# Banding logic

This document tries to explain the logic in the process of combining computational bands. Suppose these is a model with 6 classes of HSU (a-f), whose original computational bands are numbered 1 to n, with 1 being the head of the catchment. These bands are to be combined into new bands identified by Roman numerals.

## Head of the catchment

At the head of the catchment the first band (band 1) does not receive any inflow to the saturated zone. Band 2 can receive inflows from Band 1, Band 3 can receive inflows from Bands 1 & 2, Band 4 can receive inflows from Bands 1, 2 and 3 and so on.

The following diagram outlines the current situation where the shaded boxes represent the combinations of bands and classes which occur.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| New band | band | a | b | c | d | e | f |
| I | 1 | X | X | X |  |  |  |
|  | 2 | X | X |  |  | X | X |
|  | 3 | X | X | X | X | X |  |
|  | 4 | X |  | X | X | X | X |
|  | 5 | X |  |  | X |  |  |

This is simplified this into new bands based on assigning one new HSU per class. This area of the new HSU is the sum of the areas of the old HSUs in the same class. Similarly the length of the new HSU is the sum of the lengths of the old HSUs of the same class.

The redistribution of flows from the HSU is by necessity a simplification of the original structure. One approach would be to assign flows based on the flow division of the most downslope (highest band) of the original HSUs. This however may result in ‘orphan’ HSUs which receive no subsurface inflow unless present in earlier bands.

The approach proposed is to evaluate the new HSUs in order of the first occurrence of the class in the original bands which gives:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| New band | band | a | b | c | d | e | f |
| I |  | X | X | X |  |  |  |
| Ii |  |  |  |  |  | X | X |
| iii |  |  |  |  | X |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

This is itself not adequate to ensure that no HSUs are ‘orphaned’. To achieve this we also need to re-evaluate the distribution of fluxes from each HSU to represent fluxes between classes for all of the original bands. We do this as for the original classification but ignoring the fluxes between HSUs on the same new band.