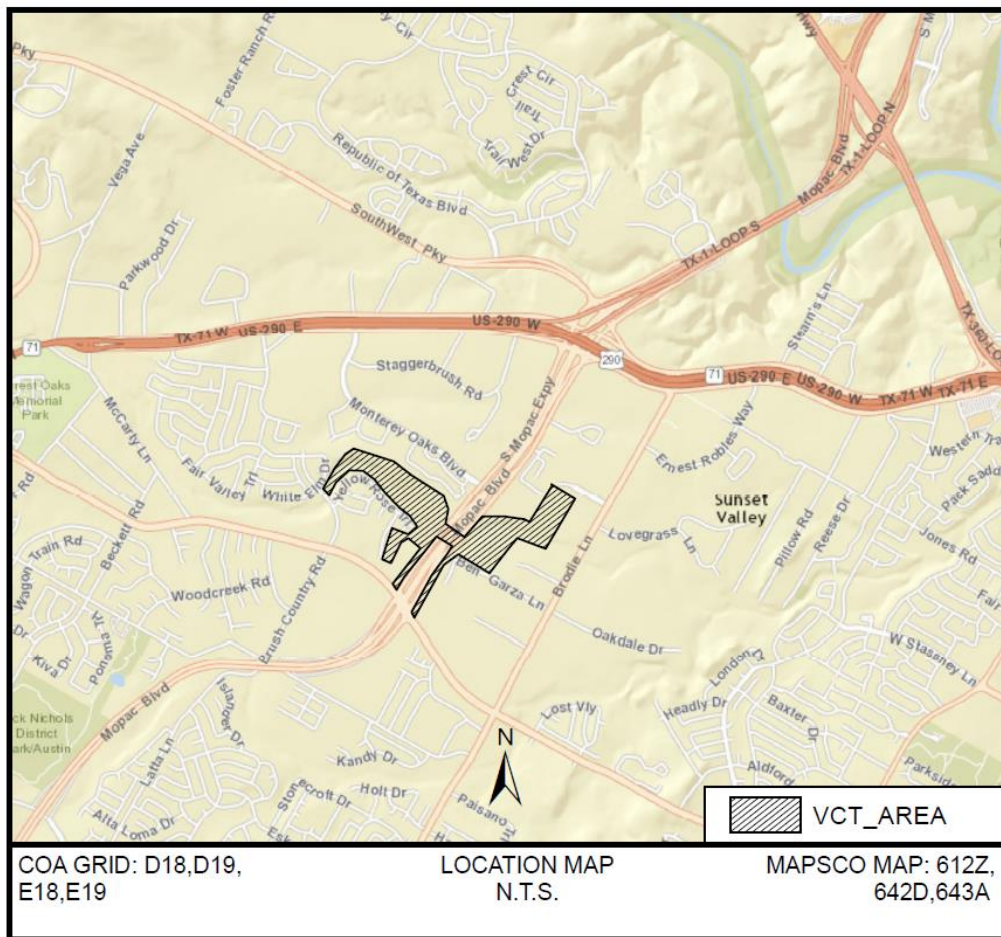




VIOLET CROWN TRAIL 2A NORTH PRELIMINARY ENGINEERING REPORT

CIP PROJECT NUMBER: 10796.006

Trail Improvements



Engineering Services Division
City of Austin Public Works Department
505 Barton Springs Rd., Suite 900
Austin, Texas 78704

December 2014

VIOLET CROWN TRAIL 2A NORTH

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FDU 8181.6207.8288

December 2014

Prepared For:

City of Austin
Public Works
Community Services Division
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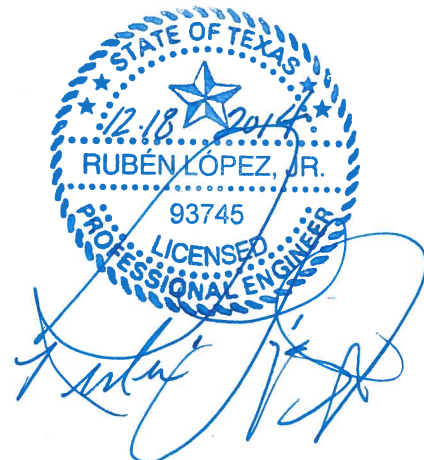


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EXECUTIVE SUMMARY

The purpose of this Preliminary Engineering Report (PER) is to gather all applicable data and provide an analysis and recommendation for a proposed alignment of the Violet Crown Phase 2A north segment of the Violet Crown Trail. The matrix and report will be submitted to the Community Services Division of Public Works. The report will account for the importance of the Urban Trails Program's goal to create an "all ages and abilities, all weather, connected trail network". The Phase 2A North is located between Phase 1 (that ends at Home Depot Blvd.) and Phase 2A South (that begins at Convict Hill) in South Austin. This preliminary engineering report will yield the options in alignment, cost, and material from which a recommendation will be determined. The City of Austin Public Works Department - Community Services Division, The City of Austin Parks and Recreation Department (PARD), Hill Country Conservancy (HCC), the Oak Hill Trails Association (OHTA), the City of Austin Watershed Protection Department and the City of Austin Planning and Development Review Department have all provided input for possible VCT trail alignments for this phase.

The scope of the PER includes a verification and detailed inventory of the project objectives, scope, inventory of existing utility and other improvements within the project area, possible trail creek crossing locations and benefits and costs of different alignment options. The Level-of-Service for each alternative will be evaluated. The benefit cost analysis of each alignment will include impacts to the floodplain for both the 25 year (4%) and 100 year (1%) ultimate City of Austin floodplains, the Critical Water Quality Zone, the Erosion Hazard Zone (EHZ), known critical environmental feature setbacks, topography constraints, perceived public/neighborhood opposition/input, existing utilities, trees, and natural drainage patterns. The scope also includes the type of trail material options, the type of crossings, research of surrounding existing improvements that impact alignment options, coordination of an environmental screening document and Environmental Resource Inventory and survey during the PER development, a summary of permitting requirements, assessment of additional easement requirements, a

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recommendation for overall scope of proposed design and construction, preliminary opinion of probable construction cost and proposed preliminary project schedule

The recommended proposed trail Alternate that creates a shared use, non-motorized path connecting neighborhoods, parks, and businesses is Alternate 3. The trail will serve as an amenity for the surrounding community so that nature can be enjoyed. Alternate 3 will provide a safer route for joggers, walkers, cyclists, and wheel chair users alike. A user's sense of safety while on urban trails is emphasized in design goals. The result of the level-of-service analysis for both pedestrian and cyclist use supports this. The level-of-service analysis is discussed in section **7.3** and includes some intersection crash data. The user's sense of safety from vehicular traffic encourages use of the urban trails. The Alternate 3 construction cost is estimated at approximately **\$1,169,534.91**. The estimate is based on a 30% preliminary design stage. Construction costs may vary depending on the final design and field conditions at the time of construction. The Opinion of Probable Construction Cost is provided in **Appendix R**. The Alignment Alternatives Matrix that outlines the physical constraint of the alternates is provided in **Appendix S** and the weighted alternative matrix that summarizes the alternate design parameters is provided in **Appendix U** and indicated below for convenience.

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PARAMETER	ALIGNMENT ALTERNATIVES											Recommendation	
	1					2	3		4	5			
	a	b	c	d			a			a	b		
Permitting Complexity ¹	3					2	1		2	2			3
Environmental Impact ²	3					2	2		2	This option was not analyzed for LOS due to cost			2,3, or 4
Cost	\$ 1,806,637.67					\$ 879,205.54	\$ 1,169,534.91		\$ 1,202,252.69	\$ 3,089,485.67			2
Easements	1	1	1	1	4	1	3	3	1	3	3	1	2 or 4
Public Input*	753					744	849		780	This option was not presented to public due to cost			3
Level of Service ³	C					E	A		F	This option was not analyzed for LOS due to cost			3
Recommended Alignment Alternative													3

- indicates the number of times or number of incident the parameter is required

- numbers reflect weighted results of open house (7-30-2014) as prepared by the Community Services Division for

* favorability

1. Permitting complexity is based on the number of Williamson Creek crossings, TXDOT review impacts for work along the ROW and crossing TXDOT intersections and **general permit** ineligibility.

2. Environmental Impact is based on the Environmental Screening Document prepared by Weston, Inc. and Amatterra Environmental, Inc. (**Appendix C**).

