CITY OF CHARLOTTESVILLE, VIRGINIA
CITY COUNCIL AGENDA

Agenda Date:	February 1, 2021
Action Required:	N/A
Presenter:	Jeanette Janiczek, UCI Program Manager
Staff Contacts:	Tony Edwards, Public Works Development Services Manager Jack Dawson, City Engineer
Title:	West Main Streetscape project – Value Engineering Study

Background: Value Engineering (VE) is defined by the Society of American Value Engineers International as "the systematic application of recognized techniques by a multi-disciplined team that identifies the function of a product or service; establishes a worth for that function, generates alternatives through the use of creative thinking; and provides the necessary functions, reliably, at the lowest overall cost." Put simply, an independent firm reviews the project to identify alternative means to achieve the project's purpose and need with the goals of:

- Improving project quality
- Eliminating unnecessary costs
- Reducing overall life-cycle costs
- Identifying other possible benefits, such as a shorter construction schedule

The Code of Virginia requires VE to be conducted on any Virginia Department of Transportation (VDOT) highway construction and maintenance projects costing more than $15 million in construction costs. They may be conducted in one of three stages of project development: at the Scoping (conceptual) stage prior to commencement of design activity; the "Preliminary Field Inspection" (PFI) stage when approximately 20% of the design is complete; or at the "Field Inspection" stage when approximately 70% of the design has been completed.

The City has conducted the VE Study for the West Main Streetscape project at the PFI stage when the VE team had access to more complete project information as well as a detailed cost estimate.

All VE recommendations must be submitted to the VDOT. The final decision as to which recommendations are incorporated into the final plans is made by the VDOT Chief Engineer for all federal aid projects and any project to be maintained by VDOT. For UCI Projects, final

decisions regarding which recommendations are incorporated into the project will be made by the locality.

The City is able to determine which measures of the VE Study to incorporate for the West Main Streetscape project as it maintains its own roadway network, it is a member of Urban Construction Initiative (UCI) and Phase 1 & 2 are not federally funded.

An overview of the project's purpose and need is attached which summarizes the project's intent and current proposed outcome.

Discussion: While the West Main Streetscape project has been developed into four independent phases, the whole corridor was studied holistically during this VE process. The estimated cost savings covers all four phases.

Fifteen Areas of Recommendations were identified by the VE Study Team and outlined below. Staff is endorsing 10 recommendations for acceptance/approval with the remaining 5 being explored further for possible inclusion.

Recommendation	Cost Saving Measure	Improves Constructability	Reduced Maintenance	City Approval	Estimated Savings
#1: General (Roadway/MOT)	X	X	X	Further Exploration Needed/Maybe	$TBD by Design Team
#2: General (Environmental)	X			Yes	$TBD by Design Team
#3: Cultural Resource Monitoring	X	X		Yes	$TBD by Design Team
#4: Concrete Duct Bank	X	X		Further Exploration Needed/Maybe	$300,000 - $500,000
#5: Depth of Cover	X	X	X	Further Exploration Needed/Maybe	$30,000 - $100,000
#6: Spare Conduits	X	X		Further Exploration Needed/Maybe	$200,000 - $400,000
#7: Silva Cell Replacement	X	X	X	Further Exploration Needed/Maybe	$354,000 - $784,000
#8: Outfall Analysis	X	X	X	Yes	$654,177 - $939,177
#9: Seating	X		X	Yes	$219,900 – $249,600
#10: Boulder Slices	X	X		Yes	$307,440
#11: Catenary Lighting	X	X	X	Yes	$144,500
#12: Bus Shelter	X	X	X	Yes	$161,000 - $266,000
#13: Fine Grading	X	X		Yes	$60,000
#14: Trench Boxes	X	X		Yes	$60,000
#15: Curb and Sidewalk Removal	X	X		Yes	$280,000

Please note recommendation #7 and #8 are two alternatives to meet stormwater requirements and both cannot be enacted. Some items cannot yet be quantified. While other items in the line item estimate are based on a percentage of overall construction costs, such as mobilization and survey, so as the construction estimate is lowered so are these items' cost lowered proportionately. The following table identifies the range of potential cost savings.

Roadway / Maintenance of Traffic - #1	$TBD by Design Team
Environmental - #2 & #3	$TBD by Design Team
Utilities and Right-of-Way - #4, #5 & #6	$530,000 - $900,000
Stormwater/Drainage - #7 & #8	$354,000 - $939,177
Landscaping/Lighting - #9, #10, #11 & #12	$832,840 - $967,540
Constructability - #13, #14 & #15	$400,000
Total:	**$2,116,840 - $3,206,717**
3.0% Construction Surveying	$63,505 - $96,202
3.0% Materials Testing	$63,505 - $96,202
12.0% Mobilization (including general conditions)	$254,021 - $384,806
Overall Potential Project Savings	**$2,497,871 - $3,783,927**

The VE Study is attached and contains more details regarding the measures discussed below as well as the estimated savings.

Measures Recommended to be Accepted (Yes):

#2: General Environmental

As environmental work begins, it was suggested to review the requirements for each funding source and ensure the appropriate environmental forms/activities were identified.

Staff agrees and recommends acceptance of this measure.

#3: Cultural Resource Monitoring

A previous assumption that the project may require full-time cultural resource monitoring was challenged and recommended further coordination with the Virginia Department of Historic Resources (DHR).

Since the VE, coordination with DHR has commenced on Phase 1. DHR has concurred with the VDOT that no archaeological survey was necessary as the project footprint has been previously disturbed from a variety of activities and exhibits little potential for intact, significant archaeological deposits. It is reasonable to assume the same on the remaining 3 phases.

#8: Outfall Analysis

The current outfall analysis determines adequacy at the manmade outfalls using the energy balance equation. This results in a need for a large amount of detention throughout the project.

Manmade outfalls can be analyzed by studying the 2-year velocity and 10-year capacity of the downstream system to the 1% point thus eliminating or reducing the need for underground detention based on the existing infrastructure. This could allow for the reduction in Silva Cells or other alternative means of detention.

Since the VE, the project team has completed some outfall analysis for Phase 1 and 2 (phases with design funding in place) so preliminary results could be shared with City Council. Onsite detention would be needed at two outfalls which could be satisfied with Silva Cells. An exhibit attached shows a preliminary estimate of the minimal area of Silva Cells shaded in blue needed to meet detention requirements.

