

## HYDROLOGIC AND HYDRAULIC MODELING

**Hydrologic**    Precipitation & Basin Parameters,  
Flood Frequency Analysis

**Hydraulic**    Energy & Momentum Relationships

## HYDROLOGIC MODELING

**Water Budget Analysis**    Droughts  
Water Supply  
Rule Curve

**Hydrologic Routings**    Overland Flow  
*(Rational Formula:  $Q = CIA$ )*  
River Channel  
*(Muskingum, Straddle Stagger, etc.)*

**Flood Frequencies**    e.g., 50 & 100 Year Floods  
*(log Pearson Type III distribution)*

# HYDRAULIC MODELING

**Steady State**                      Step Backwater Computations  
(*FEMA FIRM Flood Studies*)

**Unsteady State**                      Dam Breach Analyses,  
Detail Flood Studies,  
Dynamic Riverine Conditions

# HYDRAULIC MODELING HISTORY

**Pre 1970**                      **Paper Spreadsheets**

**Physical Models**

*Logan Martin at Univ of AL  
Farley Nuclear Plant at Auburn Univ  
US Army Corps of Engineers  
Waterways Experiment Station (WES)  
at Vicksburg, MS*

**Post 1970**                      **Fortran 66**

*US Army Corps of Engineers  
Hydrologic Engineering Center (HEC)  
at Davis, CA*

HEC-1 (*Basin Overland Flow*)

**HEC HMS**

HEC-2 (*Steady State River Routings*)

**HEC RAS** (*Also Unsteady State*)

HEC-5 (*Reservoir Operations*)

**RES SIM**

HEC-6 (*Sediment Transport*)

