

Corporate Watershed Base Order and Magnitude Technical Documentation

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Revision History

Date	Description
January 18, 2007	Modified order rules surrounding lake arms.
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1 COMPUTING ORDER AND MAGNITUDE

The following sections outline the rules for computing modified Strahler Order and magnitude on the BC stream network.

1.1 Modified Strahler Order

1.1.1 Primary Flow Rules

1. Source nodes given degree 1
2. At in-degree 2, out-degree 1 nodes
 - if two input order are the same output order is one greater
 - if two input orders different the output order is maximum of the two

1.1.2 Secondary Flow Rules

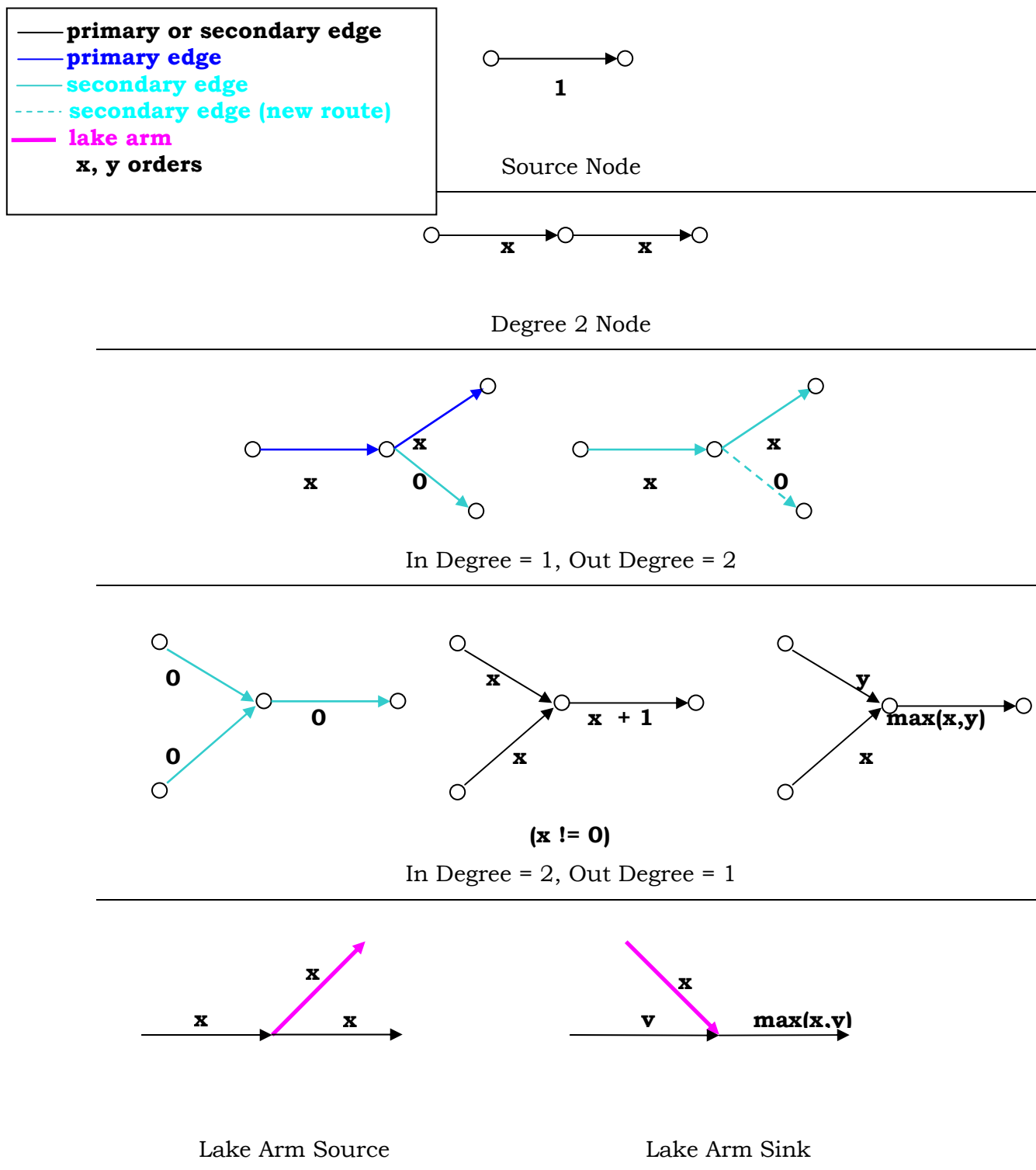
1. Source of edges secondary flows given 0.
2. Other secondary edges treated same as primary edges.

