

LHW



Smith Seckman Reid, Inc.

C O N S U L T I N G

E N G I N E E R S

May 2, 1995

Mr. Dave Parker
City Engineer
City of Franklin
City Hall, Box 305
Franklin, TN 37064

**RE: Parkview Drainage Improvements
SSR #95-41-002.0**

Dear Dave:

Pursuant to your request, we have investigated the hydrology and hydraulics involved with the installation of a storm sewer system to serve the Parkview area. As you are aware, the preliminary design of the storm sewer system was to begin along Evans Avenue and extending north along Evans Avenue to a point where the natural drainage way crosses under Evans Avenue and then crosses Parkview and Fowlkes Streets. The drainage way then travels back to Evans Avenue at approximately the intersection of Evans Avenue and Buford Street. The system would then continue to extend northward along Evans Avenue to a point just east of the South Central Bell parking lot. The system would then traverse through the South Central Bell parking lot to the west side of Cummings Street. The system would then traverse north along the west side of Cummings Street to a point on the northeast side of the Handy Hardware parking lot. It would then traverse westward through the Handy Hardware parking lot and connect to the existing storm sewer system in Columbia Avenue. Please refer to the exhibit attached.

There is very little storm sewer systems in place in these areas at this time. The majority of the system in the southern portion of the project is culverts under driveways, roadways, etc. In the northern portion a more formal storm sewer system exists. This system is old and generally is of varying sizes and types of pipes. The storm sewer system in Columbia Avenue was constructed in the early 80's as a part of a Tennessee Department of Transportation (TDOT) project.

The drainage basin for this project is approximately 50 acres. The terrain is fairly gentle and has some slopes approaching 6 to 7 percent. The majority of the drainage basin is residential with lots ranging from one quarter acre to one acre in size. The majority of the drainage basin is developed. Typically, surface runoff is collected at roadside ditches and then is transferred to downstream drainage ways and/or pipes. Based upon our calculations, the flow two-year storm event is approximately 120 cfs



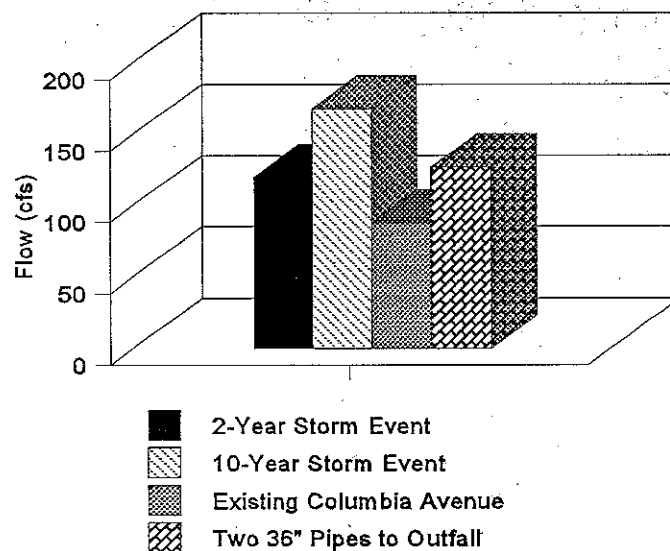
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at Columbia Avenue and the flow for the ten-year storm event is approximately 168 cfs at Columbia Avenue.

This project has been considered due to localized flooding and/or ponding in some of the areas of the drainage basin. This appears to be more of a problem in the southern end along Evans Street and the natural drainage way to the east of Evans Street. The localized ponding and/or flooding is currently acting as a natural detention basin thereby reducing the flow downstream.

At the proposed point of connection (in front of Franklin Plumbing), there is a 36" x 20" box culvert and two 18" pipes which can transfer the existing flow across Columbia Avenue to a catch basin. The outlet of this catch basin is two 36" pipes continuing westward to a natural drainage way. There have been reports that this downstream drainage way currently also has localized flooding problems.

Based upon our investigation, the allowable capacity in the two 36" pipes is approximately 127 cfs (for both pipes). The existing 36" x 20" box culvert will handle approximately 40 cfs and the two 18" pipes will handle approximately 12 cfs each. There are additional 18" pipes available at South Margin Street and on the western side of Columbia Avenue. Under the current situations, the maximum that could be discharged from the Parkview drainage area under Columbia Avenue is 48 cfs for the 18" pipes (4 each at 12 cfs each) and 40 cfs for the 36" x 20" box from Cummings Street to Columbia Avenue for a grand total of 88 cfs.