  
**NEXGEN**

# HYDRAULIC MODELING HISTORY *(Continued)*

Post 1977

DAMBRK

*Dr. Danny Fread  
National Weather Service (NWS)  
Silver Springs, MD*

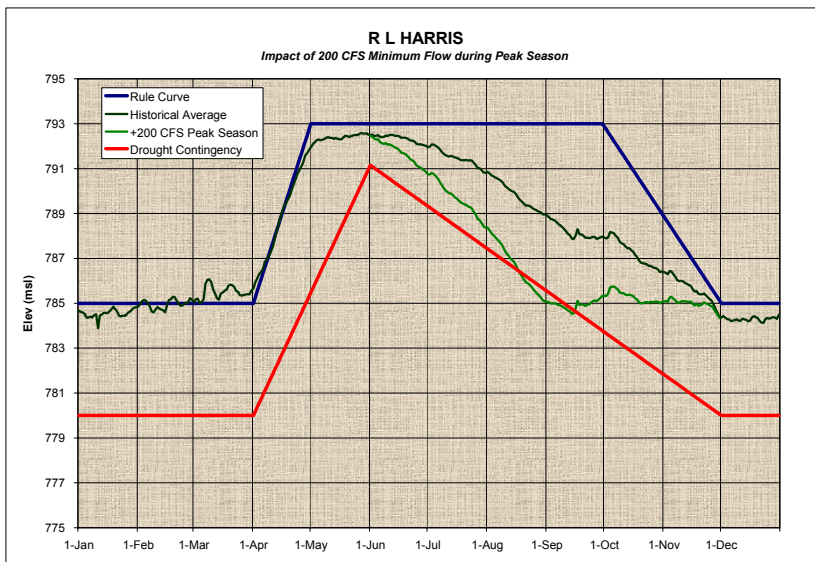
UNET

*Dr. Robert Barkau  
at Colorado State*

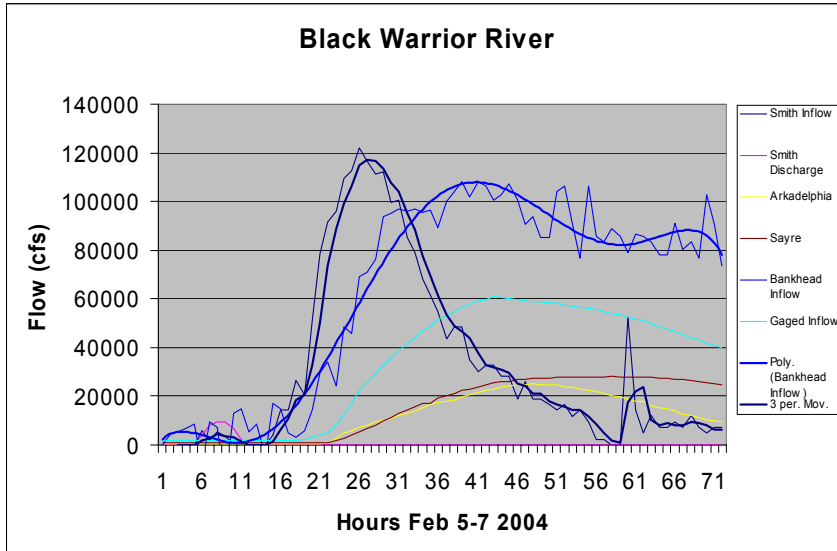
DWOPER  
BRANCH  
FLDWAV

HEC RAS

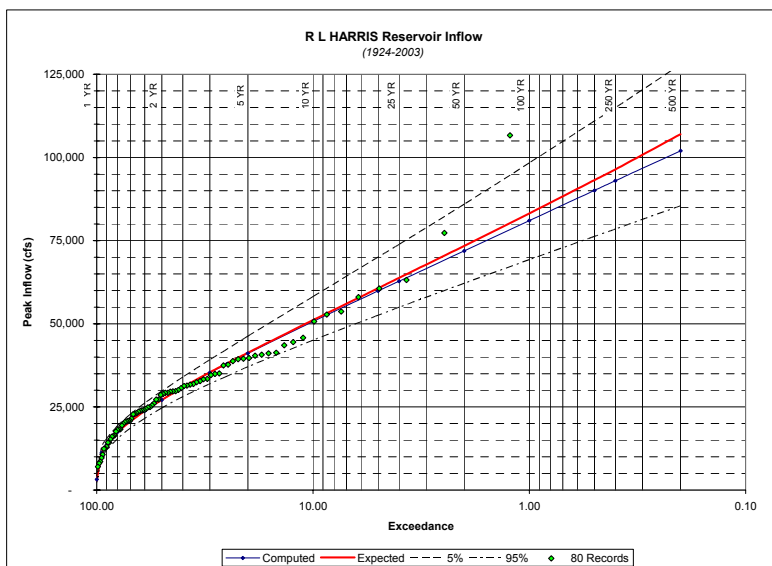
## HYDROLOGIC MODELING EXAMPLE – *(Water Budget)*



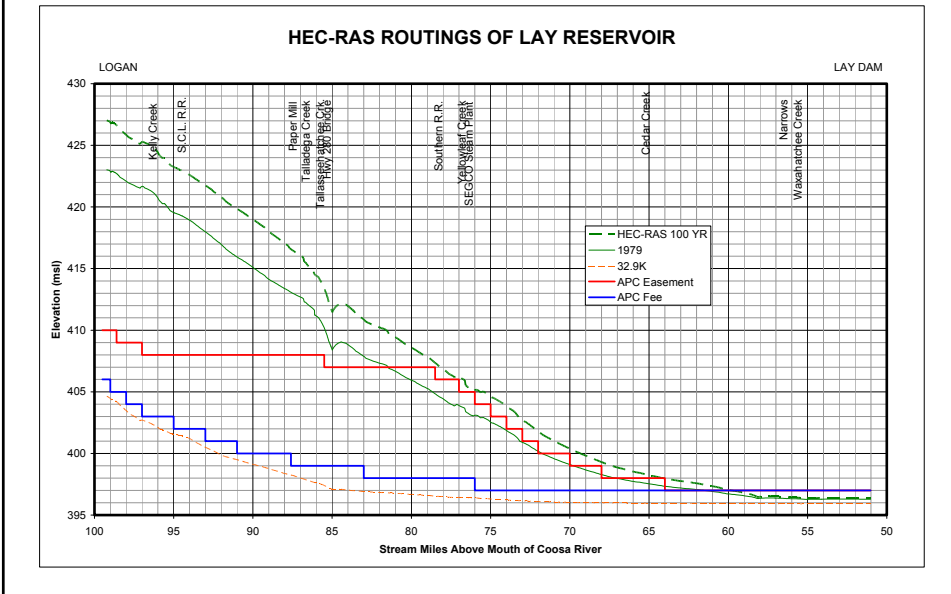
### HYDROLOGIC MODELING EXAMPLE – (Routings)



