

SAM

Stable Channel Design

**Larry A. Arneson, Ph.D., P.E.
Federal Highway Administration**

**Western Hydraulics Engineers
Conference**

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SAM

Cooperative Research and Development Agreement

- **U.S. Army Corps of Engineers**
 - WES (ERDC) – FORTRAN Software
- **Ayres Associates**
 - Windows Interface
- **FHWA**
 - Technology Applications Funds Coordinated Through Central Federal Lands Highway Division
- **State DOTs and FHWA Site Licenses**

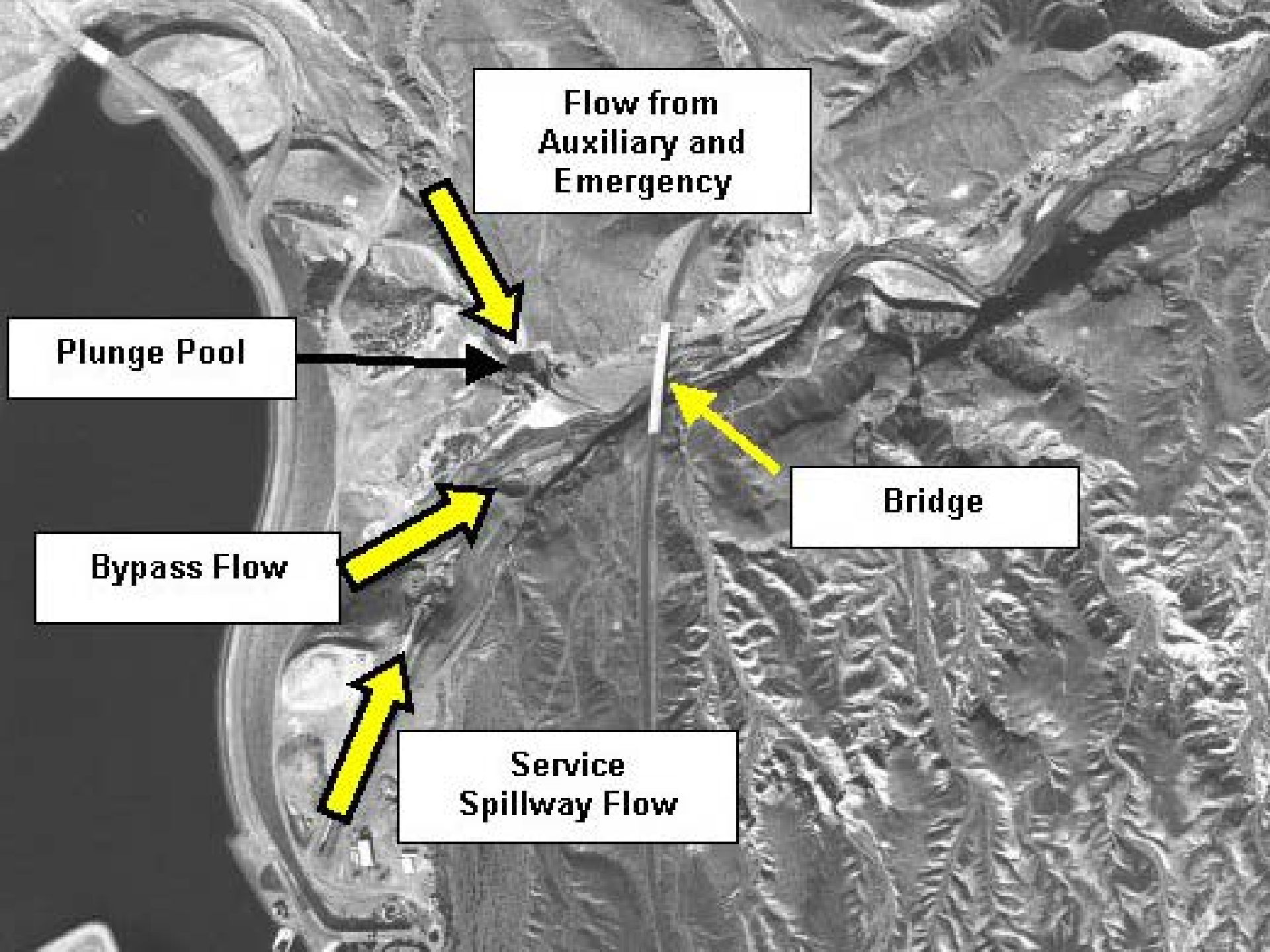
SAM – Main Components

- **SAM.hyd – Hydraulics**
- **SAM.sed – Sediment Transport**
- **SAM.yld – Sediment Yield**

