



**Hamilton Co. – ORDC HAM-Vine St  
PID No. 96425**

**Analysis Summary**

The drainage design was developed in accordance with requirements specified within the Ohio Department of Transportation Location and Design Manual, Volume 2. The relevant sections are noted below:

- Storm Sewer Design Criteria - Section 1104.3

- Pavement Drainage Criteria - Section 1103.3.1,2,3

The Design Year (2046) ADT and design speed for each roadway facility within the project limits is shown below:

| Road                | ADT  | Design Speed |
|---------------------|------|--------------|
| Vine Street         | 9835 | 35 MPH       |
| Spring Grove Avenue | 9885 | 35 MPH       |

**Drainage Design Summary**

The storm drainage system is designed to maintain the existing drainage patterns within the project area to the maximum extent practicable while meeting ODOT drainage design guidelines. To limit project impacts and construction costs, existing drainage infrastructure was retained with proposed drainage structures incorporated where necessary. Drainage diversions due to the proposed design remain minimal, and the project will result in an overall decrease in stormwater runoff due to a net reduction in impervious area. The following assumptions were used to develop the drainage design:

**Assumptions**

- The CB-6 at Vine St. Sta. 325+42 LT was analyzed in CDSS Inlet Spacing Analysis as a CB-3A since CDSS doesn't include CB-6 as an option.

The following items are included as attachments to this document:

- Hydrology Calculations
- Drainage Area Map
- CDSS Inlet Spacing Analysis
- CDSS Storm Sewer Analysis



HAM CR101 13.63  
PID No. 111842  
Drainage Calculations

| <b>Ham-Vine Hydrology - Storm System Design Flows</b> |                |                      |                 |                                   |                                |                  |               |                |                |                |                  |
|---|----------------|----------------------|-----------------|-----------------------------------|--------------------------------|------------------|---------------|----------------|----------------|----------------|------------------|
|   |                |                      |                 |                                   |                                | Calculations By: | <b>BTS</b>    |                | Date:          |                | <b>6/20/2024</b> |
|   |                |                      |                 |                                   |                                | Checked By:      | <b>AA</b>     |                | Date:          |                | <b>6/28/2024</b> |
| <b>Rational Method</b>                                |                |                      |                 |                                   |                                |                  |               |                |                |                |                  |
| <b>Drainage Area</b>                                  |                | <b>Input Summary</b> |                 |                                   |                                | <b>Q (cfs)</b>   |               |                |                |                |                  |
| <b>Drainage Area ID</b>                               | <b>Station</b> | <b>Area Prop.</b>    | <b>Tc (min)</b> | <b>Weighted C<sub>value</sub></b> | <b>Intensity Value (10 Yr)</b> | <b>2 Year</b>    | <b>5 Year</b> | <b>10 Year</b> | <b>25 Year</b> | <b>50 Year</b> | <b>100 Year</b>  |
| <b>D-1</b>  | <b>188+95</b>  | <b>0.340</b>         | <b>10.0</b>     | <b>0.85</b>                       | <b>5.32</b>                    | <b>1.18</b>      | <b>1.39</b>   | <b>1.53</b>    | <b>1.73</b>    | <b>1.87</b>    | <b>2.03</b>      |
| <b>D-2</b>  | <b>189+02</b>  | <b>0.293</b>         | <b>10.0</b>     | <b>0.65</b>                       | <b>5.32</b>                    | <b>0.77</b>      | <b>0.91</b>   | <b>1.01</b>    | <b>1.14</b>    | <b>1.23</b>    | <b>1.33</b>      |
| <b>D-5</b>  | <b>325+42</b>  | <b>0.105</b>         | <b>10.0</b>     | <b>0.90</b>                       | <b>5.32</b>                    | <b>0.39</b>      | <b>0.46</b>   | <b>0.50</b>    | <b>0.57</b>    | <b>0.61</b>    | <b>0.67</b>      |
| <b>D-7</b>  | <b>191+88</b>  | <b>0.240</b>         | <b>10.0</b>     | <b>0.88</b>                       | <b>5.32</b>                    | <b>0.86</b>      | <b>1.01</b>   | <b>1.12</b>    | <b>1.26</b>    | <b>1.36</b>    | <b>1.48</b>      |
| <b>D-8</b>  | <b>191+89</b>  | <b>0.304</b>         | <b>10.0</b>     | <b>0.68</b>                       | <b>5.32</b>                    | <b>0.84</b>      | <b>0.99</b>   | <b>1.10</b>    | <b>1.24</b>    | <b>1.34</b>    | <b>1.45</b>      |
| <b>D-9</b>  | <b>326+14</b>  | <b>0.286</b>         | <b>10.0</b>     | <b>0.89</b>                       | <b>5.32</b>                    | <b>1.03</b>      | <b>1.22</b>   | <b>1.35</b>    | <b>1.52</b>    | <b>1.64</b>    | <b>1.78</b>      |