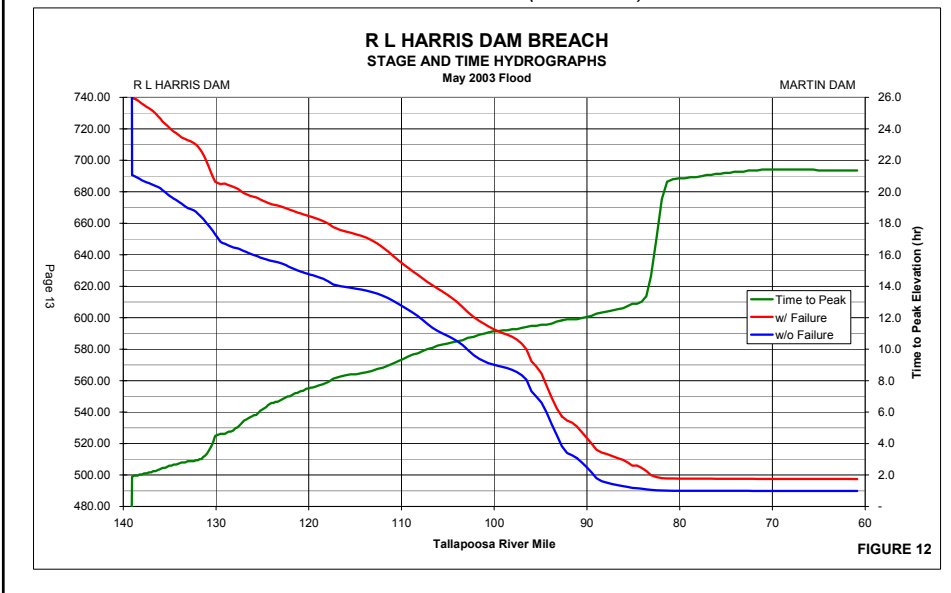
### HYDROLOGIC MODELING EXAMPLE – (Flood Frequency Analysis)



### HYDRAULIC MODELING EXAMPLE - (HEC-RAS Steady State)

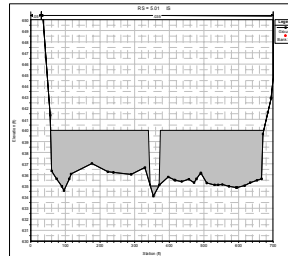
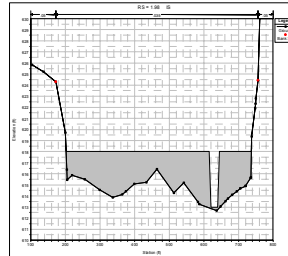
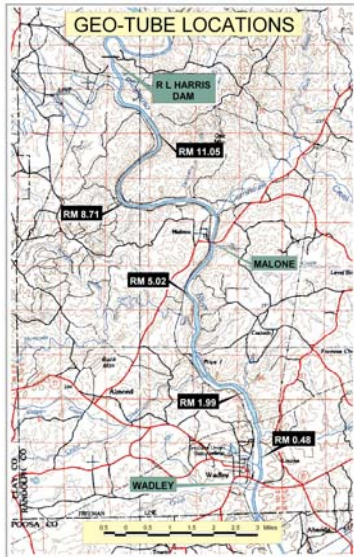


