Professional Engineering Consultants, P.A.

DRAINAGE STUDY

FOR

COLONEL JAMES JABARA TAXIWAY A AND APRON AREA

DECEMBER 2007

303 S. TOPEKA
WICHITA, KANSAS
67202
316-262-2691
FAX
316-262-3003
www.pec1.com
designers@pec1.com

WICHITA
TOPEKA
LAWRENCE
PITTSBURG
TULSA

PREPARED BY

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
303 S. TOPEKA
WICHITA, KANSAS

FOR

WICHITA AIRPORT AUTHORITY

Introduction

Professional **E**ngineering **C**onsultants, P.A.

December 4, 2007

Wichita Airport Authority
Wichita Mid Continent
2173 Air Cargo Road
P.O. Box 9130
Wichita, KS 67277-0130

Attention: Mr. John Oswald, P.E.

Reference: Colonel James Jabara Taxiway A and Aircraft Apron Drainage Study
PEC Project No. 32-07363-0019

Dear Mr. Oswald:

This letter presents a summary of the engineering analysis performed to determine the hydrologic and hydraulic effects the development of approximately 30 acres of land owned by the Wichita Airport Authority would have on the existing detention pond (borrow area), taxiway extension and the west tributary of Dry Creek water surface elevations. The project location is shown in FIGURE 1.

The purpose of this letter report is to present the findings of the engineering analysis and to identify the governmental or permitting agencies that have jurisdiction over development.

The hydrologic and hydraulic analysis focused on two major drainage structures:

A 9'x 5'x 55' reinforced concrete box culvert (RCB) located along the abandoned 39th Street from Webb Road to existing Taxiway A.

2. The existing detention pond with a 36" RCP and weir structure (elevation 1396.40) located east of Webb Road and just north of the existing Taxiway A.

The total drainage area that contributes runoff to this location was estimated to be 192± acres. A map showing the overall drainage basin boundaries and the major drainage structures are shown behind tab "PROPOSED SITE PLAN".

PREVIOUS STUDIES AND OTHER INFORMATION SOURCES

Several parcels of land upstream of Colonel James Jabara Airport, (west of Webb Road), have been developed over the last few years. Drainage plans and computations for the developments were submitted to the City of Wichita, Storm Water Management Department, during the platting process. To strive for consistency with previous hydrology calculations and to make use of available information, PEC reviewed drainage plans submitted for the nearby developments. PEC also reviewed the previous drainage report prepared for the Wichita Airport Authority for the extension of Runway 18-36 project and Taxiway A that was previously approved by the FAA.

303 S. TOPEKA
WICHITA, KANSAS
67202
316-262-2691
316-262-3083 FAX
www.pec1.com

WICHITA
TOPEKA
TULSA
LAWRENCE
PITTSBURG

The construction plans for the extension of Runway 18-36 and Taxiway A, which included drainage and hydraulic design data for drainage structures within the Colonel James Jabara Airport property, were also used as a reference. PEC's study generally relied on plans or record information for hydraulic data such as culvert sizes, flowline elevations, street grades, etc. However, a field survey was conducted to verify critical drainage features.

More specifically, the following information was obtained from these sources:

Construction plans for the extension of Runway 18-36 and Taxiway A, designed by PEC was reviewed. The following information was included in the plans:

For the 36" RCP outlet pipe underneath the runway safety area:

- The upstream and downstream flowline elevations are 1389.60 and 1386.00, respectively. The approximate "Overtopping" elevation for the runway safety area is 1396.40 and is approximately 532' wide.

The drainage report was reviewed and included the following information:

- The drainage area, 238 acres, contributing runoff to the existing detention pond.
- The computed 100-year discharge from the existing detention pond is 565 cfs.
- The computed 100-year water surface elevation of the existing detention pond is 1396.48.

HYDROLOGIC AND HYDRAULIC ANALYSIS

The procedure used by PEC for the hydrologic and hydraulic analysis maybe summarized as follows:

1. The overall basin boundary was established using the USGS map. This boundary was compared to the existing drainage study that was prepared by PEC for the Runway Extension.

2. The "Rational Method" was used in the initial effort to estimate a peak 100-year discharge rate. This discharge was compared to the 100-year discharge contained in the previous drainage report.

3. A rating curve was developed for the culvert underneath the runway safety area and for the existing 9'x 5' RCB crossing the access roadway to Taxiway A. The rating curves relate water surface elevations at the upstream ends of both culverts to runoff rates.

4. The tailwater elevation for the existing 9'x 5' RCB was based on the 100-year elevation of the detention pond.

5. The tailwater elevation for the existing 36" RCP outlet pipe was based on the flowline of the discharge pipe and flow of the existing channel downstream.

6. The FAA requires that the drainage system be designed to handle the 5-year storm event. Whereas, the City of Wichita requires that the site runoff meet the pre vs. post discharge rates for the 100-year/24-hour storm event. Since the City of Wichita's design criterion is more stringent than the FAA's the drainage study only has detailed information for the 100-year/24-hour requirement.

7. As was noted, the Rational Method was used to initially estimate the 100-year peak discharge. To further refine the analysis, the HEC-1 computer program was used to model the basin's response to rainfall. HEC-1 computed the peak runoff rates and corresponding water surface elevations at the major drainage structures.

   HEC-RAS was used to compute the 100-year water surface profile upstream of the 9'x 5' RCB, (under 39th Street North), to Webb Road.

8. According to FAA AC 150/5200-33B "HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS" the new storm water facility should be designed, engineered, constructed, and maintained for a maximum 48-hour detention period after the design storm and remain completely dry between storms.

9. According to the FAA AC 150/5300-13 "AIRPORT DESIGN" the new storm water facility needs to meet the design standards for the runway safety area, obstacle free zone, object free area and the clearway standards. These protection zones are labeled on the map behind the tab "RUNWAY PROTECTION ZONE".

The two models used in the analysis were developed to consider both "Existing" and "Proposed" basin topographic conditions. This analysis shows the effects upon flow rates and water surface elevations caused by the proposed development.

PEC looked at two options for the development plan regarding the detention pond as follows:

Option

The proposed site plan that was supplied to PEC by SJCF was overlayed on the existing property survey. The east edge of the proposed 35' taxiway is located approximately 1,127' east of Webb Road or 160' west of the 35' building restriction line. The proposed taxiway was assumed to be constructed at an elevation of 1406.4 with a 22-foot buffer area immediately to the east. The buffer then was sloped at a 4:1 slope back to the existing grade of 1392.4. See proposed site plan located behind tab labeled "SITE PLAN" and "DEVELOPMENT PLAN" for location and details.

Option 2:

1 The above-mentioned site plan was also used in determining Option 2's layout. It was assumed that the building would be constructed on the "Building Restriction Line", which is approximately 1,284' east of Webb Road. The building was assumed to be constructed at an elevation of 1402.2 with a 10-foot buffer area immediately east. The buffer would be sloped at a 4:1 slope back to the existing grade of 1392.4. See proposed site plan located behind tab labeled "SITE PLAN" and "DEVELOPMENT PLAN" for location and details.

Additionally, a backwater analysis was performed to look at the impacts that the proposed development would have on the west tributary into Dry Creek. Approximately 89.6 acres drain through a 9'x 5' RCB underneath the dirt access road (old 39th Street North) from Webb Road to Taxiway A. PEC is to determine what impacts the proposed development and channel improvements will have on the existing 9'x5' RCB, if any. See HEC-RAS Stations and Tributary location behind the tab labeled "HEC-RAS STATIONS" for location and details.

SUMMARY OF RESULTS

The results of the hydrologic and hydraulic analysis performed by PEC are as follows:

Option 1:

1 Proposed conditions with existing 36" RCP outlet pipe with existing flowline at 1389.60 and overflow elevation at 1396.40.
- Drainage Area = 192.00 Ac.
- Q100in = 615 cfs
- Q100out – 302 cfs, (includes 226 cfs overflow)
- Computed Water Surface Elevation of Detention Pond = 1396.94
- Q5in – 241 cfs
- Q5out – 65 cfs
- Computed 5-Year Elevation of Detention Pond = 1394.35

2. Proposed conditions with two 36" RCP outlet pipes with flowline at 1389.60 and overflow elevation at 1396.40.
- Drainage Area = 192.00 Ac.
- Q100 – 212 cfs, (includes 54 cfs overflow)
- Computed 100-year Water Surface Elevation of Detention Pond = 1396.61
- Q5in – 241 cfs
- Q5out – 106 cfs
- Computed 5- Year Elevation of Detention pond = 1393.66

3. Proposed conditions with existing 36" RCP outlet pipe with flowline at 1389.60 and no overflow.
   - Drainage Area = 192.00 Ac.
   - Q100 – 76 cfs
   - Computed Water Surface Elevation of Detention Pond = 1397.84
   - Q5 – 56 cfs
   - Computed 5-year Elevation of Detention Pond = 1394.37

4. Proposed conditions with two 36" RCP outlet pipes with no overflow.
   - Drainage Area = 192.00 Ac.
   - Q100 – 158 cfs
   - Computed Water Surface Elevation of Detention Pond = 1396.79
   - Q5 – 106 cfs
   - Computed 5-year Elevation of Detention Pond = 1393.66

Option 2:

1. Proposed conditions with existing 36" RCP outlet pipe at elevation 1389.60 and overflow elevation at 1396.40.
   - Drainage Area = 192.00 Ac.
   - Q100 – 378 cfs
   - Computed Water Surface Elevation of Detention Pond = 1397.05
   - Q5 – 67 cfs
   - Computed 5-Year Elevation of Detention Pond = 1394.43

2. Proposed conditions with two 36" RCP outlet pipes and overflow elevation at 1396.40.
   - Drainage Area = 192.00 Ac.
   - Q100 – 297 cfs
   - Computed 100-Year Water Surface Elevation of Detention Pond = 1396.79
   - Q5 – 107 cfs
   - Computed 5-Year Elevation of Detention pond = 1393.70

3. Proposed conditions with existing 36" RCP outlet pipe at elevation 1389.60 and no overflow.
   - Drainage Area = 192.00 Ac.
   - Q100 – 80 cfs
   - Computed Water Surface Elevation of Detention Pond = 1398.36
   - Q5 – 57 cfs
   - Computed 5-Year Elevation of Detention Pond = 1394.52

4. Proposed conditions with two 36" RCP outlet pipes with no overflow.
   - Drainage Area = 192.00 Ac.
   - Q100 – 161 cfs
   - Computed Water Surface Elevation of Detention Pond = 1397.25
   - Q5 – 107 cfs
   - Computed 5-Year Elevation of Detention Pond = 1393.70

Backwater Analysis:

Using the proposed conditions with an improved channel.

- Bottom width = 8' for maintenance
- Q100 = 347 cfs
- Channel bottom will be straight with some grass
- Slope will be 0.89%
- Trapezoidal channel with 4:1 side slopes or flatter
- Normal Depth = 2.88'
- Velocity = 2.40 fps or lower
- 100-Year water surface elevation at the 9'x 5' RCB = 1400.27

DISCUSSION

In reviewing the previous drainage plan submitted to the FAA along with the construction plans for Taxiway A and Runway Extension there are some inconsistencies between the drainage studies developed by PEC for the present study.

The contributing drainage area for the detention pond, (borrow area), was 238 acres. The drainage area in the present study is 192.00 acres, which was included in the previous study. This difference is due to the previous drainage study taking into account the area north of the proposed site. According to the USGS maps and existing survey this area naturally drainages to the north and east where it discharges into Dry Creek downstream of the detention pond. This area was probably included in the drainage to the pond based on future development of this land. If development of this area occurs then detention will be required to meet the pre vs. post development discharge rates.

The existing condition, 100-year storm event, discharge rate without the proposed Center for Aviation Training Jabara Campus development is 594 cfs into the detention pond with the pond discharging 274 cfs at an elevation of 1396.89. Comparing this to the post development discharge rate the site has a 100-year discharge rate of 615 cfs going into the detention pond and 302 cfs discharging out of the pond at an elevation of 1396.94. Comparing the two models it shows that the proposed development has very little effect on the overall discharge from the airport property (28 cfs and 0.05' increase in water surface elevation).

If it were desired that the detention basin would not be permitted to overtop the runway safety area, there a few options to achieve this. One option would be to excavate the existing detention pond deeper and to increase the size of the pond by excavating the area to the north to account for any additional runoff. This would require that a minimum of 25 ac.-ft. or 41,000 cubic yards of storage be added to the detention pond for Option 1. In Option 2 the pond would have to be 4' deeper, a second outfall structure would have to be added for Option 1 and 2 to maintain a dry detention pond. There would have to be improvements made to the channel downstream to account for the second outfall structure being constructed at the lower elevation. The downstream improvements would allow the detention pond to discharge as it does today through a gravity pipe system just at a lower elevation.

The second option would be to add a discharge pipe large enough to stop the discharge over the safety area. To completely stop the overflow would require two additional 36" RCP be added to the existing 36" RCP. This would allow the 100-year water surface elevation for Option 2 to peak out at elevation 1396.35 with a Q100 = 223 cfs. This option would also require channel improvements where the structures discharge.

The last option would be to berm the safety area so that overflow would not be allowed to discharge. This can be only be done by placing a berm from the existing elevation of 1396.4 to a maximum elevation of 1398.00. This would leave approximately an area 15' wide area to place the 1.6' high berm with 4:1 side slopes to match the existing pond slope with a minimum 6' wide flat top and then graded at a maximum 5% slope down to existing grade within the safety area.

The FAA requires that the proposed development meet the pre vs. post discharge rate for the 5-year storm event. The City of Wichita requires that the pre vs. post discharge rate be met for the 100-year storm event. If only the FAA requirement (5-year storm event) is met then the existing detention pond is currently sized to handle the additional runoff and no additional improvements to the pond would be necessary. If the area to the north of the proposed site is developed in the future then the existing detention pond would need to be re-evaluated to see if it is still in compliance with the FAA regulations.

PERMITTING ISSUES

The channel improvements that are proposed will need to be submitted to the FAA for approval based on a 7460-1 Notice of Construction on Airports. Other agencies that have an interest in the development, but may not have jurisdiction include the Army Corp. of Engineers, Department of Water Resources, and FEMA.

The Department of Water Resources will not require a permit on the proposed channel improvements due to the drainage area, 192.0 acres, being below DWR's criteria that they regulate to, 240 acres. After contacting Mr. Ed Byrd, DWR, no permits will be required, but if desired the permit applications can be submitted to DWR to get an official determination. The official determination process can still take longer than two or three months.

The proposed improvements may require a permit application be submitted to the Army Corp of Engineers. The first step is to get a jurisdictional determination. Once this has been completed, the process usually takes between one to nine months to receive the nationwide or individual permit, if necessary.

Mr. John Foster, FEMA Map Assistance Center, stated that if a portion of the proposed development is located within a FEMA Flood Zone "A" the building owners can either pay for flood insurance on the structure (if required by their lending institution) or take the structure out of the floodplain. He also stated that the local agencies could have stricter regulations and guidelines than FEMA and if that were the case, any development would need to meet their requirements. The City of Wichita and Sedgwick would require that the buildings finish floor elevation be elevated 2 feet above the base flood elevation. After talking to Mr. Scott Lindebak, City of Wichita, he state that the City would require a detailed study be submitted to FEMA on the tributary before a building permit would be issued.

The only way to remove the floodplain zone is by obtaining a Conditional Letter of Map Revision, (CLOMR/CLOMR-Fill) or a Letter of Map Revision (LOMR/LOMR-Fill). The application fee for the CLOMR/CLOMR-F is $4,400.00/$500.00 plus an additional $4,000.00/$325.00 once the project is built and the elevations are verified that were established in the CLOMR. This process allows the project to be pre-approved before the project is built. The LOMR application fee is $4,400.00 and must be submitted post-construction. Both processes can take a minimum of six months to receive FEMA's final determination with the LOMR taking longer based on construction schedule for the project.

CONCLUSIONS

Based on PEC's analysis of the basin, the following conclusions may be reached:

The major drainage structure crossing under the access road (old 39th Street North) from Webb Road to Taxiway A is not sized to handle the 100-year storm event if the roadway is not raised to an elevation of 1401.00 or higher the access road will be overtopped by a 25-year storm event or larger.

2. If Option 1 is developed then the 100-year discharge from the detention pond will flow approximately 0.5' over the safety area without any improvements to the pond. The detention pond with Option 1 will have a drawdown time less than 48-hours (18-hours) meeting FAA regulations requirements.

3. If Option 2 is developed then the 100-year discharge from the detention pond will flow approximately 0.65' over the safety area without any improvements to the pond. The detention pond with Option 2 will have a drawdown time less than 48-hours (28-hours) meeting FAA regulations requirements.

4. If either Option 1 or 2 is developed, the flow over the safety area will be equivalent to what flows over the area today during the 100-year storm event (0.48' compared to 0.5' and 0.65' respectfully). If the flow over the safety area is not allowed the most viable option is to berm the safety area to a minimum elevation of 1398.00.

5. The proposed improvements to the site will not have any significant impact to the 100-year floodplain water surface elevation, increase of 0.04 ft., within the Airport Authorities property. Currently the area is an "A" Zone, which means that there has never been an official floodplain study done for the tributary. The floodplain will change based on more accurate information once a study has been completed and submitted to FEMA. The study will establish base flood elevations throughout the tributary and set floodplain limits within the property boundaries.

If you have any questions regarding this project or need additional information, please let me know.

Sincerely,

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

Shawn R. Bryan, P.E.
Project Engineer

SRB/tac

Encl: As noted

Professional Engineering Consultants, P.A.

October 3, 2007

Wichita Airport Authority
Wichita Mid Continent
2173 Air Cargo Road
P.O. Box 9130
Wichita, KS 67277-0130

Attention: Mr. John Oswald, P.E.

Reference: Colonel James Jabara Taxiway A and Aircraft Apron Drainage Study
PEC Project No. 32-07363-0019

Dear Mr. Oswald:

This letter presents a summary of the engineering analysis performed to determine the hydrologic and hydraulic effects the development of approximately 30 acres of land owned by the Wichita Airport Authority would have on the existing detention pond (borrow area), taxiway extension and the west tributary of Dry Creek water surface elevations. The project location is shown in FIGURE 1.

The purpose of this letter report is to present the findings of the engineering analysis and to identify the governmental or permitting agencies that have jurisdiction over development.

The hydrologic and hydraulic analysis focused on two major drainage structures:

1. A 9'x 5'x 55' reinforced concrete box culvert (RCB) located along the abandoned 39th Street from Webb Road to existing Taxiway A.

2. The existing detention pond with a 36" RCP and weir structure (elevation 1396.40) located east of Webb Road and just north of the existing Taxiway A.

The total drainage area that contributes runoff to this location was estimated to be 192± acres. A map showing the overall drainage basin boundaries and the major drainage structures are shown behind tab "Proposed Site Plan".

PREVIOUS STUDIES AND OTHER INFORMATION SOURCES

Several parcels of land upstream of Colonel James Jabara Airport, (west of Webb Road), have been developed over the last few years. Drainage plans and computations for the developments were submitted to the City of Wichita, Storm Water Management Department, during the platting process. To strive for consistency with previous hydrology calculations and to make use of available information, PEC reviewed drainage plans submitted for the nearby developments. PEC also reviewed the previous drainage report prepared for the Wichita Airport Authority for the extension of Runway 18-36 project and Taxiway A that was previously approved by the FAA.

303 S. TOPEKA
WICHITA, KANSAS
67202
316-262-2691
316-262-3003 FAX
www.pec1.com

WICHITA
TOPEKA
TULSA
LAWRENCE
PITTSBURG

The construction plans for the extension of Runway 18-36 and Taxiway A, which included drainage and hydraulic design data for drainage structures within the Colonel James Jabara Airport property, were also used as a reference. PEC's study generally relied on plans or record information for hydraulic data such as culvert sizes, flowline elevations, street grades, etc. However, a field survey was conducted to verify critical drainage features.

More specifically, the following information was obtained from these sources:

1 Construction plans for the extension of Runway 18-36 and Taxiway A, designed by PEC was reviewed. The following information was included in the plans:

For the 36" RCP outlet pipe underneath the runway safety area

- The upstream and downstream flowline elevations are 1389.60 and 1386.00, respectively. The approximate "Overtopping" elevation for the runway safety area is 1396.40 and is approximately 532' wide.

The drainage report was reviewed and included the following information:

- The drainage area, 238 acres, contributing runoff to the existing detention pond.
- The computed 100-year discharge from the existing detention pond is 565 cfs.
- The computed 100-year water surface elevation of the existing detention pond is 1396.48

HYDROLOGIC AND HYDRAULIC ANALYSIS

The procedure used by PEC for the hydrologic and hydraulic analysis maybe summarized as follows:

The overall basin boundary was established using the USGS map. This boundary was compared to the existing drainage study that was prepared by PEC for the Runway Extension.

2 The "Rational Method" was used in the initial effort to estimate a peak 100-year discharge rate. This discharge was compared to the 100-year discharge contained in the previous drainage report.

3 A rating curve was developed for the culvert underneath the runway safety area and for the existing 9'x 5' RCB crossing the access roadway to Taxiway A. The rating curves relate water surface elevations at the upstream ends of both culverts to runoff rates.

4. The tailwater elevation for the existing 9'x 5' RCB was based on the 100-year elevation of the detention pond.

5 The tailwater elevation for the existing 36" RCP outlet pipe was based on the flowline of the discharge pipe and flow of the existing channel downstream.

6. The FAA requires that the drainage system be designed to handle the 5-year storm event. Whereas, the City of Wichita requires that the site runoff meet the pre vs. post discharge rates for the 100-year/24-hour storm event. Since the City of Wichita's design criterion is more stringent than the FAA's the drainage study only has detailed information for the 100-year/24-hour requirement.

7. As was noted, the Rational Method was used to initially estimate the 100-year peak discharge. To further refine the analysis, the HEC-1 computer program was used to model the basin's response to rainfall. HEC-1 computed the peak runoff rates and corresponding water surface elevations at the major drainage structures.

   HEC-RAS was used to compute the 100-year water surface profile upstream of the 9'x 5' RCB, (under 39th Street North), to Webb Road.

8. According to FAA AC 150/5200-33B "HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS" the new storm water facility should be designed, engineered, constructed, and maintained for a maximum 48 hour detention period after the design storm and remain completely dry between storms.

9. According to the FAA AC 150/5300-13 "AIRPORT DESIGN" the new storm water facility needs to meet the design standards for the runway safety area, obstacle free zone, object free area and the clearway standards. These protection zones are labeled on the map behind the tab "RUNWAY PROTECTION ZONE".

10. The FAA AC 150/5320-5C "SURFACE DRAINAGE DESIGN" was also reviewed for this study.

The two models used in the analysis were developed to consider both "Existing" and "Proposed" basin topographic conditions. This analysis shows the effects upon flow rates and water surface elevations caused by the proposed development.

PEC looked at two options for the development plan regarding the detention pond as follows:

Option 1

1 The proposed site plan that was supplied to PEC by SJCF was overlayed on the existing property survey. The east edge of the proposed 35' taxiway is located approximately 1,127' east of Webb Road or 160' west of the 35' building restriction line. The proposed taxiway was assumed to be constructed at an elevation of 1406.4 with a 22-foot buffer area immediately to the east. The buffer then was sloped at a 4:1 slope back to the existing grade of 1392.4. See proposed site plan located behind tab labeled "SITE PLAN" and "DEVELOPMENT PLAN" for location and details.

Option 2:

1. The above-mentioned site plan was also used in determining Option 2's layout. It was assumed that the building would be constructed on the "Building Restriction Line", which is approximately 1,284' east of Webb Road. The building was assumed to be constructed at an elevation of 1402.2 with a 10-foot buffer area immediately east. The buffer would be sloped at a 4:1 slope back to the existing grade of 1392.4. See proposed site plan located behind tab labeled "SITE PLAN" and "DEVELOPMENT PLAN" for location and details.

Additionally, a backwater analysis was performed to look at the impacts that the proposed development would have on the west tributary into Dry Creek. Approximately 89.6 acres drain through a 9'x 5' RCB underneath the dirt access road (old 39th Street North) from Webb Road to Taxiway A. PEC is to determine what impacts the proposed development and channel improvements will have on the existing 9'x5' RCB, if any. See HEC-RAS Stations & Tributary location behind the tab labeled "HEC-RAS STATIONS" for location and details.

SUMMARY OF RESULTS

The results of the hydrologic and hydraulic analysis performed by PEC are as follows:

Option 1

1 Proposed conditions with existing 36" RCP outlet pipe with existing flowline at 1389.60 and overflow elevation at 1396.40.
- Drainage Area = 192.00 Ac.
- Q100in = 615 cfs
- Q100out – 302 cfs, (includes 226 cfs overflow)
- Computed Water Surface Elevation of Detention Pond = 1396.94
- Q5in – 241 cfs
- Q5out – 65 cfs
- Computed 5-Year Elevation of Detention Pond = 1394.35

2. Proposed conditions with two 36" RCP outlet pipes with flowline at 1389.60 and overflow elevation at 1396.40.
- Drainage Area = 192.00 Ac.
- Q100 – 212 cfs, (includes 54 cfs overflow)
- Computed 100-Year Water Surface Elevation of Detention Pond = 1396.61
- Q5in – 241 cfs
- Q5out – 106 cfs
- Computed 5- Year Elevation of Detention pond = 1393.66

3. Proposed conditions with existing 36" RCP outlet pipe with flowline at 1389.60 and no overflow.
   - Drainage Area = 192.00 Ac.
   - Q100 – 76 cfs
   - Computed Water Surface Elevation of Detention Pond = 1397.84
   - Q5 – 56 cfs
   - Computed 5-Year Elevation of Detention Pond = 1394.37

4. Proposed conditions with two 36" RCP outlet pipes with no overflow.
   - Drainage Area = 192.00 Ac.
   - Q100 – 158 cfs
   - Computed Water Surface Elevation of Detention Pond = 1396.79
   - Q5 – 106 cfs
   - Computed 5-Year Elevation of Detention Pond = 1393.66

Option 2:

Proposed conditions with existing 36" RCP outlet pipe at elevation 1389.60 and overflow elevation at 1396.40.
- Drainage Area = 192.00 Ac.
- Q100 – 378 cfs
- Computed Water Surface Elevation of Detention Pond = 1397.05
- Q5 – 67 cfs
- Computed 5-Year Elevation of Detention Pond = 1394.43

2. Proposed conditions with two 36" RCP outlet pipes and overflow elevation at 1396.40.
   - Drainage Area = 192.00 Ac.
   - Q100 – 297 cfs
   - Computed 100-Year Water Surface Elevation of Detention Pond = 1396.79
   - Q5 – 107 cfs
   - Computed 5-Year Elevation of Detention pond = 1393.70

3. Proposed conditions with existing 36" RCP outlet pipe at elevation 1389.60 and no overflow.
   - Drainage Area = 192.00 Ac.
   - Q100 – 80 cfs
   - Computed Water Surface Elevation of Detention Pond = 1398.36
   - Q5 – 57 cfs
   - Computed 5-Year Elevation of Detention Pond = 1394.52

4 Proposed conditions with two 36" RCP outlet pipes with no overflow.
- Drainage Area = 192.00 Ac.
- Q100 – 161 cfs
- Computed Water Surface Elevation of Detention Pond = 1397.25
- Q5 – 107 cfs
- Computed 5-Year Elevation of Detention Pond = 1393.70

Backwater Analysis

1 Using the proposed conditions with an improved channel.
- Bottom width = 8' for maintenance
- Q100 = 347 cfs
- Channel bottom will be straight with some grass
- Slope will be 0.89%
- Trapezoidal channel with 4:1 side slopes or flatter
- Normal Depth = 2.88'
- Velocity = 2.40 fps or lower
- 100-Year water surface elevation at the 9'x 5' RCB = 1400.27

DISCUSSION

In reviewing the previous drainage plan submitted to the FAA along with the construction plans for Taxiway A and Runway Extension there are some inconsistencies between the drainage studies developed by PEC for the present study.

The contributing drainage area for the detention pond, (borrow area), was 238 acres. The drainage area in the present study is 192.00 acres, which was included in the previous study. This difference is due to the previous drainage study taking into account the area north of the proposed site. According to the USGS maps and existing survey this area naturally drainages to the north and east where it discharges into Dry Creek downstream of the detention pond. This area was probably included in the drainage to the pond based on future development of this land. If development of this area occurs then detention will be required to meet the pre vs. post development discharge rates.

The existing condition, 100-year storm event, discharge rate without the proposed Center for Aviation Training Jabara Campus development is 594 cfs into the detention pond with the pond discharging 274 cfs at an elevation of 1396.89. Comparing this to the post development discharge rate the site has a 100-year discharge rate of 615 cfs going into the detention pond and 302 cfs discharging out of the pond at an elevation of 1396.94. Comparing the two models it shows that the proposed development has very little effect on the overall discharge from the airport property (28 cfs and 0.05' increase in water surface elevation).

If it were desired that the detention basin would not be permitted to overtop the runway safety area, there a few options to achieve this. One option would be to excavate the existing detention pond deeper and to increase the size of the pond by excavating the area to the north to account for any additional runoff. This would require that a minimum of 25 ac.-ft. or 41,000 cubic yards of storage be added to the detention pond for Option 1. In Option 2 the pond would have to be 4' deeper, a second outfall structure would have to be added for Option 1 and 2 to maintain a dry detention pond. There would have to be improvements made to the channel downstream to account for the second outfall structure being constructed at the lower elevation. The downstream improvements would allow the detention pond to discharge as it does today through a gravity pipe system just at a lower elevation.

The second option would be to add a discharge pipe large enough to stop the discharge over the safety area. To completely stop the overflow would require two additional 36" RCP be added to the existing 36" RCP. This would allow the 100-year water surface elevation for Option 2 to peak out at elevation 1396.35 with a Q100 = 223 cfs. This option would also require channel improvements where the structures discharge.

The last option would be to berm the safety area so that overflow would not be allowed to discharge. This can be only be done by placing a berm from the existing elevation of 1396.4 to a maximum elevation of 1398.00. This would leave approximately an area 15' wide area to place the 1.6' high berm with 4:1 side slopes to match the existing pond slope with a minimum 6' wide flat top and then graded at a maximum 5% slope down to existing grade within the safety area.

The FAA requires that the proposed development meet the pre vs. post discharge rate for the 5-year storm event. The City of Wichita requires that the pre vs. post discharge rate be met for the 100-year storm event. If only the FAA requirement (5-year storm event) is met then the existing detention pond is currently sized to handle the additional runoff and no additional improvements to the pond would be necessary. If the area to the north of the proposed site is developed in the future then the existing detention pond would need to be re-evaluated to see if it is still in compliance with the FAA regulations.

The proposed improvements to the site will not have any significant impact to the 100-year floodplain within the Airport Authorities property. Currently the area is an "A" zone, which means that there has never been an official floodplain study done for the tributary. The floodplain will change based on more accurate information once a study has been completed and submitted to FEMA. The study will establish base flood elevations throughout the tributary and set floodplain limits within the property boundaries.

PERMITTING ISSUES

The channel improvements that are proposed to be made will need to be submitted to the FAA for approval based on a 7460-1 Notice of Construction on Airports. Other agencies that have an interest in the development, but may not have jurisdiction include the Army Corp. of Engineers, Department of Water Resources, and FEMA.

The Department of Water Resources will not require a permit on the proposed channel improvements due to the drainage area, 192.0 acres, being below DWR's criteria that they regulate to, 240 acres. After contacting Mr. Ed Byrd, DWR, no permits will be required, but if desired the permit applications can be submitted to DWR to get an official determination. The official determination process can still take longer than two or three months.

The proposed improvements will require a permit application be submitted to the Army Corp of Engineers. The first step will be to get an official jurisdictional determination done by the Corps of Engineers. Once the determination is completed, the process usually takes between one to nine months or longer depending on if the permit needs to be reviewed by EPA to receive the nationwide or individual permit, if necessary.

A portion of the proposed development is located within a FEMA Flood Zone "A". The building owners can either pay for flood insurance on the structure (if required by their lending institution) or take the structure out of the floodplain. The only way to remove the floodplain zone is by obtaining a Conditional Letter of Map Revision, (CLOMR/CLOMR-Fill) or a Letter of Map Revision (LOMR/LOMR-Fill). The application fee for the CLOMR/CLOMR-F is $4,400.00/$500.00 plus an additional $4,000.00/$325.00 once the project is built and the elevations are verified that were established in the CLOMR. This process allows the project to be pre-approved before the project is built. The LOMR application fee is $4,400.00 and must be submitted post-construction. Both processes can take a minimum of six months to receive FEMA's final determination with the LOMR taking longer based on construction schedule for the project.

CONCLUSIONS

Based on PEC's analysis of the basin, the following conclusions may be reached

1 The major drainage structure crossing under the access road (old 39th Street North) from Webb Road to Taxiway A is not sized to handle the 100-year storm event if the roadway is not raised to an elevation of 1401.00 or higher the access road will be overtopped by a 25-year storm event or larger.

2. If Option 1 is developed then the 100-year discharge from the detention pond will flow approximately 0.5' over the safety area without any improvements to the pond. The detention pond with Option 1 will have a drawdown time less than 48-hours (18-hours) meeting FAA regulations requirements.

3. If Option 2 is developed then the 100-year discharge from the detention pond will flow approximately 0.65' over the safety area without any improvements to the pond. The detention pond with Option 2 will have a drawdown time less than 48-hours (28-hours) meeting FAA regulations requirements.

4. If either Option 1 or 2 is developed, the flow over the safety area will be equivalent to what flows over the area today during the 100-year storm event (0.48' compared to 0.5' and 0.65' respectfully). If the flow over the safety area is not allowed the most viable option is to berm the safety area to a minimum elevation of 1398.00.

5. The FAA requires that the proposed development meet the pre vs. post discharge rate for the 5-year storm event. The City of Wichita requires that the pre vs. post discharge rate be met for the 100-year storm event. If only the FAA requirement (5-year storm event) is met then the existing detention pond is currently sized to handle the additional runoff and no additional improvements to the pond would be necessary. The water surface elevation and discharge rate for proposed Option 1, with the existing outlet structure, is 65 cfs at an elevation of 1394.35. The water surface elevation and discharge rate for proposed Option 2, with the existing outlet structure, is 67 cfs at an elevation of 1394.43. If the area to the north of the proposed site is developed in the future then the existing detention pond would need to be re-evaluated to see if it is still in compliance with the FAA regulations.

