



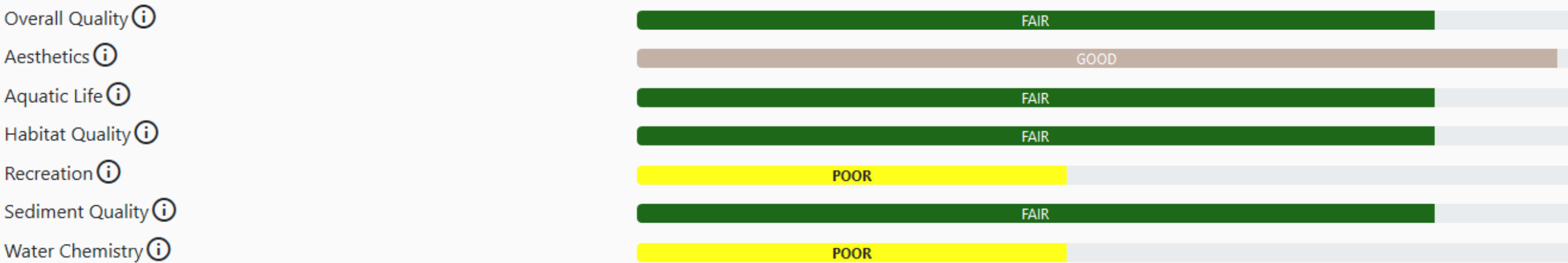
THE CITY OF AUSTIN'S FUNCTIONAL ASSESSMENT OF FLOODPLAIN HEALTH:

FROM REGULATORY MECHANISM TO DESIGN TOOL

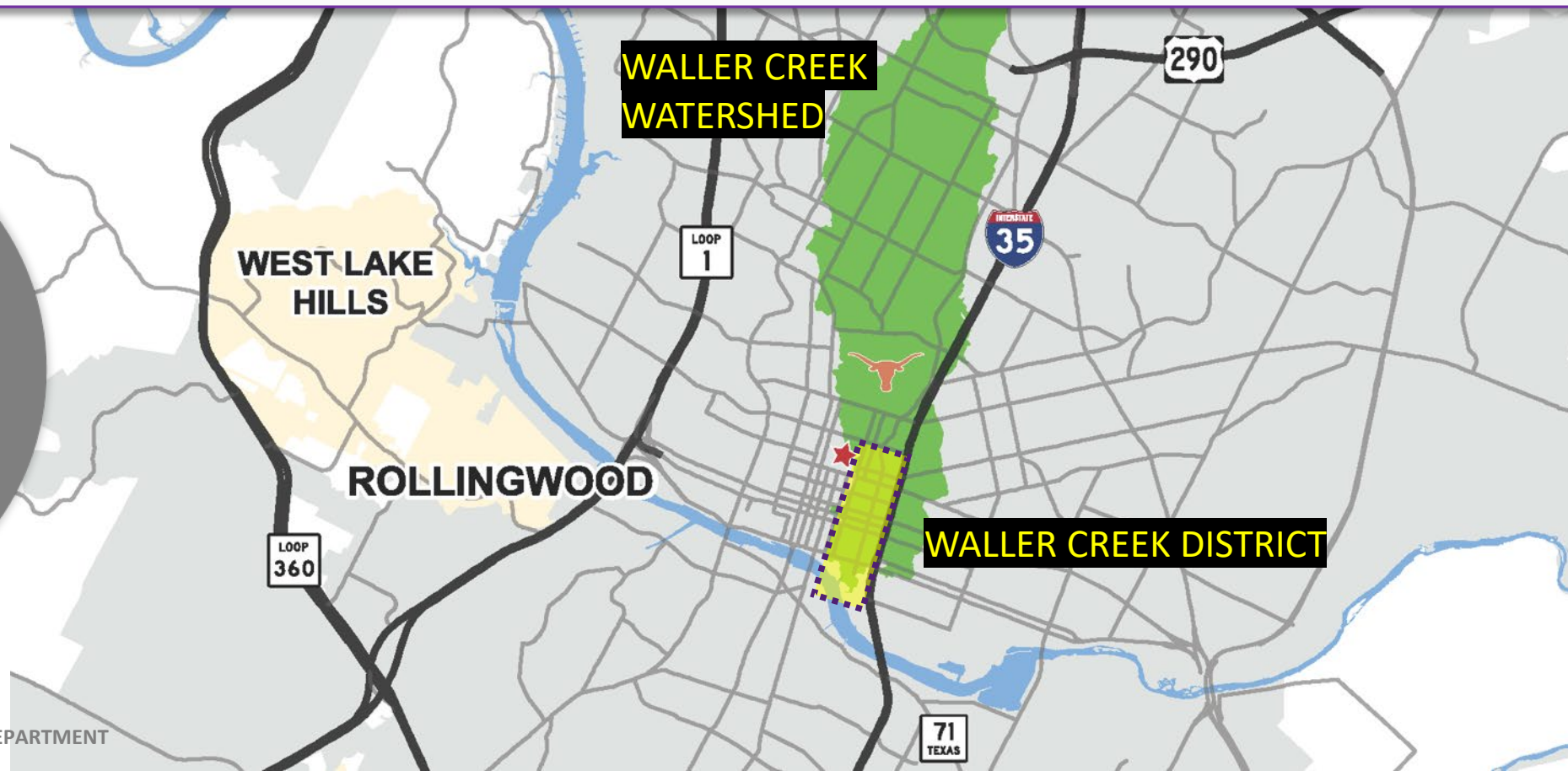
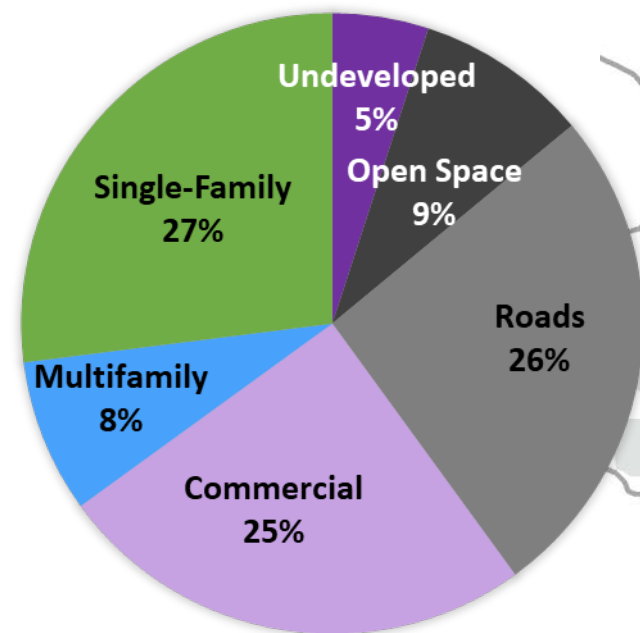
Susan Kenzle, RLA, TX-ISA
Landscape Architect
Watershed Protection Department
City of Austin, TX



