# Appendix A

# SWAC Methodology and Stream Tube Plots

# APPENDIX A
# GIS-BASED STREAM TUBE METHODOLOGY

## PREPARING THE SAMPLE DATA

1. Sources of sediment transect data:
   a. 1993/1994 Sediment Investigation
   b. 2008 Plainwell No 2 Sediment Transect Sampling
   c. 2008 SRI Sediment Transect Sampling
   d. 2009 SRI Sediment Transect Sampling

2. The transect data points contained interval information in the form of start and end depths.

3. Intervals for SWAC analysis were defined to be:
   a. Interval 1 = 0–6 inches
   b. Interval 2 = 6–12 inches
   c. Interval 3 = 12–24 inches

4. A “participation in interval” calculation was created to appropriately weight a sample concentration by its depth, relative to a given interval because the transect samples were collected at depths that did not necessarily fall into the interval categories used in this SWAC calculation. For example, if a sample (A) had an interval of 0 to 2 inches, and the next sample in the same core (B) had an interval of 2 to 6 inches. The concentration of A was multiplied by 2 inches (the thickness), and then divided by 6 (the full thickness of the analysis interval) or A × 2 / 6. The concentration of B was multiplied by 4 inches (the thickness) and then divided by 6 (the full thickness of the analysis interval) or B × 4 / 6. The two “participation in interval” weighted concentrations are then added together to give one concentration for the analysis of the 0 to 6-inch interval using this core. This is a weighted average based on sampling depth for each sample within an interval.

5. Samples were assigned to each analysis interval that the sample participated in. A single sample could participate in multiple analysis intervals (e.g., a sediment core sampled from 2 to 8 inches would be assigned to Interval 1 and Interval 2).

## CREATING STREAM TUBES

6. The river outline and centerline were used as the extent of the study. These data appear to be compiled from multiple sources, including Geographic Names Information System (GNIS), Digital Raster Graphics (DRGs), and Fieldwork.

7. The centerlines were copied parallel on both sides in 5-foot increments extending to approximately 390 feet beyond the centerline.

8. The ends were capped with additional lines perpendicular to the river centerline of the river in order to support conversion to polygons.

9. The resulting polygons were clipped by the river outline (riverbanks) polygons.

10. The sample data set was queried to only include samples assigned to one interval.

11. A “near” analysis was performed on the polygon data set from step 9. This analysis associates a data point with the stream tube polygons nearest to the data point. Polygons with the same nearest sample point were dissolved to group and merge them into single polygons. Due to the sinuosity of the river, this was approximately 75 percent successful in generating reasonable stream tubes. Manual editing and merging for the remaining 25 percent of the polygons was necessary to establish complete and correct stream tubes associated with each data point.

12. Laterally, stream tube edges are half way between data points in the same transect.

13. Longitudinally, stream tubes between transects ended half way between two transects. Where a Section boundary intersects a stream tube, stream tube boundaries are adjusted to correspond to Section boundaries so that data from one Section does not contribute to another Section only due to stream tube delineation.

14. Once stream tubes were generated for Interval 1, the sample data set was queried to only include samples assigned to Interval 2.

15. A copy of the Interval 1 stream tubes was created to serve as the starting point of the stream tubes for Interval 2.

16. If data points existed in Interval 1, but did not exist in Interval 2, the stream tube in the second interval with no data point associated with the stream tube was removed.

17. Steps 15 through 17 were repeated with stream tubes from the second interval and a data query for the third interval to create stream tubes for interval 3 data points.

18. Stream tubes were attributed by Section IDs.

19. Intervals deeper than Interval 3 (12 to 24 inches) were not analyzed due to the depth and paucity of data.

**ATTRIBUTING THE STREAM TUBES WITH THE SAMPLE LOCATION DATA FOR NON-TRANSECT DATA POINTS**

20. Both the stream tubes and the sample data were queried to Interval 1 only.

21. There were a few points that were not associated with a complete transect. These points were referred to as non-transect data points. These points were the result of transects where samples could not be gathered. A spatial join by location on the stream tubes and

non-transect data points was performed and these non-transect data points associated with the appropriate stream tube. Concentrations for the non-transect and transect data points were averaged for the stream tube.

**CALCULATING THE SWAC**

The area of the stream tube polygon was calculated for each Section. The total area of the polygons within that Section was summed (total Section area) and the following calculation for each individual polygon was performed:

$$\frac{\textit{(Individual Polygon Area) x (Participation Weighted Concentration)}}{\textit{(Total Area of Section)}}$$

This is the contribution of an individual stream tube to the SWAC. The sum of all the individual polygon contributions within a Section and depth interval equals the SWAC for that Section.