3. L.O.S.-CSD definition stated in section 7.3 of the P.E.R.

1.0 INTRODUCTION

1.1 Project Location

The general project area is located south of Home Depot Blvd. in the City of Sunset Valley; the remainder extends south to Williamson Creek within the City of Austin full purpose jurisdiction. The project area extents are also bound by the Mopac Expressway right of way and the retail

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development situated between the west side of Mopac and by Brush Country Road to the west. The project area is located within the Williamson Creek Watershed and the Barton Springs Zone. The project area is also located within the Oak Hills Neighborhood Plan (<http://austintexas.gov/page/neighborhood-planning-areas>). A Project Location Map has been provided in **Appendix A**.

1.2 Project Background

The project is a multi-use trail with a proposed cross section width of 12 ft. The cross section meets federal standards (American Association of Highway Transportation Officials). This project is referred to as Phase 2A North of the Violet Crown Trail as outlined in the Violet Crown Trail Final Master Plan dated September 28, 2010. The study was prepared by Greenways, Inc. for the Hill Country Conservancy in partnership with the City of Austin, City of Sunset Valley, Hays County, National Parks Service, Texas Parks and Wildlife, TXDOT, Travis County, University of Texas McCombs School of Business, American Youth Works E-Corps, Austin Parks Foundation, Hill Country Trail Runners, Lady Bird Johnson Wildflower Center, Austin Ridge Riders, Greenbelt Guardians, and the Real Estate Council of Austin. This Phase will complete the connection of the existing urban phase 1 portion of the Violet Crown Trail that currently terminates at Home Depot Blvd. in Sunset Valley and the Phase 2A South trail that starts at Convict Hill Road. The proposed Phase 2A North is approximately 1.65 miles in length.

1.3 Project Scope and Objectives

The objective of this project is to connect the Violet Crown Trail between two existing phases while adhering to the goals of the Urban Trails Program with the creation of an “all ages and abilities, all weather, connected” trail network. Proposed Phase 2A North is between Phase 1 (that ends at Home Depot Blvd) and Phase 2A South (that begins at Convict Hill Rd.) in South Austin. However, a portion of the original proposed route for Phase 2A North was aligned

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through the Ben Garza Tract. The Ben Garza tract is at the inception of their development/entitlement process. This report analyzes alternate routes that would circumvent the scheduling conflicts due to the Ben Garza Tract development occurring at a later date. The other parameter that has developed after initial studies of the VCT is the connectivity to future trails as outlined in the Oak Hill Combined Neighborhood Plan (<http://austintexas.gov/page/neighborhood-planning-areas>) and the Urban Trails Master Plan. Due to the above, there are other possible alternate routes that were not addressed in the original VCT Master Plan. These alternate routes may provide better greenway alternatives versus aligning the trail along existing arterial roadways in the Mopac Expressway and crossing the busy Mopac/William Cannon Drive intersection. Project Scope Maps can be found in **Appendix B** and below. These exhibits outline the five trail alignment alternatives and identify them by number. Those routes/alignments are described below in Table 1.

TABLE 1

Alignment Alternative	sub-option	Description
1		From Home Depot Blvd to Williamson Creek Crossing preferred by HCC, parallel to Wm. Creek on south bank in a wastewater easement clearing, cross the Ben Garza Tract NW corner, align around a ravine tributary to Wm. Creek at MOPAC, west under MOPAC expressway frontage and main lanes on south side of Williamson Creek, follow Williamson creek in the existing wastewater easement clearing between residences and Williamson creek, cross Williamson creek before Brush Country Rd. bridge crossing. Ascend to Brush Country Rd. and turn south on Brush Country Rd. to the William Cannon Intersection and cross intersection to the Shops at Arbor Trails Retail development DG trail.
	a	Connect to trail from Home Depot Blvd to existing cleared utility trail that has substantial rock outcrops then re-connect to proposed trail listed in 1 prior to creek crossing
	b	Connect to trail from Home Depot Blvd and extend trail to the west away from the Indian Grass Prairie conservation area prior to crossing Williamson Creek. The Williamson Creek crossing would occur at an existing swale at Williamson Creek that was constructed with the Apartment development drainage improvements from the development's pond.
	c	Instead of routing alignment around the ravine tributary to Williamson Creek at Mopac, construct a bridge structure to span the ravine. It would eliminate the need to cut back the MOPAC NBF road side slope to accommodate 12 ft wide trail along MOPAC per alignment 1.
	d	Instead of aligning the trail on the south bank of Williamson creek west of Mopac, the alignment would cross the creek on the west side of the Mopac southbound frontage (SBF) Rd. just west of the bridge and align with the alignment out lined in Alternative 4 (west of Mopac).

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2		From Home Depot Blvd to Williamson Creek Crossing preferred by HCC, parallel to Wm. Creek on south side in wastewater easement clearing cross Ben Garza Tract NW corner. The trail would then be aligned along the Mopac NBF road lane on the west right of way line. It would traverse the Ben Garza Tract undeveloped frontage and connect to existing 5-6 ft sidewalk along commercial tracts to the William Cannon Drive intersection. The trail would cross the intersection to the south and align along the south side of William Cannon Drive and cross under the Mopac over pass. The trail would cross the Mopac SBF road lanes and connect to the existing DG trail on The Shops at Arbor Trail retail development.
3		From Home Depot Blvd to Williamson Creek Crossing preferred by HCC, parallel to Williamson Creek on south side in the existing wastewater easement clearing, cross the Ben Garza Tract NW corner, align around ravine tributary to Williamson Creek at MOPAC, west under MOPAC expressway frontage and main lanes on south side of Williamson Creek, the alignment would head in a southwest direction toward the Randall's development. The alignment would be situated between the Randall's development and the residential home and then run perpendicular to Sanderson Avenue (between the Randall's re-irrigation field to the south and the single family lots to the north). The alignment would then cross Sanderson Avenue and run along the rear property line of the Gold's Gym Development to Brush Country Rd. At Brush County Rd., the trail would head south across the William Cannon Drive intersection to The Shops at Arbor Trails DG trail.
	a	From Home Depot Blvd to Williamson Creek Crossing preferred by HCC, parallel to Williamson Creek on south side in the existing wastewater easement clearing, cross the Ben Garza Tract NW corner, align around ravine tributary to Williamson Creek at MOPAC, west under MOPAC expressway frontage and main lanes on south side of Williamson Creek, the alignment would head in a southwest direction toward the Randall's development. The alignment would be situated between the Randall's development and the residential home and then run diagonally across the Randall's re-irrigation field to Sanderson Avenue. The alignment would cross the cul-de-sac at the end of Sanderson and run along the south side of the Gold's Gym retail pond to the main driveway entrance to the development. The alignment would cross the main driveway and run parallel to the west side and cross William Cannon at the existing street light that provides access to both the Gold's Gym retail development and the Shops at Arbor Trail retail development.
4		From Home Depot Blvd to Williamson Creek Crossing preferred by HCC, parallel to Williamson Creek on south side in the existing wastewater easement clearing, cross the Ben Garza Tract NW corner, align around ravine tributary to Williamson Creek at MOPAC, west under MOPAC expressway frontage and main lanes on south side of Williamson Creek, the alignment would head in a southwest direction toward the Randall's development. The alignment would follow the natural clearing between trees and turn back towards the Mopac Expressway SBFR. The alignment would follow the westernmost right of way line and cross the existing driveways to the Randall's Shopping Center. Those existing driveway s would require to be reconstructed. The alignment would then cross the William Cannon Drive/Mopac intersection. At the southwest corner, the alignment would connect to the Shops at Arbor Trails Retail Development's DG trail.