If you have any questions regarding this project or need additional information, please let me know.

Sincerely,

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

Shawn R. Bryan, P.E.
Project Engineer

SRB/tac

Encl: As noted

32-07363-0019

U.S. Department
of Transportation

**Federal Aviation
Administration**

Central Region
Iowa, Kansas,
Missouri, Nebraska

901 Locust
Kansas City, Missouri 64106
(816) 329-2600

KTTI

Bill

October 15, 2007

Mr. John Oswald, P.E.
Director of Airport Engineering and Planning
Wichita Airport Authority
2173 Air Cargo Road
Wichita, KS 67209

Dear Mr. Oswald:

Colonel James Jabara Airport
Taxiway A Drainage Study/KTTI

I have reviewed the revised study that was with your October 4, 2007 letter and note the following facts:

- For the 100-year storm event under present conditions and future Options 1 and 2, the result would be approximately 0.5' of water in the Runway Safety Area (RSA), but the detention area would drain in less than 48 hours (18 hours under Option 1 and 28 hours under Option 2). Water would also encroach on the Object Free Area (OFA) and Runway Protection Zone (RPZ) during drawdown.
  For the 5-year storm event under present conditions and future Options 1 and 2, the water elevation would remain approximately 2" below the RSA, so the RSA would not flood. While specifics are not available, the drawdown time would be less than the 18 and 28 hour times stated above. Water would encroach on the OFA and RPZ during drawdown.

We have the following conclusions:

Because the RSA would not flood under the 5-year storm event, the proposed development meets FAA Design standards for drainage of the RPZ.
AC 150/5200-33B, Hazardous Wildlife Attractants On or Near Airports, says that there should be a maximum 48-hour detention period for detention basins. The proposed development meets that standard.
We generally advise placing new detention basins outside the OFA, and RPZ. However, this is a modification of an existing basin. With the quick drawdown times demonstrated in your analysis, we see little advantage to requiring the basin be located outside the OFA and RPZ.

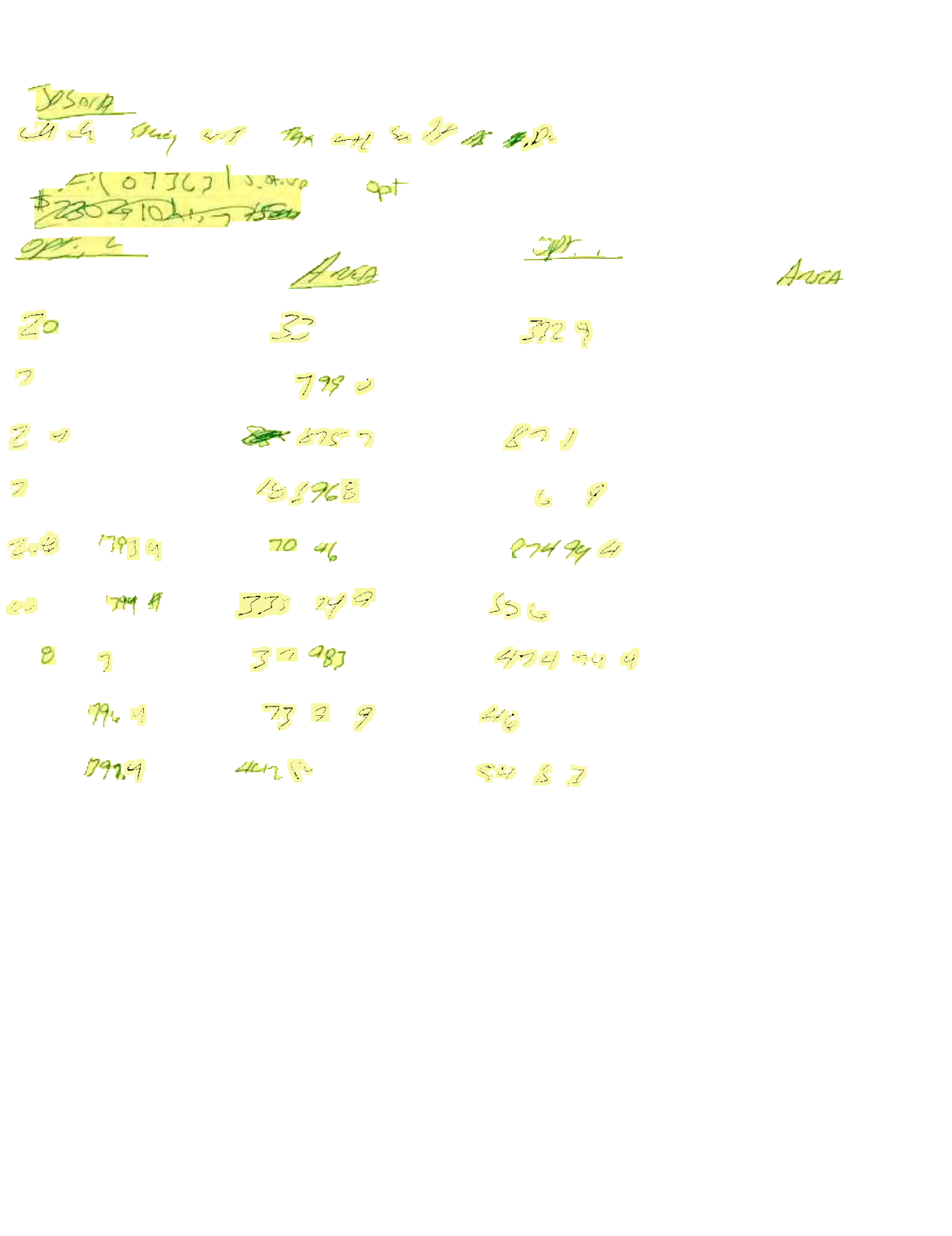
The development is acceptable. If you have any questions, please call me at 816-329-2617.

Sincerely,

Glenn Helm, P.E.
Program Manager

RECEIVED
OCT 19 2007
Airport
Engr.

RECEIVED
OCT 19 2007
W.A.A



1**********
****

FLOOD HYDROGRAPH PACKAGE (HEC-1)

JUN 1998

VERSION 4.1

RUN DATE 17OCT07 TIME 10:00:28

with Taxiway proposed Location

U.S. ARMY CORPS OF ENGINEERS
HYDROLOGIC ENGINEERING CENTER
609 SECOND STREET
DAVIS, CALIFORNIA 95616
(916) 756-1104

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

             1          ID      HEC-1 ANALYSIS FOR JABARA TAXIWAY A & APRON DRAINAGE STUDY
             2          ID      PROPOSED CONDITIONS - OPTION 1-1-36" RCP WITH OVERFLOW AT 1396.40
             3          ID      5-YEAR & 100-YEAR STORM - POST DEVELOPMENT
*** LIST ***
*** FREE ***
                        *DIAGRAM
             4          IT      15 11JUN07    1200       0 12JUN07    2000
             5          IN      15 11JUN07    1200
             6          IO       0        5
             7          JR    PREC     3.5     7.8
```

```
                *
                *
                *
                *
                *

    8           KK         A
    9           KO         5
   10           BA    0.0560
   11           PB      1.00
   12           PC     0.000    0.003    0.006    0.008    0.011    0.014    0.017    0.019    0.022    0.025
   13           PC     0.029    0.032    0.035    0.038    0.042    0.045    0.048    0.052    0.056    0.060
   14           PC     0.064    0.068    0.072    0.076    0.080    0.085    0.090    0.095    0.100    0.105
   15           PC     0.110    0.115    0.120    0.127    0.134    0.140    0.147    0.155    0.163    0.172
   16           PC     0.181    0.193    0.204    0.220    0.235    0.259    0.283    0.387    0.663    0.699
   17           PC     0.735    0.754    0.772    0.786    0.799    0.810    0.820    0.828    0.835    0.843
   18           PC     0.850    0.858    0.865    0.873    0.880    0.885    0.889    0.894    0.898    0.903
   19           PC     0.907    0.912    0.916    0.921    0.925    0.929    0.934    0.938    0.943    0.947
   20           PC     0.952    0.955    0.958    0.961    0.964    0.967    0.970    0.973    0.976    0.979
   21           PC     0.982    0.985    0.988    0.991    0.994    0.997    1.000
   22           LS         0       80       20
   23           UD      0.56
                *
                *

   24           KK         B
   25           KO         5
   26           BA    0.0686
   27           PB      1.00
   28           PC     0.000    0.003    0.006    0.008    0.011    0.014    0.017    0.019    0.022    0.025
   29           PC     0.029    0.032    0.035    0.038    0.042    0.045    0.048    0.052    0.056    0.060
   30           PC     0.064    0.068    0.072    0.076    0.080    0.085    0.090    0.095    0.100    0.105
   31           PC     0.110    0.115    0.120    0.127    0.134    0.140    0.147    0.155    0.163    0.172
   32           PC     0.181    0.193    0.204    0.220    0.235    0.259    0.283    0.387    0.663    0.699
   33           PC     0.735    0.754    0.772    0.786    0.799    0.810    0.820    0.828    0.835    0.843
   34           PC     0.850    0.858    0.865    0.873    0.880    0.885    0.889    0.894    0.898    0.903
   35           PC     0.907    0.912    0.916    0.921    0.925    0.929    0.934    0.938    0.943    0.947
   36           PC     0.952    0.955    0.958    0.961    0.964    0.967    0.970    0.973    0.976    0.979
   37           PC     0.982    0.985    0.988    0.991    0.994    0.997    1.000
   38           LS         0       80       72
   39           UD      0.22
                *
                *

1                                        HEC-1 INPUT                                                  PAGE  2

LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   40           KK         C
   41           KO         5
   42           BA    0.0714
   43           PB      1.00
   44           PC     0.000    0.003    0.006    0.008    0.011    0.014    0.017    0.019    0.022    0.025
   45           PC     0.029    0.032    0.035    0.038    0.042    0.045    0.048    0.052    0.056    0.060
   46           PC     0.064    0.068    0.072    0.076    0.080    0.085    0.090    0.095    0.100    0.105
   47           PC     0.110    0.115    0.120    0.127    0.134    0.140    0.147    0.155    0.163    0.172
   48           PC     0.181    0.193    0.204    0.220    0.235    0.259    0.283    0.387    0.663    0.699
```

```
PC    0.735     754    0.772    0.786    0.799    0.810    0.820     328      835    0.843
PC    0.850    0.858    0.865    0.873    0.880    0.885    0.889    0.894    0.898    0.903
PC    0.907    0.912    0.916    0.921    0.925    0.929    0.934    0.938    0.943    0.947
PC    0.952    0.955    0.958    0.961    0.964    0.967    0.970    0.973    0.976    0.979
      0.982    0.985    0.988    0.991    0.994    0.997      000
LS        0                  61
        0.70
```

57

```
        0.0613
PB        1.00
          0.000      003    0.006    0.008    0.011    0.014    0.017    0.019    0.022    0.025
PC        0.029    0.032    0.035    0.038    0.042    0.045    0.048    0.052    0.056    0.060
          0.064    0.068    0.072    0.076    0.080    0.085    0.090    0.095    0.100    0.105
PC        0.110      115    0.120      127    0.134    0.140    0.147    0.155    0.163    0.172
          0.181      193    0.204      220    0.235    0.259    0.283    0.387    0.663    0.699
          0.735    0.754    0.772    0.786    0.799    0.810    0.820    0.828    0.835    0.843
PC        0.850    0.858    0.865    0.873    0.880    0.885    0.889    0.894    0.898    0.903
PC        0.907    0.912    0.916    0.921    0.925    0.929    0.934    0.938    0.943    0.947
          0.952    0.955    0.958    0.961    0.964    0.967    0.970    0.973    0.976    0.979
PC        0.982    0.985    0.988    0.991    0.994    0.997    1.000
            0
          0.60
```

73

```
BA    0.0469
```

75

```
PB      1.00
PC      0.000      003    0.006    0.008    0.011    0.014    0.017      019    0.022    0.025
PC      0.029    0.032    0.035    0.038    0.042    0.045    0.048    0.052    0.056    0.060
PC      0.064    0.068    0.072    0.076    0.080    0.085    0.090    0.095    0.100    0.105
        0.110      115    0.120    0.127    0.134    0.140    0.147      155    0.163    0.172
PC      0.181      193    0.204    0.220    0.235    0.259    0.283    0.387    0.663    0.699
        0.735      754    0.772    0.786    0.799    0.810    0.820    0.828    0.835    0.843
PC      0.850    0.858    0.865    0.873    0.880    0.885    0.889    0.894    0.898    0.903
PC      0.907    0.912    0.916    0.921    0.925    0.929    0.934    0.938    0.943    0.947
        0.952    0.955    0.958    0.961    0.964    0.967    0.970    0.973    0.976    0.979
PC      0.982    0.985    0.988    0.991    0.994    0.997    1.000
LS
```

HEC INPUT PAGE

```
      .1.              3.              .5.      6.              8.

      0.30
```

Total

```
                    *
                    *
 91                 KK   PONDA
 92                 KO        5
 93                 RS        1    ELEV  1389.6
 94                 SA    0.008     0.48    6.69    8.19   10.73   12.58
 95                 SE   1389.6  1390.4  1393.4  1394.4  1396.4  1397.4
 96                 SQ        0     50.0   100.0   150.0   200.0   250.0   300.0   350.0   400.0   450.0
 97                 SQ      500
 98                 SE   1389.6 1393.38 1396.52 1396.65 1396.76 1396.85 1396.94 1397.01 1397.08 1397.16
 99                 SE   1396.2
                    *
                    *
                    *
                    *
                    *
100                 ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING           (--->) DIVERSION OR PUMP FLOW
   NO.      (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

    8             A
                  .
                  .
   24             .             B
                  .             .
                  .             .
   40             .             .             C
                  .             .             .
                  .             .             .
   56             .             .             .             D
                  .             .             .
                  .             .             .
   72             .             .             .                           E
                  .             .             .                           .
                  .             .             .                           .
   88         Total.....................................           ......
                     V
                     V
   91         PONDA

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS
  *
 *                JUN   1998            *                    *   HYDROLOGIC ENGINEERING CENTER
  *
 *              VERSION 4.1             *                    *        609 SECOND STREET
                                        *                    *      DAVIS, CALIFORNIA 95616
```

RUN DATE 17OCT07 TIME 10:00:28 (916) 756-1104

HEC-1 ANALYSIS FOR JABARA TAXIWAY A & APRON DRAINAGE STUDY
PROPOSED CONDITIONS - OPTION 1-1-36" RCP WITH OVERFLOW AT 1396.40
5-YEAR & 100-YEAR STORM - POST DEVELOPMENT

6 IO OUTPUT CONTROL VARIABLES

IPRNT	0	PRINT CONTROL
IPLOT	5	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	15	MINUTES IN COMPUTATION INTERVAL
IDATE	11JUN 7	STARTING DATE
ITIME	1200	STARTING TIME
NQ	129	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	12JUN 7	ENDING DATE
NDTIME	2000	ENDING TIME
ICENT	19	CENTURY MARK

COMPUTATION INTERVAL .25 HOURS
TOTAL TIME BASE 32.00 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
3.50 7.80

```
  8 KK      *         A  *
            *            *
            **************

  9 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            5  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
 24 KK      *         B  *
            *            *
            **************

 25 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            5  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
 40 KK      *         C  *
            *            *
            **************

 41 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            5  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***

            **************
            *            *
 56 KK      *         D  *
            *            *
            **************

 57 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
```

```
                    IPLOT           5  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


          **************
          *            *
  72 KK   *          E *
          *            *
          **************

  73 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           5  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


          **************
          *            *
  88 KK   *     Total  *
          *            *
          **************

  89 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           5  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


          **************
          *            *
  91 KK   *     PONDA  *
          *            *
          **************

  92 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           5  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
1

            PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                         FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
```

TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2
					3.50	7.80
HYDROGRAPH AT						
+	A	.06	1	FLOW	35.	105.
				TIME	12.50	12.50
HYDROGRAPH AT						
+	B	.07	1	FLOW	90.	218.
				TIME	12.00	12.00
HYDROGRAPH AT						
+	C	.07	1	FLOW	51.	129.
				TIME	12.50	12.50
HYDROGRAPH AT						
+	D	.06	1	FLOW	45.	119.
				TIME	12.50	12.50
HYDROGRAPH AT						
+	E	.05	1	FLOW	57.	134.
				TIME	12.25	12.25
5 COMBINED AT						
+	Total	.30	1	FLOW	241.	615.
				TIME	12.25	12.25
ROUTED TO						
+	PONDA	.30	1	FLOW	66.	310.
				TIME	13.50	13.00

** PEAK STAGES IN FEET **

1	STAGE	1394.36	1396.95
	TIME	13.50	13.00

*** NORMAL END OF HEC-1 ***

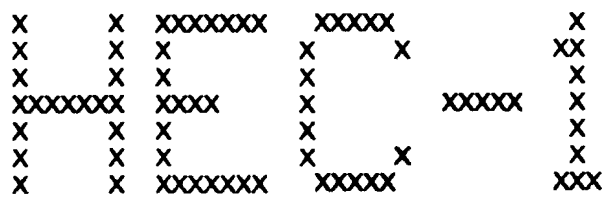
1**** **********
***** **********
*
*
FLOOD HYDROGRAPH PACKAGE (HEC-1)

JUN 1998

VERSION 4.1
*
*
RUN DATE 17OCT07 TIME 10:22:00 *
*
****
****

With taxiway proposed Location

U.S. ARMY CORPS OF ENGINEERS
HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
DAVIS, CALIFORNIA 95616
(916) 756-1104
*



THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE

```
          LINE          ID.  ....1.......2.......3.......4.......5.......6....   7.......8.......9..   .10

             1          ID      HEC-1 ANALYSIS FOR JABARA TAXIWAY A & APRON DRAINAGE STUDY
             2          ID      PROPOSED CONDITIONS - OPTION 2- 1-36" RCP WITH OVERFLOW AT 1396.40
             3          ID      100-YEAR STORM - POST DEVELOPMENT
 *** LIST ***
 *** FREE ***
                        *DIAGRAM
             4          IT      15 11JUN07    1200       0 12JUN07    2000
             5          IN      15 11JUN07    1200
             6          IO       0        5
             7          JR    PREC     3.5     7.8
```

0560

11

0.000	003	006	008	011	014	017	019	022	025
0.029	0.032	0.035	0.038	0.042	0.045	0.048	0.052	0.056	0.060
PC 0.064	0.068	0.072	0.076	0.080	0.085	0.090	0.095	100	105
PC 110	115	120	127	134	140	147	155	163	172
181	193	204	220	0.235	259	283	387	0.663	0.699
PC 735	754	772	786	799	0.810	0.820	0.828	0.835	0.843
0.850	0.858	0.865	0.873	0.880	0.885	0.889	0.894	0.898	0.903
0.907	0.912	0.916	0.921	0.925	929	0.934	0.938	0.943	0.947
952	955	958	0.961	0.964	0.967	0.970	973	976	0.979
982	0.985	988	0.991	0.994	997	000			

22 LS

0686

0.000	003	006	008	011	014	017	019	022	025
0.029	0.032	0.035	0.038	0.042	0.045	0.048	0.052	0.056	0.060
PC 0.064	0.068	0.072	0.076	0.080	0.085	0.090	0.095	100	105
110	115	120	127	134	140	147	155	163	172
181	193	204	220	235	259	283	387	663	0.699
33 735	754	772	786	799	0.810	0.820	0.828	0.835	0.843
0.850	858	0.865	0.873	0.880	0.885	0.889	0.894	0.898	0.903
0.907	912	916	0.921	925	0.929	0.934	938	0.943	0.947
0.952	955	0.958	961	964	0.967	0.970	973	0.976	0.979
0.982	985	0.988	0.991	0.994	0.997	000			

LS

PAGE

INE

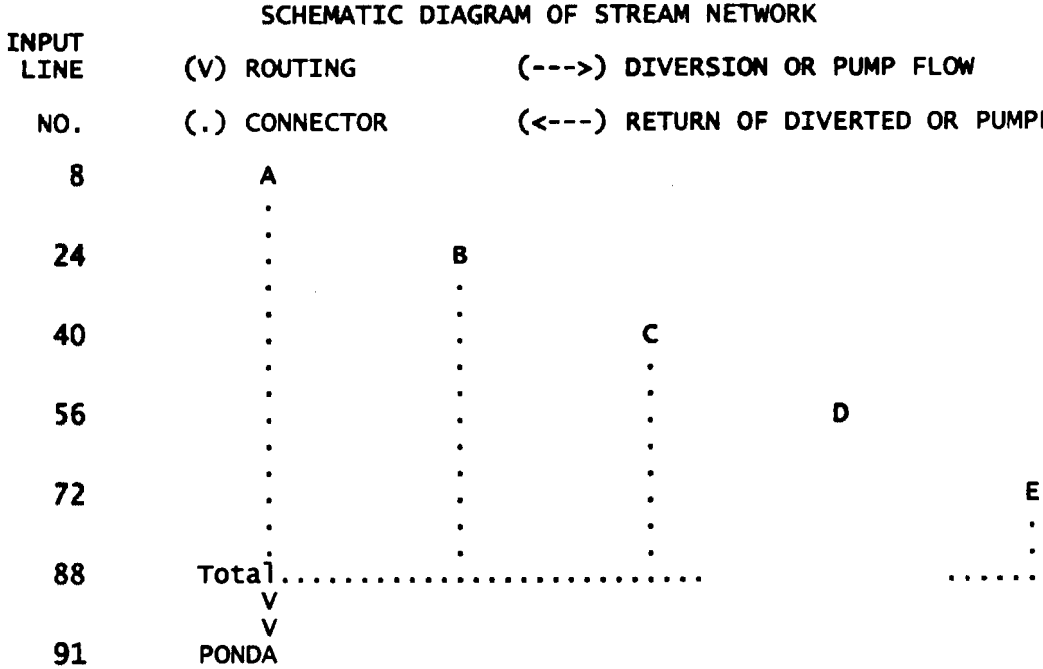
42 0714

0.000	003	006	008	011	014	017	019	022	025
0.029	032	0.035	0.038	0.042	0.045	0.048	0.052	0.056	0.060
0.064	0.068	0.072	0.076	0.080	0.085	0.090	0.095	100	105
PC 110	115	120	127	134	140	147	155	163	172
PC 181	193	204	220	235	259	283	387	0.663	0.699
735	754	772	786	799	0.810	0.820	0.828	0.835	0.843
850	0.858	0.865	0.873	0.880	0.885	889	0.894	0.898	0.903

```
 51          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
 52          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
 53          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
 54          LS       0      80      61
 55          UD    0.70
             *
             *
             *

 56          KK       D
 57          KO       5
 58          BA  0.0613
 59          PB    1.00
 60          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
 61          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
 62          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 63          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
 64          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
 65          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
 66          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
 67          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
 68          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
 69          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
 70          LS       0      80      50
 71          UD    0.60
             *
             *

 72          KK       E
 73          KO       5
 74          BA  0.0469
 75          PB    1.00
 76          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
 77          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
 78          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 79          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
 80          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
 81          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
 82          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
 83          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
 84          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
 85          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
 86          LS       0      80      80
1                                    HEC-1 INPUT                                          PAGE

LINE         ID.......1.......2       3.......4.......5.......6..     7...    8..     9.    .10

 87          UD    0.30
             *
             *
             *

 88          KK   Total
 89          KO       5
 90          HC       5       0
             *
             *
```

```
 91          KK   PONDA
 92          KO       5
 93          RS       1    ELEV  1389.6
 94          SA   0.008    0.48    6.40    7.73   8.569   10.17
 95          SE  1389.4  1390.4  1393.4  1394.4  1396.4  1397.4
 96          SQ       0    50.0   100.0   150.0   200.0   250.0   300.0   350.0   400.0   450.0
 97          SQ     500
 98          SE  1389.6 1393.38 1396.52 1396.65 1396.76 1396.85 1396.94 1397.01 1397.08 1397.16
 99          SE  1397.2
             *
             *
             *
             *
             *
100          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*****************************************
*                                       *
*    FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*                                       *
*                JUN   1998             *
*                                       *
*             VERSION 4.1               *
*                                       *
*                                       *
*   RUN DATE   17OCT07  TIME  10:22:00  *
```

U.S. ARMY CORPS OF ENGINEERS
HYDROLOGIC ENGINEERING CENTER
609 SECOND STREET
DAVIS, CALIFORNIA 95616
(916) 756-1104

```
  *
  *                                        *                                              *
  *
 ****************************************
****************************************




                              HEC-1 ANALYSIS FOR JABARA TAXIWAY A & APRON DRAINAGE STUDY
                              PROPOSED CONDITIONS - OPTION 2- 1-36" RCP WITH OVERFLOW AT 1396.40
                              100-YEAR STORM - POST DEVELOPMENT

    6 IO           OUTPUT CONTROL VARIABLES
                        IPRNT          0  PRINT CONTROL
                        IPLOT          5  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

      IT           HYDROGRAPH TIME DATA
                         NMIN         15  MINUTES IN COMPUTATION INTERVAL
                        IDATE   11JUN  7  STARTING DATE
                        ITIME       1200  STARTING TIME
                           NQ        129  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE   12JUN  7  ENDING DATE
                       NDTIME       2000  ENDING TIME
                        ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .25 HOURS
                      TOTAL TIME BASE   32.00 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT

      JP            MULTI-PLAN OPTION
                        NPLAN          1  NUMBER OF PLANS

      JR            MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     3.50      7.80


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


              **************
                           *
    8 KK              A    *
                           *
```

```
               **************

  9 KO              OUTPUT CONTROL VARIABLES
                         IPRNT             5  PRINT CONTROL
                         IPLOT             5  PLOT CONTROL
                         QSCAL            0.  HYDROGRAPH PLOT SCALE


 ** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
 *


               **************
               *            *
 24 KK         *         B  *
               *            *
               **************

 25 KO              OUTPUT CONTROL VARIABLES
                         IPRNT             5  PRINT CONTROL
                         IPLOT             5  PLOT CONTROL
                         QSCAL            0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
***


               **************
               *            *
 40 KK         *         C  *
               *            *
               **************

 41 KO              OUTPUT CONTROL VARIABLES
                         IPRNT             5  PRINT CONTROL
                         IPLOT             5  PLOT CONTROL
                         QSCAL            0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
 **


               **************
               *            *
 56 KK         *         D  *
               *            *
               **************

 57 KO              OUTPUT CONTROL VARIABLES
                         IPRNT             5  PRINT CONTROL
                         IPLOT             5  PLOT CONTROL
                         QSCAL            0.  HYDROGRAPH PLOT SCALE
```

*** *** *** *** *** *** *** ** ** ***
**

```
          **************
          *            *
 72 KK    *      E     *
          *            *
          **************
```

 73 KO OUTPUT CONTROL VARIABLES
          IPRNT   5 PRINT CONTROL
          IPLOT   5 PLOT CONTROL
          QSCAL   0. HYDROGRAPH PLOT SCALE

*** ***
***

```
          **************
          *            *
 88 KK    *    Total   *
          *            *
          **************
```

 89 KO OUTPUT CONTROL VARIABLES
          IPRNT   5 PRINT CONTROL
          IPLOT   5 PLOT CONTROL
          QSCAL   0. HYDROGRAPH PLOT SCALE

*** ***
***