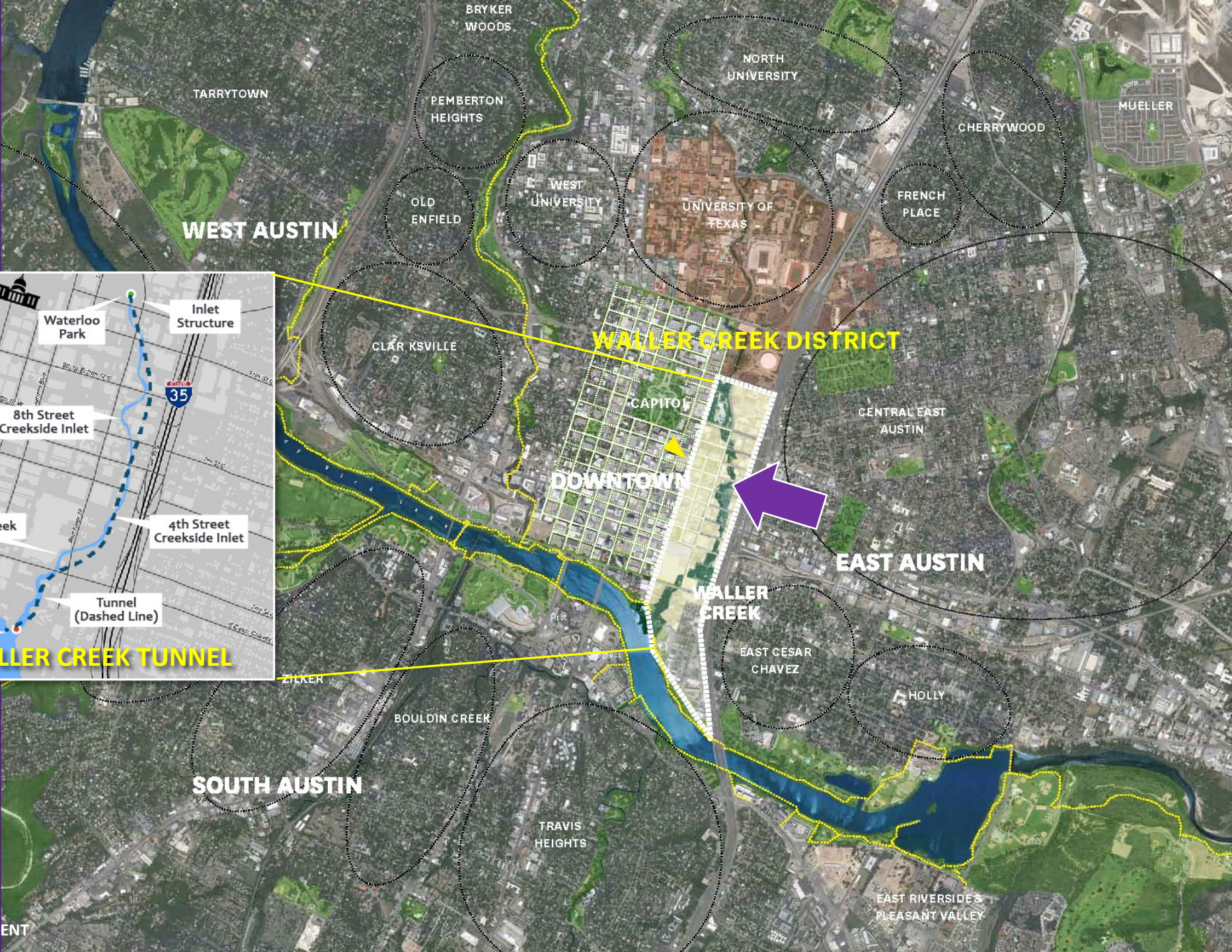
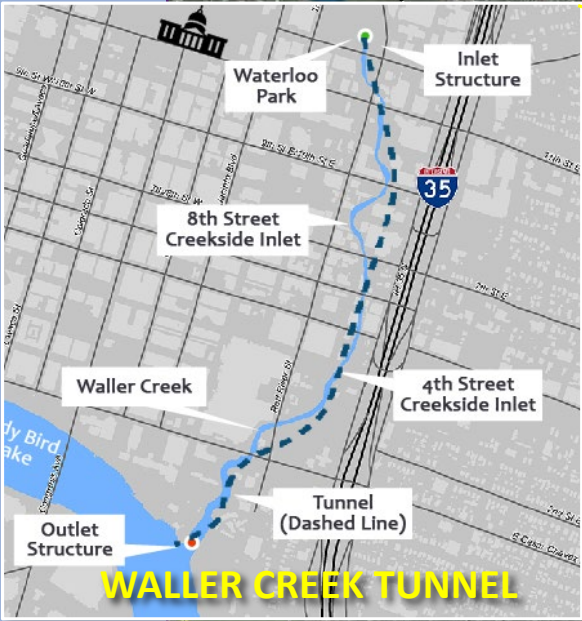
Reach Integrity Scores - EII Phase 1 2017 ⓘ



WATERSHED



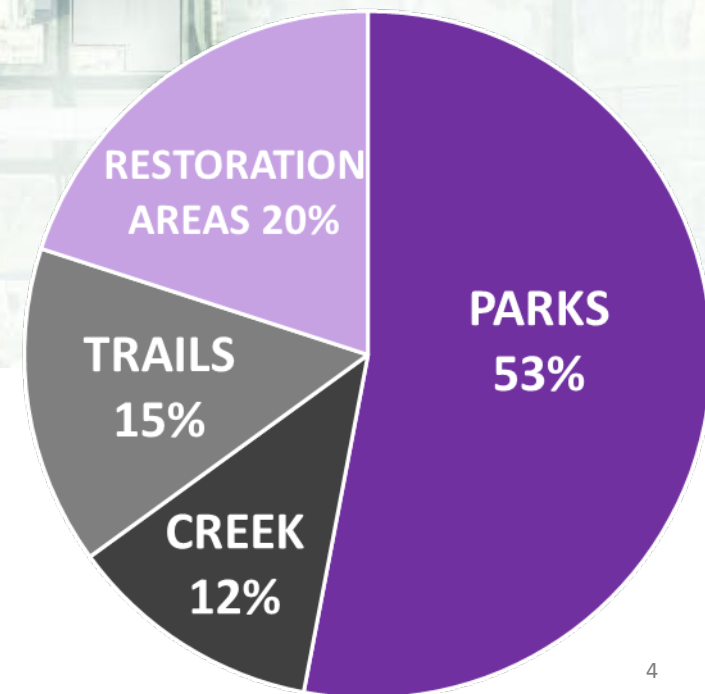
WALLER CREEK DISTRICT



WALLER CREEK DISTRICT



<https://www.wallercreek.org>
<https://www.wallercreek.org/design-team/>



WALLER CREEK DISTRICT



WATERLOO PARK

11-acre park at the northern end of the new Waller Creek Park.

Construction: Feb. 2019 – May 2020



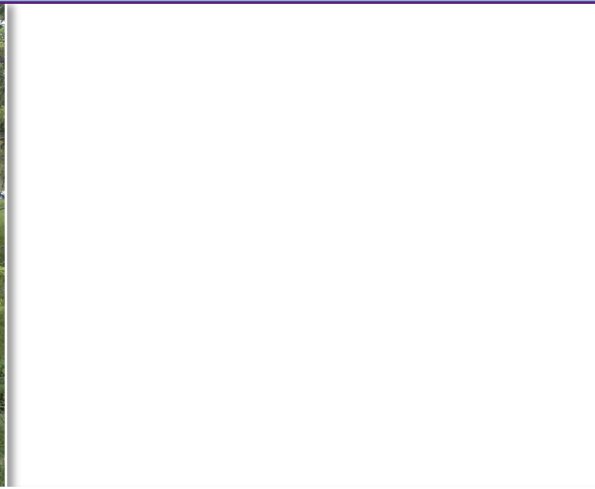
WATERLOO PARK: CREEK & RIPARIAN RESTORATION



WATERLOO PARK: CREEK & RIPARIAN RESTORATION - EXISTING



Trails
and
walls



Existing building in 100-yr floodplain



stairs

trail

erosion

bridges

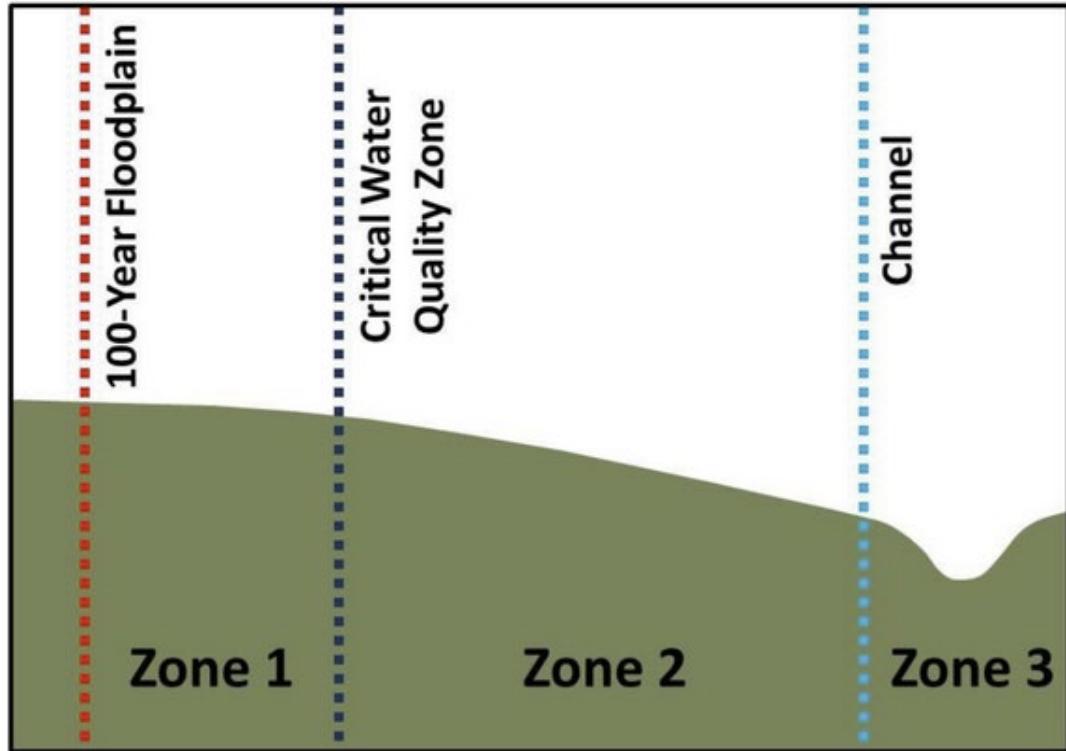
FUNCTIONAL ASSESSMENT OF FLOODPLAIN HEALTH: REGULATORY MECHANISM

A regulatory mechanism for measuring ecosystem function in stream and riparian zones where development will result in cross-sectional changes to the 100-year floodplain.