1.1.3 Lake Arm Rules

1. A source lake arm is given the same order and the inflow.
2. Where a lake arm rejoins the main flow (sinks) the order of the next output edge is maximum order of the lake arm input and the main flow input edge.

The purpose of implementing special rules for lake arms is to ensure that the output order of the lake is the same if the lake arm existed or if the lake arm did not exist.

Figure 1: Order Rules



1.1.4 Post Processing

After the order has been calculated for each edge, all edges with an order of 0 are given an order of 1.

Figure 2: Order Example (all primary flows)

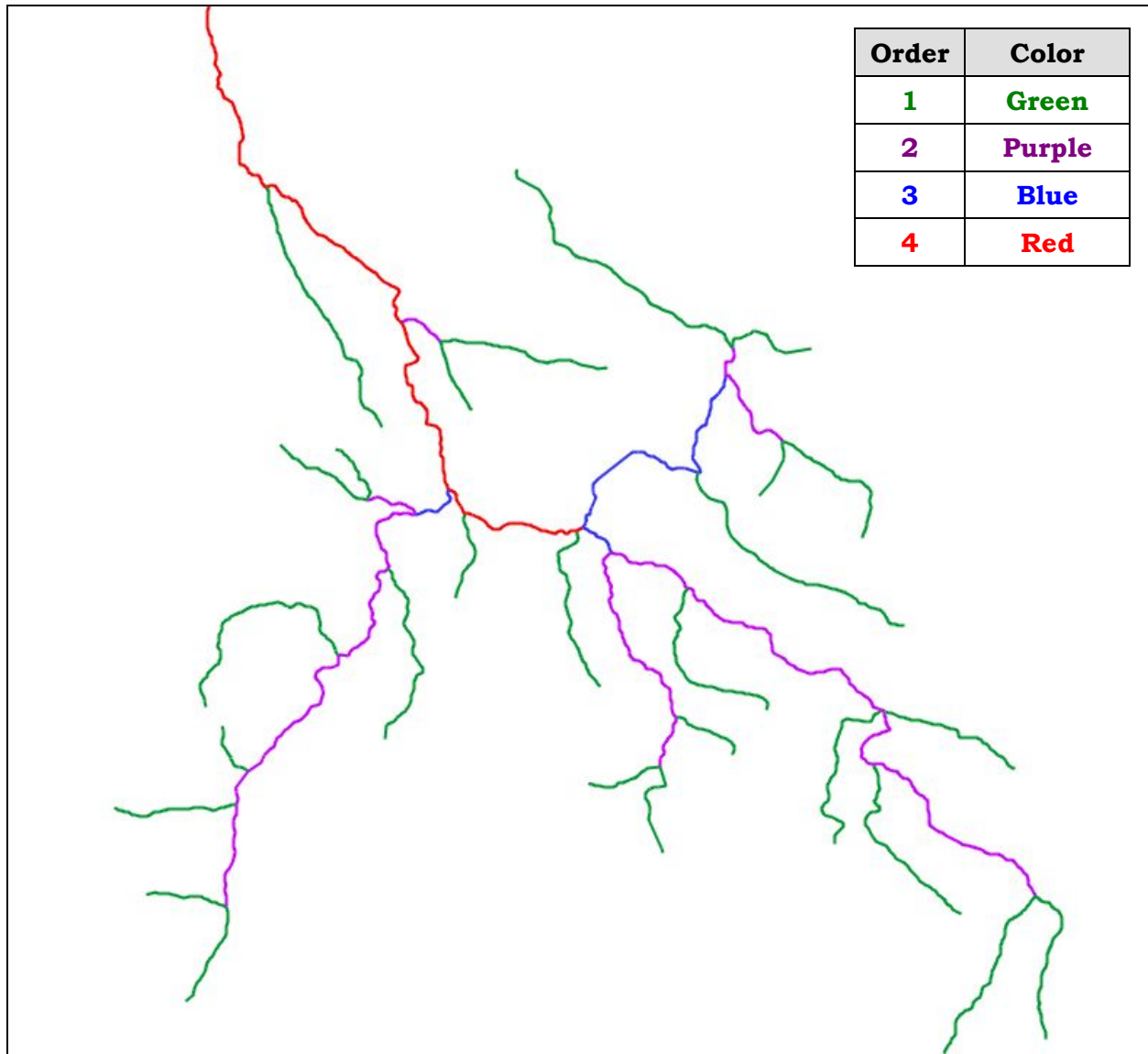
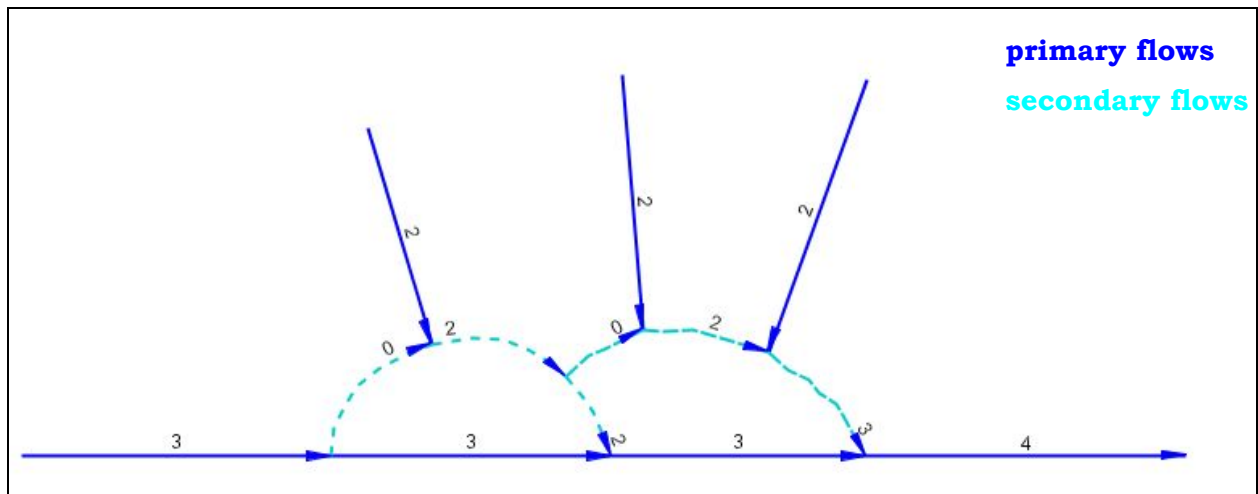


