

# Alabama Department of Environmental Management

## TMDL Town Creek – Tennessee River Basin Organic Enrichment/Dissolved Oxygen Ammonia

July 25, 1996  
Water Quality Branch

**MEMORANDUM**

To: Water Quality File

From: Charles Reynolds  
Water Quality Branch

Subject: Town Creek TMDL

As mandated by section 303(d) of the Clean Water Act, a seasonal TMDL has been completed for Town Creek in DeKalb and Marshall counties. Town Creek is a tributary to the Tennessee River (Lake Guntersville). Town Creek is classified as Fish & Wildlife (F&W).

All of Town Creek, a distance of 60.1 miles, was shown on the 303(d) list as partially supporting its F&W use classification. Due to the historical development of this model (see the summer and winter rationales), Town Creek was divided into two models. The original model begins at the Hudson Foods outfall and extends to the Lake Guntersville backwaters, a distance of approximately 9½ miles. This part of the modeled reach is referred to as the point source part of the TMDL (i.e., the PS model). The other part of the model begins at Town Creek's source and goes to the Hudson Foods outfall, a distance of approximately 50½ miles. This part of the modeled reach is referred to as the nonpoint source part of the TMDL (i.e., the NPS model).

Attached are three spreadsheets summarizing all relevant information for the TMDLs, including maximum allowable loadings. "Total LA" refers to "total load allocation" and is the maximum allowable loadings from all nonpoint sources, including tributaries, headwaters and incremental inflow (IF). "Total WLA" refers to "total waste load allocation" and is the maximum allowable loadings from all point sources. "Total Loading" is the sum of all point and nonpoint source loadings and is the maximum allowable loadings from all sources.

One of the spreadsheets is labeled "ADEM TMDL SUMMARY/SUMMER/PS MODEL." This sheet lists allowable loadings for the PS part of the model in summer. There is no NPS model for summer because there is no flow upstream of the Hudson Foods outfall in the summer (in fact, the only flow present in the summer model is the Hudson Foods effluent). The second sheet is labeled "ADEM TMDL SUMMARY/WINTER/NPS MODEL." This sheet lists allowable loadings for the NPS part of the model in winter. The third sheet is labeled "ADEM TMDL SUMMARY/WINTER/PS MODEL." This sheet lists allowable loadings for the PS part of the model in winter.

One of the sources of water quality impairment to this waterbody is the point source wastewater discharge from Hudson Foods. In order to bring D.O. model predictions up to the required F&W D.O. standard of 5 mg/l, pollutant loading reductions had to be made to the Hudson Foods WWTP for summer. Effluent limitations for the winter season remained the same as they were in the

previous permit (see summer and winter rationales). The seasonal effluent limitations for Hudson Foods are as follows:

<b>PARAMETER</b>	<b>SUMMER</b>	<b>WINTER</b>
CBOD <sub>5</sub> (mg/l)	5	10
NH <sub>3</sub> -N (mg/l)	1.2	3
Min. D.O. (mg/l)	6	6.

In previous modeling for this discharger, an ultimate-to-five-day CBOD ratio (CBOD<sub>U</sub>/CBOD<sub>5</sub>) of 1.5 was assumed. It is the opinion of the Water Quality Branch that a more appropriate ratio for a rendering facility is 3. That is the value employed for Hudson Foods in the current modeling.

Chronic ammonia toxicity to aquatic life was considered for both seasons. For the NPS model in the winter season, the maximum allowable instream NH<sub>3</sub>-N concentration was determined to be 2.14 mg/l. This was calculated from the EPA 15°C criterion. For the PS model at the Hudson Foods outfall, the EPA criteria for 28 and 15°C were employed for summer and winter, respectively. This resulted in allowable Hudson Foods' effluent NH<sub>3</sub>-N concentrations of 1.2 and 74.3 mg/l, respectively, for the summer and winter.

**MEMORANDUM**

To: Clay Wood  
Industrial Branch

From: Charles Reynolds  
Water Quality Branch

Subject: Effluent Limitations for Hudson Foods/DeKalb County

As mandated by section 303(d) of the Clean Water Act, a seasonal TMDL has been completed for Town Creek in DeKalb and Marshall counties. In conjunction with this work, seasonal effluent limitations were determined for Hudson Foods. Two seasons were modeled - winter and summer. Winter includes the months of December through April; summer, the other seven months.

