

**Exhibit Q**  
**to Development Agreement**  
**German Creek Diversion Channel**

(Blieders/German Creek Area Preliminary Engineering Report)

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# **Blieiders/German Creek Area Preliminary Engineering Report**

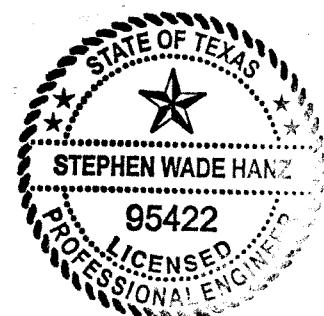
*Report prepared for:*  
**City of New Braunfels**

**Drainage Analysis  
New Braunfels, Texas  
March 2011**

**Prepared by:**



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## 1.0 Project Scope and Location

The City of New Braunfels, Texas Public Works Department has authorized HMT Engineering and Surveying to prepare a Preliminary Engineering Report to research the Blieders/German Creek area and provide analysis of rerouting drainage through this region. The City held a series of public meetings to discuss the flooding problems experienced by citizens during the June 2010 storm events. This report will focus on the drainage issues in the Blieders/German Creek area which is one of the areas the City considers critical for major drainage improvements. This report examines the existing drainage conditions of the study area and presents possible solutions to the City for consideration. A conclusion has been made which analyzes the benefit of the improvements versus the expected cost associated with the project. The report is meant to be used as a tool for planning purposes so that the City can make the best decision about improving the drainage conditions in this area.

The Blieders/German Creek area is within the New Braunfels City Limits, located to the northeast and upstream of Landa Lake and the Comal Springs. Appendix 8.1 contains a Location Map of the area. Two creeks define this area, Blieders Creek and German Creek. Blieders Creek begins in the north and follows a path south parallel to River Road before making a final bend and entering the headwaters of the Comal River. German Creek is the shorter of the two, and primarily flows west to east into the Guadalupe River. A railroad line divides the area, located along a local high ridge point, and prevents the flood waters of the two creeks from merging. There is a possibility that Blieders Creek used to naturally flow into German Creek prior to the construction of the railroad tracks; however, historical maps of the area show that neither creek connected to each other as the City began to develop. A map of the City of New Braunfels from December 1868, which confirms these findings, is included in Appendix 8.2. The local area consists of mainly undeveloped land with some low-density single family homes and an apartment complex. There are also a few small businesses and two industrial/municipal use properties owned by the City of New Braunfels.

## 2.0 Existing Conditions and Drainage Patterns

The Blieders/German Creek area is part of the Middle Guadalupe Watershed #12100202, as the Comal and Guadalupe Rivers converge further downstream of this location. According to FEMA Map No. 48091C0455F, dated September 2, 2009, portions of the area reside within the limits of the 100-year floodplain. A copy of the FEMA map is provided in Appendix 8.3.

According to the FEMA Floodplain Map, a significant amount of the area is inundated during the 100-yr storm event. The railroad tracks act as a barrier between the two creeks, preventing the floodwaters of Blieders Creek from migrating into German Creek and eventually to the Guadalupe River. Field inspection of the area did not reveal any existing culvert system that may have conveyed flows under the railroad at one time. The properties located downstream of Blieders Creek and the headwaters of the Comal River are severely affected by the runoff of Blieders Creek. Providing some relief to this area in the form of diverting storm water runoff away from Blieders Creek would greatly benefit these properties, which include Landa Park, the Comal Springs Wading Pool, and Landa Park Golf Course.

### 3.0 Hydraulic Analysis Parameters

Hydrology calculations were not performed as part of this report. The area was analyzed based on the flow rates obtained from recent FEMA hydraulic models on Blieders Creek, the Comal River, and the Guadalupe River. The models were performed using HEC-RAS modeling software. Pertinent data from these models are included in table format in Appendix 8.4. The runoff value (Q) and the water surface elevation (WSE) are reported for each river station point of analysis. A map of each model area which includes River Stations is provided in Appendix 8.4 for reference. The stretch shown for Blieders Creek in the table represents the area beginning at the headwaters of the Comal River and flowing upstream towards the intersection of River Road and Rock Street.

The benefit of diverting storm water runoff from Blieders Creek is defined by the amount that the downstream floodplain will be lowered. To determine a base line of benefit, HMT chose to examine the effects of lowering the 100-yr water surface elevation in Landa Lake by one foot. Several new HEC-RAS models were run for Blieders Creek, diverting water from the creek at a chosen removal point. The removal point was considered as a location upstream of the main problem area where there is available space for improvements to take place. This occurs at roughly River Station 15250 on Blieders Creek. Drainage improvements would begin at River Station 15250 and convey water away from Blieders Creek. Various flow rates were randomly selected for removal from the model, and the drop in water surface elevation of the 100-yr floodplain for Blieders Creek was noted for each. The table on the following page displays the findings of the analysis and the overall difference in water surface elevation between the two models:

Blieders Creek 100-yr Water Surface Elevation Difference

Model Run	Q (CFS)	13409 Headwaters Comal	14370 Lakeview St	15250
		<b>633.62</b>	<b>638.37</b>	<b>639.55</b>
1	-1000	<u>633.05</u> -0.57	<u>637.57</u> -0.80	<u>639.18</u> -0.37
2	-2000	<u>632.42</u> -1.20	<u>636.66</u> -1.71	<u>638.49</u> -1.06
3	-1500	<u>632.74</u> -0.88	<u>637.10</u> -1.27	<u>638.77</u> -0.78
4	-1700	<u>632.61</u> -1.01	<u>636.93</u> -1.44	<u>638.66</u> -0.89

By conveying 1700 cfs away from Blieders Creek and the Comal River, the 100-yr floodplain would lower by approximately one foot at the headwaters to the Comal River. Further proof lies in running a HEC-RAS model for the Comal River and analyzing the river stations between Landa Park and the headwaters, shown in the following table:

Comal River/Landa Lake 100-yr Water Surface

Model Run	Q (CFS)	9340	11090	12120
		<b>625.99</b>	<b>628.95</b>	<b>630.97</b>
1	-1700	<u>625.28</u> -0.71	<u>628.01</u> -0.94	<u>629.89</u> -1.08

To check the negative effects of displacing 1700 cfs from Blieders Creek into German Creek, a new HEC-RAS model was run for the section of the Guadalupe River that would receive the diverted flows. River Station 51690 was estimated as the study point to discharge the 1700 cfs flow rate. The following table presents the effects at pertinent river stations upstream and downstream in the Guadalupe River:

Guadalupe River 100-yr Water Surface Elevation Difference

Model Run	Q (CFS)	50210	51170	51690	52710
		<b>621.81</b>	<b>622.93</b>	<b>623.96</b>	<b>624.55</b>
1	+1700	<u>622.09</u> 0.28	<u>623.26</u> 0.33	<u>624.30</u> 0.34	<u>624.88</u> 0.33

Conveying 1700 cfs into German Creek and the Guadalupe River raises the 100-yr Water Surface Elevation by approximately 4" in the immediate area of the discharge point. The discharge point in German Creek is located near the New Braunfels Utilities Surface Water Plant. The floodplain for German Creek extends upstream to the low-lying areas of Torrey Park and downstream to the

Guadalupe River. The negative effect of this rise is minimal to German Creek and the Guadalupe River and would not affect any existing structures currently located outside the floodplain upstream or downstream of the discharge point. The benefit provided to the Bleiders Creek floodplain makes this a reasonable option for improvement.

The data from each model run is located in Appendix 8.5. Effects of diverting runoff were analyzed between the river stations provided in the table in Appendix 8.4. The difference between water surface elevations began to lessen the further downstream the study progressed; therefore, it was assumed that the water surface elevation would return to expected levels past the extents of this analysis. Further examination and study of flow rates downstream on the Guadalupe and Comal Rivers should be performed to ensure these assumptions are correct. A study would also be required for a Letter of Map Revisions submitted to FEMA, if improvements to the floodplain occur.

#### **4.0 Proposed Improvements**

The City requested that HMT analyze the capacity of a potential culvert under the railroad tracks. This report takes the analysis a step further by choosing a proposed alignment between the two creeks and reviewing the costs and limitations. This report chose an alignment for the proposed improvements based on a field inspection of the area. The City does not currently own any drainage easements in this area and would be required to obtain an easement that provides a means for installation, operation, and maintenance of the improvements. It was estimated that a 60-ft Drainage Easement would be required in this area, based on the size of the infrastructure proposed. Anything larger than 60-ft would require the City to purchase entire properties and existing buildings that would lie within the path.

The route chosen for the improvements limits the impact to properties and existing structures in the area. A Proposed Improvement Route Exhibit is presented in Appendix 8.6 for reference. The route follows the property lines in most cases and cuts across undeveloped areas when available. The alignment must cross River Road, the railroad tracks, and Torrey Street before ending in German Creek. The improvement would need to consider conveying 1700 cfs under these locations. In addition, the railroad is located at a natural high for the area so that the flowline of any type of improvement in this location would be forced very deep.

HMT examined the potential for a trapezoidal channel to span the distance between the two creeks and convey 1700 cfs. Limitations due to potential slope, depth, and width of the channel within the 60-ft easement caused this idea to be unfeasible. Maximum slope for the alignment is 0.59% and the largest

depth reached by the channel would be nearly 19-ft. At a 3:1 side slopes, the channel would not fit within the 60-ft drainage easement. A table included in Appendix 8.7 reiterates the limits of this type of improvement design.

Therefore, a multiple concrete box structure was considered as an improvement method to convey 1700 cfs. The structure would consist of (5) 7'x5' Reinforced Concrete Box Culvert pipes, laid at a 0.59% slope beginning before River Road and crossing under Torrey Street before day-lighting in German Creek. A preliminary plan and profile view of the improvement project, along with calculations of the pipe network is provided in Appendix 8.7. The roadway crossings would be considered for open-cut trenching due to the nature of the paved surfaces and the ability to close off these portions of the roadways temporarily. In order to cross under the railroad tracks, a boring or temporary bridge may be required to prevent interference with the railway operation. This type of construction procedure may become costly. The City may be able to coordinate this construction with the railway during the design process.

## 5.0 Additional Improvements Considerations

The Multiple Box Culvert improvement previously discussed solves for the scope of this report and conveys floodwaters away from Blieders Creek and the headwaters of the Comal River towards German Creek and the Guadalupe River. While analysis of this particular issue is important, it is imperative to review the improvements with a broader scope of overall Public Works infrastructure planning. This area consists of many homes and businesses. The intersection of River Road and Lakeview Street has become a busy intersection as the northeast side of the City continues to grow. Since Blieders Creek flows uncontained through this area, the intersection is continuously inundated during large storm events. The potential improvements would lower the 100-yr floodplain in this area; however, the intersection and much of the surrounding land owned by the City of New Braunfels would require additional drainage improvements in order to bring them entirely out of the floodplain.

HMT reviewed the region and determined that a more direct path of flow during high intensity rainfall events for Blieders Creek into the headwaters of the Comal River would benefit the area greatly. The City may decide to consider this additional improvement, which is shown in an exhibit in Appendix 8.8. A channel is proposed to follow a nearly straight path, cutting the water off in Blieders Creek before it is able to flood River Road, Lakeview Street, or Klingemann Street. Water is redirected by the proposed channel to flow behind the City property before entering the Comal River. This additional improvement consideration would be designed to ensure that the 100-yr floodplain is contained in the channel and

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eliminate the constant flooding issues of the roadways crossing Blieders Creek. This improvement could also be integrated into any future improvements or developments to the City Property.

## 6.0 Permits

The improvement project suggested in this report would change the floodplain limits in this area. During the design stage of this project, the new floodplain will need to be modeled and analyzed in order to submit a Letter of Map Revision to FEMA. As part of its administration of the National Floodplain Insurance Program, FEMA publishes Flood Insurance Rate Maps in order to show areas in the community that are in risk of flooding. Map revisions would be required due to the nature of the change to the floodplain.

Portions of this project lie between the Edwards Aquifer Recharge Zone and Transition Zone. Installation of the sub-surface storm drain system in this area is considered a regulated activity over top of the Edwards Aquifer Recharge Zone. When dealing with regulated activities in the Edwards Aquifer Recharge Zone, the Texas Commission on Environmental Quality (TCEQ) requires the submittal of a Water Pollution Abatement Plan (WPAP). The WPAP describes the proposed improvements to be constructed that will treat the pollutants generated by the regulated activity.

Other permits required for this project would include a U.S. Army Corps of Engineer's Individual Permit for construction within a designated Waters of the United States. Approval would be gained through submittal of an application to the regional offices and review by the USACE. The City would also be required to obtain a Pass-Through Permit from the Railroad Company for extensive work and boring under the tracks. Costs for all the different permits have been added to the overall costs for this project.

## 7.0 Conclusions & Costs

This preliminary engineering report was prepared in an effort to analyze the existing drainage issues and concerns brought forth by the City of New Braunfels for the Blieders/German Creek area. HMT analyzed floodplain levels and examined the impact of lowering the 100-yr Water Surface Elevation of Blieders Creek by 1-ft by diverting 1700 cfs of water to German Creek and the Guadalupe River. An improvement project was developed based on the design flow rate which considers the installation of (5) 7'x5' Reinforced Box Culvert pipes inside a designated 60-ft Drainage Easement. Listed on the following page are the key elements to consider for this improvement project:

- Blieders/German Creek
  - Acquisition of 60-ft Drainage Easement along the preferred route
  - Acquire appropriate permits from FEMA, TCEQ, USACE, and the railroad
  - Installation of (5) 7'x5' Reinforced Concrete Box Culvert Pipes inside 60-ft drainage easement beginning before River Road and ending past Torrey Street
  - Perform minor channel grading at box culvert entrance and exit
  - Open-cut trenching through River Road and Torrey Street with temporary traffic detours
  - Boring under railway line through entire right-of-way and installation of the box culvert system
  - Re-grade 60-ft drainage easement after box culvert installation to carry surface runoff away from existing structures

The report also refers to additional improvement considerations that would bring many more properties and roadways completely out of the 100-yr floodplain. These ideas were not included in determining the costs for the improvement project. The following items should be further studied by the City:

- Acquiring additional drainage easement and constructing open channel behind City property to contain 100-yr floodplain and bring areas out of flooding hazard zones
- Enhancing culvert crossings at River Road, Lakeview Street, and Klingemann Street in order to convey remaining flow efficiently through Blieders Creek

An engineer's cost estimate for construction as well as other project contingencies has been prepared and included in Appendix 8.9. A table summary of the estimated project costs for improving the Blieders/German Creek area neighborhood is provided below:

#### **CONSTRUCTION COSTS**

- Drainage Improvement Construction	\$ 4,367,884.46
- Tree Preservation (0.5%)	\$ 21,839.42
- Bond & Insurance (3%)	\$ 131,691.72
- Barricades (3%)	\$ 135,642.47
- Mobilization & Preparation of R.O.W. (15%)	\$ 658,458.58

#### **CONSTRUCTION COST ESTIMATE** **\$ 5,315,516.64**

Land Acquisition	\$ 163,760.30
Design, Project Admin, Contingencies, Inflation	\$ 3,077,278.96
<b>TOTAL PROJECT COST ESTIMATE</b>	<b>\$ 8,556,555.90</b>

These costs include design, construction, project management, inflation, easement acquisition and contingencies. Costs associated with acquiring funding were not included in the engineer's cost estimate. The estimated total project cost to implement all the drainage improvements for this area is \$8,556,555.90.

