APÉNDICE - H

Resultados del Modelo Hidráulico HEC-RAS, versión 3.0
Canal Trapezoidal - Cond. Existente

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X     X
X     X  X        X            X   X     X    X   X
XXXXXXX  XXXX     X       XXX  XXXX      XXXXXX    XXXX
X     X  X        X            X  X      X    X       X
X     X  X        X    X       X   X     X    X       X
X     X  XXXXXX    XXXX        X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: Hydraulic Analysis for Existing Channel
Project File : hr.prj
Run Date and Time: 2/5/05 12:53:42 PM

Project in SI units

Project Description:
Hydraulic Analysis for Existing Channel
Project: Dorado Office Park,
Dorado
Design Flow: 100-yr

PLAN DATA

Plan Title: existingcond
Plan File : C:\PROJECTS\Dorado\Office\RAS\hr.p01

Geometry Title: existing cond
Geometry File : C:\PROJECTS\Dorado\Office\RAS\hr.g01

Flow Title : Design Flow
Flow File : C:\PROJECTS\Dorado\Office\RAS\hr.f01

Plan Description:
Hydraulic Analysis for Existing Channel
Project: Dorado Office Park,
Dorado
Design Flow: 100-yr

Plan Summary Information:
Number of: Cross Sections = 9 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculaton tolerance = 0.003
Maximum number of interations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Design Flow
Flow File : C:\PROJECTS\Dorado\Office\RAS\hr.f01

Flow Data (m3/s)

River	Reach	RS	100-yr
r-1	rch-1	6	12.57

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
r-1	rch-1	100-yr	Critical	Known WS = 6

GEOMETRY DATA

Geometry Title: existing cond
Geometry File : C:\PROJECTS\Dorado\Office\RAS\hr.g01

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 6

INPUT
Description: Sec- #6
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4.07	14.75	3.98	27.05	4.59	33.31	7.07	38.16	7.06
49.05	7.36								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.03	33.31	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	33.31	79.16	79.16	.1	.3

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 5

INPUT
Description: Sec- #5
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3.55	20.52	4	30.75	4.19	38.25	6.74	43.98	6.65
54.86	6.97								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.03	38.25	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	38.25	9.15	9.15	.1	.3

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 4.3

INPUT
Description: Sec. 4.3, Copy Sec- #4
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3.88	9.93	4.15	25.88	4.2	27.24	3.87	29.27	3.99
29.55	4.3	34.3	6.59	39.38	6.56	50.28	6.88		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	25.88	.03	34.3	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
25.88	34.3	8	8	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
888		F	

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 4

INPUT
Description: Sec- #4
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3.88	9.93	4.15	25.88	4.2	27.24	3.87	29.27	3.99
29.55	4.3	34.3	6.59	39.38	6.56	50.28	6.88		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	25.88	.03	34.3	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
25.88	34.3	57.91	57.91	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
888		F	

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 3.3

INPUT
Description: Sec- #3.3; Copy Sec.3.0
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2.49	8.47	2.66	11.14	4.57	21.21	4.8	22.43	3.7
26.61	3.42	27.49	3.1	29.88	2.97	33.99	2.97	35.3	3.1
47.65	6.33	53.09	6.21						

Manning's n Values num= 3

```
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .025   21.21     .03   47.65     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.21   47.65             24.5    24.5    24.5             .1      .3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
888        F

CROSS SECTION           RIVER: r-1
REACH: rch-1               RS: 3

INPUT
Description: Sec- #3
Station Elevation Data     num=      12
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0     2.49     8.47     2.66    11.14     4.57    21.21      4.8    22.43      3.7
   26.61     3.42    27.49     2.72    29.88     2.59    33.99     2.59     35.3     2.72
   47.65     6.33    53.09     6.21

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .025   21.21     .03   47.65     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.21   47.65            78.39   78.39   78.39             .1      .3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
888        F

CROSS SECTION           RIVER: r-1
REACH: rch-1               RS: 2

INPUT
Description: Sec- #2
Station Elevation Data     num=      12
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0     2.22     5.93     2.38      9.9     4.96    14.54     5.11    16.08     3.87
   20.56     3.45    22.65     2.06    30.33     2.17    31.02     2.47    42.56     5.78
   47.86     5.73    61.72     6.14

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .025   14.54     .03   42.56     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         14.54   42.56             10.5    10.5    10.5             .1      .3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
888        F

CROSS SECTION           RIVER: r-1
REACH: rch-1               RS: 1.9

INPUT
Description: Sec. 1.9, Copy Sec- #2
Station Elevation Data     num=      12
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0     2.22     5.93     2.38      9.9     4.96    14.54     5.11    16.08     3.87
   20.56     3.45    22.65     2.06    30.33     2.17    31.02     2.47    42.56     5.78
   47.86     5.73    61.72     6.14

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .025   14.54     .03   42.56     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         14.54   42.56            103.6   103.6   103.6             .1      .3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
888        F

CROSS SECTION           RIVER: r-1
REACH: rch-1               RS: 1

INPUT
Description: Sec- #1
Station Elevation Data     num=      11
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0     1.97     3.54     3.98     7.71     4.28     8.77     3.25    13.72     2.85
   14.37     2.01    23.03     2.16     23.8     2.44    32.32     5.22    37.64      5.2
   51.37     5.58

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .025    7.71     .03   32.32     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          7.71   32.32                   0       0       0             .1      .3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
888        F
```

SUMMARY OF MANNING'S N VALUES

River:r-1

Reach	River Sta.	n1	n2	n3
rch-1	6	.025	.03	.02
rch-1	5	.025	.03	.02
rch-1	4.3	.025	.03	.02
rch-1	4	.025	.03	.02
rch-1	3.3	.025	.03	.02
rch-1	3	.025	.03	.02
rch-1	2	.025	.03	.02
rch-1	1.9	.025	.03	.02
rch-1	1	.025	.03	.02