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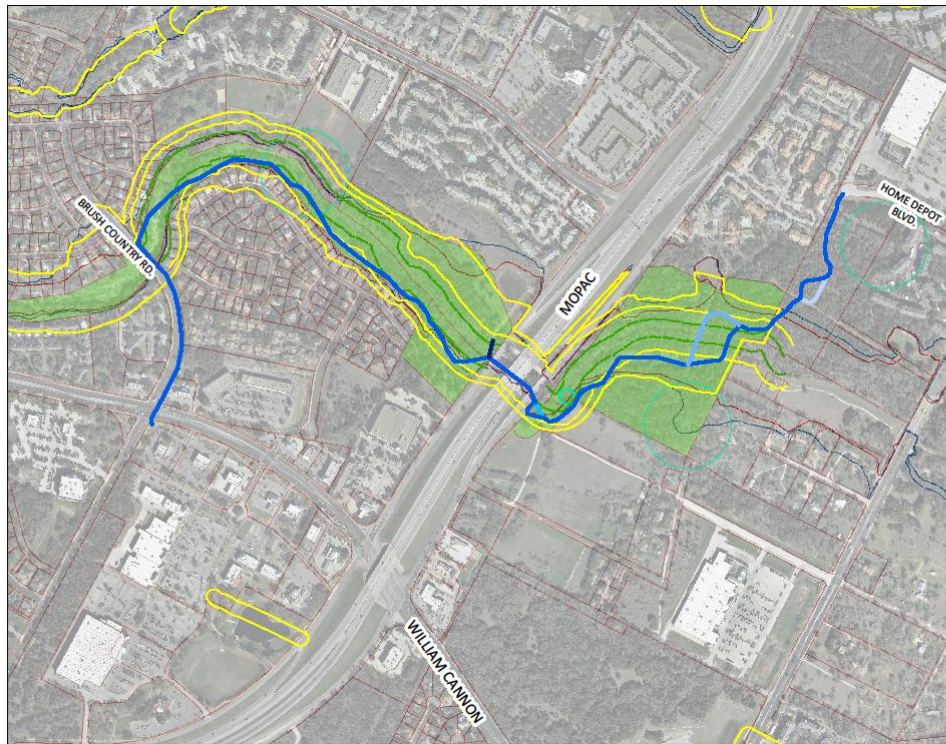
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5		<p>From Home Depot Blvd to Williamson Creek. The Trail would remain on the north side of Wm. Creek and cross the Apartment development swale drainage improvements and connect to Mopac NBF Rd north of the Mopac/Wm. Creek bridge. The alignment would follow the NBF road south to the bridge and cross under the Mopac bridge to the SBF Road west ROW line. The trail would be aligned to head NW onto the Northland Sedona Springs LLC, property within an existing drainage easement and a proposed easement to the Hope in the City LLC property in a proposed easement, and finally onto the Austin Monterrey Oaks, Inc. property. The trail would follow the north bank of Williamson Creek (bluff) past the maintenance house on the property and then traverse a natural area to an existing 8 ft wide DCG trail that leads to the west boundary of the property at the Sunset Valley Tributary to Wm. creek. The trail would cross the Sunset Valley tributary to Wm. creek and connect to Brush Country Rd (where it dead ends). the trail would then be aligned along the east ROW of Brush Country Rd. and cross William Cannon Drive to the Shops at Arbor Trails Retail Development's DG trail.</p>
	a	<p>From Home Depot Blvd to Williamson Creek. The Trail would remain on the north side of Williamson Creek and cross the Apartment development swale drainage improvements and connect to Mopac NBF Road north of the Mopac/Wm. Creek bridge. The alignment would follow the NBF rd. south to the bridge and cross under the Mopac bridge to the SBF Rd west ROW. The trail would be aligned to head NW onto the Northland Sedona Springs LLC, property within an existing drainage easement and a proposed easement to the Hope in the City LLC property in a proposed easement, and finally onto the Austin Monterrey Oaks, Inc. property. The alignment would immediately connect to the existing 8 ft wide DCG trail on the property (away from Williamson Creek). The trail would cross the Sunset Valley tributary to Williamson creek and connect to Brush Country Rd. (where it dead ends). The trail would then be aligned along the east ROW of Brush Country Rd. and cross William Cannon Drive to the Shops at Arbor Trails Retail Development's DG trail.</p>
	b	<p>From Home Depot Blvd to Williamson Creek. The Trail would remain on the north side of Wm. Creek and cross the Apartment development swale drainage improvements and connect to Mopac NBF Rd north of the Mopac/Wm. Creek bridge. The alignment would follow the NBF rd. south to the bridge and cross under the Mopac bridge to the SBF Rd west ROW. The trail would be aligned to head NW onto the Northland Sedona Springs LLC, property within an existing drainage easement and a small proposed easement and cross Williamson creek at an existing unofficial pedestrian crossing just south of the development's secondary pond. The alignment would then connect to the natural cleared path that runs along the rear property line of the single family lots and the south bank of Williamson Creek. The alignment would then cross Williamson creek before Brush Country Rd. bridge crossing. Ascend to Brush Country Rd. and turn south on Brush Country Rd. to William Cannon intersection and cross the intersection to the Shops at Arbor Trails Retail development DG Trail.</p>

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VIOLET CROWN TRAIL ALTERNATE 2

Legend

- Alternate 2
- GreenBelt/Parkland Area
- Critical Water Quality Zone
- Erosion Hazard Zone
- 150ft CWQZ
- CEF 50' Setback
- CEF 300' Setback
- COA 100YR
- COA 25YR
- Parcels



0 0.05 0.1 Miles

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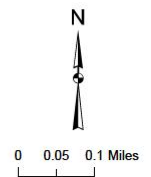


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**VIOLET CROWN
TRAIL ALTERNATE 3**

- Legend**
- Alternate 3
 - a - sub alt
 - GreenBelt/Parkland Area
 - Critical Water Quality Zone
 - Erosion Hazard Zone
 - 150R CWQZ
 - CEF 50' Setback
 - CEF 300' Setback
 - COA 100YR
 - COA 25YR
 - Parcels



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VIOLET CROWN TRAIL ALTERNATE 4

Legend

- Alternate 4
- GreenBelt/Parkland Area
- Erosion Hazard Zone
- 150 ft CWQZ
- Critical Water Quality Zone
- CEF 50' Setback
- CEF 300' Setback
- COA 100YR
- COA 25YR
- Parcels

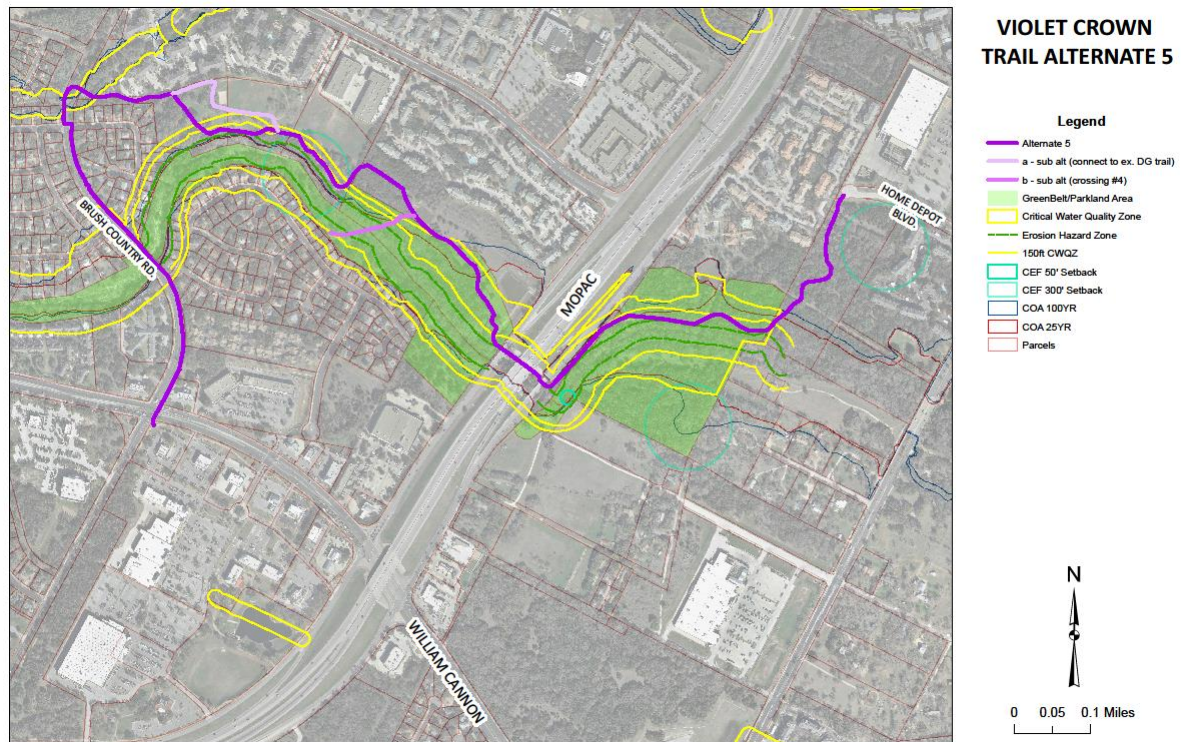


0 0.05 0.1 Miles

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1.4 Related Studies

The sole related study prepared for this project was the Violet Crown Trail Final Master Plan dated September 28, 2010. As mentioned briefly, the proposed Phase 2A north alignment may deviate from the originally planned alignment. Other information compiled for a portion of this Phase 2A North area are the known locations of existing critical environmental features (CEF's) as identified by the City of Austin – Watershed Protection Department . The setbacks associated with those CEF's are identified in the alternate route exhibits. Some of the identified CEF's will impact the proposed alignments. All alternates with the exception of 1 and 5 will avoid the set-

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backs. Given the constraints, a variance granted by the City of Austin Land Use Commission will be required for development within the CEF setbacks per the City of Austin Land Development Code Section 25-8-41.

