Maple Avenue Utility Undergrounding Feasibility Study

December 21, 2020

Submitted to:

Town of Vienna, Virginia

Prepared By:

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EXECUTIVE SUMMARY

The Town of Vienna (The Town) retained Rinker Design Associates (RDA) to complete a feasibility study to convert the existing overhead utility facilities to underground facilities along Maple Avenue (Rt 123). This 9,600-foot section spans from Nutley Street to Mashie Drive Southeast. Existing overhead utilities are owned by Cox, Verizon, and Dominion Energy Virginia (DEV). Phone, internet, and cable TV are owned by Cox and Verizon. Power facilities are owned by DEV.

Project design goals and tasks addressed in the report include, reviewing existing utilities, reports, and information; identifying possible funding sources and financing strategies; identifying possible land development requirements which result in undergrounding as part of redevelopment and rezoning projects; identifying and prioritizing implementation strategies; reviewing existing franchise agreements with utility companies and making recommendations for amended agreement terms which support an undergrounding strategy; developing practical and economical phased undergrounding segments; and preparing undergrounding overhead utilities implementation strategies.

Based on research RDA identified possible funding from federal grants, state grants, and local taxes. Additionally, it was determined that citizen input would be crucial in the success of the project implementation. RDA provided recommendations to the zoning ordinance language promoting undergrounding in new development and redevelopment projects based upon research into other local jurisdictions. The Town's franchise agreements with DEV, Cox, and Verizon were reviewed, as well as agreements between these utility providers and other local jurisdictions. Recommendations of items to be re-negotiated are provided in the report based on the reviewed agreements. An economic and practical phased conceptual design for undergrounding the existing overhead utilities along Maple Avenue was developed.

The proposed undergrounding plan can be accomplished in phases, allowing the undergrounded facilities to tie into the existing facilities. The phases can be built as redevelopment along the Maple Avenue corridor occurs. Based on the conceptual design the estimated cost to complete the proposed undergrounding at one time is approximately $20,000,000 and approximately $22,000,000 if the construction is completed in phases. This is a conceptual level cost and includes a 20% contingency. This cost does not include a complete mill and overlay of the entire roadway. The conceptual layout has been designed with the flexibility to be shifted in the roadway along Maple Avenue once a detailed design is performed and all existing utility conflicts are known.

INTRODUCTION AND PROJECT BACKGROUND

Rinker Design Associates, P.C.(RDA) is a Virginia-Certified Small Business and a leading provider of professional civil, transportation and traffic engineering, utility design/relocation/coordination, stormwater management design, environmental, surveying, Right-of-Way/easement acquisition and appraisal, land planning, litigation support, and permitting services to both the public and private sector.

RDA was retained by the Town of Vienna (The Town) to complete a feasibility study to convert utilities from overhead to underground along the Maple Avenue (Rt 123) corridor from Nutley Street to Mashie Drive, Southeast. The Town's objective is to ensure a reliable and sustainable infrastructure through undergrounding the existing utilities in the corridor.

During the study, a review of existing utilities was performed, identification of possible funding sources, financing strategies, identification of possible land development requirements to underground utilities during redevelopment and rezoning, and identification of and prioritization of possible implementation strategies. Existing franchise agreements with utilities were reviewed and amended agreement terms were presented. The study includes a conceptual design and associated cost estimate information.

STUDY AREA DESCRIPTION

General

The section of Maple Avenue identified in the utility undergrounding feasibility study is currently served by four overhead utilities. The utilities provide services primarily to local businesses and homes. The businesses served extend the entire length of the project limits between James Madison Drive and Nutley Street to East Street. The homes include townhome communities and single-family homes on the northern end of the project limit, both east and west of Maple Avenue from East Street to Mashie Drive, Southeast.

Maple Avenue's right-of-way (ROW) is generally 75 feet wide, with a few areas of variance. It is a four-lane asphalt road with an additional center turn lane for left turn movements throughout the corridor and at major intersections. Concrete curb and gutter are present throughout the project on both the east and west sides of the road. Existing ROW improvements include sections of brick sidewalk, business entrances, and road crossings extending from Courthouse Road to East Street. Concrete sidewalk exists along the remainder of the study area.

A brick median is present from James Madison Drive to north of Nutley Street at the southern project limit. A grass median exists from Follin Lane, Southeast to Mashie Drive, Southeast, at the northern project limit.

This is a heavily travelled traffic corridor. The corridor serves local traffic to the businesses within The Town; additionally, it serves through traffic with destinations to the north, which include the Tyson's Corner shopping center, I-495 corridor, and the Silver Line Metro Stations; and through traffic with destinations to the south, which include the I-66 corridor and Orange Line Metro Stations.

The existing overhead utilities (electric, phone, internet, and cable) are located on wood utility poles in the sidewalk and utility strip along the east side of Maple Avenue, with some facilities along the west side. The existing underground utilities include water, stormwater, and sanitary sewer (The Town), gas (Washington Gas), phone, internet, and cable TV (Verizon and Cox), and communications (Fiberlite and Zayo).

The project limits include a road crossing the Washington and Old Dominion (W&OD) bike trail and a Dominion Energy Virginia (DEV) Transmission power line.

The study area did not include the Windover Heights Historic District or any of the historic properties or facilities owned by The Town. However, one privately owned historic property located at 171 Maple Ave West is within the study area.

Existing Conditions Refer to the map in Appendix I for a map of the study area.

Roadway and Sidewalk

The average roadway width for Maple Avenue is approximately 50 feet from curb to curb. No bike lanes or parking spaces exist within the project area roadway. Most of the length of the project is comprised of sidewalks on both sides, which include a grass utility strip. Wood utility poles, roadway signs and concrete streetlight poles are located within the utility strip. At some intersections, traffic signal poles are located within the sidewalk. The brick sidewalk begins near Courthouse Road and extends north to East Street. Concrete sidewalk comprises the remainder of the project. The average sidewalk width varies from 4 to 6 feet. The area from the back of the curb to the back edge of the sidewalk, including the utility strip, varies from 9 to 11 feet.

Existing Underground Utilities

Existing facility maps were provided by Cox, DEV, Fiberlite, Verizon, and Zayo.

It is beyond the scope of this feasibility study to perform a topographic and boundary survey, dig test holes, or designate underground utilities.

In addition to the underground utilities previously mentioned, the power is supplied by DEV. The DEV underground facilities consist mainly of underground primary line extensions (also known as taps) to pad mounted transformers and underground secondary/services from existing overhead transformers. When an overhead or underground wire extends from the mainline to feed additional facilities such as those along side streets, it is called a line extension or tap. DEV has duct bank systems that cross Maple Avenue at Center Street and at the W&OD Trail.

Existing Overhead Utilities

Cox

Cox facilities are both overhead and underground on the project along Maple Avenue. These facilities are both coaxial and fiber. Overhead Cox facilities are attached to DEV and Verizon owned poles on the east and west respectively. Cox overhead facilities extend the length of the project, except from Park Street to Beulah Road, where they are completely underground.

DEV

DEV has an overhead mainline pole line that extends the length of the project, as follows. The overhead mainline is a double circuit 3 phase pole line, which extends from the beginning of the project traveling northbound to Nutley Street. From the Nutley Street intersection northbound to Branch Road, Southeast, the overhead mainline is a single circuit 3 phase pole line. The overhead mainline is a double circuit 3 phase pole line from Branch Road, Southeast, northbound to Beulah Road. The overhead mainline becomes a single circuit 3 phase pole line from Beulah Road northbound to Mashie

Drive, Southeast. There are various primary line extensions both overhead and underground along the project. The line extensions feed the businesses and residences along Maple Avenue, as well as the pole lines which provide service to the residents and businesses on the side streets.

Verizon

Verizon has facilities, both overhead and underground, along the entire length of the project. The overhead facilities are on poles along the west side of Maple Avenue beginning just south of Nutley Street headed northbound to Courthouse Road. From Courthouse Road to East Street the facilities are mainly underground, with the exception of smaller aerial facilities located on DEV poles on the east side of Maple Avenue. From East Street northbound to Mashie Drive, Southeast, the facilities are both overhead and underground. Overhead facilities along the project are comprised of large copper cables and fiber with areas of smaller aerial facilities. An underground conduit system, which begins south of Nutley Street and continues to Follin Lane, is located along the west side of Maple Avenue; it is comprised of various conduit and cable sizes; and it is noted to be concrete encased from Beulah Road to Follin Lane.