The design wasteflow assumed for Hudson Foods was 0.14 mgd. The water quality model predicted the following effluent limitations for each season:

<b>PARAMETER</b>	<b>SUMMER</b>	<b>WINTER</b>
CBOD <sub>5</sub> (mg/l)	5	10
NH <sub>3</sub> -N (mg/l)	1.2	3
Min. D.O. (mg/l)	6	6.

In previous modeling for this discharger, an ultimate-to-five-day CBOD ratio (CBOD<sub>U</sub>/CBOD<sub>5</sub>) of 1.5 was assumed. It is the opinion of the Water Quality Branch that a more appropriate ratio for a rendering facility is 3. That is the value employed for Hudson Foods in the current modeling. If Hudson Foods disagrees with this ratio, the Water Quality Branch would recommend that actual longterm CBOD data be obtained on its effluent. If Hudson Foods decides to do this, please have them contact the Water Quality Branch for the correct procedure to follow in obtaining longterm CBOD data.

Chronic ammonia toxicity to aquatic life was considered at the Hudson Foods outfall for both seasons. The summer ammonia number listed above is limited by chronic toxicity; the winter number, by water quality.

The model was run using routine EPA modeling procedures. Low flows for winter and summer critical conditions were calculated using data from a USGS gage on Town Creek near Geraldine at Alabama Highway 75 (#03572900). If you have any questions concerning this situation, please don't hesitate to let me know.

**ADEM TMDL SUMMARY/SUMMER/PS MODEL**

**Impacted Waterbody:** Town Creek  
**303(d) Priority Ranking:** Medium  
**County(s):** DeKalb, Marshall  
**Size:** 9.49 miles  
**From:** Lake Guntersville  
**To:** Hudson Foods Outfall  
**Use Classification:** F&W  
**Support Status:** Partial  
**Causes:** Toxicity, Pesticides, Ammonia, Nutrients, pH, Siltation, Org Enrichment, Pathogens  
**Sources:** Industrial, Non-Irrigated Crop Production, Specialty Crop Production, Feedlots, Animal Holding Areas, Urban Surface Runoff  
**Critical Conditions:** 7Q<sub>10</sub> Flows & 28°C Temp  
**Water Quality Model:** DOMODEL  
**MOS:** 7Q<sub>10</sub> Flows, 28°C Temp & Model Reaction Rate Coefficients  
**Pollutants Evaluated:** CBOD<sub>5</sub>, NH<sub>3</sub>-N & Ammonia Toxicity  
**Background Numbers for Ammonia Toxicity:** 28°C Temp & pH of 7  
**EPA Chronic Total Ammonia Criterion:** 1.43 mg/l

**TMDL LOADINGS (ppd)**

Source	CBOD <sub>5</sub>	NH <sub>3</sub> -N
Headwaters	0	0
Incremental Inflow (IF)	0	0
<b>Total LA</b>	0	0
Hudson Foods	5.84	1.40
<b>Total WLA</b>	5.84	1.40
<b>Total Loading</b>	5.84	1.40

**SUMMER TMDL: TOWN CREEK/PS MODEL**

SOURCE	FLOW		CONCENTRATION (mg/l)				LOADING (ppd)	
	(cfs)	(mgd)	CBODU	CBOD5	ANOD	NH3-N	CBOD5	NH3-N
Headwaters	0	0.00	2	1.33	0.5	0.11	0.00	0.00
IF	0	0.00					0.00	0.00
Hudson Foods		0.14	15	5.00	5.484	1.20	5.84	1.40

**ADEM TMDL SUMMARY/WINTER/NPS MODEL**

**Impacted Waterbody:** Town Creek  
**303(d) Priority Ranking:** Medium  
**County(s):** DeKalb, Marshall  
**Size:** 50.61 miles  
**From:** Hudson Foods  
**To:** Its Source  
**Use Classification:** F&W  
**Support Status:** Partial  
**Causes:** Toxicity, Pesticides, Ammonia, Nutrients, pH, Siltation, Org Enrichment, Pathogens  
**Sources:** Non-Irrigated Crop Production, Specialty Crop Production, Feedlots, Animal Holding Areas, Urban Surface Runoff  
**Critical Conditions:** Monthly 7Q<sub>10</sub> Flows & 15°C Temp  
**Water Quality Model:** DOMODEL  
**MOS:** Monthly 7Q<sub>10</sub> Flows, 15°C Temp & Model Reaction Rate Coefficients  
**Pollutants Evaluated:** CBOD<sub>5</sub>, NH<sub>3</sub>-N & Ammonia Toxicity  
**Background Numbers for Ammonia Toxicity:** 15°C Temp & pH of 7  
**EPA Chronic Total Ammonia Criterion:** 2.60 mg/l