Figure 3: Order Example (secondary flows)*



* as a post-processing step the 0's are converted to 1's.

Figure 4: Order Example 1 (lake arm)

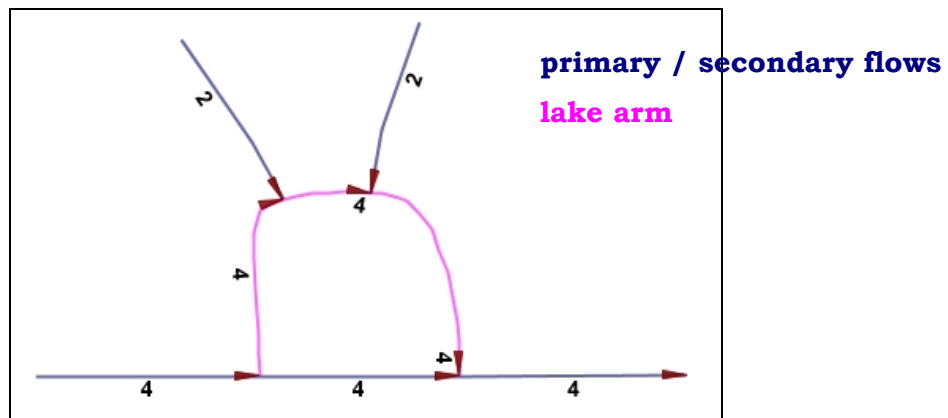


Figure 5: Order Example 2 (lake arm)

