

CHaMP 2014

Review of Topographic Data: Side Channels

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In 2014, CHaMP modified how side channels are delineated during topographic post-processing by adding a multi-threaded centerline in the main channel and all qualifying side channels. The objective of this document is to outline the steps used to check the accuracy of side channel delineation within the topographic survey.

Step 1: Identify Sites with Side Channels

Any CHaMP defined qualifying side channel (\geq bankfull elevation for a length \geq the average bankfull width) determined in the field should have been identified with a unique segment number. To identify sites with side channels:

- 1) On champonitoring.org, go to your Watershed’s home page and select the Measurements tab.
- 2) From the Measurements tab under the Measurement Type dropdown, select Channel Segment.
- 3) Sort the Segment Number Column from high to low or filter by Segment Number “2”. This will give you a list of all sites with a side channel (Figure 1). Alternatively you can download the table so you do not have to return to this page.

SiteID	Sample Date	Visit ID	Measur #	Crew	Visit Phase	Visit Status	Stream Name	Panel	Channel Segment ID	Segme Numbe	Segment Type	Is Continuous Wet?	Side Channel Length	Side Channel Width	Percent Wetted
CBW05583-007039	07/31/201	2384	1876394	Tucannon Cr	Quality Assur	In Q/A	Tucannon River	Annual	2	2	Small Side C	No - Partially	102.0 m	2.5 m	100 %
CBW05583-007039	07/31/201	2470	1876573	Tucannon Cr	Quality Assur	In Q/A	Tucannon River	Annual	2	2	Small Side C	No - Partially	102.0 m	2.5 m	100 %
CBW05583-038783	08/04/201	2471	1852086	Tucannon Cr	Data Collect	Post Process	Tucannon River	Rotating Panel 1	2	2	Large Side C	-	-	-	-
CBW05583-072139	08/16/201	2585	1855741	Tucannon Cr	Data Collect	Post Process	Tucannon River	Annual	2	2	Small Side C	Yes - Continu	16.4 m	6.7 m	75 %
CBW05583-168191	09/12/201	2689	1870728	Tucannon Cr	Data Collect	Post Process	Tucannon River	Rotating Panel 1	2	2	Large Side C	-	-	-	-
CBW05583-168855	08/28/201	2649	1858070	Tucannon Cr	Data Collect	Post Process	Tucannon River	Annual	2	2	Small Side C	Yes - Continu	65.0 m	3.5 m	43 %
CBW05583-170443	08/18/201	2586	1876719	Tucannon Cr	Quality Assur	In Q/A	Tucannon River	Annual	2	2	Large Side C	-	-	-	-
CBW05583-170443	08/14/201	2637	1885676	Colin Crew	Quality Assur	In Q/A	Tucannon River	Annual	2	2	Large Side C	-	-	-	-
CBW05583-178047	09/25/201	2694	1875549	Tucannon Cr	Data Collect	Post Process	Tucannon River	Rotating Panel 1	2	2	Large Side C	-	-	-	-
CBW05583-203211	08/14/201	2587	1859863	Tucannon Cr	Quality Assur	In Q/A	Tucannon River	Annual	2	2	Small Side C	Yes - Continu	70.0 m	3.0 m	60 %
CBW05583-310143	09/02/201	2650	1859866	Tucannon Cr	Data Collect	Post Process	Panjab Creek	Rotating Panel 1	2	2	Small Side C	Yes - Continu	46.0 m	3.9 m	25 %
CBW05583-427903	08/30/201	2652	1859870	Tucannon Cr	Data Collect	Post Process	Tucannon River	Annual	2	2	Large Side C	-	-	-	-
CBW05583-519039	06/23/201	2179	1841930	Tucannon Cr	Data Collect	Post Process	Tucannon River	Annual	2	2	Small Side C	Yes - Continu	83.0 m	1.5 m	100 %

Figure 1. Channel Segment measurement data on cm.org listing all sites with at least one side channel. The above table is sorted where “Segment Number” = 2.

Step 2: Check Centerline Delineation for each Side Channel

If a qualifying side channel (Large or Small) had continuous flow and both the entrance and exit of the side channel were contained in the site, the side channel should have a centerline drawn through it.