**TMDL LOADINGS (ppd)**

<b>Source</b>	<b>CBOD<sub>5</sub></b>	<b>NH<sub>3</sub>-N</b>
Headwaters	0.00	0.00
Incremental Inflow (IF)	1686.33	90.13
Crow Creek	129.39	6.92
Shumaker Branch	101.35	5.42
Bengis Creek	504.61	26.97
Caney Creek	133.70	7.15
Ivy Creek	103.51	5.53
Rock Creek	103.51	5.53
Reedy Creek	200.55	10.72
<b>Total LA</b>	<b>2963</b>	<b>158.4</b>
<b>Total WLA</b>	<b>0</b>	<b>0</b>
<b>Total Loading</b>	<b>2963</b>	<b>158.4</b>

**WINTER TMDL: TOWN CREEK/NPS MODEL**

SOURCE	FLOW		CONCENTRATION (mg/l)				LOADING (ppd)	
	(cfs)	(mgd)	CBOD <sub>U</sub>	CBOD <sub>5</sub>	ANOD	NH <sub>3</sub> -N	CBOD <sub>5</sub>	NH <sub>3</sub> -N
Headwaters	0.00	0.00	60	40.00	9.77	2.14	0.00	0.00
Incremental Inflow (IF)	7.82	5.05	60	40.00	9.77	2.14	1686.33	90.13
Crow Creek	0.6	0.39	60	40.00	9.77	2.14	129.39	6.92
Shumaker Branch	0.47	0.30	60	40.00	9.77	2.14	101.35	5.42
Bengis Creek	2.34	1.51	60	40.00	9.77	2.14	504.61	26.97
Caney Creek	0.62	0.40	60	40.00	9.77	2.14	133.70	7.15
Ivy Creek	0.48	0.31	60	40.00	9.77	2.14	103.51	5.53
Rock Creek	0.48	0.31	60	40.00	9.77	2.14	103.51	5.53
Reedy Creek	0.93	0.60	60	40.00	9.77	2.14	200.55	10.72

## ADEM TMDL SUMMARY/WINTER/NPS MODEL

**Impacted Waterbody:** Town Creek  
**303(d) Priority Ranking:** Medium  
**County(s):** DeKalb, Marshall  
**Size:** 50.61 miles  
**From:** Hudson Foods  
**To:** Its Source  
**Use Classification:** F&W  
**Support Status:** Partial  
**Causes:** Toxicity, Pesticides, Ammonia, Nutrients, pH, Siltation, Org Enrichment, Pathogens  
**Sources:** Non-Irrigated Crop Production, Specialty Crop Production, Feedlots, Animal Holding Areas, Urban Surface Runoff  
**Critical Conditions:** Monthly 7Q<sub>10</sub> Flows & 15°C Temp  
**Water Quality Model:** DOMODEL  
**MOS:** Monthly 7Q<sub>10</sub> Flows, 15°C Temp & Model Reaction Rate Coefficients  
**Pollutants Evaluated:** CBOD<sub>5</sub>, NH<sub>3</sub>-N & Ammonia Toxicity  
**Background Numbers for Ammonia Toxicity:** 15°C Temp & pH of 7  
**EPA Chronic Total Ammonia Criterion:** 2.60 mg/l

### TMDL LOADINGS (ppd)

Source	CBOD <sub>5</sub>	NH <sub>3</sub> -N
Headwaters	0.00	0.00
Incremental Inflow (IF)	56.21	4.61
Crow Creek	4.31	0.35
Shumaker Branch	3.38	0.28
Bengis Creek	16.82	1.38
Caney Creek	4.46	0.37
Ivy Creek	3.45	0.28
Rock Creek	3.45	0.28
Reedy Creek	6.68	0.55
<b>Total LA</b>	<b>98.8</b>	<b>8.10</b>
<b>Total WLA</b>	<b>0</b>	<b>0</b>
<b>Total Loading</b>	<b>98.8</b>	<b>8.10</b>