SAM – Case Study

Las Vegas Wash, Las Vegas NV

- **FHWA Central Federal Lands Project**
- **Nevada State Route 147**
- **Downstream of Lake Las Vegas**
- **Upstream of Lake Mead**
- **Severe Channel Degradation**



**Flow from
Auxiliary and
Emergency**

Plunge Pool

Bypass Flow

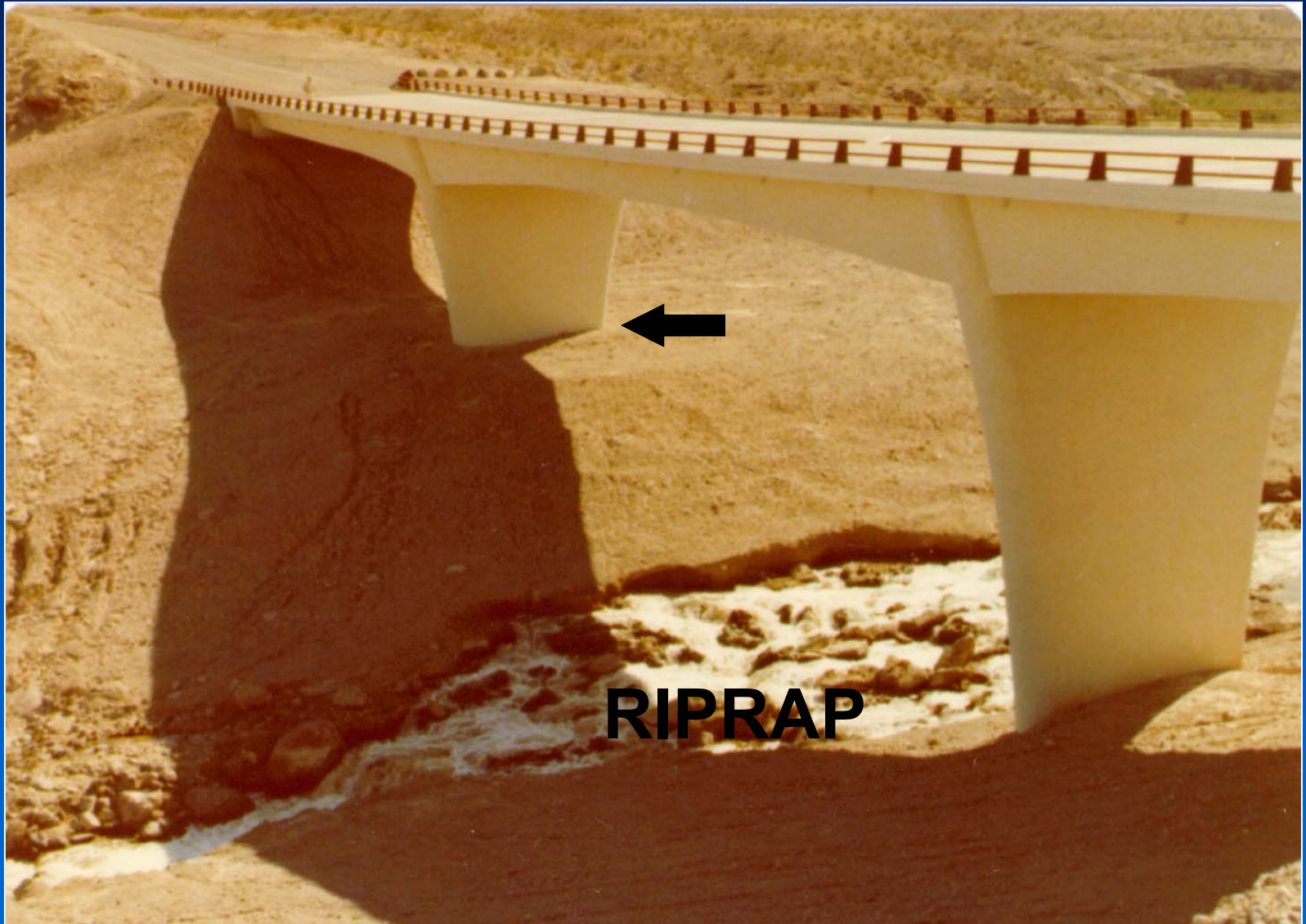
**Service
Spillway Flow**

Bridge

SR 147 CROSSING - 1976



BRIDGE CROSSING - 1978

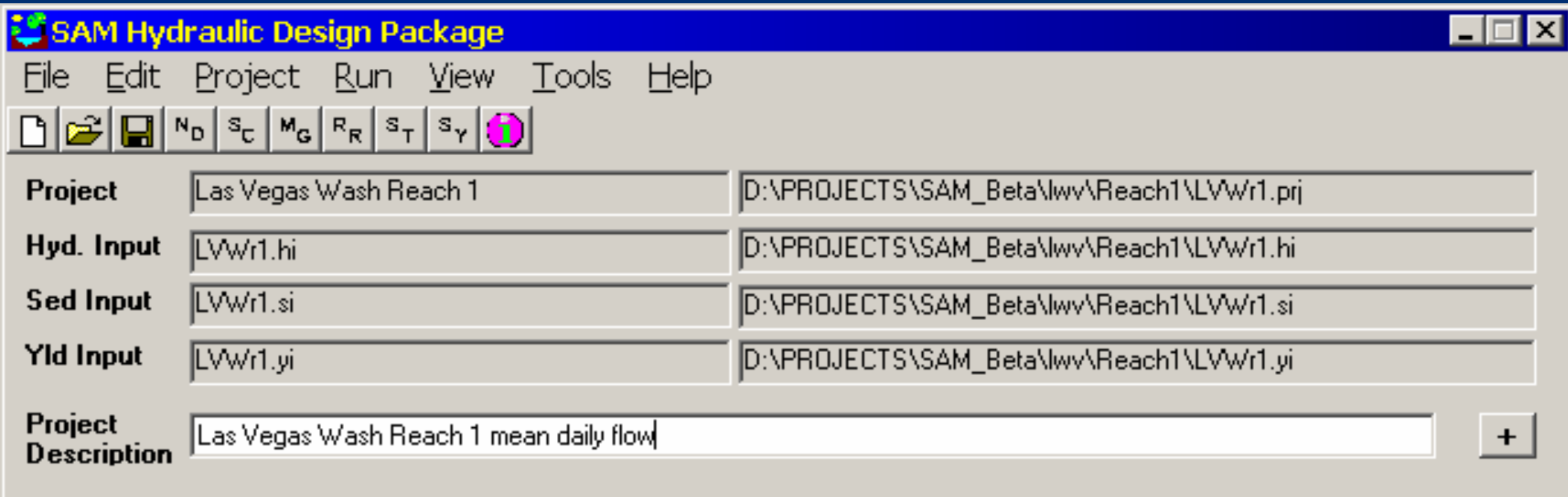




RIPRAP



SAMWin – Main Menu



SAMWin – Hydraulics

Normal Depth and Variations

File

Title Records

Normal Depth Calculations for Reach 1

Calculation Options

Variable to Calculate: Normal Depth

Compositing Method: Conveyance

Geometry: Simple Channel

Flow Data

	1	2	3	4	5	6	7	8	9	10
Discharge Q (cfs)	309	311								
W.S. Elevation (ft)										
Energy Slope (ft/ft)	.0066									
Temperature (deg F)	70									

Hydraulic Variable Input

Solve Print Flow Distribution Display Entire Output File

Enter Geometry Data

Summary Output

TABLE 8-1. CALCULATE NORMAL DEPTH; COMPOSITE PROPERTIES BY CONVEYANCE METHOD.