The most basic and quickest way to check whether a centerline was drawn for each side channel is to check the topographic images that were submitted during post processing. To do this:

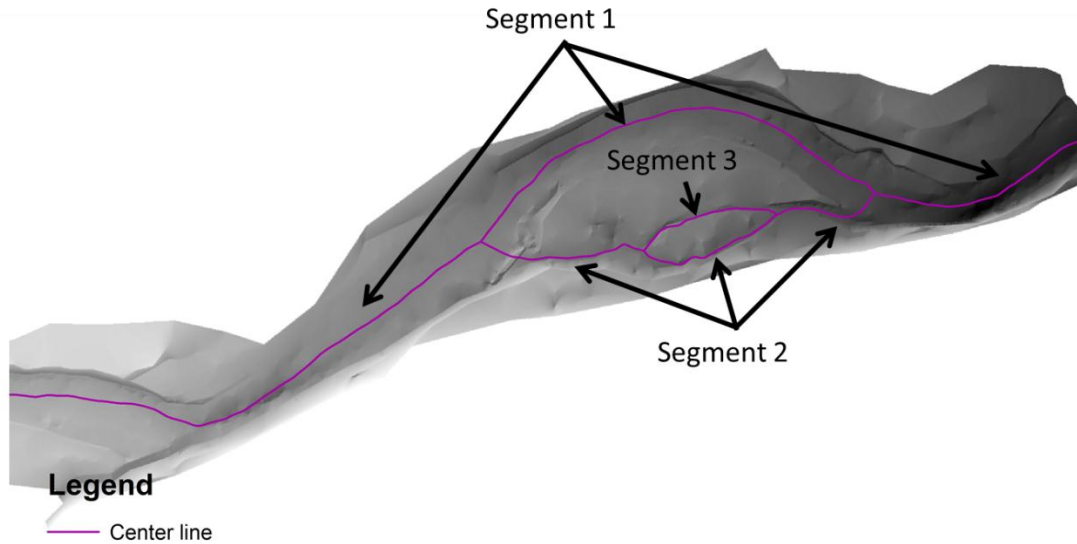
- 1) In cm.org from your Watershed's page, select the Visit tab and click on the site of interest. Note that if you hold down the Ctrl key while clicking on the Site ID, the page will open in a new tab.
- 2) Select the Measurements tab and then the Topographic Data tab.
- 3) Under the RBT Images heading, download and view the "Center Line" image (see below).

The screenshot shows the cm.org interface for site CBW05583-519039 (Tucannon River). The 'Topographic Data' tab is selected, showing a list of 'Topographic Measurement Files' and 'RBT Images'. The 'RBT Images' section includes a 'Center Line' image with a download button. Below the images is a 'Site GDB Files' section with three items: Site GDB, Site GDB Log File, and Site GDB Results XML.

- 4) Check the image to see that the number of centerlines equally splits the number of segments at a site.

The RBT cannot delineate centerlines through non-wetted areas. If a centerline is missing, check the Channel Segment table. If the segment is a Large Side Channel, there should be a centerline through it (unless it meets the criterion in Example 1). If the side channel is a Small Side Channel and "Is Continuously Wet?" = No (Partially Wet or Dry), no centerline is likely to exist.

In the image below, there are three centerlines. One representing the main channel and two others representing small side channel centerlines. These three centerlines match up with the three segments recorded in the auxiliary data which are summarized in the Channel Segment table.



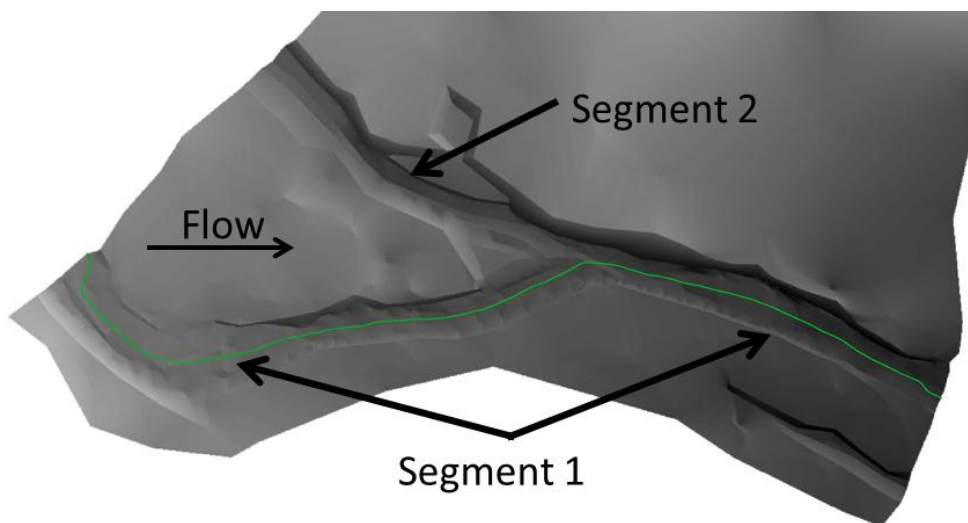
Where to Expect Missing Centerlines

Centerlines should have been delineated for each unique channel segment number at a site. There are some limitations with how the RBT can delineate complex centerlines, which are discussed in the following examples.