STUDY CRITERIA

Town of Vienna

The project has been divided into 10 segments, A thru J. The sections vary in lengths and costs, the improvements costs range from approximately $1,000,000 to $3,400,000. The variance in cost depends on the length of the duct bank, number of circuits, and number of surface mounted equipment required. Each section can be undergrounded independently of the others. When sections in the middle of the project are undergrounded, the utility companies will set poles at each end of the completed section and on the side streets to transition from underground to back to overhead facilities. The criteria used to determine the segment breaks included ease of the location to install the transition poles and the amount of surface mounted equipment required. Since there are line extensions at each intersection, the segments end past the intersection with side streets for ease of construction. When breaking the construction into phases, there will be additional construction costs for mobilization and transition of the underground facilities back to the existing overhead lines.

Cox

The Cox Communication standard duct bank configuration is four 2-inch conduits from manhole to manhole. Manholes are placed near side streets and services. This allows the tap lines to exit the duct bank system to serve customers on the side streets. Manholes are placed no more than 500 feet apart due to service drop locations. On the side streets, Cox will transition to overhead on existing poles.

DEV

Each overhead transformer on the DEV power line will need to be replaced with a pad mounted transformer to feed the existing electric service. Each overhead and underground tap line requires a switch along the mainline to feed the existing tap line. The pad mount switches can serve up to 2 tap lines.

While the duct banks can be constructed within the travel path of the roadway, the transformers and switches are surface mounted and must be placed on private property within easements. DEV specifications require easements due to safety and operating reasons for this equipment. The facilities must be placed on private property as previously described. These devices are shown in Appendix V and Appendix VI.

In some parts of DEV's service area, equipment may be placed within underground vaults. The vault option is not considered for this project because DEV requires individual property owners to enter into an agreement (legal document) to build, own, and maintain each vault. The yearly cleaning and maintenance that is required is performed by DEV at the property owner's expense. Considering the initial and recurring costs, as well as the easement acquisition required, this alternative is considered cost prohibitive.

DEV's standard duct bank configurations are noted in Appendix IX. The design of the duct banks will include one 8-inch conduit and one spare 8-inch conduit for each existing circuit. Additional conduits, one conduit and one spare, are necessary to feed the circuit tap lines for the side streets, the switches, and transformers along Maple Avenue. DEV design specifications place manholes no more than 500 feet apart. Manholes are also placed near surface mounted equipment to allow conduits to exit the duct bank and enter the switch or transformer.

DEV will set two new poles for a single circuit segment and four new poles for a double circuit segment. The poles will provide a temporary transition from overhead cable to underground cable and they will be removed as adjacent segments are placed underground. The new poles will require guy wires and a conduit which brings the underground cable to the pole. Cox and Verizon will not be able to utilize these poles to transition from underground to overhead due to the space restrictions caused by the DEV conduits.

Verizon

Verizon's standard duct bank configuration is two, six, or ten 4-inch concrete encased conduits from manhole to manhole. Manholes are placed near side streets and services for tap lines to exit the duct bank system. Manholes are placed no more than 500 feet apart. Verizon may require additional poles for transition to overhead on the side streets.

EVALUATION OF ALTERNATIVES

Taking into consideration the existing conditions of the project site and the parameters of the study, three route alternatives were considered for the utility corridor the sidewalk, private property, and the roadway corridors.

Sidewalk Corridor Alternative

The sidewalk area was found to have space limitations. The area is encumbered with other utilities. Currently, the DEV and Verizon poles are in the utility strips on both sides of Maple Ave causing constructability issues. Excavation at the depth needed for duct bank is prohibited within 8 feet of existing poles, as this may compromise the integrity of the pole and cause it to fall. Due to the 8-foot spacing requirement construction for this alternative would not be feasible without major service disruptions.

Private Property Alternative

The private property alternative was not considered a viable option due to the cost and time required to acquire the easements for the installation of the duct banks. Acquiring easements on private property requires negotiating with the property owners, for both residential or corporate owners, this process can take months or years to complete. Furthermore, easements encumber the available square footage of the property for development and can be seen as a disadvantage if the property has utility service. Therefore, the property owners view them unfavorably, which adversely impacts the acquisition efforts. Additionally, easements are costly as the property owners expect market rate compensation for the square footage being encumbered.

Roadway Corridor Alternative

The large width of the roadway and the existing Cox and Verizon underground facilities within the roadway make this an attractive alternative. Cox and Verizon may have spare conduits in their duct bank system to accommodate the installation of underground cables replacing the existing overhead lines. Although other utilities are present in the roadway, the duct bank system can be routed around them, or in some cases the existing utility can be relocated. The construction of this alternative can be completed in phases, this will prevent any interference with the existing pole lines. Phased construction will allow the installation of the underground facilities to be coordinated with the removal of the overhead utilities. This alternative will not hinder the property owner's ability to redevelop because the improvements would be largely constructed within the ROW.

Recommended Utility Corridor Alternative – See Conceptual Plan Appendix XVI.

RDA recommends the roadway corridor alternative for the underground utility work. The conceptual plan indicates the approximate locations for the proposed duct bank systems for Cox, DEV, and Verizon. The route shown was determined taking existing approved plans and proposed site plans into consideration. The conceptual plan is

based on GIS and aerial information as well as site visits. No survey of the area has been performed. The conceptual layout has been designed with the flexibility to be shifted in the roadway along Maple Avenue when a detailed design is performed, and all existing utility conflicts are known. Determination for final duct bank locations to be made at a later date with a comprehensive detailed design.

The Cox layout consists of a 4-way 2-inch duct bank from Nutley Street to Park Street where it will tie into an existing Cox duct bank. A 2-way 2-inch duct bank is proposed for the existing road crossing at Beulah Road. From East Street to Follin Lane a 2-way 2-inch duct bank is to be built. A 2-way 4-inch system is proposed from Follin Lane to the end to the project. Conduits will exit the duct bank at various manhole locations in various configurations, from 2-way 2-inch to 4-way 2-inch, to provide primary feeds to existing side streets and service to existing residential and commercial buildings. Although most transitions from underground to overhead for side streets will occur at existing poles, there may be instances where it is necessary to set a new pole. The final determination of these occurrences will be made with the detailed design.

The DEV power facilities layout consists of a new duct bank system running the length of the project. The DEV duct bank is comprised of various configurations based on the number of circuits and the locations of tap lines onto side streets. A 6-way 8-inch configuration is proposed with additional ducts for tap lines and services. Existing overhead services will be extended from pad mounted transformers located on or near the property being served. Side streets with overhead tap lines will have service provided from pad mounted switches located in the green space along Maple Avenue, with an exception at 444 Maple Avenue, here the proposed switches are located along Nutley Street near the transformer which serves the Tequila Grande. Transitions back to overhead services are at pole locations shown on the plan.

The underground Verizon facilities layout consists of a 6-way 4-inch duct bank from Nutley Street to Courthouse Road where it ties into the existing Verizon duct bank system. To provide feeds to existing side streets and services, conduits will exit the duct bank at manhole locations in various configurations, ranging from 2-way 4-inch to 4-way 4-inch. When transitioning to overhead services on the side streets it may be necessary to set a new pole, in many locations existing poles can be used to transition. The finalized detailed design will be modified once more project specifics are determined.

Right-of-Way/Easement Acquisition for surface mounted equipment can be time consuming. Sufficient time should be allotted in the project pre-construction schedule for these acquisition efforts. Acquisition of easements will need to be closely coordinated with the utility design, the design will change if an easement cannot be obtained for a particular property and an alternative location for the facilities will be determined. Easements must be acquired prior to construction.

Additional Considerations

The restoration requirements for the roadway and concrete and brick sidewalk areas will include alternatives to completely repave the roadway, or mill and overlay only in the construction area. The Town's roadway repaving schedule should be taken into consideration. Since both concrete and brick sidewalks are affected, a determination should be made as to the extent of restoration necessary, or possible installation of additional brick sidewalk. Complete mill and overlay restoration of the roadway is not included in the cost estimate.

The existing street lighting in the Town is attached to pole lines that will be removed. The Town will need to develop a new lighting plan. The Town will be able to consider a variety of lighting options now available. The Town must decide whether to own the new streetlights, or have DEV install and own them. The impacts of these options can be discussed at length with DEV during the design phase.

The W&OD crossing must be temporarily rerouted during duct bank construction. The existing transmission line along the W&OD crossing will not be affected by the duct bank construction.

The general cost estimate for the overall project is $20 million see Appendix XI.

