

MEMORANDUM

To: File
From: Rich Squire
Date: 4-1-20, Rev.
Subject: CHU9 Drainage and Water Pollution Abatement Approach

Background - Drainage

The Critical Habitat Unit (CHU) 9, which is critical habitat for two karst invertebrates receives off site drainage from an area north of LP1604. This area is identified as UTSA Tributary to Leon Creek and totals 545.4 acres, shown on Figure 1. The existing 6 – 8' x 5' multiple box culvert (MBC) conveys this water across LP1604 to the northern area of CHU9. Figure 2 depicts the existing and proposed drainage areas for the LP1604 improvements adjacent to CHU9.

Mitigation Approach

As shown in Exhibits 2 & 3, the existing drainage area to the cross culvert totaled 50.3 acres. An analysis of the contributing drainage areas was performed with the goal of matching the existing quantity of water going to the CHU9 area for the LP1604 drainage area. The constraints included the topography and roadway layout and the pervious and impervious area differences. For more detail see Figure 3 – Impervious and Pervious Area. This analysis showed that a drainage area reduction of 2.8 acres was necessary to closely match the existing quantity of water flowing to CHU9. This was achieved by reducing the area on the west by 2.0 acres and the east by 0.8 acre.

To compensate for the anticipated higher flows, mitigation is proposed that limits flow to the same or less than the existing conditions. This mitigation is provided by increasing the size of the storm system pipe.

WPAP Approach

The analysis of the water quality treatment and total suspended solid (TSS) removal looked at the contributing area and surfaces within the proposed drainage areas defined above – See Figure 5 – TSS Surface Analysis.

Two approaches were analyzed: (1) additional TSS removal to benefit the CHU9 area and (2) closely matching the requirements of TCEQ. Each analysis utilized removal of 100% approach to the TSS removal. The results of this analysis for both options are presented in Figure 6 – TSS Calculations and Figure 7 – Summary of TSS Removal.

It is proposed that Option 1, 33% TSS reduction, will be implemented for the LP1604 improvements.