**** N	Q	WS	TOP	COMPOSITE	SLOPE	COMPOSITE	VEL	FROUDE	SHEAR
	CFS	ELEV	WIDTH	R	ft/ft	n-Value	FPS	NUMBER	STRESS
		FT	FT	FT					#/SF
**** 1	309.	1.16	61.8	1.12	0.006600	0.0301	4.32	0.71	0.46
**** 2	311.	1.16	61.8	1.12	0.006600	0.0301	4.33	0.71	0.46

Calculation Options

Channel Template Input

View

Channel Geometry

Bottom Width: 61.8 Left Side Slope (Horiz. to 1): 0

Bank Height: 5 Right Side Slope (Horiz. to 1): 0

Channel Type

Is this a composite channel? No Yes

Roughness Input -- Simple Channel

Roughness Equation: Limerinos Roughness Value: []

Geometry and Sediment Gradation Input

Bed Material Gradation

DMAX (mm): 75 Specific Gravity of Sediment: 2.65

	1	2	3	4	5	6	7	8	9
Particle Size (mm)	75	46.6	29	18.7	12	7.4	4.6	2	.9
Percent Finer (%)	100	90	80	70	60	50	40	30	20

Add Riprap

Cancel OK

SAMWin – Sediment Transport

Select Sediment Transport Functions

Hydraulic Results Carried Forward from SAM.hyd

Summary Output

Sediment Transport Input

File

Title Records

Sediment Transport for mean daily flow

Transport Functions

Toffaleti. Toffaleti-Schoklitsch Laursen(Copeland) Einstein(Bed-Load)
 Yang. MPM(1948) Yang,D50 Profitt(Sutherland)
 Einstein(Total-Load) Brownlie,D50 Ackers-White,D50 Engelund-Hansen
 Ackers-White. Toffaleti-MPM MPM(1948),D50 Schoklitsch
 Colby Laursen(Madden),1985 Parker Van.Rijn

Clear All Check All

Flow Characteristics

	1	2	3	4	5	6	7	8	9	10
Discharge Q (cfs)	309	311								
Velocity (ft/sec)	4.32	4.33								
Depth (ft)	1.16	1.16								
Top Width (ft)	62.	61.8								
Energy Slope (ft/ft)	.0066									
Temperature (deg F)	70									

Solve Display Entire Output File Enter Bed Material Data

Q | WATER | TRANSPORT FUNCTIONS
 NO | DISCHARGE | YANG | EINSTEIN | MPM(1948) | SCHOKLITSCH |
 | | (HEC-6) | TOTAL LOAD | (HEC-6) | |
 1 | 309.00 | 1373.17 | 1318.03 | 1611.34 | 1143.24 |
 2 | 311.00 | 1376.90 | 1325.69 | 1616.94 | 1142.65 |

Q | WATER | TRANSPORT FUNCTIONS
 NO | DISCHARGE | VAN.RIJN | |
 1 | 309.00 | 1918.28 | |
 2 | 311.00 | 1912.09 | |

SAMWin – Sediment Yield

Enter
Flow Duration Curve
or
Storm Hydrograph

Summary Output
for Each Selected
Sediment Transport
Function in SAM.sed

Title Records

Sediment Yield for 1 year of mean daily flow.

Discharge Data

Specify Flow Duration Curve

Flow Duration Time Interval (days)

Specify Flow Hydrograph

Optional Data

Number of Output Class Intervals

Specific Weight of Sediment (lbs/cu-ft)

Number of Integration Steps

Flow Duration

	% Exceedence	Discharge (cfs)
1	100	311
2	0	309
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Solve Display Entire Output File