Establish baseline data and quantify improvements.

To achieve maximum functional lift in challenging urban streams.

FUNCTIONAL ASSESSMENT OF FLOODPLAIN HEALTH: REGULATORY MECHANISM



Scoring: Zone 3 – Active Channel

Riparian Zone

Site/Project Name: _____

Date: _____ Time: _____

Transect Number: _____

Staff (if applicable): _____

Parameter	Excellent (4)	Good (3)	Fair (2)	Poor (1)	Score
Gap Frequency <i>A visual assessment of the number of gaps in vegetation.</i>	0 - 20% of riparian area has visual gaps in vegetation	20% - 40% of riparian area has visual gaps in vegetation	40 - 60% of riparian area has visual gaps in vegetation	> 60% of riparian area has visual gaps in vegetation	
Large Woody Debris <i>An evaluation of the amount of large woody debris.</i>	7 or more pieces of large woody debris	5 - 6 pieces of large woody debris	3 - 4 pieces of large woody debris	2 or less pieces of large woody debris	
Soil Compaction <i>An assessment of the bulk density of the soil.</i>	0 - 200 pounds per square inch	201 - 400 pounds per square inch	401 - 600 pounds per square inch	> 600 pounds per square inch	
Structural Diversity <i>An evaluation of the canopy and understory vegetation.</i>	> 65% canopy; or > 50% canopy and > 50% understory	51 - 65% canopy; or 0 - 50% canopy and > 40% understory	31 - 50% canopy; or 0 - 30% canopy and > 30% understory	0 - 30% canopy; or 0 - 15% canopy and 0 - 30% understory	
Tree Demography <i>An assessment of the age class distribution of all canopy tree species.</i>	Canopy tree species are present in all 4 age classes	Canopy tree species are present in 3 of 4 age classes	Canopy tree species are present in 2 of 4 age classes	Canopy tree species are present in only 1 age class or no trees	
Wetland Tree Status <i>Percent of total trees that are defined as FAC+ or greater with respect to wetland status.</i>	> 65% of trees are FAC+ or greater	50 - 65% of trees are FAC+ or greater	25 - 49% of trees are FAC+ or greater	< 25% of trees are FAC+ or greater	
Riparian Zone Width <i>A measure of the width of the undisturbed riparian zone.</i>	> 18 meters or > 75% of the CWQZ	12 - 18 meters or 50 - 75% of the CWQZ	6 - 12 meters or 25 - 49% of the CWQZ	< 6 meters or < 25% of the CWQZ	
In-Stream Canopy Cover <i>An assessment of the amount of canopy cover extending over the stream banks.</i>	> 75% canopy cover	50 - 75% canopy cover	25 - 49% canopy cover	< 25% canopy cover	

Riparian Zone Score: _____

Assessed Condition (Circle One)

Excellent: 29 - 32

Good: 21 - 28

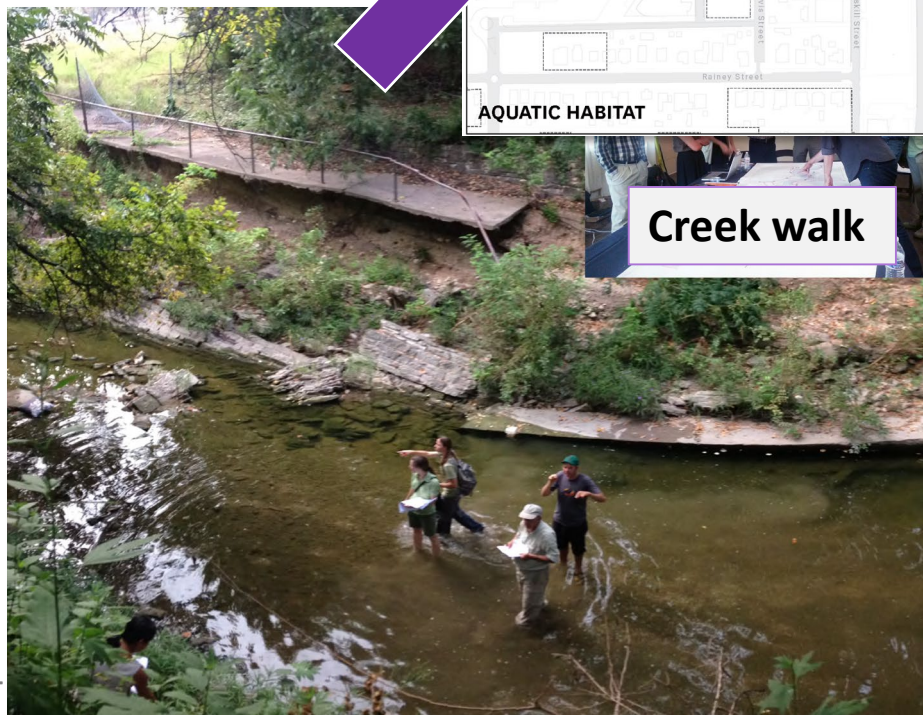
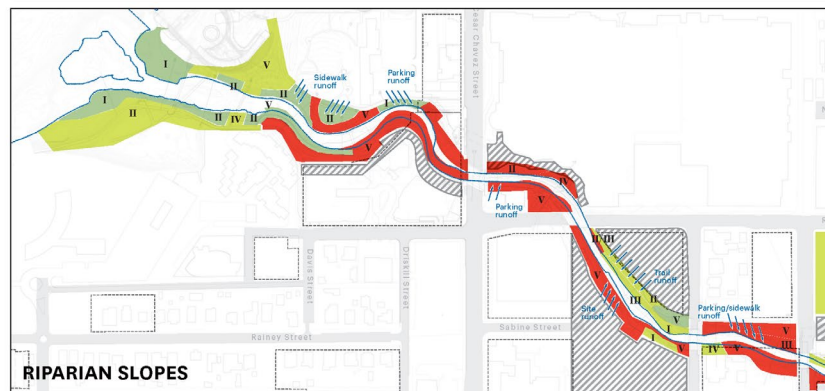
Fair: 13 - 20

Poor: 8 - 12

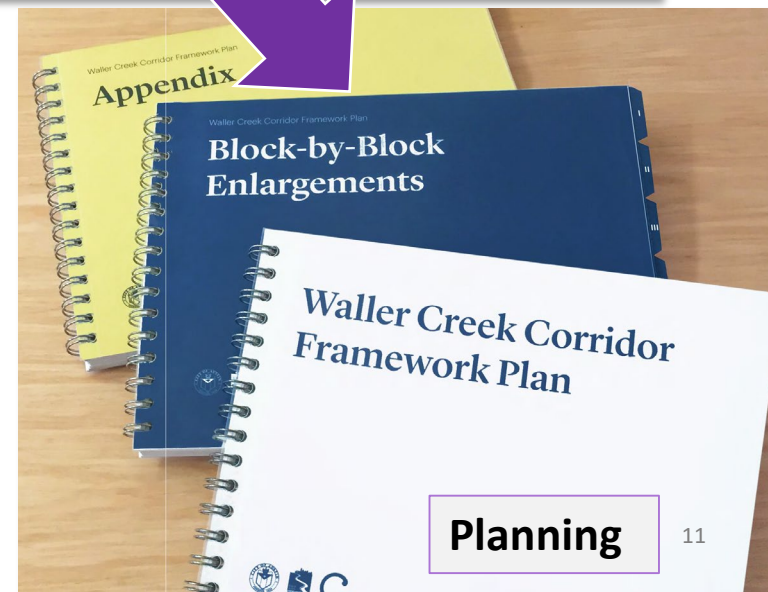
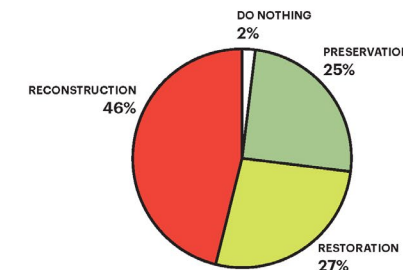


FUNCTIONAL ASSESSMENT OF FLOODPLAIN HEALTH: DESIGN TOOL

- Can be a design tool for guiding stream and riparian design beyond minimal compliance;
- A toolbox for solutions;
- Provides a foundation for the design;
- Common language for the design team.



