MARICOPA COUNTY
FLOOD CONTROL DISTRICT

DRAINAGE DESIGN MANAGEMENT SYSTEM FOR WINDOWS

VERSION 6.8.0

TUTORIAL # 22

PIER INFLUENCE ZONE CALCULATION

HEC-18 PROCEDURE

KVL Consultants, Inc.

PIER INFLUENCE ZONE CALCULATION
[HEC-18 PROCEDURE]

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PIER INFLUENCE ZONE CALCULATION
[HEC-18 PROCEDURE]
DATE UPDATED: MAY 7, 2024
TUTORIAL TIME: 15 MINUTES

1.0 INTRODUCTION

A pier influence zone is the top width (W_T as shown in the figure below) of a pier local scour hole in cohesionless bed material. This tutorial computes the pier influence zone by using the procedure outlined in the Federal Highway Administration HEC-18 Manual (April 2012).

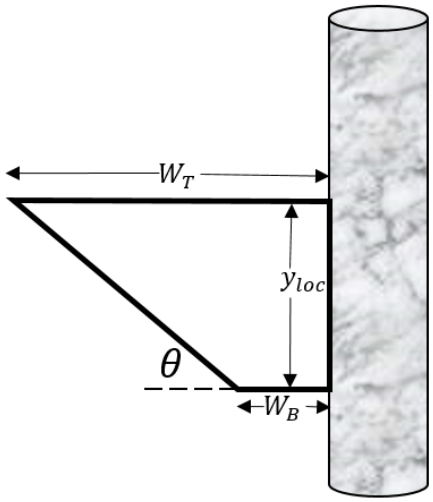


Figure 1: Top Width of Scour Hole Sketch Adapted from FHWA (2012)

2.0 REQUIRED DATA

For this tutorial on calculating pier influence zone, use the following conditions:

- Pier Scour Depth, Ys (ft): *15.00*
- Ratio of bottom width to depth of local pier scour, B: *1.0*
- Angle of repose of the bed material in water, θ (degrees): *44.00*
- Distance from outside edge of pier, X (ft): *10.00*

3.0 STEP-BY-STEP PROCEDURE

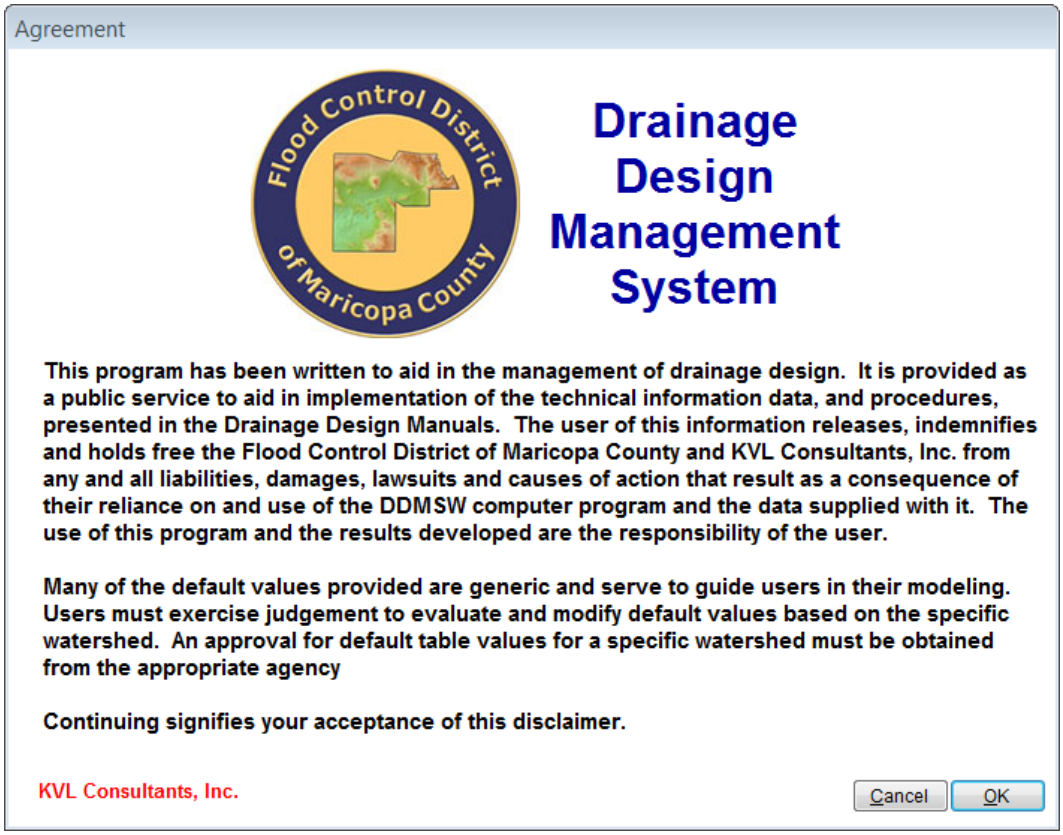
The step-by-step procedure for calculating pier influence zone is described as follows:

Step 1: Establish a New Project and Set-up the Defaults
Step 2: Prepare the Data

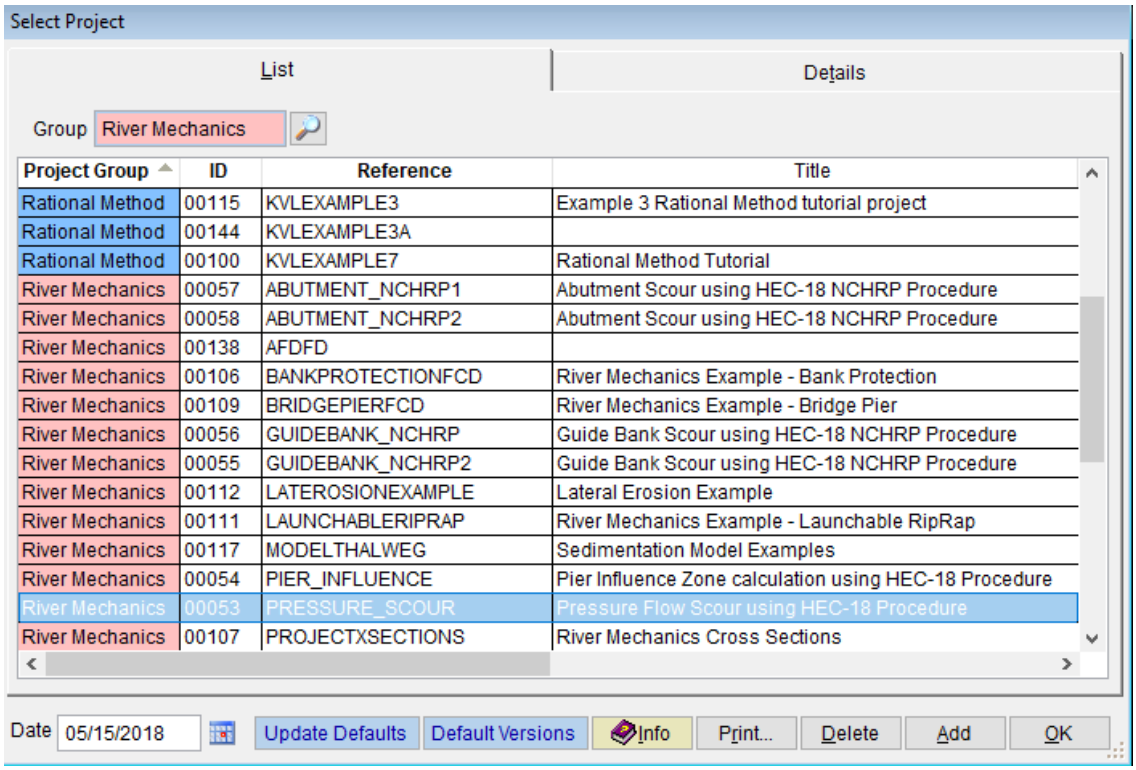
Step 3: Calculate the Pier Influence Zone Width
Step 4: Reporting and Documentation of Results

3.1 Step 1 - Establish a New Project and Set-up the Defaults

(a) Click the **DDMSW** icon on the Desktop or Program menu to launch the **DDMSW.** Click the ***OK*** button to accept the software disclaimer as shown in the following figure.



After the **DDMSW** is launched, the **SELECT PROJECT** form is automatically opened as shown in the following figure.



(b) Click the ***Add*** button on the **SELECT PROJECT** form to start a new project (Alternatively, **File ➔ New Project ➔ Add**).

(c) On the **NEW PROJECT OPTIONS** dialog box, select the **River Mechanics** checkbox, then click the ***OK*** button to close / exit the form.

(d) On the **SELECT PROJECT** form (***Details*** tab), enter "*V605_PIER_INFLUENCE*" into the ***Reference*** textbox. This is the name of the new project. Users can choose any name for the ***Reference*** textbox as long as it does not exist already in the current **DDMSW** project database.