Private Property Conversion

The cost estimate does not include the conversion of existing overhead services to underground services for the various properties along Maple Avenue. The existing overhead and underground services will remain unchanged. There are no existing overhead services served directly from the utility poles on Maple Avenue. The overhead services that serve the properties are fed from poles on properties adjacent to the Maple Ave pole line.

CONCEPTUAL PLAN

The conceptual plan is shown in ten phases, Phase A through Phase J. The cost per phase is shown on Appendix XIV. Each phase has conceptual transformer and switch locations on private property along Maple Ave. The phases begin and end past the major intersections because the transition from overhead to underground will increase constructability and reduce the cost in the areas further away from the intersections. Completed site plans not yet constructed were also taken into consideration.

Phase A is the Nutley Street intersection with Maple Avenue. The three utilities are overhead in this major intersection with mainline and services. The services feed businesses. The 444 Maple Avenue property is included in this phase. Also, the proposed redevelopment of 465 Maple Avenue West is in this phase.

Phase B begins north of Nutley Street and ends north of the Lewis Street/Wade Hampton Street intersection. The utilities serve mainly business customers. The property at the address 374 to 380 Maple Avenue has submitted plans to develop their site. The location for the transformer and switch location can be found along Wade Hampton Drive.

Phase C begins north of the Lewis Street/Wade Hampton Street intersection and ends north of the Pleasant Street intersection. The utility customers are businesses in this phase with switch and transformer locations in the green space along Maple Avenue.

Phase D begins north of the Pleasant Street intersection and ends north of the Courthouse Road/Lawyers Road intersection. The customers served by this phase are businesses.

Phase E begins north of the Courthouse Road/Lawyers Road intersection and ends north of the Center Street intersection. There is an existing DEV duct bank crossing at Center Street which will be crossed. This phase primarily serves businesses.

Phase F begins north of the Center Street intersection and ends at the W&OD Trail. It primarily serves business along the way.

Phase G begins at the W&OD Trail and ends north of the Park Street intersection. The proposed redevelopment of 200 Maple Street East is in this phase. This phase provides services to business customers.

Phase H begins north of the Park Street intersection and ends north of the Glyndon Street intersection with services to businesses in this phase.

Phase I begins north of the Glyndon Street intersection and ends north of the Beulah Road intersection. This phase provides services to businesses.

Phase J begins north of the Beulah Road intersection and ends at Mashie Street. The properties serviced in this phase include both business and residential customers.

When a project is built in phases, there are additional construction costs for mobilization and transition of the underground facilities back to the existing overhead line associated with each phase. The additional costs for DEV include two additional poles for each circuit and the cost to connect the new underground to the existing underground circuit. For Verizon, two additional poles and the cost of connecting the new underground to the existing overhead is included. The additional cost for Cox is associated with connecting the new underground to the existing overhead on an existing pole.

The additional construction mentioned above increases the cost estimate for the project built in phases to $22 million see Appendix XI.

FRANCHISE AGREEMENT REVIEW

RDA reviewed the franchise agreements between The Town and Cox, DEV, Verizon, and Mobilitie to determine possible items to add to negotiations in the future. Franchise agreements between other municipalities and these utilities were also reviewed for context, the agreements reviewed included those between Cox, the City of Fairfax, and Fairfax County; and Verizon, the City of Fairfax, and Town of Herndon.

The franchise agreements with Cox and Verizon were negotiated recently. The terms of which extend from 06-2014 to 02-2024 for Cox and from 9-2006 to 9-2021 for Verizon. Outlined below are some items to consider including in future agreements.

Cox Franchise Agreement

1. Cox will designate a single point of contact for the Town.
2. The Town will review and approve location of new or relocated facilities.
3. Upon written notification from The Town, the utility company shall relocate facilities which are on The Town's Right-of-Way. The Town will negotiate a time frame for the completion of the relocation and a remedy if the relocation is not completed within the agreed upon time frame.
4. Before The Town approval of a site plan, the utility company shall review and conceptually agree on the location for the service.

Verizon Franchise Agreement

1. Verizon will designate a single point of contact for The Town.
2. The Town will review and approve the location of new or relocated facilities.
3. In an emergency, the utility company shall notify The Town of the location of the work. The Town to negotiate a time frame for the notification to occur.
4. The utility company will provide as-built drawings to The Town upon construction completion of new facilities.
5. Upon written notification from The Town, the utility company will relocate facilities which are on The Town's Right-of-Way. The Town will negotiate a time frame for the completion of the relocation and a remedy if the relocation is not completed in the agreed upon time frame.
6. The utility company shall avoid damage to trees plants and other vegetation when installing new or relocating existing facilities.
7. When the utility company damages The Town's property it shall notify The Town and perform restoration within a negotiated time frame.
8. If The Town would like to attach to a utility company owned pole, The Town will cover the costs.
9. All new facilities shall be installed underground.
10. Before The Town approves a site plan, the utility company will review and conceptually agree on the location for service.
11. If The Town closes a street on which the utility company has permitted facilities. The Town to notify the utility company and obtain easement for existing facilities.
12. The utility company is required to obtain a permit for use of Public ROW.

DEV Franchise Agreement

RDA reviewed franchise agreements between DEV and the City of Fairfax, Town of Herndon, and City of Falls Church.

DEV has been operating in the Town of Vienna with a franchise agreement since 1986. Prior to negotiations, the Town should determine the preferred term for a franchise agreement. The term between DEV and Town of Herndon is 40 years, the City of Fairfax is 20 years and City of Falls Church is 30 years.

Considering the updated language in franchise agreements between The Town and Cox, Verizon, Mobilitie, and DEV's updated language in the franchise agreements with other municipalities it would be beneficial to the Town to consider adding language such as that listed below.

1. For tree trim, require the utility company to use Best Management Practices, Utility Pruning of Trees, International Society of Arboriculture.
2. The utility will avoid unnecessary damage to trees.
3. A tree permit shall be required from The Town for the utility company to perform non-emergency, maintenance, or removal tree trimming.
4. The utility company will give reasonable advance notice to residents in writing prior to performing work on their property. The Town should negotiate a time frame such as: no less than 2 weeks, no more than 4 weeks.
5. If trimming by the utility company will badly disfigure trees and removal is necessary, it will be at the expense of the utility company.
6. If emergency tree trimming (defined as severe weather, act of God, etc.) by the utility company is required, it will notify The Town Manager within 96 hours and describe the location and nature of the work
7. If The Town determines it is necessary to attach to the utility poles for police, traffic signals, etc., the attachment will be free of rental and application fee from the utility.
8. The utility company will remove unused overhead facilities within 90 days of attachments to poles being removed from service.
9. New installation of utility facilities to be underground. All new services to be installed underground at DEV or developer expense.
10. If Town facilities are damaged during utility construction, the utility company will immediately provide notice to The Town Manager. The Town facilities will be repaired or replaced at the utility company's cost in a reasonable time frame (90 days). If repairs are not completed in this time frame, The Town may do so and be reimbursed by the utility company.
11. When utility facilities are located on The Town's property and removal, or relocation, is requested by The Town in connection with repair, maintenance, relocation, or improvement of Public Rights-of-Way the utility company will relocate or remove like for like facilities, overhead for overhead and underground for underground. This is to be done in a reasonable time frame allowing 30 days for design and 90 days to schedule the work. If this work is not completed in the agreed upon time frame, The Town can give notice and take action to remove or

relocate at the utility company's expense. Any betterment cost is at the utility company's expense.

12. A permit will be required to inspect, remove, repair, maintain, improve, alter, modify replace, or relocate utility facilities on The Town's property or ROW. The location is subject to approval by The Town Manager. A permit from Town is required prior to allowing a third-party attachment to the utility poles.
13. The Falls Church, City of Fairfax and Town of Herndon franchise agreements have various terms in place to underground existing overhead utility facilities during the term of the agreement. For example, the Falls Church agreement specifies 300 circuit feet (cf) per year to underground for a total of 9,000 cf; and the City of Fairfax specifies 200 cf per year up to a total of 3,000 cf. In these agreements the municipality constructs and installs manholes, splice boxes, conduit, and encasement of conduit. Furthermore, the municipality covers costs associated with switches and transformers. The municipality obtains public or private easements. DEV will design, remove, and relocate existing overhead facilities to underground. Any betterment is at the utility company's expense. The City of Alexandria franchise agreement allows the installation of parallel overhead on existing pole lines. DEV will pay for the future undergrounding of the lines added. The Alexandria franchise agreement provides for cost sharing in the undergrounding in the Old and Historic District.
14. A Surety Bond is to be posted by the utility company and will be replenished if any portion is used. The balance is to be maintained. Examples of surety bonds posted by DEV are below:
    1. Town of Herndon: $25,000
    2. City of Falls Church: $50,000
    3. City of Fairfax: $50,000

Negotiations with DEV will produce an executable document for The Town prepared for easements and/or permits on Town property. See Appendix X for sample exhibit. When DEV facilities are removed from Town property, DEV shall begin paperwork within 30 days of service removal to vacate the easement.