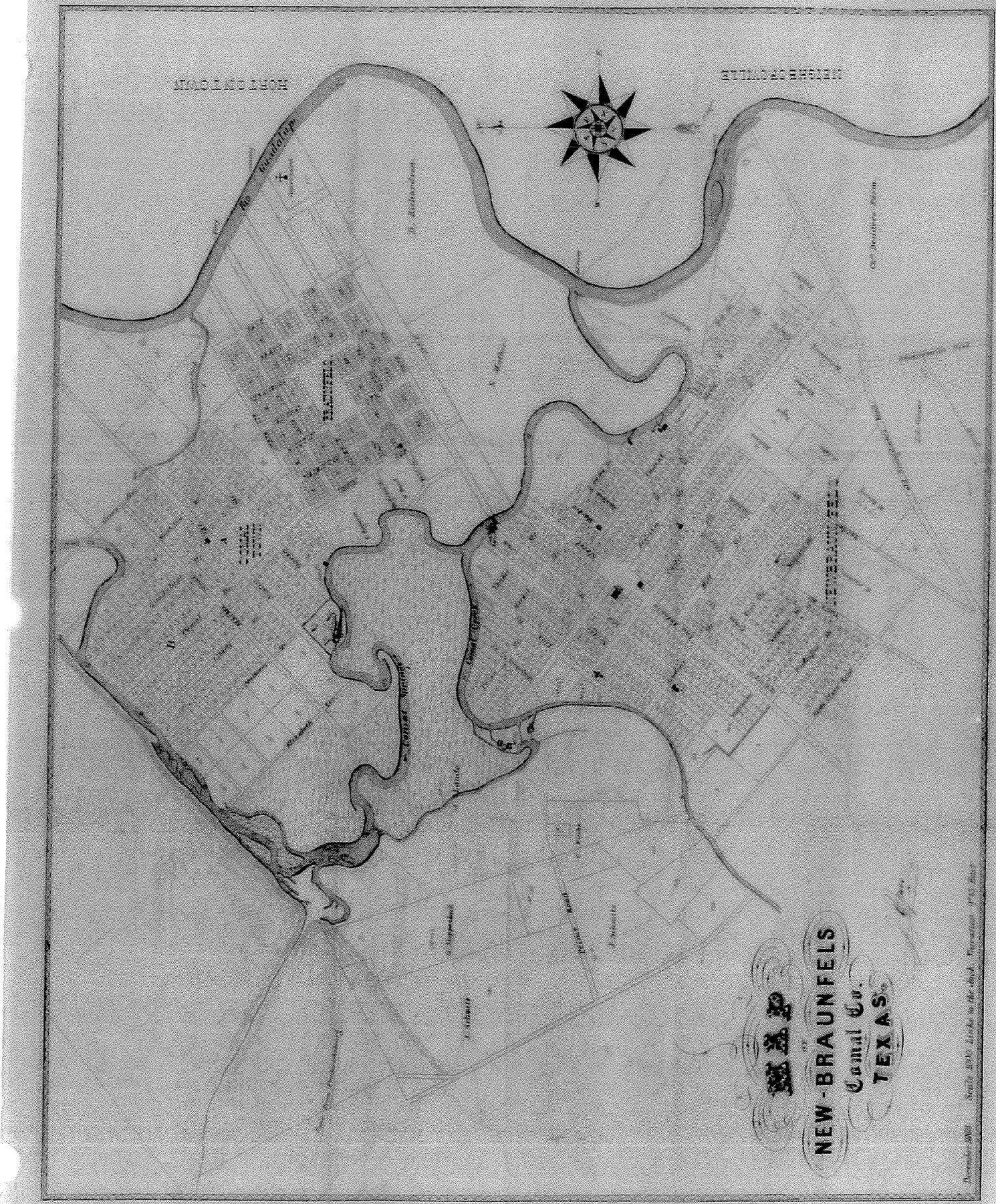
Due to the sizeable scope and high cost nature of the proposed drainage improvement projects, HMT believes the City should not give precedence to the Blieders/German Creek area over other flood prone areas considered for drainage improvements. This area is a known drainage problem for the City; however, a more cost effective alternative may exist. Future development in and around the community, for example Word Ranch development and the Klingemann Property, may factor into solving some of the existing issues. The additional drainage improvement considerations brought forth in this report can also be used as a future planning tool to re-route water through the area. Other areas within the City that experience continual lot-to-lot flooding problems should be considered as higher priority projects than the Blieders/German Creek area. Although the analysis in this report proves that it is feasible to divert water from Blieders Creek to German Creek, the cost of improvements outweighs the benefits to the community at this time.

## 8.0 Appendix

## 8.1 Location Map



## 8.2 Historical City of New Braunfels Map



November 2001 *Music Links to the Past: Variations on a Theme* (CD)

### **8.3 FEMA FIRM Map No. 48091C0455F**

National Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 1000'

2000 FEET

PANEL 0455F

**FIRM** FLOOD INSURANCE RATE MAP  
COMAL COUNTY,  
TEXAS  
AND INCORPORATED AREAS

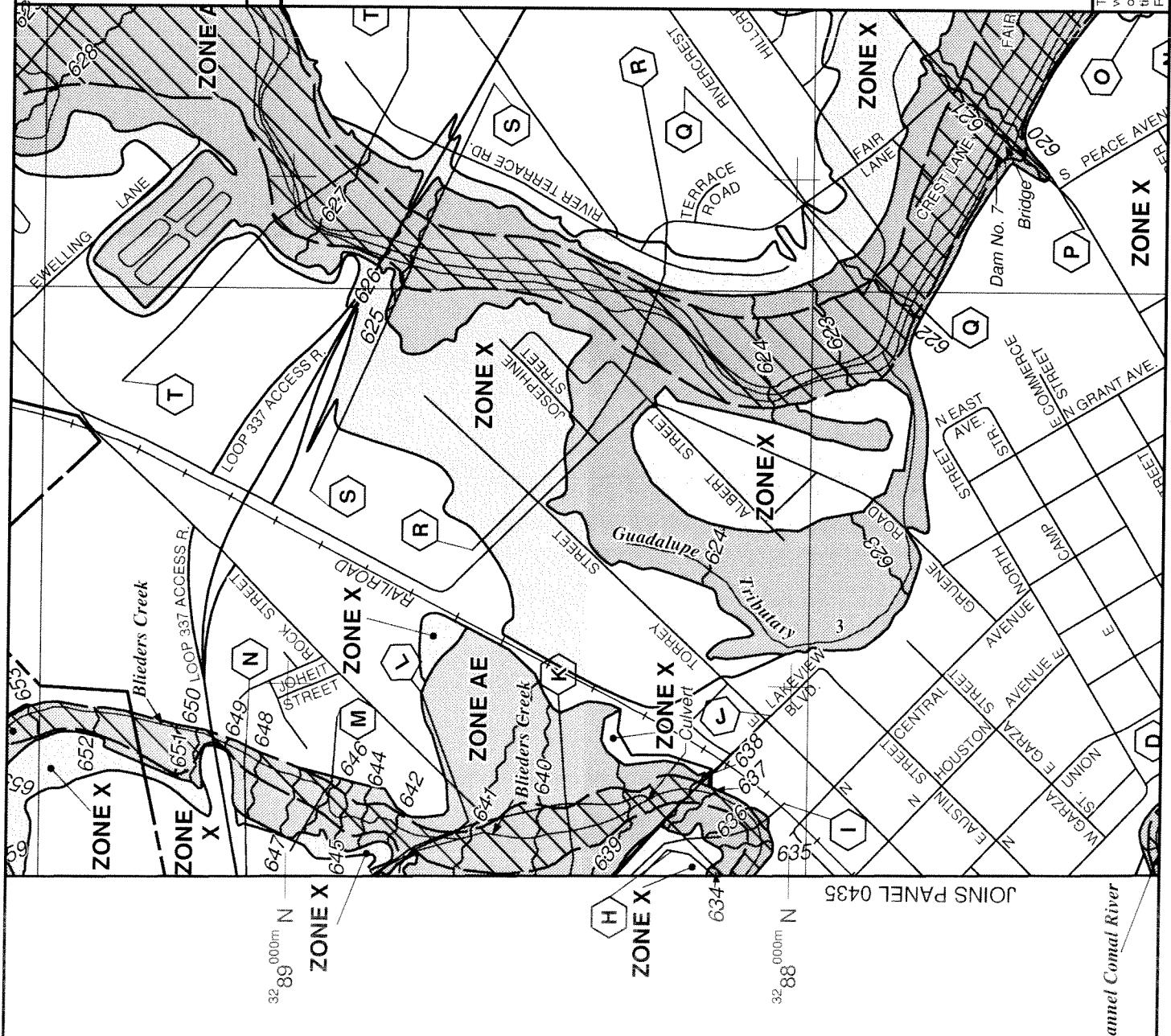
**PANEL 455 OF 505**  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)  
 CONTAINS:  
 COMMUNITY  
 COMMUNAL  
 BRAUNFELS, CITY OF  
 NEW BRAUNFELS, CITY OF

Notice to User. The **Map Number** shown below should be used when placing map orders, the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER  
48091C0455F  
EFFECTIVE DATE  
SEPTEMBER 2, 2009

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps, check the FEMA Flood Map Store at [www.fema.gov](http://www.fema.gov).



#### **8.4 FEMA HEC-RAS Model Data**

FEMA Models

Bieders Creek

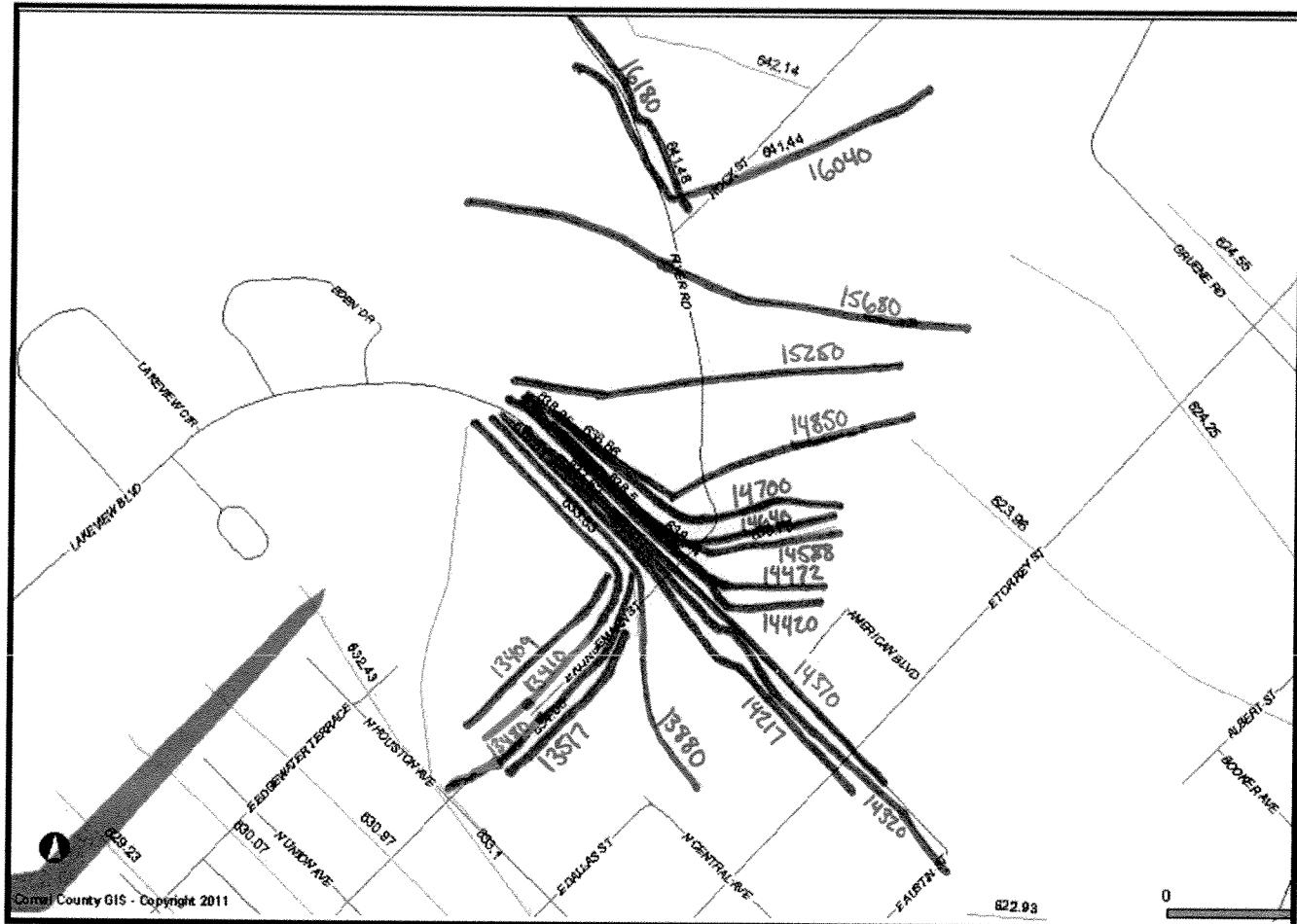
River Station	Location	WS 2-year		WS 5-year		WS 10-year		WS 25-year		WS 50-year		WS 100-year		WS 500-year	
		Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)
13409	Begin Comal Springs	937	626.28	2400	629.32	3531	630.88	5124	632.20	6306	632.97	7445	633.62	14129	636.17
13410	DS Klingeman Rd	937	626.33	2400	629.45	3531	631.02	5124	632.37	6306	633.16	7445	633.83	14129	636.74
13445	4 - 20" Concrete	937	629.60	2400	630.84	3531	631.49	5124	632.37	6306	633.08	7445	633.56	14129	635.52
13480	US Klingeman Rd	937	629.96	2400	631.25	3531	631.97	5124	632.62	6306	633.08	7445	633.56	14129	635.52
13517		917	629.99	2349	631.36	3466	632.13	5026	632.92	6188	633.50	7306	634.06	14070	636.40
13880		917	630.18	2349	631.90	3466	632.92	5026	634.05	6188	634.81	7306	635.51	14070	638.69
14217		917	630.51	2349	632.67	3466	633.90	5026	635.25	6188	636.17	7306	636.91	14070	639.92
14320		917	630.69	2349	633.08	3466	634.36	5026	635.77	6188	636.71	7306	637.52	14070	640.16
14370	Lakeview St	917	631.22	2349	633.20	3466	634.74	5026	636.38	6188	637.46	7306	638.37	14070	640.99
14420		917	631.84	2349	633.47	3466	634.87	5026	636.48	6188	637.58	7306	638.50	14070	641.13
14472		917	631.89	2349	633.51	3466	634.89	5026	636.51	6188	637.58	7306	638.44	14070	641.10
14583		917	632.16	2349	634.06	3466	635.40	5026	636.92	6188	637.89	7306	638.73	14070	641.21
14640	DS Access Road (#57)	917	632.23	2349	634.22	3466	635.57	5026	637.07	6188	637.98	7306	638.85	14070	641.28
14670	3 - 36" Concrete	917	632.13	2349	634.08	3466	635.46	5026	636.88	6188	637.94	7306	638.85	14070	641.28
14700	US Access Road (#57)	917	632.13	2349	634.08	3466	635.46	5026	636.88	6188	637.94	7306	638.86	14070	641.28
14850		917	632.60	2349	634.46	3466	635.65	5026	637.25	6188	638.11	7306	639.01	14070	641.42
15250		917	633.50	2349	635.75	3466	636.94	5026	638.29	6188	639.18	7306	639.55	14070	641.67
15680		917	635.98	2349	637.63	3466	638.54	5026	639.71	6188	640.32	7306	640.68	14070	642.36
16040	DS River Rd (#41)	973	638.48	2247	639.48	3271	640.14	4804	640.90	5995	641.17	6963	641.44	13936	642.90
16180	US River Rd (#41)	973	638.55	2247	639.55	3271	640.20	4804	640.95	5995	641.21	6963	641.48	13936	642.83