(e) Type into the **Title** textbox a brief descriptive title for this project. *(Optional) (e.g., 'Pier Influence Zone Calculation using HEC-18 Procedure').*

(f) Type into the ***Location*** textbox the location of this project. *(Optional) (e.g., 'Maricopa County, Arizona')*

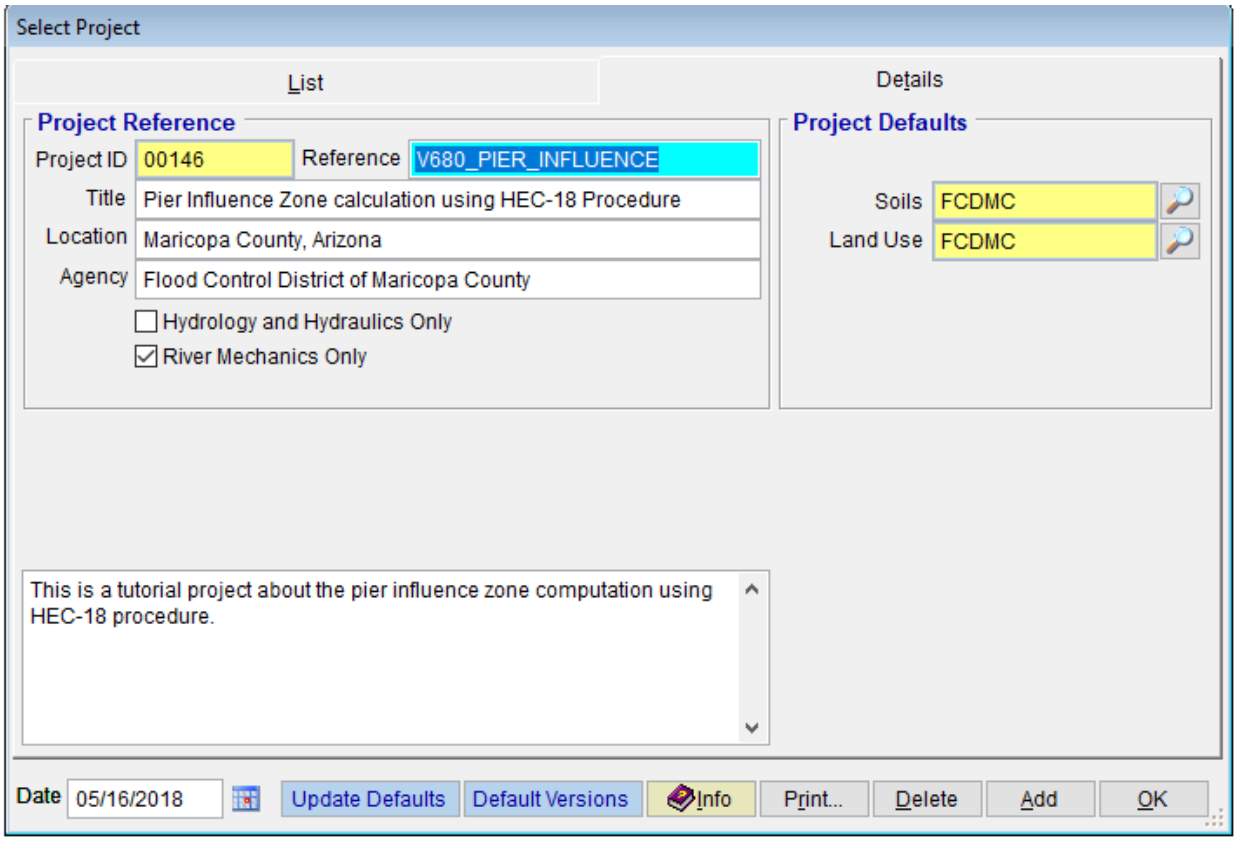
(g) Type into the ***Agency*** textbox the agency or company name**.** *(Optional) (e.g., 'Flood Control District of Maricopa County').*

(h) Check the ***River Mechanics Only*** checkbox.

(i) Type a detailed description of this project into the comment area under the ***Project Reference*** frame. *(Optional) (e.g., 'This is a tutorial project for calculating Pier Influence Zone Width using HEC-18 Procedure').*

(j) Set the ***Modification Date*** using today's date by clicking on the Calendar icon.

(k) Click the ***Save*** button to save the entered data. The following figure shows what the current form looks like.