Once the trail alignments are identified and prioritized, an environmental consultant will be selected. This report will aid in defining the environmental consultant's scope in advance of progressing into the design phase. As a requirement of this preliminary engineering report, an associated environmental screening document is discussed in section **4.2** and included in **Appendix C**.

2.0 EXISTING CONDITIONS

2.1 Topography Conditions

The general project area is located within both the City of Sunset Valley and the City of Austin. The project is located on MAPSCO grids D18, D19, E18, and E19. The majority of the project area is located within public property in the form of parkland (Williamson Creek West Greenbelt), drainage easement or roadway right of way.

Based on City of Austin GIS 2013 LIDAR, topography falls gently north to south at approximately 1% towards Williamson Creek from Home Depot Blvd. Elevation in this Phase varies from approximately 719 feet (ft) mean-sea-level (msl) to approximately 704 ft msl in Williamson Creek. This area is heavily wooded with some existing cleared paths for existing utilities and abandoned street ROW's. Visible rock outcrops are located within a portion of the cleared paths. Topography within the Williamson Creek floodway bank falls at approximately 3% from the north into the creek, while the south bank rises at approximately 8% from the creek.

The south side of Williamson Creek is relatively flat along the proposed route. The elevation change is gradual and rises to approximately 747 ft msl in the Brushy Creek Road right of way. The majority of the alignment of the proposed trail runs parallel to Williamson Creek. This

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portion of the trail alignment is located within existing clearings. These clearings are located within existing utility line assignments.

The existing utilities consist of a 36" to 42" wastewater main that follows the Williamson Creek alignment and is identified as WW-88-0553. The vacated right of way in the City of Sunset Valley is Forest Oak Drive. Photographs of the area are included in **Appendix D**.

2.2 Infrastructure Conditions

The Mopac Expressway crossing will require coordination with the Texas Department of Transportation (TXDOT). It is our understanding that the trail system has been coordinated with TXDOT in the past. However, given the challenges of crossing Mopac and design parameters offered in this report, their input as to the feasibility and approval of the type of trail elements within the Mopac ROW will be required. Their input will help in prioritizing the options. Photographs of the MOPAC bridge crossings are located in **Appendix E**. The trail element options are also presented in this Appendix.

3.0 UTILITY COORDINATION, PROPOSED PROJECTS, AND EASEMENTS

3.1 Existing Utilities and Proposed Projects

On May 7, 2014 ESD submitted 30% preliminary schematics to the Austin Utility Location Coordination Committee (AULCC) to receive existing utility information within the project location area. The submittal to AULCC allows the utility providers an opportunity to determine if any necessary upgrades or improvements to their facilities in the area of the project limits. On May 29, 2014 the AULCC met at the One Texas Center to transfer information on existing utilities to ESD. A summary of the responses, copy of e-mail correspondence and utility responses from agencies and utilities notified of the project has been provided in **Appendix F**.

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3.1.1 Austin Water Utility Water Facilities

Provided system maps and indicated that both a 12" water main and the 42" waste water main were in the project vicinity and that the alignments needed to be indicated on construction plans.

3.1.2 Public Works Street & Bridge Division

Indicated project was clear and that there were no planned improvements in the area.

3.1.3 Texas Gas Service

Indicated the project was clear and that there were no conflicts or infrastructure in the green belt area.

3.1.4 Austin Energy (AE)

AE indicated that there were overhead lines in the area and provided GIS information but that there were no apparent conflicts with their infrastructure.

3.1.5 Watershed Engineering Division (WED)

Indicated project was clear and that there were no planned improvements in the project area. WED provided GIS information from storm viewer.

3.1.6 ATT Utilities

Indicated project was clear and that there were no planned improvements in the area. However, they requested that utilities along the roadway, especially Brush Country Rd, be potholed. Their infrastructure in the area is so old, it may only have 12" of cover and if plans to grade for the trail were anticipated, field locating their lines would be necessary. – Call locate.

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4.0 PERMITTING REQUIREMENTS

4.1 Summary of Permitting Requirements

The following sections summarize the permit requirements for the Violet Crown Trail Phase 2A North project. These are the known permits required at the time of the report. There may be other permits required if new scope is added or if any findings are made during the design or construction process.

4.1.1 City of Austin

The project may qualify to be constructed under the General Permit Requirements. Therefore, no other City of Austin permits will be required. Multi-use trails constructed in city ROW are subject to Sections 25-8-261 and 262 of the City Land Development Code. Based on the Watershed Protection Ordinance Phase One that is effective as of October, 2013, the majority of the proposed trail alignments will require an administrative variance. The administrative variance will be for the location of the trail being within the 150 ft offset from the centerline of the major waterway (Williamson Creek) – development within the Critical Water Quality Zone. The process is administrative and will be processed by the reviewer at the time of permitting (per code City of Austin Land Development Code Section 25-8-42(B)(1)(d)).

As a requirement of the permit application an Environmental Resource Inventory will be required. An environmental consultant will be required because of the area in which development is proposed. The project area has known CEF's, is within a karst aquifer, and is within the critical water quality zone and the 100 year floodplain, which are all criteria outlined in code Section 25-8-121.

As mentioned briefly in section **1.4**, a land use commission variance will be required for those alignments within the setbacks of the CEF's identified. If a variance from the land use commission is required, the project would not be eligible for a general permit. This would make

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the permitting for Alternates 1 and 5 more complex. The variance will require written justification. Per LDC Section 25-1-46, the land use commission should be the Planning Commission (as opposed to City Council) in this case due to the project area being located within the boundaries of the Oak Hill East neighborhood plan. The variance would go before the Environmental Board prior to the Land Use Commission. The Environmental Board acts in an advisory capacity and its decision is used by the Land Use Commission in determining their approval or disapproval of a proposed variance. With notification requirements the process could take 3 to 6 months for approval and depends on public input.

Bikeways must also adhere to the Transportation Criteria Manual Section 7 as some of the alternates may share public roads with vehicle traffic. With the majority of the trail within a greenway the design speed will be 15 mph. With that design speed, the desired horizontal radius of curvature will be 50 ft.

There are also some alternatives that would require obtaining additional easements from property owners. The City of Austin process in obtaining easements takes on average 1 year and is handled by the Real Estate Department. Easement field note preparation by a registered surveyor would also be required

4.1.2 City of Sunset Valley

The project may qualify to be constructed under the Watershed Permit Requirements. As mentioned briefly, the northern portion of the VCT Phase 2A North is located within the full purpose jurisdiction of the City of Sunset Valley. The alignment in this area is subject to the Sunset Valley Trail Master Plan. According to the Environmental Services Department, each green space has trail specifications. This section is referred to the Indian Grass Prairie Preserve. The specification for this area is limited to a 6-8 ft tread and a 10 ft wide and high clearance. The material type is limited to existing natural surface. Any changes to the design specifications will require City of Sunset Valley Council approval.

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A copy of the City of Sunset Valley Master plan is included in **Appendix G**. The pages applicable to the Indian Grass Prairie Preserve are 32 and 33. Based on the VCT trail requirements for a multi-use trail; 12 ft width tread (10 ft minimum) and the desired smooth surface, a variance from council will be required.

The watershed variance for a surface trail that is impervious would be required because the Indian Grass Prairie area is considered a zero development areas. Granite gravel and possibly Stalok® (discussed in section 5.6) may be exempted. City Council meetings are held twice a month with the agenda set approximately a month in advance. Best case scenario is that a request could go before City council in three (3) weeks. The City Council may refer it back to committee which could take an additional one (1) or two (2) months for approval.