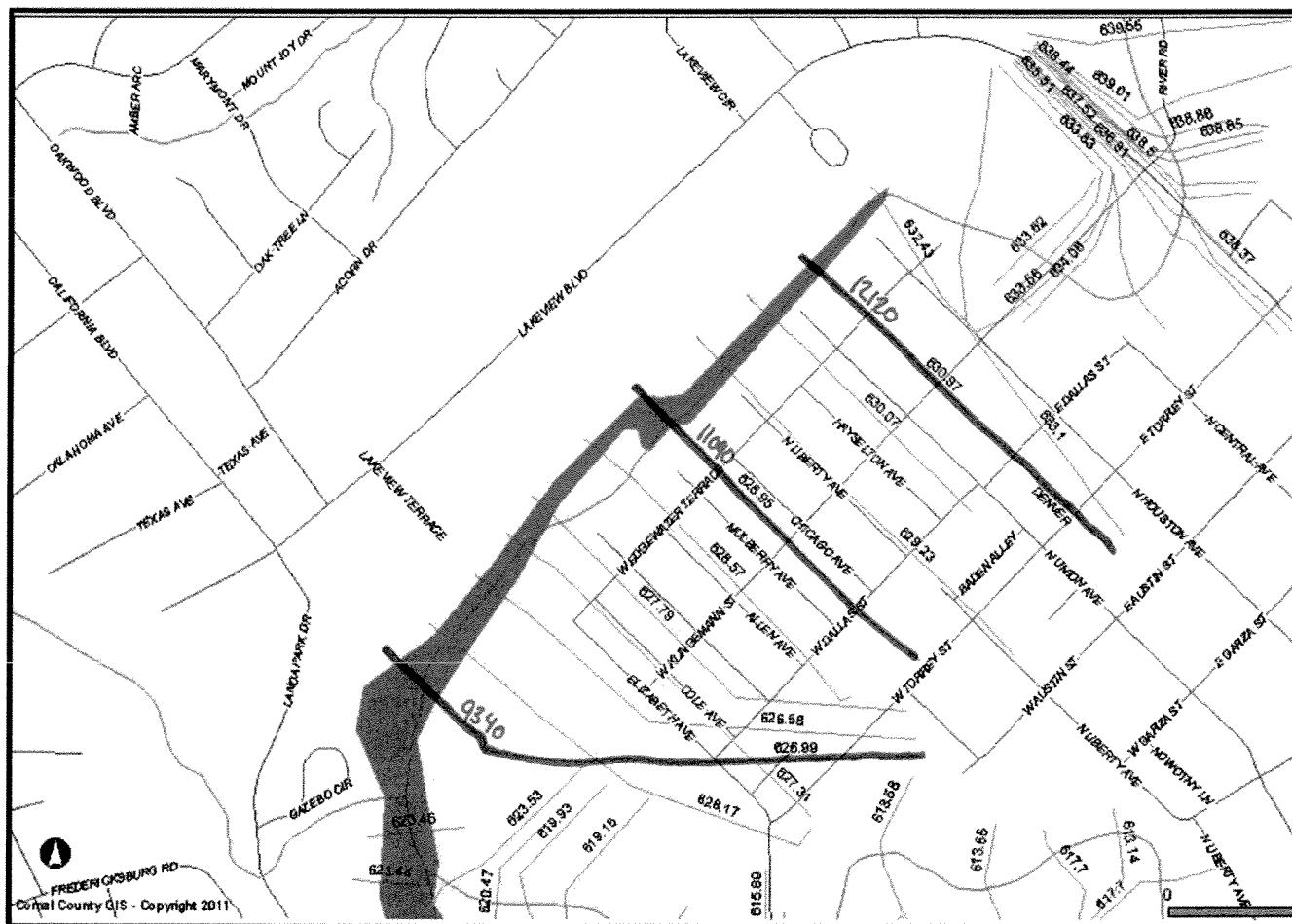
Guadalupe River

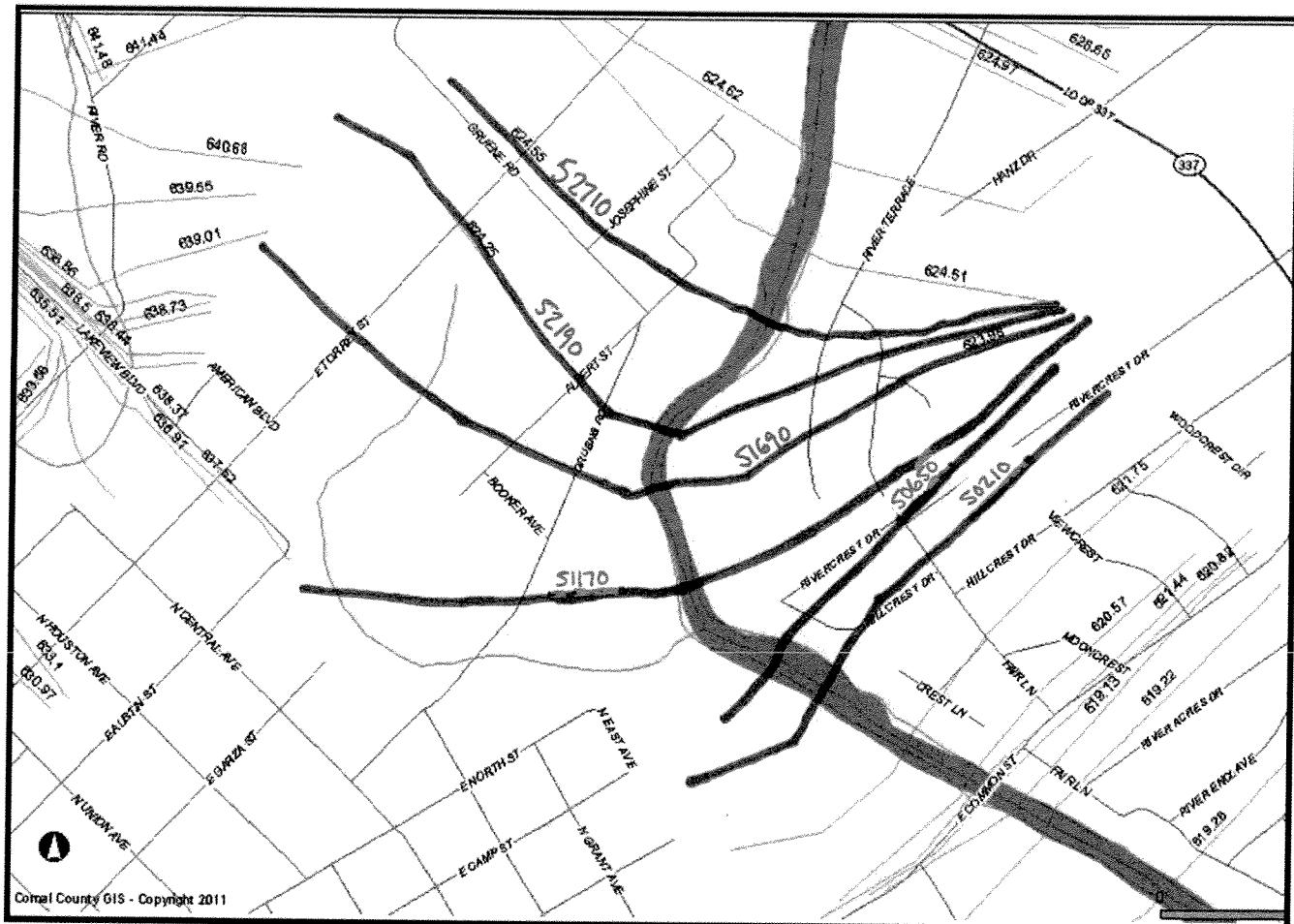
River Station	Location	WS 2-year		WS 5-year		WS 10-year		WS 25-year		WS 50-year		WS 100-year		WS 500-year	
		Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)
50210		10201	597.45	26133	606.09	39222	610.39	57406	615.66	71538	618.89	85618	621.81	133217	631.99
50650		10201	597.58	26133	606.18	39222	610.47	57406	615.74	71538	618.98	85618	621.94	133217	632.10
51170		10201	597.66	26133	606.03	39222	610.36	57406	615.87	71538	619.41	85618	622.93	133217	634.28
51690		10201	598.13	26133	607.25	39222	611.97	57406	617.48	71538	620.83	85618	623.96	133217	634.35
52190		10201	598.89	26133	607.87	39222	612.50	57046	617.84	71538	621.15	85618	624.25	133217	634.68
52710		10201	600.16	26133	608.47	39222	613.00	570406	618.22	71538	621.53	85618	624.55	133217	635.55

Comal River/Landa Lake

River Station	Location	WS 2-year		WS 5-year		WS 10-year		WS 25-year		WS 50-year		WS 100-year		WS 500-year	
		Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)	Q (cfs)	WSE (ft)
9340		937	622.28	2400	623.49	3531	624.19	5124	625.02	6306	625.57	7445	625.99	14129	628.07
11090		937	623.59	2400	625.47	3531	626.51	5124	627.64	6306	628.34	7445	628.95	14129	631.34
12120		937	624.63	2400	626.88	3531	628.07	5124	629.44	6306	630.27	7445	630.97	14129	633.68







HEC-RAS Plan: Blieders River; Reach #1 Reach: Blieders Creek-C

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Blieders Creek-C	16180	2-year	973.00	634.64	638.55		638.60	0.000401	1.82	540.86	242.88	0.20
Blieders Creek-C	16180	5-year	2247.00	634.64	639.55		639.68	0.000670	2.95	811.69	296.54	0.28
Blieders Creek-C	16180	10-year	3271.00	634.64	640.20		640.39	0.000783	3.58	1024.14	377.99	0.31
Blieders Creek-C	16180	25-year	4804.00	634.64	640.95		641.22	0.000915	4.32	1339.39	467.30	0.34
Blieders Creek-C	16180	50-year	5995.00	634.64	641.21		641.58	0.001165	5.04	1467.31	499.00	0.39
Blieders Creek-C	16180	100-year	6963.00	634.64	641.48		641.91	0.001293	5.49	1603.79	530.74	0.42
Blieders Creek-C	16180	500-year	13936.00	634.64	642.83		643.69	0.002075	8.07	2406.32	632.91	0.55
Blieders Creek-C	16040	2-year	973.00	636.00	638.48	637.10	638.55	0.003688	2.02	489.65	289.93	0.25
Blieders Creek-C	16040	5-year	2247.00	636.00	639.48	637.84	639.60	0.004738	2.85	838.40	399.16	0.30
Blieders Creek-C	16040	10-year	3271.00	636.00	640.14	638.32	640.28	0.004506	3.12	1194.11	1028.42	0.31
Blieders Creek-C	16040	25-year	4804.00	636.00	640.90	638.92	641.02	0.003436	3.14	2049.63	1224.57	0.28
Blieders Creek-C	16040	50-year	5995.00	636.00	641.17	639.30	641.31	0.003792	3.44	2382.28	1292.82	0.29
Blieders Creek-C	16040	100-year	6963.00	636.00	641.44	639.56	641.58	0.003638	3.51	2747.69	1363.87	0.29
Blieders Creek-C	16040	500-year	13936.00	636.00	642.90	641.05	643.06	0.003108	3.91	4991.82	1678.86	0.28
Blieders Creek-C	15680	2-year	917.00	632.44	635.98	635.76	636.14	0.010319	4.23	314.59	266.86	0.45
Blieders Creek-C	15680	5-year	2349.00	632.44	637.63	636.35	637.74	0.003685	3.45	893.04	429.70	0.29
Blieders Creek-C	15680	10-year	3466.00	632.44	638.54	636.68	638.66	0.002943	3.50	1265.90	671.52	0.27
Blieders Creek-C	15680	25-year	5026.00	632.44	639.71	637.09	639.84	0.002252	3.49	1827.16	1146.34	0.24
Blieders Creek-C	15680	50-year	6188.00	632.44	640.32	637.38	640.40	0.001570	3.10	3298.39	1536.84	0.20
Blieders Creek-C	15680	100-year	7306.00	632.44	640.68	637.63	640.76	0.001511	3.14	3853.04	1557.81	0.20
Blieders Creek-C	15680	500-year	14070.00	632.44	642.36	638.95	642.44	0.001347	3.39	6553.18	1666.17	0.20
Blieders Creek-C	15250	2-year	917.00	625.57	633.50		633.66	0.002954	3.33	320.38	120.93	0.26
Blieders Creek-C	15250	5-year	2349.00	625.57	635.75		635.99	0.003329	4.53	734.70	257.42	0.30
Blieders Creek-C	15250	10-year	3466.00	625.57	636.94		637.18	0.003052	4.79	1088.56	337.61	0.29
Blieders Creek-C	15250	25-year	5026.00	625.57	638.29		638.55	0.003033	5.28	1625.92	549.74	0.30
Blieders Creek-C	15250	50-year	6188.00	625.57	639.18		639.42	0.002819	5.39	2300.90	973.21	0.29
Blieders Creek-C	15250	100-year	7306.00	625.57	639.55		639.80	0.002997	5.68	2689.55	1148.26	0.30
Blieders Creek-C	15250	500-year	14070.00	625.57	641.67		641.81	0.001716	4.83	5769.29	1509.00	0.23
Blieders Creek-C	14850	2-year	917.00	624.35	632.60		632.72	0.002215	3.01	355.73	117.04	0.23
Blieders Creek-C	14850	5-year	2349.00	624.35	634.46		634.76	0.003882	4.86	607.90	169.05	0.32
Blieders Creek-C	14850	10-year	3466.00	624.35	635.65		636.01	0.004135	5.55	852.92	243.53	0.34
Blieders Creek-C	14850	25-year	5026.00	624.35	637.25		637.56	0.003320	5.59	1557.75	718.64	0.31
Blieders Creek-C	14850	50-year	6188.00	624.35	638.11		638.46	0.003765	6.28	2362.90	1487.72	0.34
Blieders Creek-C	14850	100-year	7306.00	624.35	639.01		639.14	0.001724	4.48	3701.89	1498.24	0.23
Blieders Creek-C	14850	500-year	14070.00	624.35	641.42		641.49	0.000852	3.56	7340.78	1525.80	0.17
Blieders Creek-C	14700	2-year	917.00	626.10	632.13	631.01	632.49	0.001591	6.54	307.15	136.83	0.47
Blieders Creek-C	14700	5-year	2349.00	626.10	634.08	632.76	634.48	0.001700	8.15	757.24	279.51	0.51
Blieders Creek-C	14700	10-year	3466.00	626.10	635.46	633.87	635.76	0.001223	7.69	1171.18	318.31	0.44
Blieders Creek-C	14700	25-year	5026.00	626.10	636.88	634.55	637.29	0.001567	9.57	1766.07	620.69	0.51
Blieders Creek-C	14700	50-year	6188.00	626.10	637.94	634.97	638.24	0.001154	8.74	2611.59	968.40	0.45
Blieders Creek-C	14700	100-year	7306.00	626.10	638.66	635.33	639.03	0.000726	7.29	3526.01	1014.73	0.36
Blieders Creek-C	14700	500-year	14070.00	626.10	641.28	638.33	641.42	0.000557	7.17	6085.27	1099.71	0.32
Blieders Creek-C	14670			Culvert								
Blieders Creek-C	14640	2-year	917.00	625.56	632.23	630.66	632.45	0.004496	4.95	316.84	137.48	0.34
Blieders Creek-C	14640	5-year	2349.00	625.56	634.22	632.56	634.45	0.004743	6.07	737.54	255.64	0.37
Blieders Creek-C	14640	10-year	3466.00	625.56	635.57	633.50	635.76	0.003377	5.65	1106.40	291.20	0.32
Blieders Creek-C	14640	25-year	5026.00	625.56	637.07	634.13	637.28	0.003332	6.17	1640.42	454.46	0.32
Blieders Creek-C	14640	50-year	6188.00	625.56	637.98	634.52	638.18	0.002980	6.14	2109.58	582.73	0.31
Blieders Creek-C	14640	100-year	7306.00	625.56	638.85	634.83	639.02	0.002533	5.93	3026.18	1070.60	0.29
Blieders Creek-C	14640	500-year	14070.00	625.56	641.28	636.00	641.41	0.001582	5.25	5714.00	1137.07	0.23
Blieders Creek-C	14588	2-year	917.00	625.06	632.16		632.26	0.002090	2.50	367.88	99.86	0.21
Blieders Creek-C	14588	5-year	2349.00	625.06	634.06		634.29	0.003294	4.02	699.35	247.06	0.29
Blieders Creek-C	14588	10-year	3466.00	625.06	635.40		635.63	0.002761	4.20	1060.09	289.11	0.27
Blieders Creek-C	14588	25-year	5026.00	625.06	636.92		637.16	0.002482	4.51	1582.96	446.09	0.27
Blieders Creek-C	14588	50-year	6188.00	625.06	637.89		638.12	0.002179	4.52	2089.40	593.39	0.25
Blieders Creek-C	14588	100-year	7306.00	625.06	638.73		638.93	0.001889	4.44	2944.29	1093.09	0.24
Blieders Creek-C	14588	500-year	14070.00	625.06	641.21		641.35	0.001365	4.34	5737.44	1154.03	0.21
Blieders Creek-C	14472	2-year	917.00	624.95	631.89		632.01	0.002198	2.81	353.61	106.64	0.23
Blieders Creek-C	14472	5-year	2349.00	624.95	633.51		633.85	0.004630	4.95	580.88	176.57	0.34
Blieders Creek-C	14472	10-year	3466.00	624.95	634.89		635.26	0.004264	5.40	880.31	268.92	0.34
Blieders Creek-C	14472	25-year	5026.00	624.95	636.51		636.85	0.003483	5.53	1428.69	436.72	0.32
Blieders Creek-C	14472	50-year	6188.00	624.95	637.58		637.87	0.002829	5.35	1986.31	605.43	0.29
Blieders Creek-C	14472	100-year	7306.00	624.95	638.44		638.71	0.002578	5.39	2751.17	1130.78	0.28
Blieders Creek-C	14472	500-year	14070.00	624.95	641.10		641.25	0.001454	4.65	5823.56	1188.15	0.22
Blieders Creek-C	14420	2-year	917.00	624.43	631.84		631.91	0.001025	2.16	487.36	150.36	0.16
Blieders Creek-C	14420	5-year	2349.00	624.43	633.47		633.63	0.002044	3.60	771.57	199.56	0.23
Blieders Creek-C	14420	10-year	3466.00	624.43	634.87		635.05	0.001993	4.00	1100.49	286.70	0.24
Blieders Creek-C	14420	25-year	5026.00	624.43	636.48		636.67	0.001969	4.45	1700.89	560.94	0.24
Blieders Creek-C	14420	50-year	6188.00	624.43	637.58		637.73	0.001503	4.16	2549.95	980.62	0.22
Blieders Creek-C	14420	100-year	7306.00	624.43	638.50		638.59	0.000942	3.46	3566.68	1149.88	0.17
Blieders Creek-C	14420	500-year	14070.00	624.43	641.13		641.20	0.000537	2.97	6652.60	1200.26	0.14