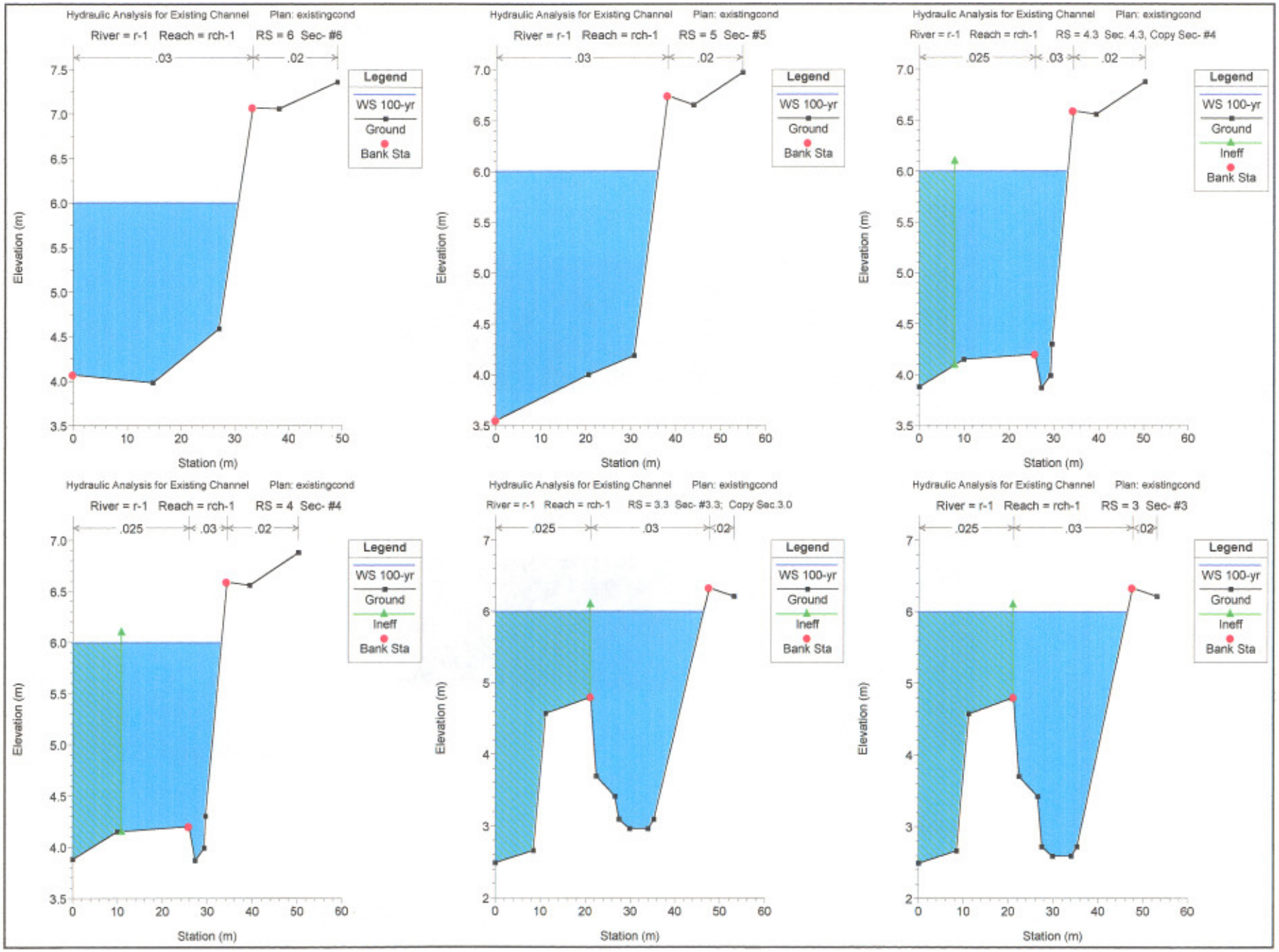
SUMMARY OF REACH LENGTHS

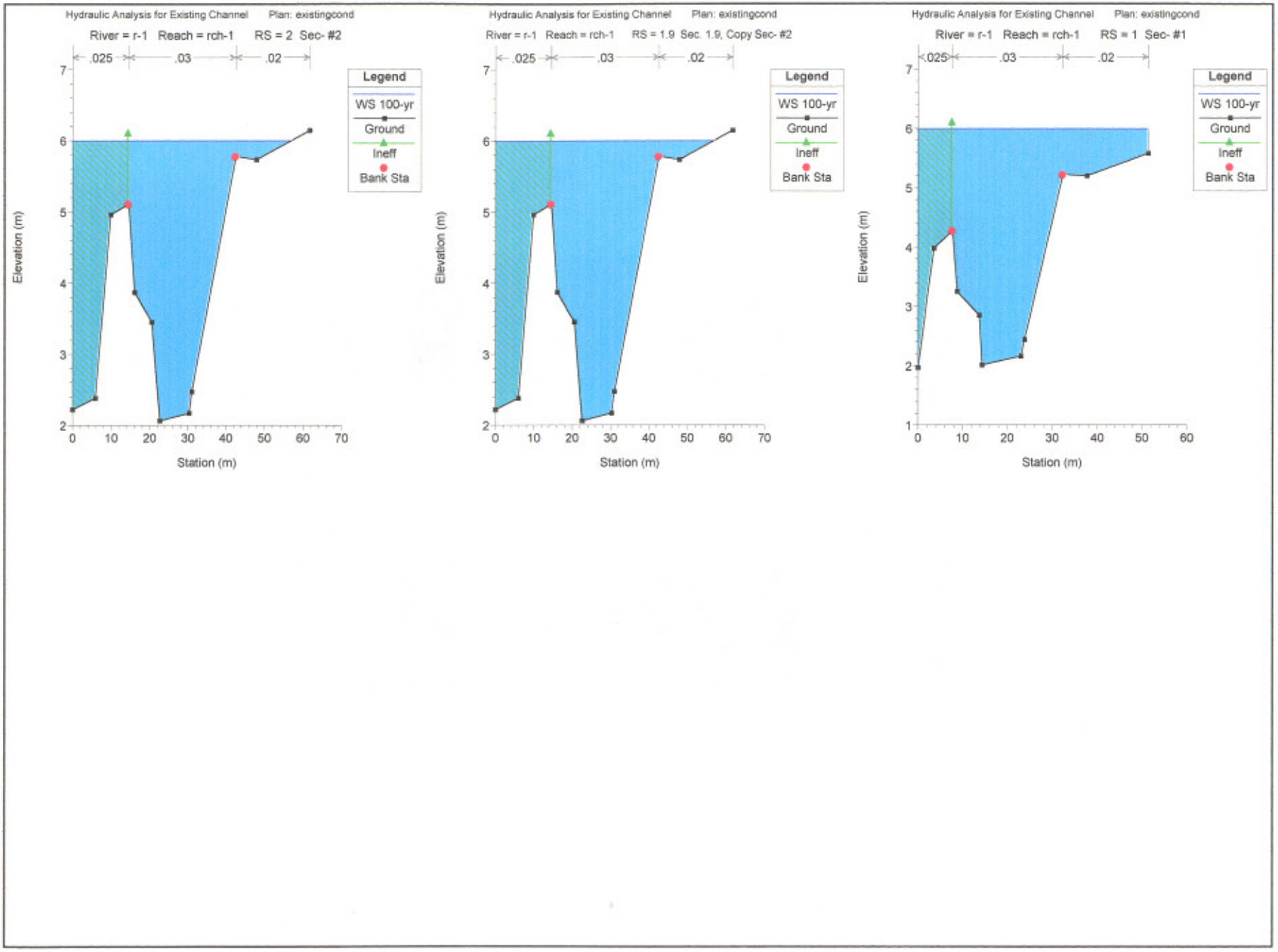
River: r-1

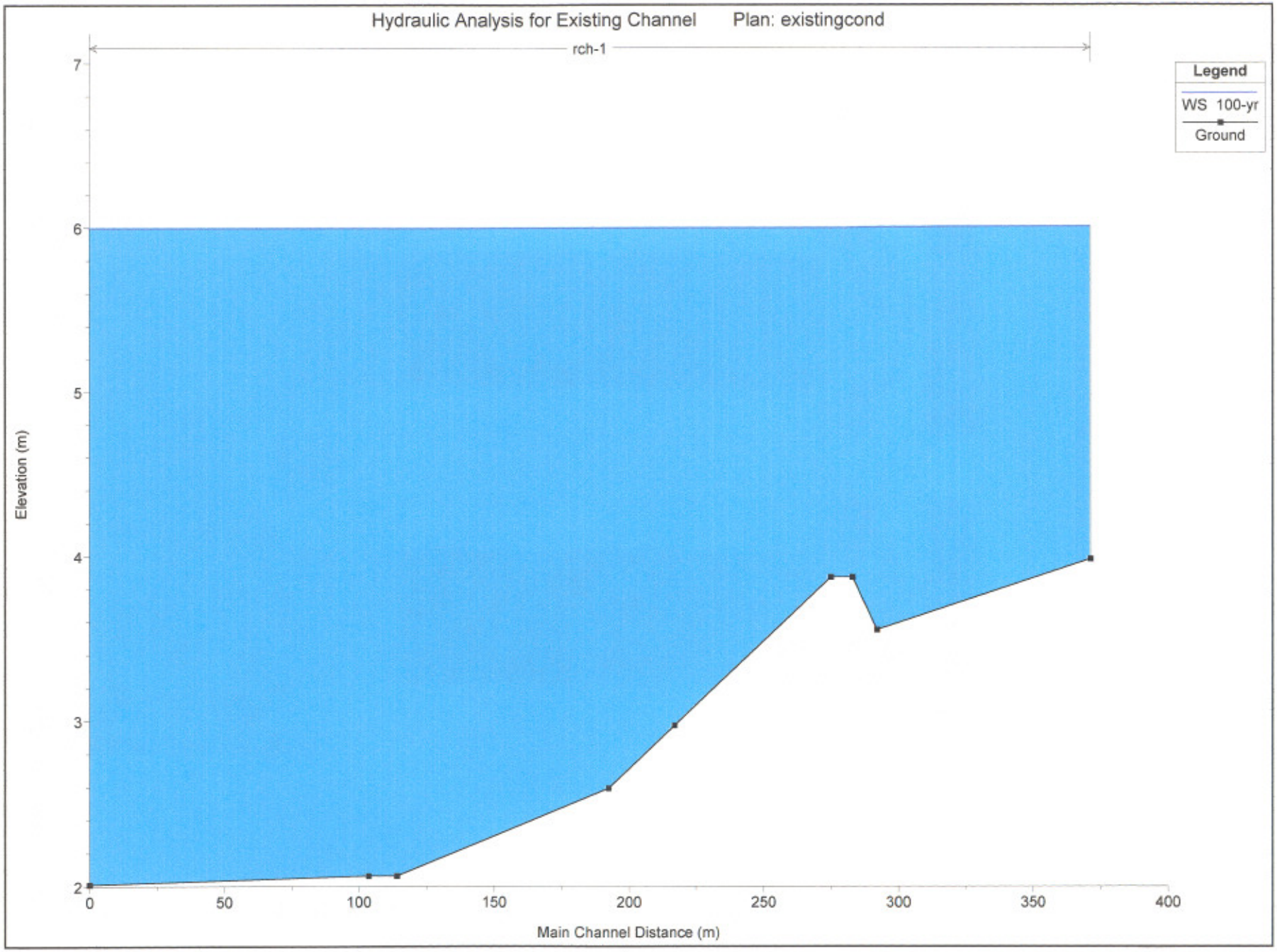
Reach	River Sta.	Left	Channel	Right
rch-1	6	79.16	79.16	79.16
rch-1	5	9.15	9.15	9.15
rch-1	4.3	0	0	0
rch-1	4	57.91	57.91	57.91
rch-1	3.3	24.5	24.5	24.5
rch-1	3	78.39	78.39	78.39
rch-1	2	10.5	10.5	10.5
rch-1	1.9	103.6	103.6	103.6
rch-1	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: r-1

Reach	River Sta.	Contr.	Expan.
rch-1	6	.1	.3
rch-1	5	.1	.3
rch-1	4.3	.1	.3
rch-1	4	.1	.3
rch-1	3.3	.1	.3
rch-1	3	.1	.3
rch-1	2	.1	.3
rch-1	1.9	.1	.3
rch-1	1	.1	.3


Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 6 Sec- #6
.03
.02
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 5 Sec- #5
.03
.02
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 4.3 Sec. 4.3, Copy Sec- #4
.025
.03
.02
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 4 Sec- #4
.025
.03
.02
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 3.3 Sec- #3.3; Copy Sec.3.0
.025
.03
.02
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 3 Sec- #3
.025
.03
.02
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 2 Sec- #2