#9: Seating

This VE recommendation is to reduce the proposed 30 custom benches down to 11 as well as reduce the proposed amount of overall resting furnishings by 20% from 85 to 73.

Staff agrees with these recommendations which focuses the custom benches to the high impact area of Midway Park and reducing the overall furnishings on the 0.75 mile long corridor to reduce pedestrian obstructions within the widened sidewalk.

#10: Boulder Slices

This VE recommendation is to replace boulder slices within Midway Park with a selection of natural boulders of approximately the same total volume.

Staff agrees this would achieve the stated design intent while reducing project material and installation costs.

#11: Catenary Lighting

It was recommended to remove the catenary light strings mounted on poles in three areas of the project: at the eastern terminus of West Main at the Ridge/McIntire intersection, at the railroad bridge, and at the western terminus of the project at Jefferson Park Ave intersection.

Staff notes that there is no other catenary lighting on any vehicular roadway within the City. Its impact on the character of West Main would be limited and is being met by other design elements within the streetscape project.

#12: Bus Shelters

The VE Study also recommended replacing the proposed bus shelters with integrated solar powered lighting with an alternate shelter product with an electrical connection or a supplemental solar power system.

Before the VE, City staff had begun discussions to adapt the existing City Standard bus shelter for installation on the West Main Streetscape project though the estimate retains the original cost estimate for more specialized bus shelters.

#13: Fine Grading, #14: Trench Boxes & #15: Curb and Sidewalk Removal

Each of these items need to be further explored to ensure they are accurately reflected in the estimate. The estimate's format has been adapted to the VDOT system and these items are incidental to other bid items per the 2020 Road and Bridge Specifications. Staff will be ensure these activities are accounted for under other bid items.

Measures Recommended to be Explored Further (Maybe):

#1: General Roadway/MOT

Maintenance of Traffic (MOT) plans have not yet been developed as the City determines which phases can/will be constructed together, but the VE did highlight several items to be explored when the MOT was developed such as minimizing pavement patch along utility corridors and reconstruct with the rest of the roadway; installing multiple utilities concurrently; shifting vaults and other structures off the centerline of the roadway to enable easier traffic flow; revisiting the cross section to find a solution that does not remove as much grade from the center of the roadway as the current proposed design and ensuring time period of MOT meets the needs of construction.

Staff will be investigating each of these measures as the MOT is developed and incorporate where feasible.

#4: Concrete Duct Bank

The current design shows concrete encasement of the entire duct bank and it was recommended to investigate substituting stone encasement with a lightweight concrete slab on top as an alternative.

The City Standards and Design Manual requires concrete encasement of electrical lines, but staff will consider stone encasement with a concrete stab on top for the other, private utilities during coordination efforts.

#5: Depth of Cover

The current design shows some of the duct bank trenches will be 8 to 9 feet deep which could be revised to wider, shallower duct banks.

The City Standards and Design Manual requires 36" cover for electric/power facilities and 24" for all other utilities. Staff will explore different configurations during coordination efforts with the private utility companies.

#6: Spare Conduit

The current design includes 100% spare conduits and it was recommended that exploration be undertaken to determine if the amount of spares can be reduced.

Staff will be investigating the possibility of reducing the number of spare conduits as well as the possibility of cost sharing as utility coordination is completed.

#7: Silva Cell Replacement

The current design uses Silva Cells, a soil cell product, to provide sufficient soil volume for the street trees in the project as well as on-site water quality treatment and a portion of water quantity requirements. The City does not have any experience with this application or with Silva Cells in particular therefore, the VE Team explored alternative solutions with various combinations of stormwater management (quality and quantity) and root volume. This included replacing Silva Cells with an alternative soil cell product or suspended slabs and root paths, purchase of nutrient credits, and other underground detention methods. Reducing the number of Silva Cells could potentially have construction and maintenance savings for both cost and time.

In the current design, Silva Cells provide approximately 20% more soil volume beyond what is required by the trees to meet their stormwater treatment function. Staff does not support exploring another proprietary soil cell system nor other underground detention methods; however does recommend exploring the reduction of Silva Cells to targeted locations along the corridor, which would provide some on-site treatment and require the purchase of supplemental nutrient credits. A targeted approach of Silva Cells with additional suspended slabs & root paths would ensure they are placed in optimal locations for either use while balancing the landscaping needs expected by the community. More discussion on stormwater is above under #8 Outfall Analysis.

Alignment with City Council's Vision Areas and Strategic Plan: Approval of this agenda item upholds the City's commitment to create "a connected community" by improving upon our existing transportation infrastructure. In addition, it would contribute to Goal 2 of the Strategic Plan, Be a safe, equitable, thriving, and beautiful community; Objectives 2.3. Provide reliable and high quality infrastructure and 2.6. Engage in robust and context sensitive urban planning.

Community Engagement: There has had significant engagement throughout project planning through a Steering Committee, project specific public meetings, coordination with City boards/commissions and public surveys to develop the West Main Street Master Plan and the adopted alternative. A Design Public Hearing will be conducted later this year in 2021 which will include conceptual drawings incorporating the VE measures adopted, anticipated right of way impacts, environmental documentation and other informational boards. The website, www.gowestmain.org, will be updated with this information as well as future project development.

Budgetary Impact: None at this time. As project plans progress to construction documents, the estimate will be refined to incorporate these recommendations as well as the final construction details. While these VE recommendations will lower the estimate, and staff is committed to spending public dollars as judiciously as possible, staff does not recommend releasing funding until after construction is complete.

Recommendation: Staff will continue to pursue the recommendations as noted above.

Alternatives: City Council may elect to recommend adopting a different combination of measures proposed within the VE Study.

Attachments:

1) West Main Street Value Engineering Summary Report
2) Silva Cell Exhibit – Required for Phase 1 and 2
3) Project Overview

City of Charlottesville:

WEST MAIN STREET
VALUE ENGINEERING SUMMARY REPORT

DECEMBER 23, 2020

RK&K

RESPONSIVE PEOPLE | CREATIVE SOLUTIONS

Introduction

A Value Engineering (VE) study took place for the West Main Street project in Charlottesville, Virginia, per recommendation of City Council. The VE team worked to find potential savings opportunities for the City of Charlottesville in order to eliminate any unnecessary costs while maintaining the desired function and character of the streetscape presented in the design documents. The study sought to maintain or improve the project quality, reduce the overall life-cycle costs, improve efficiencies and shorten the construction schedule. The VE team was sensitive to the project's purpose and need, previous public input, and previous feedback/direction from Charlottesville's City Council.