## HEC-RAS Plan: Blieders River: Reach #1 Reach: Blieders Creek-C (Continued)

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 # Chn
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Blieders Creek-C	14370	2-year	917.00	630.00	631.22	631.22	631.73	0.013079	5.75	159.43	155.74	1.00
Blieders Creek-C	14370	5-year	2349.00	630.00	633.20		633.51	0.002081	4.45	556.17	248.46	0.47
Blieders Creek-C	14370	10-year	3466.00	630.00	634.74		634.98	0.000942	4.02	997.42	324.12	0.34
Blieders Creek-C	14370	25-year	5026.00	630.00	636.38		636.61	0.000621	4.05	1612.83	505.25	0.29
Blieders Creek-C	14370	50-year	6188.00	630.00	637.46		637.68	0.000481	3.98	2344.10	847.47	0.26
Blieders Creek-C	14370	100-year	7306.00	630.00	638.37		638.55	0.000373	3.80	3225.67	1032.94	0.24
Blieders Creek-C	14370	500-year	14070.00	630.00	640.99		641.17	0.000314	4.22	6072.29	1134.90	0.23
Blieders Creek-C	14320	2-year	917.00	622.08	630.69		630.81	0.001233	2.76	346.30	81.13	0.20
Blieders Creek-C	14320	5-year	2349.00	622.08	633.08		633.41	0.002321	4.76	613.39	137.54	0.29
Blieders Creek-C	14320	10-year	3466.00	622.08	634.36		634.84	0.002895	5.85	807.68	176.05	0.33
Blieders Creek-C	14320	25-year	5026.00	622.08	635.77		636.43	0.003482	7.03	1113.49	258.85	0.37
Blieders Creek-C	14320	50-year	6188.00	622.08	636.71		637.47	0.003683	7.65	1394.58	341.85	0.39
Blieders Creek-C	14320	100-year	7306.00	622.08	637.52		638.33	0.003751	8.06	1702.97	420.48	0.40
Blieders Creek-C	14320	500-year	14070.00	622.08	640.16		640.95	0.003890	9.31	4316.72	1134.63	0.42
Blieders Creek-C	14217	2-year	917.00	622.35	630.51		630.66	0.001753	3.09	299.49	65.76	0.23
Blieders Creek-C	14217	5-year	2349.00	622.35	632.67		633.11	0.003630	5.41	523.82	154.15	0.35
Blieders Creek-C	14217	10-year	3466.00	622.35	633.90		634.50	0.004206	6.46	726.12	174.60	0.39
Blieders Creek-C	14217	25-year	5026.00	622.35	635.25		636.04	0.004857	7.65	991.68	222.29	0.43
Blieders Creek-C	14217	50-year	6188.00	622.35	636.17		637.06	0.005086	8.31	1217.77	317.01	0.45
Blieders Creek-C	14217	100-year	7306.00	622.35	636.91		637.91	0.005348	8.91	1530.71	522.55	0.46
Blieders Creek-C	14217	500-year	14070.00	622.35	639.92		640.65	0.004175	9.18	4439.71	1146.34	0.42
Blieders Creek-C	13880	2-year	917.00	621.79	630.18		630.26	0.000757	2.34	469.44	131.62	0.16
Blieders Creek-C	13880	5-year	2349.00	621.79	631.90		632.18	0.002038	4.46	733.51	174.54	0.27
Blieders Creek-C	13880	10-year	3466.00	621.79	632.92		633.35	0.002806	5.64	930.36	213.08	0.32
Blieders Creek-C	13880	25-year	5026.00	621.79	634.05		634.66	0.003680	6.95	1194.34	260.98	0.37
Blieders Creek-C	13880	50-year	6188.00	621.79	634.81		635.58	0.004279	7.85	1430.66	357.68	0.41
Blieders Creek-C	13880	100-year	7306.00	621.79	635.51		636.36	0.004553	8.42	1711.10	446.01	0.42
Blieders Creek-C	13880	500-year	14070.00	621.79	638.69		639.53	0.004278	9.52	3535.44	638.77	0.43
Blieders Creek-C	13517	2-year	917.00	622.14	629.99		630.05	0.000449	1.87	496.09	106.34	0.14
Blieders Creek-C	13517	5-year	2349.00	622.14	631.36		631.58	0.001408	3.74	661.36	141.75	0.26
Blieders Creek-C	13517	10-year	3466.00	622.14	632.13		632.50	0.002114	4.86	781.79	169.08	0.33
Blieders Creek-C	13517	25-year	5026.00	622.14	632.92		633.51	0.003119	6.23	926.06	195.95	0.40
Blieders Creek-C	13517	50-year	6188.00	622.14	633.50		634.24	0.003703	7.04	1044.33	215.49	0.44
Blieders Creek-C	13517	100-year	7306.00	622.14	634.06		634.94	0.004112	7.67	1171.36	239.95	0.47
Blieders Creek-C	13517	500-year	14070.00	622.14	636.40		637.97	0.005920	10.65	2140.93	719.44	0.59
Blieders Creek-C	13480	2-year	937.00	621.60	629.96	625.65	630.03	0.000181	2.25	509.58	147.41	0.16
Blieders Creek-C	13480	5-year	2400.00	621.60	631.25	627.78	631.52	0.000561	4.47	711.12	161.98	0.28
Blieders Creek-C	13480	10-year	3531.00	621.60	631.97	628.43	632.42	0.000837	5.80	830.46	168.34	0.35
Blieders Creek-C	13480	25-year	5124.00	621.60	632.62	629.97	633.39	0.001336	7.69	948.00	198.49	0.45
Blieders Creek-C	13480	50-year	6306.00	621.60	633.08	630.79	634.09	0.001658	8.86	1045.00	220.97	0.50
Blieders Creek-C	13480	100-year	7445.00	621.60	633.56	631.41	634.76	0.001884	9.75	1156.53	244.28	0.54
Blieders Creek-C	13480	500-year	14129.00	621.60	635.52	635.52	637.68	0.003001	13.86	2089.64	685.44	0.70
Blieders Creek-C	13445	Culvert										
Blieders Creek-C	13410	2-year	937.00	621.08	626.33	624.02	626.79	0.003647	5.42	173.01	59.08	0.42
Blieders Creek-C	13410	5-year	2400.00	621.08	629.45	626.57	629.84	0.002211	5.09	530.05	132.78	0.33
Blieders Creek-C	13410	10-year	3531.00	621.08	631.02	626.78	631.50	0.002249	5.83	791.87	196.77	0.34
Blieders Creek-C	13410	25-year	5124.00	621.08	632.37	628.05	633.00	0.002600	6.88	1096.99	260.74	0.38
Blieders Creek-C	13410	50-year	6306.00	621.08	633.16	629.28	633.89	0.002825	7.53	1323.47	310.05	0.40
Blieders Creek-C	13410	100-year	7445.00	621.08	633.83	630.41	634.63	0.002986	8.05	1544.86	351.83	0.41
Blieders Creek-C	13410	500-year	14129.00	621.08	636.74	633.93	637.51	0.002851	9.10	3748.76	884.39	0.42
Blieders Creek-C	13409	2-year	937.00	620.41	626.28		626.41	0.001479	2.94	319.11	76.97	0.25
Blieders Creek-C	13409	5-year	2400.00	620.41	629.32		629.60	0.001578	4.24	599.67	118.47	0.28
Blieders Creek-C	13409	10-year	3531.00	620.41	630.88		631.26	0.001667	4.99	825.83	184.90	0.30
Blieders Creek-C	13409	25-year	5124.00	620.41	632.20		632.73	0.002013	6.03	1119.99	269.79	0.34
Blieders Creek-C	13409	50-year	6306.00	620.41	632.97		633.60	0.002230	6.67	1357.83	347.21	0.36
Blieders Creek-C	13409	100-year	7445.00	620.41	633.62		634.32	0.002383	7.18	1605.64	412.71	0.38
Blieders Creek-C	13409	500-year	14129.00	620.41	636.17		637.17	0.003054	9.30	2904.81	598.37	0.44

## HEC-RAS Plan: Bleders River: Reach #1 Reach: Bleders Creek-C

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chf
Bleders Creek-C	12120	2-year	937.00	620.41	624.63		624.73	0.001332	2.51	373.82	105.13	0.23
Bleders Creek-C	12120	5-year	2400.00	620.41	626.88		627.11	0.001631	3.87	619.75	113.87	0.29
Bleders Creek-C	12120	10-year	3531.00	620.41	628.07		628.40	0.002164	4.66	758.32	119.17	0.33
Bleders Creek-C	12120	25-year	5124.00	620.41	629.44		629.91	0.002747	5.48	934.40	137.22	0.37
Bleders Creek-C	12120	50-year	6306.00	620.41	630.27		630.83	0.003128	5.99	1052.46	149.09	0.40
Bleders Creek-C	12120	100-year	7445.00	620.41	630.97		631.61	0.003478	6.41	1161.35	160.97	0.42
Bleders Creek-C	12120	500-year	14129.00	620.41	633.68		634.62	0.003995	8.06	2641.86	1185.68	0.47
Bleders Creek-C	11800	2-year	937.00	620.53	624.19		624.28	0.001499	2.44	384.42	123.34	0.24
Bleders Creek-C	11800	5-year	2400.00	620.53	626.31		626.50	0.001951	3.53	679.89	152.30	0.29
Bleders Creek-C	11800	10-year	3531.00	620.53	627.45		627.72	0.002040	4.12	857.25	156.55	0.31
Bleders Creek-C	11800	25-year	5124.00	620.53	628.71		629.08	0.002337	4.83	1059.84	168.13	0.34
Bleders Creek-C	11800	50-year	6306.00	620.53	629.45		629.89	0.002617	5.31	1186.94	177.98	0.36
Bleders Creek-C	11800	100-year	7445.00	620.53	630.07		630.58	0.002844	5.73	1299.99	189.94	0.38
Bleders Creek-C	11800	500-year	14129.00	620.53	632.51		633.42	0.003524	7.78	2498.15	1380.49	0.45
Bleders Creek-C	11450	2-year	937.00	619.79	623.75		623.82	0.001229	2.22	422.34	134.06	0.22
Bleders Creek-C	11450	5-year	2400.00	619.79	625.69		625.87	0.001820	3.38	710.07	160.99	0.28
Bleders Creek-C	11450	10-year	3531.00	619.79	626.76		627.00	0.002231	3.95	896.21	191.82	0.32
Bleders Creek-C	11450	25-year	5124.00	619.79	627.92		628.23	0.002672	4.52	1141.31	232.43	0.35
Bleders Creek-C	11450	50-year	6306.00	619.79	628.62		628.99	0.002637	4.87	1324.46	287.77	0.36
Bleders Creek-C	11450	100-year	7445.00	619.79	629.23		629.64	0.002603	5.17	1514.76	338.72	0.36
Bleders Creek-C	11450	500-year	14129.00	619.79	631.65		632.29	0.002838	6.69	2854.71	824.39	0.40
Bleders Creek-C	11090	2-year	937.00	619.68	623.59		623.60	0.000288	0.99	945.13	258.98	0.09
Bleders Creek-C	11090	5-year	2400.00	619.68	625.47		625.51	0.000471	1.65	1519.74	375.18	0.12
Bleders Creek-C	11090	10-year	3531.00	619.68	626.51		626.57	0.000549	2.00	1948.19	435.76	0.14
Bleders Creek-C	11090	25-year	5124.00	619.68	627.64		627.72	0.000641	2.41	2461.96	478.62	0.15
Bleders Creek-C	11090	50-year	6306.00	619.68	628.34		628.45	0.000697	2.66	2810.98	508.54	0.16
Bleders Creek-C	11090	100-year	7445.00	619.68	628.95		629.07	0.000745	2.89	3129.27	536.93	0.17
Bleders Creek-C	11090	500-year	14129.00	619.68	631.34		631.55	0.001031	3.98	5806.58	1598.83	0.21
Bleders Creek-C	10750	2-year	937.00	619.68	623.42		623.44	0.000840	1.18	795.76	299.20	0.13
Bleders Creek-C	10750	5-year	2400.00	619.68	625.23		625.28	0.001007	1.78	1349.62	312.91	0.15
Bleders Creek-C	10750	10-year	3531.00	619.68	626.24		626.31	0.001098	2.12	1669.31	319.79	0.16
Bleders Creek-C	10750	25-year	5124.00	619.68	627.32		627.42	0.001240	2.55	2018.15	327.81	0.18
Bleders Creek-C	10750	50-year	6306.00	619.68	627.99		628.12	0.001336	2.83	2241.76	332.84	0.19
Bleders Creek-C	10750	100-year	7445.00	619.68	628.57		628.72	0.001425	3.08	2457.46	412.10	0.20
Bleders Creek-C	10750	500-year	14129.00	619.68	630.82		631.08	0.001868	4.19	4659.39	1807.62	0.24
Bleders Creek-C	10310	2-year	937.00	619.70	623.11		623.15	0.000687	1.61	582.24	195.23	0.16
Bleders Creek-C	10310	5-year	2400.00	619.70	624.73		624.84	0.001224	2.60	923.65	233.99	0.23
Bleders Creek-C	10310	10-year	3531.00	619.70	625.65		625.80	0.001500	3.06	1155.09	267.74	0.26
Bleders Creek-C	10310	25-year	5124.00	619.70	626.64		626.84	0.001691	3.59	1431.85	287.01	0.28
Bleders Creek-C	10310	50-year	6306.00	619.70	627.27		627.51	0.001772	3.93	1613.18	293.46	0.29
Bleders Creek-C	10310	100-year	7445.00	619.70	627.79		628.07	0.001860	4.23	1769.21	298.91	0.30
Bleders Creek-C	10310	500-year	14129.00	619.70	629.85		630.28	0.002122	5.48	4001.55	1810.93	0.34
Bleders Creek-C	10150	2-year	937.00	619.70	622.90		622.95	0.001242	1.87	502.10	210.34	0.21
Bleders Creek-C	10150	5-year	2400.00	619.70	624.40		624.53	0.001755	2.82	851.66	249.53	0.27
Bleders Creek-C	10150	10-year	3531.00	619.70	625.28		625.45	0.001859	3.29	1075.23	262.09	0.29
Bleders Creek-C	10150	25-year	5124.00	619.70	626.21		626.45	0.002058	3.87	1326.22	273.78	0.31
Bleders Creek-C	10150	50-year	6306.00	619.70	626.81		627.09	0.002146	4.24	1491.32	277.52	0.32
Bleders Creek-C	10150	100-year	7445.00	619.70	627.31		627.63	0.002257	4.58	1629.90	280.62	0.33
Bleders Creek-C	10150	500-year	14129.00	619.70	629.44		629.83	0.002112	5.42	4662.36	1989.34	0.34
Bleders Creek-C	9910	2-year	937.00	619.64	622.66		622.70	0.000858	1.72	545.59	191.38	0.18
Bleders Creek-C	9910	5-year	2400.00	619.64	623.97		624.11	0.001690	2.99	802.99	202.62	0.26
Bleders Creek-C	9910	10-year	3531.00	619.64	624.74		624.93	0.002417	3.57	990.19	252.21	0.32
Bleders Creek-C	9910	25-year	5124.00	619.64	625.59		625.87	0.002783	4.23	1210.56	265.20	0.35
Bleders Creek-C	9910	50-year	6306.00	619.64	626.14		626.48	0.003009	4.64	1360.00	275.92	0.37
Bleders Creek-C	9910	100-year	7445.00	619.64	626.58		626.97	0.003330	5.02	1484.09	289.69	0.39
Bleders Creek-C	9910	500-year	14129.00	619.64	628.62		629.15	0.003660	6.12	3148.48	1988.96	0.43
Bleders Creek-C	9600	2-year	937.00	619.40	622.36		620.42	0.001076	1.31	716.35	457.14	0.18
Bleders Creek-C	9600	5-year	2400.00	619.40	623.61		623.67	0.001020	1.86	1293.56	468.78	0.20
Bleders Creek-C	9600	10-year	3531.00	619.40	624.33		624.40	0.001055	2.16	1633.24	483.18	0.21
Bleders Creek-C	9600	25-year	5124.00	619.40	625.18		625.28	0.001095	2.50	2054.06	505.53	0.22
Bleders Creek-C	9600	50-year	6306.00	619.40	625.74		625.85	0.001112	2.70	2341.40	520.24	0.22
Bleders Creek-C	9600	100-year	7445.00	619.40	626.17		626.32	0.001162	2.91	2567.43	660.78	0.23
Bleders Creek-C	9600	500-year	14129.00	619.40	628.28		628.46	0.001065	3.53	5216.20	2203.30	0.24
Bleders Creek-C	9340	2-year	937.00	619.40	622.28		620.11	0.000168	0.73	1277.69	484.97	0.08
Bleders Creek-C	9340	5-year	2400.00	619.40	623.49		620.54	0.000324	1.28	1872.27	501.50	0.12
Bleders Creek-C	9340	10-year	3531.00	619.40	624.19		624.23	0.000406	1.59	2225.20	513.07	0.13
Bleders Creek-C	9340	25-year	5124.00	619.40	625.02		625.15	0.000486	1.93	2657.87	525.44	0.15
Bleders Creek-C	9340	50-year	6306.00	619.40	625.57		625.64	0.000500	2.14	2949.65	533.62	0.16
Bleders Creek-C	9340	100-year	7445.00	619.40	625.99		626.07	0.000588	2.35	3172.18	539.78	0.17
Bleders Creek-C	9340	500-year	14129.00	619.40	628.07		628.22	0.000710	3.15	5464.20	2215.38	0.20