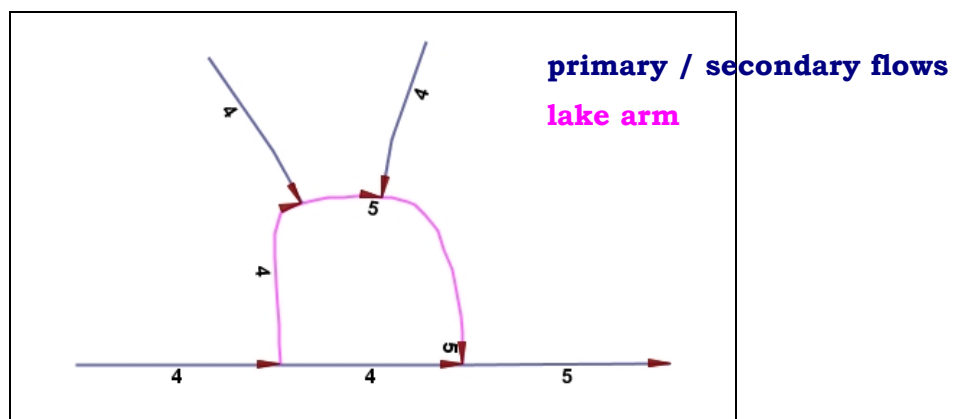
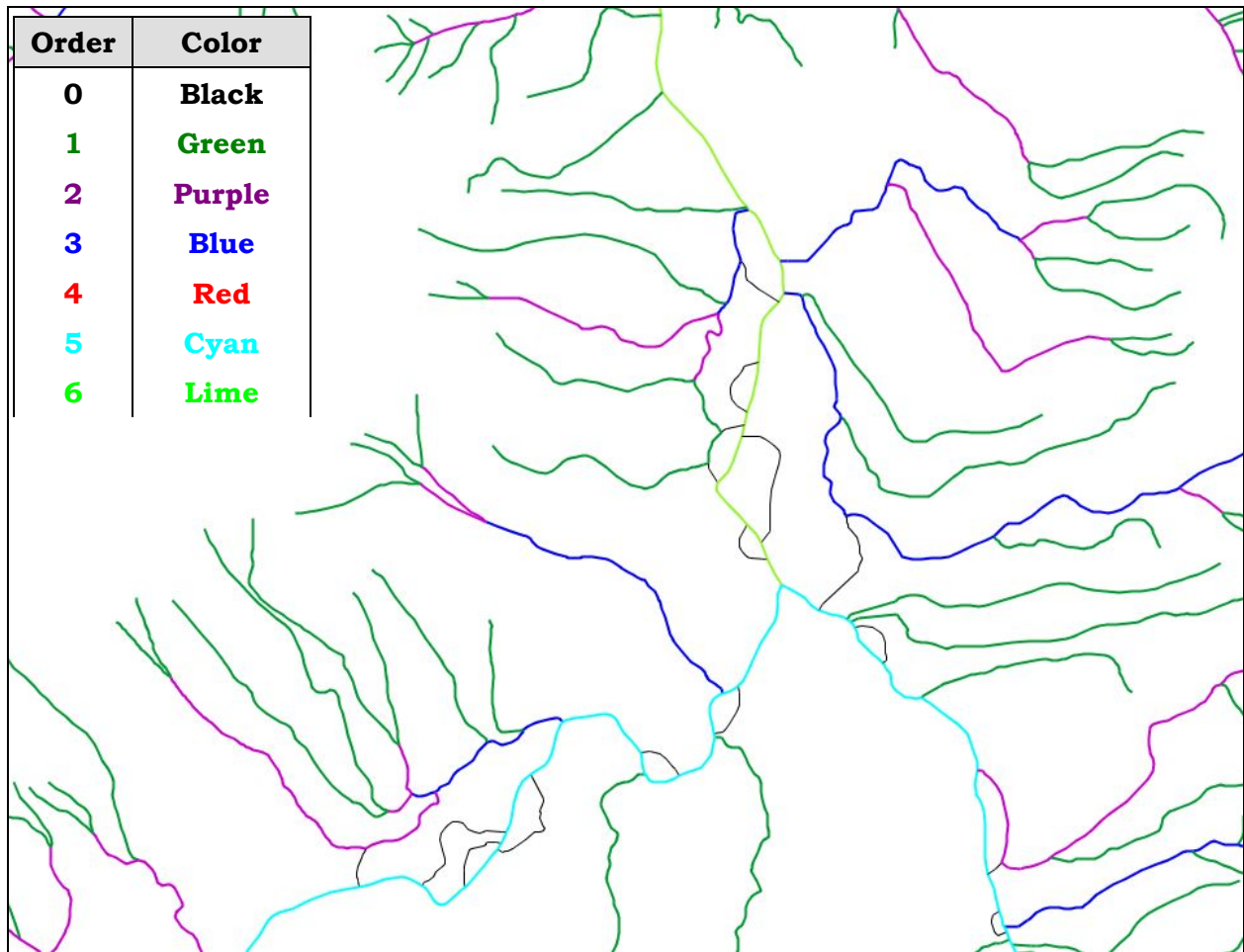