Analysis



Planning

FUNCTIONAL ASSESSMENT OF FLOODPLAIN HEALTH:

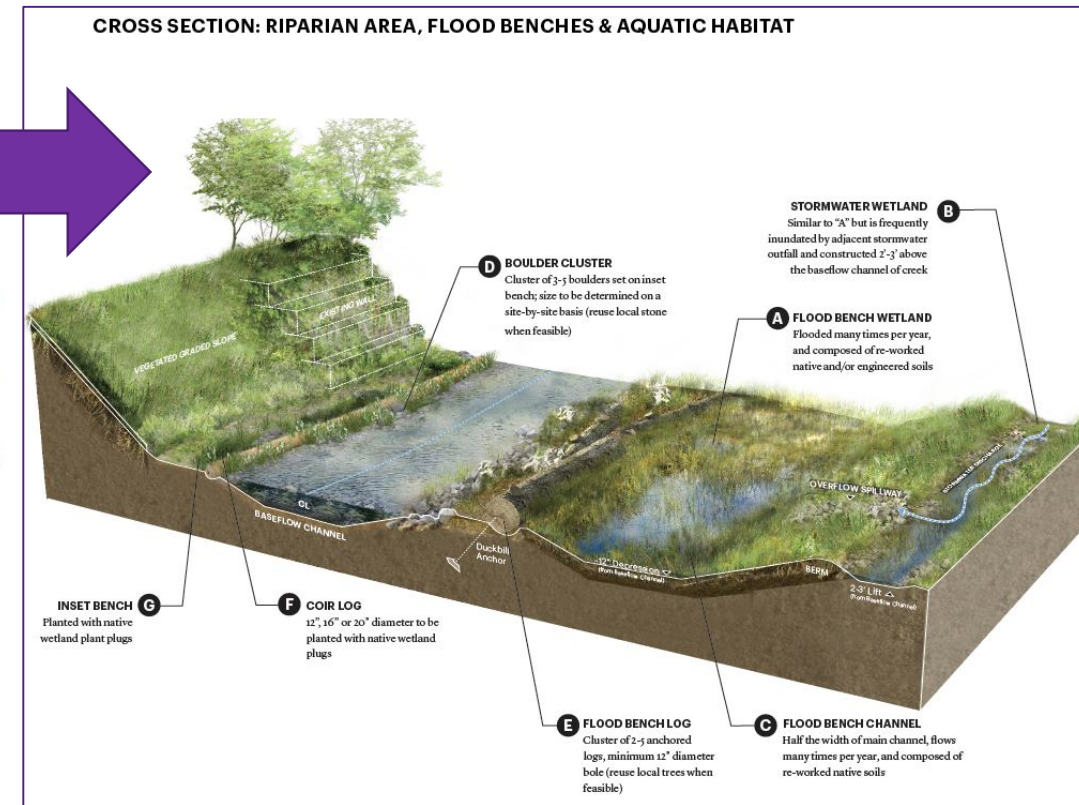
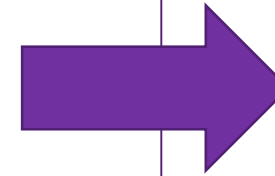
DESIGN TOOL: EXAMPLE

MATRIX: Aquatic functional lift

GEOMORPHOLOGY	Ensure Dense/Healthy Vegetation & Stable Soils	Prevents Mass Wasting	Prevent Entrenchment of Channel	Provides Obstructions, Deflections & Beneficial Scouring & Deposition	Ensure Storm Flows Inundate Floodplain
AQUATIC	Provides Epifaunal Substrate & Cover	Prevent Embeddedness of Stream Bottom	Ensure Diversity of Velocity/Depth Regimes	Ensure Frequent riffles for Habitat Diversity	Ensure Islands/Point Bars Not Enlarging & Prevent Sedimentation

TOOL BOX of possible design solutions

- A** FLOOD WETLAND BENCH
- B** STORMWATER WETLAND
- C** FLOOD BENCH CHANNEL
- D** BOULDER CLUSTER
- E** FLOOD BENCH LOG
- F** COIR LOG
- G** INSET BENCH



Parameter	Existing Conditions (04-2015)
Riparian Zone	
Gap Frequency %)	2
Large Woody Debris	1
Soil Compaction	2
Structural Diversity	2
Tree Demography	3
Wetland Tree Status	2
Riparian Zone Width	1
In-Stream Canopy Cover	2
Geomorphology	
Mass Wasting	4
Veg Bank Protection	3
Obs, Defl, Sed Traps	3
Undercutting	3
Cons. or Part. Packing	1
Scouring and Deposition	1
Entrenchment Ratio	1
Flood/Bank Ht Ratio	1
Aquatic Habitat	
Epifaunal Substrate	1
Embeddedness	1
Velocity/Depth Regimes	1
Frequency of Riffles	1
Flow Permanence Score	4
Final Score	
Riparian Zone Score	15
Geomorphology Score	17
Aquatic Habitat Score	8
Total Zone 3 Score	40
Assessed Condition	
Riparian Zone Score	FAIR
Geomorphology Score	FAIR
Aquatic Habitat Score	POOR
Total Zone 3 Score	FAIR