.025
.03
.02
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 1.9 Sec. 1.9, Copy Sec- #2
.025
.03
.02
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: existingcond
River = r-1 Reach = rch-1 RS = 1 Sec- #1
.025
.03
.02
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Hydraulic Analysis for Existing Channel Plan: existingcond
rch-1
Legend
WS 100-yr
Ground
Elevation (m)
7
6
5
4
3
2
0
50
100
150
200
250
300
350
400
Main Channel Distance (m)

HEC-RAS Plan: existcond River: r-1 Reach: rch-1 Profile: 100-yr

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
rch-1	6	12.57	3.98	6.01	4.39	6.01	0.000027	0.24	52.99	30.63	0.06
rch-1	5	12.57	3.55	6.01		6.01	0.000013	0.18	70.15	36.09	0.04
rch-1	4.3	12.57	3.87	6.00	4.46	6.01	0.000028	0.21	43.16	33.08	0.06
rch-1	4	12.57	3.87	6.00	4.50	6.01	0.000038	0.25	37.52	33.08	0.07
rch-1	3.3	12.57	2.97	6.00	3.62	6.00	0.000018	0.23	54.25	46.39	0.05
rch-1	3	12.57	2.59	6.00	3.24	6.00	0.000013	0.21	59.71	46.52	0.04
rch-1	2	12.57	2.06	6.00	2.73	6.00	0.000008	0.17	76.14	56.99	0.03
rch-1	1.9	12.57	2.06	6.00	2.73	6.00	0.000008	0.17	76.14	56.99	0.03
rch-1	1	12.57	2.01	6.00	2.66	6.00	0.000005	0.15	87.11	51.37	0.03