Based upon the above graph, it becomes evident that the existing drainage ways under Columbia Avenue can not pass the 2- or 10-year storm events. After performing the investigation and finding that the critical section is under Columbia Avenue, we investigated the following options. Option 1 is to install a storm sewer system which would encompass the entire Parkview drainage area as

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described and install a new pipe under Columbia Avenue. Option 2 would be to install the drainage system as described to the point of the intersection of Buford Street and Evans Avenue, thereby reducing the discharge under Columbia Avenue to the existing drainage way capacity (88 cfs). Option 3 is to construct a detention basin just north of the intersection of East Fowlkes Street and the natural drainage way. Option 4 would be to install a storm water pumping station near the Buford Street and Evans Avenue intersection. Option 5 would be to install the Option 1 improvements and construct an outfall pipe down Church or South Margin Streets to the Harpeth River. A planimetric representation of the options is attached. A brief discussion of the options, including their advantages and disadvantages is as follows:

Option 1

This option is the construction of a new storm sewer system for the entire drainage basin and the installation of a new 54" reinforced concrete pipe under Columbia Avenue. This storm system would follow the path previously described and would alleviate localized flooding and/or ponding on the southern end during the design rainfall events. We would recommend that the 10-year storm be designed in this case. There are some disadvantages in using this option. We have previously indicated there is localized flooding downstream of the Parkview project. Once the new storm sewer system improvements are installed, this problem will only grow in magnitude. The scope of this project at this time does not allow for investigation of downstream drainage ways; therefore, they have not been investigated.

Option 2

Option 2 is the installation of a storm sewer system to a point near the intersection of Buford Street and Evans Avenue. This system would connect to the existing 18" RCP and 36" x 20" box culverts under Columbia Avenue. Again, we would recommend that this storm sewer system be designed as a 10-year system to allow the pipes to be utilized in the future. The connections to the 5 drainage ways under Columbia Avenue would be accomplished through flow splitting devices which will allow only a certain portion to be discharged at each connection point; thereby, spreading out the flows to allow multiple connection points. This alleviates the need for the construction of a new pipe under Columbia Avenue. We believe this to be only a short-term solution until planning and the accumulation of funds can be accomplished to construct/improve the necessary drainage ways downstream of Columbia Avenue. On the southern end where the localized ponding/flooding is occurring, no improvements other than some minor ditch repairs would be constructed. As previously stated, the existing drainage ways act as a natural detention basin. Therefore, the peak flows are attenuated by the localized ponding/flooding. In doing so, the peak discharge is therefore reduced and the downstream drainage ways are not impacted as greatly. While this is not desirable for the residents in this area, it alleviates downstream problems. The improvements

in the southern Parkview area could be constructed at a later date when the downstream drainage ways have been improved to provide the capacity for these additional flows.

Option 3

This option entails construction of a detention basin somewhere within the drainage basin. Assuming that the goal of the detention basin is to reduce the flows to allow connection to the existing drainage ways under Columbia Avenue (capacity of 88 cfs), the size of the detention basin for a 2-year storm event would be approximately 1 acre-foot and for a 10-year storm event would be approximately 2.25 acre-feet. The sizes of these detention basins have been calculated based upon containing the first 20 minutes of the difference between the allowable discharge rate (under Columbia Avenue) and the peak discharge for the design storm.

After preliminarily sizing the detention basin, the next step was to determine where to locate this structure. With the Parkview drainage area being densely populated with houses, there is only one area of sufficient size that could be utilized as a detention basin. This area is located immediately upstream (south) of the intersection of Buford Street and Evans Avenue. The physical characteristics of the detention basin can vary. In general, should the detention basin be 1 foot deep, then the surface area of the detention basin would be as indicated, i.e. for a 2-year storm event the surface area would be 1 acre and for a 10-year storm event the service area would be 2.25 acres. Should the detention basin be 2 feet in depth, then the depths for 2-year and 10-year storm events would be .5 acre and 1.625 acres respectively. This method can be used for any depth desired. In the investigation for the location of the detention basin, an area is needed that has sufficient change in elevation to allow the detention basin to have a reasonable depth so as to reduce the surface area. In further investigating the proposed site, it was determined that, on this property alone, the difference in elevation was approximately one foot. Based upon this, there is not sufficient area to accommodate the required detention basin for either storm event. A two foot elevation drop could be attained if the detention basin extended under Park Avenue. However, there are significant problems with existing garages, structures, and other items within the necessary detention area which would have to be relocated. Due to the problems with location of a detention basin of the size and depth necessary, and the questionable value of a detention basin only storing the first 20 minutes of a storm, this option was eliminated from further consideration.