### HYDRAULIC MODELING EXAMPLE - (DAMBRK)

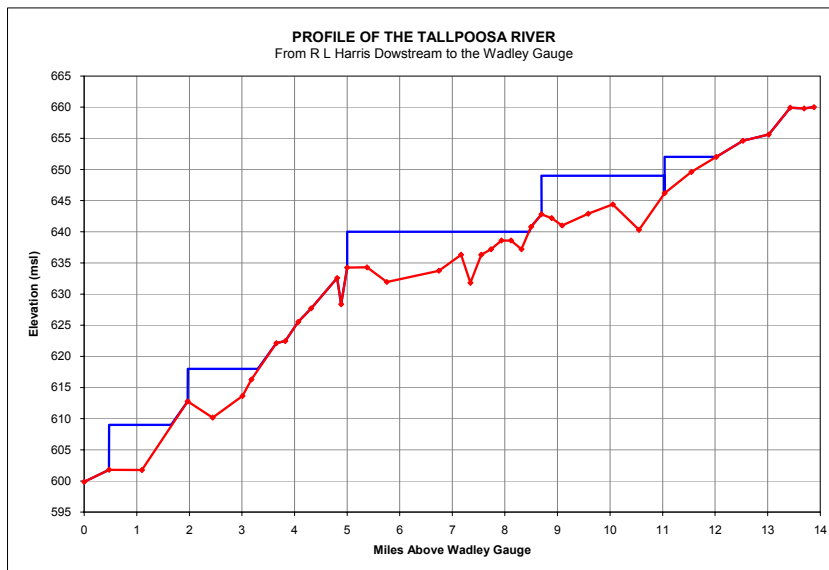


**FIGURE 12**

### HYDRAULIC MODELING EXAMPLE - (HEC-RAS Unsteady State)



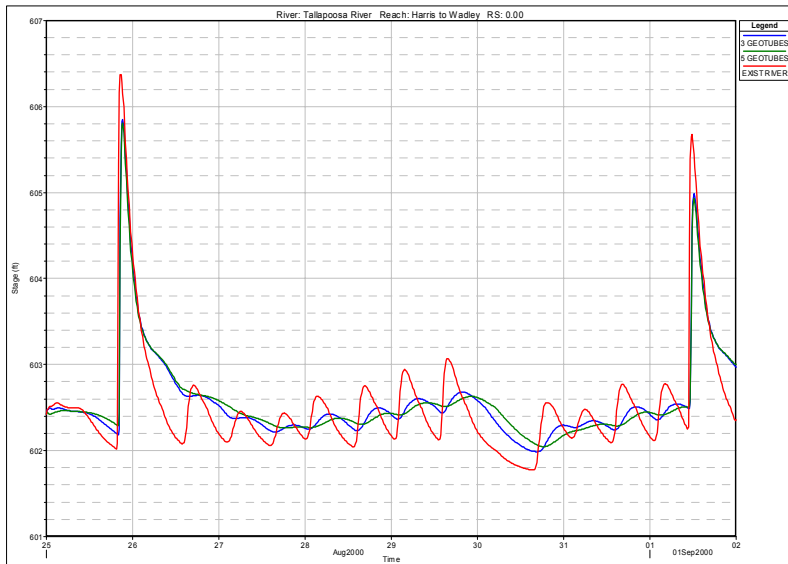
### HYDRAULIC MODELING EXAMPLE - (HEC-RAS Unsteady State)