The study reviewed the 60% plans and cost estimate provided by the design team lead by Rhodeside and Harwell. This document summarizes the findings of the VE team in the form of potential cost saving recommendations for consideration by the City and design team.

The members of the VE team were:

- Facilitator: Amy Samberg, PE, ENVSP, LEED AP BD+C, SITES AP (RK&K)
- Roadway: John Koch (RK&K)
- Maintenance of Traffic: Jim Durbin, PE, LEED AP (RK&K)
- Environmental: Ricky Woody, PWS (RK&K)
- Utilities and Right-of-Way: Jeff Kapinos, PE (RK&K)
- Stormwater/Drainage: Megan Ryan, PE, CFM (RK&K)
- Landscaping/Lighting: Tristan Cleveland, PLA, ASLA (LPDA)
- Constructability: Mohammed Aziz, PMP, CCM (RK&K)

Project Description

The West Main Street project began in 2013 with master planning efforts and a review of current zoning. It has since evolved from schematic design to the current 60% design development plans, which were developed in 2019. RK&K and their team were tasked with completing a value engineering study to determine if any scope items can be modified, removed or reduced to save overall project costs.

The project extends between Jefferson Park Avenue and Ridge Street*, and has been broken into the following four phases:

1. Ridge Street to 6th Street NW
2. 6th Street NW to 8th Street NW
3. 8th Street NW to Roosevelt Brown Avenue
4. Roosevelt Brown Avenue to Jefferson Park Avenue

* During the VE Presentation session on November 18, 2020, the design team mentioned that the project extended through the intersection of Ridge Street.

The VE team understands that there are various characteristics throughout the corridor that the City and design team desire to remain in the project. Due to this, the VE suggestions are tailored to cut costs while preserving components of importance to the project stakeholders. Items such as reducing the number of trees or elimination of undergrounding utilities were not considered, as these were deemed to be important to the project by the City Council and staff, public, and the design team.

Project Graphics

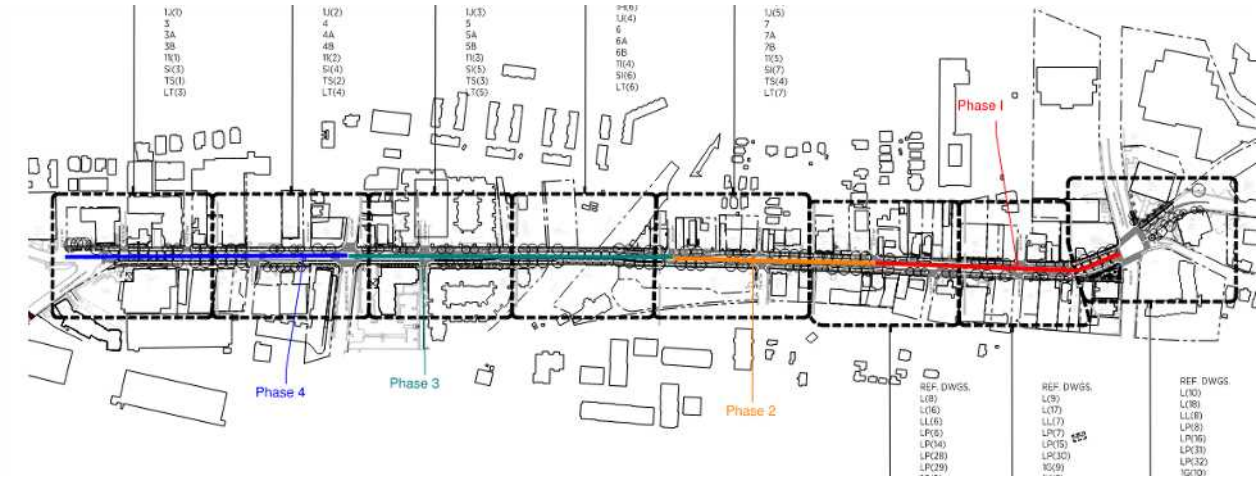

Figure 1: Graphic of project phasing. Background imaging taken from West Main Street 60% Plans.

Value Engineering Approach

The VE study was completed virtually in lieu of the traditional 2-day immersive session.

The efforts were kicked off on November 2, 2020 with a virtual session with representatives from the City, the design team, and the VE team. The design team presented an overview of the project and, with the City, answered questions regarding the design and project priorities from the VE team. Some of the key takeaways were as follows:

- Materials have been provisionally approved by the BAR
- Furnishings are important to the project's identity
- Non-monolithic trees are important to the corridor
- Over 100 test holes were completed for Phase 1 and 2
- Silva Cells, which the City does not have experience with, are not to be installed around public services to the buildings
- Phase 1 and 2 are going to be constructed together
- Phase 3 and 4 are not yet funded
- The VE study is for the entire project
- MOT plans have not been developed at this point
- Cross sections depict maintaining the storefront elevations and sloping toward the center of the roadway, resulting in a finished roadway surface approximately 1' below existing
- City's preference is to have stormwater addressed on site
- City Council has reviewed the design, which included Silva Cells and 400% tree enhancement
- Furnishing manufacturer of concrete benches is local to Charlottesville
- Paul Josey, Tree Commission, has developed the landscaping/tree plan as a subconsultant for the project

The VE Team took this information and channeled it into the review of provided materials to look for cost savings. The methodology in the following sections demonstrates the approach taken.

A Findings presentation was given by the VE team to the City and design team on November 18, 2020. This session was held virtually and presented the findings of this study.

Cost Estimation Review

The design team provided a cost estimate to accompany the 60% plans. The VE team focused efforts on evaluating items that were the top 20% highest cost items. This totaled 44 items of the 219, which are shown in the table below. The items shown represent the cumulative total for all 4 phases of the project.