**WINTER TMDL: TOWN CREEK/NPS MODEL**

<b>SOURCE</b>	<b>FLOW</b>		<b>CONCENTRATION (mg/l)</b>				<b>LOADING (ppd)</b>	
	<b>(cfs)</b>	<b>(mgd)</b>	<b>CBOD<sub>U</sub></b>	<b>CBOD<sub>5</sub></b>	<b>ANOD</b>	<b>NH<sub>3</sub>-N</b>	<b>CBOD<sub>5</sub></b>	<b>NH<sub>3</sub>-N</b>
Headwaters	0.00	0.00	2	1.33	0.5	0.11	0.00	0.00
Incremental Inflow (IF)	7.82	5.05	2	1.33	0.5	0.11	56.21	4.61
Crow Creek	0.6	0.39	2	1.33	0.5	0.11	4.31	0.35
Shumaker Branch	0.47	0.30	2	1.33	0.5	0.11	3.38	0.28
Bengis Creek	2.34	1.51	2	1.33	0.5	0.11	16.82	1.38
Caney Creek	0.62	0.40	2	1.33	0.5	0.11	4.46	0.37
Ivy Creek	0.48	0.31	2	1.33	0.5	0.11	3.45	0.28
Rock Creek	0.48	0.31	2	1.33	0.5	0.11	3.45	0.28
Reedy Creek	0.93	0.60	2	1.33	0.5	0.11	6.68	0.55

**ADEM TMDL SUMMARY/WINTER/PS MODEL**

**Impacted Waterbody:** Town Creek  
**303(d) Priority Ranking:** Medium  
**County(s):** DeKalb, Marshall  
**Size:** 9.49 miles  
**From:** Lake Guntersville  
**To:** Hudson Foods Outfall  
**Use Classification:** F&W  
**Support Status:** Partial  
**Causes:** Toxicity, Pesticides, Ammonia, Nutrients, pH, Siltation, Org Enrichment, Pathogens  
**Sources:** Industrial, Non-Irrigated Crop Production, Specialty Crop Production, Feedlots, Animal Holding Areas, Urban Surface Runoff  
**Critical Conditions:** Monthly 7Q<sub>10</sub> Flows & 15°C Temp  
**Water Quality Model:** DOMODEL  
**MOS:** Monthly 7Q<sub>10</sub> Flows, 15°C Temp & Model Reaction Rate Coefficients  
**Pollutants Evaluated:** CBOD<sub>5</sub>, NH<sub>3</sub>-N & Ammonia Toxicity  
**Background Numbers for Ammonia Toxicity:** 15°C Temp & pH of 7  
**EPA Chronic Total Ammonia Criterion:** 2.60 mg/l

**TMDL LOADINGS (ppd)**

Source	CBOD <sub>5</sub>	NH <sub>3</sub> -N
Headwaters	1267.36	73.97
Incremental Inflow (IF)	310.53	16.60
<b>Total LA</b>	1578	90.6
Hudson Foods	11.68	3.50
<b>Total WLA</b>	11.68	3.50
<b>Total Loading</b>	1590	94.1

**WINTER TMDL: TOWN CREEK/PS MODEL**

SOURCE	FLOW		CONCENTRATION (mg/l)				LOADING (ppd)	
	(cfs)	(mgd)	CBODU	CBOD5	ANOD	NH3-N	CBOD5	NH3-N
Headwaters	13.73	8.88	25.683	17.12	4.567	1.00	1267.36	73.97
IF	1.44	0.93	60	40.00	9.77	2.14	310.53	16.60
Hudson Foods		0.14	30	10.00	13.71	3.00	11.68	3.50

**TOWN CREEK/GERALDINE/SUMMER/PS MODEL**

SW1/4, Sec 28, T7S, R6E

Lat. Long.