4.1.3 State Permitting Requirements

The project location is within the Edwards Aquifer Recharge Zone and is subject to permitting under the Edwards Aquifer rules. A Water Pollution Abatement Plan will be required to be submitted to the Texas Commission on Environmental Quality (TCEQ).

4.1.4 Texas Department of Transportation (TxDOT)

Approximately 660 ft of the 12 ft wide trail is anticipated to be within the TxDOT ROW on either the north or south side of the Mopac overpass over Williamson Creek. Based on conversations with TxDOT, their review is courtesy in nature. The only procedural item to be defined prior to approval of design documents will be the execution of a Memorandum of Understanding (MOU) for the maintenance of the Trail.

4.1.5 Federal Permitting Requirements

The proposed trail alignment will cross Williamson Creek at least once. The number of crossings depends on the trail alignment alternative that is selected. The crossing will be subject to the Clean Water Act Section 404. (f) (2) *“Any discharge of dredged or fill material into the navigable*

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waters incidental to any activity having as its purpose bringing an area of the navigable waters into a use to which it was not previously subject, where the flow or circulation of navigable waters may be impaired or the reach of such waters be reduced, shall be required to have a permit under this section. The U.S. Corps of Engineers typically requires a permit for construction within bodies of water (i.e., creeks, rivers and lakes), also known as waters of the United States (US). “

A Nationwide Permit (NWP) - Linear Transportation Projects. “Activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the United States. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge cannot cause the loss of greater than 1/3-acre of waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project. This NWP also authorizes temporary structures, fills, and work necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be re-vegetated, as appropriate. This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars. Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) the loss of waters of

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the United States exceeds 1/10-acre; or (2) there is a discharge in a special aquatic site, including wetlands. (See general condition 31.) (Sections 10 and 404) Note: Some discharges for the construction of farm roads or forest roads, or temporary roads for moving mining equipment, may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4)."

The Environmental Protection Agency typically requires a Federal Construction Stormwater Discharge Permit if the project area to be disturbed is one acre or greater. The work area of this project is expected to be more than one acre and will require a Federal Construction Stormwater Discharge Permit and a Stormwater Pollution Prevention Plan.

4.2 Environmental Resource Inventory

As a condition of the Preliminary Engineering Report for an urban trail an environmental screening document has been prepared to evaluate the impacts of proposed alignments on the biological and cultural resources of the project area. An environmental consultant was selected from the City's rotation list to prepare the document. Weston Solutions, Inc. and Amatererra Environmental, Inc. completed the document and it is included in **Appendix C**. Their report is titled "Environmental Screening Document – Violet Crown Trail Route Alternatives" dated December 2014 (contract PA100000043, Sol#CLMP030). ***Alternate 5 has been evaluated to be financially infeasible was excluded from the environmental screening document.***

Once the Violet Crown trail alignment is selected by the sponsor, another assignment request will be submitted for the selection of an environmental consultant to complete an Environmental Resource Inventory. The general area of the alignment will be coordinated with the consultant for their preparation of an Environmental Resource Inventory that will fulfill the requirements of both the City of Austin and the City of Sunset Valley. The information obtained via this report will be shared with the consultant to supplement their report. The information will include the location of the existing Critical Environmental Features (CEF's) identified by the City of Austin Watershed Protection Department.

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5.0 ENGINEERING ANALYSIS

5.1 Williamson Creek Crossings

Based on field observations with the stakeholders, there are potentially six (6) feasible creek crossings associated with the proposed trail alignment. Because of permitting issues, efforts to minimize the construction footprint, and future maintenance of the crossing, the number of creek crossings is to be minimized.

All proposed creek crossings, with the exception of one (Alternate 1c) are to be at grade crossings. These at grade crossing(s) will be such that they follow FHA guidelines in that no ledges are to be incorporated and that the trail width in the creek will be expanded to provide a stabilized crossing that will deter erosion.

The trail and the crossings are subject to the City of Austin Land Development Code chapter 25-8-262 (C) which states “In all watersheds, multi-use trails may cross a critical water quality zone of any waterway”. If Alternate 1c is selected to cross the contributing ravine on the south side of Williamson Creek at the Mopac northbound lane, a bridge structure would be required. The structure would span the ravine, avoid the significant trees, and span a TXDOT drainage structure. The width of the bridge would be a minimum of 14 ft wide. Should grades allow, a metal grate board walk could be installed. The metal grate boardwalk could serve two purposes as a bridge for pedestrian use and to minimize the obstruction of flow in the creek because of the grate type deck that could be implemented (flow-through capability). An example of the type of decking is located in the Violet Crown Trail Master Plan report, 5-16 provided in **Appendix H**. The possible six (6) Williamson Creek crossings are identified in **Appendix J**.

5.2 Williamson Creek Floodplain

The current effective floodplain depicted on City of Austin Geographic Information Systems (G.I.S.) reflects the study prepared by Halff Associates Inc., dated October 29, 2004 in

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conjunction with the City of Austin Watershed Protection Department (WPD) and subsequent restudy of Williamson Creek prepared by Espey Consultants, Inc. dated July 21, 2006. It is important to note that this information is not the official model as indicated by the WPD. The official model must be requested from the Federal Emergency Management Agency (FEMA) Regional Office.

For preliminary purposes, the model information parameters provide by WPD were utilized for this report. The WPD disclaimer still applies : *“This hydrologic or hydraulic model information is made available by the City of Austin as a service to the community, but is not intended to be used without independent engineering judgment as to its applicability to a particular scenario. The City of Austin makes no warranties, expressed or implied, concerning the accuracy, completeness, reliability, or suitability of the information provided. A Texas Licensed Professional Engineer must certify any results developed through the use of this model information that are submitted to the City as part of the land development review and permit approval process.”*

The 100 year floodplain reflected on the City of Austin’s GIS does fall within reason of the model floodplain elevation results. The WPD Williamson Creek Flood Study Maps and model result table is provided in **Appendix K**.

5.3 Critical Water Quality Zone

Based on the unofficial floodplain information, the drainage area basin at Brush Country Road is 6.66 square miles. Therefore, per section 25-8-91 of the Land Development Code, Williamson Creek is considered a major waterway. Per section 25-8-92 of the Land Development Code, the Critical Water Quality Zone boundaries for Williamson Creek (in the Barton Springs Zone) are located not less than 200 feet and not more than 400 feet from the centerline of the waterway and does not apply to a previously modified drainage feature serving a public roadway right-of-way. As per sections 25-8-261 (B)(3)(e) and 25-8-262 (C) of the City of Austin Land Development

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Code, the proposed trail alignment cannot be located less than 150 ft from the center line of the Creek and may cross critical waterway of any waterway, respectively.

An administrative variance to allow a trail to be placed closer to the waterway than designated in 25-8-261(B)(3) is available under section 25-8-42 and the requirements are outlined in the Environmental Criteria Manual (ECM) section 1.5.3.

5.4 Erosion Hazard Zone

Due to the proposed Williamson Creek Crossing, an Erosion Hazard Zone study must be completed to analyze impacts to the EHZ per Land Development Code section 25-7-32. The 25-8-261 and 25-8-262(c) of the City of Austin Land Development Code.

The City of Austin GIS does have an 100 ft buffer for Williamson Creek in the project area indicated, however based on coordination with the City of Austin WPD, the depiction is considered a verification zone. One benefit of preparing the EHZ analysis is that the hydraulic information obtained in the Williamson Creek floodplain model is used to determine the depth of the 2 year event which is less than the calculated depth from topography information and assumed high bank and low bank elevations. Utilizing the hydraulic model and those results aids in defining the projected EHZ depth.

Based our coordination with WPD, the projected incision depth assumed for Williamson Creek was reduced to 1 times the existing depth. This also reduced the width of the project EHZ. The reduction in future incision depth is based on the “Williamson Creek Watershed Assessment”, dated May 1997. The project portion of Williamson Creek is referred to as segment 11 in said report. The description of the creek is a rock bed with aggradation. The report was prepared under C.I.P. 485-617-2000. The preliminary EHZ work maps and calculations are included in **Appendix L**.