APÉNDICE - I

Resultados del Modelo Hidráulico HEC-RAS, versión 3.0
Canal Trapezoidal - Cond. Propuesta

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X     X
X     X  X        X            X   X     X    X   X
XXXXXXX  XXXX     X       XXX  XXXX      XXXXXX    XXXX
X     X  X        X            X  X      X    X        X
X     X  X        X    X       X   X     X    X        X
X     X  XXXXXX    XXXX        X    X    X    X   XXXXX
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PROJECT DATA
Project Title: Hydraulic Analysis for Existing Channel
Project File : hr.prj
Run Date and Time: 2/15/05 1:41:44 PM

Project in SI units

Project Description:
Hydraulic Analysis for Existing Channel
Project: Dorado Office Park,
Dorado
Design Flow: 100-yr

PLAN DATA

Plan Title: propcond2
Plan File : C:\PROJECTS\Dorado\Office\RAS\hr.p04

Geometry Title: proposed cond2
Geometry File : C:\PROJECTS\Dorado\Office\RAS\hr.g04

Flow Title : Design Flow
Flow File : C:\PROJECTS\Dorado\Office\RAS\hr.f01

Plan Description:
Hydraulic Analysis for Improvemennt of the Existing Channel
Project: Dorado
Office Park, Dorado
Design Flow: 100-yr

Puente de 25 metros de span.

Plan Summary Information:

Number of:	Cross Sections =	9	Mulitple Openings =	0
	Culverts =	0	Inline Weirs =	0
	Bridges =	1		

Computational Information

Water surface calculation tolerance =	0.003
Critical depth calculaton tolerance =	0.003
Maximum number of interations =	20
Maximum difference tolerance =	0.1
Flow tolerance factor =	0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Design Flow
Flow File : C:\PROJECTS\Dorado\Office\RAS\hr.f01

Flow Data (m3/s)

River	Reach	RS	100-yr
r-1	rch-1	6	12.57

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
r-1	rch-1	100-yr	Critical	Known WS = 6

GEOMETRY DATA

Geometry Title: proposed cond2
Geometry File : C:\PROJECTS\Dorado\Office\RAS\hr.g04

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 6

INPUT
Description: Sec- #6
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4.07	14.75	3.98	27.05	4.59	33.31	7.07	38.16	7.06
49.05	7.36								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.03	33.31	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	33.31	79.16	79.16	.1	.3

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 5

INPUT
Description: Sec- #5
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3.55	20.52	4	30.75	4.19	38.25	6.74	43.98	6.65
54.86	6.97								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.03	38.25	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	38.25	9.15	9.15	.1	.3

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 4.3

INPUT
Description: Sec. 4.3, Copy Sec- #4
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3.88	9.93	4.15	25.88	4.2	27.24	3.45	29.27	3.99
29.55	4.3	34.3	6.59	39.38	6.56	50.28	6.88		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	25.88	.03	34.3	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
25.88	34.3	8	8	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
888	F		

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 4

INPUT
Description: Sec- #4
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.3	10.53	7.3	19.56	3.35	27.24	3.35	34.3	6.59
39.38	6.56	50.28	6.88						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	10.53	.03	34.3	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10.53	34.3	57.91	57.91	.3	.5

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 3.3

INPUT
Description: Sec- #3.3; Copy Sec.3.0
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.3	13	7.3	26.31	2.97	33.99	2.97	47.65	6.33
53.09	6.21								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	13	.03	47.65	.02

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            13   47.65             24.5    24.5    24.5             .3       .5

BRIDGE                  RIVER: r-1
REACH: rch-1              RS: 3.15

INPUT
Description: Puente Propuesto para Acceso a Proyecto.
Distance from Upstream XS =       1
Deck/Roadway Width        =    22.5
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=        6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      13    7.47    6.71    17.5    7.47        5    17.5    7.47    6.71
    42.5    7.36     6.6    42.5    7.36        5    47.5    7.36       6

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     7.3      13     7.3   26.31    2.97   33.99    2.97   47.65    6.33
   53.09    6.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .025      13     .03   47.65     .02

Bank Sta: Left   Right    Coeff Contr.   Expan.
            13   47.65             .3       .5

Downstream  Deck/Roadway Coordinates
    num=        6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      13    7.47    6.71    17.5    7.47        5    17.5    7.47    6.71
    42.5    7.36     6.6    42.5    7.36        5    47.5    7.36       6

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     7.3      13     7.3   26.31    2.59   33.99    2.59   47.65    6.33
   53.09    6.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .025      13     .03   47.65     .02

Bank Sta: Left   Right    Coeff Contr.   Expan.
            13   47.65             .3       .5

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =    7.36
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION           RIVER: r-1
REACH: rch-1              RS: 3

INPUT
Description: Sec- #3
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     7.3      13     7.3   26.31    2.59   33.99    2.59   47.65    6.33
   53.09    6.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .025      13     .03   47.65     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            13   47.65            78.39   78.39   78.39             .3       .5