34°23'30" 86°01'04"

NH<sub>3</sub> Toxicity=1.2 mg/l

Q<sub>w</sub>=0.14 mgd

7Q<sub>10</sub>=0 cfs

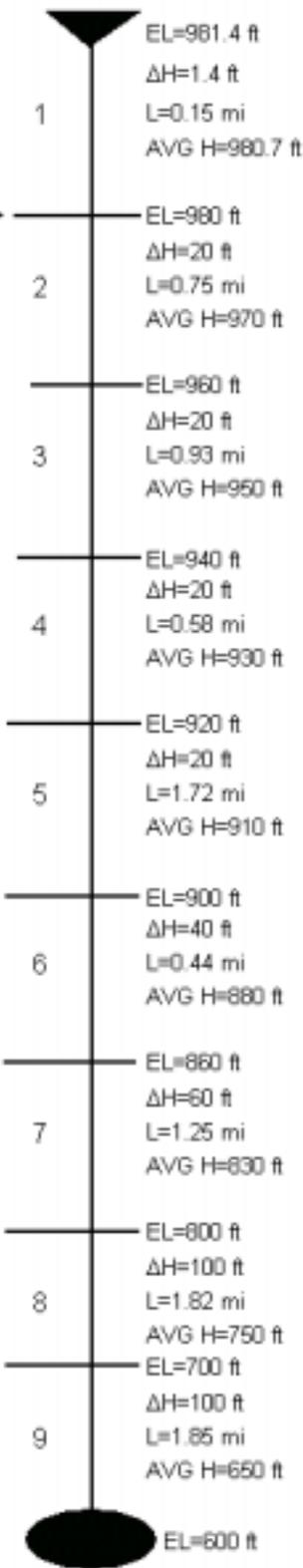
T=28° C

IF=0

Total Length=9.49 miles

FALLS  
HGT=15 ft

HIGH FALLS  
HGT=20 ft



**LAKE GUNTERSVILLE**

### TOWN CREEK/GERALDINE/WINTER/NPS MODEL

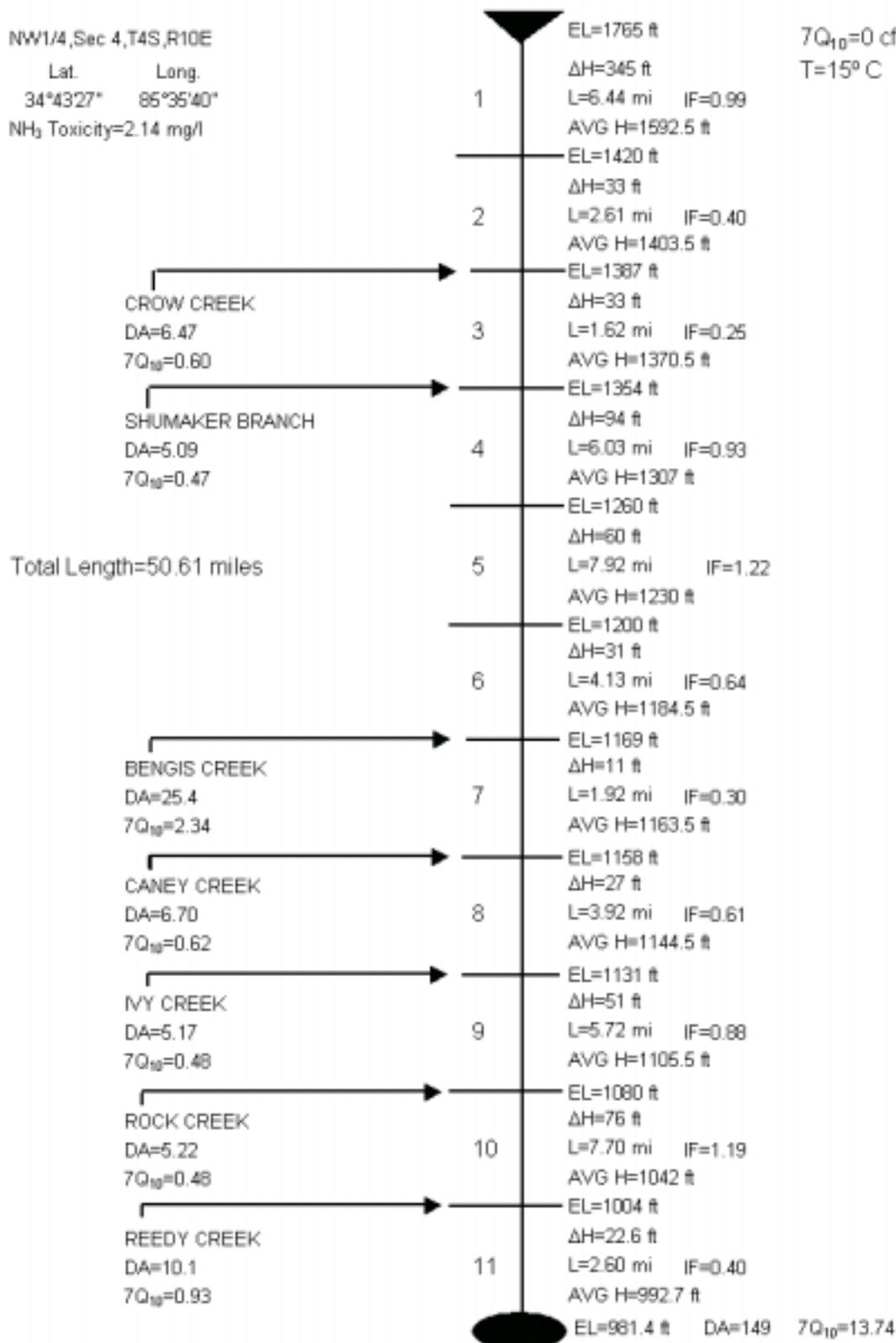
NW1/4, Sec 4, T4S, R10E

Lat. Long.  
34°43'27" 85°35'40"

NH<sub>3</sub> Toxicity=2.14 mg/l