```
          **************
          *            *
 91 KK    *    PONDA   *
          *            *
          **************
```

 92 KO OUTPUT CONTROL VARIABLES
          IPRNT   5 PRINT CONTROL
          IPLOT   5 PLOT CONTROL
          QSCAL   0. HYDROGRAPH PLOT SCALE

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2
					3.50	7.80
HYDROGRAPH AT	A	.06	1	FLOW	35.	105.
				TIME	12.50	12.50
+ HYDROGRAPH AT	B	.07	1	FLOW	90.	218.
				TIME	12.00	12.00
+ HYDROGRAPH AT	C	.07	1	FLOW	51.	129.
				TIME	12.50	12.50
+ HYDROGRAPH AT	D	.06	1	FLOW	45.	119.
				TIME	12.50	12.50
+		.05	1	FLOW	57.	134.
				TIME	12.25	12.25
+ 5 COMBINED AT	Total	30	1	FLOW	241.	615.
				TIME	12.25	12.25
+ ROUTED TO	PONDA	30	1	FLOW	67.	379.
				TIME	13.50	12.75
			** PEAK STAGES IN FEET **			
			1	STAGE	1394.43	1397.05
				TIME	13.50	12.75

*** NORMAL END OF HEC-1 ***

Figure 1

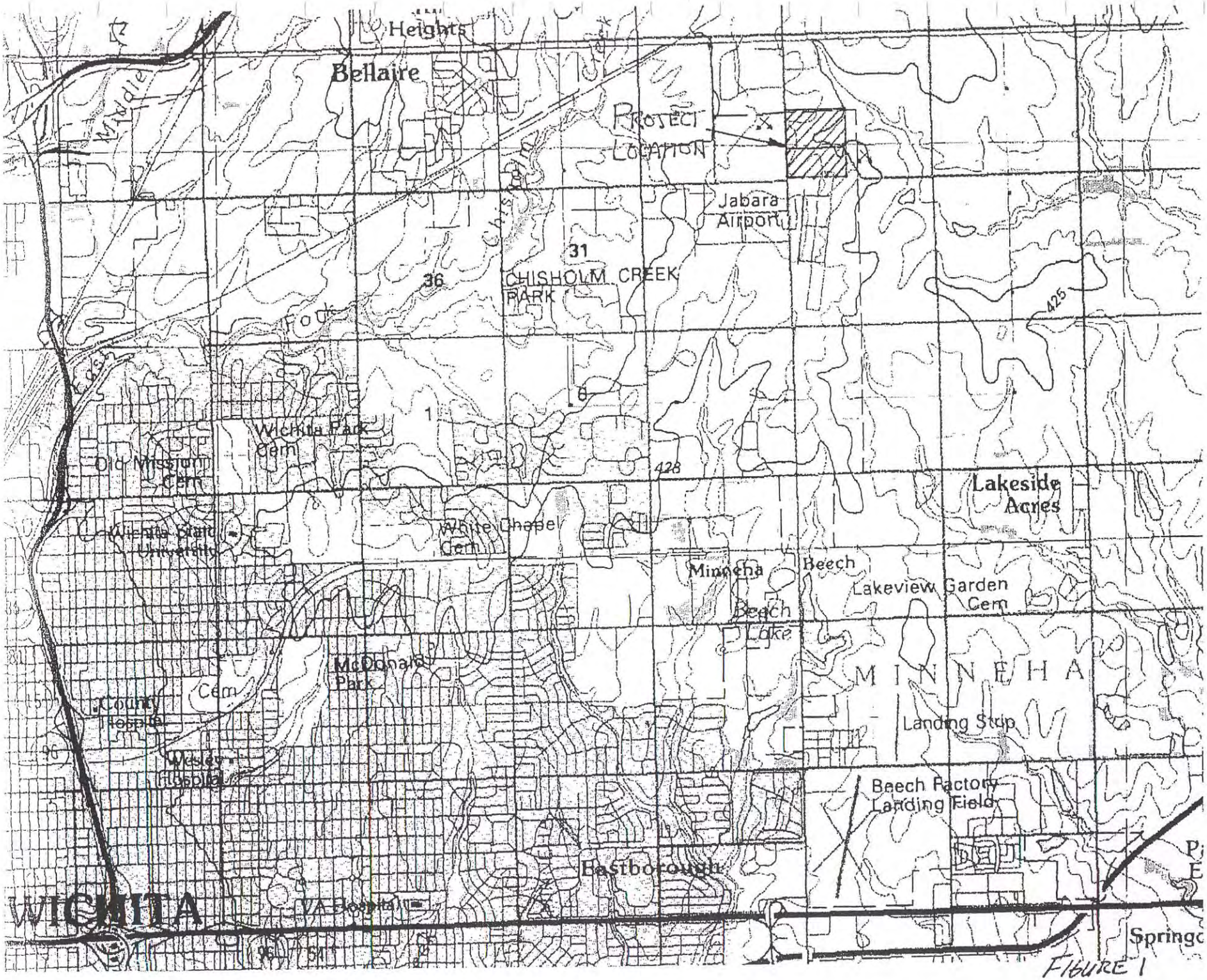

Heights
Bellaire
PROJECT LOCATION
Jabara Airport
31
36
CHISHOLM CREEK PARK
425
Fou
1
6
Wichita Park Cem
Old Mission Cem
428
Lakeside Acres
Wichita State University
White Chapel Cem
Minneha
Beech
Lakeview Garden Cem
Beech Lake
McDonald Park
Cem
County Hospital
M I N N E H A
Landing Strip
Wesley Hospital
Beech Factory Landing Field
Eastborough
WICHITA
VA Hospital
Springc

FIGURE 1

Figure 2

BASIN
Boundary
Basin A
Area =
35.83 Ac.
Basin B
Area = 43.88
Ac.
Basin C
Area = 45.69 Ac.
Basin D
Area = 69.21 Ac.
PIPER AIRPORT
Col James Jabara
Airport
Oil Well
Greenwich Cem
Cottonwood
Cem
Chisholm
FIELD
MISSOURI
PACIFIC
29TH
STREET
1400
1402
1399
1390
1393
1376
1385
1383
1412
1414
1418
1429
1408
1416
1409
1421
1420
1428
1398
1388
1392
1395
1405
1381
1377
32
33
29
28
21
20

FIGURE 2

Rating Curves

CURRENT DATE: 07-11-2007
CURRENT TIME: 13:10:00

FILE DATE: 07-11-2007
FILE NAME: JABARA

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
U	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1389.60	1385.10	570.02	2 RCP	3.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: JABARA DATE: 07-11-2007

LEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1389.60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1391.93	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1393.38	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1395.86	150.0	150.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1396.58	200.0	154.7	0.0	0.0	0.0	0.0	0.0	44.54	7
1396.70	250.0	155.7	0.0	0.0	0.0	0.0	0.0	93.33	5
1396.80	300.0	156.5	0.0	0.0	0.0	0.0	0.0	141.88	4
1396.89	350.0	157.1	0.0	0.0	0.0	0.0	0.0	191.64	4
1396.97	400.0	157.7	0.0	0.0	0.0	0.0	0.0	238.64	3
1397.04	450.0	158.3	0.0	0.0	0.0	0.0	0.0	288.04	3
1397.11	500.0	158.8	0.0	0.0	0.0	0.0	0.0	337.94	3
1396.40	153.3	153.3	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: JABARA DATE: 07-11-2007

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1389.60	0.000	0.00	0.00	0.00
1391.93	0.000	50.00	0.00	0.00
1393.38	0.000	100.00	0.00	0.00
1395.86	0.000	150.00	0.00	0.00
1396.58	-0.006	200.00	0.72	0.36
1396.70	-0.004	250.00	0.96	0.38
1396.80	-0.007	300.00	1.66	0.55
1396.89	-0.006	350.00	1.21	0.35
1396.97	-0.004	400.00	3.62	0.90
1397.04	-0.004	450.00	3.63	0.81
1397.11	-0.004	500.00	3.26	0.65

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 07-11-2007
CURRENT TIME: 13:10:00

FILE DATE: 07-11-2007
FILE NAME: JABARA

PERFORMANCE CURVE FOR CULVERT 1 - 2(3.00 (ft) BY 3.00 (ft)) RCP

DISCHARGE FLOW (cfs)	HEADWATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1389.60	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
50.00	1391.93	2.33	2.33	1-S2n	1.29	1.61	1.21	0.00	9.40	0.00
100.00	1393.38	3.78	3.78	5-S2n	1.99	2.29	1.89	0.00	10.65	0.00

77.64	1396.66	6.27	7.06	2-M2c	3.00	2.77	2.77	0.00	11.44	0.00
78.06	1396.76	6.32	7.16	2-M2c	3.00	2.78	2.78	0.00	11.49	0.00
78.42	1396.86	6.36	7.26	2-M2c	3.00	2.78	2.78	0.00	11.53	0.00
78.73	1396.94	6.39	7.34	2-M2c	3.00	2.79	2.79	0.00	11.57	0.00
79.02	1397.01	6.43	7.41	2-M2c	3.00	2.79	2.79	0.00	11.60	0.00
79.31	1397.08	6.46	7.48	2-M2c	3.00	2.80	2.80	0.00	11.63	0.00
79.58	1397.15	6.49	7.55	2-M2c	3.00	2.80	2.80	0.00	11.66	0.00
9.59	1397.16	6.49	7.56	2-M2c	3.00	2.80	2.80	0.00	11.66	0.00

El. inlet face invert 1389.60 ft El. outlet invert 1385.10 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	1389.60 ft
OUTLET STATION	570.00 ft
OUTLET ELEVATION	1385.10 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0079
CULVERT LENGTH ALONG SLOPE	570.02 ft

**** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	BEVELED EDGE (1:1)
INLET DEPRESSION	NONE

CURRENT DATE: 07-11-2007 FILE DATE: 07-11-2007
CURRENT TIME: 13:08:17 FILE NAME: JABARA

TAILWATER

CONSTANT WATER SURFACE ELEVATION
1385.10

ROADWAY OVERTOPPING DATA

WEIR COEFFICIENT	2.80
EMBANKMENT TOP WIDTH	560.00 ft
CREST LENGTH	200.00 ft
OVERTOPPING CREST ELEVATION	1396.40 ft

150.00	1395.86	5.99	6.26	2-M2c	3.00	2.73	2.73	0.00	11.10	0.00
154.74	1396.59	6.25	6.99	2-M2c	3.00	2.76	2.76	0.00	11.41	0.00
155.71	1396.71	6.30	7.11	2-M2c	3.00	2.77	2.77	0.00	11.47	0.00
156.46	1396.81	6.34	7.21	2-M2c	3.00	2.78	2.78	0.00	11.51	0.00
157.14	1396.90	6.38	7.30	2-M2c	3.00	2.78	2.78	0.00	11.55	0.00
157.74	1396.97	6.41	7.37	2-M2c	3.00	2.79	2.79	0.00	11.58	0.00
158.33	1397.05	6.44	7.45	2-M2c	3.00	2.79	2.79	0.00	11.62	0.00
8.80	1397.11	6.47	7.51	2-M2c	3.00	2.80	2.80	0.00	11.64	0.00

El. inlet face invert 1389.60 ft El. outlet invert 1385.10 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

*** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	1389.60 ft
OUTLET STATION	570.00 ft
OUTLET ELEVATION	1385.10 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0079
CULVERT LENGTH ALONG SLOPE	570.02 ft

**** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	BEVELED EDGE (1:1)
INLET DEPRESSION	NONE

3

CURRENT DATE: 07-11-2007 FILE DATE: 07-11-2007
CURRENT TIME: 13:10:00 FILE NAME: JABARA

TAILWATER

CONSTANT WATER SURFACE ELEVATION
1385.10

ROADWAY OVERTOPPING DATA

WEIR COEFFICIENT	2.80
EMBANKMENT TOP WIDTH	560.00 ft
CREST LENGTH	200.00 ft
OVERTOPPING CREST ELEVATION	1396.40 ft

JRRENT DATE: 07-11-2007
CURRENT TIME: 13:08:17

FILE DATE: 07-11-2007
FILE NAME: JABARA

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULVERT NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS	SHAPE	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1389.60	1385.10	570.02	1	RCP	3.00	3.00	.012	CONVENTIONAL
2									
3									
4									
5									
6									

SUMMARY OF CULVERT FLOWS (cfs) FILE: JABARA DATE: 07-11-2007

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1389.60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1393.38	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1396.52	100.0	77.1	0.0	0.0	0.0	0.0	0.0	22.12	11
1396.65	150.0	77.6	0.0	0.0	0.0	0.0	0.0	71.80	6
1396.76	200.0	78.1	0.0	0.0	0.0	0.0	0.0	121.26	5
1396.85	250.0	78.4	0.0	0.0	0.0	0.0	0.0	170.26	4
1396.94	300.0	78.7	0.0	0.0	0.0	0.0	0.0	220.21	4
1397.01	350.0	79.0	0.0	0.0	0.0	0.0	0.0	267.67	3
1397.08	400.0	79.3	0.0	0.0	0.0	0.0	0.0	317.36	3
1397.16	450.0	79.6	0.0	0.0	0.0	0.0	0.0	367.47	3
1397.22	500.0	79.6	0.0	0.0	0.0	0.0	0.0	417.73	3
96.40	76.7	76.7	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: JABARA DATE: 07-11-2007

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1389.60	0.000	0.00	0.00	0.00
1393.38	0.000	50.00	0.00	0.00
1396.52	-0.002	100.00	0.77	0.77
1396.65	-0.002	150.00	0.56	0.37
1396.76	-0.003	200.00	0.68	0.34
1396.85	-0.006	250.00	1.32	0.53
1396.94	-0.005	300.00	1.06	0.35
1397.01	-0.004	350.00	3.31	0.95
1397.08	-0.004	400.00	3.34	0.83
1397.16	-0.003	450.00	2.95	0.66
1397.22	-0.003	500.00	2.67	0.53

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

JRRENT DATE: 07-11-2007
CURRENT TIME: 13:08:17

FILE DATE: 07-11-2007
FILE NAME: JABARA

PERFORMANCE CURVE FOR CULVERT 1 - 1(3.00 (ft) BY 3.00 (ft)) RCP

DIS-RGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1389.60	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
50.00	1393.38	3.78	3.78	5-S2n	1.99	2.29	1.89	0.00	10.65	0.00
77.12	1396.52	6.22	6.92	2-M2c	3.00	2.76	2.76	0.00	11.38	0.00

Existing Conditions HEC-1 Model

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)  *
*            FEBRUARY 1981          *
*          REVISED 02 AUG 88        *
*                                   *
*  RUN DATE  09/03/1991  TIME  14:57:39 *
*                                   *
*************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*  THE HYDROLOGIC ENGINEERING CENTER *
*         609 SECOND STREET         *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 551-1748          *
*                                   *
*************************************
```

E/

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
      LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

        1       ID      HYDROLOGY STUDY - JABARA AIRPORT
        2       ID      PEC PROJ NO 32-91125-1-0019
        3       ID      PROPOSED RUNWAY EXTENSION & 37TH ST NO RELOCATION
        4       ID      PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
        5       ID      WICHITA, KANSAS
        6       ID      DISKNAME: MWB07     FILENAME:\JABARA\DETENTIN.HEC
        7       ID      COMPUTED BY M.W.BERRY, P.E.    REVISED 9/03/91
*** LIST ***
*** FREE ***
                *DIAGRAM
                * RATIO 1 =   5 YR 24 HR STORM
                * RATIO 2 =  10 YR 24 HR STORM
                * RATIO 3 =  25 YR 24 HR STORM
                * RATIO 4 = 100 YR 24 HR STORM
                IT       6 31JUL91    1100       0 31JUL91    1800
        9       IN       6 31JUL91    1100
       10       IO       2       0
       11       JR    FLOW    0.53    0.63    0.76    1.00

       12       KK    WEST    INFLOW HYDROGRAPH TO DETENTION AREA
       13       IN       6 31JUL91    1100
       14       BA    0.37
       15       QI      41      46      51      56      63      71      78      98     119     139
       16       QI     229     415     752    1139    1291    1237     981     725     551     447
       17       QI     342     288     234     207     181     163     149     139     129     122
       18       QI     115     110     105     100      96      92      88      85      83      81
       19       QI             77              74      72      71      69      68      66      65
```

```
21          QI     51
                   46

23          KKDETENTION     DETENTION AREA
24          KM          36-IN RCP OUTLET - OVERFLOW AT ELEV 1396 = 500 F
25          KM          BASED ON TW FROM 20 FT 2:1 TRAP CHANNEL
26          RS      1   ELEV  1390.0
27          SA    6.1    7.6    9.3   11.0   11.8   12.7   13.6
28          SE   1390   1392   1394   1396   1398   1400   1402
29          SQ      0     25     50     75    100    175    250   1325   6570  10075
30          SE   1390 1392.4 1393.6 1396.00 1396.07 1396.19 1396.27   1397   1399   1400

31          KK   EAST      AREA BETWEEN EXTENDED SAFETY AREA AND RELOCATED 37TH ST NO
32          IN      6 31JUL91    1100
33          BA   0.11
34          QI      8      9     10     11     12     13     14     17     19     21
35          QI     27     40     68    114    173    224    250    242    218    183
36          QI    149    125    101     87     73     64     55     49     44     40
37          QI     36     34     31     29     27     26     24     23     22     22
38          QI     21     20     20     19     19     18     18     17     17     16
39          QI     16     16     15     15     15     14     14     14     13     13
40          QI     13     13     13     12     12     12     12     12     11     11
41          QI     15
```

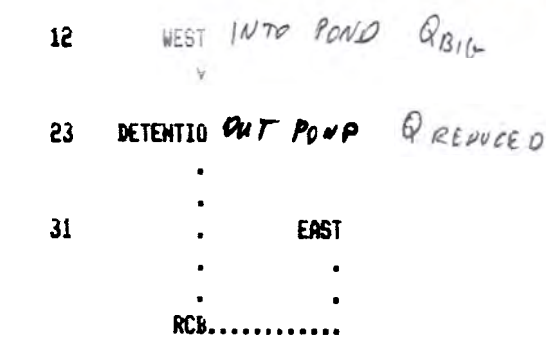
E2


```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

42          KK    RCB      CULVERT AT RELOCATED 37TH ST NO
43          HC      2      0
44          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (---)) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR ((--- RETURN OF DIVERTED OR PUMPED FLOW



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             FEBRUARY 1981             *
*           REVISED 02 AUG 88           *
*                                       *
*      DATE  09/03/1991  TIME  14:57:39 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*  THE HYDROLOGIC ENGINEERING CENTER    *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 551-1748              *
*                                       *
*****************************************
```

PROPOSED RUNWAY EXTENSION & 37TH ST NO RELOCATION
PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
WICHITA, KANSAS
DISKNAME: MWB07 FILENAME:\JABARA\DETENTIN.HEC
COMPUTED BY M.W.BERRY, P.E. REVISED 9/03/91

E3

10 IO OUTPUT CONTROL VARIABLES
IPRNT 2 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 6 MINUTES IN COMPUTATION INTERVAL
IDATE 31JUL91 STARTING DATE
ITIME 1100 STARTING TIME
NQ 71 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 31JUL91 ENDING DATE
NDTIME 1800 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .10 HOURS
TOTAL TIME BASE 7.00 HOURS

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF RUNOFF
.53 .63 .76 1.00

*** ***

****
* *
12 KK * WEST * INFLOW HYDROGRAPH TO DETENTION AREA
* *
****

13 IN TIME DATA FOR INPUT TIME SERIES
JXMIN 6 TIME INTERVAL IN MINUTES
JXDATE 31JUL91 STARTING DATE
JXTIME 1100 STARTING TIME

SUBBASIN RUNOFF DATA

14 BA SUBBASIN CHARACTERISTICS
TAREA .37 SUBBASIN AREA

***

****

HYDROGRAPH AT STATION WEST

E4

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	41.	31 JUL 1248	19	551.	31 JUL 1436	37	86.	31 JUL 1624	55	58.
JUL 1106	2	46.	31 JUL 1254	20	447.	31 JUL 1442	38	85.	31 JUL 1630	56	56.
31 JUL 1112	3	51.	31 JUL 1300	21	342.	31 JUL 1448	39	83.	31 JUL 1636	57	55.
31 JUL 1118	4	56.	31 JUL 1306	22	288.	31 JUL 1454	40	81.	31 JUL 1642	58	54.
31 JUL 1124	5	63.	31 JUL 1312	23	234.	31 JUL 1500	41	78.	31 JUL 1648	59	53.
31 JUL 1130	6	71.	31 JUL 1318	24	207.	31 JUL 1506	42	77.	31 JUL 1654	60	52.
31 JUL 1136	7	78.	31 JUL 1324	25	181.	31 JUL 1512	43	75.	31 JUL 1700	61	51.
31 JUL 1142	8	98.	31 JUL 1330	26	165.	31 JUL 1518	44	74.	31 JUL 1706	62	51.
31 JUL 1148	9	119.	31 JUL 1336	27	149.	31 JUL 1524	45	72.	31 JUL 1712	63	50.
31 JUL 1154	10	139.	31 JUL 1342	28	139.	31 JUL 1530	46	71.	31 JUL 1718	64	50.
31 JUL 1200	11	229.	31 JUL 1348	29	129.	31 JUL 1536	47	69.	31 JUL 1724	65	49.
31 JUL 1206	12	415.	31 JUL 1354	30	122.	31 JUL 1542	48	68.	31 JUL 1730	66	49.
31 JUL 1212	13	752.	31 JUL 1400	31	115.	31 JUL 1548	49	66.	31 JUL 1736	67	48.
31 JUL 1218	14	1139.	31 JUL 1406	32	110.	31 JUL 1554	50	65.	31 JUL 1742	68	48.
31 JUL 1224	15	1291.	31 JUL 1412	33	105.	31 JUL 1600	51	63.	31 JUL 1748	69	47.
31 JUL 1230	16	1237.	31 JUL 1418	34	100.	31 JUL 1606	52	62.	31 JUL 1754	70	47.
31 JUL 1236	17	981.	31 JUL 1424	35	96.	31 JUL 1612	53	61.	31 JUL 1800	71	46.
31 JUL 1242	18	725.	31 JUL 1430	36	92.	31 JUL 1618	54	59.			

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	7.00-HR
	(HR)				
	(CFS)				
1.40		212.	189.	189.	189.
	(INCHES)	5.337	5.537	5.537	5.537
	(AC-FT)	105.	109.	109.	109.

CUMULATIVE AREA = .37 SQ MI

HYDROGRAPH AT STATION WEST
PLAN 1, RATIO = .53

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	22.	31 JUL 1248	19	292.	31 JUL 1436	37	47.	31 JUL 1624	55	31.
31 JUL 1106	2	24.	31 JUL 1254	20	237.	31 JUL 1442	38	45.	31 JUL 1630	56	30.
31 JUL 1112	3	27.	31 JUL 1300	21	181.	31 JUL 1448	39	44.	31 JUL 1636	57	29.
31 JUL 1118	4	30.	31 JUL 1306	22	153.	31 JUL 1454	40	43.	31 JUL 1642	58	29.
31 JUL 1124	5	33.	31 JUL 1312	23	124.	31 JUL 1500	41	41.	31 JUL 1648	59	28.
31 JUL 1130	6	38.	31 JUL 1318	24	110.	31 JUL 1506	42	41.	31 JUL 1654	60	28.
31 JUL 1136	7	41.	31 JUL 1324	25	96.	31 JUL 1512	43	40.	31 JUL 1700	61	27.
31 JUL 1142	8	52.	31 JUL 1330	26	87.	31 JUL 1518	44	39.	31 JUL 1706	62	27.
31 JUL 1148	9	63.	31 JUL 1336	27	79.	31 JUL 1524	45	38.	31 JUL 1712	63	26.
31 JUL 1154	10	74.	31 JUL 1342	28	74.	31 JUL 1530	46	38.	31 JUL 1718	64	26.
31 JUL 1200	11	121.	31 JUL 1348	29	68.	31 JUL 1536	47	37.	31 JUL 1724	65	26.
JUL 1206	12	220.	31 JUL 1354	30	65.	31 JUL 1542	48	36.	31 JUL 1730	66	26.
31 JUL 1212	13	399.	31 JUL 1400	31	61.	31 JUL 1548	49	35.	31 JUL 1736	67	25.
31 JUL 1218	14	604.	31 JUL 1406	32	58.	31 JUL 1554	50	34.	31 JUL 1742	68	25.
31 JUL 1224	15	684.	31 JUL 1412	33	56.	31 JUL 1600	51	33.	31 JUL 1748	69	25.
31 JUL 1230	16	656.	31 JUL 1418	34	53.	31 JUL 1606	52	33.	31 JUL 1754	70	25.
31 JUL 1236	17	520.	31 JUL 1424	35	51.	31 JUL 1612	53	32.	31 JUL 1800	71	24.
31 JUL 1242	18	384.	31 JUL 1430	36	49.	31 JUL 1618	54	31.			

E5

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	7.00-HR
(CFS)	(HR)					
		(CFS)				
684.	1.40		113.	100.	100.	100.
		(INCHES)	2.828	2.935	2.935	2.935
		(AC-FT)	56.	58.	58.	58.

CUMULATIVE AREA = .37 SQ MI

****

HYDROGRAPH AT STATION WES'
PLAN 1, RATIO = .63

****

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	26.	31 JUL 1248	19	347.	31 JUL 1436	37	55.	31 JUL 1624	55	37.
31 JUL 1106	2	29.	31 JUL 1254	20	282.	31 JUL 1442	38	54.	31 JUL 1630	56	35.
31 JUL 1112	3	32.	31 JUL 1300	21	215.	31 JUL 1448	39	52.	31 JUL 1636	57	35.
31 JUL 1118	4	35.	31 JUL 1306	22	181.	31 JUL 1454	40	51.	31 JUL 1642	58	34.
31 JUL 1124	5	40.	31 JUL 1312	23	147.	31 JUL 1500	41	49.	31 JUL 1648	59	33.
31 JUL 1130	6	45.	31 JUL 1318	24	130.	31 JUL 1506	42	49.	31 JUL 1654	60	33.
31 JUL 1136	7	49.	31 JUL 1324	25	114.	31 JUL 1512	43	47.	31 JUL 1700	61	32.
31 JUL 1142	8	62.	31 JUL 1330	26	104.	31 JUL 1518	44	47.	31 JUL 1706	62	32.
31 JUL 1148	9	75.	31 JUL 1336	27	94.	31 JUL 1524	45	45.	31 JUL 1712	63	32.
31 JUL 1154	10	88.	31 JUL 1342	28	88.	31 JUL 1530	46	45.	31 JUL 1718	64	32.
31 JUL 1200	11	144.	31 JUL 1348	29	81.	31 JUL 1536	47	43.	31 JUL 1724	65	31.
31 JUL 1206	12	261.	31 JUL 1354	30	77.	31 JUL 1542	48	43.	31 JUL 1730	66	31.
31 JUL 1212	13	474.	31 JUL 1400	31	72.	31 JUL 1548	49	42.	31 JUL 1736	67	30.
JUL 1218	14	718.	31 JUL 1406	32	69.	31 JUL 1554	50	41.	31 JUL 1742	68	30.
JUL 1224	15	813.	31 JUL 1412	33	66.	31 JUL 1600	51	40.	31 JUL 1748	69	30.
31 JUL 1230	16	779.	31 JUL 1418	34	63.	31 JUL 1606	52	39.	31 JUL 1754	70	30.
31 JUL 1236	17	616.	31 JUL 1424	35	60.	31 JUL 1612	53	38.	31 JUL 1800	71	29.
31 JUL 1242	18	457.	31 JUL 1430	36	58.	31 JUL 1618	54	37.			

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	7.00-HR
(CFS)	(HR)					
		(CFS)				
813.	1.40		134.	119.	119.	119.
		(INCHES)	3.362	3.488	3.488	3.488
		(AC-FT)	66.	69.	69.	69.

CUMULATIVE AREA = .37 SQ MI

****

HYDROGRAPH AT STATION WE!
PLAN 1, RATIO = 76

****

ION HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	31.	31 JUL 1248	19	419.	31 JUL 1436	37	67.	31 JUL 1624	55	44.
31 JUL 1106	2	35.	31 JUL 1254	20	340.	31 JUL 1442	38	65.	31 JUL 1630	56	43.
31 JUL 1112	3	39.	31 JUL 1300	21	260.	31 JUL 1448	39	63.	31 JUL 1636	57	42.
31 JUL 1118	4	43.	31 JUL 1306	22	219.	31 JUL 1454	40	62.	31 JUL 1642	58	41.

31 JUL 1130	6	54.	*	31 JUL 1318	24	157.	*	31 JUL 1506	42	59.	*	31 JUL 1654	60	40.
31 JUL 1136	7	59.	*	31 JUL 1324	25	138.	*	31 JUL 1512	43	57.	*	31 JUL 1700	61	39.
31 JUL 1142	8	74.	*	31 JUL 1330	26	125.	*	31 JUL 1518	44	56.	*	31 JUL 1706	62	39.
31 JUL 1148	9	90.	*	31 JUL 1336	27	113.	*	31 JUL 1524	45	55.	*	31 JUL 1712	63	36.
31 JUL 1154	10	106.	*	31 JUL 1342	28	106.	*	31 JUL 1530	46	54.	*	31 JUL 1718	64	38.
JUL 1200	11	174.	*	31 JUL 1348	29	98.	*	31 JUL 1536	47	52.	*	31 JUL 1724	65	37.
JUL 1206	12	315.	*	31 JUL 1354	30	93.	*	31 JUL 1542	48	52.	*	31 JUL 1730	66	37.
31 JUL 1212	13	572.	*	31 JUL 1400	31	87.	*	31 JUL 1548	49	50.	*	31 JUL 1736	67	36.
31 JUL 1218	14	866.	*	31 JUL 1406	32	84.	*	31 JUL 1554	50	49.	*	31 JUL 1742	68	36.
31 JUL 1224	15	981.	*	31 JUL 1412	33	80.	*	31 JUL 1600	51	48.	*	31 JUL 1748	69	36.
31 JUL 1230	16	940.	*	31 JUL 1418	34	76.	*	31 JUL 1606	52	47.	*	31 JUL 1754	70	36.
31 JUL 1236	17	746.	*	31 JUL 1424	35	73.	*	31 JUL 1612	53	46.	*	31 JUL 1800	71	35.
31 JUL 1242	18	551.	*	31 JUL 1430	36	70.	*	31 JUL 1618	54	45.	*			

E6

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	7.00-HR
(CFS)	(HR)					
		(CFS)				
981.	1.40		161.	144.	144.	144.
		(INCHES)	4.056	4.208	4.208	4.208
		(AC-FT)	80.	83.	83.	83.

CUMULATIVE AREA = .37 SQ MI

HYDROGRAPH AT STATION WEST
PLAN 1, RATIO = 1.00

DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	41.	*	31 JUL 1248	19	551.	*	31 JUL 1436	37	88.	*	31 JUL 1624	55	58.
31 JUL 1106	2	46.	*	31 JUL 1254	20	447.	*	31 JUL 1442	38	85.	*	31 JUL 1630	56	56.
31 JUL 1112	3	51.	*	31 JUL 1300	21	342.	*	31 JUL 1448	39	83.	*	31 JUL 1636	57	55.
31 JUL 1118	4	56.	*	31 JUL 1306	22	288.	*	31 JUL 1454	40	81.	*	31 JUL 1642	58	54.
31 JUL 1124	5	63.	*	31 JUL 1312	23	234.	*	31 JUL 1500	41	78.	*	31 JUL 1648	59	53.
31 JUL 1130	6	71.	*	31 JUL 1318	24	207.	*	31 JUL 1506	42	77.	*	31 JUL 1654	60	52.
31 JUL 1136	7	78.	*	31 JUL 1324	25	181.	*	31 JUL 1512	43	75.	*	31 JUL 1700	61	51.
31 JUL 1142	8	98.	*	31 JUL 1330	26	165.	*	31 JUL 1518	44	74.	*	31 JUL 1706	62	51.
31 JUL 1148	9	119.	*	31 JUL 1336	27	149.	*	31 JUL 1524	45	72.	*	31 JUL 1712	63	50.
31 JUL 1154	10	139.	*	31 JUL 1342	28	139.	*	31 JUL 1530	46	71.	*	31 JUL 1718	64	50.
31 JUL 1200	11	229.	*	31 JUL 1348	29	129.	*	31 JUL 1536	47	69.	*	31 JUL 1724	65	49.
31 JUL 1206	12	415.	*	31 JUL 1354	30	122.	*	31 JUL 1542	48	68.	*	31 JUL 1730	66	49.
31 JUL 1212	13	752.	*	31 JUL 1400	31	115.	*	31 JUL 1548	49	66.	*	31 JUL 1736	67	48.
31 JUL 1218	14	1139.	*	31 JUL 1406	32	110.	*	31 JUL 1554	50	65.	*	31 JUL 1742	68	48.
31 JUL 1224	15	1291.	*	31 JUL 1412	33	105.	*	31 JUL 1600	51	63.	*	31 JUL 1748	69	47.
31 JUL 1230	16	1237.	*	31 JUL 1418	34	100.	*	31 JUL 1606	52	62.	*	31 JUL 1754	70	47.
31 JUL 1236	17	981.	*	31 JUL 1424	35	96.	*	31 JUL 1612	53	61.	*	31 JUL 1800	71	46.
31 JUL 1242	18	725.	*	31 JUL 1430	36	92.	*	31 JUL 1618	54	59.	*			

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	.00-HR
(CFS)	(HR)					
		(CFS)				
1291.	1.40		212.	189.	189.	189.
		(INCHES)	5.337	5.537	5.537	5.537
		(AC-FT)	105.	109.	109.	109.

*** ***

****
* DETENTIO *
****

23 KK N DETENTION AREA

36-IN RCP OUTLET - OVERFLOW AT ELEV 1396 = 500 FT
BASED ON TW FROM 20 FT 2:1 TRAP CHANNEL

HYDROGRAPH ROUTING DATA

STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	ELEV	TYPE OF INITIAL CONDITION
RSVRIC	1390.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

AREA	6.1	7.6	9.3	11.0	11.8	12.7	13.6			
ELEVATION	1390.00	1392.00	1394.00	1396.00	1396.00	1400.00	1402.00			
29 SQ DISCHARGE	0.	25.	50.	75.	100.	175.	250.	1325.	6570.	10075.
ELEVATION	1390.00	1392.40	1393.60	1396.00	1396.07	1396.19	1396.27	1397.00	1399.00	1400.00

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	13.67	30.54	50.82	73.62	98.11	124.40
ELEVATION	1390.00	1392.00	1394.00	1396.00	1398.00	1400.00	1402.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	13.67	16.78	26.89	30.54	50.82	51.59	52.92	53.80	62.02
OUTFLOW	.00	20.83	25.00	50.00	54.17	75.00	100.00	175.00	250.00	1325.00
ELEVATION	1390.00	1392.00	1392.40	1393.60	1394.00	1396.00	1396.07	1396.19	1396.27	1397.00

STORAGE	73.62	85.64	98.11	124.40
OUTFLOW	3947.50	6570.00	10075.00	17085.00
ELEVATION	1398.00	1399.00	1400.00	1402.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 6570. TO 17085.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

****

HYDROGRAPH AT STATION DETENTIO
PLAN 1, RATIO = .53

DA MON HRMN ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN ORD	OUTFLOW	STORAGE	STAGE
31 JUL 1100 1	0.	.0	1390.0	31 JUL 1324 25	61.	37.3	1394.7	31 JUL 1548 49	59.	35.6	1394.5
31 JUL 1106 2	0.	.2	1390.0	31 JUL 1330 26	61.	37.6	1394.7	31 JUL 1554 50	59.	35.4	1394.5

31 JUL 1118	4	1.	.6	1390.1	* 31 JUL 1342	28	62.	37.9	1394.7	* 31 JUL 1606	52	59.	35.0	1394.4
31 JUL 1124	5	1.	.9	1390.1	* 31 JUL 1348	29	62.	38.0	1394.7	* 31 JUL 1612	53	58.	34.8	1394.4
31 JUL 1130	6	2.	1.2	1390.2	* 31 JUL 1354	30	62.	38.0	1394.7	* 31 JUL 1618	54	58.	34.5	1394.4
31 JUL 1136	7	2.	1.5	1390.2	* 31 JUL 1400	31	62.	38.0	1394.7	* 31 JUL 1624	55	58.	34.3	1394.4
31 JUL 1142	8	3.	1.8	1390.3	* 31 JUL 1406	32	62.	38.0	1394.7	* 31 JUL 1630	56	58.	34.1	1394.3
3 . 1148	9	3.	2.3	1390.3	* 31 JUL 1412	33	62.	38.0	1394.7	* 31 JUL 1636	57	58.	33.9	1394.3
31 JUL 1154	10	4.	2.8	1390.4	* 31 JUL 1418	34	62.	37.9	1394.7	* 31 JUL 1642	58	57.	33.6	1394.3
31 JUL 1200	11	5.	3.6	1390.5	* 31 JUL 1424	35	62.	37.8	1394.7	* 31 JUL 1648	59	57.	33.4	1394.3
31 JUL 1206	12	8.	4.9	1390.7	* 31 JUL 1430	36	62.	37.7	1394.7	* 31 JUL 1654	60	57.	33.1	1394.3
31 JUL 1212	13	11.	7.4	1391.1	* 31 JUL 1436	37	61.	37.6	1394.7	* 31 JUL 1700	61	57.	32.9	1394.2
31 JUL 1218	14	17.	11.4	1391.7	* 31 JUL 1442	38	61.	37.5	1394.7	* 31 JUL 1706	62	56.	32.6	1394.2
31 JUL 1224	15	25.	16.6	1392.4	* 31 JUL 1448	39	61.	37.3	1394.7	* 31 JUL 1712	63	56.	32.4	1394.2
31 JUL 1230	16	38.	21.9	1393.0	* 31 JUL 1454	40	61.	37.2	1394.7	* 31 JUL 1718	64	56.	32.2	1394.2
31 JUL 1236	17	49.	26.4	1393.5	* 31 JUL 1500	41	61.	37.0	1394.6	* 31 JUL 1724	65	56.	31.9	1394.1
31 JUL 1242	18	53.	29.7	1393.9	* 31 JUL 1506	42	61.	36.9	1394.6	* 31 JUL 1730	66	55.	31.7	1394.1
31 JUL 1248	19	56.	32.0	1394.1	* 31 JUL 1512	43	60.	36.7	1394.6	* 31 JUL 1736	67	55.	31.4	1394.1
31 JUL 1254	20	57.	33.7	1394.3	* 31 JUL 1518	44	60.	36.5	1394.6	* 31 JUL 1742	68	55.	31.2	1394.1
31 JUL 1300	21	59.	35.0	1394.4	* 31 JUL 1524	45	60.	36.4	1394.6	* 31 JUL 1748	69	55.	30.9	1394.0
31 JUL 1306	22	60.	35.9	1394.5	* 31 JUL 1530	46	60.	36.2	1394.6	* 31 JUL 1754	70	54.	30.7	1394.0
31 JUL 1312	23	60.	36.5	1394.6	* 31 JUL 1536	47	60.	36.0	1394.5	* 31 JUL 1600	71	54.	30.5	1394.0
31 JUL 1318	24	61.	37.0	1394.6	* 31 JUL 1542	48	60.	35.8	1394.5	*				
					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			24-HR	72-HR	7.00-HR	
(CFS)	(HR)					
		(CFS)				
62	3.00		55.	47.	47.	47.
		(INCHES)	1.383	1.391	1.391	1.391
		(AC-FT)	27.	27.	27.	27.

K STORAGE	TIME		MAXIMUM AVERAGE STORAGE		
			24-HR	72-HR	7.00-HR
(AC-FT)	(HR)				
38.	3.00		33	28.	28.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			24-HR	72-HR	7.00-HR	
(FEET)	(HR)					
1394.74	3.00		1394.18	1393.61	1393.61	393.61

CUMULATIVE AREA = .37 SQ MI

****

HYDROGRAPH AT STATION DETENTIO
PLAN 1, RATIO = .63

****

DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	* DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	* DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE
					*					*				
31 JUL 1100	1	0.	.0	1390.0	* 31 JUL 1324	25	69.	44.6	1395.4	* 31 JUL 1548	49	67.	43.3	1395.3
31 JUL 1106	2	0.	.2	1390.0	* 31 JUL 1330	26	69.	45.0	1395.4	* 31 JUL 1554	50	67.	43.1	1395.2
3 . 1112	3	1.	.5	1390.1	* 31 JUL 1336	27	69.	45.2	1395.4	* 31 JUL 1600	51	67.	42.8	1395.2
31 JUL 1118	4	1.	.7	1390.1	* 31 JUL 1342	28	69.	45.4	1395.5	* 31 JUL 1606	52	67.	42.6	1395.2
JUL 1124	5	2.	1.0	1390.2	* 31 JUL 1348	29	70.	45.5	1395.5	* 31 JUL 1612	53	66.	42.4	1395.2
31 JUL 1130	6	2.	1.4	1390.2	* 31 JUL 1354	30	70.	45.6	1395.5	* 31 JUL 1618	54	66.	42.2	1395.1
31 JUL 1136	7	3.	1.7	1390.3	* 31 JUL 1400	31	70.	45.6	1395.5	* 31 JUL 1624	55	66.	41.9	1395.1
31 JUL 1142	8	3.	2.2	1390.3	* 31 JUL 1406	32	70.	45.6	1395.5	* 31 JUL 1630	56	66.	41.7	1395.1
31 JUL 1148	9	4.	2.7	1390.4	* 31 JUL 1412	33	70.	45.6	1395.5	* 31 JUL 1636	57	65.	41.4	1395.1
31 JUL 1154	10	5.	3.3	1390.5	* 31 JUL 1418	34	70.	45.6	1395.5	* 31 JUL 1642	58	65.	41.2	1395.0
31 JUL 1200	11	6.	4.3	1390.6	* 31 JUL 1424	35	70.	45.5	1395.5	* 31 JUL 1648	59	65.	40.9	1395.0

31	JUL	1212	13	13.	6.6	1391.3	*	31	JUL	1436	37	69.	45.3	1395.5	*	31	JUL	1700	61	64.	40.4	1395.0
31	JUL	1218	14	21.	13.6	1392.0	*	31	JUL	1442	38	69.	45.2	1395.4	*	31	JUL	1706	62	64.	40.1	1394.9
31	JUL	1224	15	32.	19.7	1392.7	*	31	JUL	1448	39	69.	45.1	1395.4	*	31	JUL	1712	63	64.	39.8	1394.9
31	JUL	1230	16	48.	26.0	1393.5	*	31	JUL	1454	40	69.	44.9	1395.4	*	31	JUL	1718	64	63.	39.6	1394.9
31	JUL	1236	17	55.	31.3	1394.1	*	31	JUL	1500	41	69.	44.6	1395.4	*	31	JUL	1724	65	63.	39.3	1394.9
31	JUL	1242	18	59.	35.3	1394.5	*	31	JUL	1506	42	69.	44.6	1395.4	*	31	JUL	1730	66	63.	39.0	1394.8
31	JUL	1248	19	62.	38.1	1394.7	*	31	JUL	1512	43	68.	44.4	1395.4	*	31	JUL	1736	67	63.	38.8	1394.8
1	JUL	1254	20	64.	40.2	1394.9	*	31	JUL	1518	44	68.	44.3	1395.4	*	31	JUL	1742	68	62.	38.5	1394.8
3	JUL	1300	21	66.	41.7	1395.1	*	31	JUL	1524	45	68.	44.1	1395.3	*	31	JUL	1748	69	62.	38.2	1394.8
31	JUL	1306	22	67.	42.8	1395.2	*	31	JUL	1530	46	68.	43.9	1395.3	*	31	JUL	1754	70	62.	38.0	1394.7
31	JUL	1312	23	68.	43.6	1395.3	*	31	JUL	1536	47	68.	43.7	1395.3	*	31	JUL	1800	71	62.	37.7	1394.7
31	JUL	1318	24	68.	44.2	1395.3	*	31	JUL	1542	48	67.	43.5	1395.3	*							
							*								*							

E9

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			24-HR	72-HR	7.00-HR	
(CFS)	(HR)					
		(CFS)				
70	3.10		62.	54.	54.	54.
		(INCHES)	1.567	1.577	1.577	1.577
		(AC-FT)	31.	31.	31.	31.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		24-HR	72-HR	7.00-HR	
(AC-FT)	(HR)				
46.	3.10	40.	34	34.	34

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	7.00-HR
(FEET)	(HR)				
1395.49	3.10	1394.87	1394.21	1394.21	1394.21

CUMULATIVE AREA = .37 SQ MI

****

HYDROGRAPH AT STATION DETENTIO
PLAN 1, RATIO = .76

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
							*								*							
31	JUL	1100	1	0.	.0	1390.0	*	31	JUL	1324	25	150.	52.5	1396.1	*	31	JUL	1548	49	73.	49.3	1395.8
31	JUL	1106	2	0.	.3	1390.0	*	31	JUL	1330	26	143.	52.3	1396.1	*	31	JUL	1554	50	73.	49.1	1395.8
31	JUL	1112	3	1.	.6	1390.1	*	31	JUL	1336	27	134.	52.2	1396.1	*	31	JUL	1600	51	73.	48.9	1395.8
31	JUL	1118	4	1.	.9	1390.1	*	31	JUL	1342	28	125.	52.0	1396.1	*	31	JUL	1606	52	73.	48.7	1395.8
31	JUL	1124	5	2.	1.3	1390.2	*	31	JUL	1348	29	116.	51.9	1396.1	*	31	JUL	1612	53	73.	48.4	1395.8
31	JUL	1130	6	3.	1.7	1390.2	*	31	JUL	1354	30	108.	51.7	1396.1	*	31	JUL	1618	54	72.	48.2	1395.7
31	JUL	1136	7	3.	2.1	1390.3	*	31	JUL	1400	31	101.	51.6	1396.1	*	31	JUL	1624	55	72.	48.0	1395.7
31	JUL	1142	8	4.	2.6	1390.4	*	31	JUL	1406	32	97.	51.5	1396.1	*	31	JUL	1630	56	72.	47.8	1395.7
31	JUL	1148	9	5.	3.3	1390.5	*	31	JUL	1412	33	93.	51.4	1396.1	*	31	JUL	1636	57	72.	47.5	1395.7
31	JUL	1154	10	6.	4.0	1390.6	*	31	JUL	1418	34	90.	51.3	1396.0	*	31	JUL	1642	58	71.	47.3	1395.6
31	JUL	1200	11	8.	5.1	1390.8	*	31	JUL	1424	35	86.	51.2	1396.0	*	31	JUL	1648	59	71.	47.0	1395.6
31	JUL	1206	12	11.	7.1	1391.0	*	31	JUL	1430	36	83.	51.1	1396.0	*	31	JUL	1654	60	71.	46.8	1395.6
31	JUL	1212	13	16.	10.6	1391.6	*	31	JUL	1436	37	79.	51.0	1396.0	*	31	JUL	1700	61	71.	46.5	1395.6
	JUL	1218	14	24.	16.4	1392.4	*	31	JUL	1442	38	76.	50.9	1396.0	*	31	JUL	1706	62	70.	46.2	1395.5
3	JUL	1224	15	42.	23.8	1393.2	*	31	JUL	1448	39	75.	50.8	1396.0	*	31	JUL	1712	63	70.	46.0	1395.5
31	JUL	1230	16	55.	31.3	1394.1	*	31	JUL	1454	40	75.	50.7	1396.0	*	31	JUL	1718	64	70.	45.7	1395.5
31	JUL	1236	17	62.	37.8	1394.7	*	31	JUL	1500	41	75.	50.5	1396.0	*	31	JUL	1724	65	69.	45.4	1395.5
31	JUL	1242	18	67.	42.6	1395.2	*	31	JUL	1506	42	75.	50.4	1396.0	*	31	JUL	1730	66	69.	45.2	1395.4
31	JUL	1248	19	70.	46.1	1395.5	*	31	JUL	1512	43	74.	50.3	1395.9	*	31	JUL	1736	67	69.	44.9	1395.4
31	JUL	1254	20	73.	48.6	1395.8	*	31	JUL	1518	44	74.	50.1	1395.9	*	31	JUL	1742	68	69.	44.6	1395.4

31	JUL	1306	22	106.	51.7	1396.1	*	31	JUL	1530	46	74.	49.6	1395.9	*	31	JUL	1754	70	68.	44.1	1395.3
31	JUL	1312	23	141.	52.3	1396.1	*	31	JUL	1536	47	74.	49.6	1395.9	*	31	JUL	1800	71	66.	43.8	1395.3
31	JUL	1318	24	151.	52.5	1396.2	*	31	JUL	1542	48	74.	49.5	1395.9	*							

E10

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	7.00-HR
(CFS)	(HR)					
		(CFS)				
151.	2.30		79.	68.	68.	68.
		(INCHES)	1.974	1.986	1.986	1.986
		(AC-FT)	39.	39.	39.	39.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	7.00-HR
(AC-FT)	(HR)				
52.	2.30	46.	40.	40.	40.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	7.00-HR
(FEET)	(HR)				
1396.15	2.30	1395.47	1394.73	1394.73	1394.73

CUMULATIVE AREA = .37 SQ M

HYDROGRAPH AT STATION DETENTIO
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
31	JUL	1100	1	0.	.0	1390.0	*	31	JUL	1324	25	218.	53.4	1396.2	*	31	JUL	1548	49	75.	50.7	1396.0
31	JUL	1106	2	1.	.4	1390.1	*	31	JUL	1330	26	195.	53.1	1396.2	*	31	JUL	1554	50	75.	50.6	1396.0
31	JUL	1112	3	1.	.8	1390.1	*	31	JUL	1336	27	175.	52.9	1396.2	*	31	JUL	1600	51	75.	50.6	1396.0
31	JUL	1118	4	2.	1.2	1390.2	*	31	JUL	1342	28	163.	52.7	1396.2	*	31	JUL	1606	52	75.	50.5	1396.0
31	JUL	1124	5	3.	1.7	1390.2	*	31	JUL	1348	29	152.	52.5	1396.2	*	31	JUL	1612	53	75.	50.3	1396.0
31	JUL	1130	6	3.	2.2	1390.3	*	31	JUL	1354	30	142.	52.3	1396.1	*	31	JUL	1618	54	74.	50.2	1395.9
31	JUL	1136	7	4.	2.8	1390.4	*	31	JUL	1400	31	133.	52.2	1396.1	*	31	JUL	1624	55	74.	50.1	1395.9
31	JUL	1142	8	5.	3.5	1390.5	*	31	JUL	1406	32	125.	52.0	1396.1	*	31	JUL	1630	56	74.	50.0	1395.9
31	JUL	1148	9	7.	4.3	1390.6	*	31	JUL	1412	33	119.	51.9	1396.1	*	31	JUL	1636	57	74.	49.8	1395.9
31	JUL	1154	10	8.	5.3	1390.8	*	31	JUL	1418	34	112.	51.8	1396.1	*	31	JUL	1642	58	74.	49.6	1395.9
31	JUL	1200	11	10.	6.8	1391.0	*	31	JUL	1424	35	107.	51.7	1396.1	*	31	JUL	1648	59	74.	49.5	1395.9
31	JUL	1206	12	14.	9.3	1391.4	*	31	JUL	1430	36	102.	51.6	1396.1	*	31	JUL	1654	60	73.	49.3	1395.8
31	JUL	1212	13	21.	14.0	1392.0	*	31	JUL	1436	37	98.	51.5	1396.1	*	31	JUL	1700	61	73.	49.1	1395.8
31	JUL	1218	14	37.	21.6	1393.0	*	31	JUL	1442	38	96.	51.5	1396.1	*	31	JUL	1706	62	73.	48.9	1395.8
31	JUL	1224	15	55.	31.2	1394.1	*	31	JUL	1448	39	93.	51.4	1396.1	*	31	JUL	1712	63	73.	48.7	1395.8
31	JUL	1230	16	65.	41.2	1395.0	*	31	JUL	1454	40	90.	51.3	1396.0	*	31	JUL	1718	64	73.	48.6	1395.8
31	JUL	1236	17	74.	49.8	1395.9	*	31	JUL	1500	41	88.	51.2	1396.0	*	31	JUL	1724	65	72.	48.4	1395.8
31	JUL	1242	18	392.	54.9	1396.4	*	31	JUL	1506	42	85.	51.1	1396.0	*	31	JUL	1730	66	72.	48.2	1395.7
31	JUL	1248	19	565.	56.2	1396.5	*	31	JUL	1512	43	83.	51.1	1396.0	*	31	JUL	1736	67	72.	48.0	1395.7
31	JUL	1254	20	519.	55.9	1396.5	*	31	JUL	1518	44	81.	51.0	1396.0	*	31	JUL	1742	68	72.	47.8	1395.7
31	JUL	1300	21	431.	55.2	1396.4	*	31	JUL	1524	45	79.	50.9	1396.0	*	31	JUL	1748	69	72.	47.6	1395.7
31	JUL	1306	22	350.	54.6	1396.3	*	31	JUL	1530	46	77.	50.9	1396.0	*	31	JUL	1754	70	71.	47.4	1395.7
31	JUL	1312	23	287.	54.1	1396.3	*	31	JUL	1536	47	76.	50.8	1396.0	*	31	JUL	1800	71	71.	47.2	1395.6
31	JUL	1318	24	243.	53.7	1396.3	*	31	JUL	1542	48	75.	50.8	1396.0	*							

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	7.00-HR

E11

	(CFS)					
1.80		125.	107.	107.	107.	
	(INCHES)	3.130	3.146	3.146	3.146	
	(AC-FT)	62.	62.	62.	62.	

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	7.00-HR
(AC-FT)	(HR)				
56.	1.80	48.	42.	42.	42.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	7.00-HR
(FEET)	(HR)				
1396.48	1.80	1395.73	1394.97	1394.97	1394.97

CUMULATIVE AREA = .37 SQ MI

*** ***