Example 1: Side Channel Does Not Form Complete Island Within Site Boundary

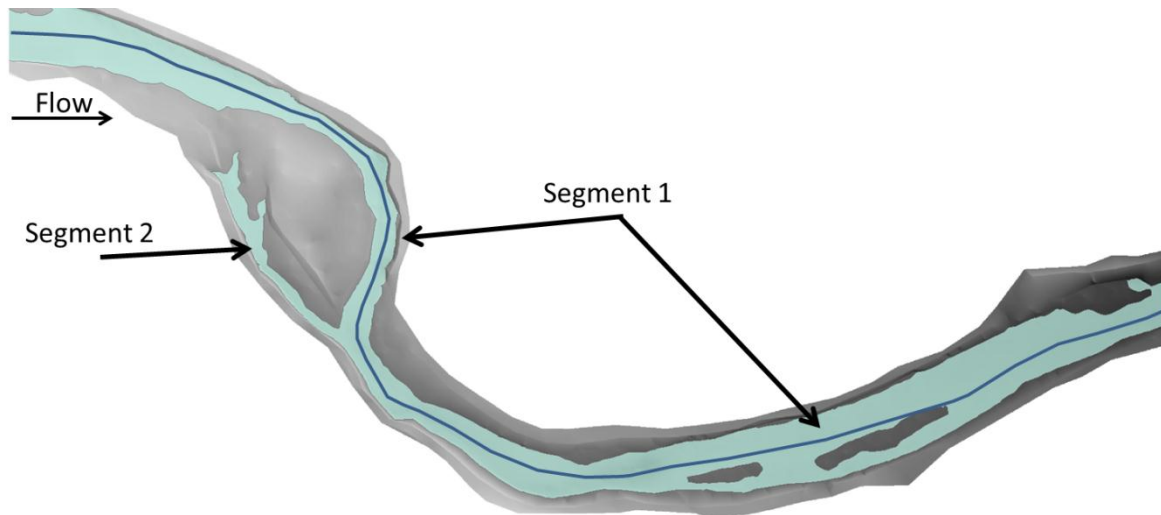
Currently, the RBT can only delineate centerlines around qualifying islands that are complete “donuts” contained within the site (e.g., water flows all around island, as seen in the previous image). **Side channels that do not BOTH begin and end within the surveyed area will not have centerlines, and will not successfully pass through the QA validation process if they do.**

The example below shows a site where there are two segments. Segment 1 = Main Channel, Segment 2 = Small Side Channel (Continuously Wetted = Yes). No centerline will be delineated down Segment 2 because the channel does not exit the Main Channel within the site boundary.



Example 2. Small Side Channel Does Not Have Continuous Flow

The example below shows a site where there are two Segments. Segment 1 = Main Channel, Segment 2 = Small Side Channel (Is Continuously Wet? = No – Partially Dry). No centerline will be delineated down Segment 2 because it is not continuously wet and therefore does not create a full island or “donut” (e.g., it is now considered a peninsula).



Special Cases

Special cases: In some cases, getting metric output for 'missing' side channels may be critical. If this is the case for your visit, please contact carol@southforkresearch.org for additional instruction on conducting additional post processing of these sites.

If the number of centerline splits doesn't equal the number of segments at a site, keep track of the visit number and which of the scenarios it falls under. Instructions to repair these are listed in Step 3:

Scenarios:

- a) Number of centerline splits equals the number of segments at the site: It's all good, carry on with QA
- b) Site has fewer centerlines than segments: continue to Step 3.
- c) Site has more centerlines than segments: continue to Step 3.

Step 3: Troubleshooting Missing or Additional Centerlines

If the review of images against sites that should have side channels identifies sites with more or fewer centerlines than expected, you'll need to troubleshoot these in the original 2014 Survey Geodatabase that was created during Topo Process. These can be downloaded from the cm.org from the Data Upload page.

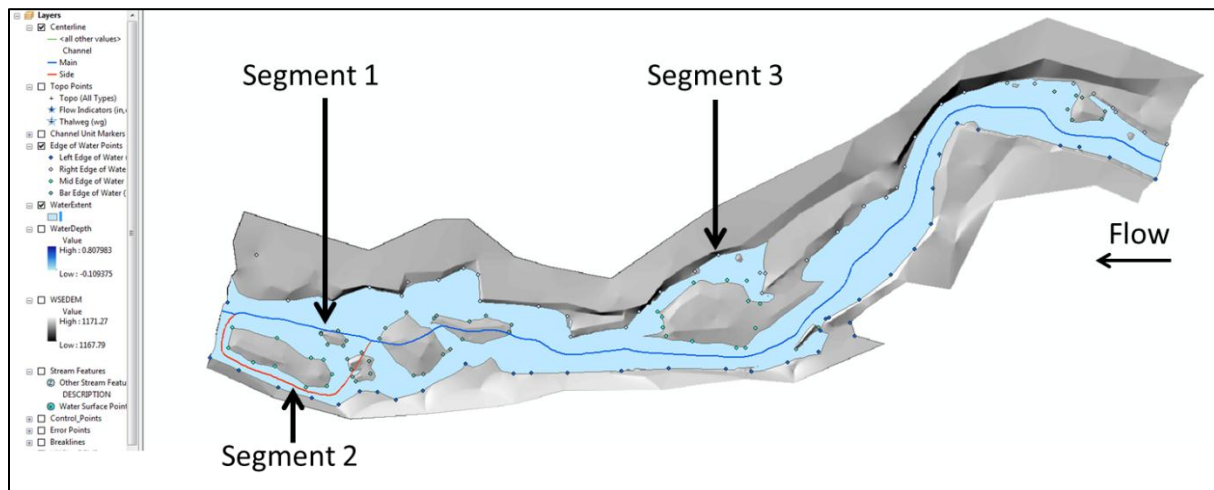
Note that **ALL** Large Side Channels should have a centerline through them unless they meet any of the two scenarios listed above.