5.5 Tree Impacts

The majority of the proposed trail alignment segments are located in existing cleared areas (utility easements) and within the full jurisdiction of the City of Austin. These areas are devoid of trees due to either existing utilities or existing pedestrian use. The impacts to existing trees because of the proposed trail should be minimal. The tree survey requirements for the City of Austin are determined by the City of Austin Environmental Criteria Manual.

The only area that is heavily wooded is that portion of the trail that lies north of Williamson Creek, east of Mopac, and south of Home Depot Blvd. The majority of this area is located within the full jurisdiction of the City of Sunset Valley. This area is also where rock outcrops are abundant. This area includes a known critical environmental feature (sinkhole) that has a 300 ft radial offset. The alignment indicated through this area was aligned via surveyed handheld gps to avoid or minimize impacts to rock outcrops and large trees while avoiding encroachment into the CEF setback.

Tree removal impact in this area will be greater and is subject to the City of Sunset Valley Tree Ordinance – Chapter 16. That section is included in **Appendix M**. Protected trees are considered those with a diameter of ten (10) inches or greater with the exception of five small tree species that are considered protected with diameters greater than five (5) inches.

The field reconnaissance of trees was visual observations only. A certified tree survey will need to be completed prior to designing the proposed trail for the chosen alignment. Alignment shifts due to field tree survey should be minimal in order to avoid impacts to trees.

5.6 Drainage Utility Conflicts

Based on field observations, existing drainage storm sewer system outfalls could impact the proposed trail alignment. The drainage outfalls were observed both visually and via City of Austin GIS record information for the single family subdivision (Westcreek) located along the

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proposed alignment Alternate 1. Culvert or boardwalk type cross sections will be required in order to minimize the effects of the concentrated flows from those outfalls.

There are drainage outfalls along the TXDOT right of way along MOPAC. These outfalls are considerably larger. The trail outfall discharge intersections will require culvert crossings in these areas. These are generally located on the MOPAC northbound lanes. Record drawings for these outfalls are included in **Appendix N** (PDF sheet 189(pg. 147) – shows future trail and outlet under bridge on PDF sheet 102 (pg. 74) The locations that impact the proposed trail are reflected in the alignment exhibits.

5.7 Trail Proposed Cross Section

As outlined in the Violet Crown Trail Final Master Plan, there are several stakeholders involved in the design and maintenance of the proposed trail. Based on conversations with the Hill Country Conservancy (HCC), their agreement in terms of maintenance of the trail is limited to the sections of the trail that utilize a StaLok® material. This material is manufactured and patented by Stabilizer Solutions. Manufacture information and specifications for the StaLok® material are included in **Appendix O**.

HCC has a pilot project underway at the Hampton Library Branch at Oak Hill. They have installed an approximate 300 linear feet of an 8 ft wide trail. The compaction during installation was not done pneumatically. Though the material is soft, it seemed to be easily disturbed and excavated by foot. The surface was significantly undulating. However, that may be due to how the material was placed.

Positive feedback has been obtained by HCC from the governmental entities in Arizona and Colorado that have used and continue to use the material. These users are primarily from the southwest region of the United States. Maintenance of the StaLok® sections of the trail in the Austin area is still unknown. There is no literature or studies that address environmental



extremes encountered in the Austin Area. Extremes include extreme temperature, occasional freezes, and extreme precipitation.

Extreme Precipitation for example:

Based on NOAA Atlas 14 Point Precipitation Frequency Estimate (volume 8 for Colorado) effective April 19, 2013 the Precipitation Frequency is about 2.81 inches for the 100 year (1%) recurrence interval for the 24 hour storm event. (1.28 inches for the 2 year (50%) recurrence)

In the same manner, based on NOAA Atlas 2 Point Precipitation Frequency Estimate (volume 1 for Arizona, Nevada, New Mexico, and Utah) effective August 6, 2003 the Precipitation Frequency is about 4.94 inches for the 100 year (1%) recurrence interval for the 24 hour storm event. (2.28 inches for the 2 year (50%) recurrence).

Austin's rainfall depth is 10.2 inches for the 100 year (1%) recurrence interval for the 24 hour storm event. Austin's rainfall depth for the 2 year (50%) recurrence interval for the 24 hour storm event is 3.44 inches. The City of Austin 2 year event occurs more frequently and produces peak flows about equivalent to Colorado's and Arizona's 100 year events that are more infrequent.

Maintenance logistics and the amount of maintenance that can be done at one time is a constraint. The closest resource of the material is currently Arizona, with future plans for the material to be made available in the Texas region. A stockpile of the material would be required to have on hand.

Natural earth and decomposed granite (DG) material is also an option used primarily for pedestrian hiking and mountain bike use. The City of Sunset Valley requires this type of trail cross section through the Indian Grass Prairie (IGP) conservation area. Most of the IGP area is outside the Williamson Creek floodplain and heavily inundated with natural rock out crops. Therefore, erosion should be minimized however long term maintenance will be significantly higher. A trail with rock outcrops and/or DG may restrict the use of road bicycles. This use is vital in creating a transportation connectivity corridor that the VCT master plan envisioned.

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In conjunction with greenway designs, the multi-use trails tend to be constructed of asphalt. Asphalt allows more control over providing a smooth non-undulating surface. The asphalt surface is preferred by users that are both runners and road bicycle users. The asphalt surface also provides a surface that smaller wheeled modes of transportation can utilize (such as skateboards, rollerblades, roller skates, and scooters). Some maintenance will be required as with similar types of asphaltic roadways. The life cycle of asphalt is longer compared to decomposed granite. The asphalt surface is less prone to erosion due to overland sheet water run-off.

Based on the Hydrologic and Hydraulic model for Williamson Creek, velocities in the creek range from 5.13 to 9.67 feet per second (fps). It is recommended and required that the crossing through the immediate visible floodway be constructed of concrete. The low water crossing should be designed to incorporate transition sides with no lip or edge drop-off. The upstream side of the crossing should have a relatively deep toe. The same side should utilize the in-situ material/rocks in the floodway to bury the transition. This will reduce scouring and reduce obstruction to existing flows in order to minimize impacts to the natural character of the creek. The downstream side of the crossing should also transition with no lip or edge drop-off. The same side should also have a relatively deep toe, with a mortared rock rip rap transition or gabion mattress to deter scouring. The bank side approaches to the low water crossing will be stabilized with a geosynthetic armoring, gabion mattress, and/or natural limestone block away from the paved trail (upstream and downstream) to minimize disturbance and bank erosion. The armoring of the bank sides may require a disturbance of 3 times the proposed trail clearing width (approximately 45 ft) until it ties back to natural grade.

The trail width for the Violet Crown Trail which is defined as a long term green way is preferred to be 12 ft wide, with projected use to increase in the next 20 years. The minimum width for a multi-use trail should be 10 ft wide as outlined in the Violet Crown Trail Master Plan Report. Possible trail cross-section alternatives are provided in **Appendix P**.

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Based on the longevity of the proposed materials and reduction in maintenance, it is recommended that the areas outside of the creek crossings be constructed of hot-mixed asphaltic concrete (HMAC). The cost of HMAC is approximately 1/3 that of the stalok material and is a material that is readily available for maintenance and requires less maintenance than crushed granite. The HMAC trail surface will provide an urban trail network that accommodates several modes of transportation.

5.8 Public-Trail Interface

Though the proposed Violet Crown Trail is part of the City of Austin Urban Trail Master Plan and increases the community's connectivity to surrounding neighborhoods, parks, and businesses, some of the alternative alignments may pose some public opposition. These areas are generally located near existing single family developments, which are located west of the Mopac Expressway (Westcreek). This area is known as the East Oak Hill Neighborhood plan.

Based on field visits, most fences along the City of Austin Williamson Creek drainage easement are either chain link or non-existent. Non-permitted uses by those abutting properties within the City-owned drainage easement include but are not limited to existing gardens, landscaping, picnic tables, and shooting targets. A public trail at this location may require eliminating these non-permitted existing uses and increasing the pedestrian traffic in the resident's current unobstructed view of the creek.

6.0 GEOTECHNICAL ENGINEERING ANALYSIS

A geotechnical report has been prepared by HVJ as a portion of the VCT Phase 2A South. There is one bore in the location of the Phase 2A North project limits at Home Depot Blvd. HVJ report is dated April 29, 2013 and is associated with the 60% review of that project. A copy of that report is included as **Appendix Q**.

