Philadelphia Volume Calculation and Extended Template Format

By Lazar Pevac

The Philadelphia method is designed to work with a very strict line template format. There are two flavors of template formats that produce correct output. The following scheme describes the point selection for the section profile:

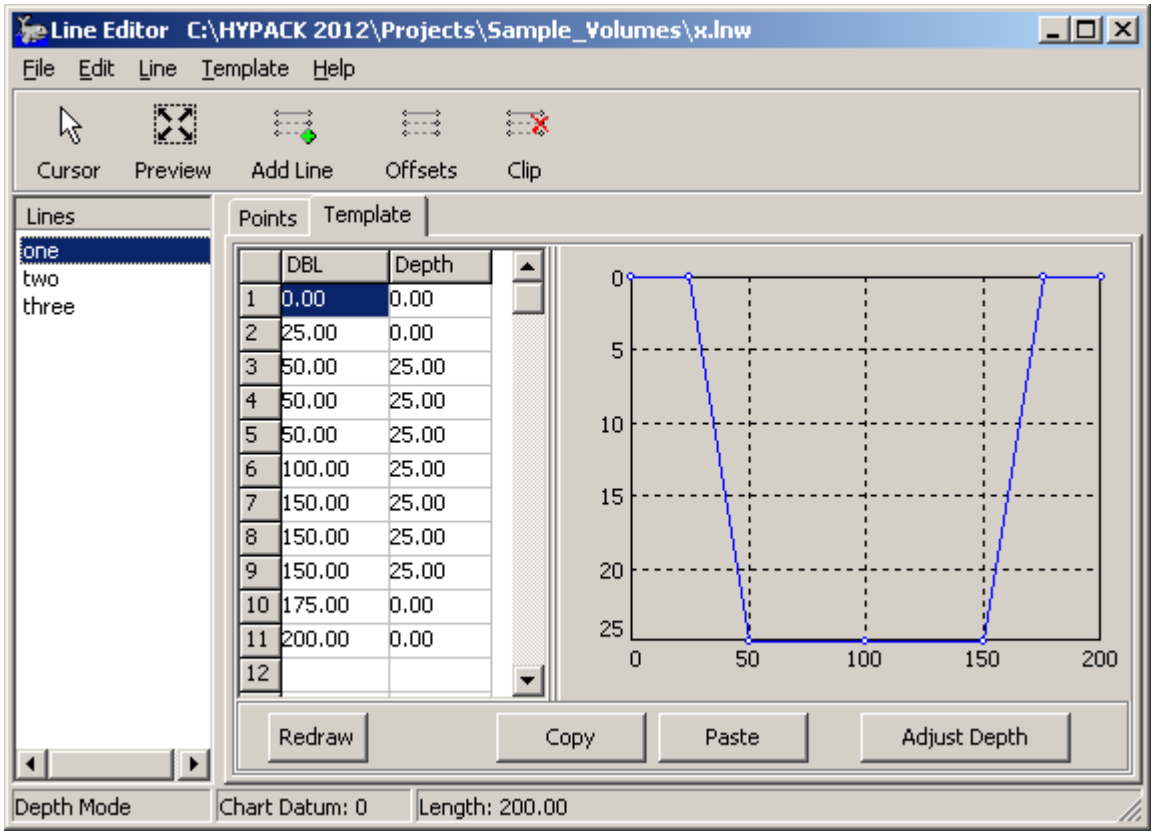
Format Type	Left Bank	Left Toe	Center	Right Toe	Right Bank
11 points	1,2 (2)	3,4,5 (5)	6	7,8,9 (7)	10,11 (10)
9 points	1	2,34 (4)	5	6,7,8 (6)	9

The TIN MODEL program will disable the Philadelphia option if the planned line file has a number of template points other than 11 or 9. It is assumed that the points in each group are identical (like 3, 4, 5). The program does not check this assumption. It takes the point in parenthesis. The scheme was working perfectly until we decided to extend the template format and allow a variable number of points. We are going to add a check for identical points to prevent the Philadelphia method to use an inappropriate template.

The question is how to use the Philadelphia method with the extended template format. The answer is “it is not possible” but we provide a method that works almost like the Philadelphia method: the TIN-to-Channel method itemized by sections and zones.

Start with a planned line file that is “Philadelphia ready”.

