

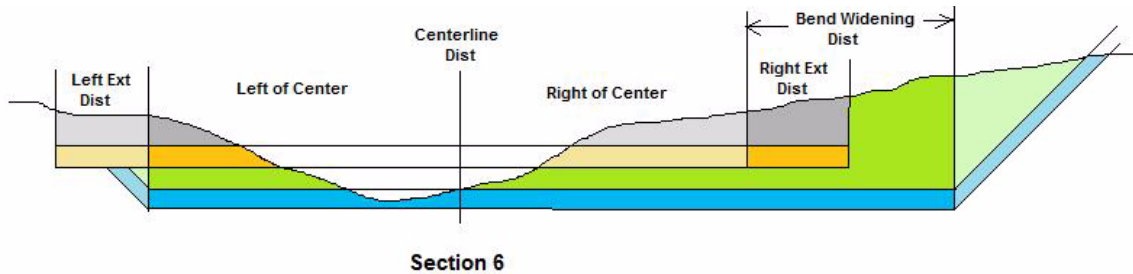


Multiple CHN Volumes in TIN MODEL

By Pat Sanders

Recently, one of our favorite clients brought the following channel design profile to us and wanted to know what we could do...

FIGURE 1. *Our Volumes Challenge*



(And you wonder why my hair is gray...)

The first two parts of the template can be handled using the Box Cut methodology in the Philadelphia method. This method is available in both the CROSS SECTIONS AND VOLUMES (CSV) program and the TIN MODEL program.

However, in this project, they are widening the channel and need to have the New Dredging – Required material (greens) and the New Dredging – Allowable Overdepth material (blues) computed. Now, we are out of options. We had the Norfolk Method in CSV, but it was the same exact design template, just lowered in depth for each section. We didn't have anything that could combine the box cut with the side slopes and separate the materials for each type.

After kicking around a few ideas with Lazar Pevac, we decided to tackle this problem in the TIN MODEL. The idea that we came up with was to create an ADVANCED CHANNEL DESIGN file (*.CHN) for each of the reporting surfaces.

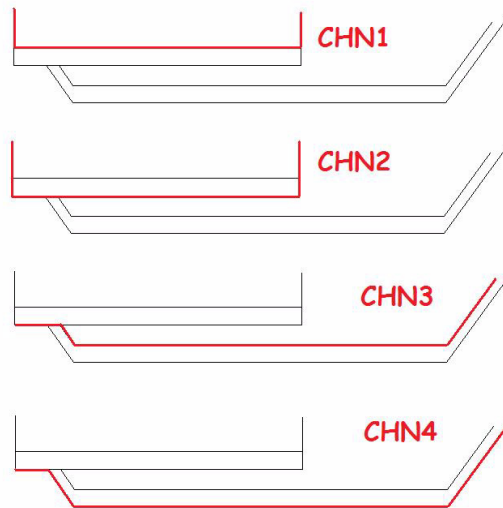
FIGURE 2. *Computing the Volumes One Channel at a Time*

We would first compute the material above CHN1. This is the Maintenance Dredging – Required material.

We would then compute the material above CHN2, and then subtract the material found above CHN1 in order to obtain the Maintenance Dredging – Allowable Overdepth.

Next, compute the material above CHN3 and subtract the material above CHN2 to obtain the New Dredging – Required.

Finally, compute the material above CHN4 and subtract the material above CHN3 to obtain the New Dredging – Allowable Overdepth.

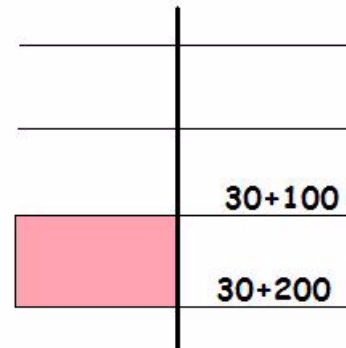


So far, so good.....

The next problem is that our client wanted the material reported by pairs of planned lines and then subdivided left-of-center and right-of-center for each pair of lines. In order to do this, we needed to bring in some Planned Line Files (*.LNW). One file would have the cross-channel lines (e.g. 30+100, 30+200, 30+300). The other file would have the channel centerline.