CROSS SECTION           RIVER: r-1
REACH: rch-1              RS: 2
```

INPUT
Description: Sec- #2
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.3	8	7.3	14.54	5.11	22.65	2.06	30.33	2.17
31.02	2.47	42.56	5.78	47.86	5.73	61.72	6.14		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	8	.03	42.56	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
8	42.56	10.5	10.5	.3	.5

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 1.9

INPUT
Description: Sec. 1.9, Copy Sec- #2
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2.22	5.93	2.38	9.9	4.96	14.54	5.11	16.08	3.87
20.56	3.45	22.65	2.06	30.33	2.17	31.02	2.47	42.56	5.78
47.86	5.73	61.72	6.14						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	14.54	.03	42.56	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
14.54	42.56	103.6	103.6	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
888	F		

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 1

INPUT
Description: Sec- #1
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1.97	3.54	3.98	7.71	4.28	8.77	3.25	13.72	2.85
14.37	2.01	23.03	2.16	23.8	2.44	32.32	5.22	37.64	5.2
51.37	5.58								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	7.71	.03	32.32	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
7.71	32.32	0	0	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
888	F		

SUMMARY OF MANNING'S N VALUES

River:r-1

Reach	River Sta.	n1	n2	n3
rch-1	6	.025	.03	.02
rch-1	5	.025	.03	.02
rch-1	4.3	.025	.03	.02
rch-1	4	.025	.03	.02
rch-1	3.3	.025	.03	.02
rch-1	3.15	Bridge		
rch-1	3	.025	.03	.02
rch-1	2	.025	.03	.02
rch-1	1.9	.025	.03	.02
rch-1	1	.025	.03	.02

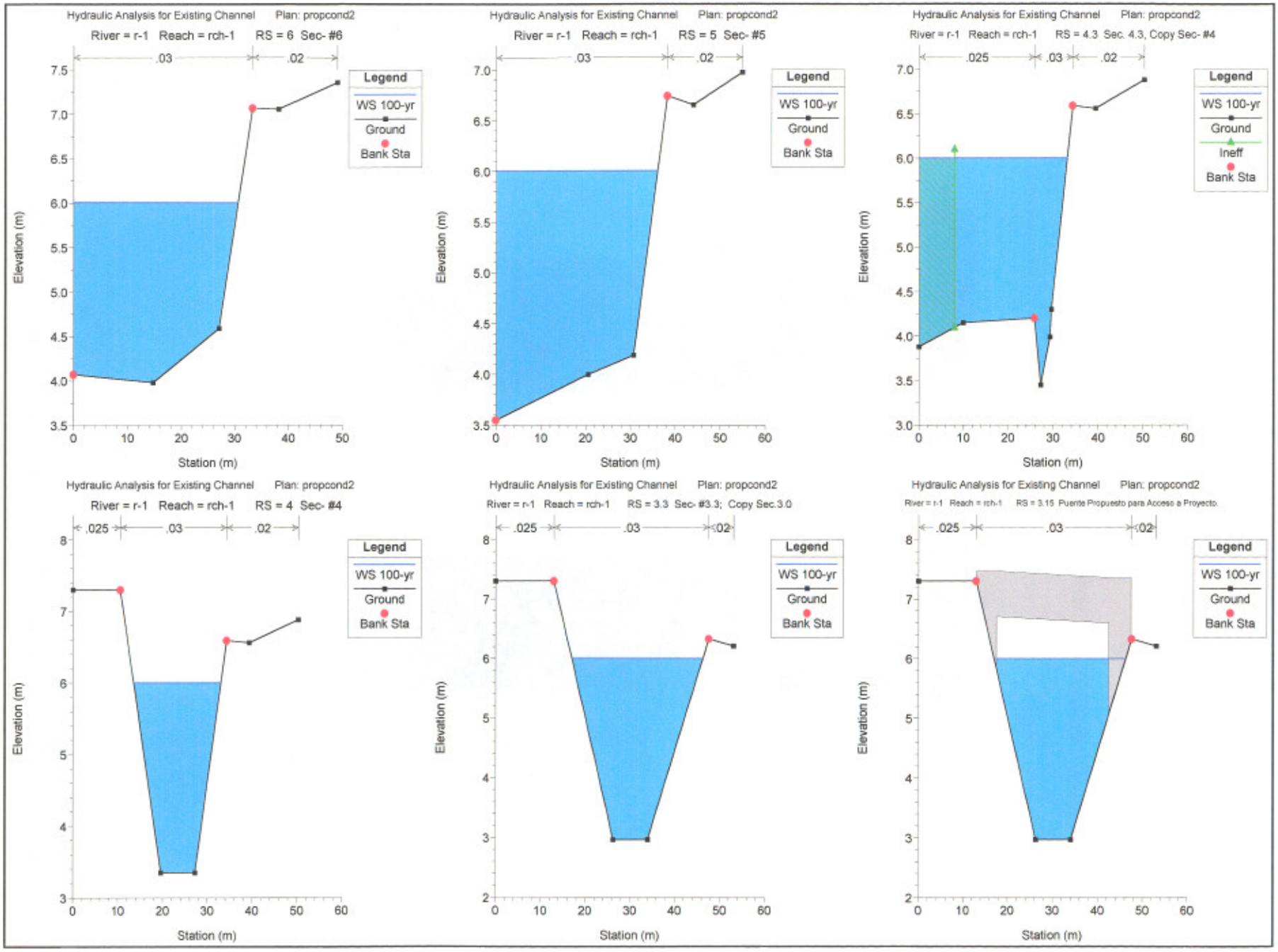
SUMMARY OF REACH LENGTHS

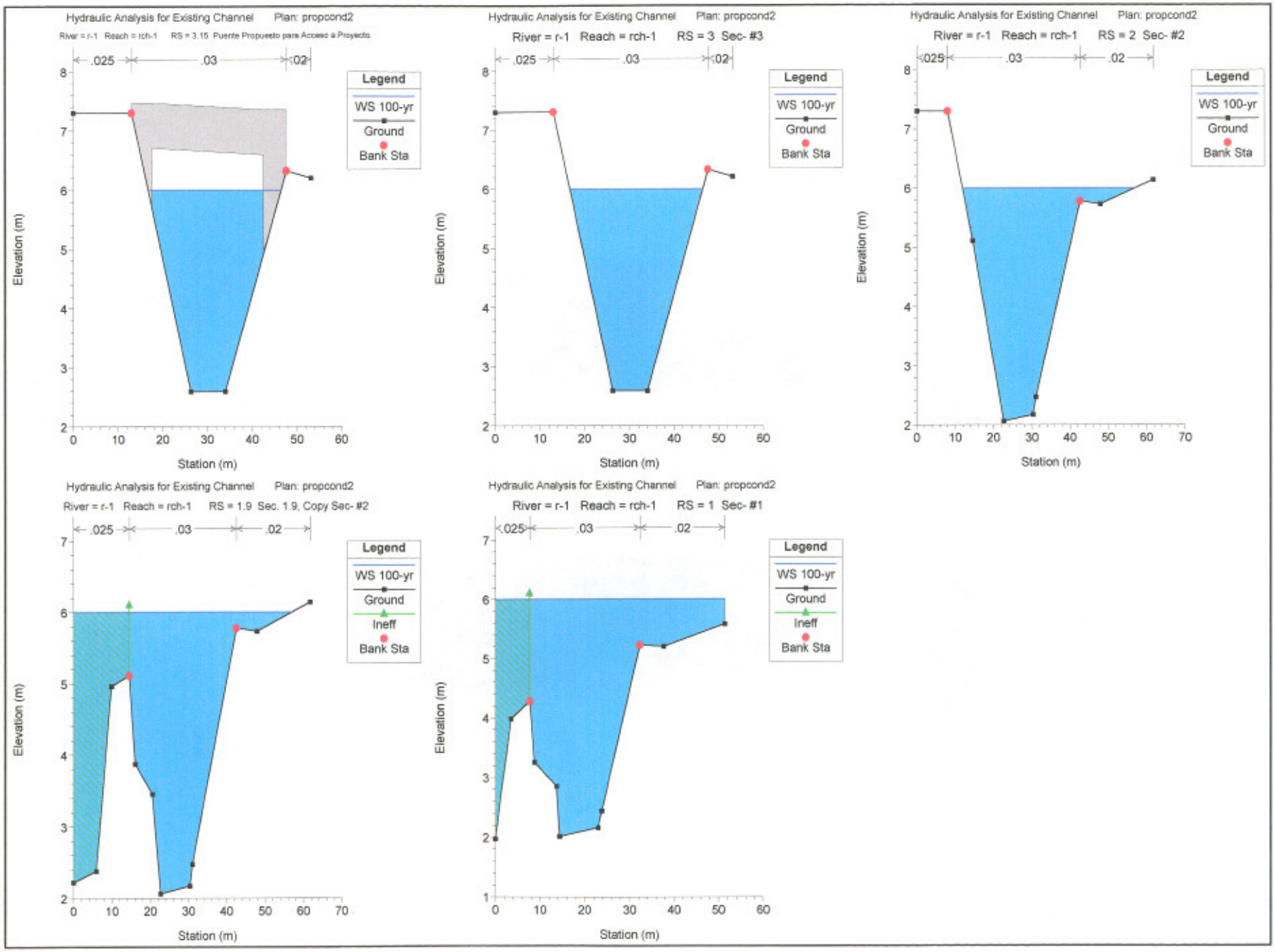
River: r-1

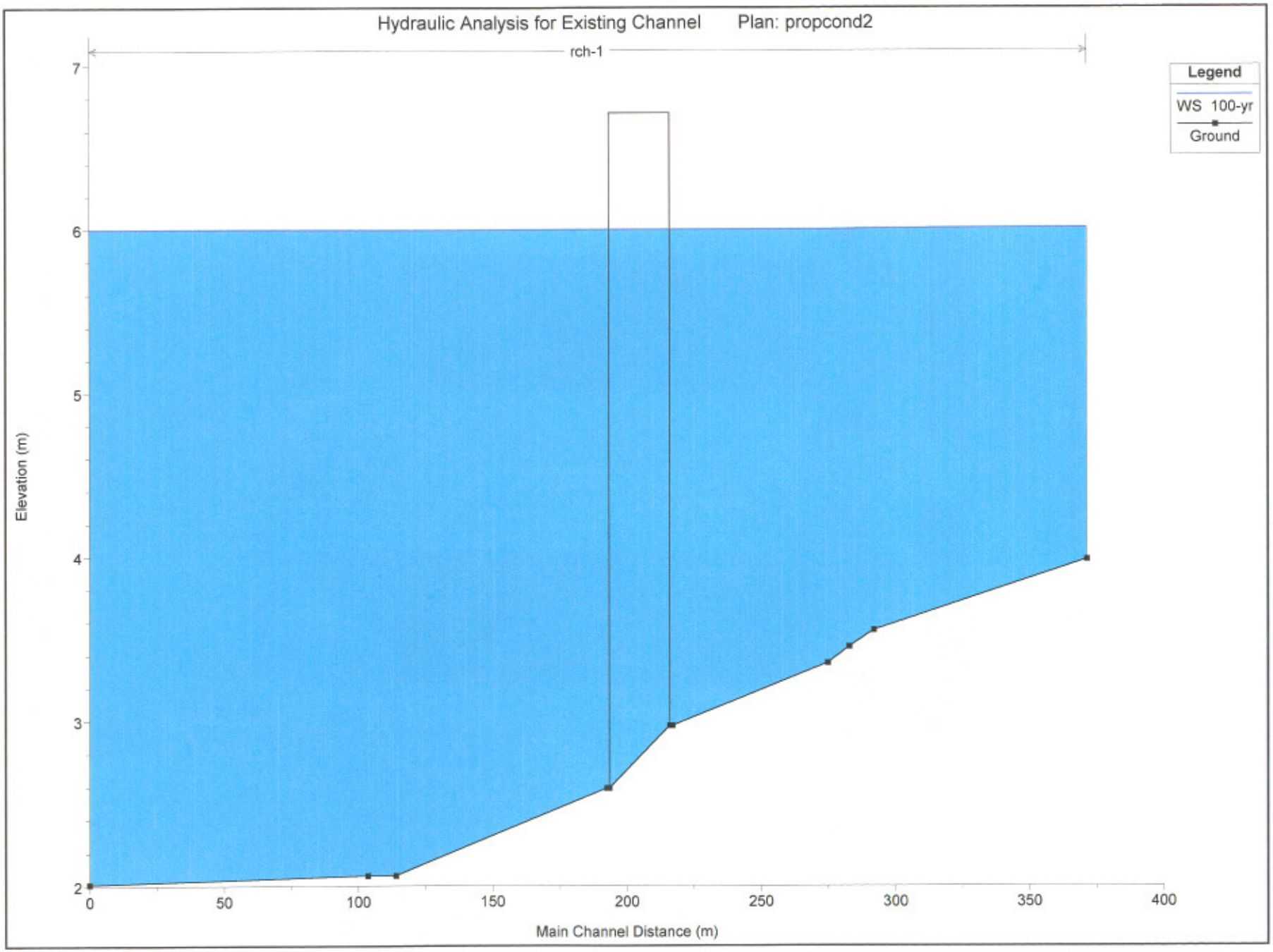
Reach	River Sta.	Left	Channel	Right
rch-1	6	79.16	79.16	79.16
rch-1	5	9.15	9.15	9.15
rch-1	4.3	8	8	8
rch-1	4	57.91	57.91	57.91
rch-1	3.3	24.5	24.5	24.5
rch-1	3.15	Bridge		
rch-1	3	78.39	78.39	78.39
rch-1	2	10.5	10.5	10.5
rch-1	1.9	103.6	103.6	103.6
rch-1	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: r-1

Reach	River Sta.	Contr.	Expan.
rch-1	6	.1	.3
rch-1	5	.1	.3
rch-1	4.3	.1	.3
rch-1	4	.3	.5
rch-1	3.3	.3	.5
