlight Saddle.
- v No evidence of a glacier passing over the Dollies Hill to 5 Rivers, but aggradation should have occurred through here to equate to an Oreti phase of aggradation.