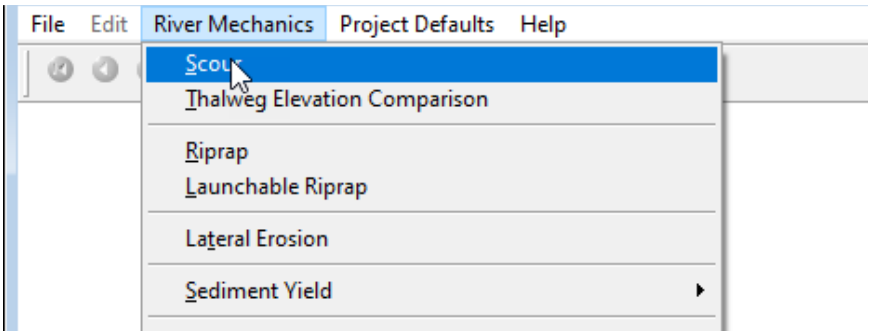


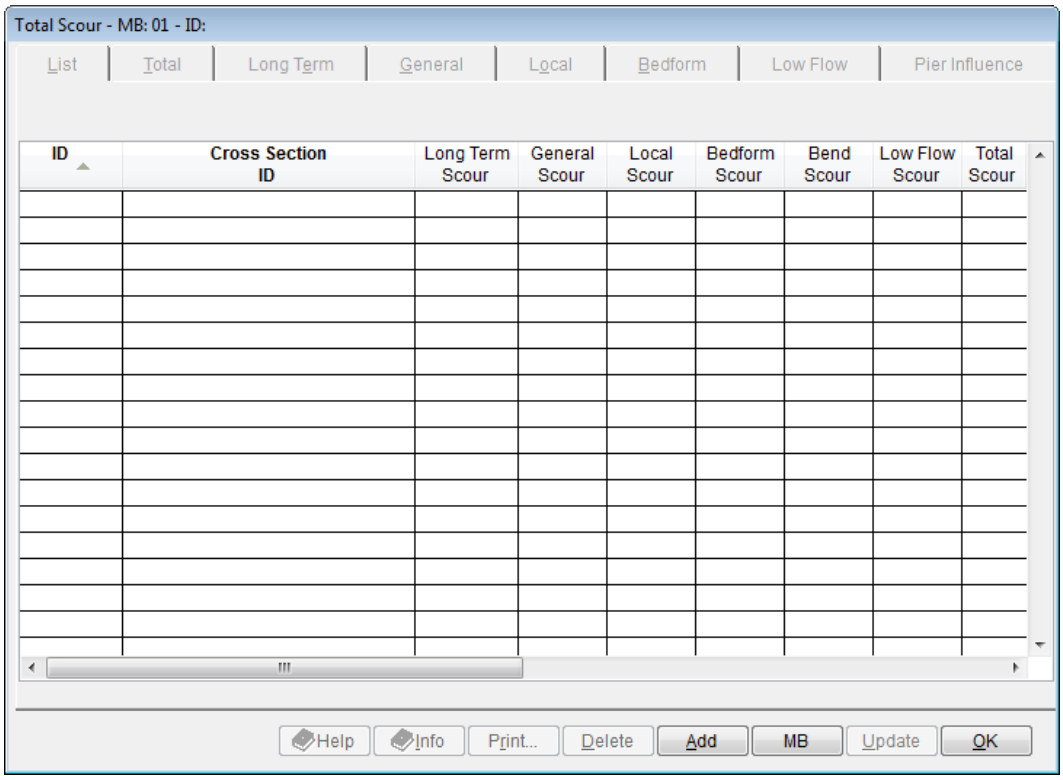
(l) Click the ***OK*** button to exit the **SELECT PROJECT** form.

Note: The ***Project ID*** *"00146"* in the above figure is the unique database record identifier for the project, which is automatically generated by the program. Each time a new project is created, a ***Project ID*** is assigned by the program. The ***Project ID*** assigned to your project will not necessary be the same as the ***Project ID*** shown in the above figure.

3.2 Step 2 - Prepare the Data

(a) From the menu bar of the main application window, click ***River Mechanics*** ➔ ***Scour***, to open the **TOTAL SCOUR** form.



