

## **APPENDIX J**

### **POLLUTION LOAD MODEL DOCUMENTATION FOR CRITICAL AREAS**

## APPENDIX J:

### Pollution Load Model Documentation For Critical Areas

#### Model Input Values

LANDUSE	IMPERVIOUS %	Event Mean Concentrations (EMC)			
		Coliform (cnts/100ml)	TSS (mg/l)	TN (mg/l)	TP (mg/l)
Water	0	500	70	1.25	0.11
Open Water	0	500	70	1.25	0.11
Low Intensity Res	25	22000	100	1.8	0.5
High Intensity Res	50	22000	100	2.42	0.5
Commercial/Ind/Transportation	85	22000	100	2.5	0.43
Barren	15	500	1000	1	0.2
Bare Rock	15	500	500	1.18	0.2
Quarries/Mines	15	500	1000	1.18	0.2
Transitional Lands	5	1000	500	1.25	0.2
Deciduous Forest	2	1000	25	1.1	0.2
Evergreen Forest	2	1000	25	1.1	0.2
Mixed Forest	2	1000	25	1.1	0.2
Pasture/Hay	15	12000	1200	6.75	0.25
Row Crops	2	2500	650	6.5	0.5
Small Grains	2	2500	400	6.4	0.45
Bare Soil	2	2500	4000	6.7	0.55
Other Grass Areas	2	22000	300	6	0.4
Woody Wet	0	200	20	1.6	0.19
Emergent	0	200	20	1.6	0.19

Hydrology assumptions: 37 inches of rain per year and 90% of rain events create runoff.

#### Livestock

For land cover classified as pasture, 0.3 livestock animals were assumed per acre. This is based on national livestock data for the eastern states. Each individual livestock animal produces an average of  $1.97 \times 10^{12}$  coliform units per year (Metcalf and Eddy, 1991). This criterion was also incorporated to supplement the nitrogen and phosphorous modeling.

## Target Nutrient Loads

Target nutrient loads were calculated for each critical area. Target annual average concentration values of total suspended sediment (TSS), total nitrogen and total phosphorous were provided by the watershed committee as 80 mg/l, 10 mg/l and 0.3 mg/l respectively. These concentrations were incorporated into an average annual runoff volume for each critical area.

The average annual runoff volume was calculated for each critical area using the equations below and :

Agriculture/Pasture	$Q = 0.008312 * \exp ( 0.011415 * P )$
Forest	$Q = 0.0053 * \exp ( 0.010993 * P )$
Urban	$Q = 0.24 * P$
Open Water/Wetlands	$Q = 0$

P = Precipitation (37 in)

Q = Runoff (in)

Average annual stream flow records from three USGS gaging stations were tabulated to validate the accuracy of runoff calculations. The station identifications are provided below:

- 04100500 ELKHART RIVER AT GOSHEN, IN
- 04099510 PIGEON CREEK NR ANGOLA, IN
- 03330500 TIPPECANOE RIVER AT OSWEGO, IN

## Pollution Load Model Documentation For Overall Watershed (non-critical areas)

### Model Input Values

LANDUSE	IMPERVIOUS %	Event Mean Concentrations (EMC)			
		PATHOGENS (cnts/100ml)	TSS (mg/l)	TN (mg/l)	TP (mg/l)
Water	0	500.0	70.0	1.25	0.11
Open Water	0	500.0	70.0	1.25	0.11
Low Intensity Res	25	6000.0	100.0	1.80	0.50
High Intensity Res	50	6000.0	100.0	2.42	0.50
Commercial/Ind/Transportation	85	6000.0	100.0	2.50	0.43
Barren	15	500.0	1000.0	1.00	0.20
Bare Rock	15	500.0	500.0	1.18	0.20
Quarries/Mines	15	500.0	1000.0	1.18	0.20
Transitional Lands	5	500.0	500.0	1.25	0.20
Deciduous Forest	2	500.0	25.0	1.10	0.20
Evergreen Forest	2	500.0	25.0	1.10	0.20
Mixed Forest	2	500.0	25.0	1.10	0.20
Pasture/Hay	15	10000.0	1000.0	2.48	0.20
Row Crops	2	4000.0	750.0	6.50	0.50
Small Grains	2	4000.0	300.0	6.40	0.45
Bare Soil	2	4000.0	4000.0	6.70	0.55
Other Grass Areas	2	4000.0	300.0	6.00	0.40
Woody Wet	0	500.0	20.0	1.60	0.19
Emergent	0	500.0	20.0	1.60	0.19

Hydrology assumptions: 37 inches of rain per year and 90% of rain events create runoff.

## References

*Areawide Water Quality management Plan*. Northeast Illinois Planning Commission, 1979.

Quenzer, Ann Marie. *A GIS Assessment of the Total Loads and Water Quality in the Corpus Christi Bay System*. University of Texas at Austin, 1997.

Metcalf and Eddy. *Wastewater Engineering Treatment, Disposal and Reuse*. Third Edition, Mc Graw Hill, New York, 1991.

National Urban Runoff Program (NURP). United States Environmental Protection Agency, 1983.

Quenzer, Ann Marie. *A GIS Assessment of the Total Loads and Water Quality in the Corpus Christi Bay System*. University of Texas at Austin, 1997.

*Urban Targeting and BMP Selection*. United States Environmental Protection Agency, 1989.

Lin, Jeff P. *Review of Published Export Coefficient and Event Mean Concentration Data*. Wetlands Regulatory Assistance Program, September 2004.

XP-SWMM Manual, Appendix IV.