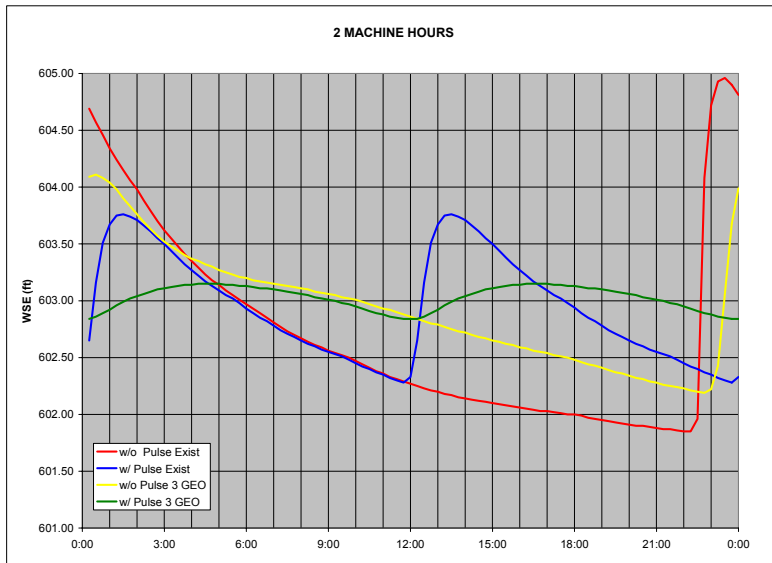
## HYDRAULIC MODELING EXAMPLE - (HEC-RAS Unsteady State)

R L HARRIS GENERATION SCHEDULE																							
8/25/2000      FRIDAY      753 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
8/26/2000      SATURDAY      170 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
8/27/2000      SUNDAY      261 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
8/28/2000      MONDAY      323 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
8/29/2000      TUESDAY      140 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
8/30/2000      WEDNESDAY      182 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
8/31/2000      THURSDAY      253 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
9/1/2000      FRIDAY      491 CFS																							
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1																							
2																							
9/6/2003      SATURDAY      428 CFS																							
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1																							
2																							
9/7/2003      SUNDAY      238 CFS																							
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1																							
2																							
9/8/2003      MONDAY      2,322 CFS																							
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2																							
9/9/2003      TUESDAY      1,186 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
9/10/2003      WEDNESDAY      1,653 CFS																							
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1																							
2																							
9/11/2003      THURSDAY      1,123 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
9/12/2003      FRIDAY      1,014 CFS																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																							
2																							
9/13/2003      SATURDAY      2,461 CFS																							
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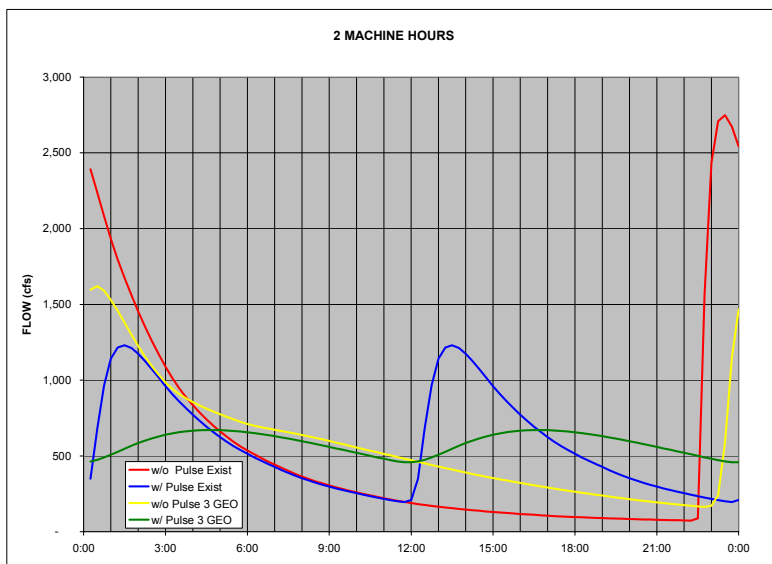
## HYDRAULIC MODELING EXAMPLE - (HEC-RAS Unsteady State)