VDOT ITEM CODE	VDOT SPEC SECTION	DESCRIPTION	UNIT
GRADING (ITEM RANGE: 00001 - 00499)			
Earthwork, Concrete Masonry, Clearing & Grubbing, Excavation, Select Material			
128	303	Extra Excavation	CY
142	303	Borrow Excavation Min. CBR-20	CY
170	ATTD	NS Soil - Contamin. Soils Disposal Allowance	CY
170	ATTD	NS Soil - Silva Cell, Uncompacted Soil	CY
DRAINAGE (ITEM RANGE: 00500 - 09999)			
Water Service Lines (Private), Pipe, Concrete, Drop Inlet, Manhole, Paved Ditch, Bedding Material,			
1152	302	15" Conc. Pipe	LF
2111	ATTD	NS Drainage - Silva Cell Impermeable Liner	SF
2112	ATTD	NS Drainage - 2x Silva Cells	EA
2112	ATTD	NS Drainage - 3x Silva Cells	EA
2112	ATTD	NS Drainage - Silva Cell Tree Grates (4' x 4')	EA
8990	ATTD	NS Drop Inlet - Silva Cell Mod. Drain Inlet	EA
9056	302	Manhole MH-1 or 2	LF
PAVEMENT (ITEM RANGE: 10000 - 11999)			
10128	315	Aggr. Base Matl. Ty. I No. 21B	TON
10608	315	Asphalt Concrete Ty. SM-12.5D	TON
10610	315	Asphalt Concrete Ty. IM-19.0A	TON
10625	515	Flex. Pave. Tie-In Planing 0"-2"	SY
10642	315	Asphalt Concrete Ty. BM-25.0A	TON
INCIDENTAL (ITEM RANGE: 12000 - 13999)			
utter, Cattle Guard, R/W Monument, Sidewalk, Guardrail, Median Barrier, Retaining Wall, Median Str			
12025	502	NS Curb - City of Charlottesville Curb	LF
13245	504	NS Sidewalk - PCC-1 PC Concrete Pavers (Complete, in-place)	SY
MAINTENANCE SCHEDULE ITEMS (ITEM RANGE: 14000 - 19999)			
Schedule Work, Plant Mix, Service Treatment, Guardrail, Fence, Slurry Seal, Cold Mix			
14100	ATTD	Remove Sidewalk and Entrance	SY
PROTECTIVE (ITEM RANGE: 20000 - 25999)			
Maintenance of Traffic, Demolition of Pavement, Obscuring Old Road, Field Office, Plant Lab, Linseed			
24265	ATTD	NS Maintenance of Traffic - Phase Traffic Control	LS
24430	508	Demo. of Pavement (Flexible)	SY
24501	510	NS Remove Exist. - Buried Trolley Tracks	LF
24505	510	NS Relocate Existing - Demo & Reset Statue Foundation Allow	LS
24825	510	NS Modify Exist. - Construction Entrance	EA
25505	514	Field Office Ty. III	MO

PLANTING (ITEM RANGE: 28000 - 39999)			
38920	ATTD	NS Bench - #407, Custom Bench 1	EA
38935	ATTD	NS Commuter - Bus Shelter (complete in-place)	EA
38950	ATTD	NS Landscape - #408, Planter Pot	EA
38955	ATTD	NS Landscape - ST 2, Stone Boulder Slice & Foundation	LF
TRAFFIC CONTROL & SAFETY ITEMS (ITEM RANGE: 50000 - 59999)			
TRAFFIC SIGNS		**(ITEM RANGE: 50000 - 50999)**	
50902	700	NS Traffic Sign - Custom Concrete Topographical Map	EA
50902	700	NS Traffic Sign - Corner Markers	EA
50902	700	NS Traffic Sign - Transit Interpretation at Bus Stop	EA
50902	700	NS Traffic Sign - Commemorative Walk at Bridge	EA
TRAFFIC SIGNALIZATION		**(ITEM RANGE: 51000 - 53999)**	
51031	703	LOCAL CONTROLLER, TY. B	EA
51238	-	CONCRETE FOUNDATION SIGNAL POLE PF-8	CY
51541	-	NS Detector - VIDEO DETECTION SYSTEM, 360 DEGREE	EA
PAVEMENT MARKING ITEMS		**(ITEM RANGE: 54000 - 54999)**	
54100	704	NS Pavement Marking - Bike Lane Special Coating	SF
LIGHTING ITEMS		**(ITEM RANGE: 55000 - 59999)**	
55505	705	NS Luminaire - Ty. KX1, 57w LED, 3500K	EA
56021	700	1" PVC Conduit	LF
59000	705	NS Lighting - Light Fixture Pole, 14'-16'	EA
59000	705	NS Lighting - Light Pole Base	EA
59001	700	NS Lighting - Lighting Wire #6	LF

Table 1: Top 20% of cost items on the 60% cost estimate

While these numbers served as the basis for our analysis, they were not exclusively studied. Items that were included in other project documentation, such as the 60% plan set, were also evaluated for value engineering as appropriate to the scope of the overall project.

Value Engineering Recommendations

Roadway and Maintenance of Traffic

Recommendation #1: General

Due to Maintenance of Traffic (MOT) plans not being included in the 60% submission reviewed by the VE team, roadway recommendations for VE was limited. Please find a list of potential options to consider when developing the MOT plans and other elements impacted by the MOT below.

Suggestions:

- If the finished grade of pavement is approximately 1' below existing pavement, it is suggested to use a minimum pavement patch along utility corridors and reconstruct with the rest of the roadway.
- It is suggested that multiple utilities be installed concurrently – to the extent feasible – even if a larger trench is required.
- To minimize MOT efforts, it is suggested to shift vaults and other structures off the centerline of the roadway to enable easier traffic flow.
- It is suggested that the phasing for all utilities (including storm drain) be carefully reviewed relative to the MOT concepts to make sure that vehicular and pedestrian access can be maintained at all times as proposed.
- To reduce the grading, paving, and MOT efforts, it is suggested that the design team revisit the cross section to find a solution that does not remove as much grade from the center of the roadway as the current proposed design. This will enable easier construction, as well as generate a cost savings to the project.

- There is a conflict between how many months of MOT are required for this project between the information in the cost estimate and what was anticipated by the City. It is suggested to ensure that the expectation is clear to all parties and the MOT duration is adequate for what will be required to complete the project.