rch-1	3.15	Bridge	
rch-1	3	.3	.5
rch-1	2	.3	.5
rch-1	1.9	.1	.3
rch-1	1	.1	.3


Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 6 Sec- #6
.03
.02
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 5 Sec- #5
.03
.02
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 4.3 Sec. 4.3, Copy Sec- #4
.025
.03
.02
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 4 Sec- #4
.025
.03
.02
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 3.3 Sec- #3.3; Copy Sec.3.0
.025
.03
.02
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 3.15 Puente Propuesto para Acceso a Proyecto
.025
.03
.02
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)


Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 3.15 Puente Propuesto para Acceso a Proyecto
.025
.03
.02
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 3 Sec- #3
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 2 Sec- #2
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 1.9 Sec. 1.9, Copy Sec- #2
Ineff
Hydraulic Analysis for Existing Channel Plan: propcond2
River = r-1 Reach = rch-1 RS = 1 Sec- #1


Hydraulic Analysis for Existing Channel Plan: propcond2
rch-1
Legend
WS 100-yr
Ground
Elevation (m)
7
6
5
4
3
2
0
50
100
150
200
250
300
350
400
Main Channel Distance (m)

HEC-RAS Plan: propcond2 River: r-1 Reach: rch-1 Profile: 100-yr

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
rch-1	6	12.57	3.98	6.01	4.39	6.01	0.000027	0.24	53.00	30.63	0.06
rch-1	5	12.57	3.55	6.01		6.01	0.000013	0.18	70.17	36.09	0.04
rch-1	4.3	12.57	3.45	6.00	4.45	6.01	0.000027	0.22	43.90	33.08	0.06
rch-1	4	12.57	3.35	6.00		6.01	0.000052	0.35	36.04	19.52	0.08
rch-1	3.3	12.57	2.97	6.00	3.56	6.00	0.000020	0.22	56.06	29.32	0.05
rch-1	3.15	Bridge									
rch-1	3	12.57	2.59	6.00		6.00	0.000013	0.20	63.86	29.77	0.04
rch-1	2	12.57	2.06	6.00		6.00	0.000008	0.17	77.32	45.11	0.03
rch-1	1.9	12.57	2.06	6.00	2.73	6.00	0.000008	0.17	76.14	56.99	0.03
rch-1	1	12.57	2.01	6.00	2.66	6.00	0.000005	0.15	87.11	51.37	0.03

APÉNDICE - J

Resultados del Modelo Hidráulico HEC-RAS, versión 3.0
Diseño de Atarjea Cuadrada para drenar Sub-Cuenca 2

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X     X