## HEC-RAS Plan: Guad River River: Reach #1 Reach: Reach #1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft/ft)	E.G. Slope (ft/s)	Vel Chnl (sq ft)	Flow Area (ft)	Top Width	Froude # Chl
Reach #1	52710	2-yr	10201.00	584.00	600.16	600.61	0.002465	5.84	2165.01	270.51	0.28	
Reach #1	52710	5-yr	26133.00	584.00	608.47	609.07	0.001961	7.23	4759.17	352.24	0.27	
Reach #1	52710	10-yr	39222.00	584.00	613.00	613.74	0.001964	8.21	6472.68	407.23	0.28	
Reach #1	52710	25-yr	57046.00	584.00	618.22	619.06	0.001836	8.97	8791.17	755.67	0.28	
Reach #1	52710	50-yr	71538.00	584.00	621.53	622.34	0.001720	9.29	12027.37	1136.32	0.28	
Reach #1	52710	100-yr	85618.00	584.00	624.55	625.45	0.001847	10.18	15850.24	1313.90	0.29	
Reach #1	52710	500-yr	133217.00	584.00	635.55	635.96	0.000800	7.95	36924.83	3082.50	0.20	
Reach #1	52190	2-yr	10201.00	583.20	598.89	599.54	0.000905	6.86	2194.55	397.63	0.34	
Reach #1	52190	5-yr	26133.00	583.20	607.87	608.46	0.000524	7.48	6695.05	597.35	0.28	
Reach #1	52190	10-yr	39222.00	583.20	612.50	613.12	0.000474	8.10	9560.66	640.61	0.28	
Reach #1	52190	25-yr	57046.00	583.20	617.84	618.48	0.000417	8.59	14431.26	1112.05	0.27	
Reach #1	52190	50-yr	71538.00	583.20	621.15	621.80	0.000399	8.98	18337.12	1249.21	0.27	
Reach #1	52190	100-yr	85618.00	583.20	624.25	624.88	0.000370	9.16	22406.46	1382.68	0.26	
Reach #1	52190	500-yr	133217.00	583.20	634.68	635.49	0.000378	10.88	44792.84	3784.70	0.28	
Reach #1	51690	2-yr	10201.00	583.00	598.13	599.15	0.001566	8.91	1803.87	289.40	0.44	
Reach #1	51690	5-yr	26133.00	583.00	607.25	608.21	0.000924	9.86	5530.28	547.86	0.37	
Reach #1	51690	10-yr	39222.00	583.00	611.97	612.90	0.000781	10.35	8356.51	638.77	0.36	
Reach #1	51690	25-yr	57046.00	583.00	617.48	618.31	0.000616	10.43	13076.70	983.86	0.33	
Reach #1	51690	50-yr	71538.00	583.00	620.83	621.64	0.000568	10.71	16611.70	1117.20	0.32	
Reach #1	51690	100-yr	85618.00	583.00	623.96	624.74	0.000521	10.85	20476.48	1334.33	0.31	
Reach #1	51690	500-yr	133217.00	583.00	634.35	635.33	0.000537	12.93	40927.15	3826.76	0.33	
Reach #1	51170	2-yr	10201.00	581.50	597.66	598.48	0.000972	7.36	1517.55	145.35	0.35	
Reach #1	51170	5-yr	26133.00	581.50	606.03	607.66	0.001081	10.73	3693.97	407.09	0.41	
Reach #1	51170	10-yr	39222.00	581.50	610.36	612.35	0.001127	12.36	5780.41	552.66	0.43	
Reach #1	51170	25-yr	57046.00	581.50	615.87	617.83	0.000972	13.06	9501.40	897.05	0.41	
Reach #1	51170	50-yr	71538.00	581.50	619.41	621.21	0.000862	13.19	13758.42	1427.01	0.39	
Reach #1	51170	100-yr	85618.00	581.50	622.93	624.39	0.000693	12.60	19603.40	1863.05	0.36	
Reach #1	51170	500-yr	133217.00	581.50	634.28	635.06	0.000363	10.83	48670.98	3777.39	0.27	
Reach #1	50650	2-yr	10201.00	580.00	597.58	597.96	0.000454	4.95	2222.78	210.32	0.24	
Reach #1	50650	5-yr	26133.00	580.00	606.18	606.98	0.000507	7.35	4319.98	294.96	0.28	
Reach #1	50650	10-yr	39222.00	580.00	610.47	611.63	0.000595	8.98	5754.93	372.59	0.31	
Reach #1	50650	25-yr	57046.00	580.00	615.74	617.26	0.000627	10.43	8009.71	480.55	0.33	
Reach #1	50650	50-yr	71538.00	580.00	618.98	620.78	0.000670	11.52	9686.98	550.26	0.35	
Reach #1	50650	100-yr	85618.00	580.00	621.94	623.94	0.000684	12.30	11373.60	582.68	0.36	
Reach #1	50650	500-yr	133217.00	580.00	632.10	634.60	0.000658	14.17	18114.24	917.91	0.36	
Reach #1	50210	2-yr	10201.00	581.00	597.45	597.82	0.000488	4.90	2189.31	221.55	0.25	
Reach #1	50210	5-yr	26133.00	581.00	606.09	606.82	0.000485	7.01	4526.09	313.34	0.27	
Reach #1	50210	10-yr	39222.00	581.00	610.39	611.43	0.000554	8.49	5953.86	353.44	0.30	
Reach #1	50210	25-yr	57046.00	581.00	615.66	617.04	0.000586	9.93	8077.99	448.41	0.32	
Reach #1	50210	50-yr	71538.00	581.00	618.89	620.55	0.000628	10.99	9584.84	490.54	0.33	
Reach #1	50210	100-yr	85618.00	581.00	621.81	623.72	0.000657	11.89	11106.95	551.98	0.35	
Reach #1	50210	500-yr	133217.00	581.00	631.99	634.39	0.000626	13.68	17659.21	859.12	0.35	

## 8.5 New HEC-RAS Model Run Results and Data

## 100-YR Water Surface Elevation Difference

### Bleders Creek 100-yr Water Surface Elevation Difference

Model Run	Q (CFS)	13409 Headwaters Comal	14370 Lakeview St	15250
		<b>633.62</b>	<b>638.37</b>	<b>639.55</b>
1	-1000	<u>633.05</u> -0.57	<u>637.57</u> -0.80	<u>639.18</u> -0.37
2	-2000	<u>632.42</u> -1.20	<u>636.66</u> -1.71	<u>638.49</u> -1.06
3	-1500	<u>632.74</u> -0.88	<u>637.10</u> -1.27	<u>638.77</u> -0.78
4	-1700	<u>632.61</u> -1.01	<u>636.93</u> -1.44	<u>638.66</u> -0.89

### Guadalupe River 100-yr Water Surface Elevation Difference

Model Run	Q (CFS)	50210	51170	51690	52710
		<b>621.81</b>	<b>622.93</b>	<b>623.96</b>	<b>624.55</b>
1	+1700	<u>622.09</u> 0.28	<u>623.26</u> 0.33	<u>624.30</u> 0.34	<u>624.88</u> 0.33

### Comal River/Landa Lake 100-yr Water Surface

Model Run	Q (CFS)	9340	11090	12120
		<b>625.99</b>	<b>628.95</b>	<b>630.97</b>
1	-1700	<u>625.28</u> -0.71	<u>628.01</u> -0.94	<u>629.89</u> -1.08

HEC-RAS Plan: Bleders River: Reach #1 Reach: Bleders Creek-C

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Bleders Creek-C	16180	2-year	973.00	634.64	638.61		638.66	0.000370	1.78	555.72	246.13	0.20
Bleders Creek-C	16180	5-year	2247.00	634.64	639.77		639.88	0.000544	2.77	876.46	307.99	0.25
Bleders Creek-C	16180	10-year	3271.00	634.64	640.28		640.46	0.000733	3.50	1053.06	387.04	0.30
Bleders Creek-C	16180	25-year	4804.00	634.64	640.85		641.14	0.000986	4.42	1295.41	455.89	0.36
Bleders Creek-C	16180	50-year	5995.00	634.64	641.26		641.62	0.001125	4.99	1490.47	504.52	0.39
Bleders Creek-C	16180	100-year	6963.00	634.64	641.42		641.86	0.001352	5.57	1571.59	523.42	0.42
Bleders Creek-C	16180	500-year	13936.00	634.64	642.67		643.60	0.002299	8.36	2304.04	625.15	0.57
Bleders Creek-C	16040	2-year	973.00	636.00	638.55	637.10	638.61	0.000310	1.95	509.48	298.07	0.24
Bleders Creek-C	16040	5-year	2247.00	636.00	639.72	637.84	639.81	0.000537	2.57	932.67	408.85	0.27
Bleders Creek-C	16040	10-year	3271.00	636.00	640.22	638.32	640.35	0.000403	3.01	1278.64	1049.43	0.29
Bleders Creek-C	16040	25-year	4804.00	636.00	640.80	638.92	640.94	0.000947	3.30	1924.84	1197.96	0.29
Bleders Creek-C	16040	50-year	5995.00	636.00	641.22	639.30	641.35	0.000558	3.36	2447.47	1305.78	0.28
Bleders Creek-C	16040	100-year	6963.00	636.00	641.37	639.56	641.52	0.000945	3.62	2657.12	1346.61	0.30
Bleders Creek-C	16040	500-year	13936.00	636.00	642.73	641.05	642.91	0.003639	4.15	4708.56	1646.73	0.30
Bleders Creek-C	15680	2-year	917.00	632.44	635.76	635.76	636.01	0.016877	5.12	258.75	240.22	0.57
Bleders Creek-C	15680	5-year	2349.00	632.44	636.83	636.35	637.10	0.012087	5.48	599.56	377.35	0.51
Bleders Creek-C	15680	10-year	3466.00	632.44	637.73	636.68	637.96	0.007026	4.84	933.85	436.63	0.40
Bleders Creek-C	15680	25-year	5026.00	632.44	638.83	637.09	639.04	0.004730	4.59	1394.59	787.62	0.34
Bleders Creek-C	15680	50-year	6188.00	632.44	639.54	637.38	639.76	0.003898	4.52	1740.53	1077.88	0.32
Bleders Creek-C	15680	100-year	7306.00	632.44	640.17	637.63	640.31	0.002569	3.90	3070.16	1528.13	0.26
Bleders Creek-C	15680	500-year	14070.00	632.44	642.04	638.95	642.14	0.001693	3.71	6028.05	1638.52	0.22
Bleders Creek-C	15250	2-year	100.00	625.57	630.61		630.62	0.000495	0.89	112.48	44.73	0.10
Bleders Creek-C	15250	5-year	649.00	625.57	632.82		632.94	0.002651	2.87	247.86	93.25	0.24
Bleders Creek-C	15250	10-year	1766.00	625.57	634.98		635.20	0.003402	4.24	555.55	206.13	0.29
Bleders Creek-C	15250	25-year	3326.00	625.57	636.82		637.06	0.003054	4.75	1049.20	329.63	0.29
Bleders Creek-C	15250	50-year	4488.00	625.57	637.88		638.10	0.002704	4.84	1436.57	401.35	0.28
Bleders Creek-C	15250	100-year	5606.00	625.57	638.66		638.94	0.003216	5.57	1860.29	725.36	0.31
Bleders Creek-C	15250	500-year	12370.00	625.57	641.24		641.39	0.001891	4.96	5122.62	1505.64	0.24
Bleders Creek-C	14850	2-year	100.00	624.35	630.51		630.51	0.000186	0.63	161.85	62.90	0.06
Bleders Creek-C	14850	5-year	649.00	624.35	632.04		632.13	0.001795	2.52	293.57	108.02	0.20
Bleders Creek-C	14850	10-year	1766.00	624.35	633.84		634.06	0.003177	4.14	513.88	137.34	0.28
Bleders Creek-C	14850	25-year	3326.00	624.35	635.55		635.89	0.004053	5.45	828.34	237.11	0.33
Bleders Creek-C	14850	50-year	4488.00	624.35	636.74		637.09	0.003760	5.74	1235.70	532.29	0.33
Bleders Creek-C	14850	100-year	5606.00	624.35	637.76		638.02	0.002841	5.34	1968.20	901.97	0.29
Bleders Creek-C	14850	500-year	12370.00	624.35	640.97		641.04	0.000886	3.56	6661.79	1520.78	0.17
Bleders Creek-C	14700	2-year	100.00	626.10	630.48	627.40	630.50	0.000103	1.34	137.46	77.36	0.11
Bleders Creek-C	14700	5-year	649.00	626.10	631.69	629.37	631.95	0.001208	5.42	254.37	112.36	0.40
Bleders Creek-C	14700	10-year	1766.00	626.10	633.18	632.31	633.74	0.002327	8.81	519.02	248.69	0.58
Bleders Creek-C	14700	25-year	3326.00	626.10	635.36	633.80	635.66	0.001212	7.60	1138.43	315.42	0.44
Bleders Creek-C	14700	50-year	4488.00	626.10	636.42	634.33	636.82	0.001516	9.14	1517.54	472.05	0.50
Bleders Creek-C	14700	100-year	5606.00	626.10	637.43	634.76	637.79	0.001372	9.26	2157.74	800.76	0.48
Bleders Creek-C	14700	500-year	12370.00	626.10	640.84	635.99	640.97	0.000549	6.98	5602.63	1083.17	0.32
Bleders Creek-C	14670	Culvert										
Bleders Creek-C	14640	2-year	100.00	625.56	630.47	627.04	630.49	0.000346	1.11	133.21	77.97	0.09
Bleders Creek-C	14640	5-year	649.00	625.56	631.76	629.82	631.93	0.003558	4.19	259.50	114.38	0.30
Bleders Creek-C	14640	10-year	1766.00	625.56	633.44	631.88	633.71	0.005813	6.30	548.27	228.11	0.40
Bleders Creek-C	14640	25-year	3326.00	625.56	635.41	633.42	635.61	0.003501	5.69	1060.22	286.99	0.32
Bleders Creek-C	14640	50-year	4488.00	625.56	636.57	633.91	636.78	0.003426	6.07	1430.98	383.60	0.33
Bleders Creek-C	14640	100-year	5606.00	625.56	637.57	634.33	637.77	0.003121	6.15	1883.36	524.81	0.31
Bleders Creek-C	14640	500-year	12370.00	625.56	640.85	636.00	640.97	0.001600	5.18	5218.64	1126.52	0.23
Bleders Creek-C	14588	2-year	100.00	625.06	630.47		630.47	0.000091	0.43	230.80	72.39	0.04
Bleders Creek-C	14588	5-year	649.00	625.06	631.72		631.78	0.001449	1.98	328.59	84.34	0.18
Bleders Creek-C	14588	10-year	1766.00	625.06	633.29		633.50	0.003271	3.66	531.69	189.44	0.28
Bleders Creek-C	14588	25-year	3326.00	625.06	635.24		635.47	0.002831	4.19	1013.65	284.05	0.27
Bleders Creek-C	14588	50-year	4488.00	625.06	636.41		636.65	0.002593	4.43	1377.61	370.02	0.27
Bleders Creek-C	14588	100-year	5606.00	625.06	637.42		637.65	0.002333	4.53	1826.71	522.20	0.26
Bleders Creek-C	14588	500-year	12370.00	625.06	640.77		640.91	0.001361	4.23	5231.32	1146.20	0.21
Bleders Creek-C	14472	2-year	100.00	624.95	630.46		630.46	0.000091	0.45	223.36	75.07	0.04
Bleders Creek-C	14472	5-year	649.00	624.95	631.54		631.61	0.001456	2.17	317.22	98.84	0.18
Bleders Creek-C	14472	10-year	1766.00	624.95	632.79		633.07	0.004272	4.39	465.34	144.37	0.32
Bleders Creek-C	14472	25-year	3326.00	624.95	634.71		635.09	0.004369	5.38	834.64	256.10	0.34
Bleders Creek-C	14472	50-year	4488.00	624.95	635.98		636.33	0.003673	5.47	1220.68	355.37	0.32
Bleders Creek-C	14472	100-year	5606.00	624.95	637.06		637.37	0.003162	5.47	1692.44	523.34	0.30
Bleders Creek-C	14472	500-year	12370.00	624.95	640.66		640.80	0.001454	4.56	5297.90	1172.70	0.22
Bleders Creek-C	14420	2-year	100.00	624.43	630.46		630.46	0.000040	0.36	307.32	109.14	0.03
Bleders Creek-C	14420	5-year	649.00	624.43	631.50		631.54	0.000678	1.68	437.76	140.22	0.13
Bleders Creek-C	14420	10-year	1766.00	624.43	632.73		632.87	0.001939	3.27	632.06	177.09	0.22
Bleders Creek-C	14420	25-year	3326.00	624.43	634.69		634.88	0.002027	3.98	1051.10	272.29	0.24
Bleders Creek-C	14420	50-year	4488.00	624.43	635.97		636.15	0.001758	4.06	1466.54	376.73	0.23
Bleders Creek-C	14420	100-year	5606.00	624.43	637.04		637.22	0.001802	4.41	2079.95	773.90	0.24
Bleders Creek-C	14420	500-year	12370.00	624.43	640.68		640.75	0.000537	2.91	6122.03	1191.17	0.13