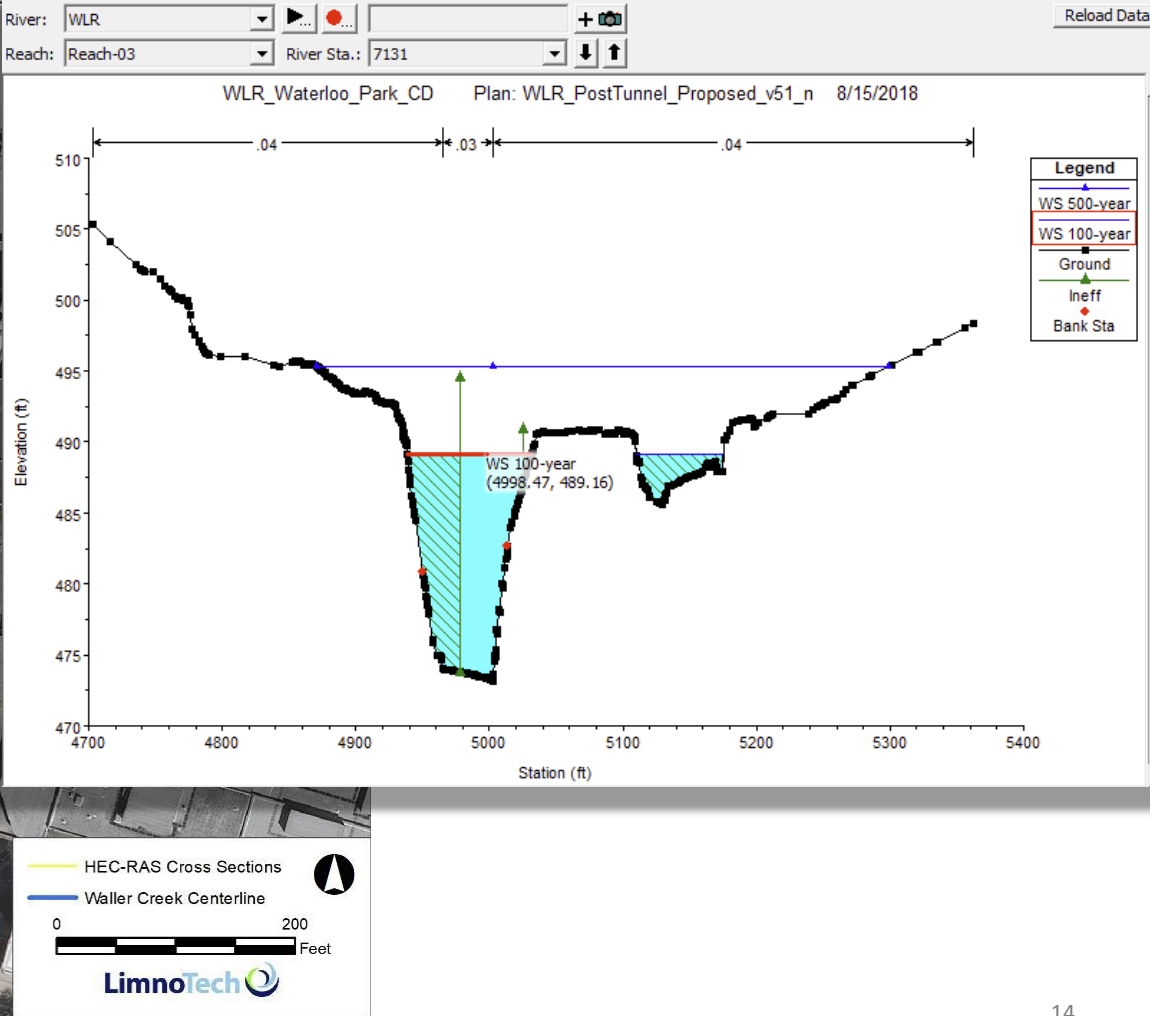
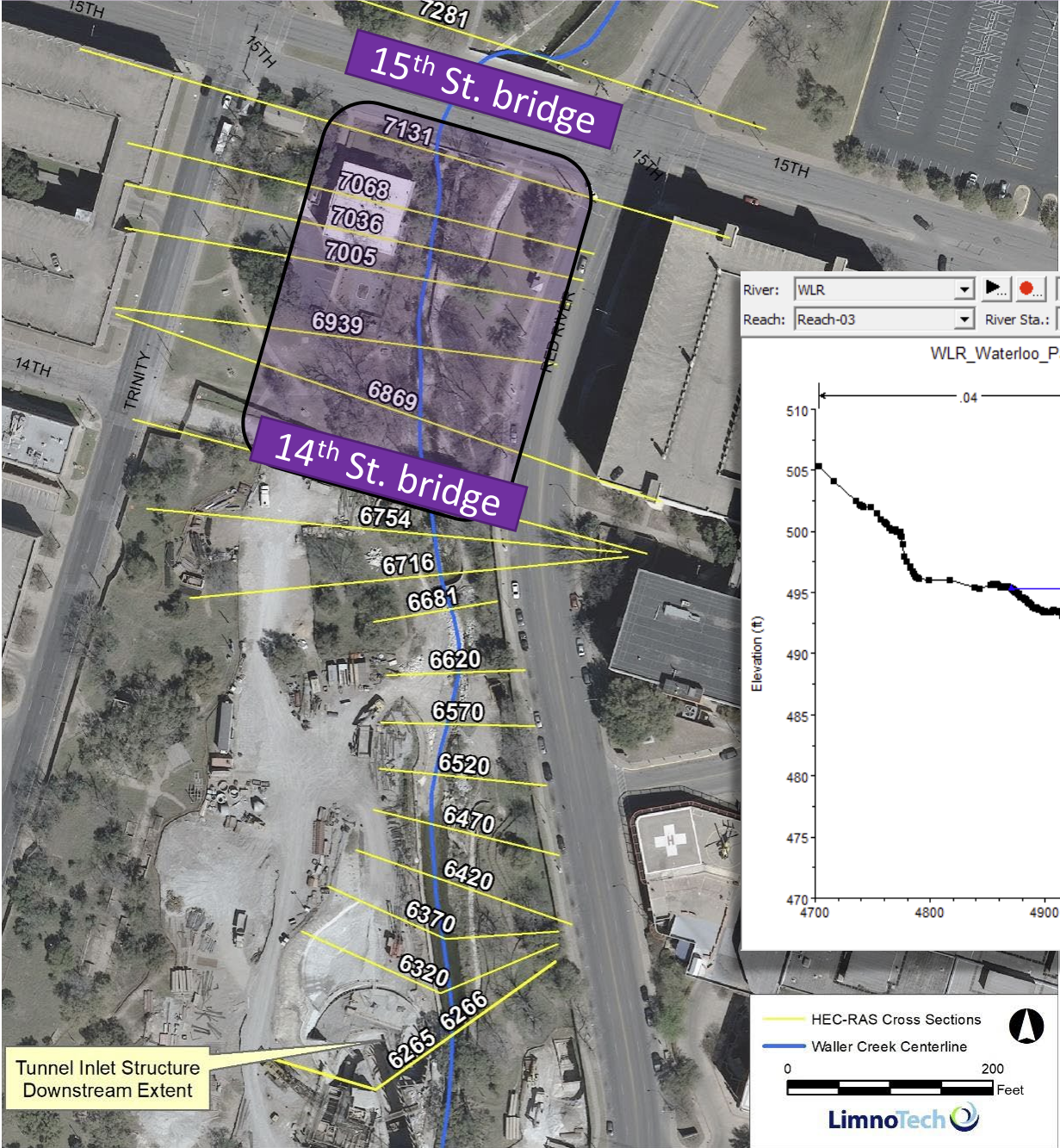
GOOD OR HIGHER