Additional Discussion Points for DEV

1. Assign a DEV Key Account Manager as a single point contact with The Town.
2. Consolidate all streetlight and traffic signal accounts and annually review rates to decrease costs.
3. The Town will establish an emergency response process with DEV. The Town to prioritize facilities for outage restoration integrated into DEV's regional storm restoration plan.
4. The Town will establish a coordination process with DEV for construction projects, permits, tree trimming, and undergrounding of proposed facilities.
5. Work with DEV to provide increased reliability to police, 911 call center, Town hall, schools, emergency shelters, immediate care facilities, surgery centers, long term care facilities, and nursing homes.
6. Collaborate with DEV on their 10-year strategic undergrounding program for residential areas with poor reliability. (Reliability history data is used by DEV to determine areas to underground existing overhead power lines).

ZONING

Many municipalities require new or replacement utility facilities to be placed underground and designated underground districts. Some examples are listed below:

City of Alexandria

Alexandria designates undergrounding districts within the city. Utilities in new developments and new or relocated utility facilities are to be placed underground. The following excerpts from their zoning ordinance show their implementation of the undergrounding efforts within their city code.

THE ZONING ORDINANCE OF THE CITY OF ALEXANDRIA SEP 29, 2020 (CURRENT)
(https://library.municode.com/va/alexandria/codes/zoning?nodeId=ARTVMIUSZO_5-510UNUT)

Sec. 5-3-22 - Designation of underground districts by ordinance−procedure generally.

(a)The council may, from time to time, call public hearings to designate underground districts in which overhead customer utility services and overhead main lines and pipes should be removed and installed underground.

(b)Prior to any public hearing the city manager shall prepare a report which shall be presented and considered at the public hearing. In preparing any report the city manager shall consult with affected public service companies and city departments. The report shall include:

(1the extent of participation by the public service companies, the owner of the affected property and the city;

(2)the total estimated cost; and

(3)the estimated time required to complete the removal and underground installation.

(c)The city manager also shall suggest one (1) or more suitable underground districts.

(d)Subsequent to any public hearing the council may, by ordinance, designate one (1) or more underground districts and order overhead customer utility services and overhead main lines and pipes within the district removed and installed underground. The ordinance shall include a description of the area comprising the underground district and shall fix the time within which the removal and underground installation shall be accomplished and affected property must be ready to receive underground service. A reasonable time shall be allowed for the removal and installation, having due regard for the availability of labor, materials, equipment, costs and disruption within the underground district. (Code 1963, Sec. 39A-8)

Sec. 5-3-23 - Same−effect of designation on construction, continuance, etc.

Whenever the council by ordinance designates an area of the city an underground district as provided in section 5-3-22, it shall be unlawful for any person or public service company to erect, construct, place, keep, maintain, continue, employ or operate any overhead customer utility service or overhead main lines and pipes in such underground district after the date when overhead customer utility service and overhead main lines and pipes or related facilities are required to be removed by the ordinance. (Code 1963, Sec. 39A-9)

Sec. 5-3-24 - Same−noncompliance; disconnection of customer service.

Whenever customer utility service has not been installed underground or the affected property is not ready to receive underground service in compliance with the ordinance enacted pursuant to section 5-3-22, the public service company furnishing service to said property is authorized to disconnect the service until such time as the affected property is in compliance. (Code 1963, Sec. 39A-10)

Sec. 5-3-25 - Cost of removal and reinstallation.

The cost of removing overhead customer utility service and overhead main lines and pipes and installing customer utility service and main lines and pipes and underground shall be paid as agreed between the city and the parties responsible for the removal and installation or in the absence of such agreement, as determined or approved by the state corporation commission. (Code 1963, Sec. 39A-11)

5-510 Underground utilities.

All developments containing new or replacement utility facilities within the development shall provide for underground installation of said facilities.

6-208 -Underground utilities.

All developments containing new or replacement utility facilities within the development shall provide for underground installation of said facilities.

Arlington County

As shown below, Arlington zoning ordinances require the undergrounding of existing overhead utilities in Streetscape projects and Special revitalization districts. Site development standards specify that utilities be underground.

Zoning Ordinance Effective 1/25/2020

https://arlingtonva.s3.amazonaws.com/wp-content/uploads/sites/38/2019/10/ACZO.pdf

7.18.6 Streetscape

A. The periphery of any site fronting on public rights-of-way shall be landscaped by the provision of curb, gutter, sidewalk, street light, street furniture and other elements, from

face of curb to face of building according to the streetscape standards set forth in the adopted sector plan for the area in which the site is located. Sites which are not located within sector plan areas shall provide streetscape improvements consistent with the Master Walkway Policy Plan:

1. The zoning administrator may approve the use of a portion of the public right-of-way to provide the area needed to fulfill the streetscape requirements, when that is consistent with all of the adopted elements of the Comprehensive Plan and provides uniformity with abutting sites.

2. In cases where an existing building is preserved and the sidewalk section is less than the standard, the zoning administrator may waive the required width of paved sidewalk area for an abutting property, in conjunction with development of that property, in order to achieve uniformity in the streetscape. The total required width of the walkway and streetscape area shall be maintained.

B. All aerial utilities on and at the periphery of the site shall be put underground with redevelopment or new construction.

7.19.6 Site development standards

A. Landscaping

10 percent of total site area is required to be landscaped open space in accordance with the requirements of §14.2, Landscaping, except by site plan as provided in §9.2.2.D: 1. For all property except within the “Clarendon Revitalization District” on the General Land Use Plan, with the approval of the zoning administrator, a portion of the public right-of-way may be used to meet this landscaping requirement if the streetscape improvements comply with adopted plans and provided that all aerial utilities on and at the periphery of the lot shall be undergrounded with new development or redevelopment

7.19.7 Additional regulations

All utility service on a lot where new development or redevelopment is placed shall be placed underground.

9.1.8 Special Revitalization Districts

All aerial utilities in the public right-of-way at the periphery of the site and within the site shall be placed underground.

City of Fairfax

Fairfax requires on-site utilities to be placed underground in existing or proposed development sites which require plan submittal. The overhead utilities on the adjacent right-of-way are to be undergrounded, however Fairfax can grant special exceptions to the requirement as shown in their code outlined below.

Zoning – Fairfax, Virginia – Code of Ordinances Chapter 110 – Zoning, June 14, 2019 (CURRENT) (https://www.fairfaxva.gov/home/showdocument?id=7891)

§4.11. UNDERGROUND UTILITIES

A. Unless specifically exempt, all existing and proposed development for which site plan approval is required (see §6.8) shall meet the provisions of §4.11.

B. All on-site utilities shall be installed underground at the applicant's expense in accordance with city and applicable utility company standards; provided that temporary overhead facilities required for construction purposes shall be permitted.

C. When the proposed development will result in moving or relocating existing overhead utilities located in adjoining rights-of-way, the applicant shall be responsible for placing such utilities underground and dedicating any additional right-of-way or easement that is necessary. Equipment such as electric distribution transformers, switch gear, meter pedestals and telephone pedestals which is normally installed above ground in accordance with generally accepted utility practice for underground distribution may be so installed.

D. Special exceptions to the above requirement shall only be granted by the city council pursuant to the procedures and limitations of §6.17.

Town of Herndon

Herndon's zoning ordinance requires utility facilities for new development or redevelopment projects to be placed underground.

https://library.municode.com/va/herndon/codes/code_of_ordinances?nodeId=PTIICOOR_CH70SULA_ARTIIIREIM_S70-309UNUT

Sec. 70-309. Underground utilities.

New and existing utilities shall be placed below ground in accordance with standards as established in the Public Facilities Manual and accepted standards of utility practice for underground construction. The subdivider or developer shall be responsible for arranging with the appropriate utility so that new, existing, or relocated distribution and customer service utility facilities, carrying or used in connection with water, sanitary sewer, electric power, communications, cable television, petroleum, gas or steam, installed within the boundaries of the site, or within the adjacent public right-of-way shall be placed below the surface of the ground. The following equipment may be installed above ground on the site, and the subdivision site plan shall reserve space on the site to accommodate it:

(1) Equipment such as electric distribution transformers, switchgear, meter pedestals, and telephone pedestals which is normally installed above ground in accordance with accepted utility practices for underground distribution;

Town of Leesburg

Leesburg's zoning ordinance requires new or relocated overhead utilities to be installed underground per the excerpt shown below.