X     X  X        X            X   X     X    X   X
XXXXXXX  XXXX     X       XXX  XXXX      XXXXXX    XXXX
X     X  X        X            X  X      X    X        X
X     X  X        X    X       X   X     X    X        X
X     X  XXXXXX    XXXX        X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: Hydraulic Analysis for Existing Channel
Project File : hr.prj
Run Date and Time: 2/1/05 8:47:06 AM

Project in SI units

Project Description:
Hydraulic Analysis for Existing Channel
Project: Dorado Office Park,
Dorado
Design Flow: 100-yr

PLAN DATA

Plan Title: propboxculvert
Plan File : C:\PROJECTS\Dorado\Office\RAS\hr.p02

Geometry Title: prop box culvert
Geometry File : C:\PROJECTS\Dorado\Office\RAS\hr.g02

Flow Title : Design Flow, prop box
Flow File : C:\PROJECTS\Dorado\Office\RAS\hr.f02

Plan Description:
Hydraulic Analysis for Proposed Box Culvert
Project: Dorado Office Park,
Dorado
Design Flow: 100-yr

Plan Summary Information:

Number of:	Cross Sections	= 4	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	0
	Bridges	= 0			

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculaton tolerance = 0.003
Maximum number of interations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Design Flow, prop box
Flow File : C:\PROJECTS\Dorado\Office\RAS\hr.f02

Flow Data (m3/s)

River	Reach	RS	100-yr
r-1	rch-1	4	2.35

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
r-1	rch-1	100-yr	Normal S = .004	Known WS = 6

GEOMETRY DATA

Geometry Title: prop box culvert
Geometry File : C:\PROJECTS\Dorado\Office\RAS\hr.g02

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 4

INPUT
Description: sec-4
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.25	1	8.25	1	5.73	2.22	5.73	2.22	8.25
3.52	8.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	1	.013	2.22	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1	2.22	84.5	84.5	.1	.3

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 3

INPUT
Description: sec-3
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.25	1	8.25	1	5.39	2.22	5.39	2.22	8.25
3.52	8.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	1	.013	2.22	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1	2.22	84.5	84.5	.1	.3