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Once an alignment for Phase 2A north is chosen by the sponsor, the alignment coordinates and criteria for bore locations will be coordinated with the geotechnical consultant selected from the City of Austin’s rotation list. It is anticipated that borings will be five (5) ft in depth or until bedrock is encountered. The number of bores is expected to be three (3) to four (4). Based on the phase 2A South information, it is anticipated that a flexible pavement cross section could be a 2” Hot Mix Asphalt Concrete surface with a 10” flexible base on a lime treated subgrade. The report also outlines a rigid pavement cross section of 5” concrete with #3 on 18” on centers each way. The alternates are outlined in **Appendix P**. The proposed geotechnical report may also enhance the EHZ calculations and delineation and provide a refined rigid pavement cross section for the proposed Williamson Creek crossing associated with Phase 2A North.

7.0 PUBLIC INPUT

7.1 History

As briefly mentioned in section **1.4**, the Violet Crown Trail has been in development since 2005. The process to connect the Water Quality Protection Lands (WQPL) (area south of the LBJ Wildflower Center) together with other parks, preserves, and neighborhoods to foster public access opportunities to the WQPL has been ongoing. The Violet Crown Master Plan – a regional trail system was developed from public input and scientific studies that transformed the WQPL Management plan.

During the planning and design process, several open house meetings were incorporated to collect citizen input regarding the route and alignment of the trail. The three Phases of the trail were defined as Phase 1 – Urban Wildlands, Phase II –Urban Villages and Neighborhoods, and Phase III – Texas Hill Country Heritage. Phase II specifically was defined as a seven mile segment that would traverse multiple open spaces, including Williamson Creek Greenbelt, Dick Nichols Park, the Deer Park at Maple Run Preserve, and the Circle C at Slaughter Creek Park.

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At that time, Phase II was identified as having high potential as an alternative transportation way through the highly populated area that is often congested with vehicular traffic. Phase II would provide an opportunity to walk or bike to work, to parks, to shop, to visit other communities and enjoy the benefits of green spaces. This segment was identified to provide connectivity to both nature and urban life.

7.2 Goals for the Violet Crown Trail

The purpose and need as outlined by the Violet Crown Master Plan is as follows:

“Simply put, the proposed Violet Crown Trail corridor offers outdoor enthusiasts access to some of the most beautiful, native landscapes of the Texas Hill Country.”

Planning and design for the Violet Crown Trail is guided by several principles, including to:

- Protect existing parkland, the Water Quality Protection Lands and their function to provide clean water within the Edwards Aquifer recharge zone,
- Construct and operate a trails system that is sustainable and minimizes impact to the surrounding parkland and WQPL,
- Meet the needs of diverse users, but at the same time recognize that the trail cannot be all things to all users, and
- Consider the impact that increased public access and trail use can have on adjacent private properties and landowners and mitigate this impact.

As the Violet Crown Trail has evolved so too has the City’s Urban Trail Program. The Community Services Division of the City of Austin Public Works Department has been chartered with fostering the development of the urban trail program. Their mission is stated as follows:

“An Urban Trail is defined as: ‘A citywide network of non-motorized, multi-use pathways that are used by bicyclists, walkers and runners for both transportation and recreation purposes.’

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The benefits of Urban Trails include:

- ◆ Provide economic benefits to the City: the cost of constructing roadways is 50 times greater than the cost of constructing cycle tracks, and 12 times greater than the cost of constructing Urban Trails,
- ◆ Help everyone save money: the cost of owning a vehicle is nearly 73 times greater than the cost of owning a bicycle,
- ◆ Support a healthy lifestyle by giving people the opportunity to be physically active, which in turn can reduce their risk of heart disease, obesity, depression, diabetes and other health problems,
- ◆ Help reduce traffic congestion by having fewer vehicles on the road,
- ◆ Help reduce pollution,
- ◆ Increase safety by providing protected pedestrian and bicycle infrastructure,
- ◆ Enhance accessibility and mobility by providing more transportation options
- ◆ Increase urban accessibility for people of all ages, from 8 to 80,
- ◆ Provide opportunities for social interaction and community engagement,
- ◆ Increase access to nature,
- ◆ Help stimulate economic growth by attracting businesses and residential development, and
- ◆ Encourage bicycle ridership and walking.”

As the city moves toward enhancing public health with alternative means of transportation while encouraging the access to the green spaces that the City has to offer, the different regulating departments have incorporated goals that echo to promote the urban trail system goals. These regulating departments include the WPD and PARD.

One of the Watershed Protection Department Master Plan Common Goals and objectives as it applies to the urban trail initiative is as follows:

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Goal: Improve the urban environment by fostering additional beneficial uses of waterways and drainage facilities.

Objective: Maximize the use of waterways and drainage facilities for public recreation; and, Maximize areas for public use within floodplains, while maintaining a natural and traditional character of floodplains to the maximum extent possible.

In the same manner, the Parks and Recreation Department's goal is to provide, protect, and preserve a park system that promotes quality recreational, cultural, and outdoor experiences for the Austin community. It is important to note that at least 1/3 or more of the Violet Crown Trail is situated on parkland.

7.3 Trail Level of Service

The proposed trail is part of a multi-modal, non-motorized transportation network. As departments of transportation look to the future, all modes of transportation must be considered/analyzed. As such, the industry standard in evaluating the various modes of transportation is level of service (LOS). Though level of service in the past has been primarily for motor vehicle traffic speed and delay, LOS indicators for non-motorized modes have been developed. The 2010 Highway Capacity Manual created urban Level of Service for both walking and cycling. Since then, the LOS for both have been refined. Some of those references can be found at the Victoria Transportation Policy Institute <http://www.vtpi.org/tdm/tdm129.htm>.

For the purposes of this preliminary engineering report, it is important to weigh the difference in LOS for each alternative. The following parameters are weighted heavily as indicators for preserving the health, safety, and welfare of the public;

Network continuity, network quality, road crossings, traffic protection, congestion and user conflicts, topography, sense of security, weather protection, cleanliness, attractiveness, and marketing of the facilities

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Tables 5 and 6 will be used from the Victoria Transportation Institute (Dixon 1996) to compile a level of service for alternates 1 through 3 and 5. *Alternate 5 LOS was not evaluated as the cost associated with that alternate makes it infeasible.*

Dixon, 1996 Dixon, L. (1996) "Bicycle and pedestrian Level-of-Service performance measures and standards for congestion management systems", Transportation Research Board, 75 th Annual Meeting, Washington D.C.

As a result of the public survey comments, concerns were raised as to the impacts of vehicular traffic at the crossing locations of William Cannon Drive. Though the Level-of-Service analysis accounts for conflict points as a parameter in the analysis, data was compiled by the Austin Transportation Department via a query of the Austin Police Department's collision data base. The data set below represents a data pool from August 2013 and August 2014. The data covers the area between the intersection of Brush Country Rd. and W. William Cannon Dr. through the intersection of S. Mopac Service Rd. and W. William Cannon Dr.

William Cannon/Brush Country	
Car to car	4
Car to pedestrian	1
William Cannon/Private Rd	
Car to car	3
MOPAC/William Cannon	
Car to car	12
Car losing control	12

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Table 5 Pedestrian Level-of-Service Alternates*

	Pedestrian	Points	1	2	3	4
Facility (Max Value = 10)	Not continuous or non-existent	0	0	0	0	0
	Continuous on one side	4	2	2	2	0
	Continuous on both sides	6	3	0	1.5	0
	Min. 1.53 m (5') wide & barrier free	2	1	1	1	0
	Sidewalk width >1.53 (5')	1	0.5	0.5	0.5	0
	Off-street/parallel alternative facility	1	0	0	1	0
Conflicts (Max Value = 10)	Driveways & sidestreets ¹	1	0.5	0.14	1	0.17
	Ped. Signal delay 40 sec. or less	0.5				
	Reduced turn conflict implementation	0.5				
	Crossing width 18.3 m (60') or less	0.5	0.25	0.047619	0.25	1.792
	Posted speed starts at 30 mph along route ²	5	5	0	5	0
	Medians present	1	1	1	1	1
Amenities (Max Value = 2)	Buffer not less than 1m (3'5")	1				
	Benches or pedestrian scale lighting	0.5				
	Shade trees	0.5	0.5	0	2	0
Motor Vehicle LOS (Max. value = 2)	LOS = E, F, or 6+ travel lanes ³	0	0	0	0	0
	LOS = D, & < 6 travel lanes	1				
	LOS = A, B, C, & < 6 travel lanes	2				
	No Motor Vehicle Lane Adjacent	3	1	0	3	0
Maintenance (Max. value = 2)	Major or frequent problems	-1				
	Minor or infrequent problems	0				
	No problems	2				
TDM/Multi Modal (Max. value = 1) ⁴	No support (no existing network in place)	0		0		0
	Support exists	1	1		1	
Total			15.75	4.69	19.25	2.96
LEVEL-OF-SERVICE			B	E	A	F

* The portion of the route that is not common to all alternatives is evaluated in the table in order to emphasize the difference in each alternative

1. Sanderson Avenue is a dead-end street that is not utilized as a local street due to surrounding rezoning. Conflict at this crossing would be minimal.