```
         **************
         *            *
31 KK    *     EAST   *        AREA BETWEEN EXTENDED SAFETY AREA AND RELOCATED 37TH ST NO
         *            *
         **************
```

TIME DATA FOR INPUT TIME SERIES

JXMIN	6	TIME INTERVAL IN MINUTES
JXDATE	31JUL91	STARTING DATE
JXTIME	1100	STARTING TIME

SUBBASIN RUNOFF DATI

SUBBASIN CHARACTERISTICS

TAREA	.11	SUBBASIN AREA

***

****

HYDROGRAPH AT STATION EAST

****

DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	8.	*	31 JUL 1248	19	218.	*	31 JUL 1436	37	24.	*	31 JUL 1624	55	15.
31 JUL 1106	2	9.	*	31 JUL 1254	20	183.	*	31 JUL 1442	38	23.	*	31 JUL 1630	56	14.
31 JUL 1112	3	10.	*	31 JUL 1300	21	149.	*	31 JUL 1448	39	22.	*	31 JUL 1636	57	14.
31 JUL 1118	4	11.	*	31 JUL 1306	22	125.	*	31 JUL 1454	40	22.	*	31 JUL 1642	58	14.
31 JUL 1124	5	12.	*	31 JUL 1312	23	101.	*	31 JUL 1500	41	21.	*	31 JUL 1648	59	
31 JUL 1130	6	13.	*	31 JUL 1318	24	87.	*	31 JUL 1506	42	20.	*	31 JUL 1654	60	13.
31 JUL 1136	7	14.	*	31 JUL 1324	25	73.	*	31 JUL 1512	43	20.	*	31 JUL 1700	61	
31 JUL 1142	8	17.	*	31 JUL 1330	26	64.	*	31 JUL 1518	44	19.	*	31 JUL 1706	62	13.
31 JUL 1148	9	19.	*	31 JUL 1336	27	55.	*	31 JUL 1524	45	19.	*	31 JUL 1712	63	13.
31 JUL 1154	10	21.	*	31 JUL 1342	28	49.	*	31 JUL 1530	46	18.	*	31 JUL 1718	64	12.
JUL 1200	11	27.	*	31 JUL 1348	29	44.	*	31 JUL 1536	47	18.	*	31 JUL 1724	65	12.
31 JUL 1206	12	40.	*	31 JUL 1354	30	40.	*	31 JUL 1542	48	17.	*	31 JUL 1730	66	12.
31 JUL 1212	13	68.	*	31 JUL 1400	31	36.	*	31 JUL 1548	49	17.	*	31 JUL 1736	67	12.
31 JUL 1218	14	114.	*	31 JUL 1406	32	34.	*	31 JUL 1554	50	16.	*	31 JUL 1742	68	12.
31 JUL 1224	15	173.	*	31 JUL 1412	33	31.	*	31 JUL 1600	51	16.	*	31 JUL 1748	69	11.
31 JUL 1230	16	224.	*	31 JUL 1418	34	29.	*	31 JUL 1606	52	16.	*	31 JUL 1754	70	11.

31 JUL 1242	18	242.	*	31 JUL 1430	36	26.	*	31 JUL 1618	54	15.	*		

E12

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			24-HR	72-HR	7.00-HR	
(CFS)	(HR)					
		(CFS)				
250.	1.60		51.	46.	46.	46.
		(INCHES)	4.335	4.492	4.492	4.492
		(AC-FT)	25.	26.	26.	26.

CUMULATIVE AREA = .11 SQ MI

HYDROGRAPH AT STATION EAS
PLAN 1, RATIO = .53

DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	4.	*	31 JUL 1248	19	116.	*	31 JUL 1436	37	13.	*	31 JUL 1624	55	8.
31 JUL 1106	2	5.	*	31 JUL 1254	20	97.	*	31 JUL 1442	38	12.	*	31 JUL 1630	56	7.
31 JUL 1112	3	5.	*	31 JUL 1300	21	79.	*	31 JUL 1448	39	12.	*	31 JUL 1636	57	7.
31 JUL 1118	4	6.	*	31 JUL 1306	22	66.	*	31 JUL 1454	40	12.	*	31 JUL 1642	58	7.
31 JUL 1124	5	6.	*	31 JUL 1312	23	54.	*	31 JUL 1500	41	11.	*	31 JUL 1648	59	7.
31 JUL 1130	6	7.	*	31 JUL 1318	24	46.	*	31 JUL 1506	42	11.	*	31 JUL 1654	60	7.
JUL 1136	7	7.	*	31 JUL 1324	25	39.	*	31 JUL 1512	43	11.	*	31 JUL 1700	61	7.
JUL 1142	8	9.	*	31 JUL 1330	26	34.	*	31 JUL 1518	44	10.	*	31 JUL 1706	62	7.
31 JUL 1148	9	10.	*	31 JUL 1336	27	29.	*	31 JUL 1524	45	10.	*	31 JUL 1712	63	7.
31 JUL 1154	10	11.	*	31 JUL 1342	28	26.	*	31 JUL 1530	46	10.	*	31 JUL 1718	64	6.
31 JUL 1200	11	14.	*	31 JUL 1348	29	23.	*	31 JUL 1536	47	10.	*	31 JUL 1724	65	6.
31 JUL 1206	12	21.	*	31 JUL 1354	30	21.	*	31 JUL 1542	48	9.	*	31 JUL 1730	66	6.
31 JUL 1212	13	36.	*	31 JUL 1400	31	19.	*	31 JUL 1548	49	9.	*	31 JUL 1736	67	6.
31 JUL 1218	14	60.	*	31 JUL 1406	32	18.	*	31 JUL 1554	50	8.	*	31 JUL 1742	68	6.
31 JUL 1224	15	92.	*	31 JUL 1412	33	16.	*	31 JUL 1600	51	8.	*	31 JUL 1748	69	6.
31 JUL 1230	16	119.	*	31 JUL 1418	34	15.	*	31 JUL 1606	52	8.	*	31 JUL 1754	70	6.
31 JUL 1236	17	133.	*	31 JUL 1424	35	14.	*	31 JUL 1612	53	8.	*	31 JUL 1800	71	6.
31 JUL 1242	18	126.	*	31 JUL 1430	36	14.	*	31 JUL 1618	54	8.	*			

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			24-HR	72-HR	7.00-HR	
(CFS)	(HR)					
		(CFS)				
133.	1.60		27.	24.	24.	24.
		(INCHES)	2.297	2.381	2.381	2.381
		(AC-FT)	13.	14.	14.	14.

CUMULATIVE AREA = .11 SQ MI

HYDROGRAPH AT STATION EAST
PLAN 1, RATIO = .63

DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW

E13

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1106	2	6.	31 JUL 1254	20	115.	31 JUL 1442	38	14.	31 JUL 1630	56	9.
31 JUL 1112	3	6.	31 JUL 1300	21	94.	31 JUL 1448	39	14.	31 JUL 1636	57	9.
31 JUL 1118	4	7.	31 JUL 1306	22	79.	31 JUL 1454	40	14.	31 JUL 1642	58	9.
31 JUL 1124	5	8.	31 JUL 1312	23	64.	31 JUL 1500	41	13.	31 JUL 1648	59	8.
31 JUL 1130	6	8.	31 JUL 1318	24	55.	31 JUL 1506	42	13.	31 JUL 1654	60	8.
31 JUL 1136	7	9.	31 JUL 1324	25	46.	31 JUL 1512	43	13.	31 JUL 1700	61	8.
31 JUL 1142	8	11.	31 JUL 1330	26	40.	31 JUL 1518	44	12.	31 JUL 1706	62	8.
31 JUL 1148	9	12.	31 JUL 1336	27	35.	31 JUL 1524	45	12.	31 JUL 1712	63	8.
JUL 1154	10	13.	31 JUL 1342	28	31.	31 JUL 1530	46	11.	31 JUL 1718	64	8.
31 JUL 1200	11	17.	31 JUL 1348	29	28.	31 JUL 1536	47	11.	31 JUL 1724	65	8.
31 JUL 1206	12	25.	31 JUL 1354	30	25.	31 JUL 1542	48	11.	31 JUL 1730	66	8.
31 JUL 1212	13	43.	31 JUL 1400	31	23.	31 JUL 1548	49	11.	31 JUL 1736	67	8.
31 JUL 1218	14	72.	31 JUL 1406	32	21.	31 JUL 1554	50	10.	31 JUL 1742	68	8.
31 JUL 1224	15	109.	31 JUL 1412	33	20.	31 JUL 1600	51	10.	31 JUL 1748	69	7.
31 JUL 1230	16	141.	31 JUL 1418	34	18.	31 JUL 1606	52	10.	31 JUL 1754	70	7.
31 JUL 1236	17	156.	31 JUL 1424	35	17.	31 JUL 1612	53	9.	31 JUL 1800	71	9.
31 JUL 1242	18	152.	31 JUL 1430	36	16.	31 JUL 1618	54	9.			

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	7.00-HR
(CFS)	(HR				
		(CFS)			
158.	1.60	32.	29.	29.	29.
		(INCHES) 2.731	2.830	2.830	2.830
		(AC-FT) 16.	17.	17.	17.

CUMULATIVE AREA = .11 SQ MI

HYDROGRAPH AT STATION EAST
PLAN 1, RATIO = .76

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	6.	31 JUL 1248	19	166.	31 JUL 1436	37	18.	31 JUL 1624	55	11.
31 JUL 1106	2	7.	31 JUL 1254	20	139.	31 JUL 1442	38	17.	31 JUL 1630	56	11.
31 JUL 1112	3	8.	31 JUL 1300	21	113.	31 JUL 1448	39	17.	31 JUL 1636	57	11.
31 JUL 1118	4	8.	31 JUL 1306	22	95.	31 JUL 1454	40	17.	31 JUL 1642	58	11.
31 JUL 1124	5	9.	31 JUL 1312	23	77.	31 JUL 1500	41	16.	31 JUL 1648	59	10.
31 JUL 1130	6	10.	31 JUL 1318	24	66.	31 JUL 1506	42	15.	31 JUL 1654	60	10.
31 JUL 1136	7	11.	31 JUL 1324	25	55.	31 JUL 1512	43	15.	31 JUL 1700	61	10.
31 JUL 1142	8	13.	31 JUL 1330	26	49.	31 JUL 1518	44	14.	31 JUL 1706	62	10.
31 JUL 1148	9	14.	31 JUL 1336	27	42.	31 JUL 1524	45	14.	31 JUL 1712	63	10.
31 JUL 1154	10	16.	31 JUL 1342	28	37.	31 JUL 1530	46	14.	31 JUL 1718	64	9.
31 JUL 1200	11	21.	31 JUL 1348	29	33.	31 JUL 1536	47	14.	31 JUL 1724	65	9.
31 JUL 1206	12	30.	31 JUL 1354	30	30.	31 JUL 1542	48	13.	31 JUL 1730	66	9.
31 JUL 1212	13	52.	31 JUL 1400	31	27.	31 JUL 1548	49	13.	31 JUL 1736	67	9.
31 JUL 1218	14	87.	31 JUL 1406	32	26.	31 JUL 1554	50	12.	31 JUL 1742	68	9.
31 JUL 1224	15	131.	31 JUL 1412	33	24.	31 JUL 1600	51	12.	31 JUL 1748	69	8.
31 JUL 1230	16	170.	31 JUL 1418	34	22.	31 JUL 1606	52	12.	31 JUL 1754	70	8.
31 JUL 1236	17	190.	31 JUL 1424	35	21.	31 JUL 1612	53	11.	31 JUL 1800	71	11.
31 JUL 1242	18	184.	31 JUL 1430	36	20.	31 JUL 1618	54	11.			

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	7.00-HR
(CFS)	(HR				
		(CFS			

(INCHES)	3.294	3.414	3.414	3.414
(AC-FT)	19.	20.	20.	20.

CUMULATIVE AREA = .11 SQ MI

E14

HYDROGRAPH AT STATION EAS