APPROVED SITE PLAN

POOR OR FAIR

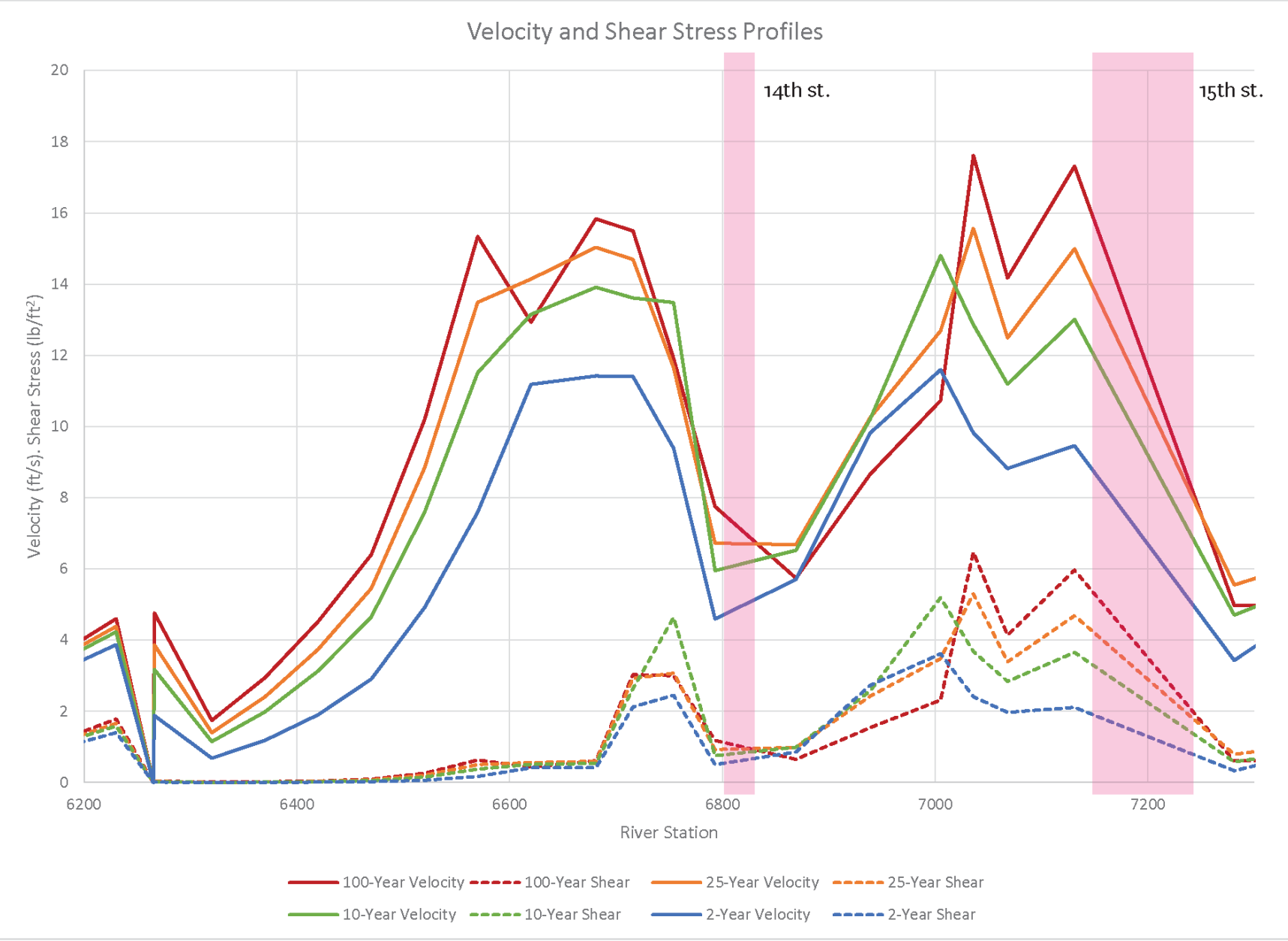


CROSS-SECTION LOCATIONS



Ve

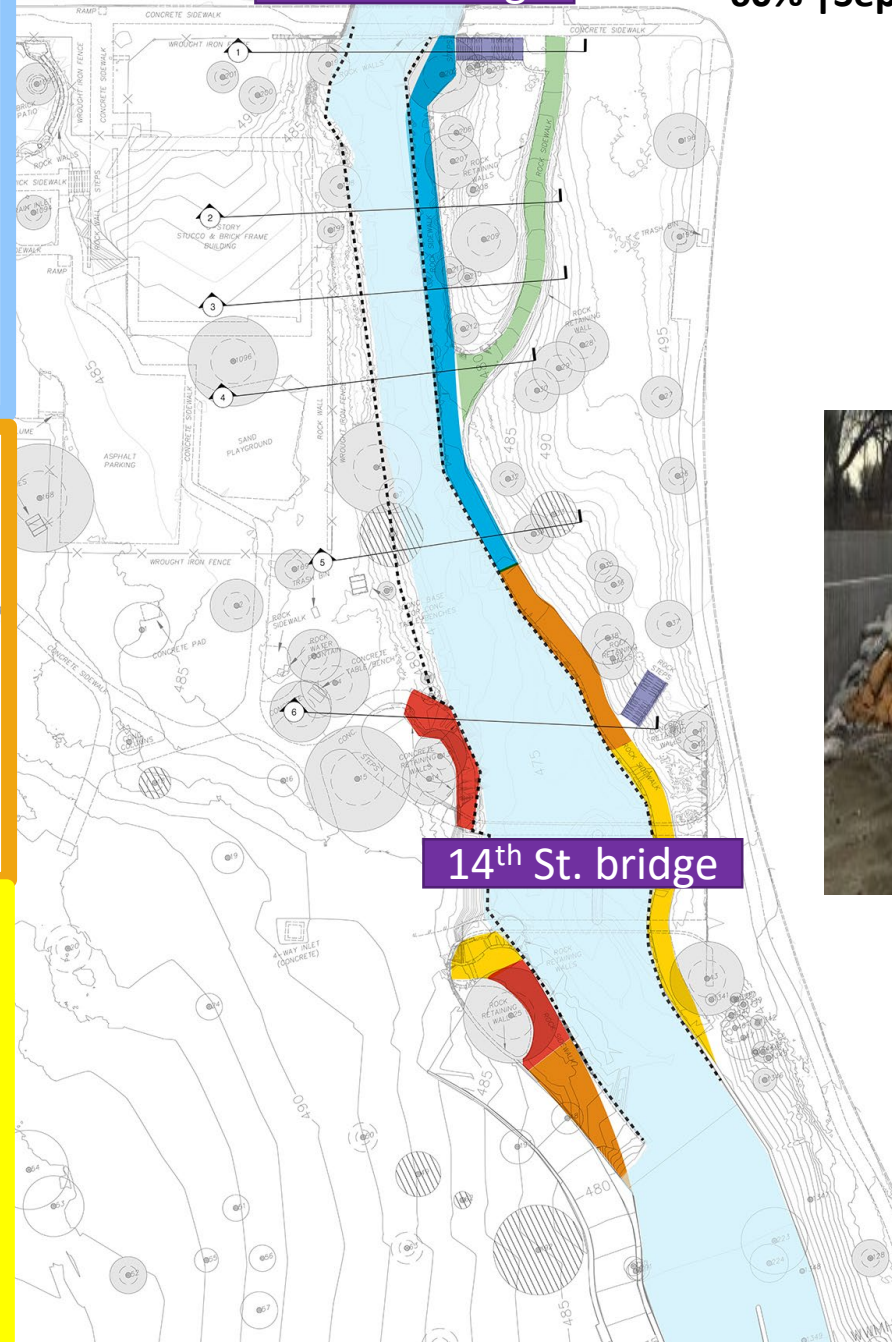
Elevation



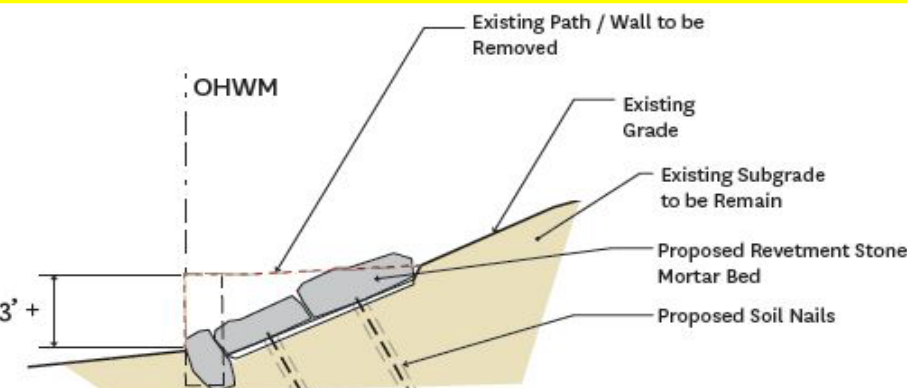
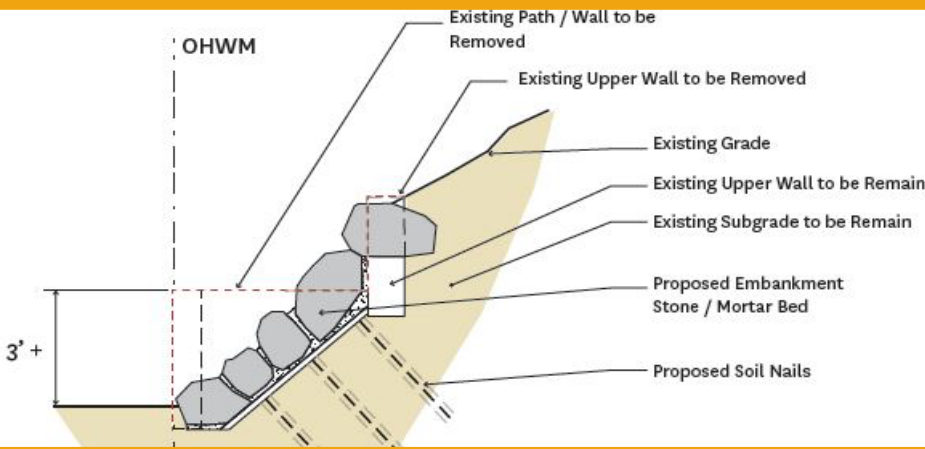
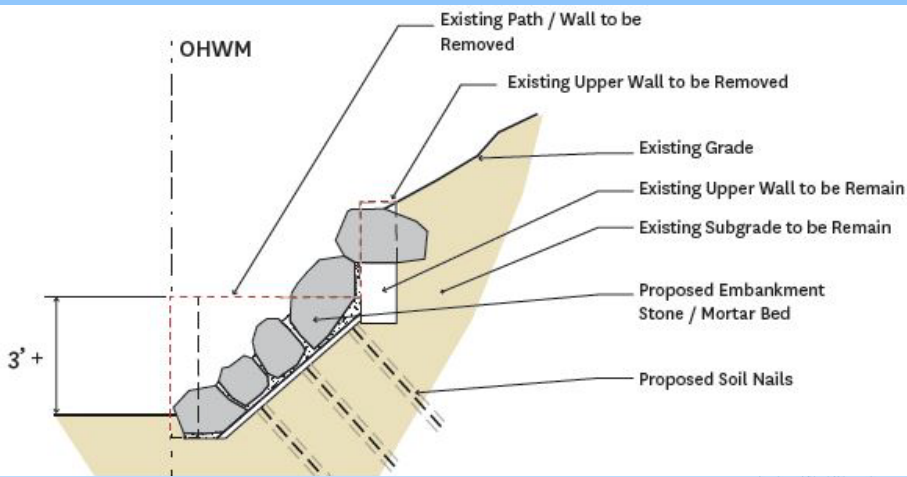
Velocity (ft/s)