FIGURE 1. *“Philadelphia Ready Planned Line*

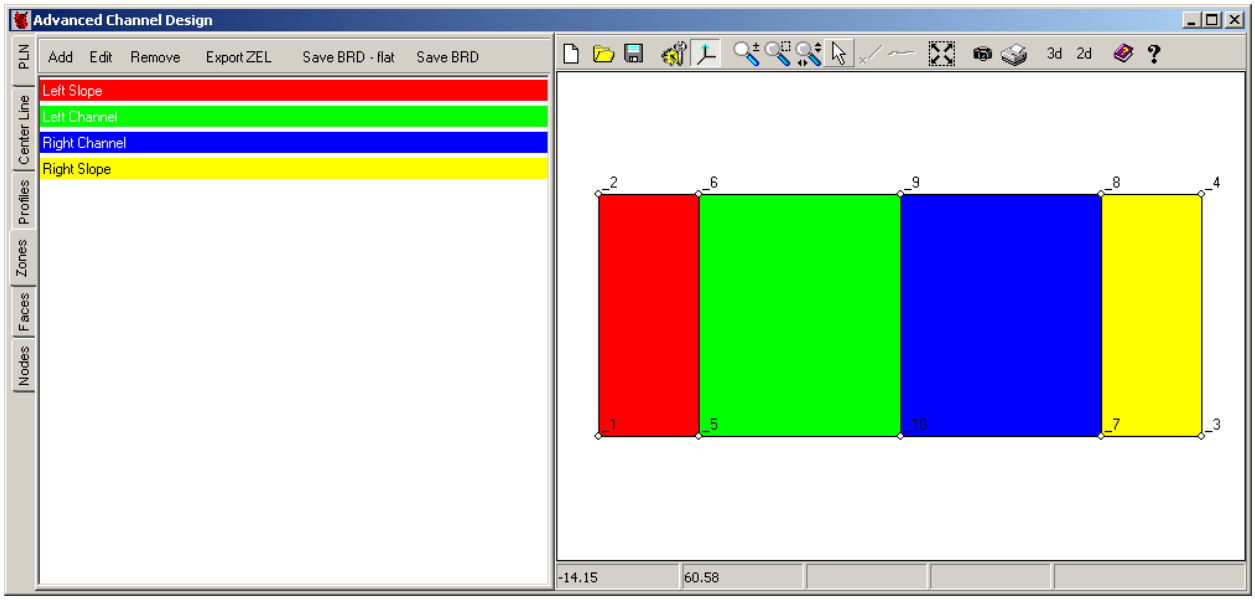


You can use this file for a Philadelphia pre-dredge volume calculation, and here is the result:

```
Philadelphia Pre-Dredge Report Volume Totals
Dredge Option: Contour
Section to                  Project         Over            Left            Right
Section                     Depth           Depth           Slope           Slope
one to three                25.00           29.00           1.0/1.0         1.0/1.0

Pre Dredge report           Volume above Design ---------------------------------------
Section                     Left            Left            Right           Right
Name                        Slope           Channel         Channel         Slope
-------------------------   ------------    ------------    ------------    ------------
one to two                           0.0             0.0          2450.0           50.0
two to three                         0.0             0.0          2450.0           50.0
-------------------------------------------------------------------------------------------
Total:                               0.0             0.0          4900.0          100.0

Pre Dredge report           Volume in Overdepth ---------------------------------------
Section                     Left            Left            Right           Right
Name                        Slope           Channel         Channel         Slope
-------------------------   ------------    ------------    ------------    ------------
one to two                           0.0             0.0          5000.0          200.0
two to three                         0.0             0.0          5000.0          200.0
-------------------------------------------------------------------------------------------
Total:                               0.0             0.0         10000.0          400.0

Dredging Quantities Summary
===========================
Total Material To Project Depth .....          5000.0
Total Allowable Overdepth ...........         10400.0
Total Pay Place .....................         15400.0
```

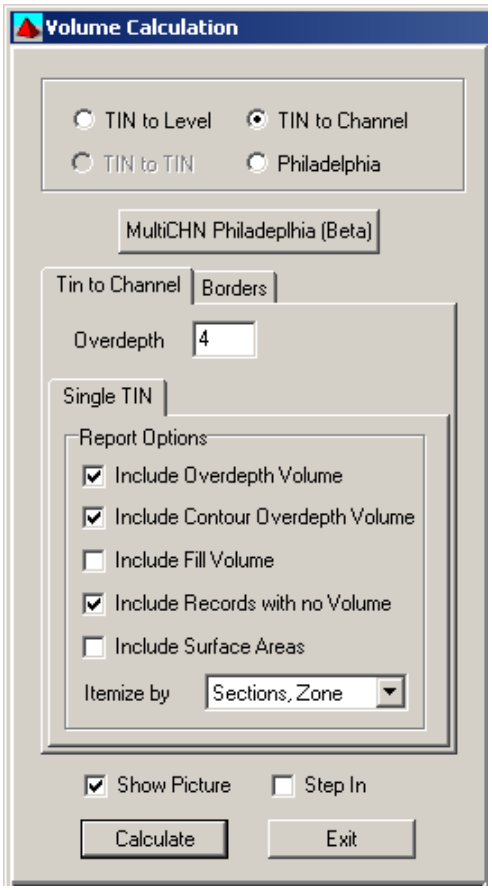
You can use the same planned line file as input for ADVANCED CHANNEL DESIGN. The program creates the faces automatically. It takes some work to remove faces created with identical points, but it is unnecessary. Additionally, you have to create zones that are going to match left/right slope/channel.