Hamilton County - Zone C      $i=a/(b+tc)^c$       $Q=C*I*A$

**Rainfall Intensity**

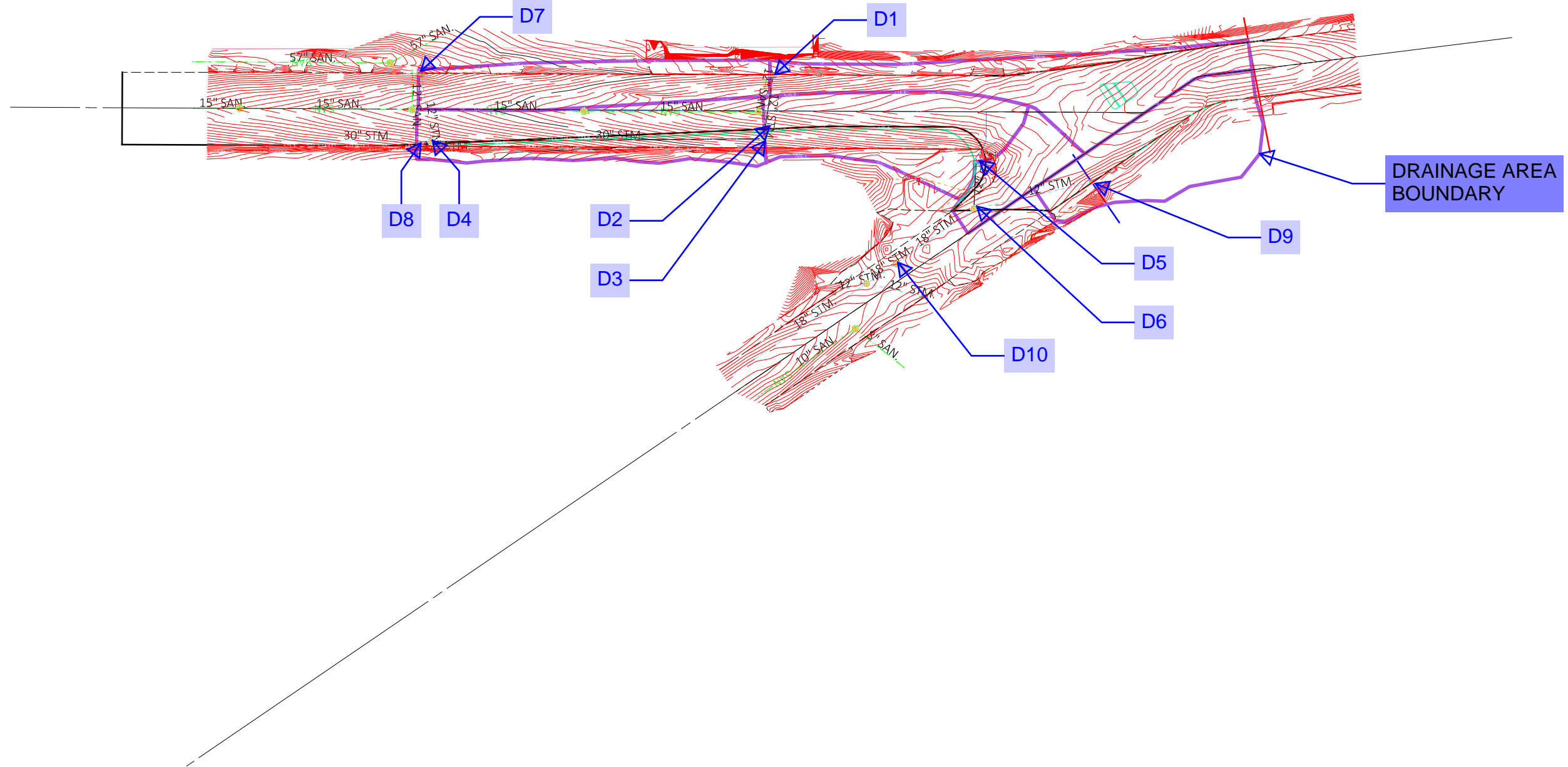
| <b>Frequency</b> | <b>a</b>        | <b>b</b>        | <b>c</b>       | <b>i(tc=5)</b> | <b>i(tc=15)</b> | <b>i(tc=30)</b> | <b>i(tc=60)</b> |
|------------------|-----------------|-----------------|----------------|----------------|-----------------|-----------------|-----------------|
| <b>2</b>         | <b>56.29900</b> | <b>10.00000</b> | <b>0.87600</b> | <b>5.25</b>    | <b>3.36</b>     | <b>2.22</b>     | <b>1.36</b>     |
| <b>5</b>         | <b>67.93300</b> | <b>11.00000</b> | <b>0.86900</b> | <b>6.11</b>    | <b>4.00</b>     | <b>2.70</b>     | <b>1.67</b>     |
| <b>10</b>        | <b>84.55000</b> | <b>13.00000</b> | <b>0.88200</b> | <b>6.61</b>    | <b>4.47</b>     | <b>3.06</b>     | <b>1.92</b>     |
| <b>25</b>        | <b>95.73600</b> | <b>14.00000</b> | <b>0.87100</b> | <b>7.37</b>    | <b>5.10</b>     | <b>3.55</b>     | <b>2.25</b>     |
| <b>50</b>        | <b>96.78300</b> | <b>14.00000</b> | <b>0.85000</b> | <b>7.92</b>    | <b>5.53</b>     | <b>3.88</b>     | <b>2.49</b>     |
| <b>100</b>       | <b>80.43600</b> | <b>11.50000</b> | <b>0.79400</b> | <b>8.68</b>    | <b>5.96</b>     | <b>4.18</b>     | <b>2.71</b>     |