HEC-RAS Plan: Blieders River: Reach #1 Reach: Blieders Creek-C (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chnl
Blieders Creek-C	14370	2-year	100.00	630.00	630.30	630.30	630.44	0.019985	3.01	33.24	118.05	1.00
Blieders Creek-C	14370	5-year	649.00	630.00	630.98	630.98	631.41	0.014019	5.25	123.67	146.05	1.00
Blieders Creek-C	14370	10-year	1766.00	630.00	632.29		632.69	0.004583	5.06	350.67	202.45	0.65
Blieders Creek-C	14370	25-year	3326.00	630.00	634.56		634.80	0.001019	4.06	937.60	315.18	0.35
Blieders Creek-C	14370	50-year	4488.00	630.00	635.87		636.09	0.000669	3.96	1393.87	378.09	0.30
Blieders Creek-C	14370	100-year	5606.00	630.00	636.93		637.16	0.000550	4.04	1939.33	679.69	0.28
Blieders Creek-C	14370	500-year	12370.00	630.00	640.56		640.72	0.000301	4.02	5581.04	1120.23	0.22
Blieders Creek-C	14320	2-year	100.00	622.08	627.30		627.31	0.000170	0.67	148.20	47.74	0.07
Blieders Creek-C	14320	5-year	649.00	622.08	630.12		630.19	0.000876	2.17	304.28	65.29	0.17
Blieders Creek-C	14320	10-year	1766.00	622.08	632.25		632.50	0.001967	4.08	505.85	121.93	0.26
Blieders Creek-C	14320	25-year	3326.00	622.08	634.20		634.67	0.002634	5.73	780.77	166.81	0.33
Blieders Creek-C	14320	50-year	4488.00	622.08	635.31		635.92	0.003329	6.69	1001.55	231.99	0.36
Blieders Creek-C	14320	100-year	5606.00	622.08	636.25		636.96	0.003602	7.36	1246.53	296.79	0.38
Blieders Creek-C	14320	500-year	12370.00	622.08	639.65		640.49	0.004000	9.23	3735.42	1122.47	0.42
Blieders Creek-C	14217	2-year	100.00	622.35	627.28		627.29	0.000191	0.73	137.61	42.90	0.07
Blieders Creek-C	14217	5-year	649.00	622.35	629.99		630.08	0.001193	2.41	268.76	53.82	0.19
Blieders Creek-C	14217	10-year	1766.00	622.35	631.92		632.25	0.003067	4.63	415.43	98.80	0.32
Blieders Creek-C	14217	25-year	3326.00	622.35	633.74		634.32	0.004188	6.37	698.37	171.94	0.39
Blieders Creek-C	14217	50-year	4488.00	622.35	634.81		635.54	0.004680	7.29	897.99	206.15	0.42
Blieders Creek-C	14217	100-year	5606.00	622.35	635.73		636.57	0.004932	7.96	1103.04	240.07	0.44
Blieders Creek-C	14217	500-year	12370.00	622.35	639.31		640.16	0.004640	9.41	3746.10	1139.95	0.44
Blieders Creek-C	13880	2-year	100.00	621.79	627.26		627.26	0.000056	0.46	219.77	55.61	0.04
Blieders Creek-C	13880	5-year	649.00	621.79	629.78		629.83	0.000472	1.78	419.19	119.50	0.12
Blieders Creek-C	13880	10-year	1766.00	621.79	631.30		631.49	0.001550	3.70	632.41	159.48	0.23
Blieders Creek-C	13880	25-year	3326.00	621.79	632.77		633.18	0.002763	5.53	898.22	207.08	0.32
Blieders Creek-C	13880	50-year	4488.00	621.79	633.68		634.23	0.003407	6.53	1101.83	242.56	0.36
Blieders Creek-C	13880	100-year	5606.00	621.79	634.44		635.14	0.004020	7.44	1306.17	310.52	0.39
Blieders Creek-C	13880	500-year	12370.00	621.79	638.10		638.94	0.004315	9.32	3153.98	638.38	0.43
Blieders Creek-C	13517	2-year	100.00	622.14	627.24		627.24	0.000037	0.40	252.21	76.10	0.04
Blieders Creek-C	13517	5-year	649.00	622.14	629.66		629.70	0.000274	1.41	462.13	100.81	0.11
Blieders Creek-C	13517	10-year	1766.00	622.14	630.90		631.04	0.001005	3.04	599.94	125.39	0.22
Blieders Creek-C	13517	25-year	3326.00	622.14	631.99		632.34	0.002080	4.77	758.05	164.23	0.32
Blieders Creek-C	13517	50-year	4488.00	622.14	632.66		633.17	0.002791	5.79	875.63	187.00	0.38
Blieders Creek-C	13517	100-year	5606.00	622.14	633.22		633.88	0.003423	6.65	984.64	205.86	0.42
Blieders Creek-C	13517	500-year	12370.00	622.14	635.91		637.37	0.005730	10.14	1809.96	452.81	0.57
Blieders Creek-C	13480	2-year	100.00	621.60	627.23	622.52	627.24	0.000032	0.88	113.67	58.74	0.07
Blieders Creek-C	13480	5-year	700.00	621.60	629.64	624.95	629.68	0.000124	1.80	463.74	139.52	0.13
Blieders Creek-C	13480	10-year	1831.00	621.60	630.81	627.78	631.01	0.000416	3.70	641.20	158.13	0.24
Blieders Creek-C	13480	25-year	3424.00	621.60	631.82	628.28	632.26	0.000850	5.77	804.50	166.98	0.35
Blieders Creek-C	13480	50-year	4606.00	621.60	632.39	629.55	633.06	0.001189	7.14	904.87	187.63	0.42
Blieders Creek-C	13480	100-year	5745.00	621.60	632.83	630.45	633.74	0.001529	8.36	992.45	209.09	0.48
Blieders Creek-C	13480	500-year	12429.00	621.60	634.46	633.88	637.01	0.003709	14.49	1466.83	490.36	0.77
Blieders Creek-C	13445	Culvert										
Blieders Creek-C	13410	2-year	100.00	621.08	622.73	621.75	622.78	0.001995	1.85	54.15	50.80	0.25
Blieders Creek-C	13410	5-year	700.00	621.08	625.68	623.50	626.01	0.003174	4.62	151.42	57.90	0.38
Blieders Creek-C	13410	10-year	1831.00	621.08	628.43	625.67	628.75	0.002176	4.59	414.54	91.66	0.32
Blieders Creek-C	13410	25-year	3424.00	621.08	630.90	626.78	631.38	0.002228	5.76	770.20	192.66	0.34
Blieders Creek-C	13410	50-year	4606.00	621.08	631.98	627.59	632.57	0.002468	6.54	1001.89	237.33	0.36
Blieders Creek-C	13410	100-year	5745.00	621.08	632.79	628.66	633.48	0.002731	7.24	1214.32	287.34	0.39
Blieders Creek-C	13410	500-year	12429.00	621.08	636.10	633.17	636.93	0.003002	9.07	3202.28	845.74	0.42
Blieders Creek-C	13409	2-year	100.00	620.41	622.62		622.64	0.000926	1.20	83.13	53.66	0.17
Blieders Creek-C	13409	5-year	700.00	620.41	625.60		625.70	0.001375	2.61	268.30	72.13	0.24
Blieders Creek-C	13409	10-year	1831.00	620.41	628.29		628.52	0.001588	3.82	489.49	95.75	0.28
Blieders Creek-C	13409	25-year	3424.00	620.41	630.78		631.14	0.001644	4.91	806.04	178.56	0.30
Blieders Creek-C	13409	50-year	4606.00	620.41	631.83		632.30	0.001893	5.70	1026.26	239.81	0.33
Blieders Creek-C	13409	100-year	5745.00	620.41	632.61		633.20	0.002140	6.39	1240.58	311.46	0.35
Blieders Creek-C	13409	500-year	12429.00	620.41	635.72		636.63	0.002827	8.76	2641.97	567.67	0.42

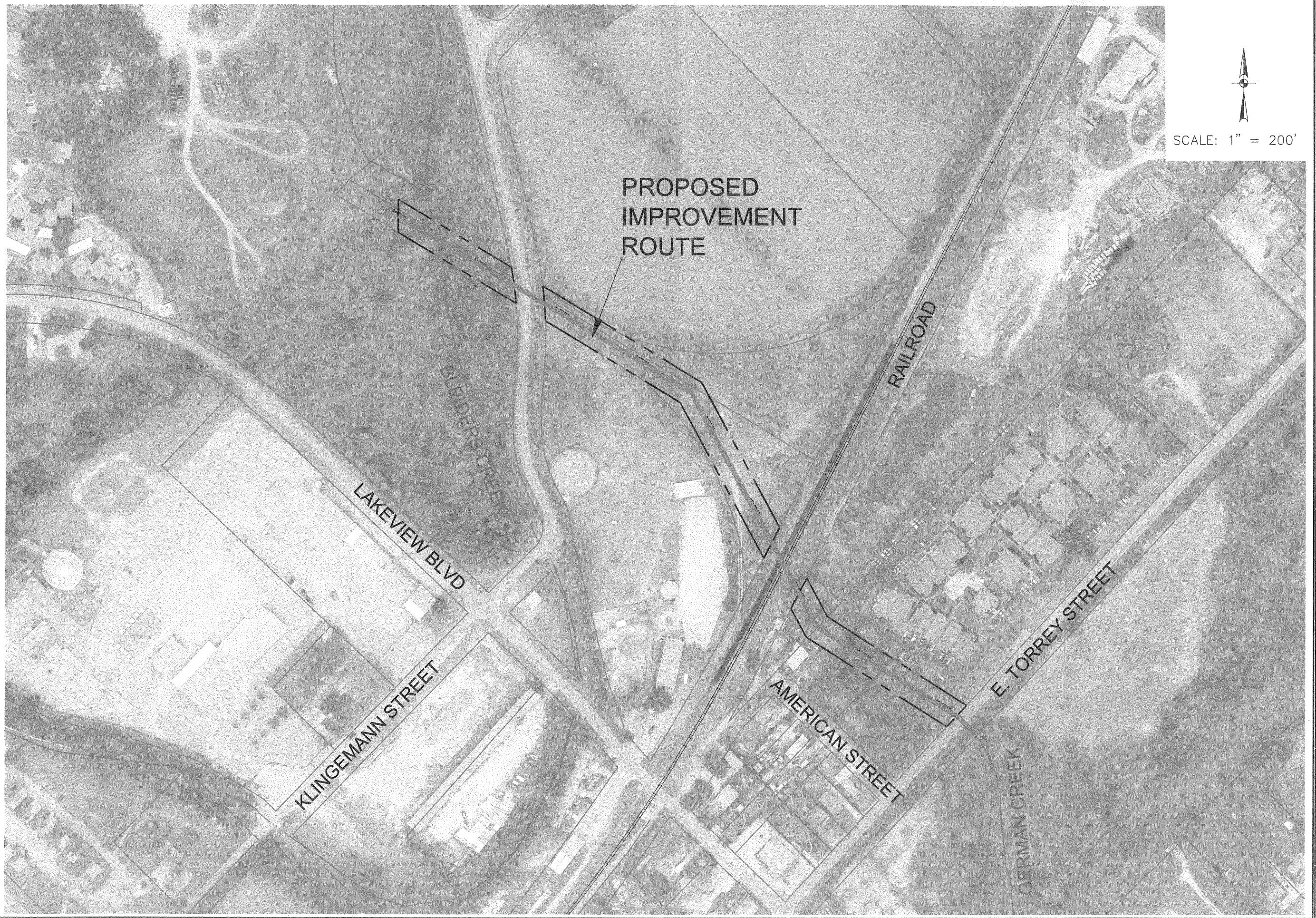
## HEC-RAS Plan: Bleders River: Reach #1 Reach: Bleders Creek-C