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
31	JUL	1100	1	8.	31	JUL	1246	19	216.	31	JUL	1436	37	24.	31	JUL	1624	55	15.
31	JUL	1106	2	9.	31	JUL	1254	20	183.	31	JUL	1442	38	23.	31	JUL	1630	56	14.
31	JUL	1112	3	10.	31	JUL	1300	21	149.	31	JUL	1448	39	22.	31	JUL	1636	57	14.
31	JUL	1118	4	11.	31	JUL	1306	22	125.	31	JUL	1454	40	22.	31	JUL	1642	58	14.
31	JUL	1124	5	12.	31	JUL	1312	23	101.	31	JUL	1500	41	21.	31	JUL	1648	59	13.
31	JUL	1130	6	13.	31	JUL	1318	24	87.	31	JUL	1506	42	20.	31	JUL	1654	60	13.
31	JUL	1136	7	14.	31	JUL	1324	25	73.	31	JUL	1512	43	20.	31	JUL	1700	61	13.
31	JUL	1142	8	17.	31	JUL	1330	26	64.	31	JUL	1518	44	19.	31	JUL	1706	62	13.
31	JUL	1146	9	19.	31	JUL	1336	27	55.	31	JUL	1524	45	19.	31	JUL	1712	63	13.
31	JUL	1154	10	21.	31	JUL	1342	28	49.	31	JUL	1530	46	18.	31	JUL	1718	64	12.
31	JUL	1200	11	27.	31	JUL	1348	29	44.	31	JUL	1536	47	18.	31	JUL	1724	65	12.
31	JUL	1206	12	40.	31	JUL	1354	30	40.	31	JUL	1542	48	17.	31	JUL	1730	66	12.
31	JUL	1212	13	68.	31	JUL	1400	31	36.	31	JUL	1548	49	17.	31	JUL	1736	67	12.
31	JUL	1218	14	114.	31	JUL	1406	32	34.	31	JUL	1554	50	16.	31	JUL	1742	68	12.
31	JUL	1224	15	173.	31	JUL	1412	33	31.	31	JUL	1600	51	16.	31	JUL	1748	69	11.
	JUL	1230	16	224.	31	JUL	1418	34	29.	31	JUL	1606	52	16.	31	JUL	1754	70	11.
..	JUL	1236	17	250.	31	JUL	1424	35	27.	31	JUL	1612	53	15.	31	JUL	1800	71	15.
31	JUL	1242	18	242.	31	JUL	1430	36	26.	31	JUL	1618	54	15.					

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	7.00-HK
(CFS)	(HR)					
		(CFS)				
250.	1.60		51.	46.	46.	46.
		(INCHES)	4.335	4.492	4.492	4.492
		(AC-FT)	25.	26.	26.	26.

CUMULATIVE AREA = .11 SQ MI

42 KK RCB CULVERT AT RELOCATED 37TH ST MD

3 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

***

SUM OF 2 HYDROGRAPHS
PLAN 1, RATIO = .53

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	4.	31 JUL 1248	19	171.	31 JUL 1436	37	74.	31 JUL 1624	55	66.
JUL 1106	2	5.	31 JUL 1254	20	154.	31 JUL 1442	38	73.	31 JUL 1630	56	65.
31 JUL 1112	3	6.	31 JUL 1300	21	138.	31 JUL 1448	39	73.	31 JUL 1636	57	65.
31 JUL 1118	4	7.	31 JUL 1306	22	126.	31 JUL 1454	40	73.	31 JUL 1642	58	65.
31 JUL 1124	5	8.	31 JUL 1312	23	114.	31 JUL 1500	41	72.	31 JUL 1648	59	64.
31 JUL 1130	6	9.	31 JUL 1318	24	107.	31 JUL 1506	42	71.	31 JUL 1654	60	64.
31 JUL 1136	7	10.	31 JUL 1324	25	100.	31 JUL 1512	43	71.	31 JUL 1700	61	63.
31 JUL 1142	8	12.	31 JUL 1330	26	95.	31 JUL 1518	44	70.	31 JUL 1706	62	63.
31 JUL 1148	9	14.	31 JUL 1336	27	91.	31 JUL 1524	45	70.	31 JUL 1712	63	63.
31 JUL 1154	10	15.	31 JUL 1342	28	88.	31 JUL 1530	46	69.	31 JUL 1718	64	62.
31 JUL 1200	11	20.	31 JUL 1348	29	85.	31 JUL 1536	47	69.	31 JUL 1724	65	62.
31 JUL 1206	12	29.	31 JUL 1354	30	83.	31 JUL 1542	48	69.	31 JUL 1730	66	62.
31 JUL 1212	13	47.	31 JUL 1400	31	81.	31 JUL 1548	49	68.	31 JUL 1736	67	61.
31 JUL 1218	14	78.	31 JUL 1406	32	80.	31 JUL 1554	50	68.	31 JUL 1742	68	61.
31 JUL 1224	15	116.	31 JUL 1412	33	78.	31 JUL 1600	51	67.	31 JUL 1748	69	60.
31 JUL 1230	16	156.	31 JUL 1418	34	77.	31 JUL 1606	52	67.	31 JUL 1754	70	60.
31 JUL 1236	17	181.	31 JUL 1424	35	76.	31 JUL 1612	53	66.	31 JUL 1800	71	62.
31 JUL 1242	18	181.	31 JUL 1430	36	75.	31 JUL 1618	54	66.			

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	7.00-HR
(CFS)	(HR)					
		(CFS)				
181.	1.70		82.	72.	72.	72.
		(INCHES)	1.587	1.618	1.618	1.618
		(AC-FT)	41.	41.	41.	41.

CUMULATIVE AREA = .48 SQ MI

HYDROGRAPH AT STATION RCB
SUM OF 2 HYDROGRAPHS
PLAN 1, RATIO = .63

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	5.	31 JUL 1248	19	199.	31 JUL 1436	37	84.	31 JUL 1624	55	75.
31 JUL 1106	2	6.	31 JUL 1254	20	179.	31 JUL 1442	38	84.	31 JUL 1630	56	74.
31 JUL 1112	3	7.	31 JUL 1300	21	159.	31 JUL 1448	39	83.	31 JUL 1636	57	74.
31 JUL 1118	4	8.	31 JUL 1306	22	145.	31 JUL 1454	40	83.	31 JUL 1642	58	74.
31 JUL 1124	5	9.	31 JUL 1312	23	131.	31 JUL 1500	41	82.	31 JUL 1648	59	73.
31 JUL 1130	6	10.	31 JUL 1318	24	123.	31 JUL 1506	42	81.	31 JUL 1654	60	73.
31 JUL 1136	7	11.	31 JUL 1324	25	115.	31 JUL 1512	43	81.	31 JUL 1700	61	72.
31 JUL 1142	8	14.	31 JUL 1330	26	109.	31 JUL 1518	44	80.	31 JUL 1706	62	72.
31 JUL 1148	9	16.	31 JUL 1336	27	104.	31 JUL 1524	45	80.	31 JUL 1712	63	72.
31 JUL 1154	10	18.	31 JUL 1342	28	100.	31 JUL 1530	46	79.	31 JUL 1718	64	71.
JUL 1200	11	23.	31 JUL 1348	29	97.	31 JUL 1536	47	79.	31 JUL 1724	65	71.
31 JUL 1206	12	34.	31 JUL 1354	30	95.	31 JUL 1542	48	78.	31 JUL 1730	66	70.
31 JUL 1212	13	56.	31 JUL 1400	31	92.	31 JUL 1548	49	78.	31 JUL 1736	67	70.
31 JUL 1218	14	93.	31 JUL 1406	32	91.	31 JUL 1554	50	77.	31 JUL 1742	68	70.
31 JUL 1224	15	141.	31 JUL 1412	33	89.	31 JUL 1600	51	77.	31 JUL 1748	69	69.
31 JUL 1230	16	189.	31 JUL 1416	34	88.	31 JUL 1606	52	77.	31 JUL 1754	70	69.

31 JUL 1242	18	211.	31 JUL 1430	36	86.	31 JUL 1618	54	76.			

E16

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			24-HR	72-HR	7.00-HR
(CFS)	(HR)				
		(CFS)			
	1.60		94.	82.	82.	82.
		(INCHES)	1.827	1.864	1.864	1.864
		(AC-FT)	47.	48.	48.	48.

CUMULATIVE AREA = .48 SQ MI

HYDROGRAPH AT STATION RCB
SUM OF 2 HYDROGRAPHS
PLAN 1, RATIO = .71

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
31 JUL 1100	1	6.	31 JUL 1248	19	236.	31 JUL 1436	37	98.	31 JUL 1624	55	83.
31 JUL 1106	2	7.	31 JUL 1254	20	212.	31 JUL 1442	38	94.	31 JUL 1630	56	82.
31 JUL 1112	3	8.	31 JUL 1300	21	188.	31 JUL 1448	39	92.	31 JUL 1636	57	82.
31 JUL 1118	4	10.	31 JUL 1306	22	201.	31 JUL 1454	40	92.	31 JUL 1642	58	82.
31 JUL 1124	5	11.	31 JUL 1312	23	218.	31 JUL 1500	41	91.	31 JUL 1648	59	81.
JUL 1130	6	12.	31 JUL 1318	24	217.	31 JUL 1506	42	90.	31 JUL 1654	60	81.
JUL 1136	7	14.	31 JUL 1324	25	205.	31 JUL 1512	43	90.	31 JUL 1700	61	80.
31 JUL 1142	8	17.	31 JUL 1330	26	191.	31 JUL 1518	44	89.	31 JUL 1706	62	80.
31 JUL 1148	9	19.	31 JUL 1336	27	176.	31 JUL 1524	45	89.	31 JUL 1712	63	80.
31 JUL 1154	10	22.	31 JUL 1342	28	162.	31 JUL 1530	46	88.	31 JUL 1716	64	79.
31 JUL 1200	11	28.	31 JUL 1348	29	149.	31 JUL 1536	47	87.	31 JUL 1724	65	79.
31 JUL 1206	12	41.	31 JUL 1354	30	139.	31 JUL 1542	48	87.	31 JUL 1730	66	78.
31 JUL 1212	13	68.	31 JUL 1400	31	129.	31 JUL 1548	49	86.	31 JUL 1736	67	78.
31 JUL 1218	14	111.	31 JUL 1406	32	123.	31 JUL 1554	50	85.	31 JUL 1742	68	78.
31 JUL 1224	15	174.	31 JUL 1412	33	117.	31 JUL 1600	51	85.	31 JUL 1748	69	77.
31 JUL 1230	16	225.	31 JUL 1418	34	112.	31 JUL 1606	52	85.	31 JUL 1754	70	76.
31 JUL 1236	17	252.	31 JUL 1424	35	107.	31 JUL 1612	53	84.	31 JUL 1800	71	79.
31 JUL 1242	18	250.	31 JUL 1430	36	102.	31 JUL 1618	54	84.			

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			24-HR	72-HR	7.00-HR
(CFS)	(HR)				
		(CFS)			
252.	1.60		117.	102.	102.	102.
		(INCHES)	2.269	2.314	2.314	2.314
		(AC-FT)	58.	59.	59.	59.

CUMULATIVE AREA = .48 SQ MI

HYDROGRAPH AT STATION RCB
SUM OF 2 HYDROGRAPHS
PLAN 1, RATIO = 1.00

E17

31 JUL 1100	1	8.	31 JUL 1248	19	783.	31 JUL 1436	37	122.	31 JUL 1624	55	89.
31 JUL 1106	2	10.	31 JUL 1254	20	702.	31 JUL 1442	38	119.	31 JUL 1630	56	88.
31 JUL 1112	3	11.	31 JUL 1300	21	580.	31 JUL 1448	39	115.	31 JUL 1636	57	88.
31 JUL 1118	4	13.	31 JUL 1306	22	475.	31 JUL 1454	40	112.	31 JUL 1642	58	88.