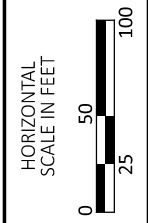
| HAM-Vine Hydrology - Storm System Design Flows |  |       |        |     |  |       |      |    |     |                         |           |        |       |   |       |       |     |                  |            |               |                  |              |
|--|--|-------|--------|-----|--|-------|------|----|-----|-------------------------|-----------|--------|-------|---|-------|-------|-----|------------------|------------|---------------|------------------|--------------|
|  |  |       |        |     |  |       |      |    |     |                         |           |        |       |   |       |       |     | Calculations By: | <b>BTS</b> | DATE:         | <b>6/20/2024</b> |              |
|  |  |       |        |     |  |       |      |    |     |                         |           |        |       |   |       |       |     | Checked By:      | <b>AA</b>  | DATE:         | <b>6/28/2024</b> |              |
| Time of Concentration Calculations             |  |       |        |     |  |       |      |    |     |                         |           |        |       |   |       |       |     |                  |            |               |                  |              |
| Drainage Area                                  | Sheet Flow - $t_o = [1.8(1.1 - C)L^{1/2}]^{1/3}$ |       |        |     | Shallow Concentrated Flow<br>$V = 3.281ks^{0.5}$ |       |      |    |     | Open Channel/Piped Flow |           |        |       |   |       |       |     |                  |            | Time Of Conc. | Time Of Conc.    |              |
|  | ID   | Slope | Length | C   | Time   | Slope | k    | V  | L   | Time                    | Elevation | Length | Slope | n | SS Lt | SS Rt | BW  | Depth            | V          | Time          | $T_c$ (min)      | $T_c$ (min)  |
|  | %  | ft    |        | min | %  |       | ft/s | ft | min | From                    | To        | ft     | ft/ft |   |       |       | ft. | ft.              | ft/s       | min           | 10/15            | >= 10/15 min |
| D-1  |  |       |        |     |  |       |      |    |     | Tc=10 Minutes           |           |        |       |   |       |       |     |                  |            | 0.0           | 10.0             |              |
| D-2  |  |       |        |     |  |       |      |    |     | Tc=10 Minutes           |           |        |       |   |       |       |     |                  |            | 0.0           | 10.0             |              |
| D-5  |  |       |        |     |  |       |      |    |     | Tc=10 Minutes           |           |        |       |   |       |       |     |                  |            | 0.0           | 10.0             |              |
| D-7  |  |       |        |     |  |       |      |    |     | Tc=10 Minutes           |           |        |       |   |       |       |     |                  |            | 0.0           | 10.0             |              |
| D-8  |  |       |        |     |  |       |      |    |     | Tc=10 Minutes           |           |        |       |   |       |       |     |                  |            | 0.0           | 10.0             |              |
| D-9  |  |       |        |     |  |       |      |    |     | Tc=10 Minutes           |           |        |       |   |       |       |     |                  |            | 0.0           | 10.0             |              |
| 0  | -  | -     | -      | -   | -  | -     | -    | -  | -   | -                       | -         | -      | -     | - | -     | -     | -   | -                | -          | -             | -                | -            |