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Proude # Chl
Bleders Creek-C	12120	2-year	100.00	620.41	621.79		621.81	0.000731	0.95	105.38	81.73	0.15
Bleders Creek-C	12120	5-year	700.00	620.41	624.10		624.18	0.001224	2.19	318.98	103.10	0.22
Bleders Creek-C	12120	10-year	1831.00	620.41	626.15		626.33	0.001639	3.40	538.48	111.04	0.27
Bleders Creek-C	12120	25-year	3424.00	620.41	627.97		628.30	0.002119	4.59	746.59	118.16	0.32
Bleders Creek-C	12120	50-year	4606.00	620.41	629.03		629.46	0.002579	5.24	878.93	131.80	0.36
Bleders Creek-C	12120	100-year	5745.00	620.41	629.89		630.40	0.002944	5.76	996.83	143.07	0.38
Bleders Creek-C	12120	500-year	12429.00	620.41	633.18		634.08	0.003983	7.75	2111.98	943.74	0.46
Bleders Creek-C	11800	2-year	100.00	620.53	621.44		621.46	0.001813	1.16	86.06	97.25	0.22
Bleders Creek-C	11800	5-year	700.00	620.53	623.70		623.77	0.001364	2.15	325.48	117.38	0.23
Bleders Creek-C	11800	10-year	1831.00	620.53	625.62		625.78	0.001837	3.17	577.28	145.36	0.28
Bleders Creek-C	11800	25-year	3424.00	620.53	627.36		627.62	0.002021	4.06	843.04	156.21	0.31
Bleders Creek-C	11800	50-year	4606.00	620.53	628.34		628.67	0.002217	4.62	998.01	163.13	0.33
Bleders Creek-C	11800	100-year	5745.00	620.53	629.11		629.51	0.002490	5.09	1127.60	173.43	0.35
Bleders Creek-C	11800	500-year	12429.00	620.53	632.05	627.76	632.90	0.003430	7.43	1856.73	1371.28	0.44
Bleders Creek-C	11450	2-year	100.00	619.79	621.17		621.18	0.000470	0.76	131.00	100.66	0.12
Bleders Creek-C	11450	5-year	700.00	619.79	623.31		623.37	0.001022	1.91	366.11	126.45	0.20
Bleders Creek-C	11450	10-year	1831.00	619.79	625.06		625.20	0.001629	3.00	610.90	152.59	0.26
Bleders Creek-C	11450	25-year	3424.00	619.79	626.68		626.91	0.002183	3.89	880.91	188.99	0.31
Bleders Creek-C	11450	50-year	4606.00	619.79	627.58		627.87	0.002544	4.35	1064.62	220.53	0.34
Bleders Creek-C	11450	100-year	5745.00	619.79	628.29		628.64	0.002675	4.71	1233.79	260.01	0.36
Bleders Creek-C	11450	500-year	12429.00	619.79	631.23		631.82	0.002669	6.28	2533.84	732.61	0.38
Bleders Creek-C	11090	2-year	100.00	619.68	621.10		621.11	0.000109	0.31	321.96	244.63	0.05
Bleders Creek-C	11090	5-year	700.00	619.68	623.18		623.19	0.000234	0.83	840.56	256.11	0.08
Bleders Creek-C	11090	10-year	1831.00	619.68	624.85		624.89	0.000411	1.43	1304.04	327.82	0.11
Bleders Creek-C	11090	25-year	3424.00	619.68	626.44		626.49	0.000539	1.97	1915.03	432.84	0.14
Bleders Creek-C	11090	50-year	4606.00	619.68	627.31		627.38	0.000610	2.28	2307.03	466.11	0.15
Bleders Creek-C	11090	100-year	5745.00	619.68	628.01		628.11	0.000674	2.55	2644.28	493.02	0.16
Bleders Creek-C	11090	500-year	12429.00	619.68	630.92		631.12	0.000980	3.78	5144.42	1573.83	0.20
Bleders Creek-C	10750	2-year	100.00	619.68	621.03		621.03	0.000497	0.51	196.09	174.70	0.08
Bleders Creek-C	10750	5-year	700.00	619.68	623.04		623.06	0.000769	1.03	682.44	295.50	0.12
Bleders Creek-C	10750	10-year	1831.00	619.68	624.64		624.68	0.000937	1.57	1166.50	309.02	0.14
Bleders Creek-C	10750	25-year	3424.00	619.68	626.17		626.24	0.001081	2.08	1646.47	319.26	0.16
Bleders Creek-C	10750	50-year	4606.00	619.68	627.01		627.10	0.001186	2.41	1916.41	325.49	0.17
Bleders Creek-C	10750	100-year	5745.00	619.68	627.67		627.79	0.001297	2.70	2135.77	330.47	0.18
Bleders Creek-C	10750	500-year	12429.00	619.68	630.43		630.67	0.001783	3.99	3952.50	1794.21	0.23
Bleders Creek-C	10310	2-year	100.00	619.70	620.87		620.87	0.000349	0.57	176.11	169.91	0.10
Bleders Creek-C	10310	5-year	700.00	619.70	622.78		622.80	0.000546	1.35	518.61	190.82	0.14
Bleders Creek-C	10310	10-year	1831.00	619.70	624.21		624.29	0.001002	2.27	807.25	215.02	0.21
Bleders Creek-C	10310	25-year	3424.00	619.70	625.60		625.74	0.001460	3.01	1139.59	265.61	0.25
Bleders Creek-C	10310	50-year	4606.00	619.70	626.36		626.54	0.001634	3.42	1351.82	284.11	0.27
Bleders Creek-C	10310	100-year	5745.00	619.70	626.97		627.19	0.001747	3.78	1525.61	290.36	0.29
Bleders Creek-C	10310	500-year	12429.00	619.70	629.52		629.91	0.001984	5.16	3451.59	1587.98	0.33
Bleders Creek-C	10150	2-year	100.00	619.70	620.75		620.76	0.000963	0.83	121.09	142.63	0.16
Bleders Creek-C	10150	5-year	700.00	619.70	622.61		622.65	0.000995	1.58	442.85	201.61	0.19
Bleders Creek-C	10150	10-year	1831.00	619.70	623.93		624.03	0.001601	2.49	735.38	241.65	0.25
Bleders Creek-C	10150	25-year	3424.00	619.70	625.23		625.39	0.001811	3.22	1062.81	261.40	0.28
Bleders Creek-C	10150	50-year	4606.00	619.70	625.95		626.16	0.001982	3.68	1254.69	271.75	0.30
Bleders Creek-C	10150	100-year	5745.00	619.70	626.52		626.78	0.002126	4.08	1410.57	275.70	0.32
Bleders Creek-C	10150	500-year	12429.00	619.70	629.12		629.49	0.002058	5.20	4019.86	1981.52	0.33
Bleders Creek-C	9910	2-year	100.00	619.64	620.58		620.59	0.000523	0.62	160.08	180.16	0.12
Bleders Creek-C	9910	5-year	700.00	619.64	622.43		622.46	0.000624	1.39	502.06	190.03	0.15
Bleders Creek-C	9910	10-year	1831.00	619.64	623.57		623.67	0.001346	2.53	723.59	197.74	0.23
Bleders Creek-C	9910	25-year	3424.00	619.64	624.71		624.90	0.002322	3.48	983.13	251.78	0.31
Bleders Creek-C	9910	50-year	4606.00	619.64	625.36		625.61	0.002617	4.00	1150.66	261.73	0.34
Bleders Creek-C	9910	100-year	5745.00	619.64	625.86		626.17	0.002934	4.47	1284.14	269.39	0.36
Bleders Creek-C	9910	500-year	12429.00	619.64	628.23	625.04	628.80	0.003941	6.10	2387.82	1980.02	0.44
Bleders Creek-C	9600	2-year	100.00	619.40	620.43	619.80	620.43	0.000446	0.53	187.52	238.14	0.11
Bleders Creek-C	9600	5-year	700.00	619.40	622.23	620.29	622.25	0.000682	1.06	657.56	405.94	0.15
Bleders Creek-C	9600	10-year	1831.00	619.40	623.26	620.86	623.30	0.000923	1.62	1127.98	463.47	0.18
Bleders Creek-C	9600	25-year	3424.00	619.40	624.32	621.51	624.39	0.000999	2.10	1629.26	482.96	0.20
Bleders Creek-C	9600	50-year	4606.00	619.40	624.97	621.90	625.05	0.001043	2.37	1946.88	499.93	0.21
Bleders Creek-C	9600	100-year	5745.00	619.40	625.45	622.49	625.56	0.001130	2.62	2191.24	512.60	0.22
Bleders Creek-C	9600	500-year	12429.00	619.40	627.85	623.64	628.05	0.001189	3.58	3588.45	1476.09	0.25
Bleders Creek-C	9340	2-year	100.00	619.40	620.37	619.71	620.37	0.000130	0.28	357.87	476.69	0.06
Bleders Creek-C	9340	5-year	700.00	619.40	622.18	620.02	622.18	0.000107	0.57	1227.45	484.61	0.06
Bleders Creek-C	9340	10-year	1831.00	619.40	623.16	620.39	623.18	0.000253	1.07	1705.86	495.73	0.10
Bleders Creek-C	9340	25-year	3424.00	619.40	624.19	620.79	624.22	0.000382	1.54	2225.17	513.07	0.13
Bleders Creek-C	9340	50-year	4606.00	619.40	624.82	621.05	624.87	0.000447	1.81	2551.83	522.44	0.14
Bleders Creek-C	9340	100-year	5745.00	619.40	625.28	621.28	625.35	0.000521	2.06	2795.35	529.31	0.16
Bleders Creek-C	9340	500-year	12429.00	619.40	627.65	622.37	627.79	0.000716	3.06	4113.89	1360.14	0.20

## HEC-RAS Plan: Guad River River: Reach #1 Reach: Reach #1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach #1	52710	2-yr	10201.00	584.00	600.82		601.21	0.001994	5.43	2347.31	277.31	0.26
Reach #1	52710	5-yr	26133.00	584.00	609.04		609.60	0.001755	6.96	4961.27	358.48	0.26
Reach #1	52710	10-yr	39222.00	584.00	613.44		614.14	0.001827	8.01	6654.44	412.81	0.27
Reach #1	52710	25-yr	57046.00	584.00	618.60		619.40	0.001793	8.79	9092.10	806.09	0.28
Reach #1	52710	50-yr	71538.00	584.00	621.87		622.64	0.001626	9.09	12420.34	1152.49	0.27
Reach #1	52710	100-yr	85618.00	584.00	624.88		625.72	0.001732	9.91	16277.13	1320.95	0.28
Reach #1	52710	500-yr	133217.00	584.00	636.28		636.63	0.000703	7.53	39259.03	3354.56	0.19
Reach #1	52190	2-yr	10201.00	583.20	599.95		600.44	0.000634	6.06	2633.26	429.23	0.29
Reach #1	52190	5-yr	26133.00	583.20	608.53		609.05	0.000454	7.10	7093.80	604.35	0.27
Reach #1	52190	10-yr	39222.00	583.20	612.99		613.57	0.000435	7.85	9881.52	645.21	0.27
Reach #1	52190	25-yr	57046.00	583.20	618.25		618.85	0.000392	8.40	14883.17	1128.14	0.26
Reach #1	52190	50-yr	71538.00	583.20	621.51		622.13	0.000378	8.81	18790.31	1263.96	0.26
Reach #1	52190	100-yr	85618.00	583.20	624.57		625.18	0.000355	9.02	22855.44	1398.43	0.26
Reach #1	52190	500-yr	133217.00	583.20	635.42		636.19	0.000388	10.71	47686.89	4126.55	0.27
Reach #1	51690	2-yr	10201.00	583.00	599.45		600.18	0.001018	7.68	2206.01	319.75	0.36
Reach #1	51690	5-yr	26133.00	583.00	608.00		608.84	0.000766	9.31	5952.58	571.17	0.35
Reach #1	51690	10-yr	39222.00	583.00	612.54		613.38	0.000701	9.94	8760.33	739.59	0.34
Reach #1	51690	25-yr	57046.00	583.00	617.91		618.69	0.000573	10.15	13506.36	1002.45	0.32
Reach #1	51690	50-yr	71538.00	583.00	621.22		621.98	0.000536	10.48	17040.45	1128.90	0.31
Reach #1	51690	100-yr	85618.00	583.00	624.30		625.04	0.000496	10.65	20933.88	1345.87	0.30
Reach #1	51690	500-yr	133217.00	583.00	635.10		636.04	0.000510	12.73	43917.48	4167.62	0.32
Reach #1	51170	2-yr	11901.00	581.50	598.68		599.64	0.001028	7.95	1673.87	163.28	0.37
Reach #1	51170	5-yr	27833.00	581.50	606.60		608.31	0.001104	11.03	3931.84	427.45	0.41
Reach #1	51170	10-yr	40922.00	581.50	610.80		612.84	0.001139	12.57	6025.41	565.64	0.43
Reach #1	51170	25-yr	58746.00	581.50	616.25		618.22	0.000971	13.14	9850.26	957.65	0.41
Reach #1	51170	50-yr	73238.00	581.50	619.79		621.57	0.000848	13.17	14307.39	1459.00	0.39
Reach #1	51170	100-yr	87318.00	581.50	623.26		624.70	0.000682	12.57	20236.47	1894.33	0.35
Reach #1	51170	500-yr	134917.00	581.50	635.06		635.77	0.000331	10.45	51723.73	3989.12	0.26
Reach #1	50650	2-yr	11901.00	580.00	598.65		599.08	0.000471	5.31	2450.51	218.05	0.25
Reach #1	50650	5-yr	27833.00	580.00	606.76		607.61	0.000525	7.60	4492.26	305.85	0.29
Reach #1	50650	10-yr	40922.00	580.00	610.90		612.11	0.000609	9.19	5916.04	378.99	0.32
Reach #1	50650	25-yr	58746.00	580.00	616.09		617.65	0.000637	10.59	8180.06	488.02	0.33
Reach #1	50650	50-yr	73238.00	580.00	619.29		621.13	0.000677	11.65	9561.71	555.26	0.35
Reach #1	50650	100-yr	87318.00	580.00	622.23		624.25	0.000689	12.42	11540.61	585.82	0.36
Reach #1	50650	500-yr	134917.00	580.00	632.63		635.30	0.000679	14.50	18668.78	1189.13	0.37
Reach #1	50210	2-yr	11901.00	581.00	598.51		598.94	0.000497	5.24	2430.50	233.87	0.25
Reach #1	50210	5-yr	27833.00	581.00	606.67		607.44	0.000498	7.24	4707.98	318.38	0.28
Reach #1	50210	10-yr	40922.00	581.00	610.82		611.91	0.000568	8.70	6106.24	360.39	0.30
Reach #1	50210	25-yr	58746.00	581.00	616.01		617.43	0.000595	10.08	8236.48	452.71	0.32
Reach #1	50210	50-yr	73238.00	581.00	619.20		620.91	0.000636	11.13	9738.63	497.20	0.34
Reach #1	50210	100-yr	87318.00	581.00	622.09		624.04	0.000663	12.01	11263.47	566.71	0.35
Reach #1	50210	500-yr	134917.00	581.00	632.39		635.10	0.000675	14.28	18192.64	1396.46	0.37

## 8.6 Proposed Improvement Route Exhibit



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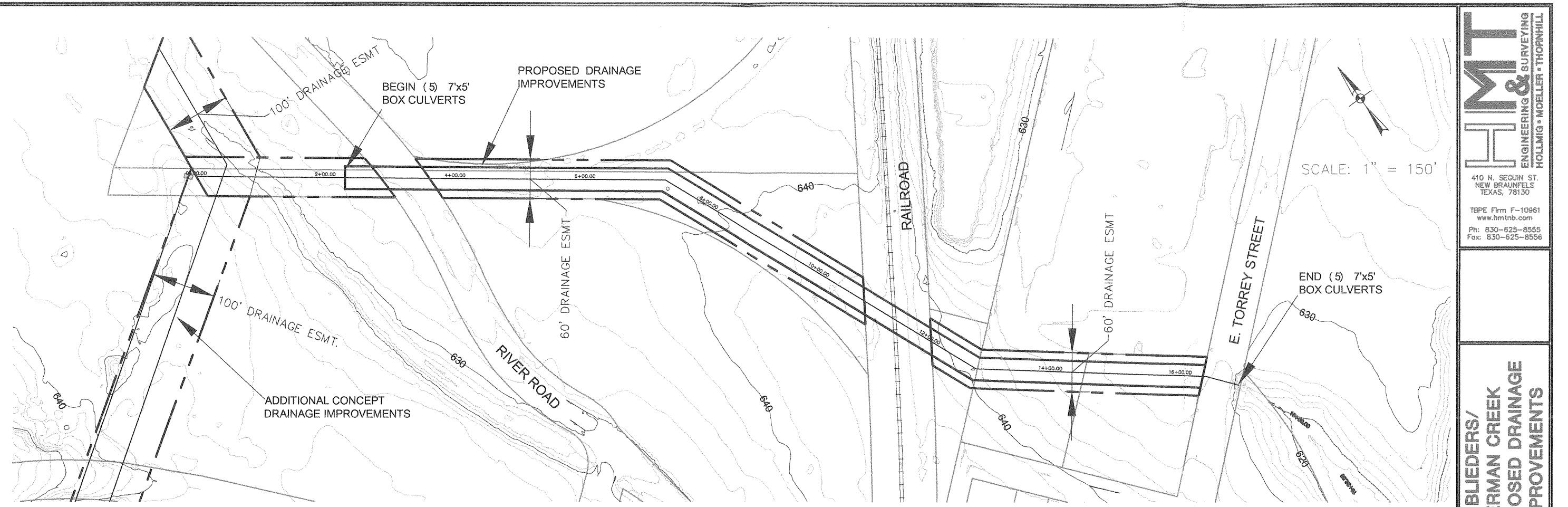
TBPE Firm F-10961  
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Fax: 830-625-8556