15th St. bridge

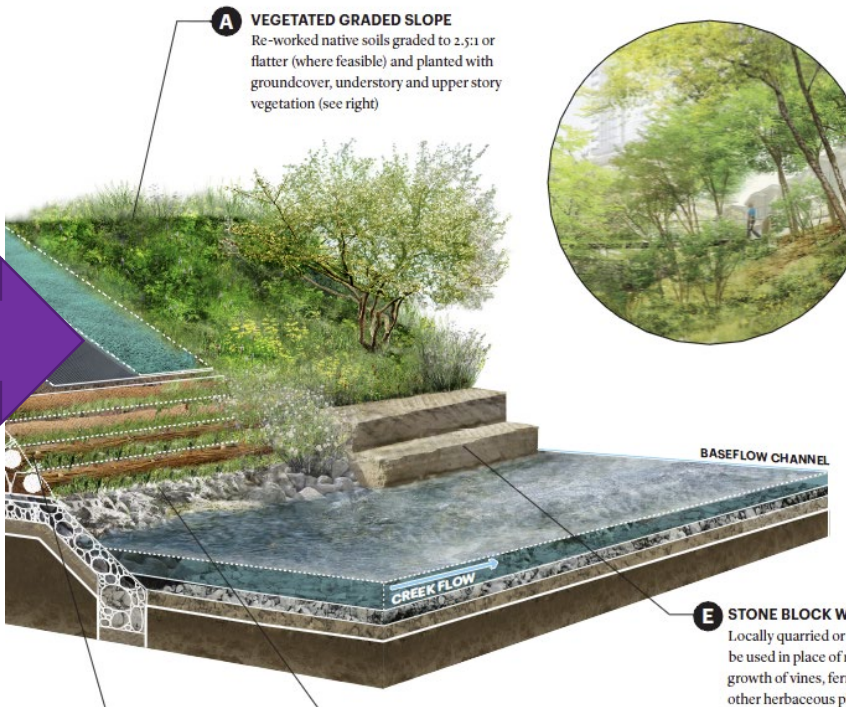
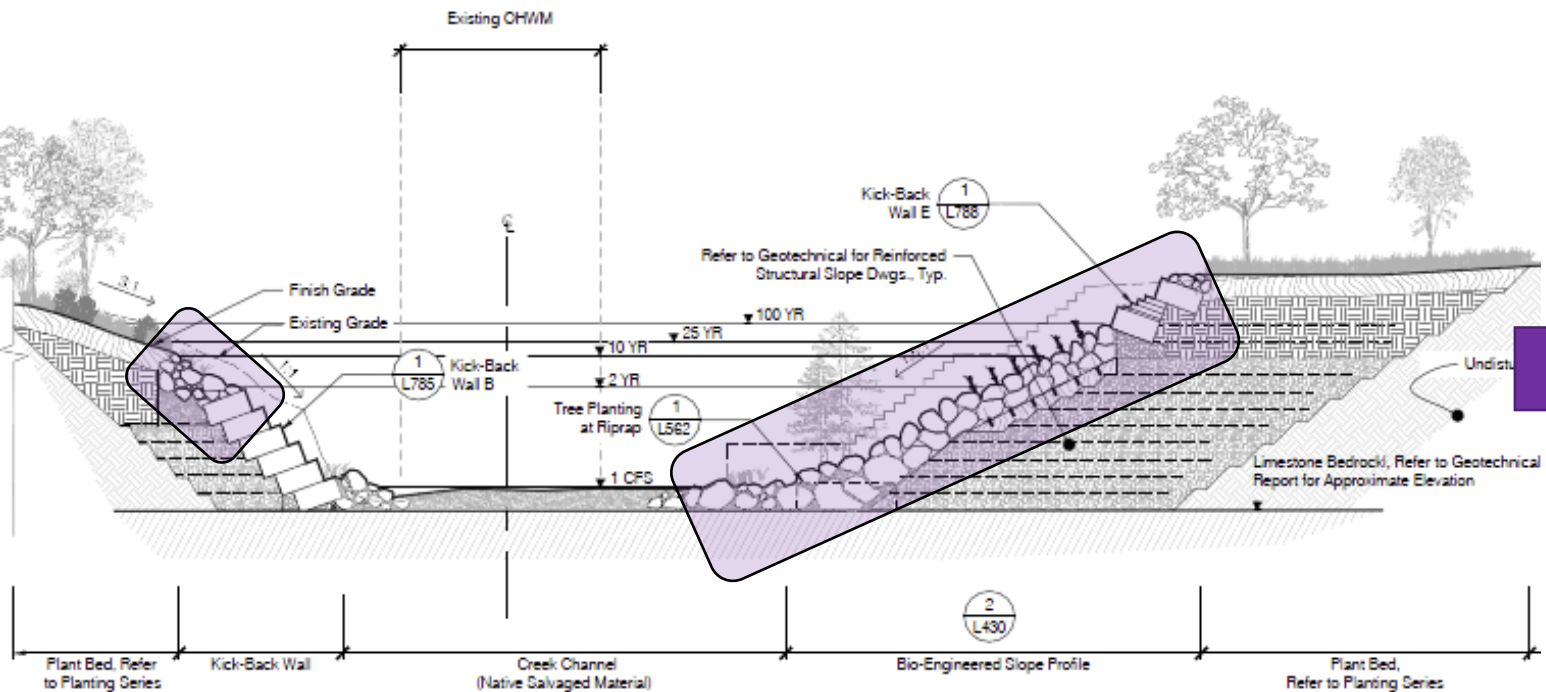
60% | Sept. 2017



14th St. bridge







Parameter	Existing Conditions (04-2015)	Current Design (ERM Score)
Riparian Zone		
Gap Frequency (%)	2	4
Large Woody Debris	1	4
Soil Compaction	2	2
Structural Diversity	2	4
Tree Demography	3	4
Wetland Tree Status	2	4
Riparian Zone Width	1	2
In-Stream Canopy Cover	2	2
Geomorphology		
Mass Wasting	4	4
Veg Bank Protection	3	3
Obs, Defl, Sed Traps	3	1
Undercutting	3	4
Cons. or Part. Packing	1	2
Scouring and Deposition	1	3
Entrenchment Ratio	1	2
Flood/Bank Ht Ratio	1	3
Aquatic Habitat		
Epifaunal Substrate	1	3
Embeddedness	1	3
Velocity/Depth Regimes	1	3
Frequency of Riffles	1	2
Flow Permanence Score	4	4
Final Score		
Riparian Zone Score	15	26
Geomorphology Score	17	22
Aquatic Habitat Score	8	15
Total Zone 3 Score	40	63
Assessed Condition		
Riparian Zone Score	FAIR	GOOD
Geomorphology Score	FAIR	GOOD
Aquatic Habitat Score	POOR	GOOD
Total Zone 3 Score	FAIR	GOOD