Article 7 Overlay and Special Purpose Districts, (Town of Leesburg, Virginia Zoning Ordinance, July 2020 7-76)

(https://www.leesburgva.gov/home/showdocument?id=9925)

Section 7.10 Crescent Design (CD) District

J. Utilities. Public utilities for stormwater, sanitary sewer and water may be located in the street right-of-way, rear alleys or in easements on the site. Other utilities, such as electricity, natural gas and telecommunication, shall be located in easements between the Required Build-to Line and the street right-of-way, within alleys or in easements along the rear of the lot and shall not interfere with the public street trees. The Town engineer may approve alternative locations for utilities. All new or relocated overhead utility lines shall be installed underground.

L. Utilities. All new utilities shall be located underground.

City of Virginia Beach

Virginia Beach requires new utilities to be placed underground, with exceptions for temporary service used for construction and electric transmission lines, demonstrated below in excerpts from their zoning ordinance.

Virginia Beach Code of Ordinances, OCT 20, 2020 (CURRENT), Appendix B – Subdivision Regulations/Required Improvements/
(https://library.municode.com/va/virginia_beach/codes/code_of_ordinances?nodeId=CO_APXBSURE_REIM_S5.10UNUT)

Sec. 5.10. - Underground utilities.

(a)Except as provided below, transmission, distribution, and customer service utility facilities carrying or used in connection with electric power, streetlights, telephone, telegraph, cable television, petroleum, gas or steam, shall be placed below the surface of the ground. Exceptions are as follows:

(1) Equipment such as electric distribution transformers, switchgear, meter pedestals, telephone pedestals, meters, service connections and the like normally installed aboveground in accordance with accepted utility practices for underground distribution.

(2) Temporary overhead facilities required for construction purposes.

(3) High tension transmission lines, fifty thousand (50,000) volts or more.

All installations shall be in accord with applicable codes and the Public Works Design Standards Manual, as approved by the council of the City of Virginia Beach and shall be in accordance with charges as approved by the state corporation commission.

Municipalities often designate areas within their jurisdiction as special undergrounding districts or special revitalization districts in which all new construction or expansion of existing buildings will require the existing overhead utilities to be placed underground. Examples of suggested zoning language for the special undergrounding or revitalization district is below.

1. New building construction or expansion of existing structures or uses shall result in no new utility poles, overhead wires or facilities on private property or public right-of-way.
2. All utility services on a lot where new development or redevelopment is placed shall be placed underground.
3. On Streetscape projects, all aerial utilities on and at the periphery of the site shall be put underground with redevelopment or new construction.

Funding Alternatives

The current project's estimated cost is approximately $20 million. The pursuit of state and federal grant opportunities is encouraged to minimize the burden on Town resources. The U. S. Economic Development Administration (EDA) and Main Street America provide grants and loans for economic development and are possible funding opportunities. The Northern Virginia Transportation Authority and Federal Highway Administration are also potential funding sources if pedestrian or multi-modal facilities are improved in conjunction with the project. The Town's meal tax revenue is also a possible funding source. The meal tax revenue would be the most expedient and straight forward revenue source, however the overall tax burden on The Town residents must be considered. A combination of multiple revenue streams is encouraged as it will ease the burden and reliance on any one source. There are nuances to every grant qualification/eligibility requirement, therefore, the project scope could expand or contract depending on the target funding source.

A separate funding alternative would be, establishing a special revitalization district for the Maple Avenue corridor to accumulate funding from developers and businesses for future undergrounding within the corridor.

As with any significant public infrastructure project, proactive public outreach is critical to successful project delivery. There are many stakeholders in a project such as this - citizens, property owners, merchants, elected officials, residents, and the impacted utility companies. These stakeholders may have varying, unique, and opposing perspectives regarding the project. It is important that all voices be heard and that a consensus be reached to the extent possible. Just as important is a clear explanation when special accommodations cannot be included in the project scope for logistical, practical, or cost considerations.

RDA has comprised background information on how a few municipalities fund infrastructure undergrounding projects. Funding sources are noted for each project.

1) The Town of Herndon

Overhead utilities along Elden Street are being placed underground from Fairfax County Parkway to Monroe Street in conjunction with a VDOT highway project. VDOT is funding a portion and Herndon is contributing a portion.

Herndon relies heavily on grants for their improvement projects. Below is an excerpt from a January 25, 2017 article in *The Connection to your community* (http://www.connectionnewspapers.com/news/2017/jan/25/herndon-begins-debate-over-capital-improvement-pro/). Several undergrounding projects are mentioned in the article.

"Herndon has begun discussing which projects should be included in the town's $54 million Capital Improvement Program.

The CIP is a financial planning document that establishes a six-year schedule for public improvements and serves as a companion policy document to the town of Herndon 2030 Comprehensive Plan, as well as the town's annual operating budget.

The total budget for the projects in the CIP for fiscal year 2018 through fiscal year 2023 is more than $54 million, but over $30 million in grants have been secured to help cover costs.

That means more than 56 percent of the projects proposed in the program would be funded through grants."

In an April 26, 2017 article of *The Connection to your community,* it mentions "general obligation bond funding", which is being used for the undergrounding of existing overhead utilities. (http://www.connectionnewspapers.com/news/2017/apr/26/herndon-looks-forward-new-downtown/)

"[The downtown utility relocation project] Provides funding to relocate overhead electric and telecommunication utilities below ground. The project will help spur downtown development by reducing infrastructure costs for the private sector. General obligation bond funding supports $2.6 million of the total cost. A portion of the town's meals tax has also been allocated toward this project.

Total CIP FY18-23: $2,925,000"

Town of Herndon 2020 budget *A Citizen's Guide to the Proposed FY2020 Budget* (https://www.herndon-va.gov/home/showdocument?id=10338)

"Downtown Utility Relocation Provides funding to relocate overhead utilities below ground. The project will help spur downtown development by reducing infrastructure

costs for the private sector. General obligation bond funding supports $2,600,000 of the total cost. Previous Allocation: $2,925,000 Total FY 20-25: $2,925,000."

2) The City of Fairfax

An ordinance regarding overhead pole lines, in which new developments are required to install utilities underground for their service and on the property, has been employed by the City of Fairfax. If this becomes cost prohibitive, the council may consider alternatives.

The City of Fairfax FY Adopted Budget 2020-2021 states, the Old Town undergrounding is to be financed by a special assessment. (https://www.fairfaxva.gov/home/showdocument?id=15648)

"Financing of the Old Town Service District's undergrounding of overhead utility lines and road improvements (totaling approximately $16 million) is supported in part by revenue generated from the Old Town District special assessment and increased revenues realized and anticipated from the ongoing redevelopment of the downtown area."

3) The Town of Marshall

About 4 years ago the Town of Marshall secured Federal funds to underground utilities on Main Street. Below is an excerpt from a March 4, 2020 article in the *Fauquier Times*. (https://www.fauquier.com/news/marshall-main-street-improvement-project-moving-forward/article_7935f188-5db5-11ea-b7d8-67a3d2bf6887.html)

"The Marshall Main Street improvement project is poised to move ahead, despite opposition from some Marshall business owners and residents. The county is in the process of soliciting bids for the project, which could begin this spring or summer. The total cost for the project is $6.29 million, all of which has already been funded.

The project, which affects Marshall's Main Street from just west of Frost Avenue to just east of Winchester Road, would move all overhead utility wires underground, expand sidewalks – narrowing the street by about 2 feet -- add crosswalks, improve signage and add trees and street lighting.

Funding for the project comes from several sources: $3.61 million from state and federal funds; $910,000 from donations and $583,000 from proffers (funded in advance by the county's capital reserve). An additional $1.19 million comes from local matching funds: $545,413 from the county's capital reserves and $643,272 is funded up-front from reserve funds and will be paid back via an increase in the Marshall special lighting district tax. The tax increase would go into effect the year after construction commences.

The increase, which would change the rate from $0.005 to $0.025 per $100 of assessed value, was passed by the board of supervisors in 2013. Under the new levy, real estate owners would pay annually $25 per $100,000 of assessed value, up from $5."

4) Arlington County

In Arlington County new poles have not been allowed for many years. Developers work directly with utility providers to underground on properties from the initial stages of site plans.