Figure 6: Order Example (primary & secondary)



1.2 Magnitude

1.2.1 Primary Flow Rules

1. Source nodes given magnitude = 1
2. At in-degree 2, out-degree 1 nodes:
 - out magnitude = sum of in magnitudes

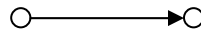
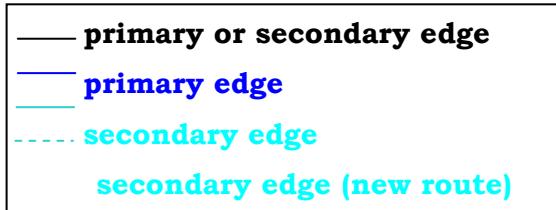
1.2.2 Secondary Flow Rules

1. Source of edges secondary flows given magnitude = 0.
2. Other secondary edges treated same as primary edges.

1.2.3 Lake Arms

For computing magnitude lake arms are treated as secondary flows.

Figure 7: Magnitude Rules



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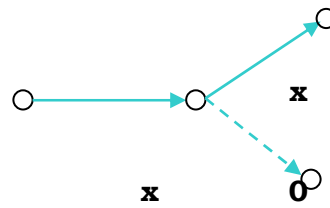
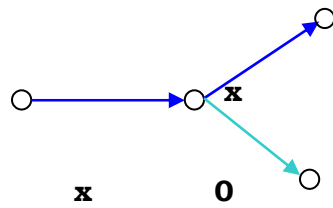
Source Node