2. posted speed for Alt 1 is 30, Alt 2 is 55, Alt 3 is 30, and Alt 5 is 55

3. The level of service based on visual observation during rush hour is estimated as E,F,E, and F for alternates 1,2,3,&5, respectively.

4. TDM is the transportation Demand Management for multi-modes of transportation. Currently the TXDOT ROW does not provide a connected pedestrian or cyclist network along the entire MOPAC frontage relative to this trail.

Shaded areas are those indicators that are either common to all alternates or where the level of design would render them subjective.

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Table 6**Bicycle Level-of-Service****Alternates***

	Bicycle	Points	1	2	3	4
Facility (max. value = 10)	Outside lane 3.66 m (12')	0				
	Outside lane 3.66-4.27m (12-14')	5	5	2.5		2.5
	Outside lane >4.27m (14')	6			6	
	Off-street/parallel alternative facility	4	2	1	2	0
Conflicts (max. value = 10)	Driveways & sidestreets ¹	6	3	0.86	6	1.00
	Barrier free	0.5				
	No on-street parking ²	2	0	2	2	2
	Medians present	0.5				
	Unrestricted sight distance	0.5				
	Intersection Implementation	0.5				
Speed Differential (Max. value = 4)	>48 KPH (>30 MPH)	0		0		0
	40-48 KPH (25-30 MPH)	1	1		0.5	
	24-30 KPH (15-20 MPH)	2				
Motor Vehicle LOS (Max. value = 2)	LOS = E, F, or 6+ travel lanes ³	0	0	0	0	0
	LOS = D, & < 6 travel lanes	1				
	LOS = A, B, C, & < 6 travel lanes	2				
Maintenance (Max. value = 2)	Major or frequent problems	-1				
	Minor or infrequent problems	0				
	No problems	2				
TDM/Multi Modal (Max. value = 1)	No support (no existing network in place)	0		0		0
	Support exists	1	1		1	
Total			12.00	6.36	17.50	5.50
LEVEL-OF-SERVICE			C	E	A	E

* The portion of the route that is not common to all alternatives is evaluated in the table in order to emphasize the difference in each alternative

1. Driveway and side streets impact bicycle traffic at a more significant rate due to speeds and sense of security.

2. On street parking does take place on Brush Country Road because of the nursing home. Because alternate 1 uses more of Brush Country Rd., this would be a greater impact if Brush Country is re-stripped for a cycle track.

3. The level of service based on visual observation during rush hour is estimated as E,F,E, and F for alternates 1,2,3,&5, respectively.

4. TDM is the transportation demand management for multi-modes of transportation. Currently the TXDOT ROW does not provide a connected pedestrian or cyclist network along the entire MOPAC frontage relative to this trail.

Shaded areas are those indicators that are either common to all alternates or where the level of design would render them subjective.

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Table 7 Level of Service Ratings

LOS	Points
A	>17
B	>14-17
C	>11-14
D	>7-11
E	>3-7
F	3 or less.

7.4 Public Meeting

As criteria of the Urban Trail Master Plan requirements for a Preliminary Engineering Report, public meetings are required in order to present trail alternatives and obtain public input. On Wednesday July, 30, 2014, a meeting was held at the Hampton Public Library to present 4 feasible trail alternatives (1, 2, 3, and 4). Public opposition to trail alternatives that were close to residential lots was raised by those residences directly adjacent to proposed alternative routes. Opposition was generally based on the proximity to the residential lots with fears of increased crime, decrease of property value, and impacts to the environment. A compilation of both survey handouts at the meeting and online survey comments was prepared by the Community Services Division. The compiled information includes all comments and can be obtained from CSD. The summary of proponents and opponents is provided in **Appendix T**.

There are studies that have been commissioned across the United States that evaluate trail implementation. With increase in use by fellow neighbors, studies have indicated to a reduction in crime along urban trails (Tracy, Morris 1998; Macy, Alexander, Macdonald, Ford 1995; Blanton 2000). Without the ability of motorized vehicle use on the trail, theft is also reduced.

With the additional mobility network via a trail, national trends have shown to increase property values (Racca, Dhanju 2006; Macy, Alexander, Macdonald, Ford 1995; Blanton 2000). It is important to note, that the majority of the residences along the Williamson Creek are located

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within the FEMA 100 year floodplain. This fact inherently affects the property value and may require the purchase of flood insurance as a condition of lenders.

1. Tracy, Tammy ; Morris, Hugh, January 1998, Rails-Trails and Safe Communities http://www.railstotrails.org/resources/documents/resource_docs/Safe%20Communities_F_lr.pdf
2. Greer, Donald L., June 2000, Omaha Recreational Trails: Their Effect on Property Values and Public Safety <http://www.unomaha.edu/recadmin/trails/omahatrails.pdf>
3. Racca, David P.; Dhanju, Amardeep, November 2006, Project Report for Property Value/Desirability Effect of Bike Paths Adjacent to Residential Areas <http://128.175.63.72/projects/DOCUMENTS/bikepathfinal.pdf>
4. Macy, Sydney Shafroth; Alexander, Leslie T.; Macdonald, Stuart H.; Ford, Chris, March 1995 The Effect of Greenways on Property Values and Public Safety <https://www.broward.org/Greenways/Documents/coloradostudy.pdf>
5. Blanton, Whit, 2000, A Study of trail impacts on property values, noise and crime <http://www.townbranch.org/info/2004/06/10/what-impact-do-trails-have-on-neighbors-and-the-local-community/>

8.0 RECOMMENDATIONS

8.1 Proposed Improvements

Alternate 3 emphasizes the Urban Trail program's goal of creating an "all ages and abilities, all weather, connected" trail network. The recommended trail alternate creates a shared use, non-motorized path connecting neighborhoods, parks, and businesses. The trail will serve as an amenity for the surrounding community so that nature can be enjoyed. Alternate 3 will provide a safer route for joggers, walkers, cyclists, and wheel chair users alike. A user's sense of safety while using this urban trail is emphasized with this alternate. The level of service for alternate 3 is greater in comparison to the other alternates. The Alternate 3 construction cost is estimated at approximately **\$1,169,534.91**. The estimate is based on a 30% preliminary design stage. Construction costs may vary depending on the final design and field conditions at the time of construction. The Opinion of Probable Construction Cost is provided in **Appendix R**. The Alignment Alternatives Matrix that outlines the physical constraint of the alternates is provided in **Appendix S**.

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The recommended Alternate 3 is further supported by the information compiled by the Community Services Division in **Appendix T** (which is based on the public informational meeting held on July 30, 2014), the separate environmental screening document prepared by Weston, Inc. (**Appendix C**), a weighted alternative matrix approved by the Community Services Division (**Appendix U**) that summarizes the five (5) alternate design parameters. This matrix emphasizes the environmental screening document, permitting complexity, and most importantly the Level-of-Service. The goal of providing an urban trail that is in the best interest of the public health and safety are weighted in determining the Level-of-Service.

8.2 Opinion of Probable Construction Costs

The quantities for the recommended proposed trail alignment Alternate designs (1-5) have been estimated using GIS / LIDAR information. The estimated construction costs are preliminary and are based on a 30% design stage. The level of accuracy will increase as the design moves forward and topographic surveys become available. The opinion of probable construction cost estimate for the proposed Alternate 3 improvements is **\$1,169,534.91**. Details of the estimate have been included in **Appendix R** of this report.

8.3 Preliminary Schedule

The Schedule reflects

Project Phase	Duration	Start	Finish
Design Phase	*9 Months		
Bid /Award Phase	3 Months		
Construction Phase	9 Months		

*Design phase may take up to 1 year for approval based on easement acquisition

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APPENDICIES

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