| <b>HAM-Vine Hydrology - Storm System Design Flows</b> |                              |  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         |                                    |                           |            |       |           |
|---|------------------------------|--|--------------------------|------------------------|-----------------------|-------------------------------------|-------------------------|---------------------|-------------------------|---------------------|------------------------|-----------------------------------|-------------------------|------------------------------------|---------------------------|------------|-------|-----------|
| <b>Weighted C Value Calculations</b>                  |                              |  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         |                                    |                           |            |       |           |
|   |                              |  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         |                                    | Calculations By:          | <b>BTS</b> | Date: | 6/20/2024 |
|   |                              |  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         |                                    | Checked By:               | <b>AA</b>  | Date: | 6/28/2024 |
| <b>Runoff Factors</b>                                 | <b>Pavements &amp; Roofs</b> | <b>Grass Shoulders</b>                 | <b>Cultivated Fields</b> |                        |                       | <b>Suburban, Normal Residential</b> |                         | <b>Lawns</b>        |                         | <b>Ponds</b>        | <b>Gravel Pavement</b> | <b>Meadows &amp; Pasture Land</b> |                         | <b>Total Drainage Area (ACRES)</b> | <b>Composite C Values</b> |            |       |           |
|   |                              | <b>Berms and Slopes 4:1 or Flatter</b> | <b>Residue &gt; 20%</b>  | <b>Rolling 2%- 10%</b> | <b>Hilly Over 10%</b> | <b>Flat 0% - 2%</b>                 | <b>Rolling 2% - 10%</b> | <b>Flat 0% - 2%</b> | <b>Rolling 2% - 10%</b> |                     | <b>Flat 0% - 2%</b>    | <b>Flat 0% - 2%</b>               | <b>Rolling 2% - 10%</b> |                                    |                           |            |       |           |
|   | 0.90                         | 0.30                                   | 0.30                     | 0.20                   | 0.30                  | 0.40                                | 0.50                    | 0.40                | 0.30                    | 0.20                | 0.50                   | 0.25                              | 0.30                    |                                    |                           |            |       |           |
| <b>Area/Node</b>                                      | <b>Area (ACRES)</b>          | <b>Area (ACRES)</b>                    | <b>Area (ACRES)</b>      | <b>Area (ACRES)</b>    | <b>Area (ACRES)</b>   | <b>Area (ACRES)</b>                 | <b>Area (ACRES)</b>     | <b>Area (ACRES)</b> | <b>Area (ACRES)</b>     | <b>Area (ACRES)</b> | <b>Area (ACRES)</b>    | <b>Area (ACRES)</b>               | <b>Area (ACRES)</b>     |                                    |                           |            |       |           |
| D-1   | 0.310                        | 0.030                                  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         | 0.34                               | 0.85                      |            |       |           |
| D-2   | 0.169                        | 0.124                                  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         | 0.29                               | 0.65                      |            |       |           |
| D-5   | 0.105                        |  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         | 0.11                               | 0.90                      |            |       |           |
| D-7   | 0.230                        | 0.010                                  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         | 0.24                               | 0.88                      |            |       |           |
| D-8   | 0.191                        | 0.113                                  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         | 0.30                               | 0.68                      |            |       |           |
| D-9   | 0.279                        | 0.007                                  |                          |                        |                       |                                     |                         |                     |                         |                     |                        |                                   |                         | 0.29                               | 0.89                      |            |       |           |