31 JUL 1124	5	15.	31 JUL 1312	23	388.	31 JUL 1500	41	109.	31 JUL 1648	59	87.
31 JUL 1130	6	16.	31 JUL 1318	24	330.	31 JUL 1506	42	105.	31 JUL 1654	60	86.
31 JUL 1136	7	18.	31 JUL 1324	25	291.	31 JUL 1512	43	103.	31 JUL 1700	61	86.
JUL 1142	8	22.	31 JUL 1330	26	259.	31 JUL 1518	44	100.	31 JUL 1706	62	86.
31 JUL 1148	9	26.	31 JUL 1336	27	230.	31 JUL 1524	45	98.	31 JUL 1712	63	86.
31 JUL 1154	10	29.	31 JUL 1342	28	212.	31 JUL 1530	46	95.	31 JUL 1718	64	85.
31 JUL 1200	11	37.	31 JUL 1348	29	196.	31 JUL 1536	47	94.	31 JUL 1724	65	84.
31 JUL 1206	12	54.	31 JUL 1354	30	182.	31 JUL 1542	48	92.	31 JUL 1730	66	84.
31 JUL 1212	13	89.	31 JUL 1400	31	169.	31 JUL 1548	49	92.	31 JUL 1736	67	84.
31 JUL 1218	14	151.	31 JUL 1406	32	159.	31 JUL 1554	50	91.	31 JUL 1742	68	84.
31 JUL 1224	15	228.	31 JUL 1412	33	150.	31 JUL 1600	51	91.	31 JUL 1748	69	83.
31 JUL 1230	16	289.	31 JUL 1418	34	141.	31 JUL 1606	52	91.	31 JUL 1754	70	82.
31 JUL 1236	17	324.	31 JUL 1424	35	134.	31 JUL 1612	53	90.	31 JUL 1800	71	86.
31 JUL 1242	18	634.	31 JUL 1430	36	126.	31 JUL 1618	54	89.			

****

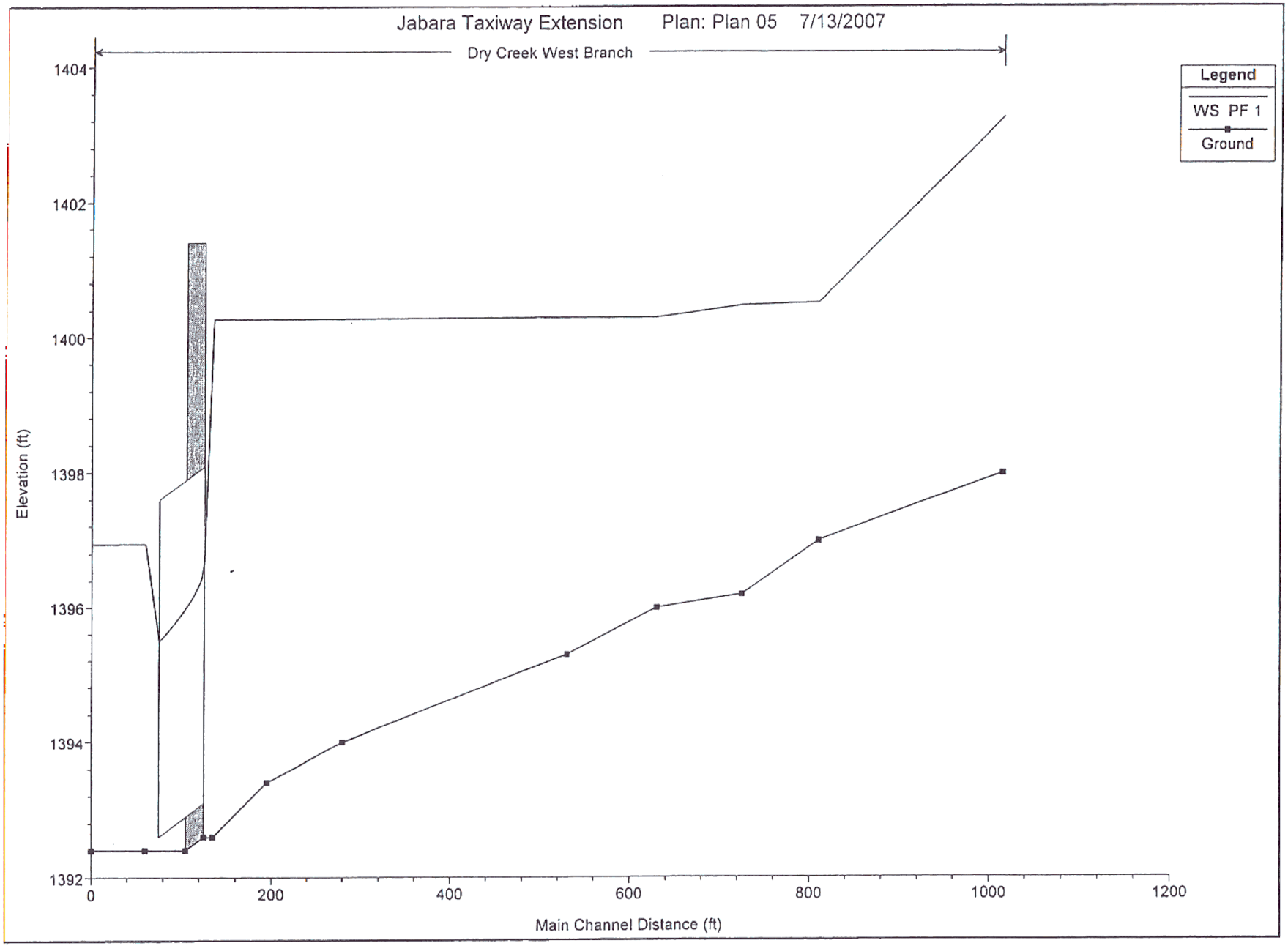
PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	7.00-HR
(CFS						
		(CFS)				
783.	1.80		175.	153.	153.	153.
		(INCHES)	3.396	3.455	3.455	3.455
		(AC-FT)	87.	88.	88.	88.

CUMULATIVE AREA = .48 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 .53	RATIO 2 .63	RATIO 3 .76	RATIO 4 1.00
HYDROGRAPH AT								
	WEST	.37		FLOW	684.	813.	981.	1291.
				TIME	1.40	1.40	1.40	1.40
ROUTED TO								
	DETENTIO	.37		FLOW	62.	70.	151.	565.
				TIME	3.00	3.10	2.30	1.80
			** PEAK STAGES IN FEET **					
			1	STAGE	1394.74	1395.49	1396.15	1396.46
				TIME	3.00	3.10	2.30	1.80
HYDROGRAPH AT								
	EAST	.11		FLOW	133.	158.	190.	250.
				TIME	1.60	1.60	1.60	1.60
)INED A								
	RCB	.48		FLOW	181.	212.	252.	783.
				TIME	1.70	1.60	1.60	1.80

Existing Conditions HEC-RAS Model


Jabara Taxiway Extension Plan: Plan 05 7/13/2007
Dry Creek West Branch
Legend
WS PF 1
Ground
Elevation (ft)
1404
1402
1400
1398
1396
1394
1392
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

HEC-RAS Plan: Plan 03 River: Dry Creek Reach: West Branch Profile: PF 1

Reach	River Sta	Profile	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
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
West Branch	1015	PF 1	347.00	1398.00	1403.26	1401.52	1403.38	0.008043	3.03	138.05	77.90	0.28
West Branch	810	PF 1	347.00	1397.00	1400.53		1400.69	0.024219	3.05	107.31	68.89	0.44
West Branch	725	PF 1	347.00	1396.20	1400.48		1400.50	0.000598	0.96	395.95	128.60	0.08
West Branch	630	PF 1	347.00	1396.00	1400.31		1400.36	0.005660	1.91	182.19	85.52	0.22
West Branch	530	PF 1	347.00	1395.30	1400.31		1400.31	0.000122	0.45	823.17	230.82	0.04
West Branch	280	PF 1	347.00	1394.00	1400.28		1400.28	0.000079	0.38	1037.36	346.75	0.03
West Branch	195	PF 1	347.00	1393.40	1400.28		1400.28	0.000067	0.36	1198.02	574.95	
West Branch	135	PF 1	347.00	1392.60	1400.27	1394.27	1400.28	0.000041	0.31	1373.91	574.17	0.02
West Branch	70		Culvert									
West Branch	60	PF 1	347.00	1392.40	1396.95		1396.95	0.000037	0.22	1446.73	452.47	0.02
West Branch	0	PF 1	615.00	1392.40	1396.94	1393.43	1396.94	0.000116	0.40	1443.80	452.18	

Plan: Plan 03 Dry Creek West Branch RS: 1015 Profile: PF 1

E.G. Elev (ft)	1403.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.080	0.100	0.080
W.S. Elev (ft)	1403.26	Reach Len. (ft)	220.00	205.00	205.00
Crit W.S. (ft)	1401.52	Flow Area (sq ft)	6.02	88.93	43.11
E.G. Slope (ft/ft)	0.008043	Area (sq ft)	6.02	88.93	43.11
Q Total (cfs)	347.00	Flow (cfs)	9.29	269.40	68.31
Top Width (ft)	77.90	Top Width (ft)	6.48	25.00	46.43
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.54	3.03	1.58
Max Chl Dpth (ft)	5.26	Hydr. Depth (ft)	0.93	3.56	0.93
Conv. Total (cfs)	3869.3	Conv. (cfs)	103.6	3004.0	761.7
Length Wtd. (ft)	206.87	Wetted Per. (ft)	6.74	25.94	46.46
Min Ch El (ft)	1398.00	Shear (lb/sq ft)	0.45	1.72	0.47
Alpha	1.22	Stream Power (lb/ft s)	0.69	5.21	0.74
Frctn Loss (ft)	2.68	Cum Volume (acre-ft)	2.05	10.56	3.95
C & E Loss (ft)	0.01	Cum SA (acres)	1.28	2.45	2.26

Plan: Plan 03 Dry Creek West Branch RS: 810 Profile: PF 1

E.G. Elev (ft)	1400.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.080	0.100	
W.S. Elev (ft)	1400.53	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)		Flow Area (sq ft)	18.94	88.38	
E.G. Slope (ft/ft)	0.024219	Area (sq ft)	18.94	88.38	
Q Total (cfs)	347.00	Flow (cfs)	77.19	269.81	
Top Width (ft)	68.89	Top Width (ft)	10.75	58.14	
Vel Total (ft/s)	3.23	Avg. Vel. (ft/s)	4.08	3.05	
Max Chl Dpth (ft)	3.52	Hydr. Depth (ft)	1.76	1.52	
Conv. Total (cfs)	2229.7	Conv. (cfs)	496.0	1733.8	
Length Wtd. (ft)	85.00	Wetted Per. (ft)	11.31	58.26	
Min Ch El (ft)	1397.00	Shear (lb/sq ft)	2.53	2.29	
Alpha	1.05	Stream Power (lb/ft s)	10.32	7.00	
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	1.99	10.15	3.85
C & E Loss (ft)	0.05	Cum SA (acres)	1.24	2.26	2.15

Plan: Plan 03 Dry Creek West Branch RS: 725 Profile: PF 1

E.G. Elev (ft)	**1400.50**	**Element**	**Left OB**	**Channel**	**Right OB**
	0.01	**Wt. n-Val.**	**0.080**	**0.100**	**0.080**
W.S. Elev (ft)	**1400.48**	**Reach Len. (ft)**	**95.00**	**95.00**	**95.00**
Crit W.S. (ft)		**Flow Area (sq ft)**	**76.63**	**278.38**	**40.94**
	0.000598	**Area (sq ft)**	**76.63**	**278.38**	**40.94**
	347.00	**Flow (cfs)**	**49.83**	**266.77**	**30.39**
Top Width (ft)	**128.60**	**Top Width (ft)**	**44.48**	**65.00**	**19.12**
Vel Total (ft/s)	**0.88**	**Avg. Vel. (ft/s)**	**0.65**	**0.96**	**0.74**
Max Chl Dpth (ft)	**4.28**	**Hydr. Depth (ft)**	**1.72**	**4.28**	**2.14**
Conv. Total (cfs)	**14189.4**	**Conv. (cfs)**	**2037.8**	**10908.7**	**1242.9**
Length Wtd. (ft)	**95.00**	**Wetted Per. (ft)**	**44.73**	**65.00**	**19.59**
Min Ch El (ft)	**1396.20**	**Shear (lb/sq ft)**	**0.06**	**0.16**	**0.08**
Alpha	**1.06**	**Stream Power (lb/ft s)**	**0.04**	**0.15**	**0.06**
Frctn Loss (ft)	**0.13**	**Cum Volume (acre-ft)**	**1.89**	**9.79**	**3.81**
C & E Loss (ft)	**0.00**	**Cum SA (acres)**	**1.18**	**2.14**	**2.13**

Plan: Plan 03 Dry Creek West Branch RS: 630 Profile: PF 1

E.G. Elev (ft)	1400.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.080	0.100	
	1400.31	Reach Len. (ft)	100.00		100.00
Crit W.S. (ft)		Flow Area (sq ft)	0.73	181.46	
E.G. Slope (ft/ft)	0.005660	Area (sq ft)	0.73	181.46	
Q Total (cfs)	347.00	Flow (cfs)	0.29	346.71	
Top Width (ft)	85.52	Top Width (ft)	4.77	80.75	
Vel Total (ft/s)	1.90	Avg. Vel. (ft/s)	0.40	1.91	
Max Chl Dpth (ft)	4.31	Hydr. Depth (ft)	0.15	2.25	
Conv. Total (cfs)	4612.4	Conv. (cfs)	3.9	4608.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)	4.78	81.21	
	1396.00	Shear (lb/sq ft)	0.05	0.79	
	1.01	Stream Power (lb/ft s)	0.02	1.51	
	0.04	Cum Volume (acre-ft)	1.81	9.29	3.77
	0.02	Cum SA (acres)	1.13	1.98	2.11

Plan: Plan 03 Dry Creek West Branch RS: 530 Profile: PF 1

E.G. Elev (ft)	1400.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.080	0.100	0.080
W.S. Elev (ft)	1400.31	Reach Len. (ft)	250.00	250.00	250.00
Crit W.S. (ft)		Flow Area (sq ft)	78.37	673.37	71.43