Figure 1 – Drainage Area North of LP1604

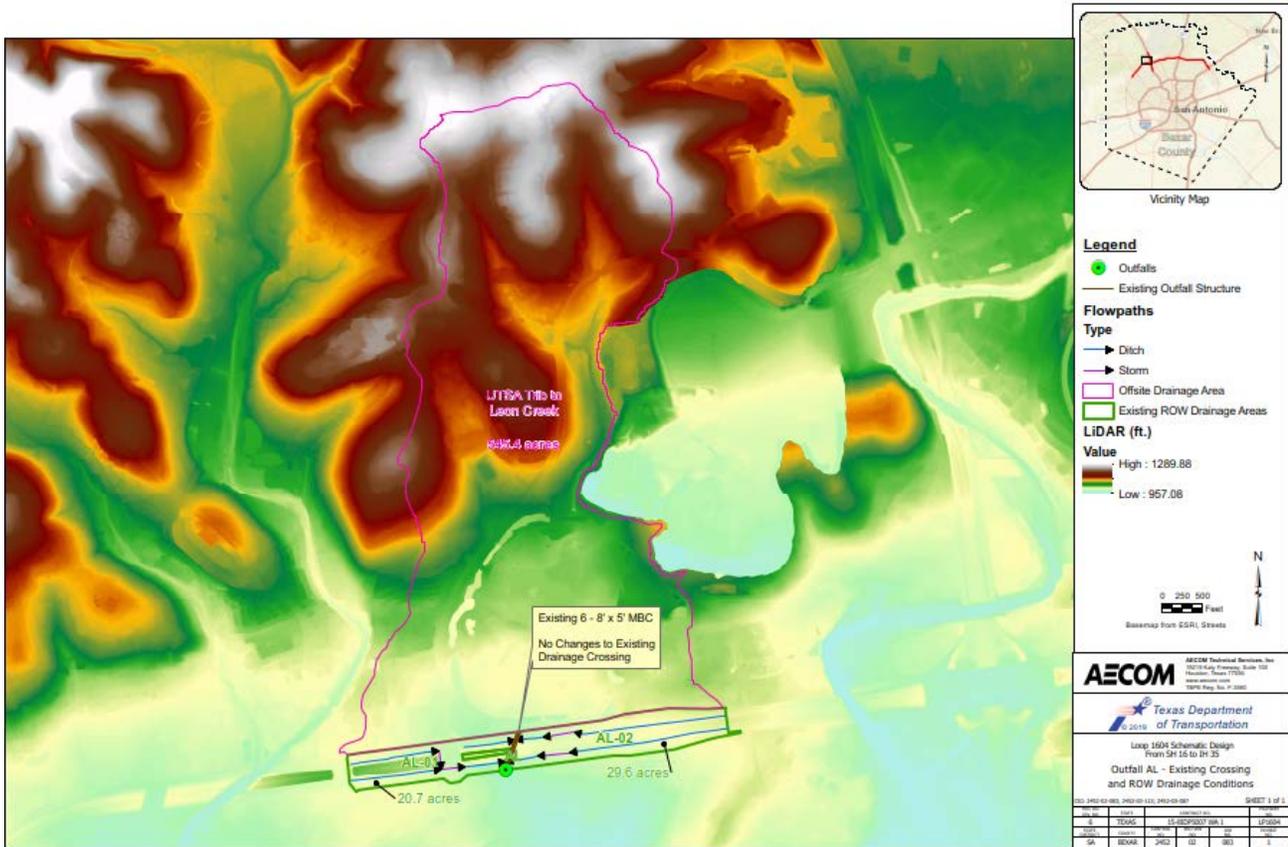


Figure 2 – Existing and Proposed LP1604 Drainage Area

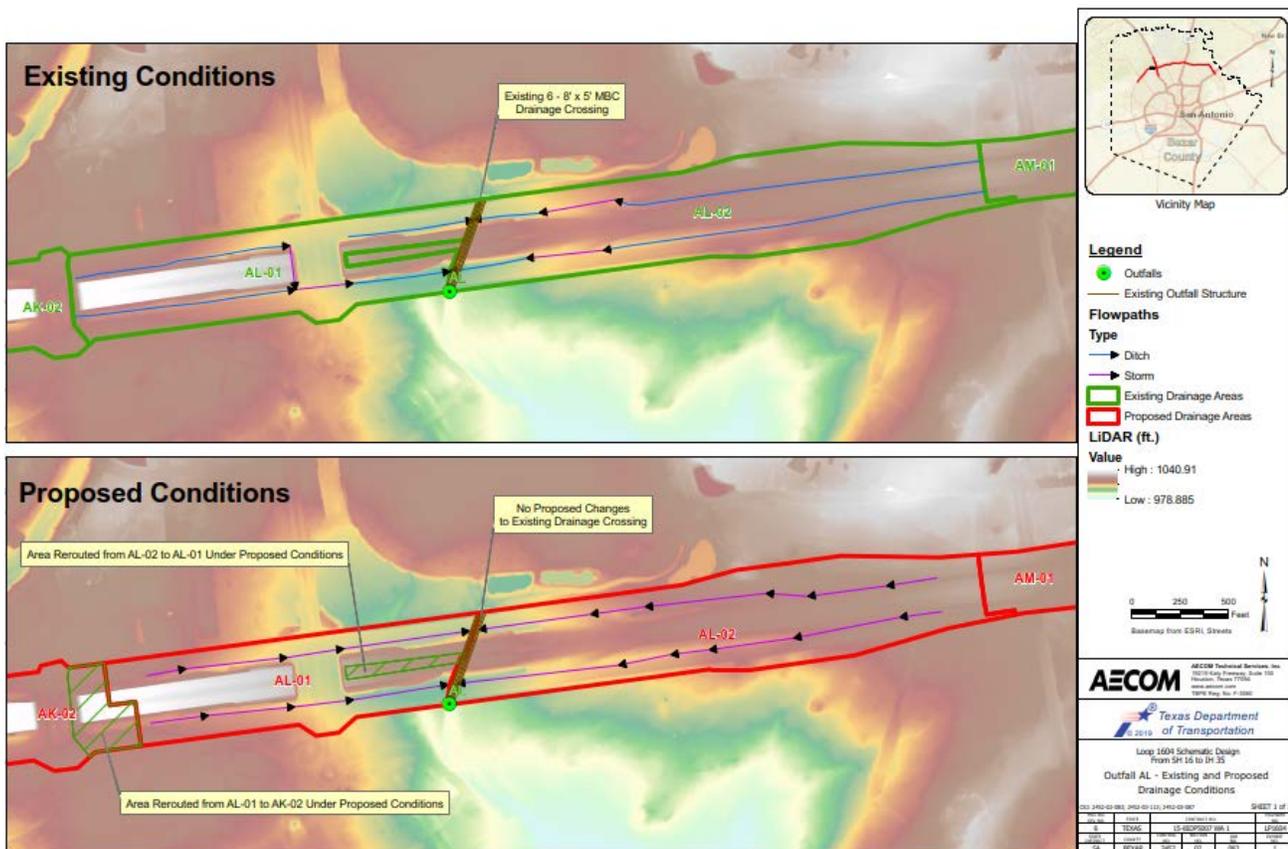


Figure 4 – Drainage Analysis

Drainage Area Characteristics							
	Existing Conditions	Proposed Conditions	Difference	Existing Conditions	Proposed Conditions	Difference	
	AL-01 (Area West of Outfall)			AL-02 (Area East of Outfall)			
Drainage Area (acres)	20.7	18.7	-2	29.6	28.8	-0.8	
C-Values	0.66	0.81	0.15	0.6	0.77	0.17	
Off-ROW Area draining to CHU 9 (UTSA Trib Culvert)							
	Existing Conditions	Proposed Conditions					
Upstream Watershed for cross drainage culvert (ac)	545.4	545.4					
Impervious Cover	51.10%	51.10%					
10-Yr Peak Flow (cfs)	1,843	1,843					
Total System at Outfall (UTSA Trib Culvert + AL-01 + AL-02)							
	Existing Conditions	Proposed Conditions	Difference				
Drainage Area (acres)	595.7	592.9	-2.8				
Peak Flow Information							