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 2

INPUT
Description: sec-2
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.25	1	8.25	1	5.05	2.22	5.05	2.22	8.25
3.52	8.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	1	.013	2.22	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1	2.22	1	1	.3	.5

CROSS SECTION RIVER: r-1
REACH: rch-1 RS: 1

INPUT
Description: sec-1
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.25	1	8.25	8	4	15	4	22	8.25
23	8.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	1	.035	22	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1	22	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:r-1

Reach	River Sta.	n1	n2	n3
rch-1	4	.03	.013	.03
rch-1	3	.03	.013	.03
rch-1	2	.03	.013	.03
rch-1	1	.03	.035	.03

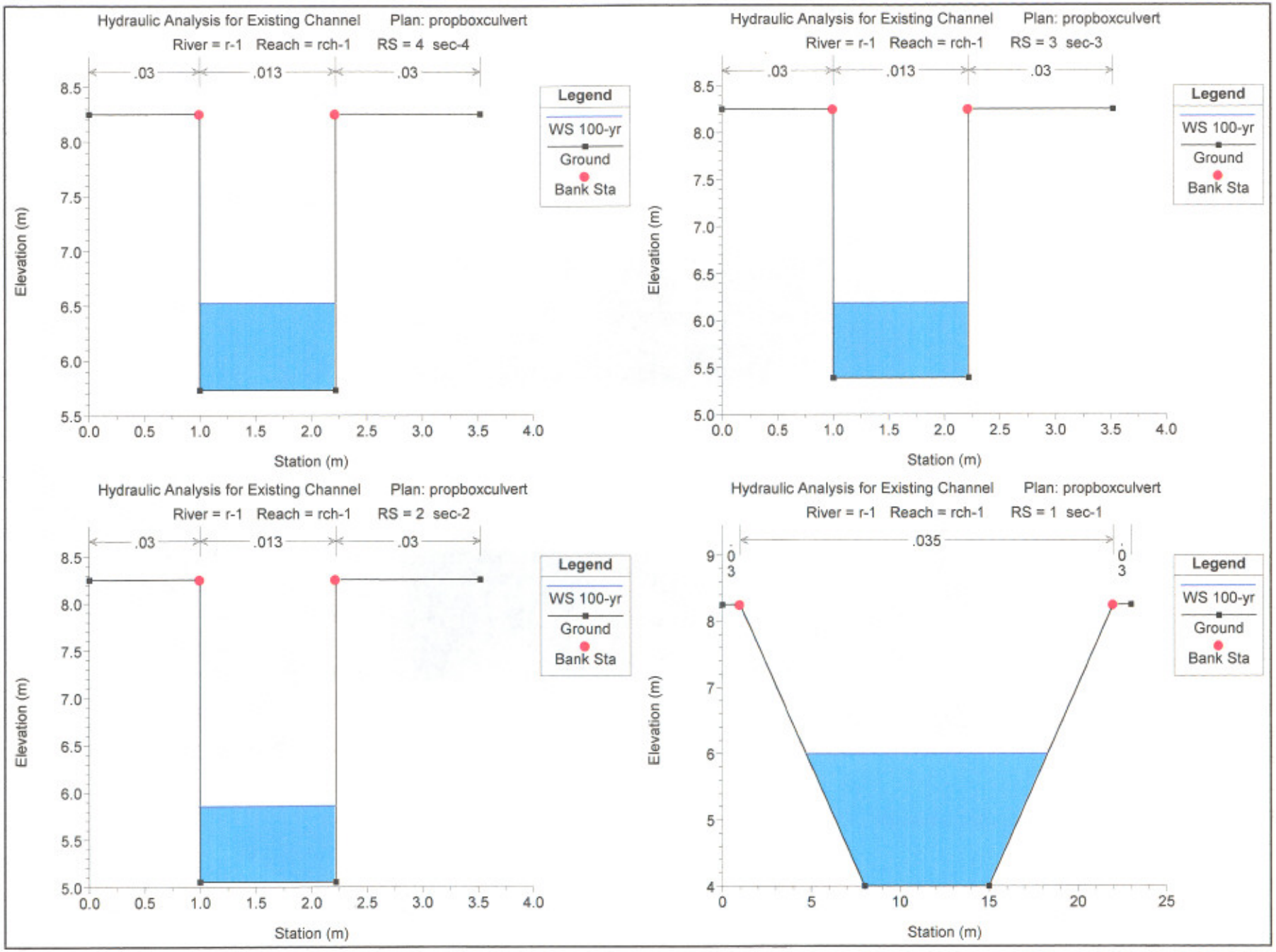
SUMMARY OF REACH LENGTHS

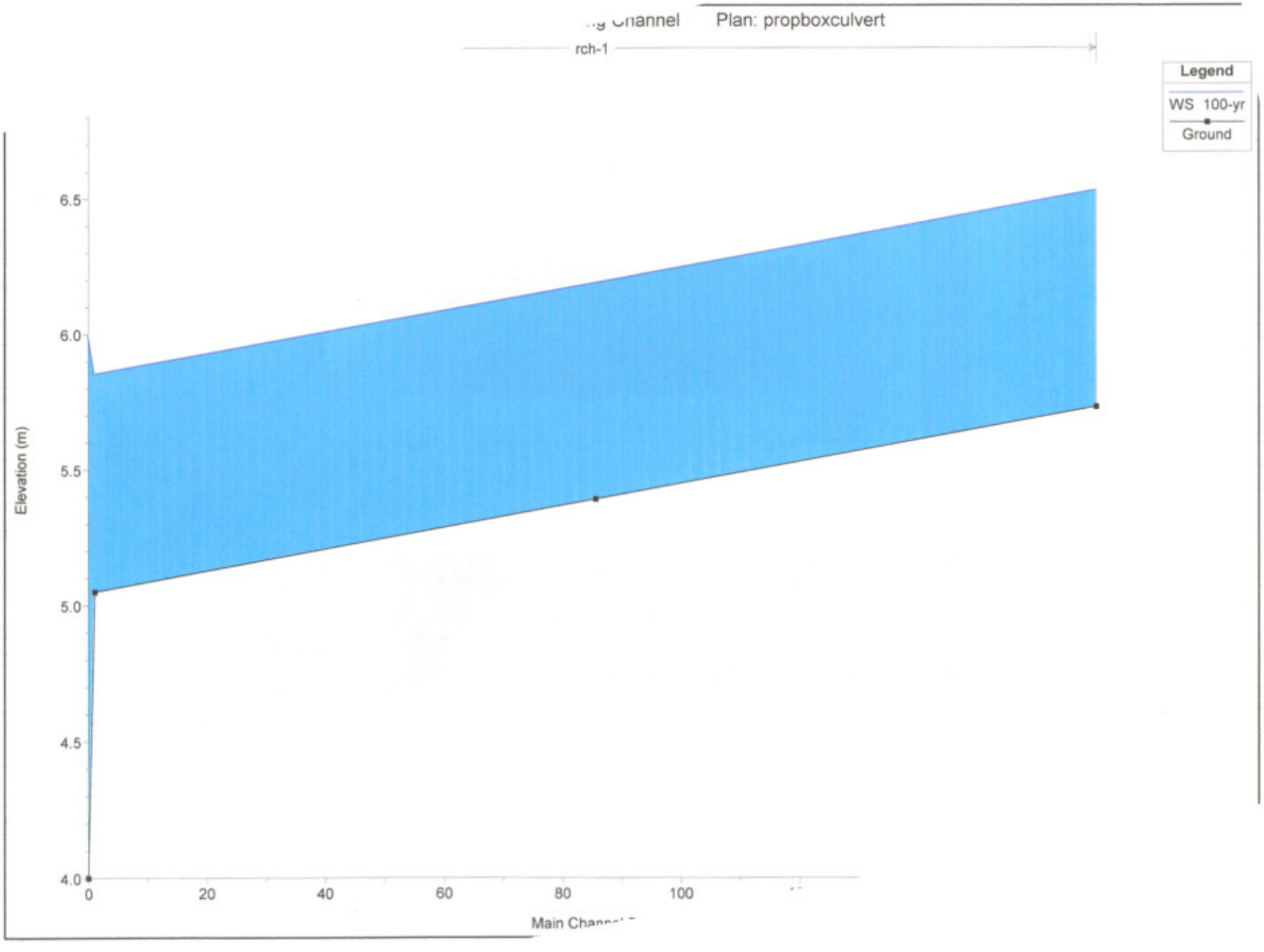
River: r-1

Reach	River Sta.	Left	Channel	Right
rch-1	4	84.5	84.5	84.5
rch-1	3	84.5	84.5	84.5
rch-1	2	1	1	1
rch-1	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: r-1

Reach	River Sta.	Contr.	Expan.
rch-1	4	.1	.3
rch-1	3	.1	.3
rch-1	2	.3	.5
rch-1	1	.1	.3


Hydraulic Analysis for Existing Channel Plan: propboxculvert
River = r-1 Reach = rch-1 RS = 4 sec-4
.03
.013
.03
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propboxculvert
River = r-1 Reach = rch-1 RS = 3 sec-3
.03
.013
.03
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propboxculvert
River = r-1 Reach = rch-1 RS = 2 sec-2
.03
.013
.03
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)
Hydraulic Analysis for Existing Channel Plan: propboxculvert
River = r-1 Reach = rch-1 RS = 1 sec-1
.035
Legend
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)


Channel
Plan: propboxculvert
rch-1
Legend
WS 100-yr
Ground
Elevation (m)
6.5
6.0
5.5
5.0
4.5
4.0
0
20
40
60
80
100
Main Channel

HEC-RAS Plan: propbox River: r-1 Reach: rch-1 Profile: 100-yr

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
rch-1	4	2.35	5.73	6.53	6.45	6.83	0.004025	2.41	0.98	1.22	0.86
rch-1	3	2.35	5.39	6.19	6.11	6.49	0.004025	2.41	0.98	1.22	0.86
rch-1	2	2.35	5.05	5.85		6.15	0.003973	2.39	0.98	1.22	0.85
rch-1	1	2.35	4.00	6.00	4.22	6.00	0.000010	0.11	20.59	13.59	0.03