Survey Has Fewer Centerline Features than Channel Segments

If during the review of a site the number of centerlines is less than the number of segments and neither of the two examples above apply, further investigation is needed. The following scenarios outline potential explanations regarding why there may be fewer centerlines than Segments.

Example 1. Side Channel Not Filled In with Water

Even if a Small Side Channel is continuously wet throughout its course (“Is Continuously Wet?” = Yes), it may not have been captured effectively with the topographic survey. When this happens, dry spots may appear along the course of the side channel or there may not be any water in the side channel at all. In the Figure below, the entrance to the Small Side Channel (Segment 3) was not surveyed to the level of detail required to capture this feature, so the channel entrance does not fill in with water. Therefore, a centerline was not delineated through the side channel because it would cross dry land. Note that we know it is a side because the island was correctly captured with *mw* points.



Possible Solutions:

1) Test using the slider to raise the water level to see if the side channel fills in. Be cautious and make sure that you are not raising the water level to a stage that only fits a localized area in detriment to the overall site. It is better to leave the side channel as it is than to raise the water level to a point that does not represent the stage at which sampling occurred.

2) Look at the Topographic TIN and assess if the TIN accurately represents the stream topography at the side channel entrance or exit. Look for artificially high TIN facets or artificial dams that may be blocking the flow of water (depth of channel). Use TIN Editing as needed to more accurately define the channel. Then recreate the DEM, Detrended DEM and run the Stage Slider Tool to create a new wetted polygon. New cross-sections and centerlines will likely also need to be delineated.

If the topography seems ok, do not modify the TIN beyond repairing artificial features.

3) If the stage slider still does not produce a wetted polygon that reflects the field conditions, you may manually edit this feature so it accurately reflects the conditions encountered in the field.

Example 2. Island Classified Incorrectly

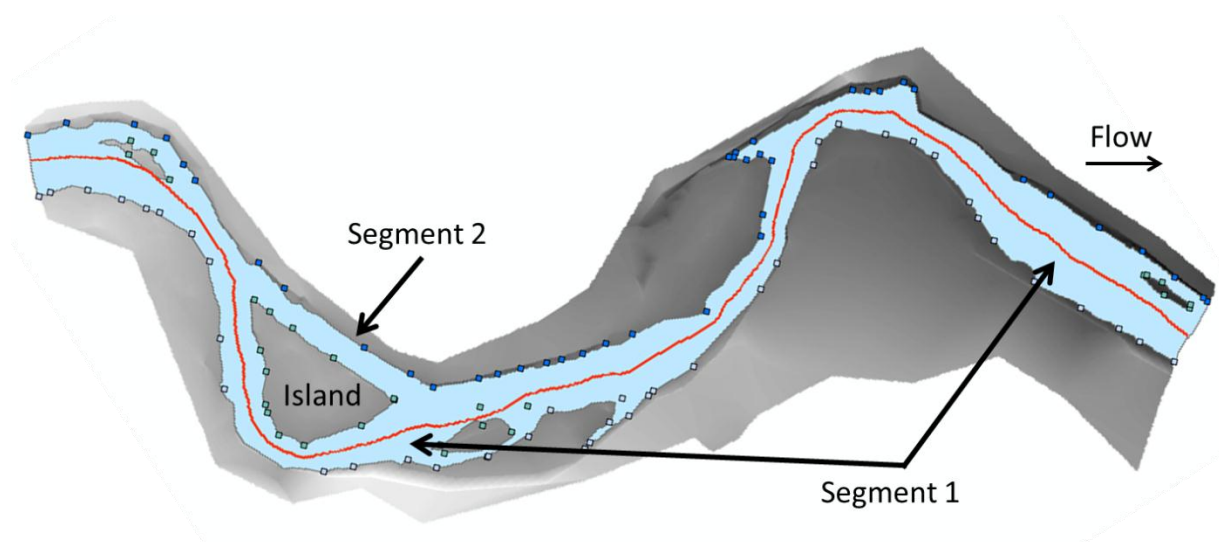
The perimeter of all qualifying islands should have received an *mw* code when surveyed in the field. If this was done correctly, the island should have been automatically identified as a qualifying island during post-processing and a centerline drawn down the side channel and main channel (again, with the exceptions listed above). There are a few possible errors that can occur:

- 1) If *mw* codes were not used when surveying the perimeter of a qualifying island, the toolbar would not classify the island as qualifying during post-processing and there will not be a centerline down the side channel.
- 2) If the stage of the water extent was high enough to exclude all of the *mw* points outside of the island polygon, then the toolbar would not classify the island as qualifying during post-processing, there will not be a centerline down the side channel. The processing crew should have manually designated the island as qualifying using the island tool during post-processing.
- 3) Likewise, if *mw* codes were used when surveying the perimeter of the qualifying island but during post-processing the user manually designated the qualifying island as non-qualifying, then a centerline will not be drawn down the side channel.

In the Figure below, the rodperson forgot to use *mw* point codes (used *br* codes instead) along the perimeter of the island. They did not notice this in post-processing and did not designate feature as a qualifying island using the toolbar so the island was left as non-qualifying. Therefore, no centerline was delineated down the side channel.

Solution(s):

- 1) Change *br* codes to *mw* codes and rerun all of the steps in the Centerline Tool. **Check to make sure the islands are correctly designated.** Resubmit GDB.
- 2) Manually designate island as qualifying side channel using the toolbar and rerun the Generate Centerline step in the Centerline Tool. Rerun the Cross-Section tool and resubmit GDB.



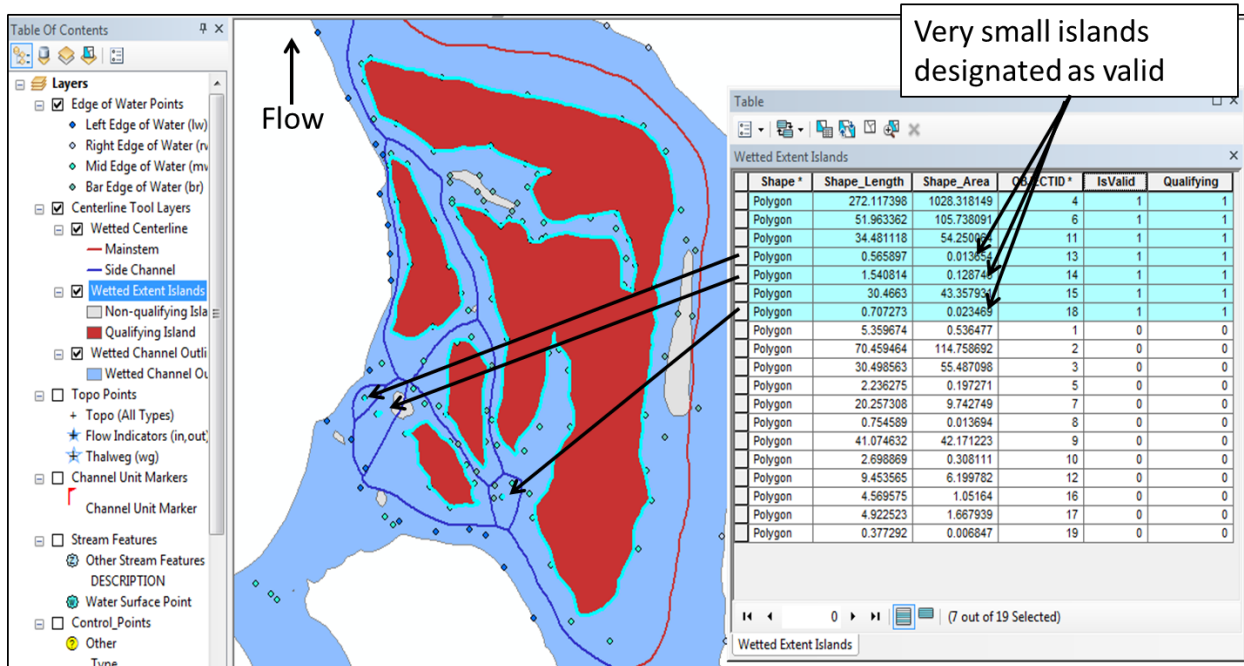
Site Has More Centerlines than Segments

If during the review of a site the number of centerlines is less than the number of segments and none of the examples above apply, further investigation is needed. The following scenarios outline potential explanations regarding why there may be more centerlines than segment numbers.