	Existing Conditions	Unmitigated Proposed Conditions	Mitigated Proposed Conditions*	Existing Conditions	Unmitigated Proposed Conditions	Mitigated Proposed Conditions*	
Quantity Characteristics							
	AL-01 (Area West of Outfall)			AL-02 (Area East of Outfall)			
2-yr Discharge to UTSA Trib (AL) culvert (cfs)	63	88	63	76	118	76	
5-Yr Discharge to UTSA Trib (AL) culvert (cfs)	79	111	79	94	148	94	
10-Yr Discharge to UTSA Trib (AL) culvert (cfs)	92	129	92	110	173	110	
*Mitigated Proposed Conditions Peak Flows Will Be Less Than or Equal to Existing Conditions Peak Flows							
Volume Information							
	Existing Conditions	Proposed Conditions	Difference	Existing Conditions	Proposed Conditions	Difference	System Total
	AL-01			AL-02			
Runoff Volume (ac-ft)	20.1	18.6	-1.5	28.5	28.6	0.1	-1.4
Mitigation Information							
	AL-01 (Area West of Outfall)			AL-02 (Area East of Outfall)			System Total
Mitigation Required (ac-ft)	2.05			3.37			5.42
Mitigation Provided (ac-ft)	2.51			3.74			6.25
Net (ac-ft)	0.46			0.37			0.83