The Columbia Pike Multimodal project combines construction for utility undergrounding with streetscape improvements. These improvements to the roadway are intended for all users, vehicle as well as bicycle and pedestrian. This $114 million project is funded with a combination of local commercial property taxes dedicated to transportation and regional transportation funds from the Northern Virginia Transportation Authority. (https://projects.arlingtonva.us/projects/columbia-pike-multimodal-street-improvements/)

5) The City of Alexandria

The franchise agreement with DEV includes language for undergrounding in the Old and Historic Alexandria District, a 36-Block area. The city provides and pays for permits, easements, construction plans, and builds the duct bank system. The city also coordinates and pays for the undergrounding of existing overhead services. DEV provides and pays for the engineering of the new distribution system, not associated with the construction plans. DEV provides and installs at its own cost materials (conductors, transformers, switches, and manhole frames and covers) and the labor to install the materials; as well as the labor and materials for all overhead rearrangements and removals and all betterment costs**.**

CONCLUSION AND NEXT STEPS

The plan to underground the overhead lines along Maple Avenue can be accomplished with a mixture of funding sources, special revitalization districts, and franchise agreement terms. Proactive public outreach to the citizens is important, therefore, a citizen's advisory board to gauge public opinion and encourage buy-in from property owners is crucial. Additional zoning requirements promoting undergrounding utilities in The Town must also be implemented. When redevelopment is proposed along this corridor The Town should take the opportunity to install a phase of the project. Negotiations of new franchise agreements with provisions to underground existing overhead facilities must also be pursued.

Implementation Strategies

RDA's recommendations are to pursue multiple strategies for funding, negotiate franchise agreements which would ensure utility participation in costs for improvements, and update the zoning requirements to include appropriate undergrounding language for new development. Funding and zoning related changes should be the first priority, followed by renegotiating franchise agreements. Then begin the planning process to underground the Maple Avenue Corridor in phases.

Funding – Discern which avenues of funding available to The Town would be tenable. Pursue multiple funding sources such as state and federal grants.

Special revitalization districts – Designating a special revitalization district along Maple Avenue would allow The Town to begin a fund for future undergrounding of phases.

Franchise agreements – The Town's first priority is to determine the necessary changes to the DEV franchise agreement and to begin negotiations with DEV. Secondly, they ought to prepare items for negotiating future agreements with Cox and Verizon. Installation of underground facilities and conversion from overhead to underground should be included in the agreement.

Zoning or Regulatory Requirements

RDA understands The Town is working on Zoning Code Amendments and Design Guidelines for the Maple Avenue Commercial Corridor. This may be an opportunity to allow for future undergrounding of utilities by at a minimum of incorporating locations for surface mounted equipment into the design of development along the corridor.

Below is language that can be incorporated into the Town's code in order to facilitate the undergrounding of overhead utilities.

Establish a Zone for undergrounding – An underground utility corridor in the Town of Vienna in the Maple Avenue district is hereby established in the area along Maple Avenue from Nutley Street to Mashie Drive SE.

Address all new or upgraded Utility facilities – All new or upgraded utility facilities in the designated underground utility corridor, whether publicly or privately owned, shall be installed underground.

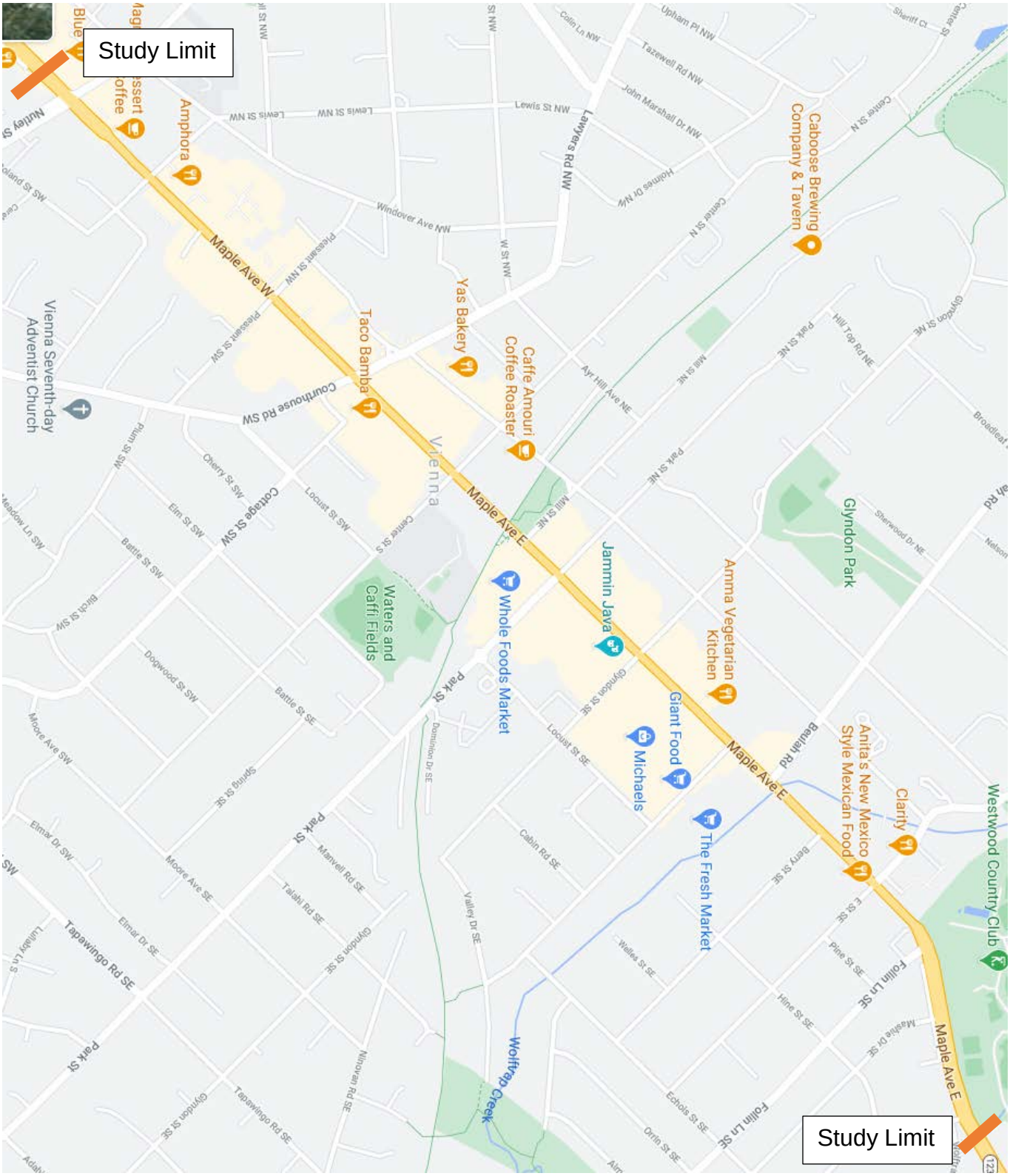
Address existing poles within the corridor – Following the effective date of this article, poles that now exist in the underground utility corridor are constructively deemed not to exist. The erection of any poles, or any new or upgraded facilities or poles, in the underground utility corridor is prohibited. The erection of such poles or facilities above-ground does not constitute good engineering practice.

The proposed undergrounding plan can be accomplished in phases which can be built as redevelopment along the Maple Avenue corridor occurs. The estimated cost to complete the proposed undergrounding at one time is approximately $20,000,000 and approximately $22,000,000 for construction in phases. The next steps for The Town include pursuing funding alternatives, negotiate cost sharing with utilities, and public outreach. The next design action items include performing a more detailed engineering design with utility locates, perform test holes, a survey of underground facilities, and coordinate with utilities to define specific locations for new facilities to prepare for future undergrounding.

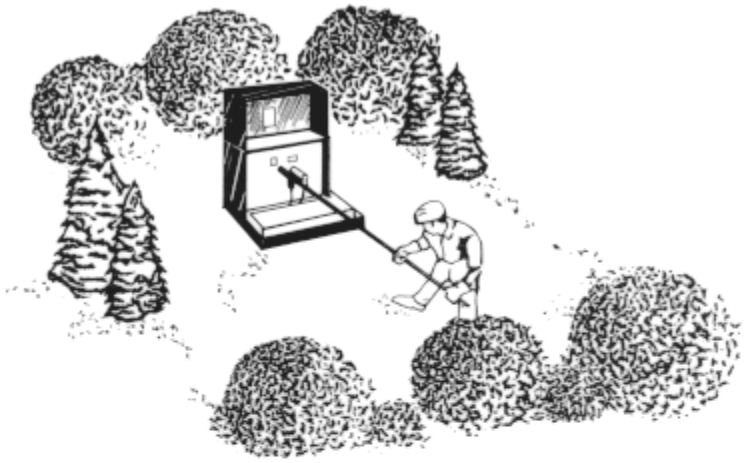
RDA appreciates the opportunity to collaborate with the Town on this feasibility study.