Option 4

This option is construction of a storm water pumping station very near the location of the intersection of Buford Street and Evans Avenue. This storm water pumping station would be designed to handle only the flow necessary to allow the design storm discharge to be transported under Columbia Avenue through the existing pipes. The approximate flows as

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indicated in Option 3 above are the same. To be more specific, the pumping station would be necessary to pump 32 cfs for the 2-year storm event and 80 cfs for the 10-year storm event. This equates to 14,400 gpm for the 2-year storm event and 36,000 gpm for the 10-year storm event. Due to these very large flows and the budget of this project, again, we have not chosen to move forward with any further investigations into this option.

Option 5

Option 5 is to divert the flows from the Parkview area away from the natural pattern of flowing under Columbia Avenue by installing a storm sewer system which would transfer the flows down Church Street or South Margin Street and, ultimately, to the Harpeth River. There is an existing pipe in Church Street which we understand to be at or near capacity. With the installation of an additional pipe down Church Street, there are two alternatives available. First, is to merely parallel the two pipes. Second, is to construct one large pipe and combine the flows.

A detailed investigation of this option has not been accomplished; however, for the purposes of this report, it is assumed that the elevation of the existing 30" pipe would be too shallow for combining with the Parkview drainage system. Therefore, we have assumed that the pipes must be paralleled and that the Parkview drainage system outfall pipe would be deeper than that of the existing storm and sanitary sewers in Church or South Margin. Additional investigation would be necessary to determine the exact cost of this option. Based upon the assumptions listed above, a cost estimate is included for this option. Also, additional investigation would be required to determine feasibility based upon existing utilities and other unknown factors.

The advantages of this option are that the Parkview storm water flows are transferred directly to the Harpeth River; thereby, alleviating some downstream drainage way ponding/flooding west of Columbia Avenue as a result of the Parkview stormwater flows.

Based upon our investigation, there are three options which we consider to be feasible, Options 1, 2 and 5. Our first recommendation would be to investigate Option 5 further so as to understand all of the constraints involved with the installation of the outfall line down Church or South Margin Streets. We recommend this because this option may alleviate some problems of the downstream drainage ways. If after further investigation this option is not chosen, then we would recommend that Options 1 and 2 be chosen. These are listed in order of preference. We feel that the construction of the total drainage way improvements are a long-term solution and provide the desired result of reducing localized ponding/flooding in the Parkview area. This is not to say that this could not occur in phases where Option 2 could be constructed first, improvements to the downstream drainage ways be investigated, planned and budgeted for and then the remainder of the system be installed.

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We trust this fully explains the situation. In accordance with your request, we will be prepared to present this to the Public Transportation Committee on Wednesday, May 10 at 6:00 p.m. Should you have any questions or comments before that time, we would be happy to respond to them.

Sincerely,

SMITH SECKMAN REID, INC.

L. Holman Waters

L. Holman Waters, Jr., P.E.

Enclosures

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cc: SCL, JMW

OPINION OF PROBABLE COST
Parkview Drainage Improvements - Option I
New Storm System Under Columbia Pike - 10-Year Storm Event

1.	18" RCP - 450 LF @ 30/LF	\$13,500.00
2.	24" RCP - 50 LF @ 34/LF	1,700.00
3.	24" CMP - 200 LF @ 30/LF	6,000.00
4.	30" CMP - 75 LF @ 40/LF	3,000.00
5.	36" RCP - 25 LF @ 57.5/LF	1,437.50
6.	36" CMP - 370 LF @ 47/LF	17,390.00
7.	42" RCP - 40 LF @ 73.5/LF	2,940.00
8.	42" CMP - 300 LF @ 57/LF	17,100.00
9.	48" RCP - 750 LF @ 90/LF	67,500.00
10.	54" RCP - 930 LF @ 110/LF	102,300.00
11.	Catchbasins w/Inlets - 40 EA @ 1200/EA	48,000.00
12.	Tunnel Columbia Avenue - 60 LF @ 500/LF	30,000.00
13.	Pavement Removal & Replacement - 1700 Sq. Yds. @ 30/Yds.	51,000.00
14.	Driveway Crossings - 8 EA @ 400 EA	3,200.00
15.	Property Restoration - Lump Sum	40,000.00
16.	Ditch Improvements - 700 LF @ 10/LF	<u>7,000.00</u>
		\$412,067.50
	Plus 10% Contingencies	<u>41,206.75</u>
	Grand Total	\$453,274.25

OPINION OF PROBABLE COST
Parkview Drainage Improvements - Option I
New Storm System Under Columbia Pike - 2-Year Storm Event