There is not enough detail provided in the plans regarding MOT or paving to calculate the cost or potential savings at this time. It is recommended that the design team consider the above suggestions to reduce paving quantities and the construction duration in order to find additional potential savings toward the overall project cost.

Pros:

- Potential savings for demolition of pavement
- Potential reduction of construction duration due to fewer MOT phases
- Potential savings in MOT cost due to fewer phases
- Potential savings by turning the project into a mill and overlay project instead of full depth reconstruction by changing the cross section and having a finished grade similar to existing.

Cons:

- Concurrent work on multiple utilities may impact traffic flow and access to businesses
- Detailed coordination of pavement trenching for utilities to match future pavement elevations will be difficult
- May require more detailed construction sequencing plan for replacement of existing utilities

Roadway and Maintenance of Traffic Summary Table:

#1: General	Cost cannot be determined without additional information
Roadway Total:	**$TBD by Design Team**

Environmental

Recommendation #2: General

Minimal environmental data was available to support this VE review. The EQ429 has been submitted for Segment 1, but not 2, 3, or 4. A technical memorandum for wetlands, streams, T&E, and hazardous materials was not provided, and VDOT is handling the cultural resources for the project.

All these activities are required to be certified for Appendix 5A for State Funded projects and the EQ forms (102 or 104, 121 and 555 and CR due diligence) for Federally Funded projects. In conclusion, the environmental processes are not completely started or clearly understood at this time, and once identified they could impact unidentified environmental resources, which will affect scope, schedule, and budget.

It is suggested that the design team review the requirements for each funding source and ensure the appropriate environmental forms are submitted.

Recommendation #3: Cultural Resource Monitoring

It was noted that full-time cultural resource monitoring of the project during construction was anticipated. The VE team recommends providing cultural resource mitigation to the extent required by DHR.

Environmental Summary Table:

#2: General	Cost cannot be determined without additional information
#3: Cultural Resource Monitoring	Cost cannot be determined without additional information
Environmental Total:	**$TBD by Design Team**

Utilities and Right-of-Way

Recommendation #4: Concrete Duct Bank

The current design shows concrete encasement of the entire duct bank. Consider investigation of acceptance of stone encasement with a lightweight concrete slab on top instead of full concrete. This could provide a potential total savings of **$300,000 to $500,000**.

Pros:

- Savings in money

Cons:

- Does not meet City's standards (City standards call for concrete encasement for underground electric lines but may be possible for telecommunication conduits)
- May not meet Utility's standards

Recommendation #5: Depth of Cover

Some of the duct bank trenches will be 8 to 9 feet deep as currently designed. It is recommended to work with the City to determine if wider, shallower ductbanks could be used where possible or if the 36" minimum burial depth could be reduced. This could provide a potential total savings of **$30,000 to $100,000.**

Pros:

- Savings in money
- Reduction in construction duration

Cons:

- Does not meet City's standards (City standards call for 36" cover for electric/power facilities and 24" for all other utilities)
- May not meet Utility's standards

Recommendation #6: Spare Conduits

The current design includes 100% spare conduits. It is recommended that the design team work with the City and utility owners to determine if the amount of spares can be reduced. Spares at 50% may

allow configurations to be adjusted and trenches would be shallower. This could provide a potential total savings of **$200,000 to $400,000.**

Pros:
- Savings in money
- Reduction in construction duration

Cons:
- May not meet City's standards (City standards call for "up to three spare 4-inch conduits")
- May not meet Utility's standards

Additional Suggestion:

RK&K's Utilities team reviewed several available documents, including the private utility plan and profile sheets (dated 9/14/18), the duct bank cost estimates (9/27/18), the City Design Manual standards (available on City website), and the betterment standards outlines in the 2016 VDOT Utility Manual.

Private Utility Cost Participation: Unless the City has a favorable franchise agreement that covers this, it is our experience that similar undergrounding of utilities in urban areas is not typically covered. However, it does not mean that further discussions/negotiations should not be held with the key utility stakeholders as their current assets that will be replaced will most likely be improved due to this project, which ultimately should save the utilities some long-term capital replacement cost. At a minimum, suggest negotiating with the utility companies and paying only the difference between the cost to underground the utilities and the cost to relocate above ground, which would be at the utility owners' expense.

Construction Delivery Method: The City may want to consider alternative project delivery methods compared to traditional design/bid/build for the utility relocation portion of the project.

Utilities and Right-of-Way Summary Table:

#4: Concrete Duct Bank	$300,000 - $500,000
#5: Depth of Cover	$30,000 - $100,000
#6: Spare Conduits	$200,000 - $400,000
Utilities and Right-of-Way Total:	**$530,000 - $900,000**

Stormwater/Drainage

Recommendation #7: Silva Cell Replacement

The current project plans use Silva Cells, a soil cell product, as one of the methods to provide sufficient soil volume for the street trees in the project. The Silva Cells are also used to provide on-site 100% of the water quality treatment and a portion of water quantity requirements. The SWM calculations for this project show a phosphorus reduction requirement of 3.06 lb/yr. DEQ law allows for projects with less than 10 lb/yr requirement to use 100% offsite treatment. A potential cost savings could be provided by modifying the drainage system to remove some or all of the Silva Cells and purchase nutrient credits*. Alternate underground storage will still be required to meet SWM water quantity requirements.

Silva Cells are one of the most expensive items on the project excluding paving and associated improvements. Therefore, the VE Team looked for alternative solutions for the combination of

stormwater management (quality and quantity) and root volume. 16,246 cu. ft. of soil volume is provided via Silva Cells. The designed soil volume goal for each tree is 400 cf., in keeping with City standards and best practices. The Silva Cells provide an additional 3,290 cf, or approximately 20%, of soil volume beyond what is required by the trees as part of their stormwater treatment function. Potential cost savings can be accomplished with replacing Silva Cells with an alternative soil cell product or an alternative soil volume method. GreenBlue Urban produces a cheaper and more space efficient soil cell, called the RootSpace product. Alternative methods to achieve soil volume include suspended slabs and root paths. The suspended slab method provides uncompacted soil beneath a reinforced concrete slab supporting the walking surface. Root paths are strip drains that function as reinforced tunnels under pavement to provide additional soil. Both the suspended slab and root paths are used currently in the project.