Figure 5 – TSS Surface Analysis

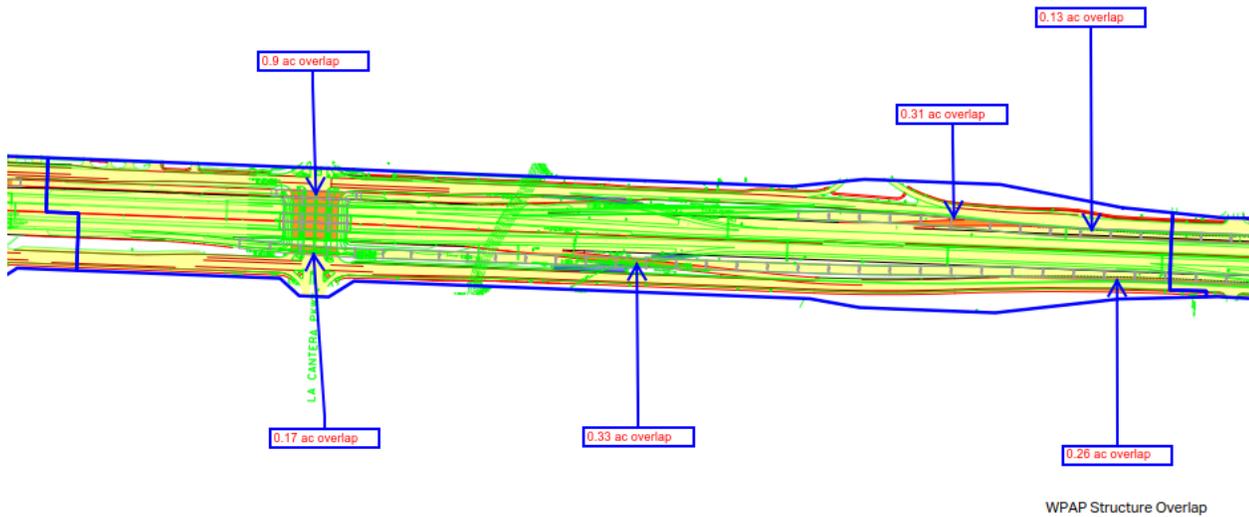


Figure 6 – TSS Calculations

OPTION 1: 2 water quality ponds and 3 Wet Vaults; provides 33% TSS reduction from existing condions			
	Existing Conditions	Proposed Conditions	Notes
Total drainage area that drains to CHU from ROW* (ac)	50.30	49.60	Proposed area decreases due to 2.8 acres is rerouted to adjacent drainage area.
Pervious Area (ac)	24.83	9.65	
Impervious Area (ac)	25.47	39.95	Proposed area includes impervious over overlaps due to DC decks and overpass bridges.
Quality Characteristics			
TSS Load (lbs/yr)	25,979	40,749	Calculated using Lm/0.8
TSS Removed by BMPs (lbs/yr)	0	23,400	Lm per TCEQ would be 11,816 lbs/yr Proposed BMPs include: 2 water quality ponds and 3 Jellyfish stormwater treatment units.
Net TSS load (lbs/yr)	25,979	17,349	A 33% reduction in TSS load from 25,979 lbs/yr to 17,349 lbs/yr from TxDOT ROW to CHU9
OPTION 2: 2 water quality ponds; provides 5% TSS reduction from existing condions			
	Existing Conditions	Proposed Conditions	Notes
Total drainage area that drains to CHU from ROW* (ac)	50.30	49.60	Proposed area decreases due to 2.8 acres is rerouted to adjacent drainage area.
Pervious Area (ac)	24.83	9.65	
Impervious Area (ac)	25.47	39.95	Proposed area includes impervious over overlaps due to DC decks and overpass bridges.
Quality Characteristics			
TSS Load (lbs/yr)	25,979	40,749	Calculated using Lm/0.8
TSS Removed by BMPs (lbs/yr)	0	16,000	Lm per TCEQ would be 11,816 lbs/yr Proposed BMPs include 2 water quality ponds.
Net TSS load (lbs/yr)	25,979	24,749	A 5% reduction in TSS load from 25,979 lbs/yr to 24,749 lbs/yr from TxDOT ROW to CHU9

Figure 7 – Summary of TSS Removal

OPTION 1: 2 water quality ponds and 3 Wet Vaults; provides 33% TSS reduction from existing conditons						
	Drainage Area (ac)	Impervious Cover (ac)	Pervious Cover (ac)	TSS Load Produced (lbs/yr)	TSS Load Removed by BMPs (lbs/yr)	Net TSS Load (lbs/yr)
Existing Conditions	50.30	25.42	24.88	25,979	0	25,979
Proposed Conditions	49.60	39.95	9.65	40,749	23,400	17,349
Delta	-0.70	14.53	-15.23	14,770	23,400	-8,630
% change	-1%	57%	-61%	57%		-33%

Note:

- Proposed area decreases due to 2.8 acres is rerouted to adjacent drainage area.
- TCEQ only requires 11,816 lbs/yr of proposed TSS load removed by BMPs.

OPTION 2: 2 water quality ponds; provides 5% TSS reduction from existing conditons						
	Drainage Area (ac)	Impervious Cover (ac)	Pervious Cover (ac)	TSS Load Produced (lbs/yr)	TSS Load Removed by BMPs (lbs/yr)	Net TSS Load (lbs/yr)
Existing Conditions	50.30	25.42	24.88	25,979	0	25,979
Proposed Conditions	49.60	39.95	9.65	40,749	1,600	24,749
Delta	-0.70	14.53	-15.23	14,770	1,600	-1,230
% change	-1%	57%	-61%	57%		-5%

Note:

- Proposed area decreases due to 2.8 acres is rerouted to adjacent drainage area.
- TCEQ only requires 11,816 lbs/yr of proposed TSS load removed by BMPs.