FIGURE 2. *Defining Zones in Your Channel in ADVANCED CHANNEL DESIGN*



Start the TIN MODEL program with the same XYZ, planned line file and newly created channel file. It will allow you to select the TIN-to-Channel method with Section, Zone items.

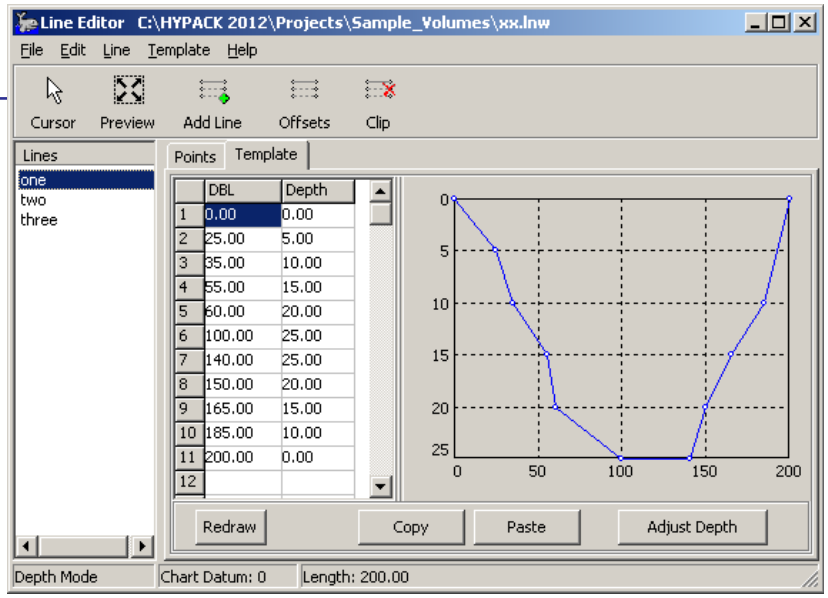
```
TIN vs Channel Volume Totals - Itemized by Sec-
tions, Zones
Overdepth: 4
 Design    Overdepth Overdepth
                Cut       NoContour Contour
Section         Volume    Volume    Volume
-------------------------------------------------
one to two
    Left Slope          0.0      50.0       0.0
    Left Channel        0.0    2550.0       0.0
    Right Channel    2450.0    5000.0    5000.0
    Right Slope        50.0     400.0     200.0
Section Total        2500.0    8000.0    5200.0
Accum. Total         2500.0    8000.0    5200.0

two to three
    Left Slope          0.0      50.0       0.0
    Left Channel        0.0    2550.0       0.0
    Right Channel    2450.0    5000.0    5000.0
    Right Slope        50.0     400.0     200.0
Section Total        2500.0    8000.0    5200.0
Accum. Total         5000.0   16000.0   10400.0

Totals:
    Left Slope          0.0     100.0       0.0
    Left Channel        0.0    5100.0       0.0
    Right Channel    4900.0   10000.0   10000.0
    Right Slope       100.0     800.0     400.0
Accum. Total:        5000.0   16000.0   10400.0
```



You can see that both methods produced matching numbers. The only difference is the table layout.

The next example is the template that is not applicable for Philadelphia method.

FIGURE 3. *Planned Line File that is not "Philadelphia Ready"*



We can load such file in ADVANCED CHANNEL DESIGN and we can create zones.

Here is the volume report from TIN MODEL program with this channel.

```
TIN vs Channel Volume Totals - Itemized by Sections, Zones
Overdepth: 4
                  Design     Overdepth Overdepth
                  Cut        NoContour Contour
Section           Volume     Volume    Volume
-----------------------------------------------
one to two
    left toe             0.0       0.0       0.0
    left center          0.0     450.0       0.0
    right center      1950.0    4000.0    4000.0
    right toe          100.0     812.5     400.0
Section Total         2050.0    5262.5    4400.0
Accum. Total          2050.0    5262.5    4400.0

two to three
    left toe             0.0       0.0       0.0
    left center          0.0     450.0       0.0
    right center      1950.0    4000.0    4000.0
    right toe          100.0     812.5     400.0
Section Total         2050.0    5262.5    4400.0
Accum. Total          4100.0   10525.0    8800.0

Totals:
    left toe             0.0       0.0       0.0
    left center          0.0     900.0       0.0
    right center      3900.0    8000.0    8000.0
    right toe          200.0    1625.0     800.0
Accum. Total:         4100.0   10525.0    8800.0
```

FIGURE 4. *Irregular Channel in ADVANCED CHANNEL DESIGN*