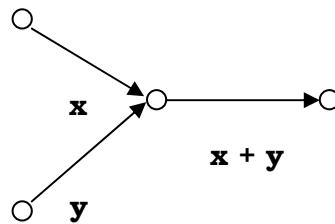
x

x

Degree 2 Node



In Degree = 1, Out Degree = 2

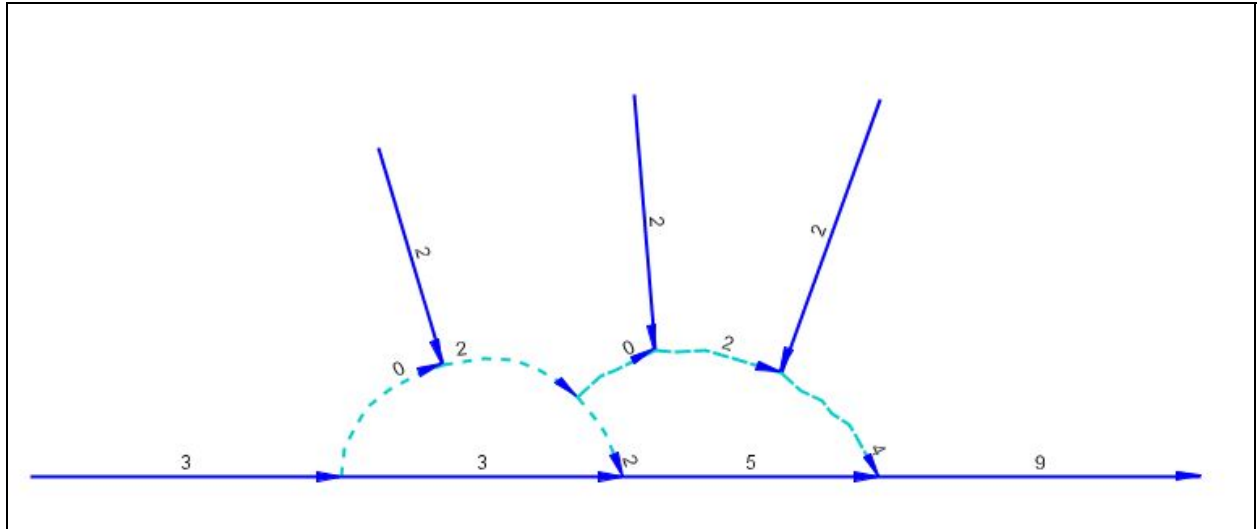


In Degree = 2, Out Degree = 1

1.2.4 Post Processing

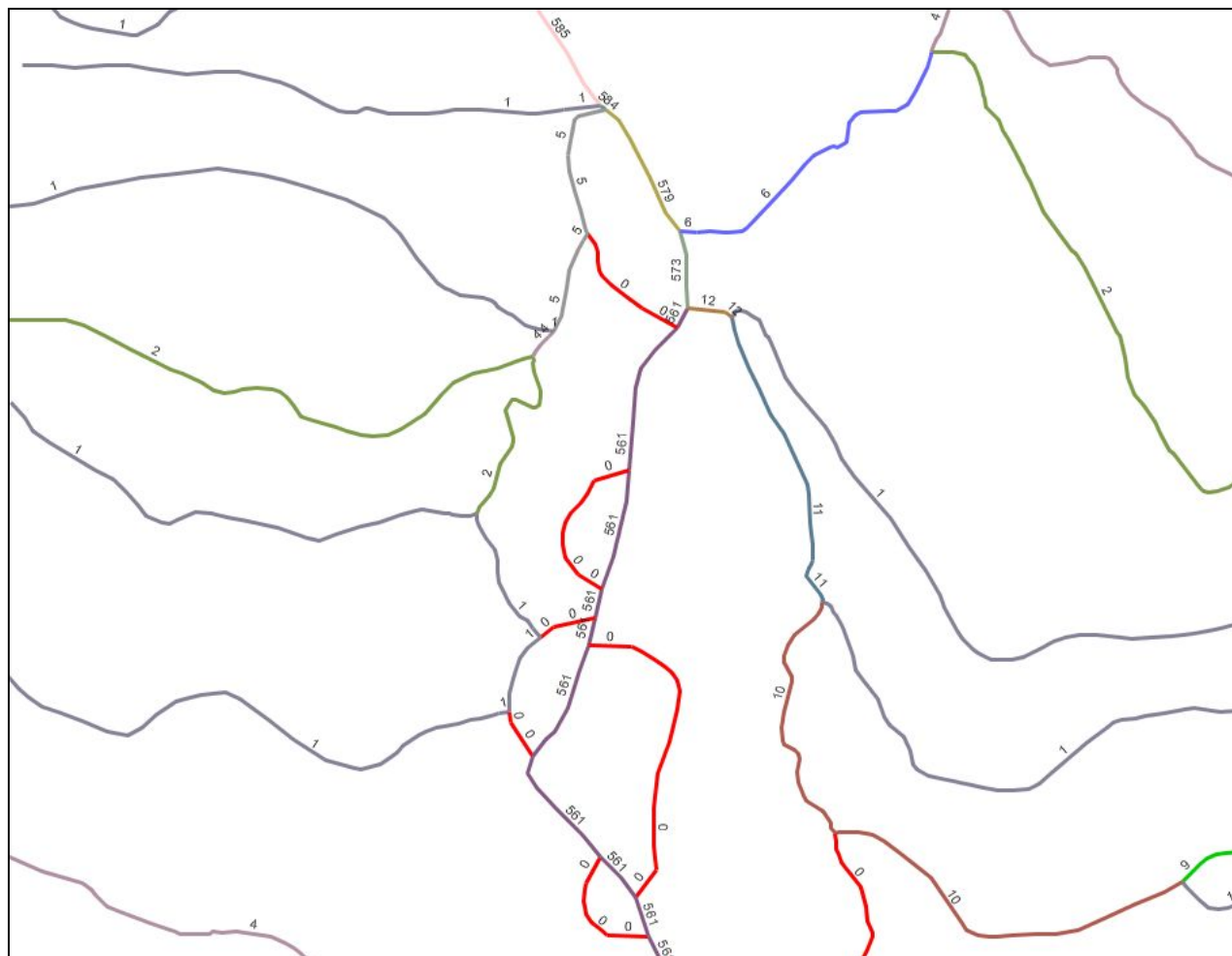
After the magnitude has been calculated for each edge, all edges with a magnitude of 0 are given a magnitude of 1.