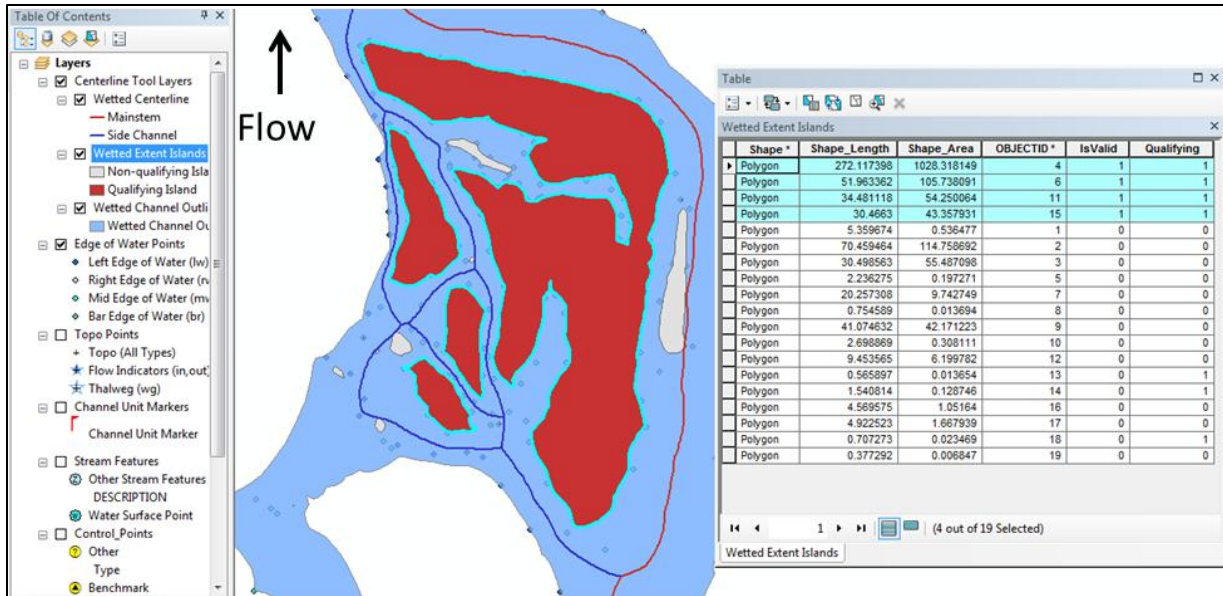
Example 1. Island Classified Incorrectly

The most common reason that too many centerlines are at a site is due to misclassifying non-qualifying islands as qualifying. Check to make sure islands have been correctly designated as qualifying or non-qualifying. The centerline tool will draw centerlines around each island designated as “qualifying”.

At complicated sites with many small non-qualifying islands, even when *mw* points were surveyed correctly and qualifying islands were designated correctly, the RBT may create additional centerlines around these features. In the figure below, the centerlines split around many small features in this complex area of stream. In this case a few very small islands were incorrectly designated as qualifying by the RBT (or user). These can be seen in the Wetted Extent Island attribute table.



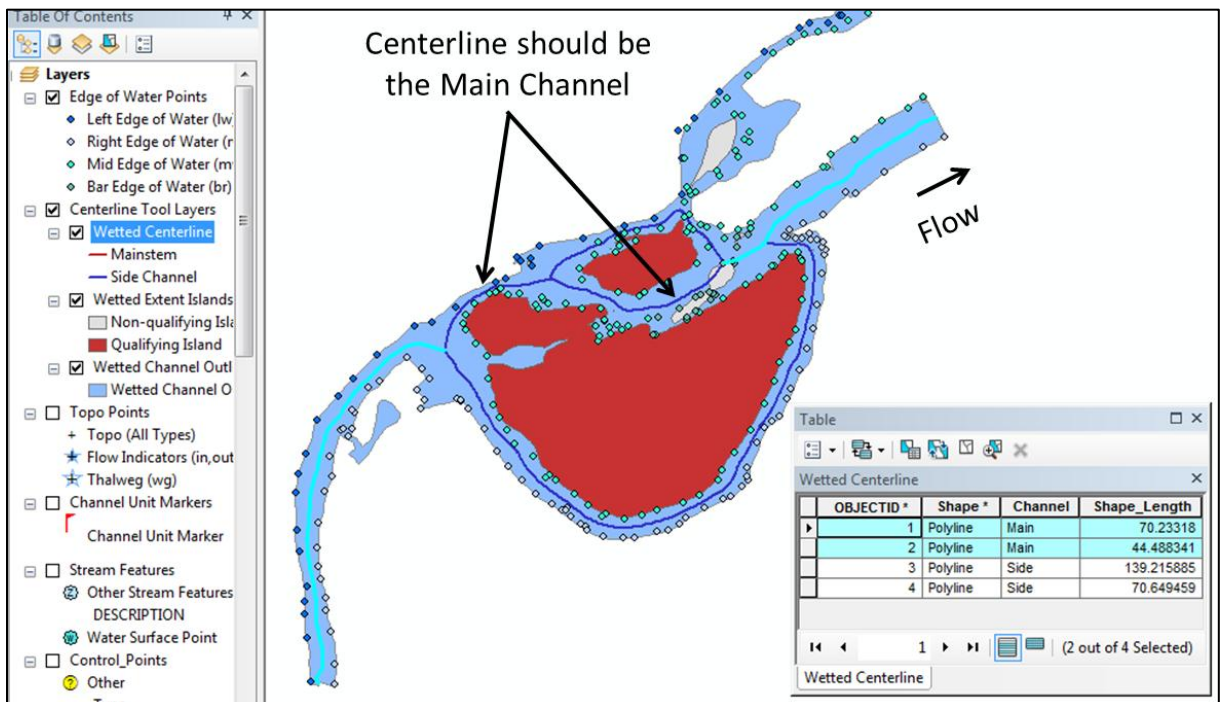
Solution: Designate these features as non-qualifying using the Centerline Tool or change their designation to invalid (= 0) in the attribute table. The figure below shows how the centerline should look for this complex section of stream.