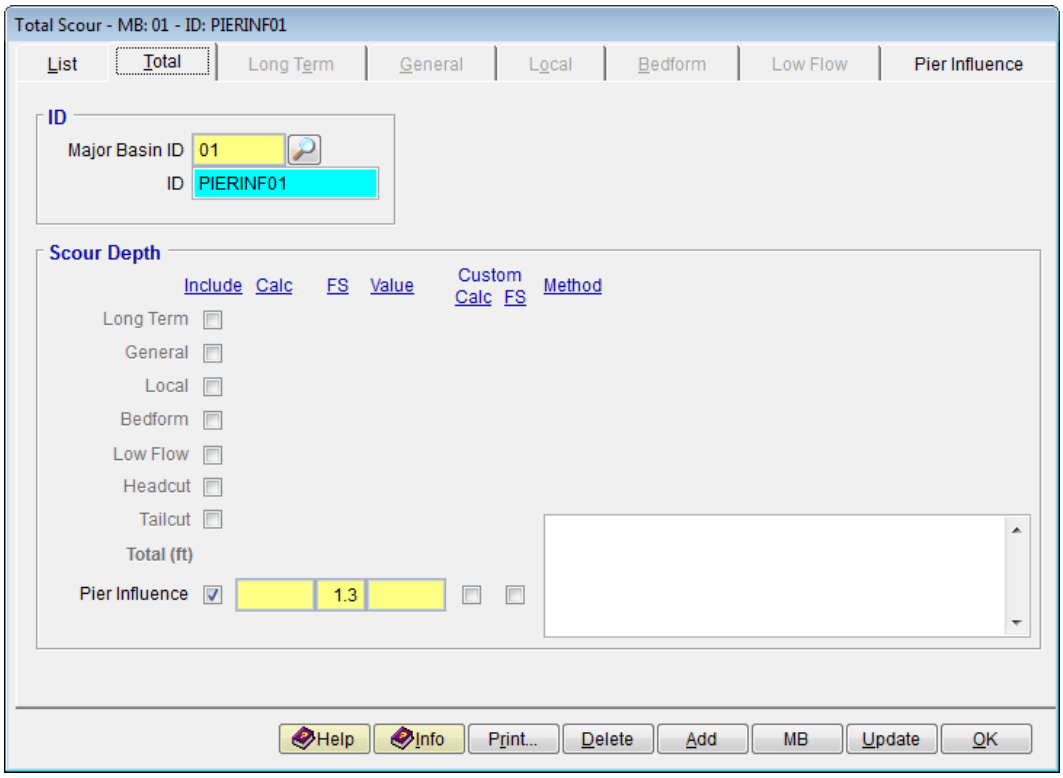


(b) Click the ***Add*** button to activate the necessary data entry fields.

(c) On the **TOTAL SCOUR** form (**Total** tab), enter "*PIERINF01*" into the ***ID*** textbox.

(d) Check the ***Pier Influence*** checkbox only.

(e) Click the ***Save*** button to save the entered data. The **TOTAL SCOUR** form should look like following figure.



3.3 Step 3 – Calculate the Pier Influence Zone Width

(a) On the **TOTAL SCOUR** form, select the ***Pier Influence*** Tab

(b) Enter *"15"* into the ***Pier Scour Depth, Ys (ft)*** textbox.

(c) Enter *"1.0"* into the ***Ratio of bottom width to depth of local pier scour, B*** textbox.

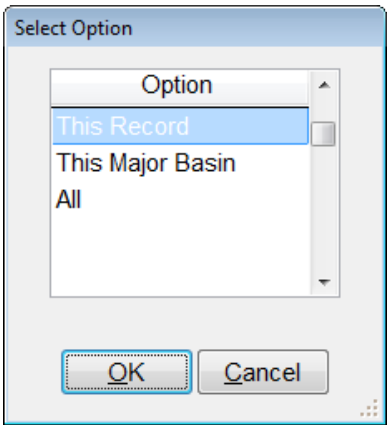
(d) Enter *"44"* into the ***Angle of repose of the bed material in water, (degrees)*** textbox.

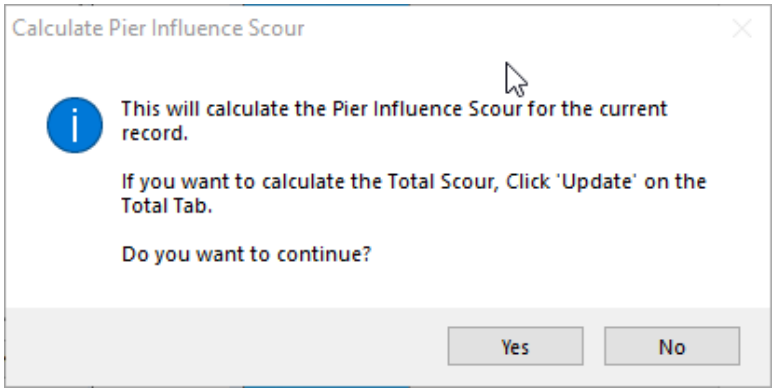
(e) Enter *"10"* into the ***Distance from outside edge of pier, X (ft)*** textbox.