GOOD OR HIGHER



APPROVED SITE PLAN

POOR OR FAIR



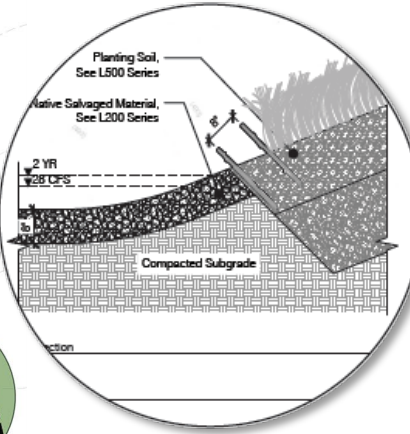
Stone Walls



Live Stakes in Riprap



Riprap



Bioengineering

15th St. bridge

lawn

Cross
Vanes

Photo source: botanicalgarden.ubc.ca

Stumpery

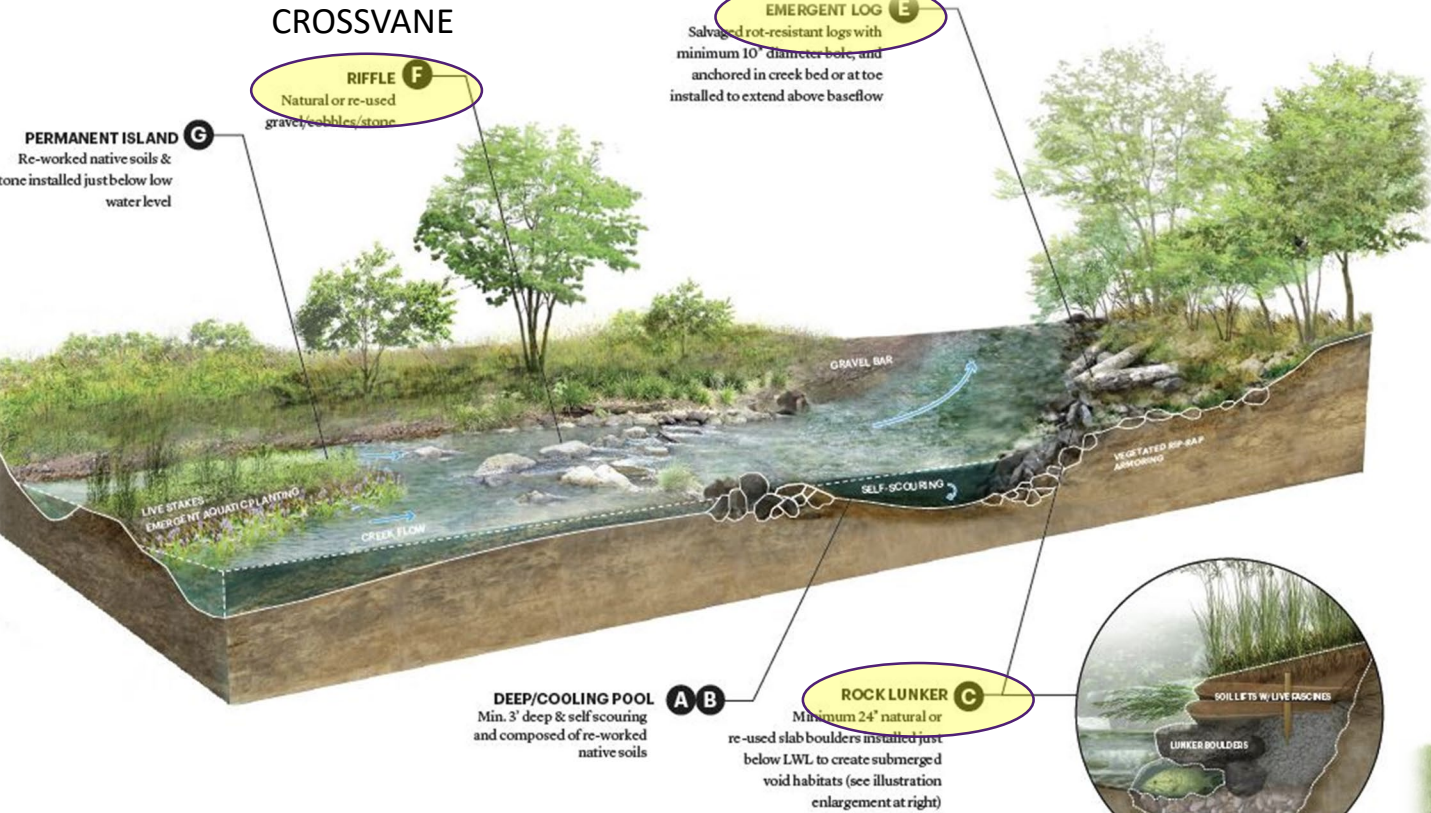
Lunkers at toe

Stumpery

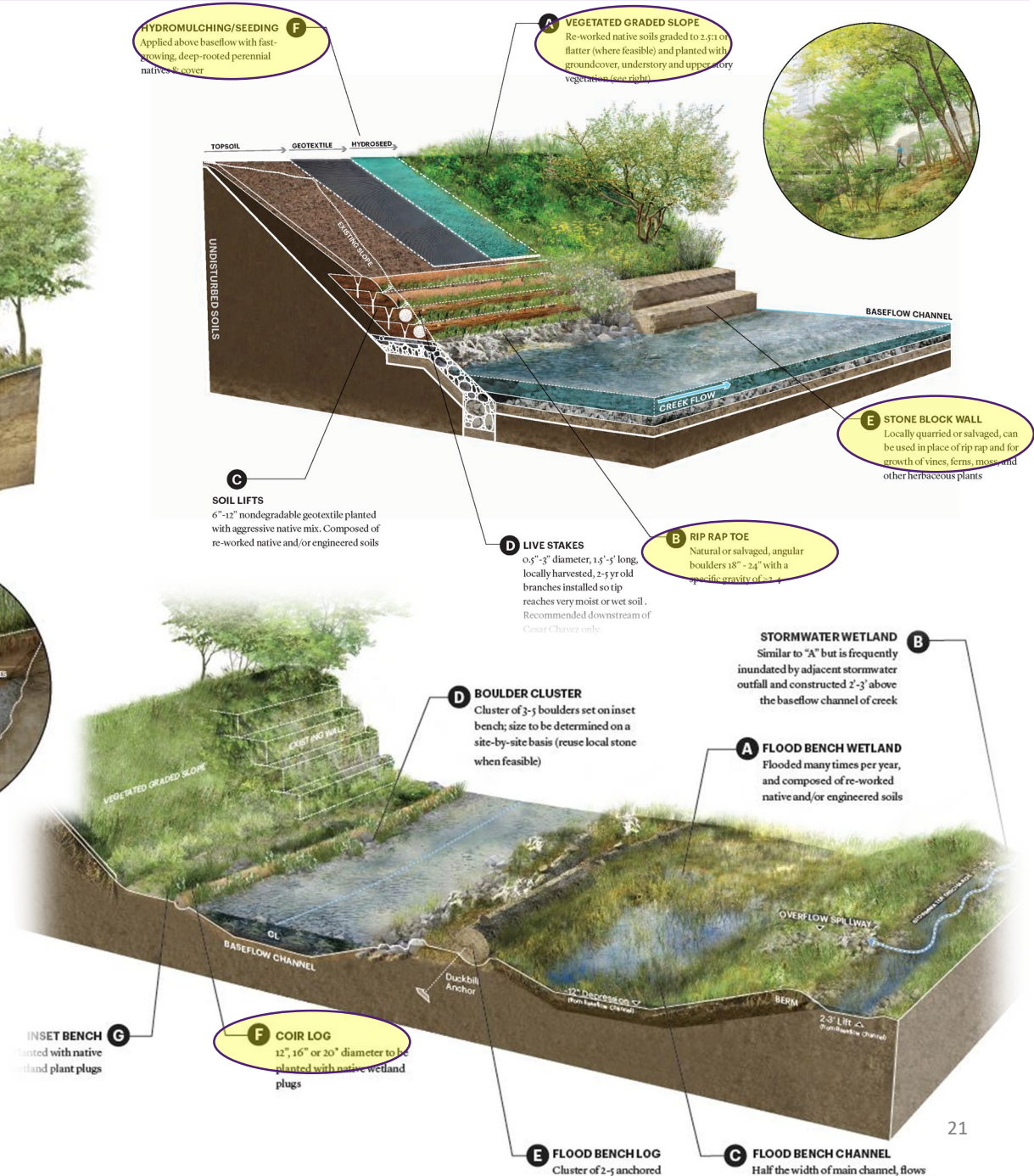
15th St. bridge

Woody Debris

TOOLBOX ITEMS



FUNCTIONAL ASSESSMENT OF FLOODPLAIN HEALTH | WATERLOO PARK |



Parameter

Existing Conditions
(04-2015)Current Design
(ERM Score)

Riparian Zone		
Gap Frequency %	2	4
Large Woody Debris	1	4
Soil Compaction	2	2
Structural Diversity	2	4
Tree Demography	3	4
Wetland Tree Status	2	4
Riparian Zone Width	1	2
In-Stream Canopy Cover	2	2
Geomorphology		
Mass Wasting	4	4
Veg Bank Protection	3	3
Obs, Defl, Sed Traps	3	1
Undercutting	3	4
Cons. or Part. Packing	1	2
Scouring and Deposition	1	3
Entrenchment Ratio	1	2
Flood/Bank Ht Ratio	1	3
Aquatic Habitat		
Epifaunal Substrate	1	3
Embeddedness	1	3
Velocity/Depth Regimes	1	3
Frequency of Riffles	1	2
Flow Permanence Score	4	4
Final Score		
Riparian Zone Score	15	26
Geomorphology Score	17	22
Aquatic Habitat Score	8	15
Total Zone 3 Score	40	63
Assessed Condition		
Riparian Zone Score	FAIR	GOOD
Geomorphology Score	FAIR	GOOD
Aquatic Habitat Score	POOR	GOOD
Total Zone 3 Score	FAIR	GOOD

**RIPARIAN
ZONE**

- Gap frequency
- Large woody debris
- Structural diversity
- Tree demography
- Wetland tree status

GEOMORPH.

- Scouring and Deposition
- Flood/Bank Ht Ratio

**AQUATIC
HABITAT**

- Epifaunal substrate
- Embeddedness
- Velocity/depth regimes

OVERALL**GOOD****POOR OR FAIR**



THANK YOU



susan.kenzle@austintexas.gov



<http://www.austintexas.gov/department/watershed-protection>



**WATERSHED
PROTECTION**