7Q<sub>10</sub>=0 cfs

T=15° C



**HUDSON FOODS**

TOWN CREEK/GERALDINE/WINTER/PS MODEL

SW1/4,Sec 28,T7S,R6E

Lat. Long.  
34°23'30" 86°01'04"

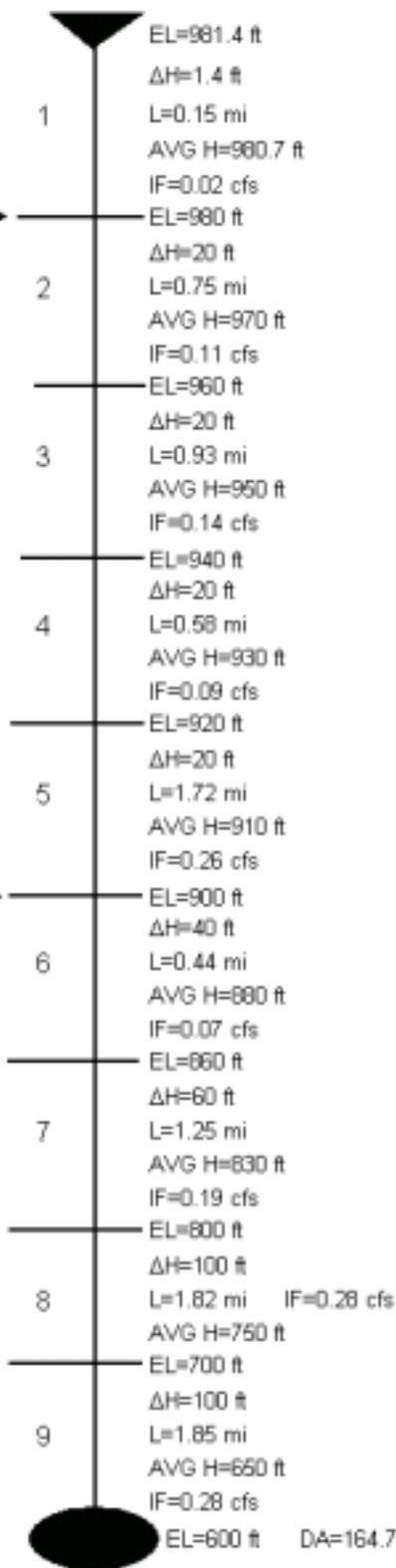
NH<sub>3</sub> Toxicity=74.3 mg/l

Q<sub>w</sub>=0.14 mgd  
7Q<sub>10</sub>=13.74 cfs  
T=15° C

Total Length=9.49 miles

FALLS  
HGT=15 ft

HIGH FALLS  
HGT=20 ft



DA=164.7 7Q<sub>10</sub>=15.19

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