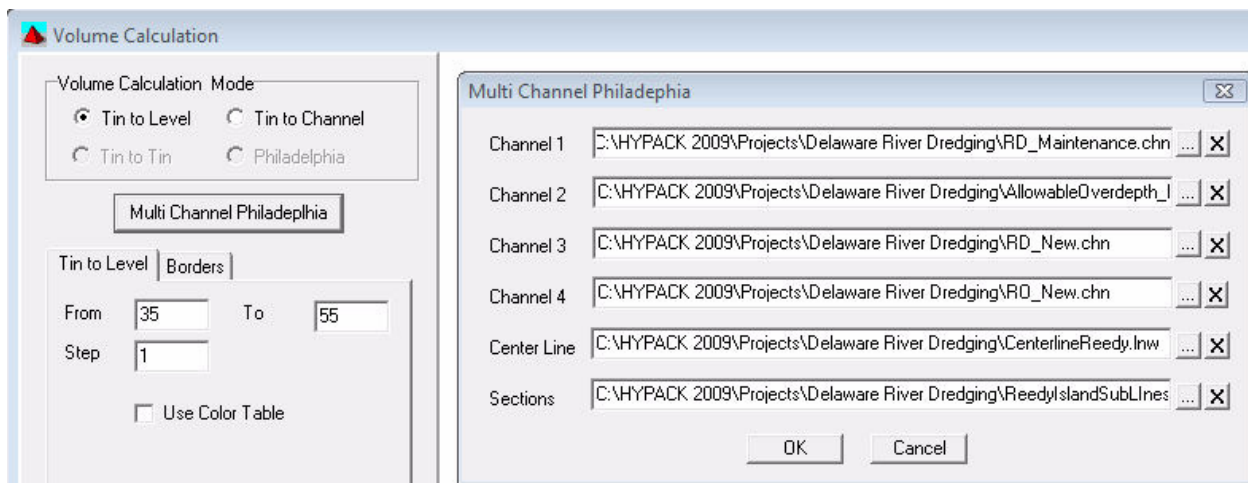
FIGURE 3. Planned Line Files

For example, the TIN MODEL would first 'clip' the surface model to the boundary created between lines 30+100 and 30+200. It would then 'clip' that result one more time to get the area to the left-of-center (or the area to the right-of-center) between the two lines. It would then compute the volume of material for each of our four categories for the 'clipped region' and do the math necessary for the report.



In the Volumes page of TIN MODEL, it looks like the following:

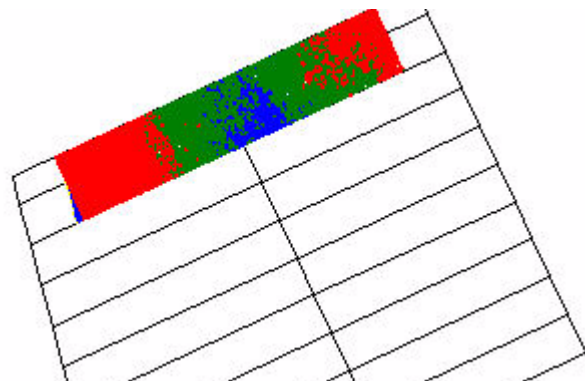
FIGURE 4. Multichannel Volumes Calculations in TIN MODEL



You have the option to insert up to four CHN files. You don't have to use four, but that is the maximum. You then enter the Centerline file (*.LNW) and the Sections file (*.LNW). Click the OK button and you can see the program go to work.

FIGURE 5. Volumes Calculation Progress in TIN MODEL

In Figure 5, it has gone to work. Material above CHN4 is yellow, material above CHN3 is blue. Material above CHN2 is green and material above CHN1 is red.



The report (Figure 6) then lists the volume quantities and the accumulate volume quantities for each pair of lines, followed by the 'Grand Totals'.

One of the remaining pieces of the puzzle is to set it up for Predredge vs. Postdredge surveys. This involves some interesting questions regarding the treatment of 'Contour Overdepth' material between the different surfaces, but we are slowly ironing out those wrinkles.

FIGURE 6. Multi-channel Volumes Report

SECTION	VOLUMES		Total	ACCUMULATED VOLUMES		Total
	Left of Center	Right of Center		Left of Center	Right of Center	
234+634 to 234+700						
Maintenance Dredging:						
Above Design	60.50	469.01	529.51	60.50	469.01	529.51
Allowable Overdepth	571.51	732.90	1304.40	571.51	732.90	1304.40
New Dredging:						
Above Design	950.87	902.61	1853.47	950.87	902.61	1853.47
Allowable Overdepth	985.06	1017.19	2002.24	985.06	1017.19	2002.24
234+700 to 234+800						
Maintenance Dredging:						
Above Design	52.54	628.24	680.78	113.05	1097.24	1210.29
Allowable Overdepth	735.09	1108.41	1843.49	1306.59	1841.30	3147.90
New Dredging:						
Above Design	1365.04	1544.86	2909.90	2315.91	2447.47	4763.38
Allowable Overdepth	1498.22	1603.40	3101.62	2483.27	2620.59	5103.86
234+800 to 234+900						
Maintenance Dredging:						
Above Design	8.38	527.32	535.71	121.43	1624.57	1746.00
Allowable Overdepth	421.60	1032.19	1453.79	1728.20	2873.49	4601.69
New Dredging:						
Above Design	1244.65	1779.49	3024.14	3560.55	4226.96	7787.51
Allowable Overdepth	1498.16	1670.10	3168.25	3981.43	4290.69	8272.12