The Silva Cells integrated stormwater management and tree rooting system could be replaced with an approach that separates the stormwater approach from the tree root requirements. This separated approach would consist of nutrient credit purchases and underground detention for the stormwater and either an alternative soil cell product or suspended slab/root path for the tree rooting volume, which could potentially have construction and maintenance cost savings.

Cost Savings Breakdown:

- Eliminate Use of Silva Cell Product/installation Cost: ($1,265,177)
  (including excavation)

- Purchase Nutrient Credit Cost to address quality: $61,000

- Purchase either underground detention system to address quantity:
  - Box Culvert Underground Detention Cost: $1,200,000
  - Proprietary Underground Detention Cost: $150,000-300,000

- Purchase either tree volume rooting option:
  - RootSpace product/installation Cost**: $550,000
  - Suspended slab and root path cost: $270,000

- This equals a potential savings of up to $784,000 by eliminating the Silva Cells. This number assumes the use of the cheapest options for quantity and tree volume rooting and could fluctuate based on final option pricing and choices.

Silva Cells have the advantage of combining the required volumes for detention and tree soil into the same system. Different combinations of the above alternatives may not provide as much cost savings; however, the elimination of Silva Cells would provide an ease of construction and eliminate the need for special bioretention soils. It would also reduce maintenance needs because an underground detention only facility is much less susceptible to clogging than a bioretention.

**If the city does not want to use 100% offsite treatment for to meet water quality requirements, a partial removal of Silva Cells or the use of the RootSpace product as water quality treatment could be an option. If desired this option should be discussed with the City and evaluated by the design engineer to determine how much treatment is preferred to be provided on site. This would lessen the amount of underground detention that would need to be provided through a method such as a box culvert or proprietary structure.*

A combination of partial onsite treatment and purchase of nutrient credits has the potential for additional cost savings.

***Cost assumes soil cell product would not function as a stormwater system and can thus 1) be sized down by approximately 20% to the soil volumes required by the trees and 2) exclude stormwater utilities (risers, drainage stone, inlets).*

Pros:
- Potential savings in construction cost
- Simplifies construction potentially reducing construction time period
- Maintenance reduction

Cons:
- Purchase of nutrient credits allows for compliance of regulation and positively impacts watershed, but does not treat stormwater on site or within City's jurisdiction
- Estimated savings could be smaller than anticipated and result in additional engineering design fees

Recommendation #8: Outfall Analysis

The current outfall analysis determines adequacy at the manmade outfalls using the energy balance equation. This results in a need for a large amount of detention throughout the project. Manmade outfalls can be analyzed by studying the 2-year velocity and 10-year capacity of the downstream system to the 1% point. All the pipes within the project area show more than enough capacity for the 10-year storm and non-erosive velocities for the 2-year storm. Unless there are known undersized parts of the downstream system, it would be expected that capacity is available since the land uses on the project will not significantly change.

Cost Savings Breakdown:

- Eliminate Silva Cell Cost	($ 1,265,177)
- Purchase Nutrient Credit Cost	$ 61,000
- Required Additional Survey/Engineering Cost	Unknown: More information on the location of the 1% point and details of the downstream system will be needed to understand capacity
- Approx. Tree soil volume options	$265,000-$550,000

- The recommendation, at a minimum, has the potential of an equal or greater savings to the "Silva Cell Removal" recommendation, $784,000, with the added benefit of zero long term maintenance.

Pros:
- Cost savings
- Maintenance Reduction
- Ease of construction

Cons:

- Purchase of nutrient credits allows for compliance of regulation and positively impacts watershed, but does not treat stormwater on site or within City's jurisdiction
- Need for additional downstream survey

Additional Suggestions:

- Not all outfalls may meet requirements which could hold up VSMP permitting efforts.
- Gutter flow is not really sheet flow. It will need to be determined if the downstream gutter/inlets will need to be analyzed and documented to ensure that flow is not increasing and can still be properly conveyed.
- There are many proposed parking areas along the side of Main Street that are bumped out from the main travel way (due to curb extensions to aid in pedestrian crossings). Most of these locations do not have an inlet on the downstream side which will need to be evaluated to ensure water does not ponding in these locations during storm events.

Stormwater/Drainage Summary Table:

#7: Silva Cell Replacement	$354,000 - $784,000
#8: Outfall Analysis	$654,177 - $939,177
Stormwater/Drainage Total*:	**$354,000 - $939,177**

* The stormwater/drainage options require selection of one option, both recommendations cannot be implemented in tandem.

Landscaping/Lighting

Recommendation #9: Seating

The current project plan includes custom concrete benches at several points through the project, including the courthouse, the historic Baptist church, and the triangle Midway Park. Elsewhere in the project, a more moderately priced bench* or seating is used. There is a total of 50 benches in the project, 30 of which are custom benches. The custom benches are up to six times more expensive than the other benches specified for use in the project. Custom benches will be more expensive to maintain and replace than a bench. The custom bench was specifically designed to complement the aesthetic of Midway Park which will include 11 of these custom benches. If all benches except those at the park were the a prefabricatedbench (#400 or #401 in the project documents), there would be a potential savings in furnishing expenses.

The following is the price difference for an exchange of 19 custom benches for prefabricated benches:

- 19 custom benches: $247,000
- 19 prefabricated benches: $39,900 - $47,500

This equals a potential savings of $199,500 - $207,100 in custom benches.

*The prefabricated bench was chosen specifically for the West Main Streetscape project with coordination with the Board of Architectural Review as well as public comment. This fixture has since been approved for use on the Belmont Bridge Replacement project and is proposed for the East High Streetscape project.

The project is approximately .75 miles long and, in that area, there are 50 proposed benches, 24 fixed chairs, and 11 leaning racks, a total of 85 resting furnishings. This report recommends reducing the number of seating furnishings by 20%, from 85 to 73.