Check That Proper Main Channel and Side Channel Centerlines are Designated

The Centerline Tool differentiates the main channel from all side channel centerlines. Check to see that the main channel is designated correctly by either visually observing the color of the line compared to side channel centerlines (this is an output of the toolbar) or opening up the attribute table of the Wetted Centerline feature class and highlighting all channels labeled "Main". The Main Channel centerline should be continuous throughout the site and go through the same channel as the thalweg that was delineated during post-processing.

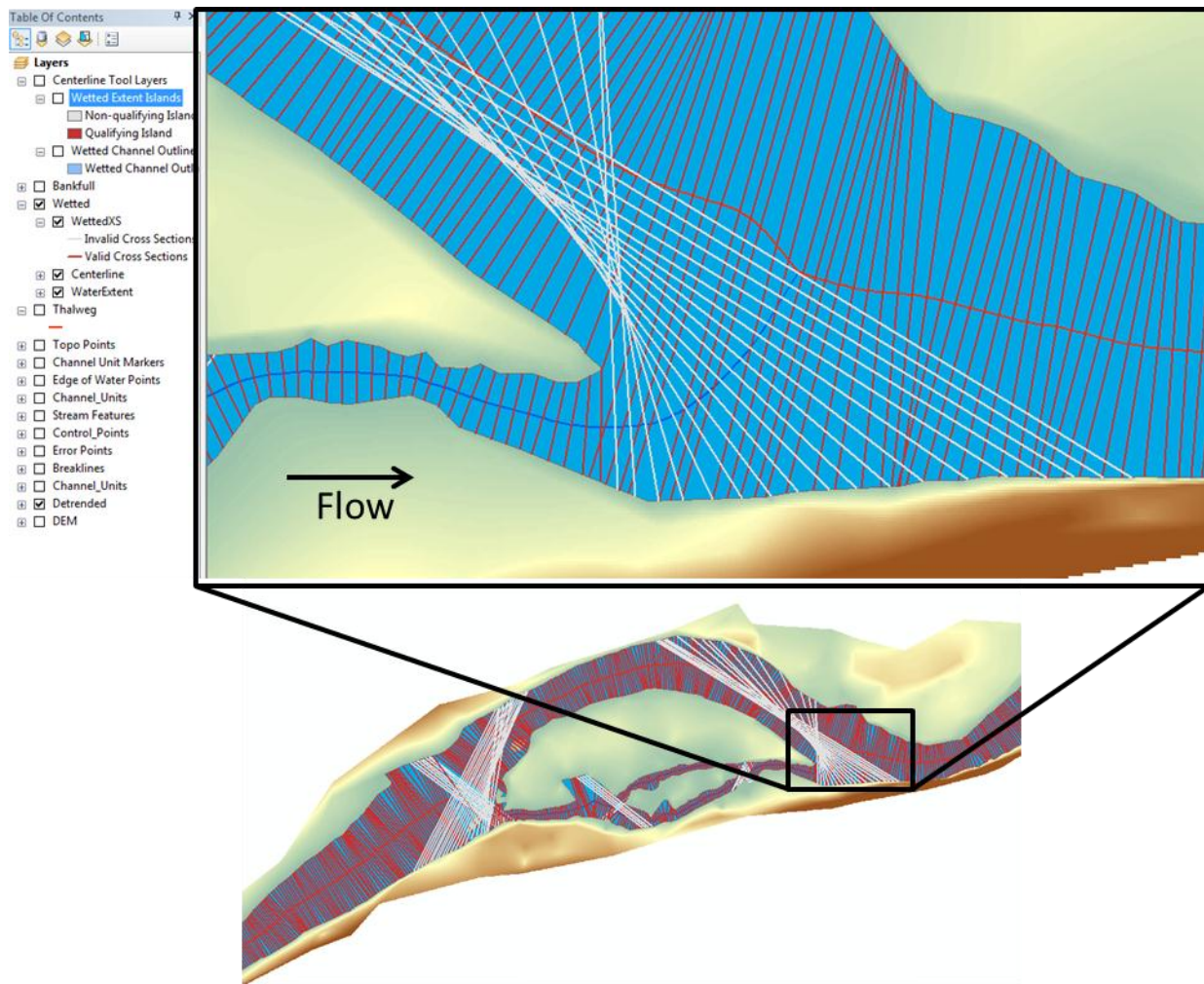
In the example below, the main channel centerline designation is correct at the top and bottom of a site but incorrectly designated as a side channel in the middle of the site.