(f) Click the ***Save*** button to save the entered data.

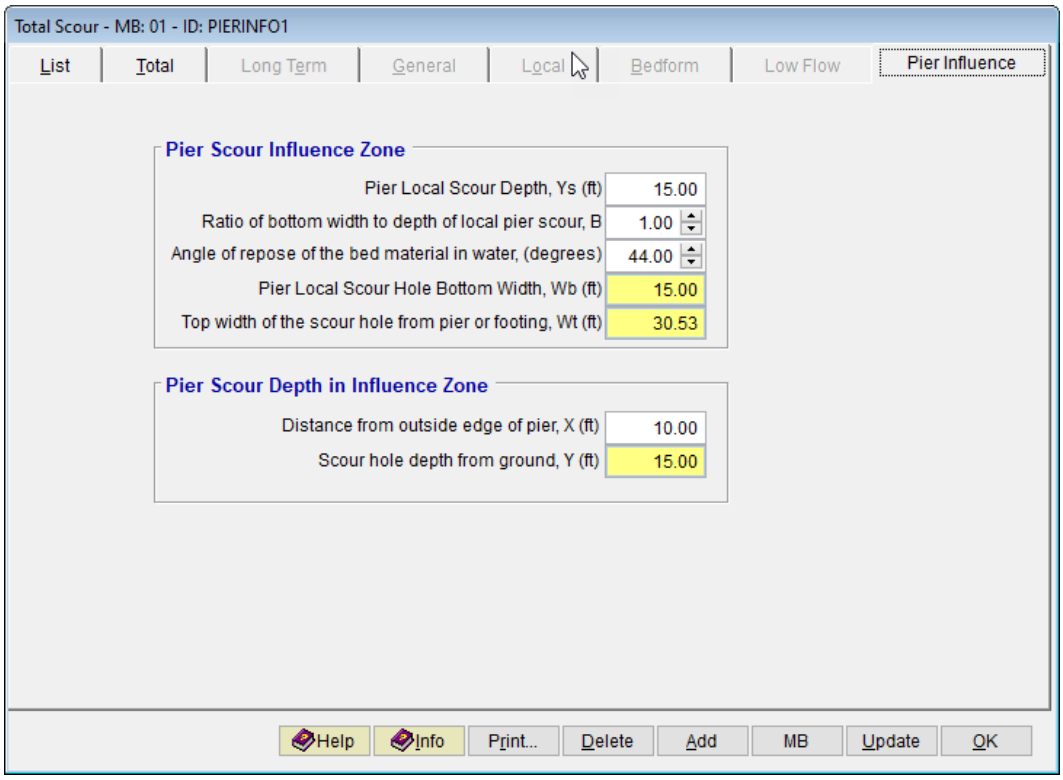
(g) Click the ***Update*** button to update or perform the analysis.

(h) Select "*This Record*" from the **SELECTION OPTION** dialog box, then click ***Yes*** on the **CALCULATE PIER INFLUENCE SCOUR** dialog box to continue.





(i) After the update, the form should look like the figure below.



3.4 Step 4 - Reporting and Documentation of Results

(a) To view the results on the screen, click the ***Print …*** button on the ***Local*** tab of the **TOTAL SCOUR – MB: 01 – ID: PIERINF01** form. A report will be generated as shown.

Flood Control District of Maricopa County
Drainage Design Management System
PIER INFLUENCE ZONE SCOUR

Page 1 — Project Reference: V680_PIER_INFLUENCE — 5/16/2024

ID: PIERINF01

Pier Scour Depth, Ys (ft)	15.00
Ratio of bottom width to depth of local pier scour, B	1.00
Angle of repose of the bed material in water, (degrees)	44.00
Top width of the scour hole from pier or footing, W (ft)	30.53
Distance from outside edge of pier, X (ft)	10.00
Scour hole depth from ground, Y (ft)	**15.00**

(b) To print a hard copy of the results, click the printer symbol ( ).

(c) To export the results to a PDF file or to other file formats, click the export symbol ( )

This concludes the tutorial for pier influence zone calculation.