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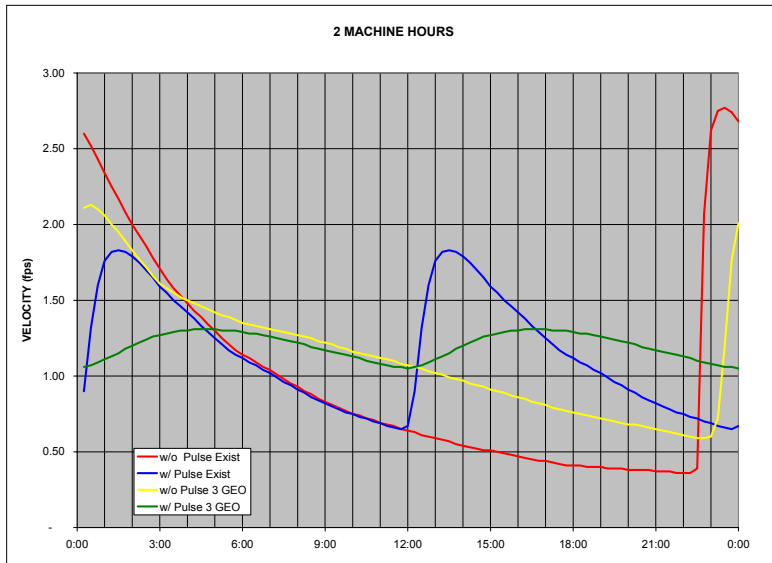


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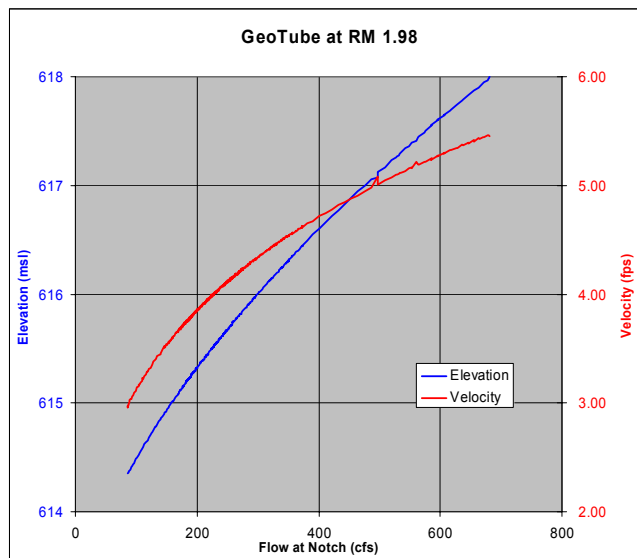




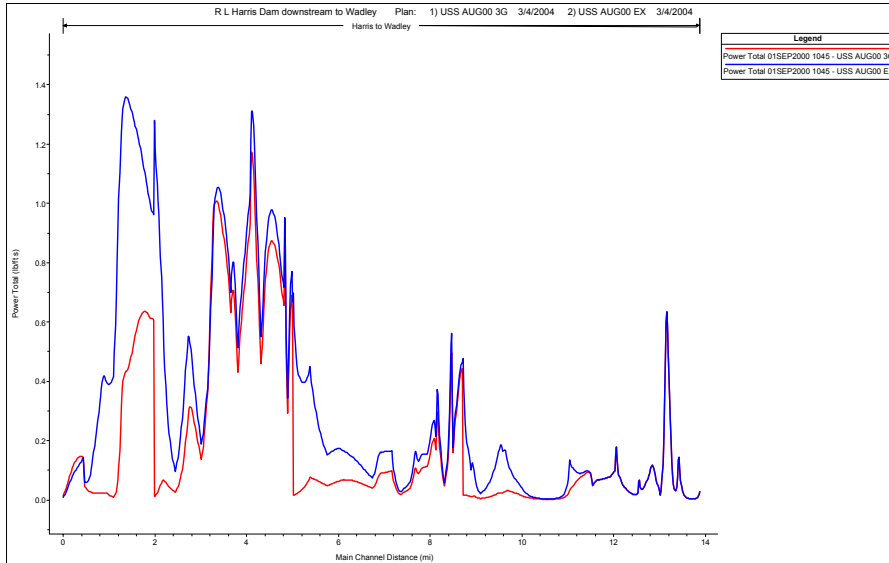
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