Figure 8: Magnitude Example (secondary flows)*



* as a post-processing step the 0's are converted to 1's.

Figure 9: Magnitude Example (primary & secondary flows)



2 PROGRAM REQUIREMENTS

2.1.1 Inputs

Requires properly routed edges:

- FWA_edges table
- FWA_route_edges tables

2.1.2 Outputs

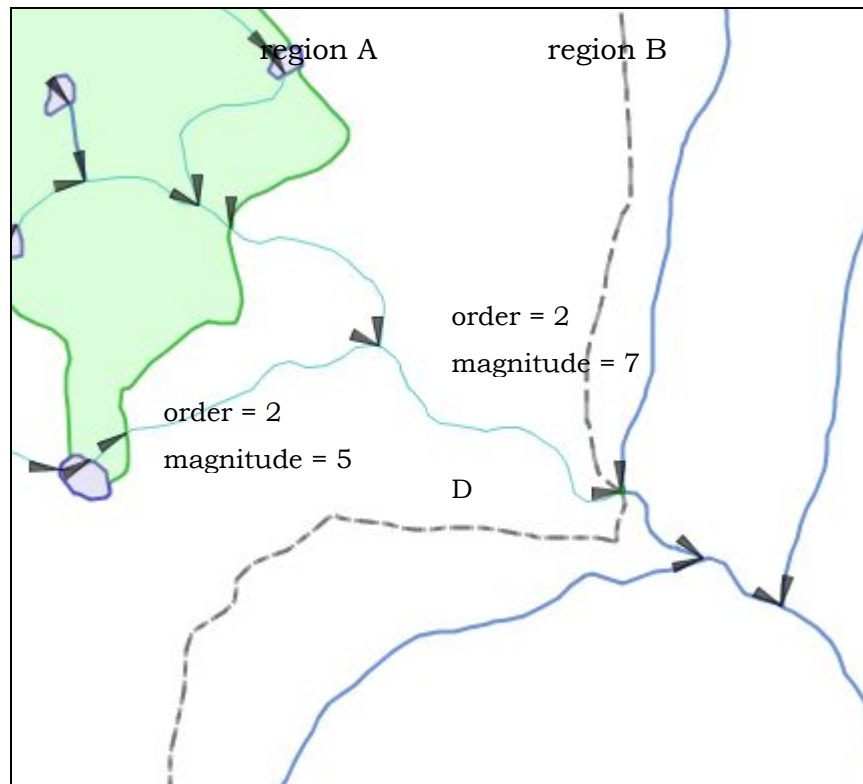
Writes output to FWA_order_magnitude table (one record for each edge).

2.1.3 Pre-Process & Connected Region Boundaries

There are a few locations where processing regions connect. In many cases these do not affect the order and magnitude; however, in a few cases the order and magnitude will be computed incorrectly.

In order to allow for this, order and magnitude can be predefined for edges. To predefine the order/magnitude for a given edge, place the edge along with the predefined order and magnitude in the FWA_order_magnitude table.

Figure 10: Cross Region Boundary Example



FRCN SKGT (1342531, 470218)

If region B and region A are computed completely independently the order and magnitude for edge D will be 2 and 7 respectively. This is incorrect as there is a secondary from region A flowing into edge D in region B. As a result edge D needs to be predefined as having an order of 3 and magnitude of 12.

2.1.4 Algorithm

1. Load in edges with routes attached.
2. Create graph from routes
3. Do a breadth first traversal of the graph computing order and magnitude at each node (using rules described above).
4. Write order and magnitude back to database.