E.G. Slope (ft/ft)	0.000122	Area (sq ft)	78.37	673.37	71.43
Q Total (cfs)	347.00	Flow (cfs)	22.88	300.57	23.55
Top Width (ft)	230.82	Top Width (ft)	46.02	150.00	34.80
Vel Total (ft/s)	0.42	Avg. Vel. (ft/s)	0.29	0.45	0.33
Max Chl Dpth (ft)	5.01	Hydr. Depth (ft)	1.70	4.49	2.05
Conv. Total (cfs)	31430.5	Conv. (cfs)	2072.1	27225.2	2133.2
Length Wtd. (ft)	250.00	Wetted Per. (ft)	46.15	150.03	35.04
Min Ch El (ft)	1395.30	Shear (lb/sq ft)	0.01	0.03	0.02
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.02	0.01
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	1.72	8.31	3.69
C & E Loss (ft)	0.00	Cum SA (acres)	1.07	1.71	2.07

Plan: Plan 03 Dry Creek West Branch RS: 280 Profile: PF 1

E.G. Elev (ft)	1400.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.080	0.100	0.080
W.S. Elev (ft)	1400.28	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)		Flow Area (sq ft)	170.92	734.81	131.63
E.G. Slope (ft/ft)	0.000079	Area (sq ft)	170.92	734.81	131.63
Q Total (cfs)	347.00	Flow (cfs)	39.06	280.24	27.70
Top Width (ft)	346.75	Top Width (ft)	105.13	150.00	91.62
Vel Total (ft/s)	0.33	Avg. Vel. (ft/s)	0.23	0.38	
Max Chl Dpth (ft)	6.28	Hydr. Depth (ft)	1.63	4.90	1.44
Conv. Total (cfs)	38975.9	Conv. (cfs)	4387.0	31477.6	3111.4
	85.00	Wetted Per. (ft)	105.22	150.12	91.68
	1394.00	Shear (lb/sq ft)	0.01	0.02	0.01
	1.13	Stream Power (lb/ft s)	0.00	0.01	0.00
	0.01	Cum Volume (acre-ft)	1.00	4.27	3.10
	0.00	Cum SA (acres)	0.64	0.85	1.71

Plan: Plan 03 Dry Creek West Branch RS: 195 Profile: PF 1

E.G. Elev (ft)	1400.28	Element	Left OB	Channel	Right OB
	0.00	Wt. n-Val.	0.080	0.100	0.080
W.S. Elev (ft)	1400.28	Reach Len. (ft)	60.00	60.00	60.00
Crit W.S. (ft)		Flow Area (sq ft)	170.29	763.92	263.82
E.G. Slope (ft/ft)	0.000067	Area (sq ft)	170.29	763.92	263.82
Q Total (cfs)	347.00	Flow (cfs)	35.88	275.63	35.49
Top Width (ft)	574.95	Top Width (ft)	104.76	150.00	320.19
Vel Total (ft/s)	0.29	Avg. Vel. (ft/s)	0.21	0.36	0.13
Max Chl Dpth (ft)	6.88	Hydr. Depth (ft)	1.63	5.09	0.82
Conv. Total (cfs)	42266.3	Conv. (cfs)	4370.5	33573.5	4322.3
Length Wtd. (ft)	60.00	Wetted Per. (ft)	104.85	150.18	320.29
Min Ch El (ft)	1393.40	Shear (lb/sq ft)	0.01	0.02	0.00
Alpha	1.31	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.67	2.80	2.72
C & E Loss (ft)	0.00	Cum SA (acres)	0.43	0.56	1.31

Plan: Plan 03 Dry Creek West Branch RS: 135 Profile: PF 1

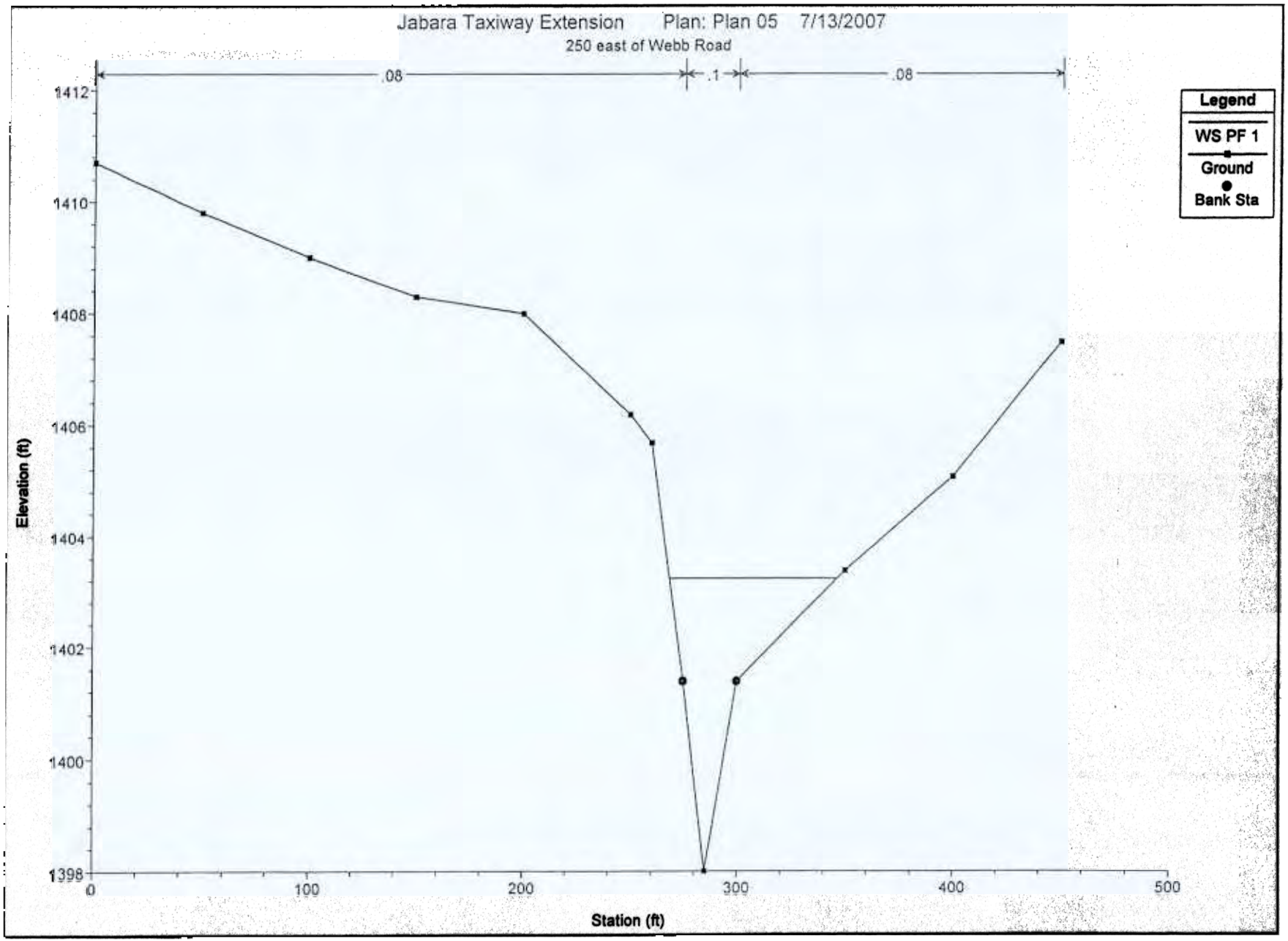
E.G. Elev (ft)	1400.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.080	0.100	0.080
W.S. Elev (ft)	1400.27	Reach Len. (ft)	75.00	75.00	75.00
Crit W.S. (ft)	1394.27	Flow Area (sq ft)	170.00	903.50	300.42
E.G. Slope (ft/ft)	0.000041	Area (sq ft)	170.00	903.50	300.42
Q Total (cfs)	347.00	Flow (cfs)	27.91	284.15	34.94
Top Width (ft)	574.17	Top Width (ft)	104.59	150.00	319.58
Vel Total (ft/s)	0.25	Avg. Vel. (ft/s)	0.16	0.31	0.12
Max Chl Dpth (ft)	7.67	Hydr. Depth (ft)	1.63	6.02	0.94
Conv. Total (cfs)	54238.2	Conv. (cfs)	4362.8	44413.7	5461.7
Length Wtd. (ft)	75.00	Wetted Per. (ft)	104.67	150.15	319.77
Min Ch El (ft)	1392.60	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	1.33	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.43	1.66	2.33
C & E Loss (ft)		Cum SA (acres)	0.29	0.35	0.86

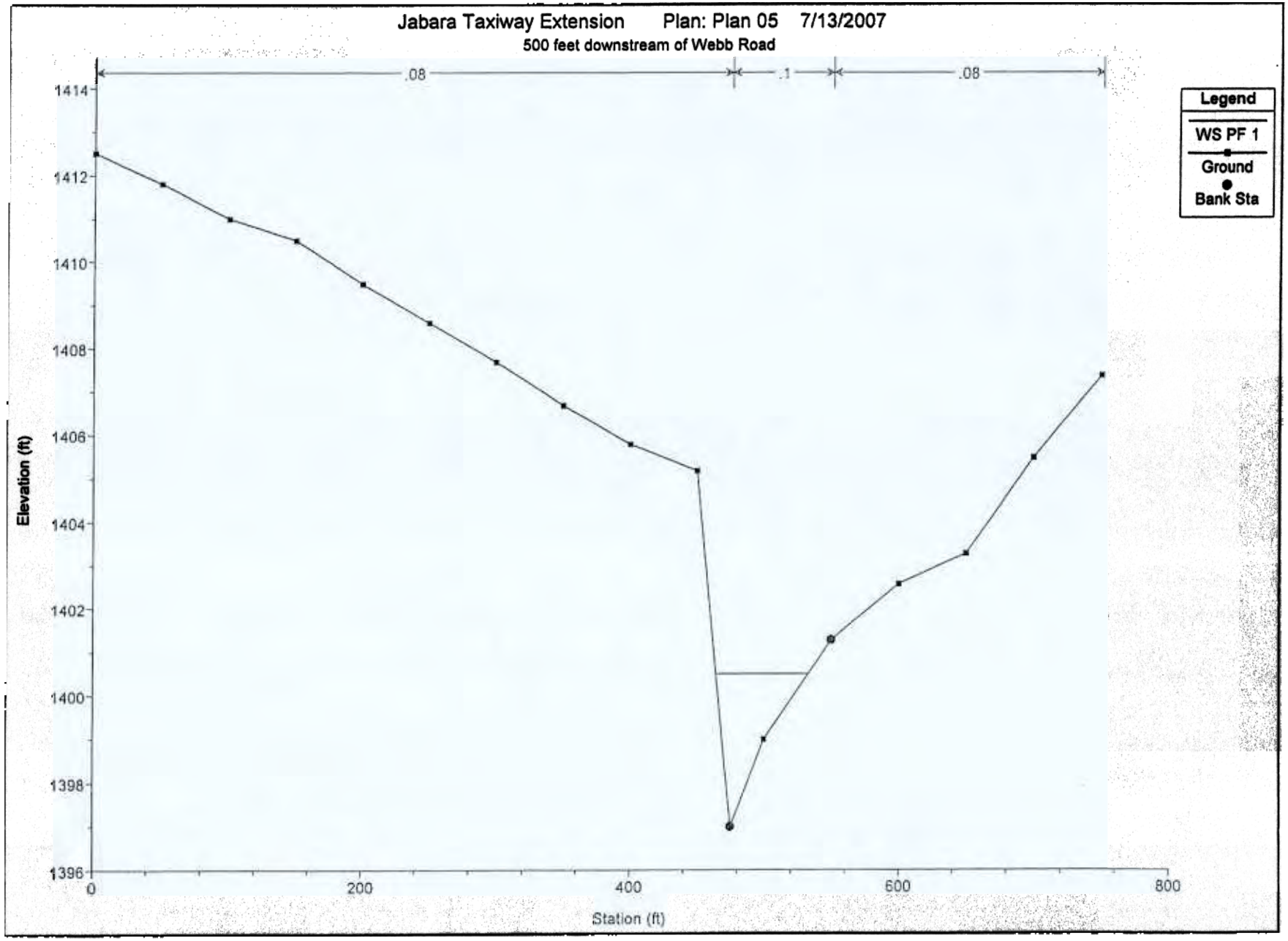
Plan: Plan 03 Dry Creek West Branch RS: 60 Profile: PF 1

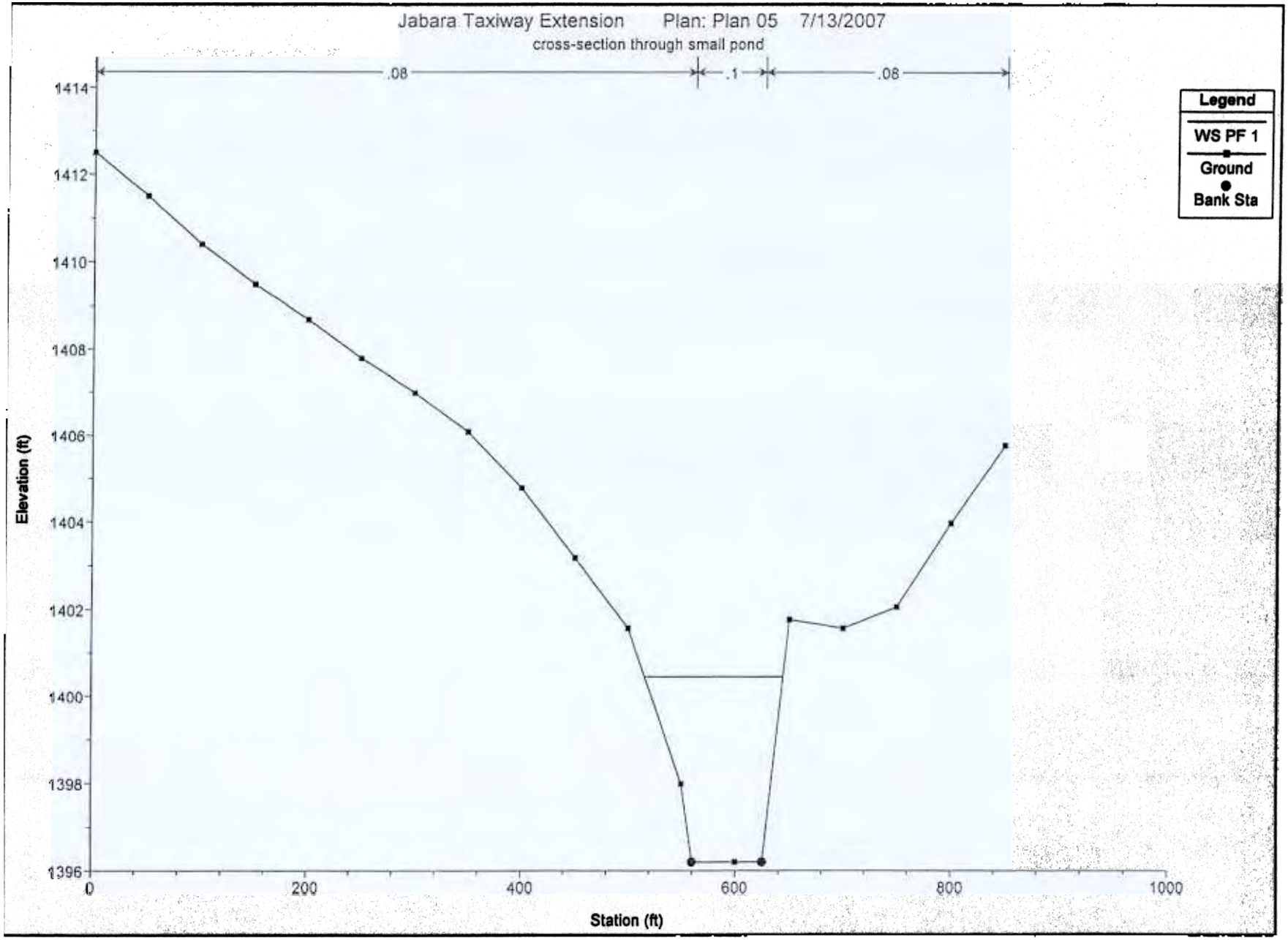
E.G. Elev (ft)	1396.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.080	0.100	0.080
W.S. Elev (ft)	1396.95	Reach Len. (ft)	60.00	60.00	60.00
Crit W.S. (ft)		Flow Area (sq ft)	129.10	392.14	925.50
E.G. Slope (ft/ft)	0.000037	Area (sq ft)	129.10	392.14	925.50
Q Total (cfs)	347.00	Flow (cfs)	18.62	87.78	240.60
Top Width (ft)	452.47	Top Width (ft)	88.95	100.00	263.52
Vel Total (ft/s)	0.24	Avg. Vel. (ft/s)	0.14	0.22	0.26
Max Chl Dpth (ft)	4.55	Hydr. Depth (ft)	1.45	3.92	3.51
Conv. Total (cfs)	57265.9	Conv. (cfs)	3072.6	14486.5	39706.8
Length Wtd. (ft)	60.00	Wetted Per. (ft)	89.00	100.03	263.63
Min Ch El (ft)	1392.40	Shear (lb/sq ft)	0.00	0.01	0.01
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.18	0.54	1.27
C & E Loss (ft)	0.00	Cum SA (acres)	0.12	0.14	0.36

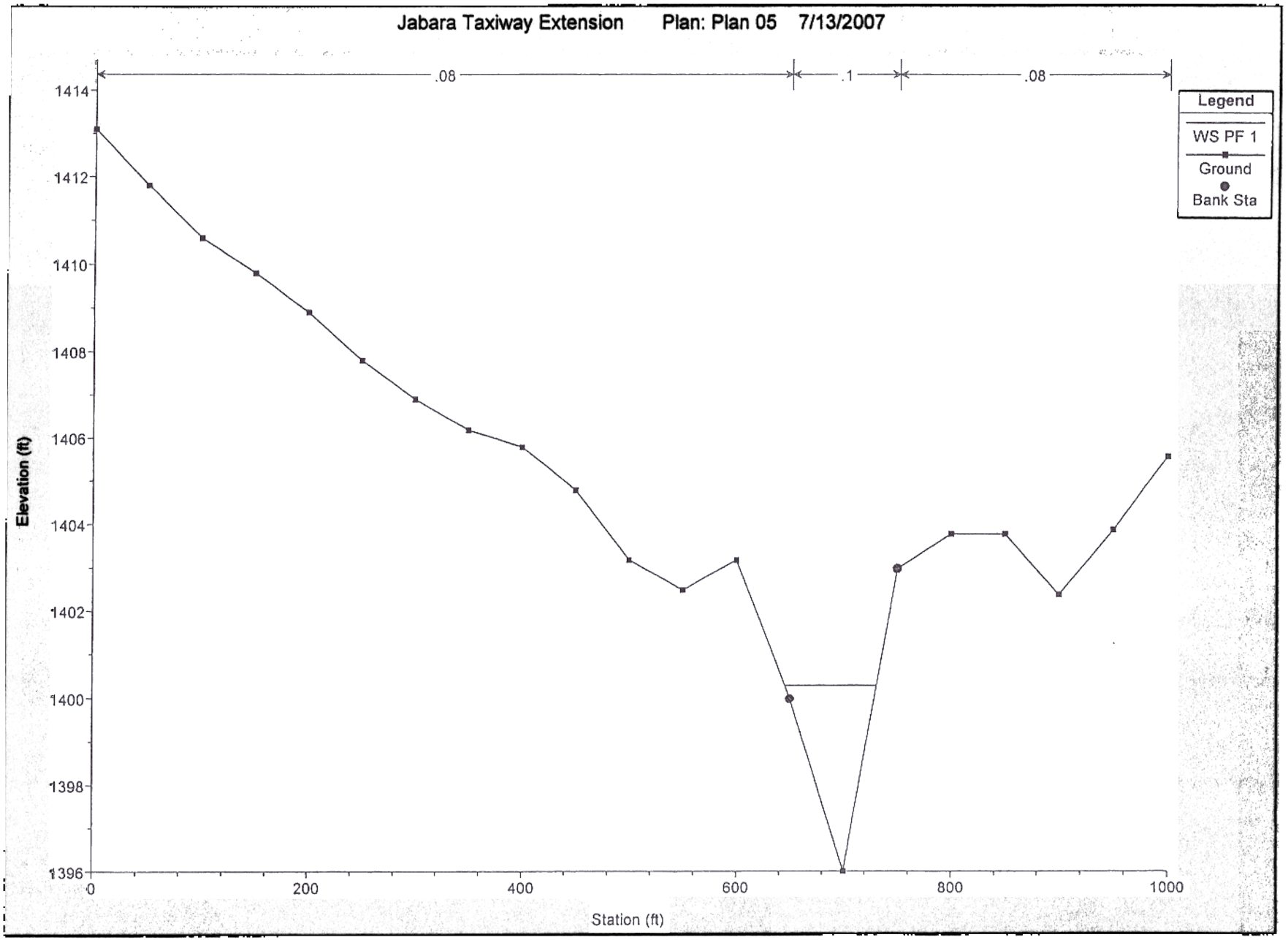
Plan: Plan 03 Dry Creek West Branch RS: 0 Profile: PF 1

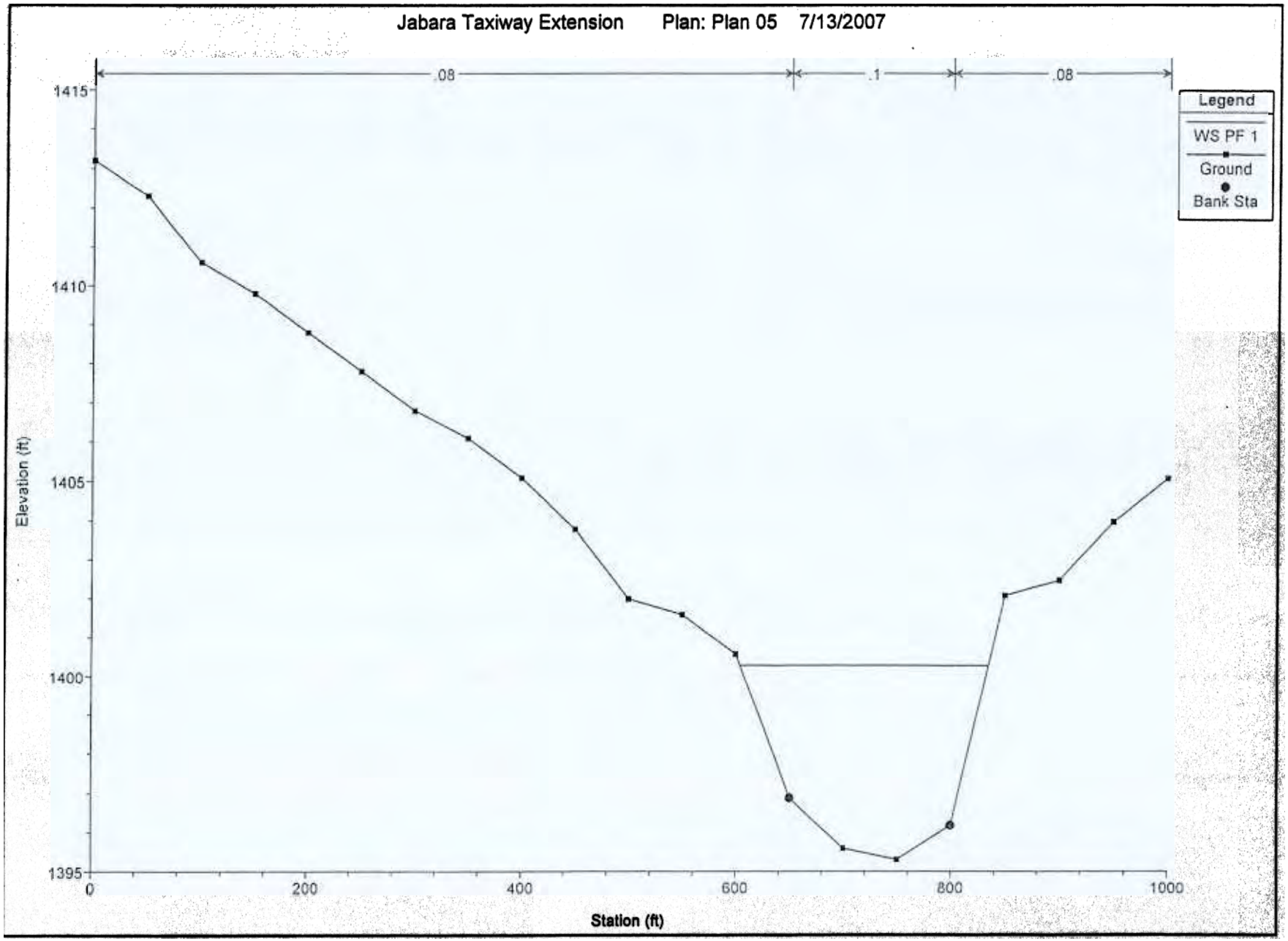
E.G. Elev (ft)	1396.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.100	0.080
W.S. Elev (ft)	1396.94	Reach Len. (ft)			
Crit W.S. (ft)	1393.43	Flow Area (sq ft)	128.52	391.49	923.79
E.G. Slope (ft/ft)	0.000116	Area (sq ft)	128.52	391.49	923.79
Q Total (cfs)	615.00	Flow (cfs)	32.90	155.61	426.49
Top Width (ft)	452.18	Top Width (ft)	88.75	100.00	263.43
Vel Total (ft/s)	0.43	Avg. Vel. (ft/s)	0.26	0.40	0.46
Max Chl Dpth (ft)	4.54	Hydr. Depth (ft)	1.45	3.91	3.51
Conv. Total (cfs)	57095.4	Conv. (cfs)	3054.5	14446.7	
Length Wtd. (ft)		Wetted Per. (ft)	88.80	100.03	
Min Ch El (ft)	1392.40	Shear (lb/sq ft)	0.01	0.03	
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.01	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

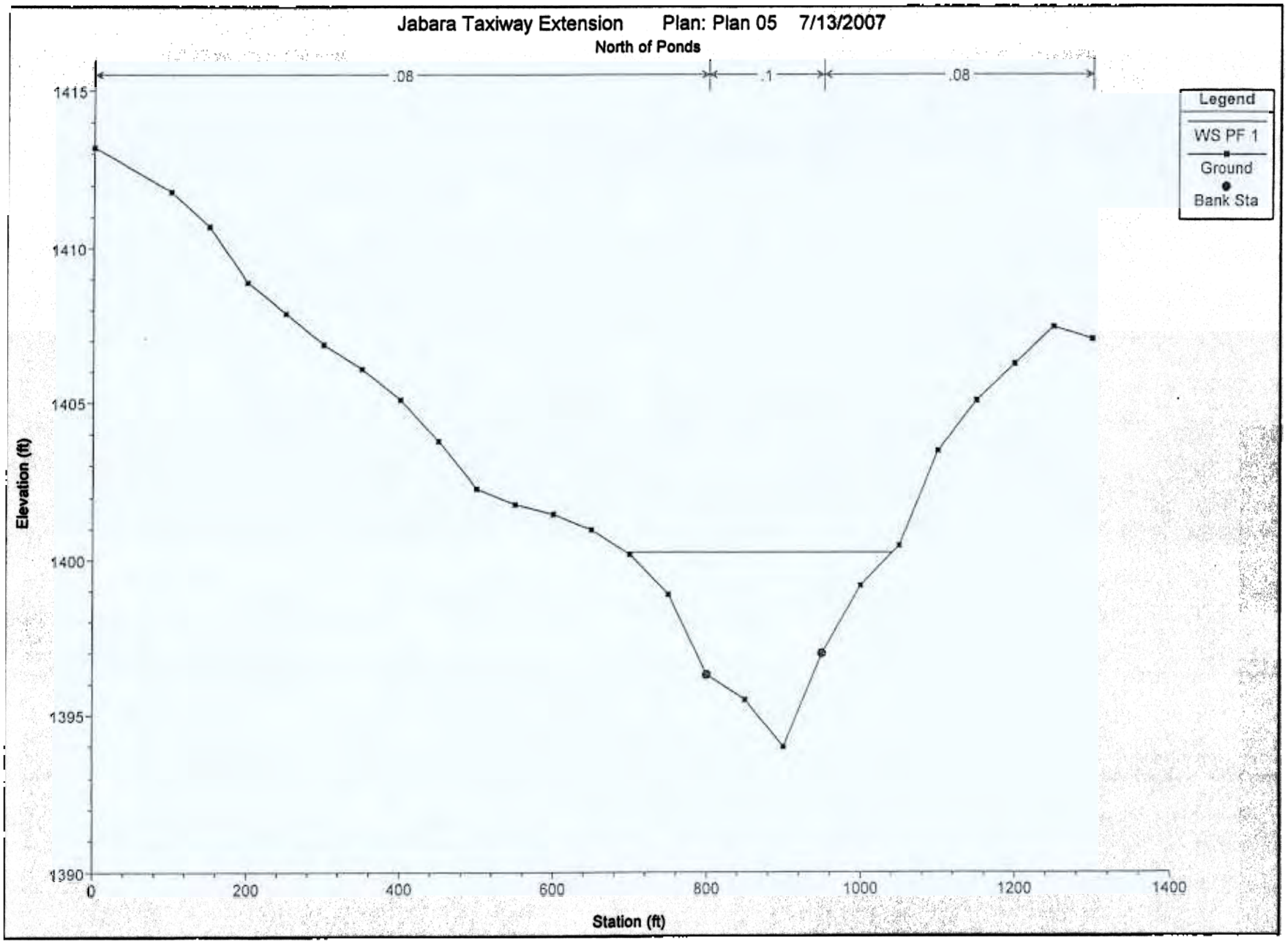

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
250 east of Webb Road
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1412
1410
1408
1406
1404
1402
1400
1398
0
100
200
300
400
500
Station (ft)

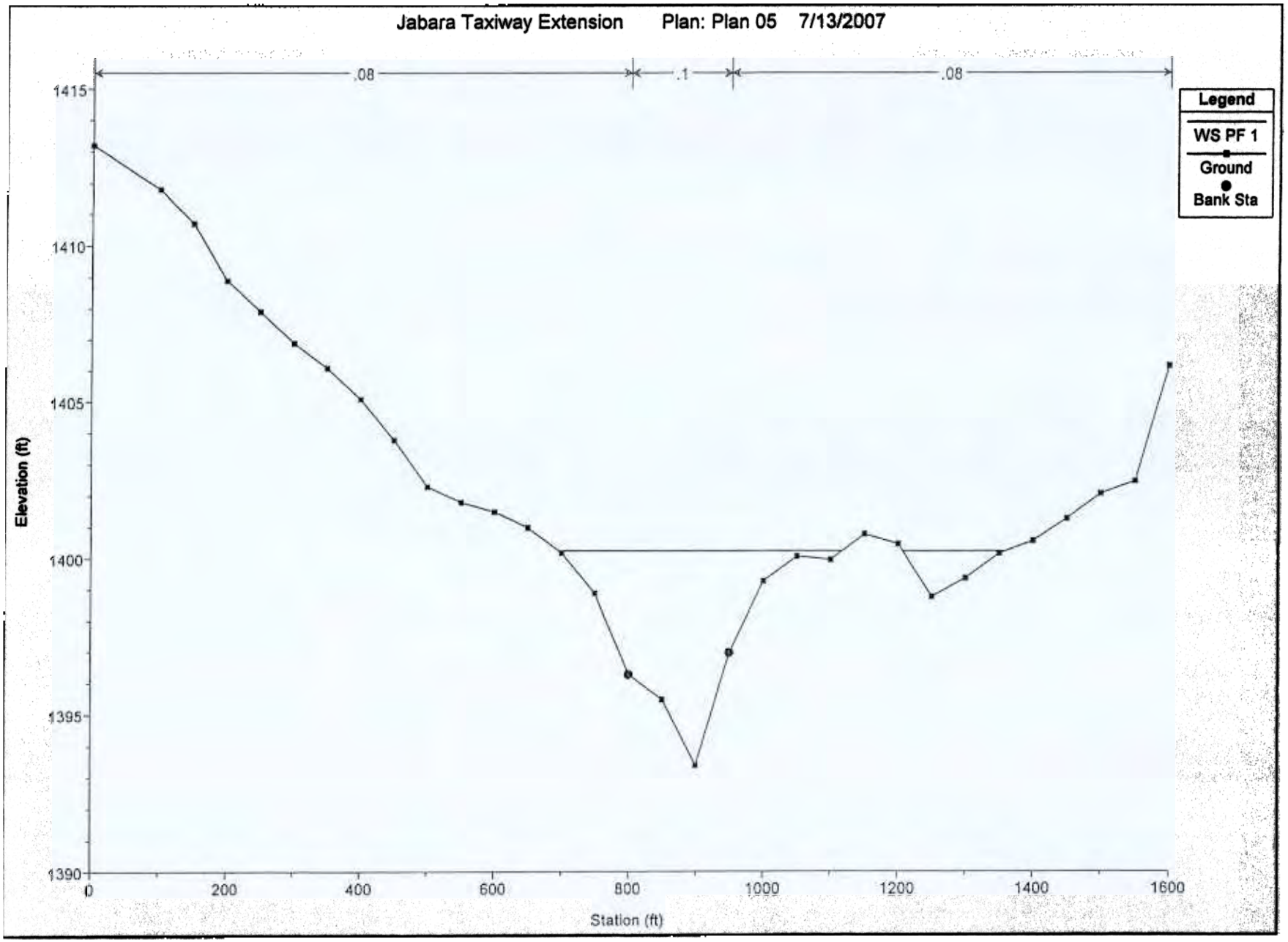

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
500 feet downstream of Webb Road
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1414
1412
1410
1408
1406
1404
1402
1400
1398
1396
0
200
400
600
800
Station (ft)

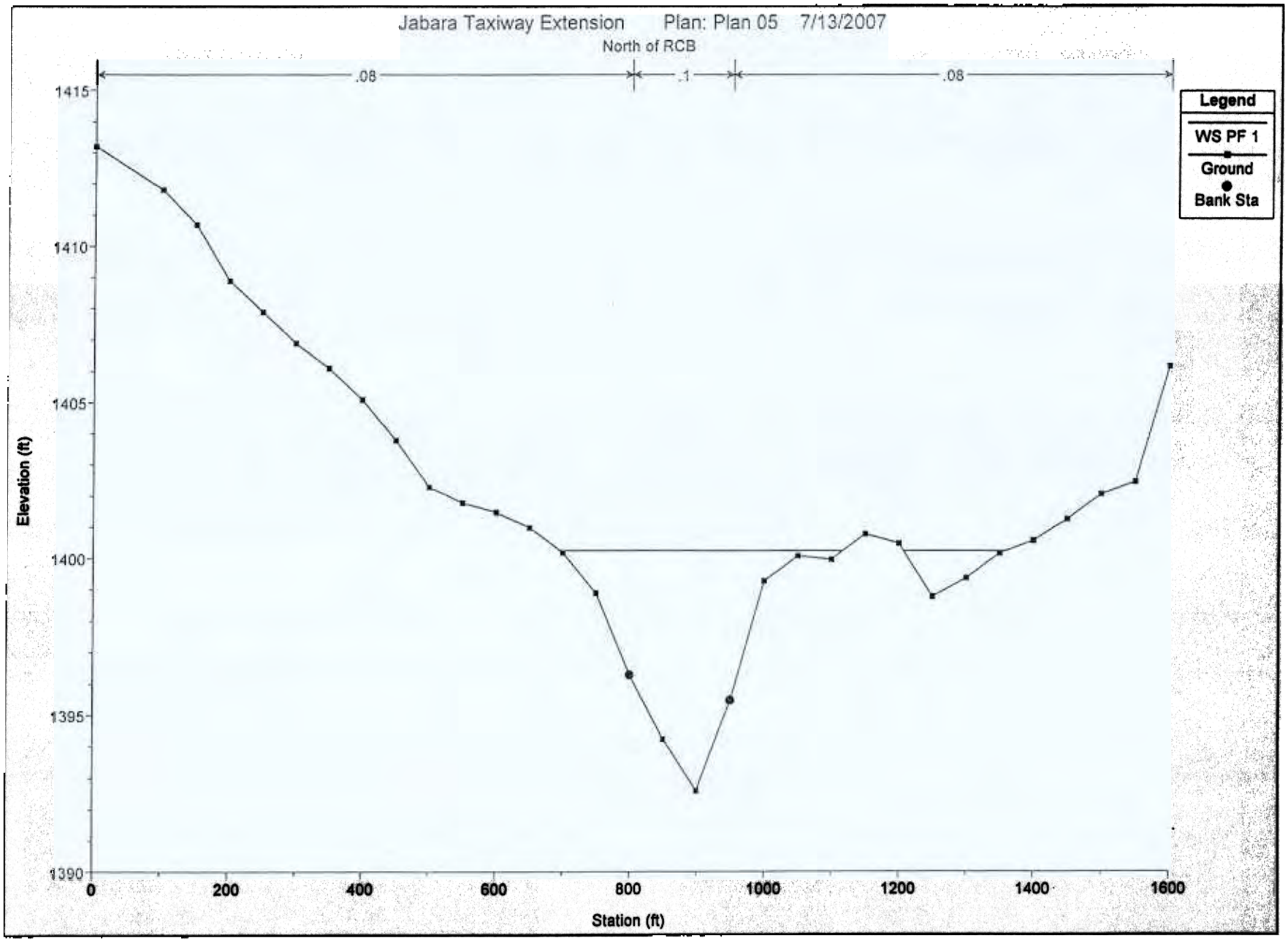

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
cross-section through small pond
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1414
1412
1410
1408
1406
1404
1402
1400
1398
1396
0
200
400
600
800
1000
Station (ft)

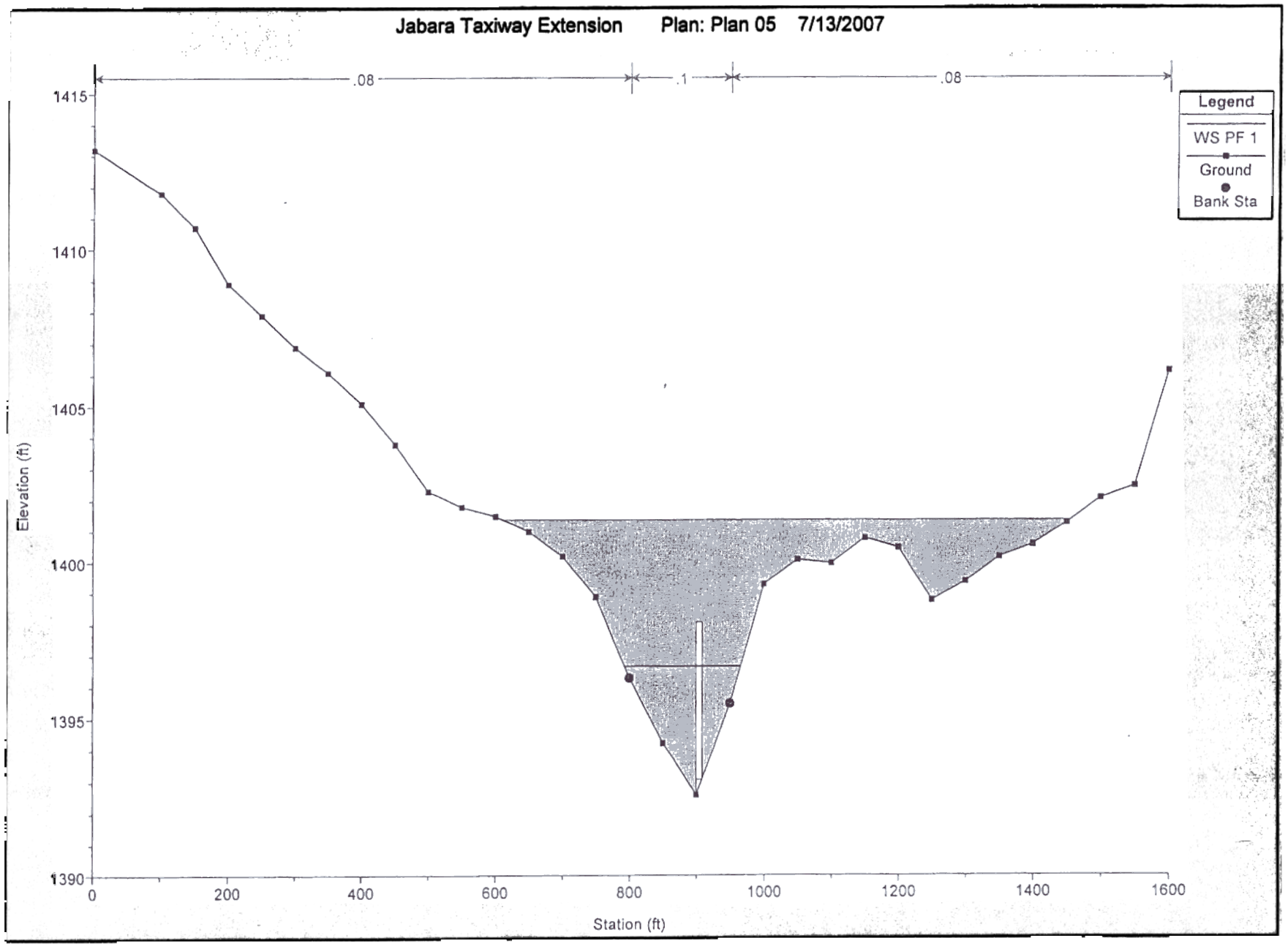

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1414
1412
1410
1408
1406
1404
1402
1400
1398
1396
0
200
400
600
800
1000
Station (ft)

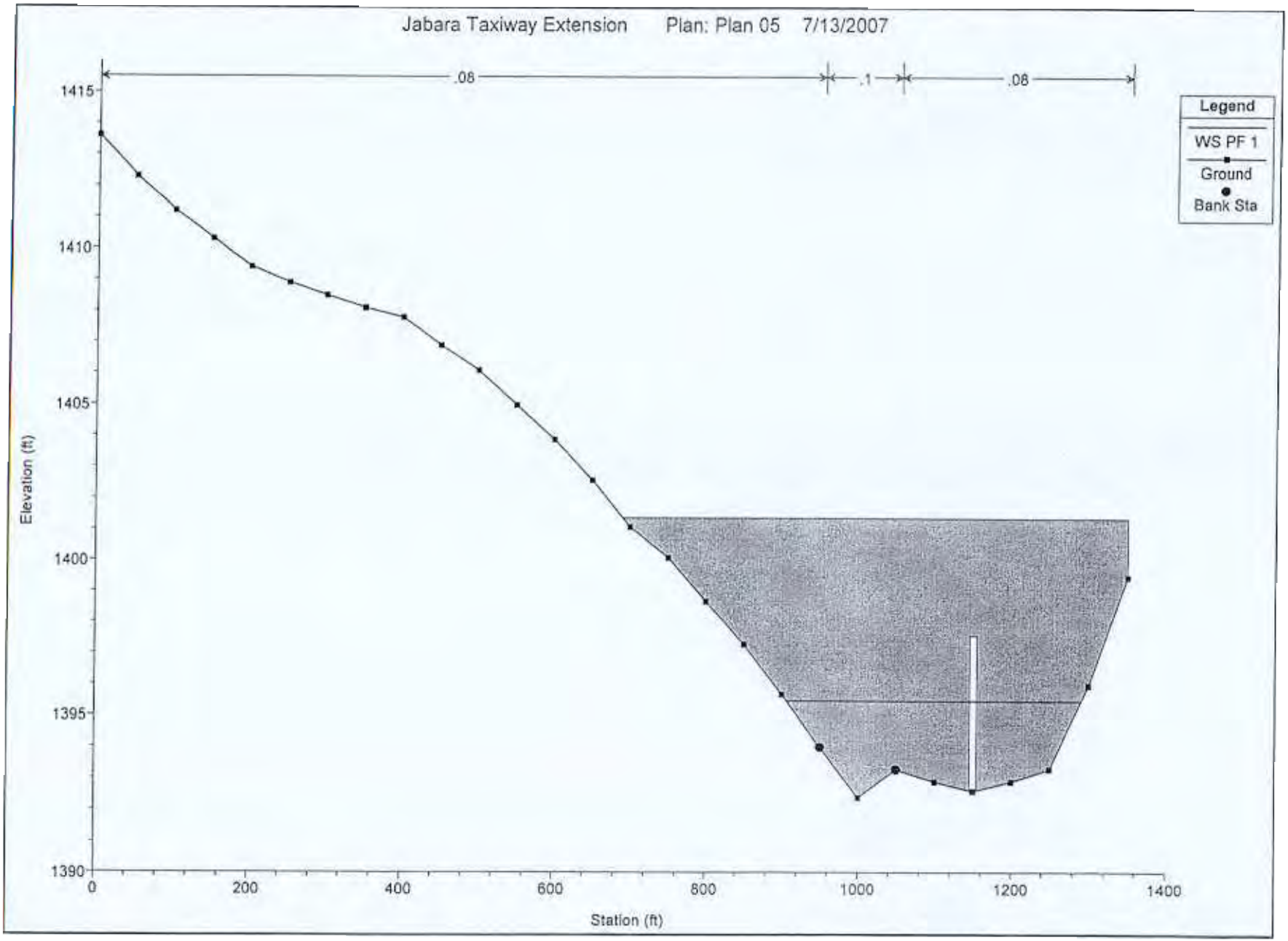

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
1415
1410
1405
1400
1395
Elevation (ft)
0
200
400
600
800
1000
Station (ft)

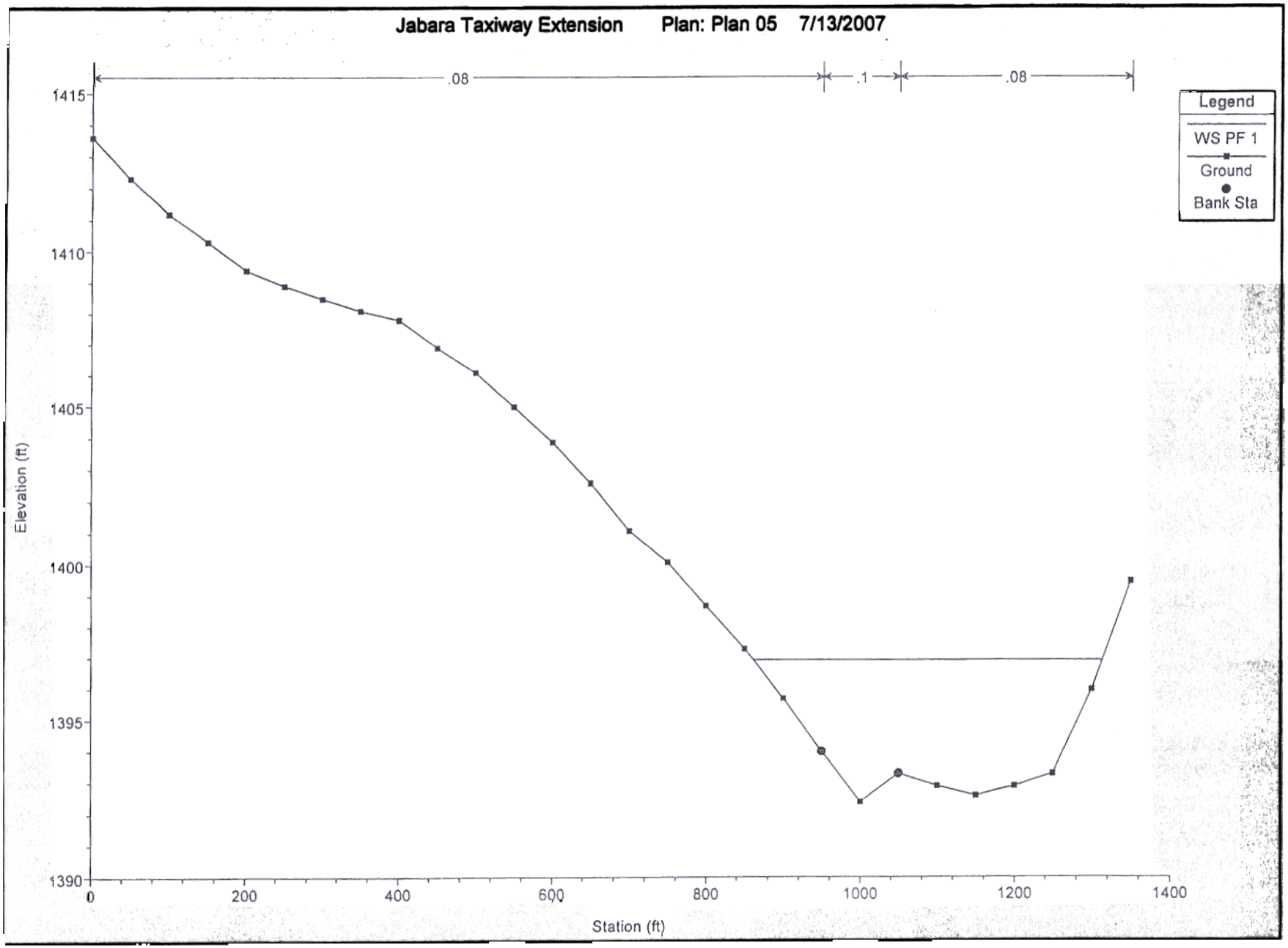

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
North of Ponds
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
Station (ft)


Jabara Taxiway Extension Plan: Plan 05 7/13/2007
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

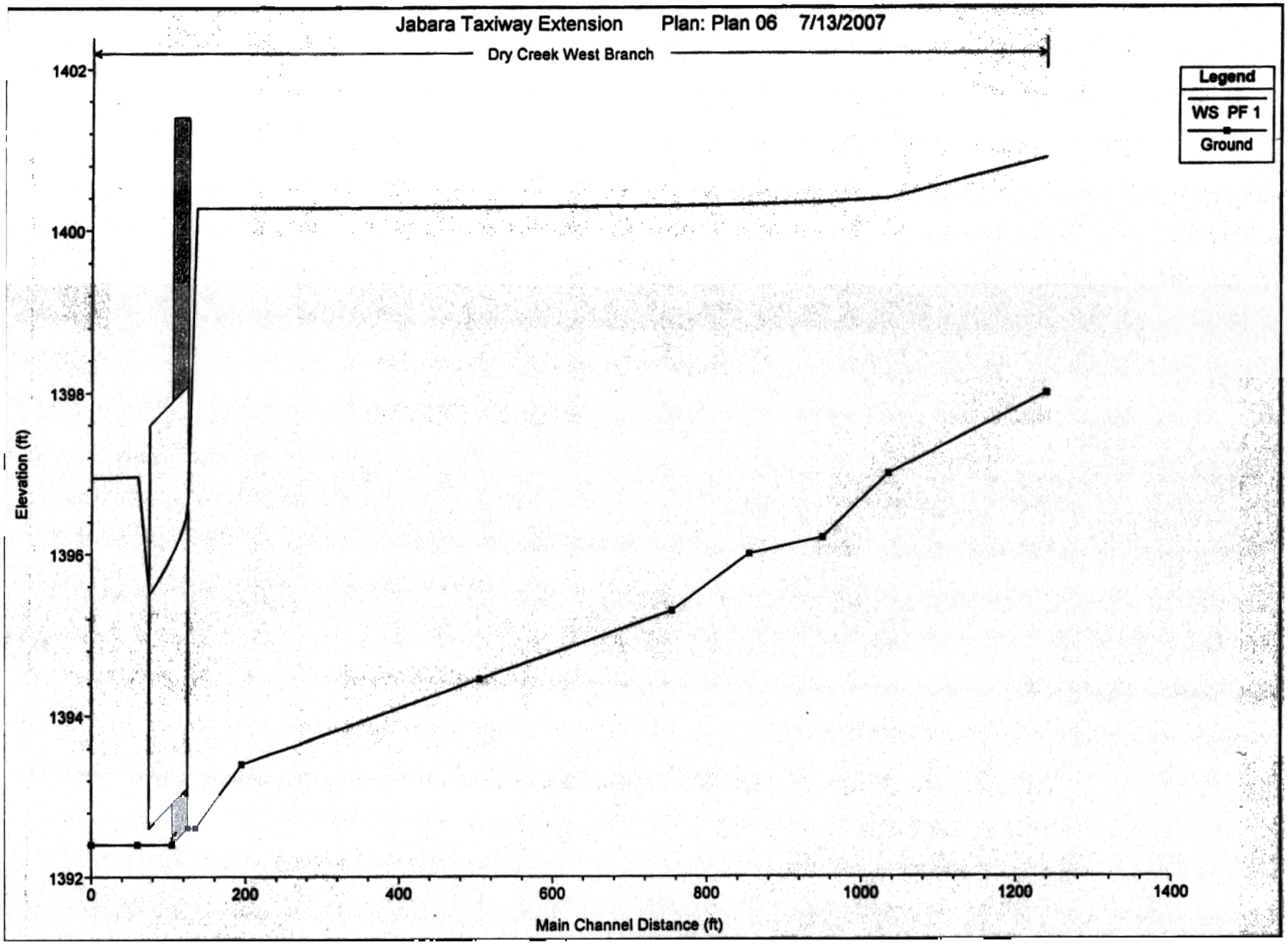

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
North of RCB
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

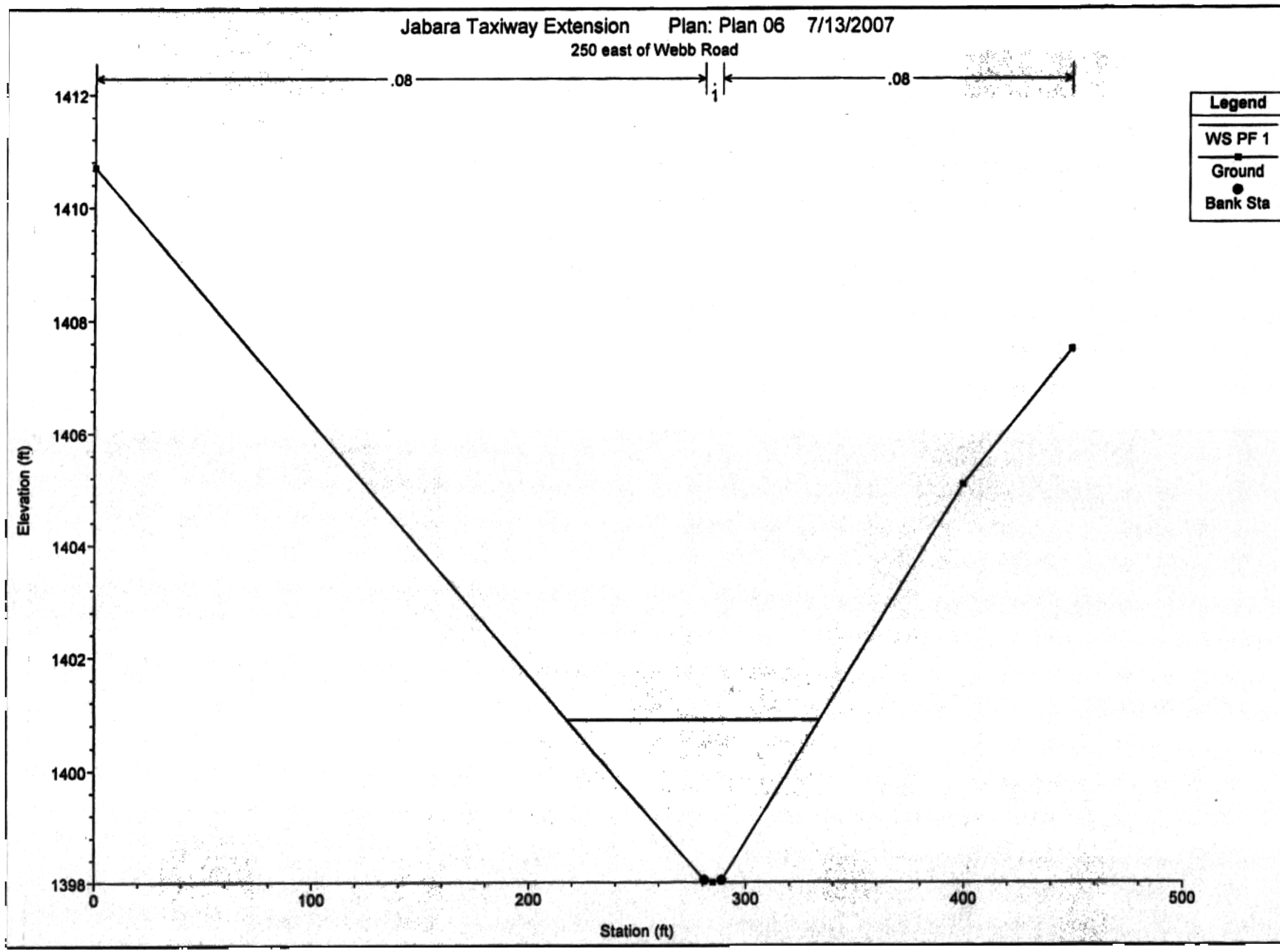

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

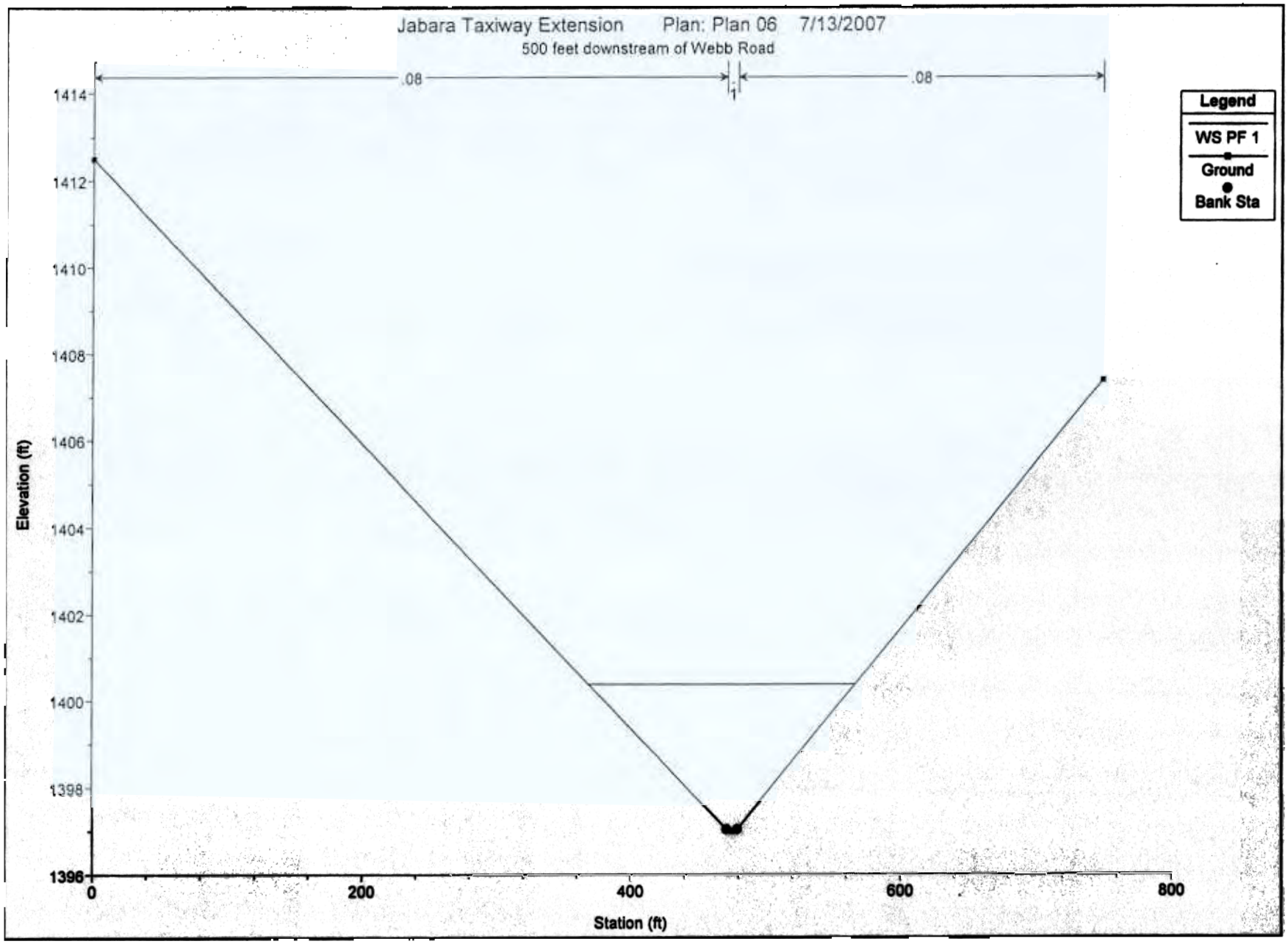

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
Station (ft)

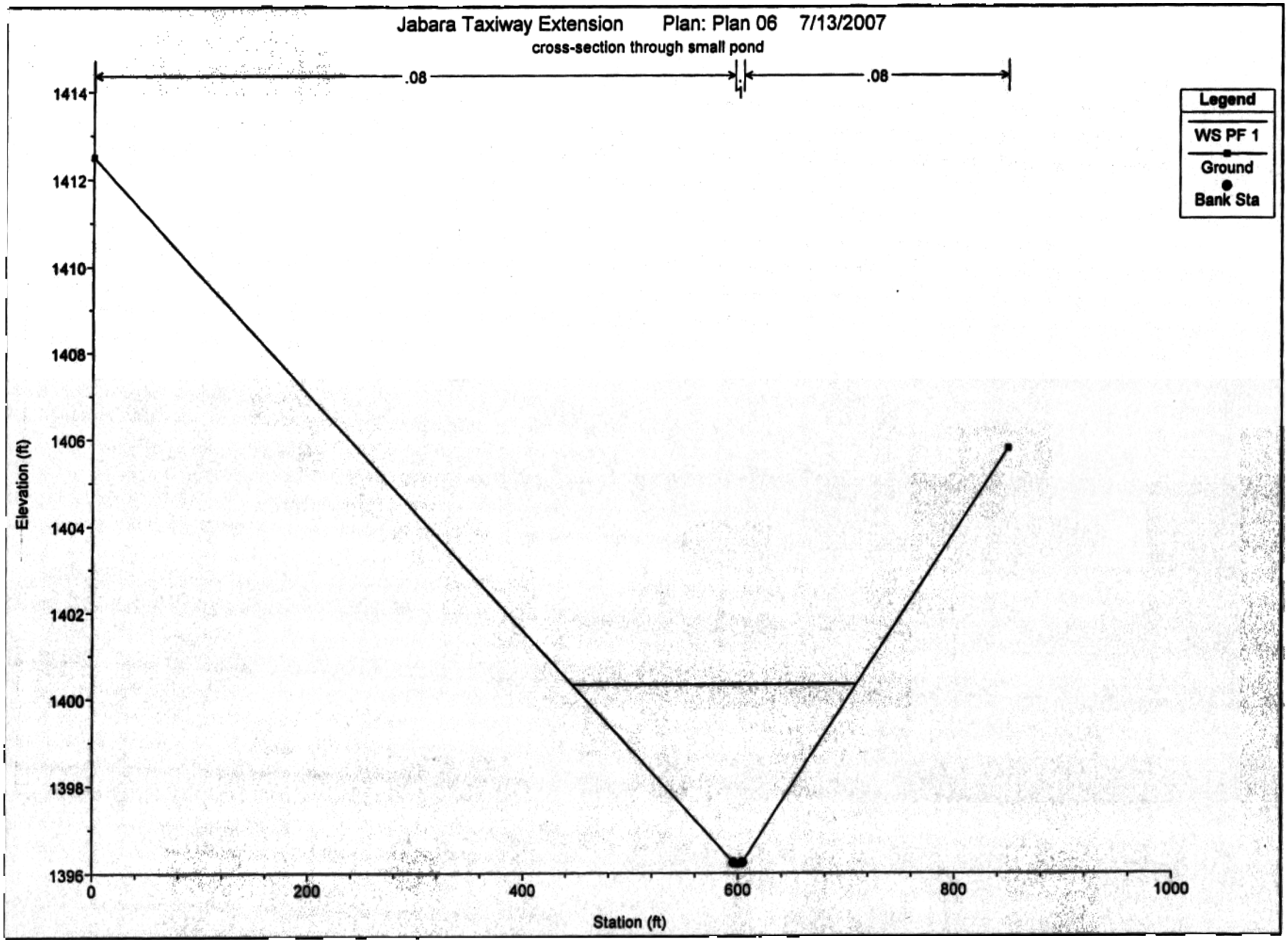

Jabara Taxiway Extension Plan: Plan 05 7/13/2007
.08
.1
.08
Legend
WS PF 1
Ground
Bank Sta
1415
1410
1405
1400
1395
1390
Elevation (ft)
0
200
400
600
800
1000
1200
1400
Station (ft)