Step 4: Check Cross-Sections at Side Channel Junctions

Cross-sections are generated perpendicular to both the main centerline and all side channel centerlines. Check to see if any cross-sections that are part of a side channel centerline extend into the main channel. This often occurs at locations where the side channel centerline splits off of the main channel centerline.

If a cross-section stemming from a side channel centerline extends into the main channel, make that cross-section invalid. Conversely, if any main channel centerline extends an inappropriate distance into a side channel, make that cross-section invalid. The figure below provides an illustration of how cross-sections should be designated near main/side channel junctions.



Step 5: Check Channel Unit Delineations

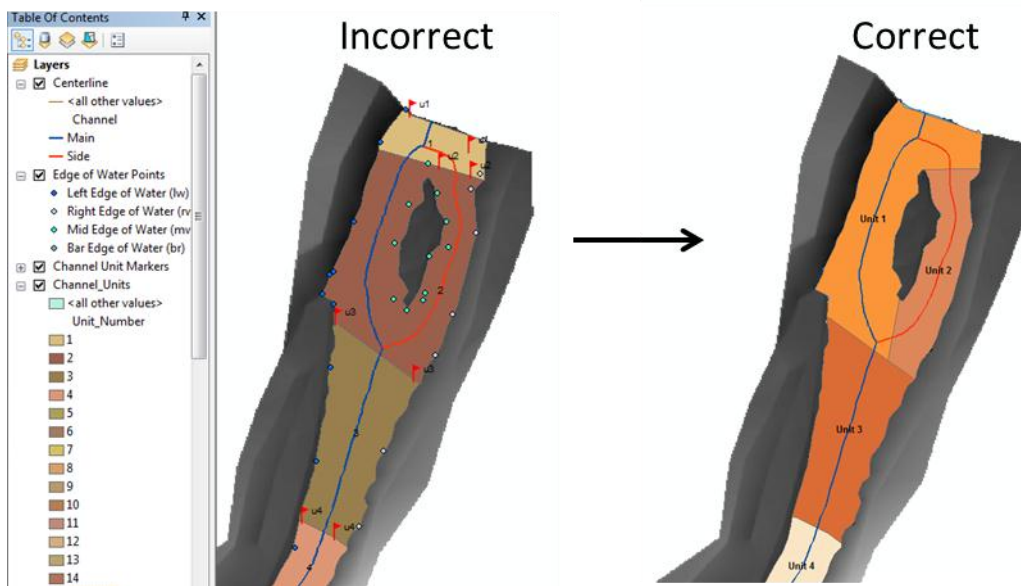
Channel Unit Miss-Classification or Digitization

If channel unit classification names were joined to the channel unit attribute table in GIS, open the attribute table. If not, under the Measurements tab, navigate to the Channel Unit table for a particular site. With this information, check to see that channel units were delineated in the correct segment.

It is also very useful to consult with the site maps for proper channel unit delineation and side channel designation.

Example 1. Incorrect Side Channel Unit Delineation

In the example below, the Segment 2 centerline was delineated correctly but Channel Unit 2 which is in Segment 2 spans both the main channel and the side channel. The same channel unit cannot be in two different segments. The boundary for both unit 1 and 2 was not delineated correctly.



Step 6: Document Repair in QA Status/Notes Page of Topographic Data Page

Since updates to RBT are ongoing, we strongly suggest noting which surveys have EXPECTED missing side channels, as described in Step 2. These visits may be reprocessed in the future if updates to RBT are made to accommodate these scenarios. Note that the visit will still pass QA and promotion with 'missing' side channels.

Summary

Use the above examples as guidance for validating centerline delineations and designations as well as cross-section and channel unit delineations. These examples may not be the exact same scenario as your situation but should help you make decisions about what the proper results should (and should not) look like.

It is strongly encouraged that you use all lines of evidence available to you while conducting side channel quality assurance. Useful resources include site maps, measurement tables, site photos, and of course, crew members. If you run into any unique problem or need assistance, please contact Kelly at kelly@southforkresearch.org or Carol at carol@southforkresearch.org.