The following is the cost saving for a reduction of 20% or 17 of the seat furnishings. To show the range of potential cost savings the least expensive standard furnishings, 24" standard chairs ($1,200 each) and the most expensive standard furnishing, 70" standard bench with back ($2,500 each) are itemized:

- 17 standard 24" chairs: $20,400
- 17 standard backed benches: $42,500

The total potential savings for revision to seating, exchanging 19 custom benches for standard and reducing the total quantity of seat furnishings by 17, is **$219,900 – $249,600.**

Pros:

- Savings in construction cost
- Reduction of future replacement and maintenance costs
- Increased ease of future replacement and repair (switching from custom to manufactured)

Cons:

- Revised design intent and aesthetic
- Reduced seating opportunities

Recommendation #10: Boulder Slices

The project includes slices of locally quarried boulders as a design feature in Midway Park. The stated design intent was to create a unique park identity, interpret local geology, reference the adjacent Lewis/Clark/Sacagawea statue, and reference the raw stone aesthetic of the existing hospital plaza anchoring the western terminus of the project. Boulder slices are out of context with the level of design of other publicly funded downtown Charlottesville parks (more highly designed). Replacing all boulder slices with a selection of natural boulders of approximately the same total volume would achieve the stated design intent while reducing project material and installation costs.

- 1,224 lf sliced boulder and foundation: $379,440
- 30 Stone Boulders: $72,000

This equals a potential savings of **$307,440** in boulder slices.

Pros:

- Savings in construction costs
- Simplifies construction
- Reduction of future replacement costs
- Increased ease of future replacement and repair

Cons:

- Revised design intent and aesthetic

Recommendation #11: Catenary Lighting

The project includes catenary light strings mounted on poles in three areas of the project: at the eastern terminus of West Main at the Ridge/McIntire intersection, at the railroad bridge, and at the western terminus of the project at Jefferson Park Ave intersection. The implied design intent of these lighting areas is to enhance the feeling of place of the project area overall and at these three sites in particular. There is no other catenary lighting on Charlottesville streets, though catenary lights are installed on the Downtown Mall, a pedestrian portion of East Main Street, as part of seasonal holiday decorations.

Increasing sense of place is one of the project's stated goals, and catenary lighting would be unique to West Main Street, contributing to the area's sense of place. However, there are many elements of the design that will contribute to its sense of place, therefore catenary lighting may not be essential. Catenary lighting is also not a design precedent in Charlottesville, so there would be no loss to overall City Standards of lighting and materials by the removal of catenary lights from this project and being primarily a vehicular thoroughfare, the impact of the catenary lights could be very limited.

Eliminating catenary lighting from the project would have a cost savings on the project:
- Catenary lighting: $51,000
- Poles and bases: $93,500

This equals a potential savings of **$144,500** in catenary lighting.

Pros:
- Savings in construction costs
- Simplifies construction
- Reduces scope of work
- Reduces long-term owner maintenance tasks and costs

Cons:
- Revised design intent and aesthetic
- Reduced night-time design impact

Recommendation #12: Bus Shelter

This project includes a bus shelter with integrated solar powered lighting, illuminated route map, and signage. This product would be new and unique to the City of Charlottesville. The shelters will be located where electrical connections are provided where it would be feasible to provide electrical connection instead for the shelters. A potential cost savings would be to use an alternate shelter product with an electrical connection or a supplemental solar power system instead of an integrated system. Potentially eliminating the illuminated route map and signage could also be a cost savings.

<u>Each</u>
- Integrated solar bus shelter: $73,000
- Alternate bus shelter with electric or separated solar: $35,000 - $50,000

<u>Total</u>
- Integrated solar bus shelter: $511,000
- Alternate bus shelter with electric or separated solar: $245,000 - $350,000

This equals a potential savings of **$161,000 - $266,000** in bus shelters.

Pros:

- Savings in construction costs
- Reduction of future replacement costs
- Increased ease of future replacement and repair

Cons:

- Lost opportunity to showcase sustainable technologies if solar not used
- Long-term electrical costs if solar not used
- Additional installation required for electrical connections
- Additional installation required for separated solar
- Separated solar components may be more susceptible to vandalism, as they can be more accessible

Before the Value Engineering study was conducted City staff had begun discussions to adapt the existing City Standard bus shelter for installation on the West Main Streetscape. This would lower maintenance issues as well as be more cost effective for initial installation and future repairs. The estimate retains the original cost estimate for more specialized bus shelters.

Landscape/Lighting Summary Table:

#9: Seating	$219,900 – $249,600
#10: Boulder Slices	$307,440
#11: Catenary Lighting	$144,500
#12: Bus Shelter	$161,000 - $266,000
Landscaping/Lighting Total:	**$832,840 - $967,540**

Constructability

Recommendation #13: Fine Grading

Grading is considered incidental to the placement of borrow and sub-base/subgrade material, and the additional cost added for fine grading should be reconsidered to ensure that it is not double counted in the estimate, per Virginia Department of Transportation (VDOT) requirements. The removal of fine grading could save approximately **$60,000**.

Recommendation #14: Trench Boxes

The use of trench boxes and dewatering activities are incidental to the cost of drainage pipe installation, per VDOT Specification Section 302. Recommended removing this cost from the estimate. This removal would save approximately **$60,000** of the overall estimate.

Recommendation #15: Curb and Sidewalk Removal

Per Section 303.06 of the VDOT specifications, the removal of sidewalk and curbs are considered incidental excavation. To follow VDOT standards, it is recommended that this item be removed from the overall cost estimate. This would result in approximately **$280,000** of savings for the project.

Constructability Summary Table:

#13: Fine Grading	$60,000

#14: Trench Boxes	$60,000
#15: Curb and Sidewalk Removal	$280,000
Constructability Total:	**$400,000**

Summary

Total Savings

The total savings from these items is summarized as follows:

Roadway / Maintenance of Traffic - #1	$TBD by Design Team
Environmental - #2 & #3	$TBD by Design Team
Utilities and Right-of-Way - #4, #5 & #6	$530,000 - $900,000
Stormwater/Drainage - #7 & #8	$354,000 - $939,177
Landscaping/Lighting - #9, #10, #11 & #12	$832,840 - $967,540
Constructability - #13, #14 & #15	$400,000
Total:	**$2,116,840 - $3,206,717**
3.0% Construction Surveying	$63,505 - $96,202
3.0% Materials Testing	$63,505 - $96,202
12.0% Mobilization (including general conditions)	$254,021 - $384,806
Overall Potential Project Savings	**$2,497,871 - $3,783,927**

A total project savings from all the measures summarized in this report is projected to be **in the range from approximately $2.5M to $3.8M**. It should be noted that the VE team believes there is the potential for change in the cost of the maintenance of traffic and constructability items, but the current information available limited the ability to quantify these items.