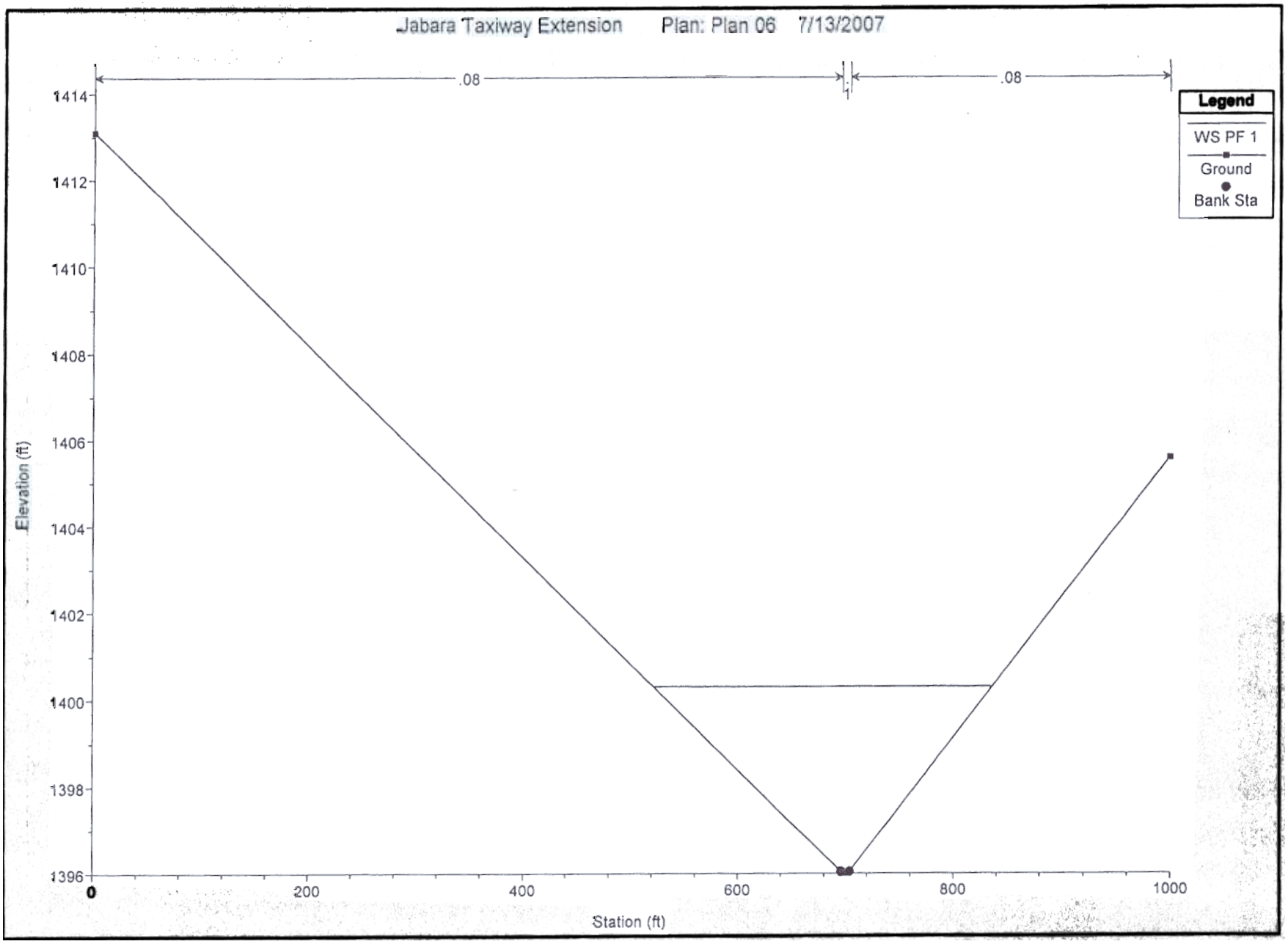
Proposed Conditions HEC-RAS Model

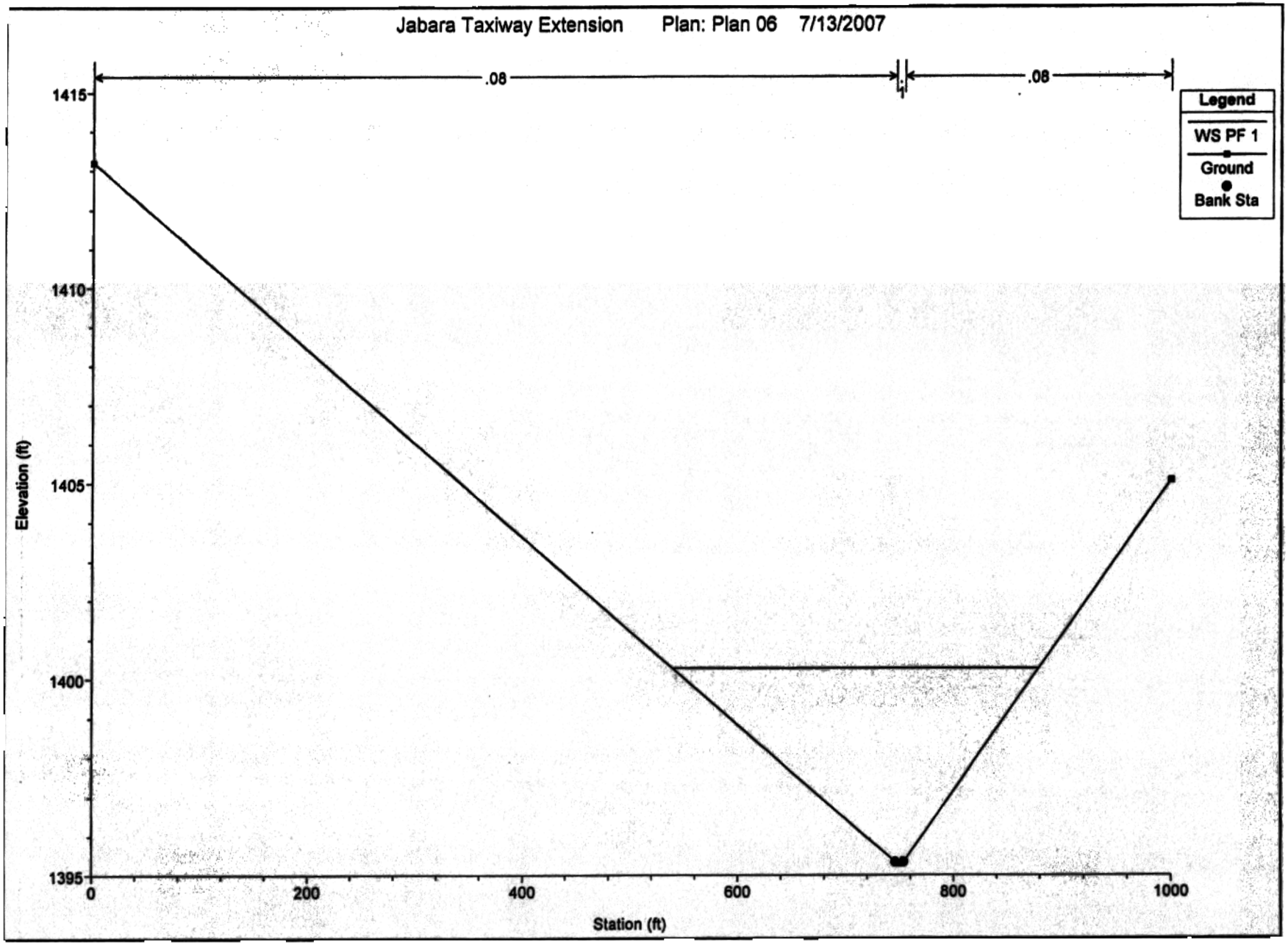

Jabara Taxiway Extension Plan: Plan 06 7/13/2007
Dry Creek West Branch
Legend
WS PF 1
Ground
Elevation (ft)
1402
1400
1398
1396
1394
1392
0
200
400
600
800
1000
1200
1400
Main Channel Distance (ft)

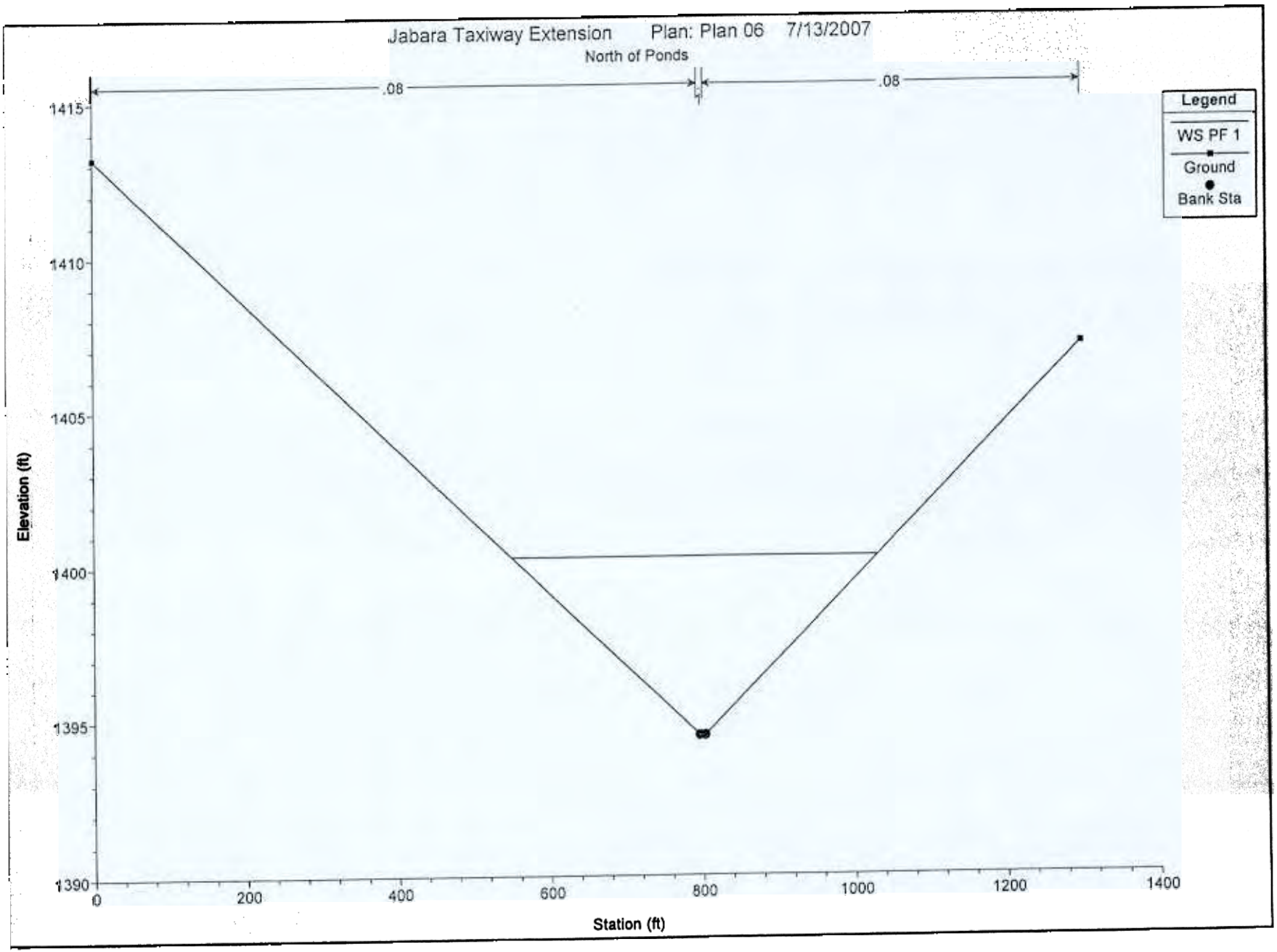

Jabara Taxiway Extension Plan: Plan 06 7/13/2007
250 east of Webb Road
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1412
1410
1408
1406
1404
1402
1400
1398
0
100
200
300
400
500
Station (ft)

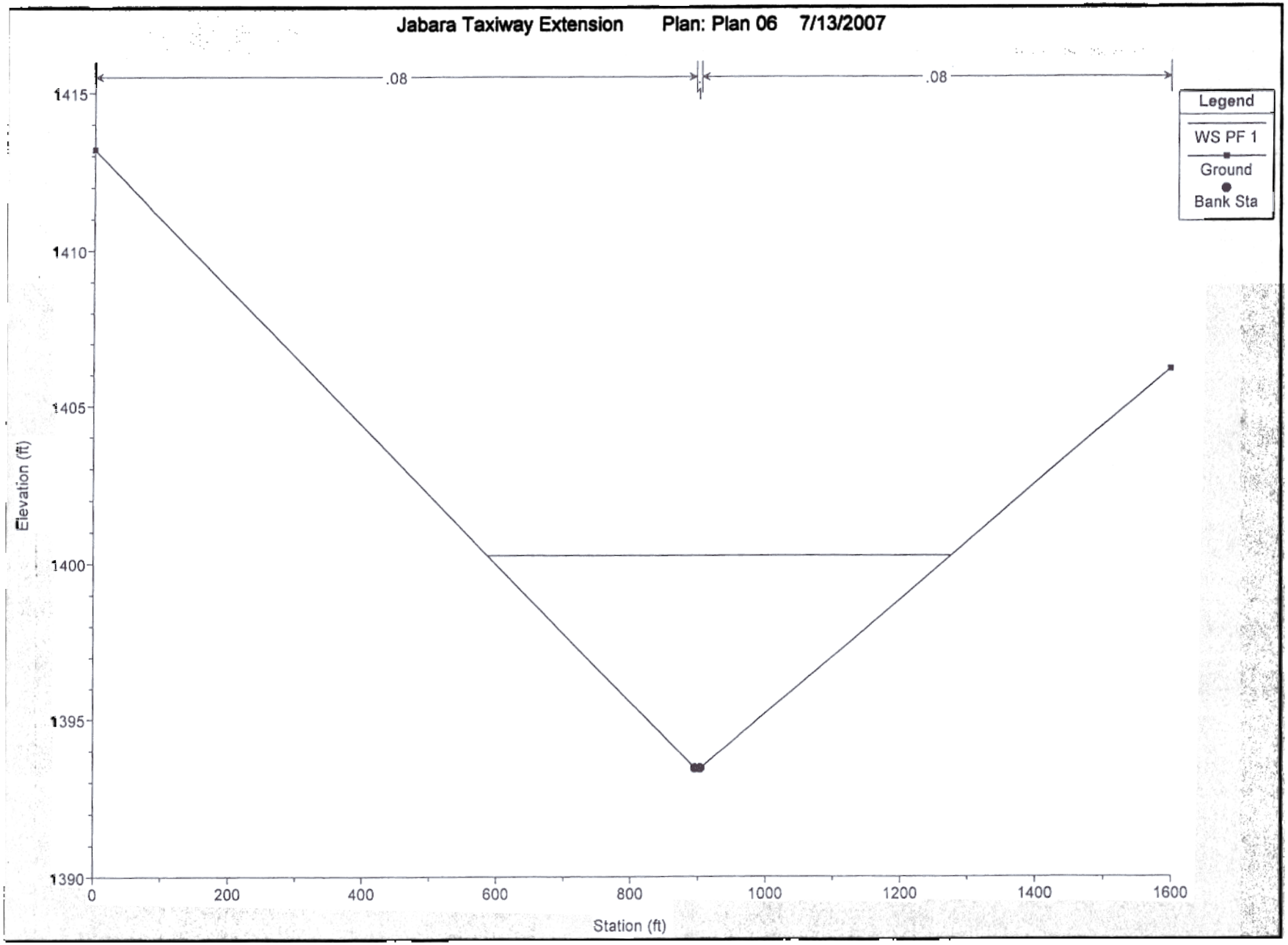

Jabara Taxiway Extension Plan: Plan 06 7/13/2007
500 feet downstream of Webb Road
.08
1
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1414
1412
1410
1408
1406
1404
1402
1400
1398
1396
0
200
400
600
800
Station (ft)

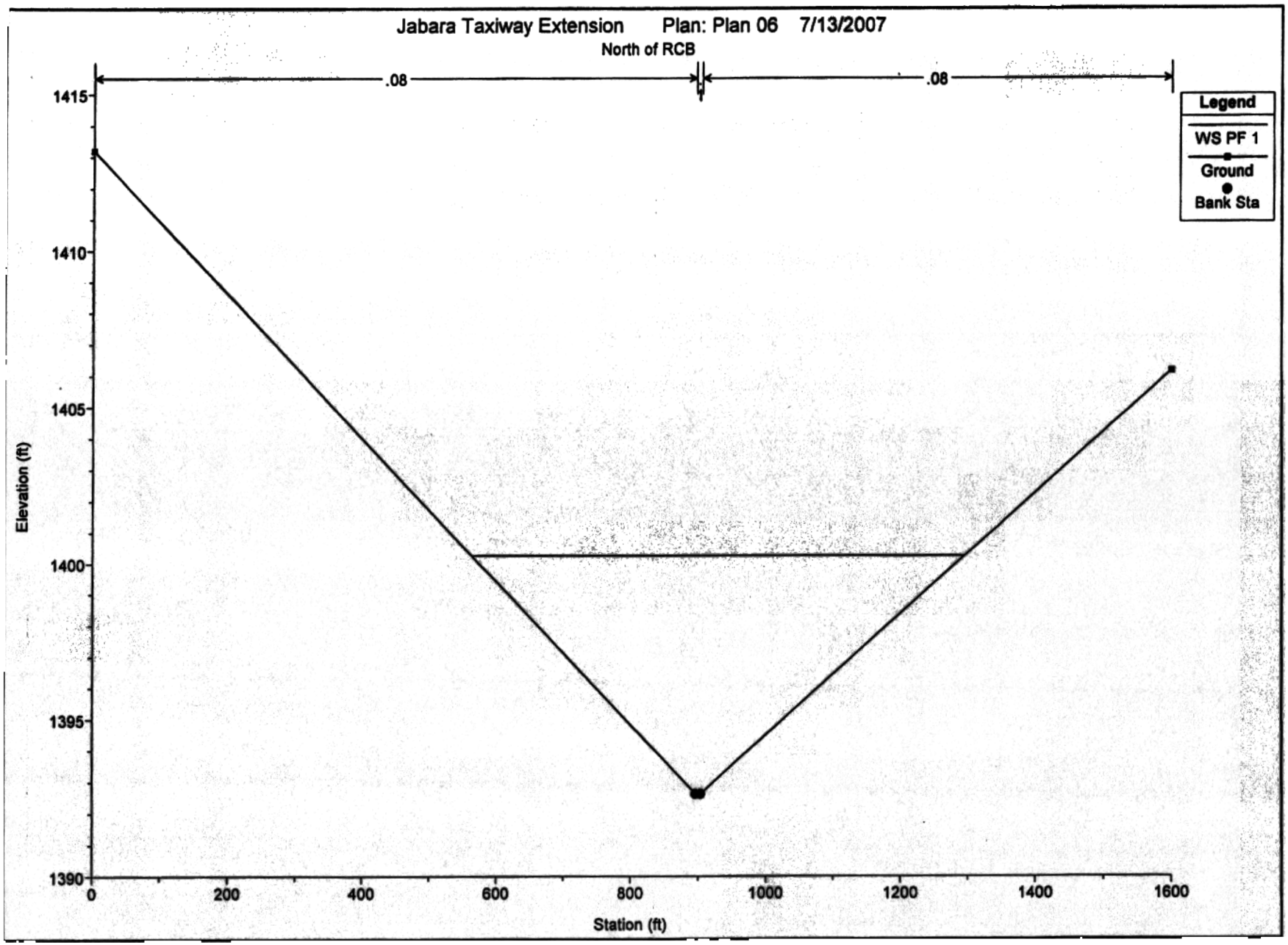

Jabara Taxiway Extension Plan: Plan 06 7/13/2007
cross-section through small pond
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1414
1412
1410
1408
1406
1404
1402
1400
1398
1396
0
200
400
600
800
1000
Station (ft)

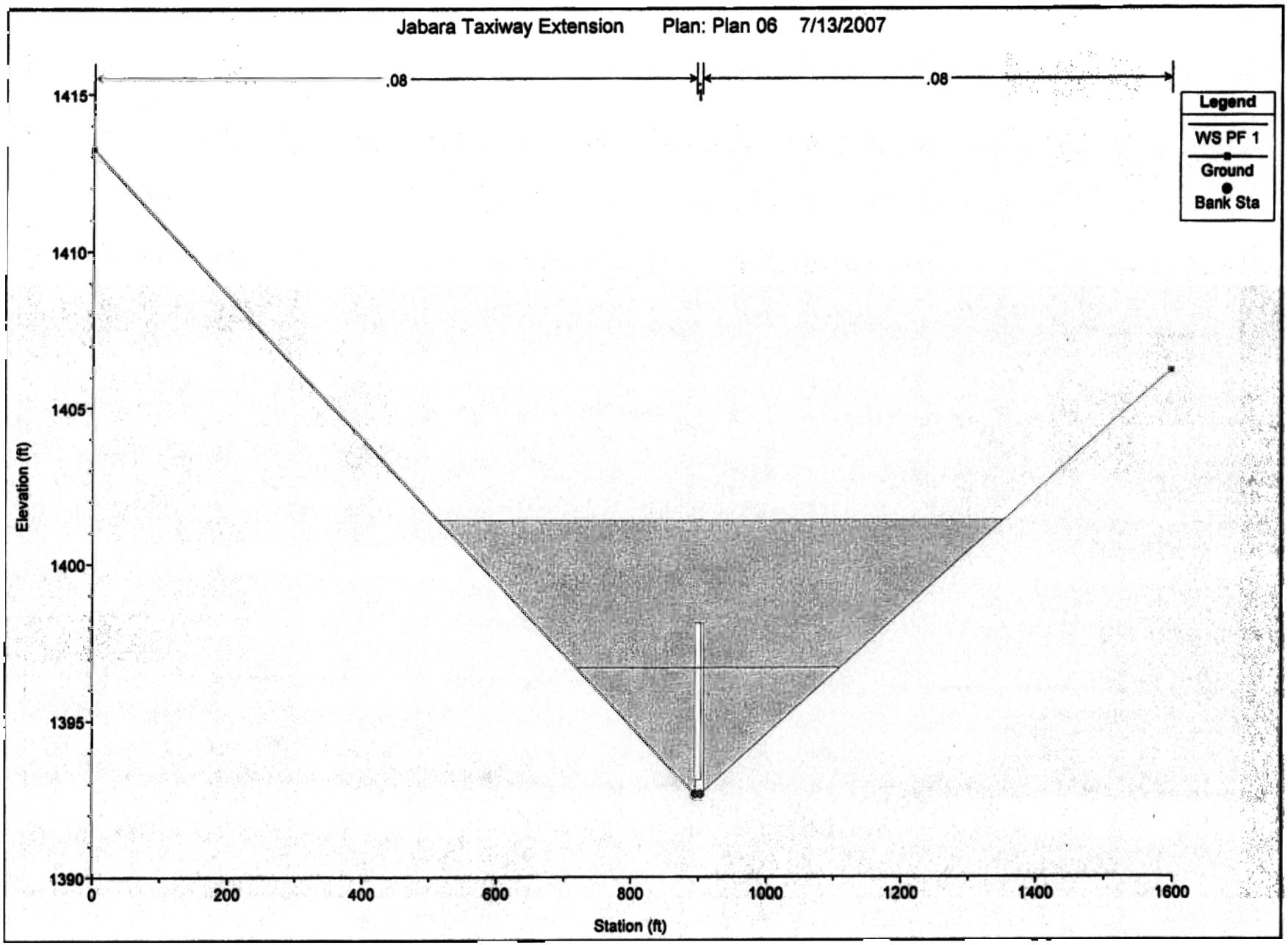

Jabara Taxiway Extension Plan: Plan 06 7/13/2007
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1414
1412
1410
1408
1406
1404
1402
1400
1398
1396
0
200
400
600
800
1000
Station (ft)

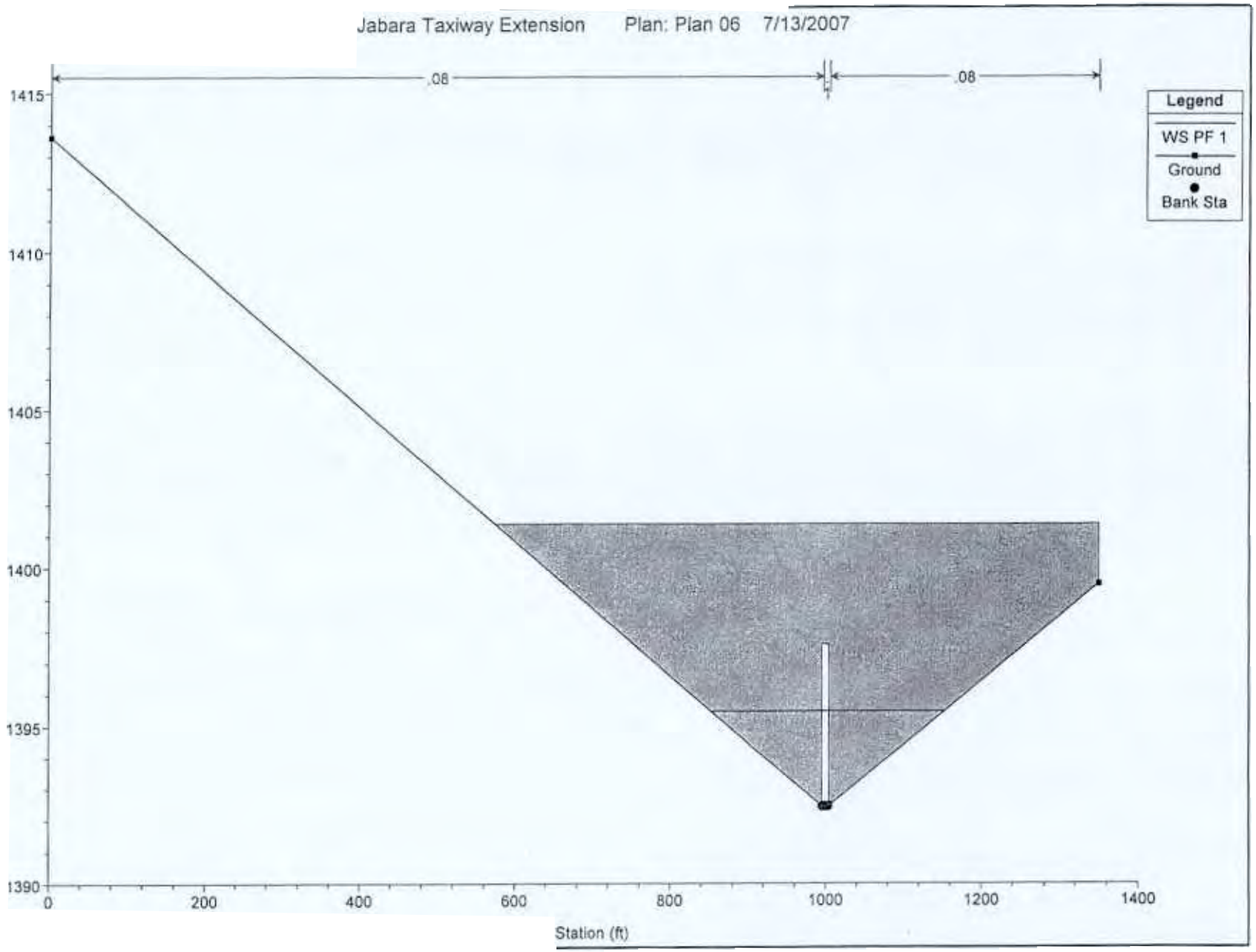

Jabara Taxiway Extension Plan: Plan 06 7/13/2007
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
0
200
400
600
800
1000
Station (ft)

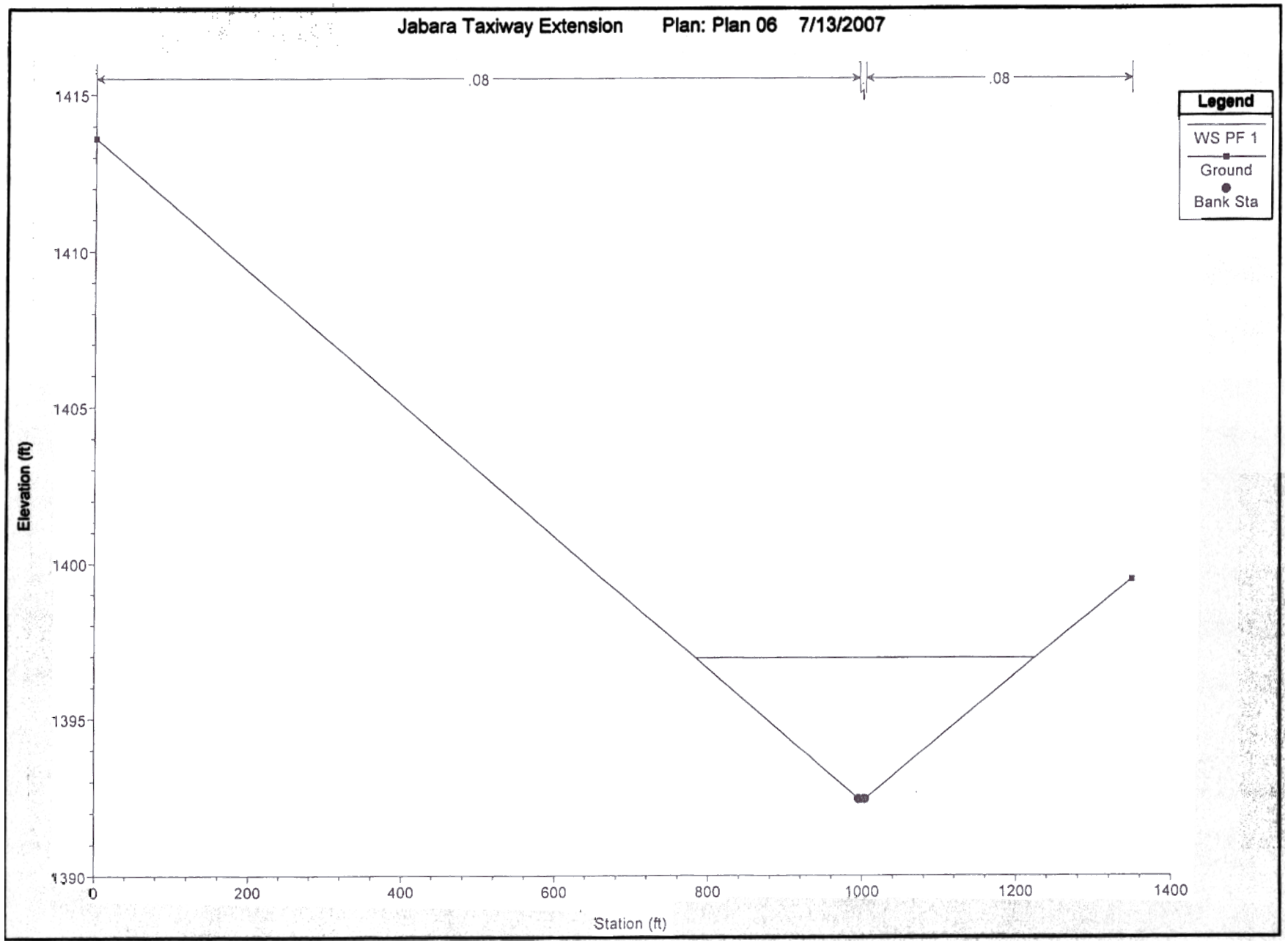

Jabara Taxiway Extension Plan: Plan 06 7/13/2007
North of Ponds
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
Station (ft)

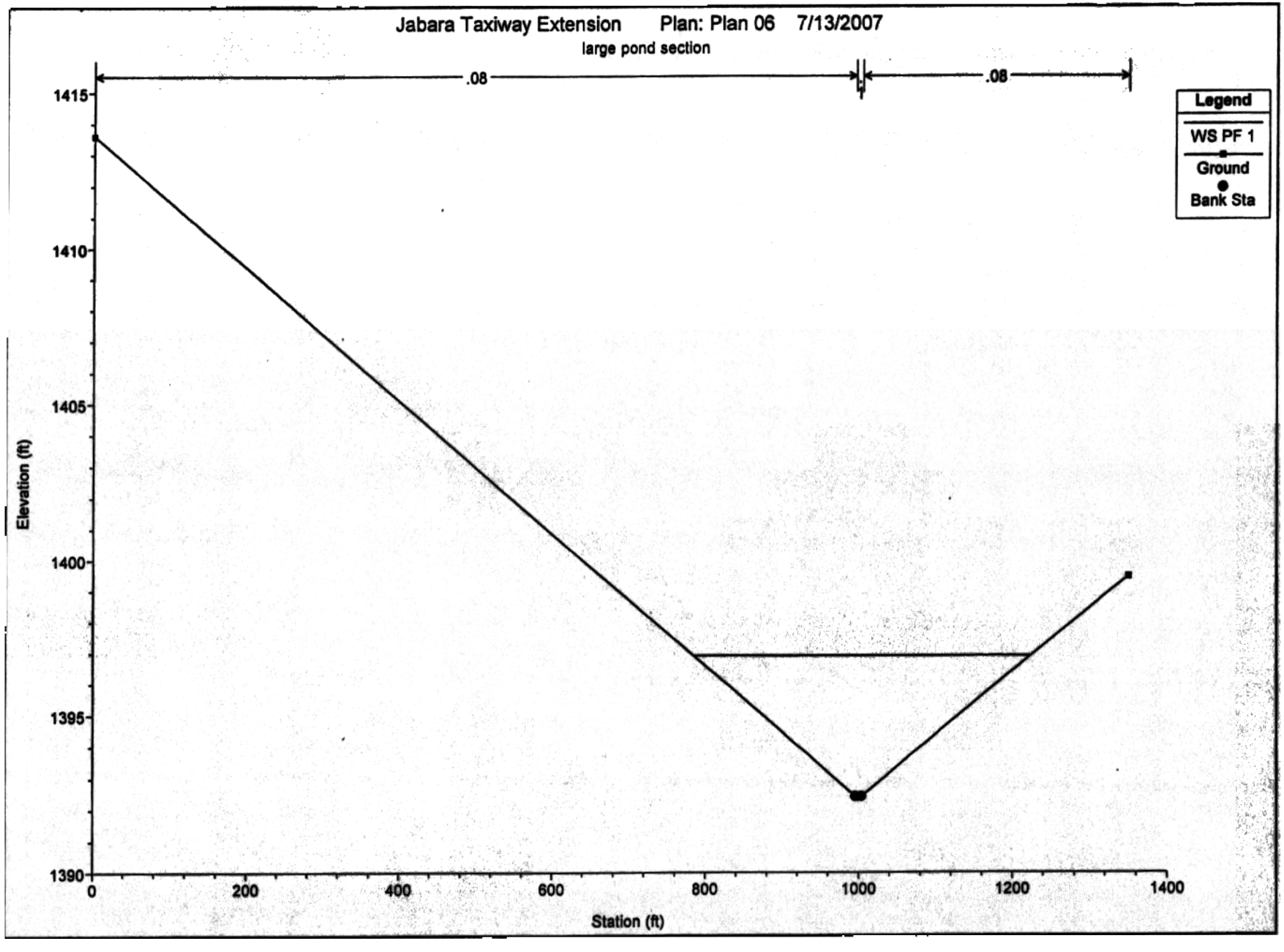

Jabara Taxiway Extension Plan: Plan 06 7/13/2007
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
1600
Station (ft)


Jabara Taxiway Extension Plan: Plan 06 7/13/2007
North of RCB
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
1600
Station (ft)


Jabara Taxiway Extension Plan: Plan 06 7/13/2007
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
1600
Station (ft)


Jabara Taxiway Extension Plan: Plan 06 7/13/2007
.08
.08
Legend
WS PF 1
Ground
Bank Sta
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
Station (ft)


Jabara Taxiway Extension Plan: Plan 06 7/13/2007
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
Station (ft)


Jabara Taxiway Extension Plan: Plan 06 7/13/2007
large pond section
.08
.08
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1415
1410
1405
1400
1395
1390
0
200
400
600
800
1000
1200
1400
Station (ft)

Plan: Plan 03 Dry Creek West Branch RS: 70 Culv Group: Culvert #1 Profile: PF 1

Q Culv Group (cfs)	347.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	10.75
Q Barrel (cfs)	347.00	Culv Vel DS (ft/s)	13.33
	1400.28	Culv Inv El Up (ft)	1393.10
W.S. US. (ft)	1400.27	Culv Inv El Dn (ft)	1392.60
E.G. DS (ft)	1396.96	Culv Frctn Ls (ft)	0.23
W.S. DS (ft)	1396.96	Culv Exit Loss (ft)	1.29
Delta EG (ft)	3.32	Culv Entr Loss (ft)	
Delta WS (ft)	3.32	Q Weir (cfs)	
	1398.90	Weir Sta Lft (ft)	
E.G. OC (ft)	1400.28	Weir Sta Rgt (ft)	
Culvert Control		Weir Submerg	
Culv WS Inlet (ft)	1396.69	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1395.49	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.33	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	3.59	Min El Weir Flow (ft)	1401.41

HEC-RAS Plan: Plan 03 River: Dry Creek Reach: West Branch Profile: FF

Reach	River Sta	Profile	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
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
West Branch	1015	PF 1	347.00	1398.00	1400.90		1400.96	0.006394	2.40	177.93	116.39	0.25
West Branch	810	PF 1	347.00	1397.00	1400.40		1400.41	0.001404	1.25	345.85	198.02	0.12
West Branch	725	PF 1	347.00	1396.20	1400.34		1400.35	0.000416	0.78	558.21	264.00	0.07
West Branch	630	PF 1	347.00	1396.00	1400.31		1400.32	0.000259	0.63	689.79	314.71	0.05
West Branch	530	PF 1	347.00	1395.30	1400.30		1400.30	0.000136	0.51	862.58	339.98	0.04
West Branch	280	PF 1	347.00	1394.45	1400.28		1400.28	0.000041	0.31	1419.24	482.13	0.02
West Branch	195	PF 1	347.00	1393.40	1400.28		1400.28	0.000012	0.18	2388.09	690.74	0.01
West Branch	135	PF 1	347.00	1392.60	1400.27	1393.83	1400.28	0.000007	0.16	2827.03	732.56	0.01
West Branch	70		Culvert									
West Branch	60	PF 1	347.00	1392.40	1396.96		1396.96	0.000112	0.43	1016.65	442.03	0.04
West Branch	0	PF 1	615.00	1392.40	1396.94	1393.95	1396.95	0.000358	0.77	1008.95	440.35	0.06

HEC-RAS
Station Map


HEC-RAS STATIONS
COLONEL JAMES JABARA AIRPORT
WICHITA
Professional Engineering Consultants, P.A.
303 S. TOPEKA • WICHITA, KANSAS 67202
316-262-2691 • FAX 316-262-3003
www.pec1.com • designers@pec1.com

Proposed Site Plan

Center for Aviation Training
Jabara Campus

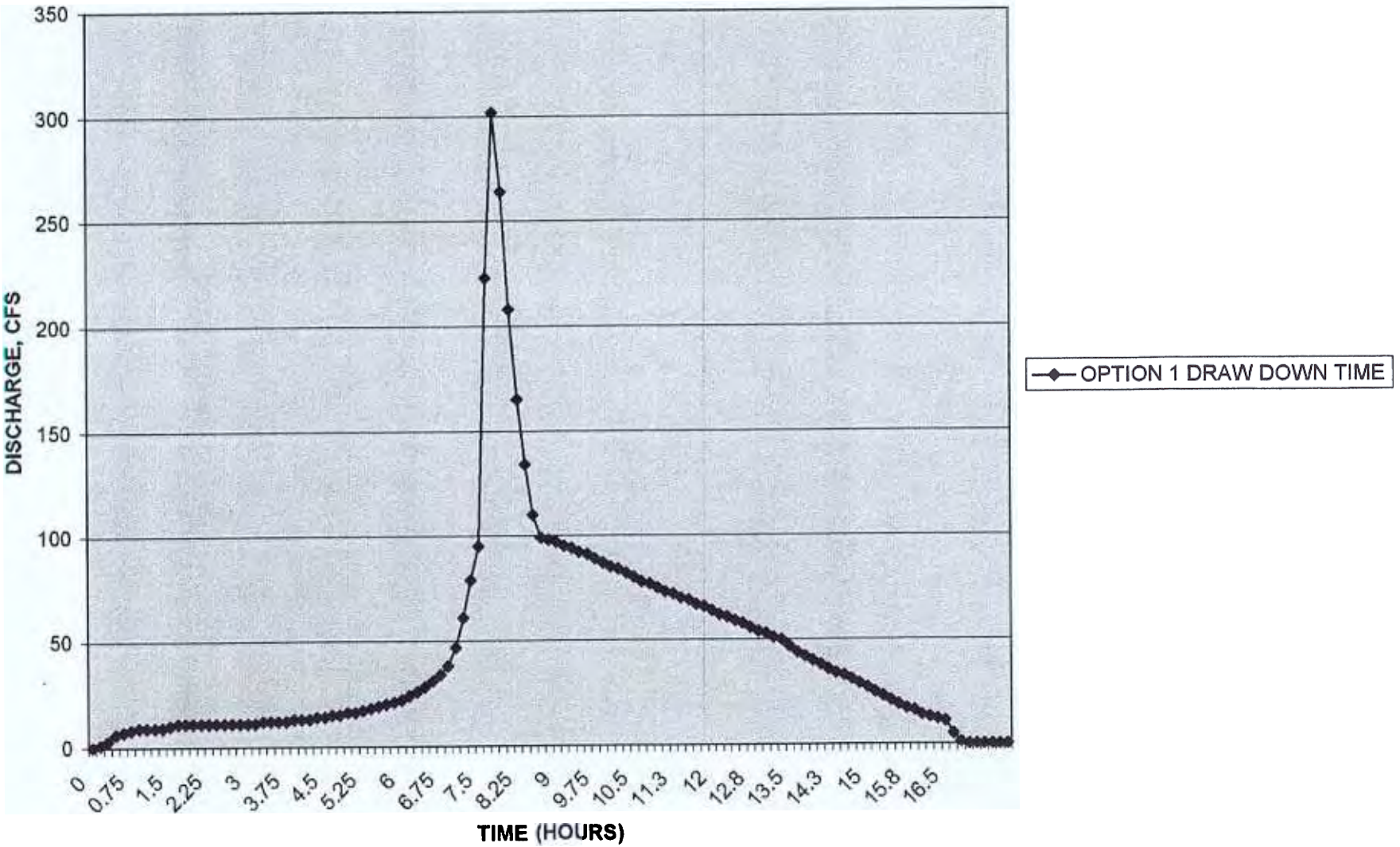
* ELEVATIONS IN CITY DATUM
ELEV. + 1187.4 = NGVD

NORTH 0 50 100 150 200 250 FT 1"=80'

SCHAEFER JOHNSON COX FREY ARCHITECTURE SJCF

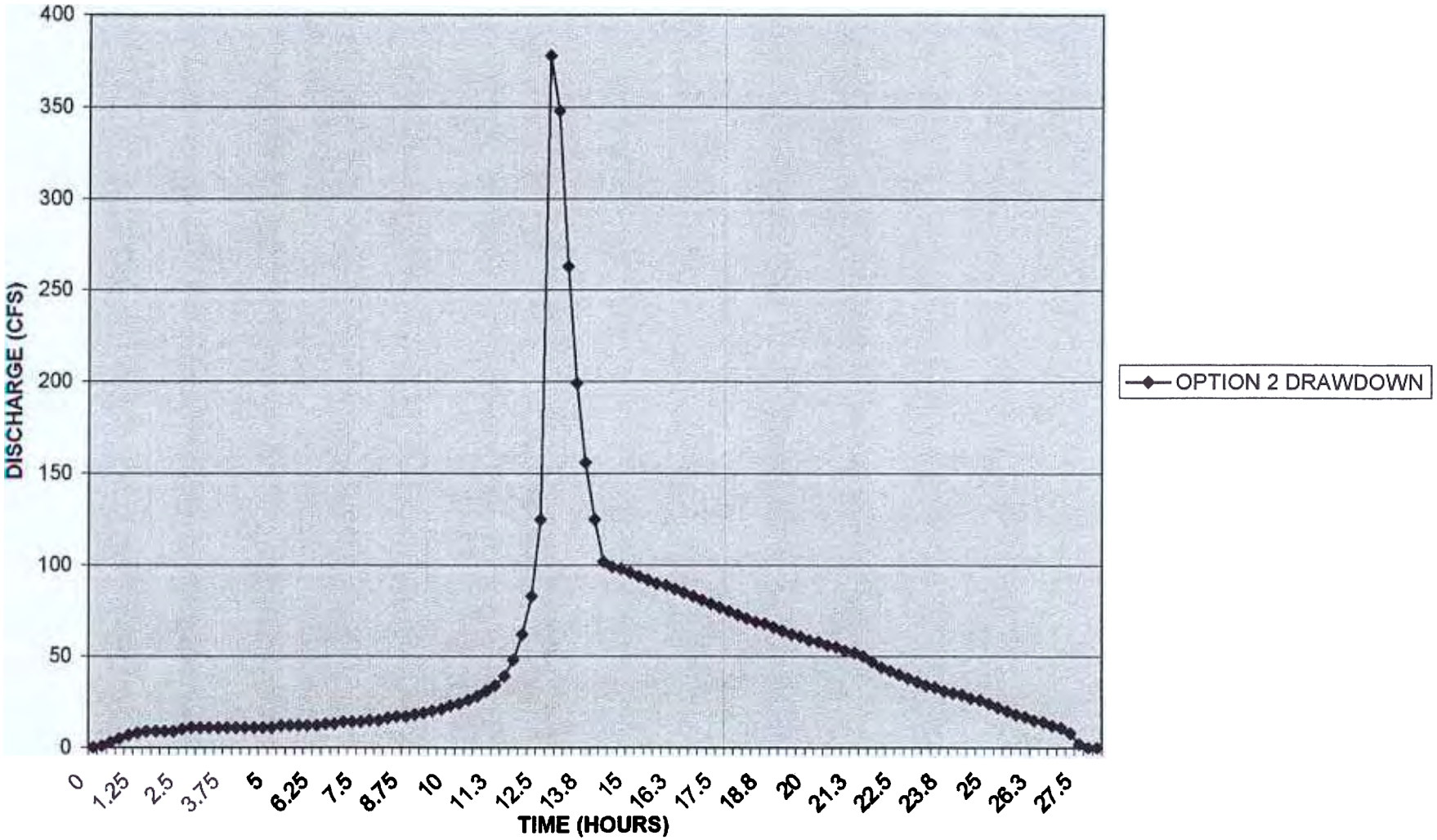
Option 1
Drawdown Time

OPTION 1 DRAWDOWN TIME



Option 2
Drawdown Time

OPTION 2 DRAWDOWN TIME



Proposed 100 year Floodplain

APPROXIMATE LIMITS OF FLOODING BASED ON THE 100-STORM EVENT

Part of lot 1 Block 1
Col. James Jabara Airport 2nd Add.

Part of lot 1 Block A
Col. James Jabara Airport Add.

WEBB ROAD

1233' FT

957 FT

825 FT

680 ft

1225 FT

Concrete Taxiway

70' SAFETY ZONE

F.A.R. Height Zone
Contour Elev. 233.3

F.A.R. Height Zone
Contour Elev. 283.3

F.A.R. Height Zone
Contour Elev. 333.3

F.A.R. Height Zone
Contour Elev. 383.3

Edge of Precision Approach Surface

Building Restriction Line 35'

35' building setback

50' road right-of-way

chain link fence

terrace

gravel

bldg.

area inlet
top 210.2
inv. 204.5

36" rcp
inv. 202.2

underdrain outlet

pond water
surf. 208.1
9-20-2006

trees and brush

concrete

WAA cable

WAA cable (abandon)

6" KGS gas line

Kansas Gas Service Gas Line

Centerline 30' Wide Natural Gas Co. Esmt.

25' Rural Water Dist. #2 Esmt.

asphalt pavement

asph. shldr.

curb & gutter

storm inlet
inv. 219.6

storm manhole

24" rcp

36" rcp

10'x4' rcb
inv. 214.6

S00°53'01"E 174.07'

S13°21'06"W 103.20'

West line SW Quarter Sec. 28-T26S-R2E
S00°50'05"E

SW. Corner NW Quarter
Section 28-T26S-R2E

SW. Corner SW Quarter
Section 28-T26S-R2E

PTR ELEV2 DESC2

SCHAEFER JOHNSON COX FREY ARCHITECTURE

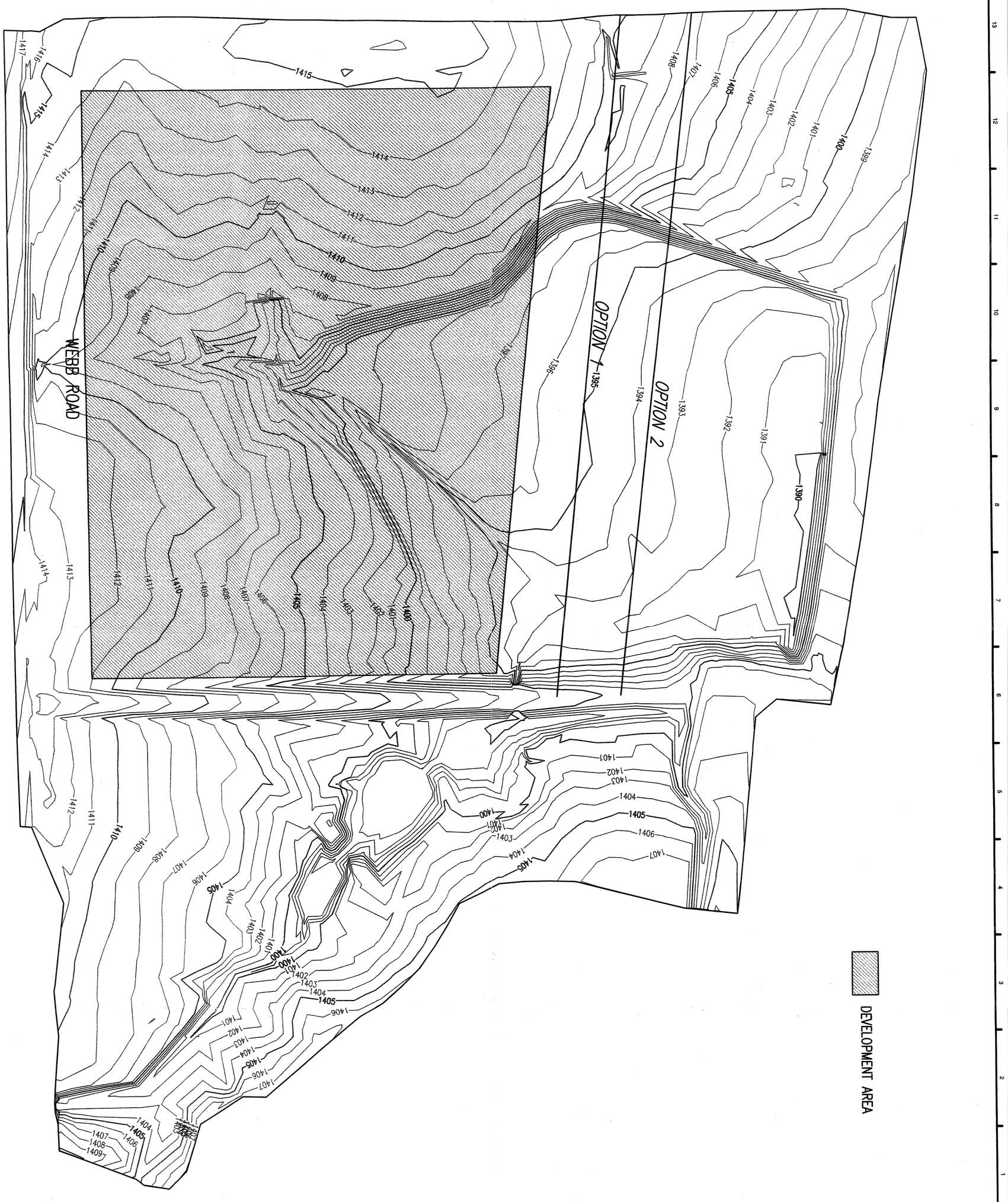
Professional Engineering Consultants, P.A.
303 S. TOPEKA • WICHITA, KANSAS 67202
316-262-2691 • FAX 316-262-3003
www.pec1.com • designers@pec1.com

PROPOSED 100 YEAR FLOOD PLAIN

COLONEL JAMES JABARA AIRPORT

WICHITA

Development Plan



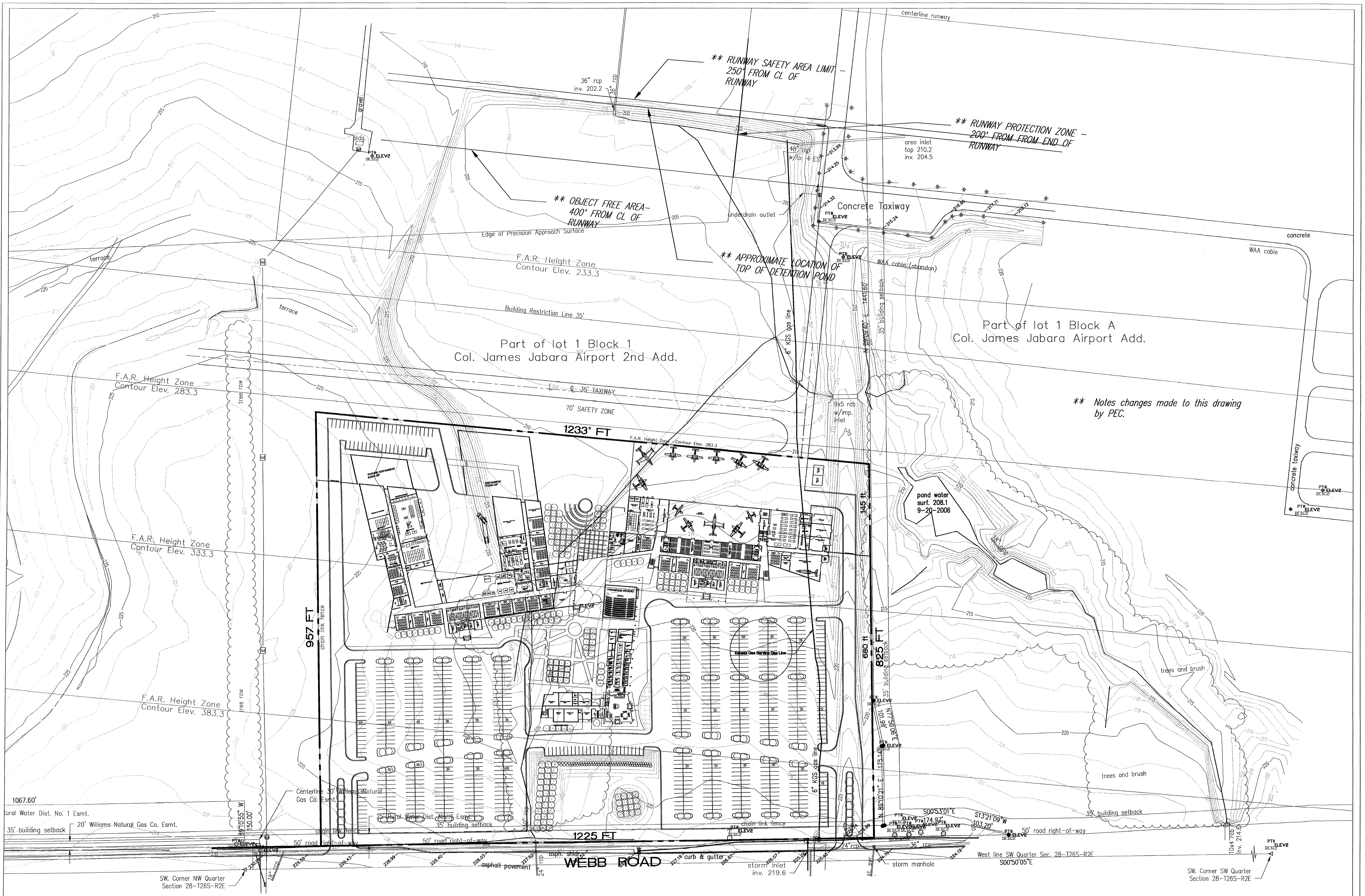
DEVELOPMENT AREA WITH OPTION 1 & 2 LIMITS

COLONEL JAMES JABARA AIRPORT

WICHITA

Professional Engineering Consultants, P.A.
303 S. TOPEKA • WICHITA, KANSAS 67202
316-262-2691 • FAX 316-262-3003
www.pec1.com • designers@pec1.com

Runway Protection Plan



Center for Aviation Training

Jabara Campus

NORTH 0 50 100 150 200 250 FT 1"=80'

SCHAEFER JOHNSON COX FREY ARCHITECTURE