DRAINAGE AREA MAP



|            |          |
|------------|----------|
| DESIGNER   | AQA      |
| REVIEWER   | BTS      |
| PROJECT ID | 06-28-24 |
| SHEET      | 96425    |
| TOTAL      | 01       |
| P.01       | 01       |



# INLET SPACING DESIGN

**PID :** 96425      **Date :** 06/28/2024      **Project :** HAM-Vine

**Location :** Int. of Vine St. & Spring Grove Ave.

**Description :** Spread Calcs Spring Grove Ave. LT

**Designer :** BTS

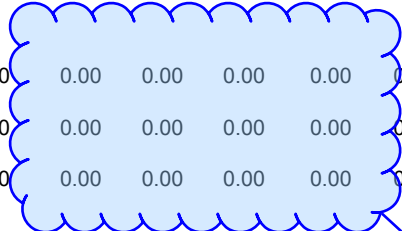
**Rainfall Area:** C

**Storm Frequency (yr.) :** 10

**Total Allow. Spread (ft.) :** 10.00

**Allowable Depth (ft.)** 0.42

| STATION | C.B. Type | GUTTER LENGTH (ft.) | RUNOFF COEF | CONC. AREA (acres) | GUTTER TIME (min.) | TIME USED (min.) | LONG. SLOPE (ft./ft.) | GUTT. SLOPE (ft./ft.) | PAVT. SLOPE (ft./ft.) | GUTT. WIDTH (ft.) | LOCAL DEPRESS. (ft.) | RAIN FALL (in./hrs.) | INTERCPTD FLOW (cfs.) | BYPASS FLOW (cfs.) | TOTAL FLOW (cfs.) | DEPTH FLOW (ft.) | PAVT. SPREAD (ft.) |
|---------|-----------|---------------------|-------------|--------------------|--------------------|------------------|-----------------------|-----------------------|-----------------------|-------------------|----------------------|----------------------|-----------------------|--------------------|-------------------|------------------|--------------------|
| 325+05  | Begin     |                     |             |                    |                    |                  |                       |                       |                       |                   |                      |                      |                       |                    |                   |                  |                    |
| 325+42  | CB-3A     | 45.00               | 0.00        | 0.00               | 0.00               | 0.00             | 0.0042                | 0.0400                | 0.0400                | 2.00              | 0.0000               | 0.00                 | 0.45                  | 0.05               | 0.50              | 0.166            | 4.14               |
| 189+02  | CB-3A     | 190.00              | 0.00        | 0.00               | 0.00               | 0.00             | 0.0049                | 0.0400                | 0.0400                | 2.00              | 0.0000               | 0.00                 | 0.82                  | 0.24               | 1.06              | 0.213            | 5.33               |
| 191+89  | CB-3A     | 285.00              | 0.00        | 0.00               | 0.00               | 0.00             | 0.0062                | 0.0320                | 0.0320                | 2.00              | 0.0000               | 0.00                 | *****                 | *****              | 1.34              | 0.205            | 6.41 End           |



This information needs filled out in order for the analysis to run correctly

refer to L&D Volume 2, Figure 1103-1

There is a high point per the intersection details near station 287+57. This run should be broken into two inlet spacing calculations.