1 Sediment Yield (Transport Capacity)

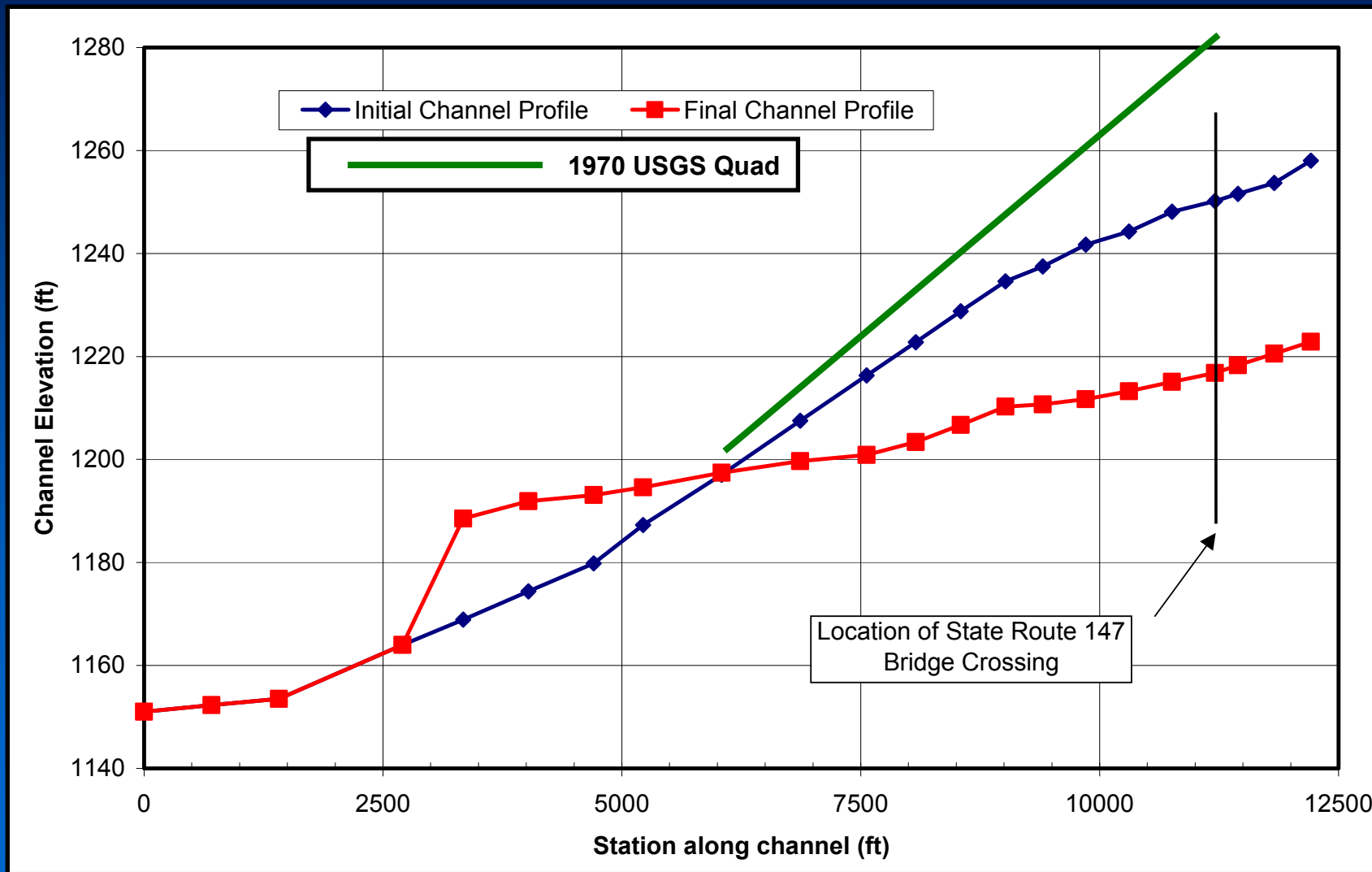
TABLE 3.1 CALCULATED YIELDS

SEDIMENT TRANSPORT FUNCTION USED -- EINSTEIN(TOTAL-LOAD)

TIME PERIOD,	DAYS =	365.000		
WATER YIELD,	ACFT =	224429..	Mean Daily Flow, CFS =	310.00
SEDIMENT YIELD,	TONS =	482543..	Mean Daily Load, T/D =	1322.
	CUYD =	384343..	Mean Daily Conc, mg/l =	1579.500

1

BRI-STARS PROFILE



GRADE CONTROL STRUCTURE



SAM – Additional Components

- **SAM.aid – Transport Function Guidance**
- **SAM.hyd – Stable Channel Dimensions**
- **Riprap Design**
- **Meander Planform Geometry**

SAMWin Summary

- **Aggradation And Degradation Studies**
- **Distribution Should Occur Within Next 30-60 Days**
- **CD-ROM With Software, Installation Instructions, and Transmittal Letter**