BLIEDERS/  
GERMAN CREEK  
PROPOSED DRAINAGE  
IMPROVEMENTS

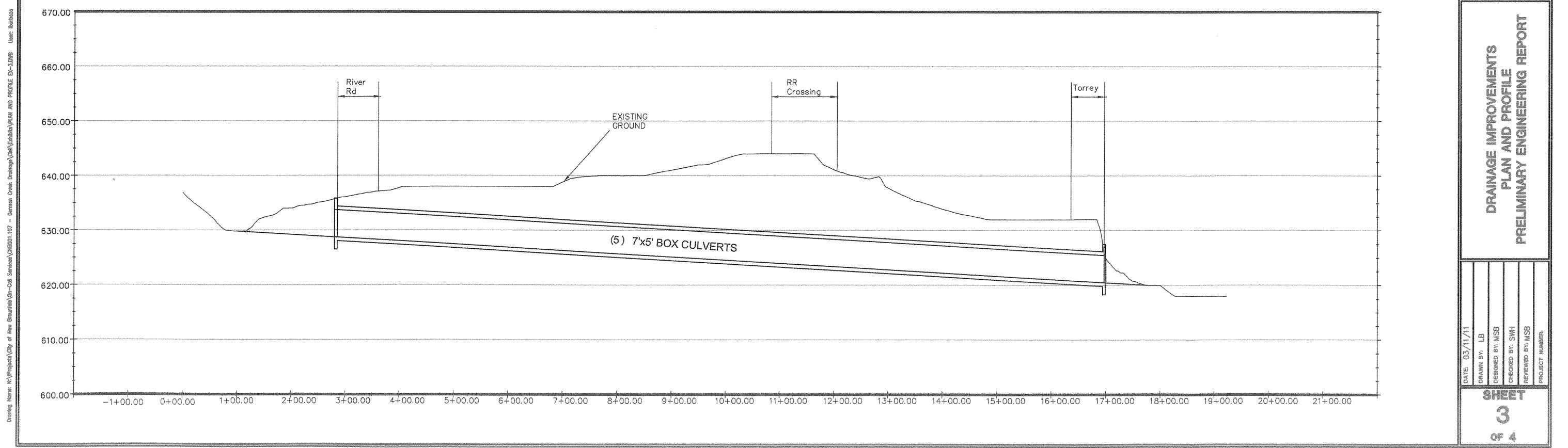
PROPOSED IMPROVEMENTS  
ROUTE EXHIBIT  
PRELIMINARY ENGINEERING REPORT

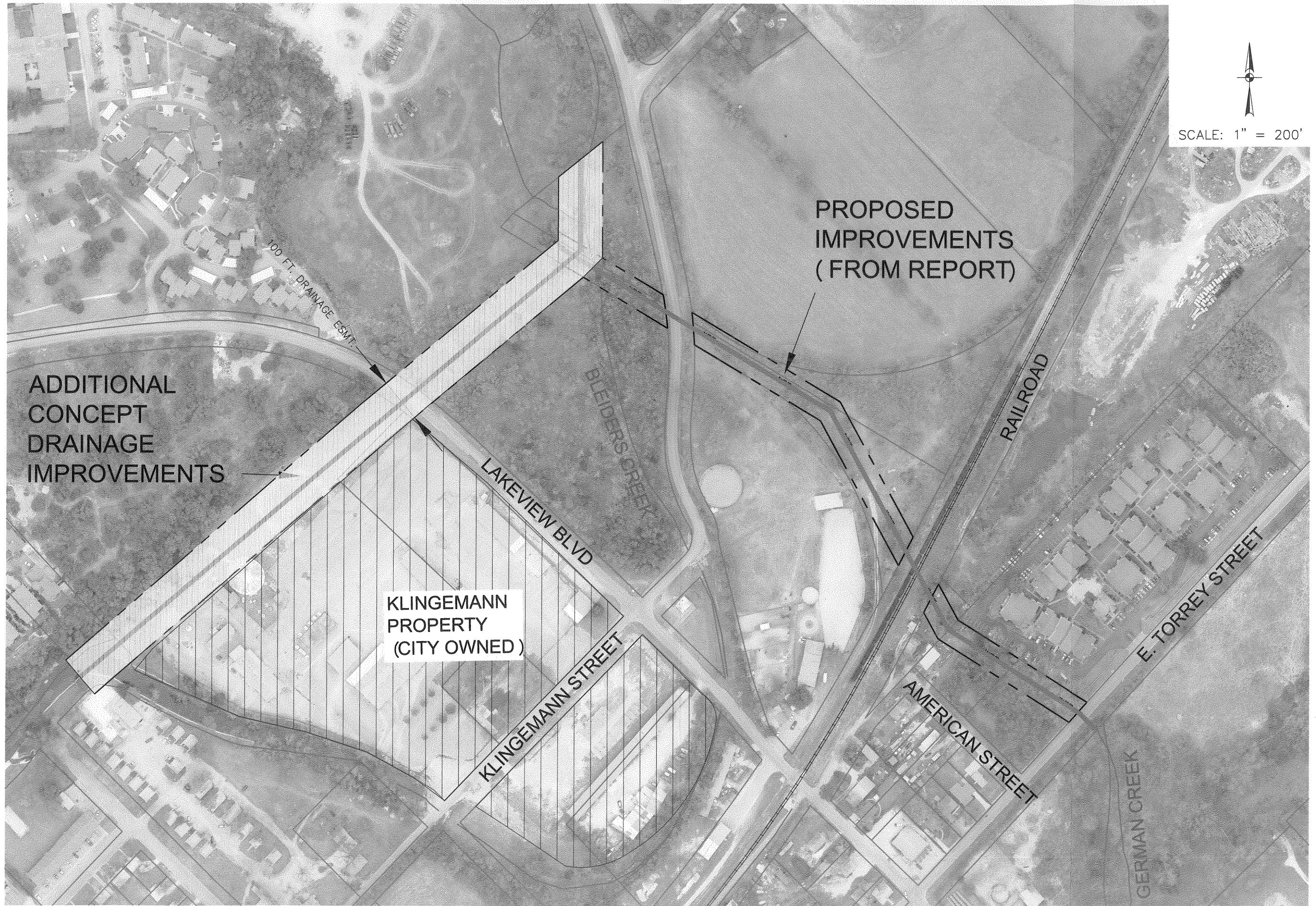
DATE: 03/16/11  
DRAWN BY: LB  
DESIGNED BY: MSB  
CHECKED BY: SWH  
REVIEWED BY: MSB  
PROJECT NUMBER:  
4 I 2  
HMT

## 8.7 Improvement Plan & Profile View with Calculations



( 5 ) 7'x5' BOX CULVERTS





DATE: 03/11/11  
DRAWN BY: LB  
DESIGNED BY: MSS  
CHECKED BY: SWH  
REVIEWED BY: MSS  
PROJECT NUMBER:  
SHE  
HMT  
4  
4

BLIEDERS/  
GERMAN CREEK  
PROPOSED DRAINAGE  
IMPROVEMENTS

ADDITIONAL IMPROVEMENTS  
CONSIDERATION EXHIBIT  
PRELIMINARY ENGINEERING REPORT

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## **8.9 Engineer's Cost Estimate**

# CAPITAL IMPROVEMENT PROGRAMS DIVISION COST ESTIMATE

<b>PROJECT NAME:</b>	Blieders/German Creek Area
<b>PROJECT LIMITS:</b>	Blieders Creek upstream of the Comal River; German Creek to the Guadalupe River
<b>DATE PREPARED:</b>	15-Mar-11
<b>DATE OF UNIT PRICE LIST USED:</b>	Oct-11
<b>DISTRICT(S):</b>	0
<b>SCOPE OF PROJECT:</b>	<p>Drainage related improvements to the area of Blieders/German Creek to include the following:</p> <ul style="list-style-type: none"><li>- Easement Acquisition</li><li>- Underground Box Culvert System</li><li>- Grading</li><li>- Boring under Railroad Tracks</li></ul>
<b>DESIGN PHASE COST:</b>	\$3,241,039
<b>CONSTRUCTION PHASE COST:</b>	\$5,315,517
<b>TOTAL COST:</b>	<b>\$8,556,556</b>
PLACE PHOTO HERE	PLACE MAP HERE
Upon selection or funding of this project, the cost estimate will be updated if necessary.	

## Blieders/German Creek Area Preliminary Engineering Report

### PROJECT ESTIMATE SUMMARY FORM

**PROJECT NUMBER:****PROJECT NAME:** Blieders/German Creek Area Drainage Imrpovements

**PROJECT LIMITS:** Blieders Creek upstream of the Comal River; German Creek to the Guadalupe River

**Firm Developing:** HMT Engineering & Surveying**Person Developing:** Staff**Date Developed:** 3/15/2011**CONSTRUCTION COSTS**

- STREET COST	\$0.00
- DRAINAGE COST	\$4,367,884.46
- TRAFFIC COST	\$0.00
- TREE PRESERVATION (1/2%)	\$21,839.42
- BOND AND INSURANCE (3%)	\$131,691.72
- BARICADES (3%)	\$135,642.47
- MOBILIZATION & PREPARATION OF R.O.W. (11% + 4%)	\$658,458.58

<b>TOTAL CONSTRUCTION COST ESTIMATE</b>	<b>\$5,315,516.64</b>
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<b>PROJECT MANAGEMENT FEE (0% of Budget)</b>	<b>\$0.00</b>
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<b>ENGINEER FEE (Fee Table plus 4%)</b>	<b>\$627,230.96</b>
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<b>ENGINEER CONTINGENCY (10%)</b>	<b>\$62,723.10</b>
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<b>CONSTRUCTION CONTINGENCY (10%)</b>	<b>\$531,551.66</b>
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<b>DESIGN ENHANCEMENT (1% Construction Costs)</b>	<b>\$53,155.17</b>
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**PERMITS**

FEMA - Letter of Map Revision	\$15,000.00
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TCEQ - Water Pollution Abatement Plan	\$15,000.00
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USACE - Regulatory Permits	\$10,000.00
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Railroad Pass-Through Permit	\$2,500.00
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<b>UTILITY RELOCATION COSTS</b>	<b>\$0.00</b>
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<b>RIGHT-OF-WAY (LAND ACQUISITION)</b>	<b>\$163,760.30</b>
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<b>RIGHT-OF-WAY SURVEY</b>	<b>\$13,200.00</b>
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<b>ENVIRONMENTAL</b>	<b>\$1,700.00</b>
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<b>MATERIAL TESTING (2% Construction Cost - &lt;\$1M, 1.5% - &gt;\$1M)</b>	<b>\$79,732.75</b>
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<b>FEMA FLOOD PLAIN STUDY</b>	<b>\$30,000.00</b>
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<b>PROJECT ADMIN. (9%)</b>	<b>\$622,896.35</b>
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<b>INFLATION FACTOR (6.5% compounded for 2 years)</b>	<b>\$1,012,588.96</b>
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<b>TOTAL PROJECT COST ESTIMATE</b>	<b>\$8,556,555.90</b>
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**Bleders/German Creek Area Preliminary Engineering Report**  
**PRELIMINARY DRAINAGE COST ESTIMATE**

PROJECT NAME: Bleders/German Creek Area Drainage Improvements

PROJECT LIMITS : Bleders Creek upstream of the Comal River; German Creek to the Guadalupe River

Developed By: HMT Engineering &amp; Surveying

Date Prepared: 03/15/11

Project Number:

**Bleders Creek/German Creek Area**

- Multiple Box Culvert System
- Entrance & Exit Headwalls
- Boring under Railroad Tracks

Description	Quantity	Unit	Unit Price	Cost
104.1 Street Excavation (1,000 C.Y. <X<10,000 C.Y.)	1395	CY	\$14.92	\$20,813.40
106.1 Box Culvert Excavation & Backfill (>10,000 C.Y.)	37250	CY	\$14.92	\$555,770.00
200.1 Flexible Base (16" Compacted Depth)	550	SY	\$17.74	\$9,757.00
205.4 Hot Mix Asphaltic Pavement, Type D (2" Comp. Depth) (< 5,000 S.Y.)	515	SY	\$8.35	\$4,300.25
307.1 Concrete Structure (Headwalls or Outfall Structures)	75	CY	\$902.42	\$67,681.50
309.1 Precast Reinforce Concrete Culvert (7"x5")	7100	LF	\$345.00	\$2,449,500.00
401.4 Safety End Treatment (Type II)	10	EA	\$3,500.00	\$35,000.00
403.1 Junction Box 4"x4"x4"	10	EA	\$3,461.07	\$34,610.70
406.2 Jacking or Tunneling Box Culvert (7"x5")	120	LF	\$5,500.00	\$660,000.00
505.1 Concrete Riprap (6" Thick) (<4,000 S.Y.)	820	SY	\$83.73	\$68,658.60
520.1 Hydromulching (Residential or Commercial)	11350	SY	\$1.00	\$11,350.00
540.1 Rock Filter Dams (Install/Remove) (Type 1)	110	LF	\$26.95	\$2,964.50
540.9 Temporary Sediment Control Fence	2250	LF	\$3.51	\$7,897.50
550.1 Trench Excavation Safety Protection	1420	LF	\$1.93	\$2,740.60
551.1 Temporary Special Shoring	11360	SF	\$3.50	\$39,760.00
Contingency	1	L.S.	10%	\$397,080
			Subtotal	\$4,367,884

Total Drainage:	\$4,367,884
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**Blieders/German Creek Area Preliminary Engineering Report**  
**PRELIMINARY REAL ESTATE COST ESTIMATE**

**PROJECT NAME:** Bleiders/German Creek Area Drainage Improvements

**PROJECT LIMITS :**

Blieders Creek upstream of the Comal River; German Creek to the Guadalupe River

**Developed By:** HMT Engineering & Surveying

**Date Prepared:** 03/15/11

Project Number:

Corner Clips - Minimum Impact	Qty	Acquisition Cost (EA)	Admin Cost (EA)	Cost
Number of minimum impact Residential (0-200 SF)		\$1,000	\$1,600	\$0

Address of minimum impact Commercial	No. of SF required	Bexar			Cost
		Appraisal Cost/SF	Acquisition Cost	Admin Cost	
		\$0	\$2,650	\$0	\$0
		\$0	\$2,650	\$0	\$0
		\$0	\$2,650	\$0	\$0
		\$0	\$2,650	\$0	\$0
		\$0	\$2,650	\$0	\$0
Subtotal for Corner Clips minimum impact					\$0

Corner clips - Significant Impact (Contact City Real Estate for assistance in Acquisition and Admin cost.)

Address of Each and impact	No. of SF required	Acquisition			Admin Cost (EA)	Cost
		Cost (EA)	Cost (EA)	Cost		
		\$0	\$0	\$0	\$0	\$0
		\$0	\$0	\$0	\$0	\$0
		\$0	\$0	\$0	\$0	\$0
		\$0	\$0	\$0	\$0	\$0
Subtotal					\$0	\$0

Address of Property Takings - Minimum Impact (Residential/Commercial)	No. of SF required	Comal			Admin Cost	Cost
		Appraisal Cost/SF	Acquisition Cost	Cost		
Property ID: 48741	12020	\$0.10	\$1,683	\$2,650	\$4,333	
Property ID: 48740	36171	\$0.31	\$15,698	\$2,650	\$18,348	
Property ID: 48737	918	\$0.81	\$1,041	\$2,650	\$3,691	
Property ID: 3261	4939	\$3.91	\$27,036	\$2,650	\$29,686	
Property ID: 3259	9848	\$3.47	\$47,842	\$2,650	\$50,492	
Property ID: 3260	11009	\$3.54	\$54,561	\$2,650	\$57,211	
Subtotal					\$163,760	

Property Takings - Significant Impact	Total SF	Acquisition			Admin Cost (EA)	Cost
		Cost (SF)	Cost (EA)	Cost		
		\$0	\$0	\$0	\$0	\$0
		\$0	\$0	\$0	\$0	\$0
		\$0	\$0	\$0	\$0	\$0
		\$0	\$0	\$0	\$0	\$0
		\$0	\$0	\$0	\$0	\$0
Subtotal					\$0	\$0

Total Real Estate Acquisition Cost		\$163,760
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Real Estate Survey Cost	Qty	Cost (EA)	Total Cost
Number of Plats and Field Notes Required	6	\$2,200	\$13,200