1.	18" RCP - 450 LF @ 30/LF	\$13,500.00
2.	18" RCP - 130 LF @ 22/LF	2,860.00
3.	24" CMP - 70 LF @ 30/LF	2,100.00
4.	30" CMP - 30 LF @ 50/LF	1,500.00
5.	30" RCP - 215 LF @ 40/LF	8,600.00
6.	36" RCP - 25 LF @ 57.5/LF	1,437.50
7.	36" CMP - 370 LF @ 47/LF	17,390.00
8.	42" RCP - 370 LF @ 73.5/LF	27,195.00
9.	42" CMP - 45 LF @ 57/LF	2,565.00
10.	48" RCP - 1,200 LF @ 90/LF	108,000.00
11.	Catchbasins w/Inlets - 40 EA @ 1200/EA	48,000.00
12.	Tunnel Columbia Avenue - 60 LF @ 500/LF	30,000.00
13.	Pavement Removal & Replacement - 1700 Sq. Yds. @ 30/Yds.	51,000.00
14.	Driveway Crossings - 8 EA @ 400 EA	3,200.00
15.	Property Restoration - Lump Sum	40,000.00
16.	Ditch Improvements - 700 LF @ 10/LF	<u>7,000.00</u>
		\$364,347.50
	Plus 10% Contingencies	<u>36,434.75</u>
	Grand Total	\$400,782.25

OPINION OF PROBABLE COST
Parkview Drainage Improvements - Option II
Utilize Existing System under Columbia Pike
Install Partial Improvements in Parkview Area - 10-Year Storm Event

1.	18" RCP - 540 LF @ 30/LF	\$ 16,200.00
2.	48" RCP - 440 LF @ 90/LF	39,600.00
3.	54" RCP - 1200 LF @ 110/LF	132,000.00
5.	Catch Basins w/Inlets - 20 @ 1200	24,000.00
6.	Flow Splitting Junction Boxes - 4 @ 8000	32,000.00
7.	Connect to Existing Catch Basins - 4 EA @ 800	3,200.00
8.	Pavement Removal & Replacement - 1800 Sq. Yds. @ 30	54,000.00
9.	Driveway Crossings - 6 EA @ 400	2,400.00
10.	Property Restoration	30,000.00
11.	Ditch Improvements - 700 LF @ 10/LF	<u>7,000.00</u>
		\$340,400.00
	Plus 10% Contingencies	<u>34,040.00</u>
	Grand Total	\$374,440.00

OPINION OF PROBABLE COST
Parkview Drainage Improvements - Option II
Utilize Existing System under Columbia Pike
Install Partial Improvements in Parkview Area - 2-Year Storm Event

1.	18" RCP - 540 LF @ 30/LF	\$16,200.00
2.	42" RCP - 440 LF @ 73.5/LF	32,340.00
3.	42" CMP - 45 LF @ 57/LF	2,565.00
4.	48" RCP - 1200 LF @ 84/LF	100,800.00
5.	Catch Basins w/Inlets - 20 @ 1200	24,000.00
6.	Flow Splitting Junction Boxes - 4 @ 8000	32,000.00
7.	Connect to Existing Catch Basins - 4 EA @ 800	3,200.00
8.	Pavement Removal & Replacement - 1800 Sq. Yds. @ 30	54,000.00
9.	Driveway Crossings - 6 EA @ 400	2,400.00
10.	Property Restoration	30,000.00
11.	Ditch Improvements - 700 LF @ 10/LF	<u>7,000.00</u>
		\$311,705.00
	Plus 10% Contingencies	<u>31,170.50</u>
	Grand Total	\$342,875.50

OPINION OF PROBABLE COST
Parkview Drainage Improvements - Option V
New Storm System - Church Street to Harpeth River - 10-Year Storm Event

1.	18" RCP - 450 LF @ 30/LF	\$13,500.00
2.	24" RCP - 50 LF @ 34/LF	1,700.00
3.	24" CMP - 200 LF @ 30/LF	6,000.00
4.	30" CMP - 75 LF @ 40/LF	3,000.00
5.	36" RCP - 25 LF @ 57.5/LF	1,437.50
6.	36" CMP - 370 LF @ 47/LF	17,390.00
7.	42" RCP - 40 LF @ 73.5/LF	2,940.00
8.	42" CMP - 300 LF @ 57/LF	17,100.00
9.	48" RCP - 750 LF @ 90/LF	67,500.00
10.	54" RCP - 4330 LF @ 110/LF	476,300.00
11.	Catchbasins w/Inlets - 40 EA @ 1200/EA	48,000.00
12.	Pavement Removal & Replacement - 1700 Sq. Yds. @ 30/Yds.	51,000.00
13.	Driveway Crossings - 8 EA @ 400 EA	3,200.00
14.	Property Restoration - Lump Sum	40,000.00
15.	Ditch Improvements - 700 LF @ 10/LF	<u>7,000.00</u>
		\$756,067.50
	Plus 10% Contingencies	<u>75,606.75</u>
	Grand Total	\$831,674.25

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SCALE: 1"=500'