TABLE OF APPENDICES

Appendix I: Study Area Map



Appendix II: DEV Clearances and Dimensions-Safe Work Area

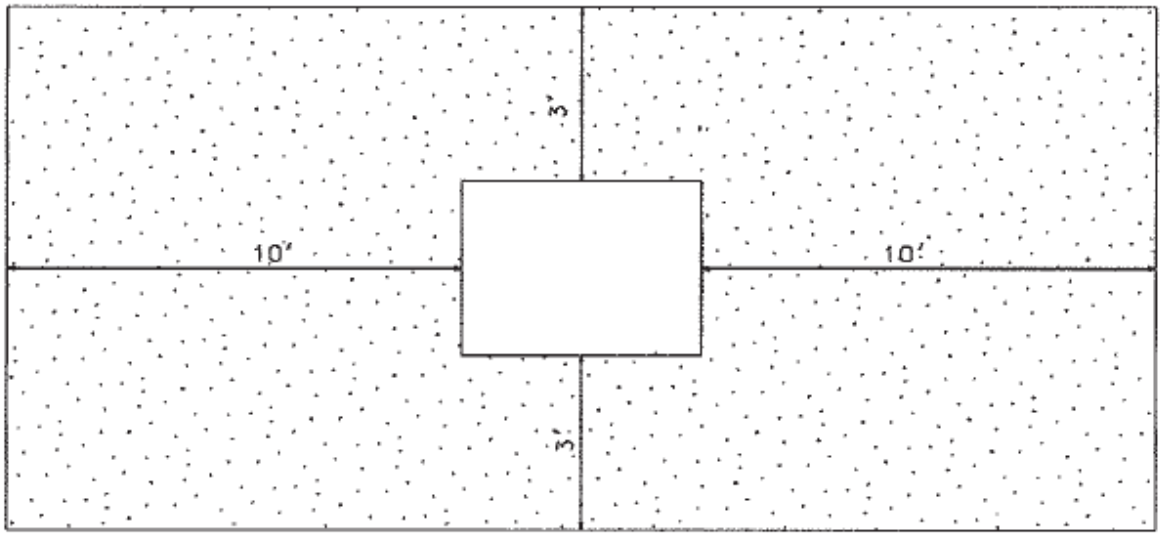


WE NEED ROOM TO WORK SAFELY ON THIS DEVICE.

PLEASE KEEP SHRUBS AND STRUCTURES 10 FEET AWAY FROM THE SIDE WITH DOORS AND 3 FEET FROM OTHER SIDES.

OBSTRUCTIONS MAY BE DAMAGED OR REMOVED DURING SERVICE RESTORATION OR MAINTENANCE.

Appendix III: DEV Switch Dimension Document

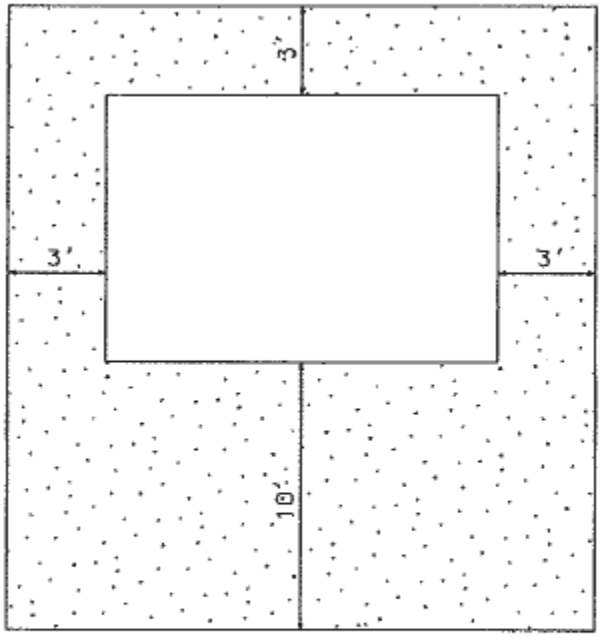


SWITCH
CLEAR WORK AREA

NOTE: ALL DIMENSIONS ARE TAKEN FROM SWITCH PAD. PAD DIMENSIONS FOR THE SWITCH TO BE INSTALLED MUST BE ADDED TO THESE DIMENSIONS. (SEE GENERAL NOTE 1)

Typical Switch Dimension: 70” Length 70” Width 48” Height

Appendix IV: DEV Transformer Dimension Document



PADMOUNTED TRANSFORMER
CLEAR WORK AREA

Typical 3 phase transformer dimensions: 82”L x 94”W x 75”H

Typical 1 phase transformer dimensions: 60”L x 38”W x 40”H

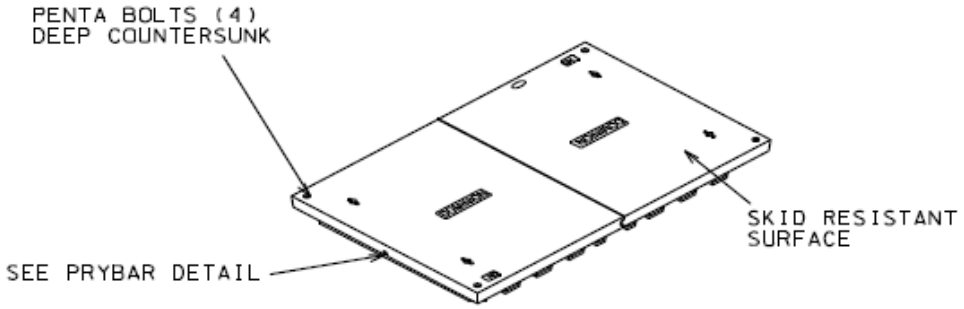
Appendix V: DEV Switch and Transformer

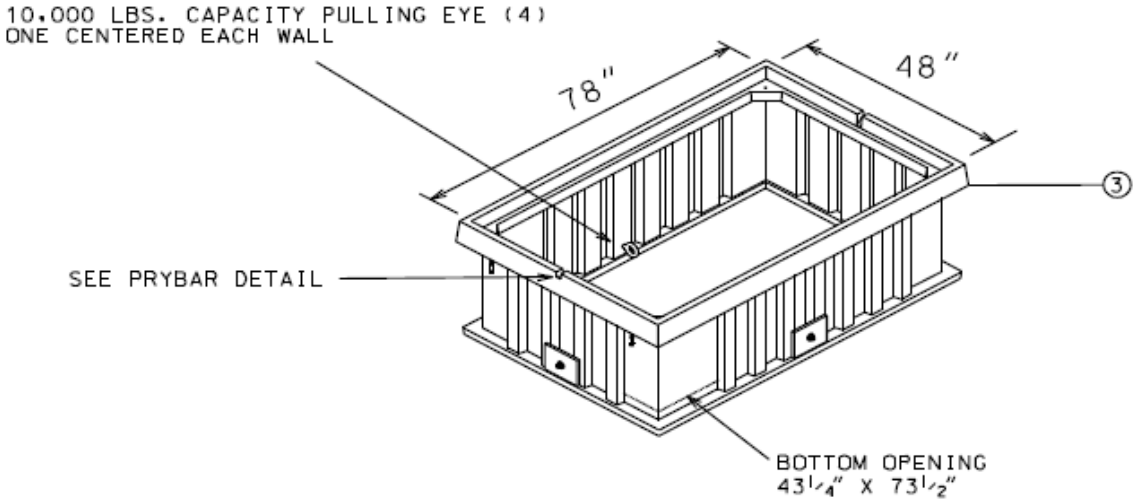
Vienna Square, Church St NE. The green box on the left is a switch, and the one on the right is a three-phase transformer.

Appendix VI: DEV Transformer and Verizon Pedestal

The photo below at the corner of Air and Space Museum Parkway and Historic Sully Way in Herndon shows a DEV single-phase transformer and a Verizon pedestal.