Additional Miscellaneous Items

It was noted during the Findings Session that the bridge work is currently proposed to be removed from the West Main Street project. The current bridge design limits the loading on the bridge (unable to add additional weight) and the existing 11' wide sidewalk will remain with no need to reset the crown of the roadway. The current condition of the bridge has been evaluated by the City Engineering staff and only minor remediation is necessary at this time. The only item clearly documented in the cost estimate for this is the *$160,000* for the commemorative work at the bridge, though it is anticipated that additional work is included in the estimate under other headings or combined items. Enhanced recognition of the Drewary Brown Bridge(signage, possible banners), minor sidewalk repair undertaken and replacement of the light fixtures would be retained.

There is also *$150,924* allocated for the removal, relocation, and resetting of the Lewis and Clark Statue. The schedule for removal will take place ahead of this project so this item can be removed from the project costs.

Cost Risks

In addition to the cost savings items the RK&K team identified in the VE study, there were also a few items that were recognized as potential for additional project costs. These items could not be quantified for

inclusion in this study, but the team wanted to include them for full disclosure of costs identified while completing our analysis.

The main item identified was the maintenance of traffic (MOT) plans. The estimate for MOT could increase dramatically due to the tight nature of the corridor with robust utility and streetscape design plans that could prove to be challenging during construction. One way to mitigate or minimize this risk would be to develop a typical section that can utilize as much of the existing pavement as possible.

Similar to this, the VE team noted that items such as erosion and sediment control and traffic control heavily depend on the duration of the MOT activities. Therefore, there is high potential for fluctuation in pricing of these items, which may add additional costs to the project. For traffic control, we also recommend ensuring the design is in compliance with VDOT Specification Section 512.

The removal of the trolley tracks, if uncovered, could also add costs to the project. It is suggested that the design team hold the current cost within the project, but for the team and City to be aware that if they are found during construction, this could be an additional cost item for the project. This risk could be mitigated during design with sonar penetrating exploration to locate their existence/extent.

Schedule delays could also impact the cost of this project. The estimate the VE Team used was developed in 2018 with escalation to 2021 for Phase 1 and 2022 for Phase 2 and Phases 3 and 4 further into the future. Phases 1 and 2 are now going to be constructed as one project. Depending on the outcome of the design team's review of the typical section, stormwater management, MOT and construction duration, escalation to the midpoint of construction for the combined project needs to be reevaluated, as the status of the design is only 60% and some of the cost savings recommendations will likely require significant redesign. It is important that the design schedule be accelerated from this point forward to realize full benefit of any cost savings measures that are implemented.

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REVISION:
14 SEP. 2018 - 100% DD QAQC

SCALE:

SHEET NAME: **SILVA CELL OVERALL PLAN**

SHEET NUMBER: **15(2)**

DATE: 14 SEPTEMBER 2018

Project Overview – West Main Streetscape project

West Main Street is a developed corridor located within the heart of the City with limited space for improvements. The roadway serves as the central east-west connection between the University of Virginia and Downtown Charlottesville as well as an important connection to surrounding neighborhoods. This heavily traveled corridor is also located within a Historic District, on the national and state registers, characterized by a well-preserved collection of commercial, residential, and institutional buildings representing a variety of styles.

- No ability or desire to add vehicular lanes
- Corridor experiencing large scale redevelopment and zoning allows for continued increased density
- Primary method to improve mobility and increased travel demand is through improving multimodal and transit modes as well technology (signal function/timing)

The West Main Streetscape project is an example of a road diet project.

- Vehicular uses reduced
  - Lanes narrowed
  - On-street parking capacity halved
- Space reallocated to pedestrians/bicyclists
  - Bike lanes adjacent to remaining on-street parking will be increased to 6' in width to prevent conflicts with opening doors/parked vehicles
  - Sidewalks will be widened – from 5' (existing) to between to 8.5' to 16' + additional space for seating/congregating

In addition to reallocating public space for multimodal use, other improvements are proposed to enhance and encourage walking, biking, scooting and transit riders:

1) Undergrounding of Utilities
   - Removes pedestrian conflicts
   - Opens up space – visual impact as well as allows for wider sidewalks/seating spaces/bus stops
2) Improved Safety Features
   - Simplifies Ridge/McIntire intersection to reduce conflicts (removes right turn lane, reduces size/legs of intersection)
   - Driveway crossings will be differentiated/highlighted
   - Pedestrian crossings of roadway would be in bulb outs reducing crossing length
   - Signal detection of bicyclists and green bike boxes to aid in turning movements/visibility
3) Replacing existing, aging infrastructure
   - Full Signal Replacement (Ridge/McIntire, 10th/Roosevelt Brown)
   - Replacing signal equipment at other intersections
   - Sidewalks that are heaving/uneven
   - Pavement/Striping that is overdue

- Stormwater system
- Trees that are at the end of their lifecycle

4) New infrastructure will meet current requirements
    - All CG-12s/ramps upgraded
    - Signal equipment also improved with audible ped buttons
    - Stormwater will address quantity and quality
5) New infrastructure will meet current City standards/unfunded mandates
    - Signal detection of bicyclist (Belmont Bridge Replacement project will be the 1st to add this to 2 signals)
    - Signals hardwired/interconnected (again Belmont adding 1st 2 signals to be interconnected)
    - Soil volume added to meet current standards & allow for healthier, longer living trees
    - Transit shelters added – meeting CAT's goal of adding shelters on its most used stops
6) Improved aesthetics
    - Creates pocket park – "Midway Park" – at current location of Sacagawea/Lewis/Clark statue
    - Replaces concrete sidewalk with pavers
    - Increases tree canopy (current proposal of 400% increase from existing)
    - Adds site furnishings – chairs/benches/leaning posts/bike racks
    - Replaces pedestrian lighting
    - Adds 3 tactile maps/art features (topography maps of City development during 3 time periods)
    - Adds signage (and possibly banners) to Drewary Brown Bridge
    - Wraps utility boxes (local art opportunity)