Appendix VII: DEV Splice Box



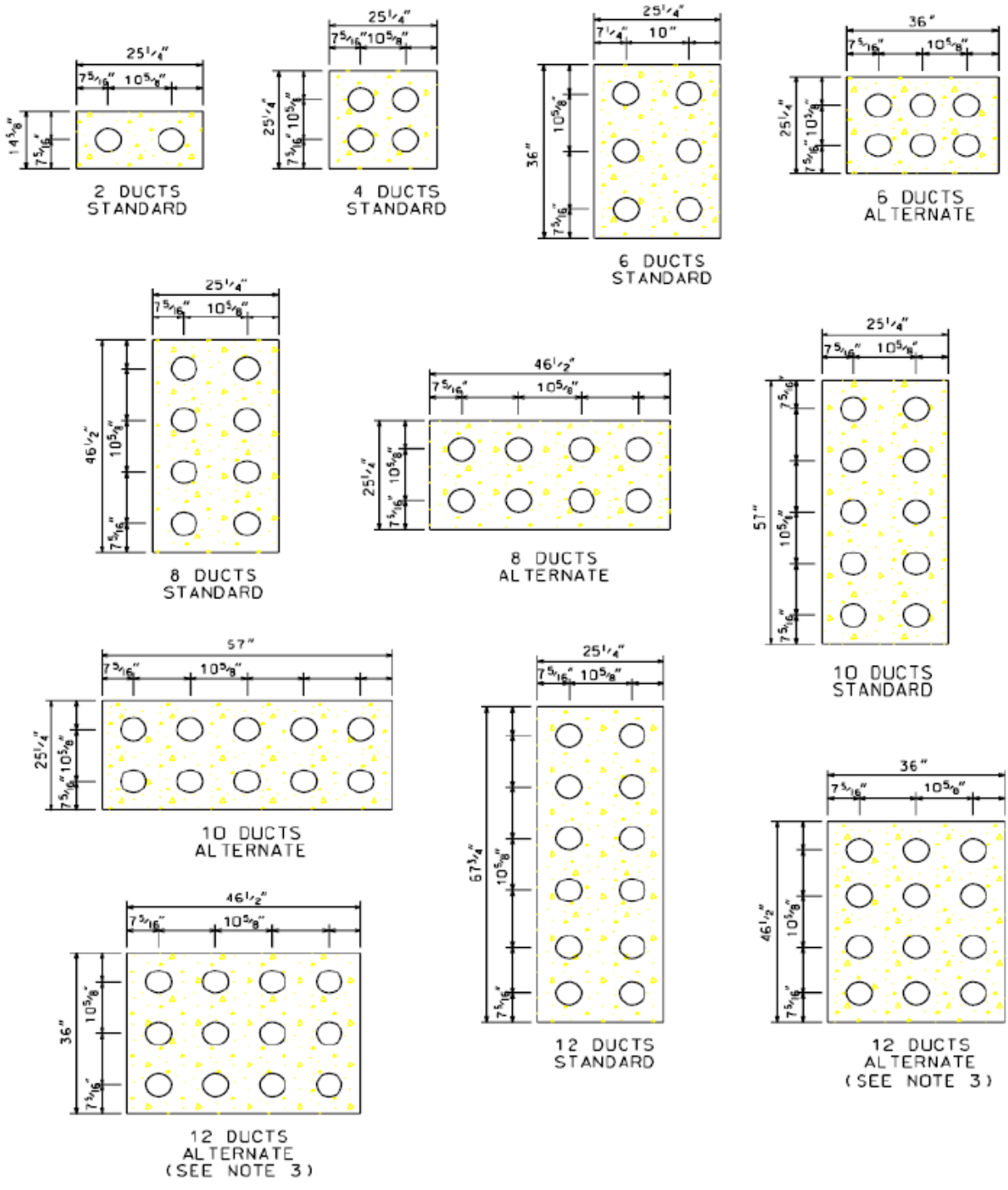


Appendix VIII: Verizon Pedestal and Splice Box

Appendix IX: Verizon Splice Box Dimension (3x5)

Various Communication Pedestals

Appendix X: DEV Standard Conduit Line Formation 8” Duct



Appendix XI: Example of DEV Right of Way Agreement Exhibit "A"

EXHIBIT "A"

This Right-of-Way Agreement dated _____, 20___, by and between _____(**GRANTOR**), and VIRGINIA ELECTRIC AND POWER COMPANY, a Virginia public service corporation doing business in Virginia as Dominion Virginia Power ("**GRANTEE**"), to which this Exhibit "A" is attached, is hereby amended as follows:

1. It is agreed between **GRANTOR and GRANTEE** that facilities installed in the easement area are to be Underground ONLY, no above ground facilities are to be installed including all pad mounted transformers, transformer enclosures, concrete pads, manholes, or connection boxes.

Witness the following signatures and seals:

GRANTORS:

_____

_____

Appendix XII: Cost Estimate Table, Total Undergrounding Cost

MAPLE AVENUE -UNDERGROUNDING
COSTS BY UTILITY

	UTILITY	TOTAL
	COX	$ 1,000,000
	DEV	$ 16,000,000
	VERIZON	$ 2,000,000
SUBTOTAL		**$ 19,000,000**
	ROAD RESTORATION	$ 1,000,000
GRAND TOTAL		***$ 20,000,000***

Appendix XIII: Cost Estimate Tables, Verizon and Cox

MAPLE AVENUE - VERIZON

ITEM	QTY	UNIT	COST	UNIT	TOTAL
(6) 4" CONCRETE ENCASED CONDUIT	2950	LF	$271	LF	$ 800,000
900 PR CABLE	2950	LF	$68	LF	$ 200,000
200 PR CABLE	3150	LF	$32	LF	$ 100,000
(10) 4" CONCRETE ENCASED CONDUIT	405	LF	$247	LF	$ 100,000
400 PR CABLE	405	LF	$49	LF	$ 20,000
144 FO CABLE	1615	LF	$12	LF	$ 20,000
(2) 4" CONCRETE ENCASED CONDUIT	200	LF	$200	LF	$ 40,000
VERIZON MANHOLE	16	EA	$20,000	EA	$ 320,000
SUBTOTAL					**$1,600,000**
ENGINEERING					$ 200,000
CONTINGENCY					$ 200,000
GRAND TOTAL					***$2,000,000***

MAPLE AVENUE - COX

	ITEM	QTY	UNIT	COST	UNIT	Total
	48 FIBER	8,650	LF	$ 52	LF	$ 450,000
	.750 COAX	8,650	LF	$ 35	LF	$ 300,000
	POWER SUPPLY	4	EA	$ 5,000	EA	$ 20,000
SUBTOTAL						**$ 770,000**
	MISCELLANEOUS					$ 230,000
TOTAL						***$ 1,000,000***

Appendix XIV: Cost Estimate Table, DEV

MAPLE AVENUE - DEV

	ITEM	QTY	UNIT	COST	UNIT	Total
	POLES AND ASSOCIATED OVERHEAD EQUIPMENT	23	EA	$ 30,435	EA	$ 700,000
	TRENCHING AND DUCTBANK various configurations					$ 7,000,000
	CABLE	18,000	LF	$ 39	LF	$ 700,000
	MANHOLE	31	EA	$ 45,161	EA	$ 1,400,000
	PADMOUNT SWITCH	25	EA	$ 56,000	EA	$ 1,400,000
	PADMOUNT TRANSFORMER	26	EA			$ 600,000
SUBTOTAL						**$ 11,800,000**
	Engineering and Flagging					$ 800,000
SUBTOTAL						**$ 12,600,000**
	Contingency					$ 3,400,000
GRAND TOTAL						***$ 16,000,000***

Appendix XV: Cost Estimate Table, Overall Cost by Phase

MAPLE AVENUE OVERALL COSTS PER PHASE INCLUDING RESTORATION OF ROADWAY

TOTAL COST PER PHASE

PHASE DESCRIPTION	PHASE	COST
Nutley St intersection	A	$ 2,100,000
Nutley St to Lewis St	B	$ 2,200,000
Lewis St to Pleasant St	C	$ 2,900,000
Pleasant St to Courthouse Rd	D	$ 2,100,000
Courthouse Rd to Center St	E	$ 2,300,000
Center St to Mill St	F	$ 1,000,000
Mill St to Park St	G	$ 1,900,000
Park St to Glyndon St	H	$ 1,300,000
Glyndon St to Beulah Rd	I	$ 2,800,000
Beulah Rd to Mashie Dr	J	$ 3,400,000
GRAND TOTAL		***$ 22,000,000 ****

* Additional costs per phase due to installation of poles and conduits for transition from overhead to underground