# INLET SPACING DESIGN

**PID :** 96425      **Date :** 06/28/2024      **Project :** HAM-Vine

**Location :** Int. of Vine St. & Spring Grove Ave.

**Description :** Spread Calcs Spring Grove Ave. RT

**Designer :** BTS

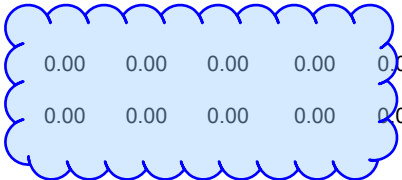
**Rainfall Area:** C

**Storm Frequency (yr.) :** 10

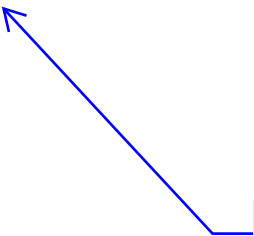
**Total Allow. Spread (ft.) :** 8.00

**Allowable Depth (ft.)** 0.42

| STATION | C.B. Type | GUTTER LENGTH (ft.) | RUNOFF COEF | AREA (acres) | CONC. TIME (min.) | GUTTER TIME (min.) | TIME USED (min.) | LONG. SLOPE (ft./ft.) | GUTT. SLOPE (ft./ft.) | PAVT. SLOPE (ft./ft.) | GUTT. WIDTH (ft.) | LOCAL DEPRESS. (ft.) | RAIN FALL (in./hrs.) | INTERCPTD FLOW (cfs.) | BYPASS FLOW (cfs.) | TOTAL FLOW (cfs.) | DEPTH FLOW (ft.) | PAVT. SPREAD (ft.) |
|---------|-----------|---------------------|-------------|--------------|-------------------|--------------------|------------------|-----------------------|-----------------------|-----------------------|-------------------|----------------------|----------------------|-----------------------|--------------------|-------------------|------------------|--------------------|
| 184+88  | Begin     |                     |             |              |                   |                    |                  |                       |                       |                       |                   |                      |                      |                       |                    |                   |                  |                    |
| 188+95  | CB-3A     | 400.00              | 0.00        | 0.00         | 0.00              | 0.00               | 0.00             | 0.0049                | 0.0520                | 0.0520                | 2.00              | 0.0000               | 0.00                 | 1.19                  | 0.34               | 1.53              | 0.270            | 5.19               |
| 191+88  | CB-3A     | 285.00              | 0.00        | 0.00         | 0.00              | 0.00               | 0.00             | 0.0062                | 0.0390                | 0.0390                | 2.00              | 0.0000               | 0.00                 | *****                 | *****              | 1.46              | 0.228            | 5.85 End           |



This information needs filled out in order for the analysis to run correctly



refer to L&D Volume 2, Figure 1103-1



# INLET SPACING DESIGN

PID : 96425      Date : 06/20/2024      Project : HAM-Vine

Location : Int. of Vine St. & Spring Grove Ave.

Description : Spread Calcs Vine St. RT

Designer : BTS

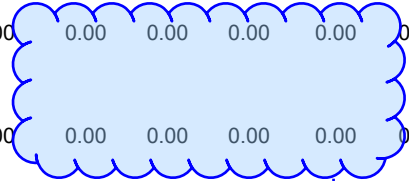
Rainfall Area: C

Storm Frequency (yr.) : 10

Total Allow. Spread (ft.) : 8.00

Allowable Depth (ft.) 0.42

| STATION | C.B. Type | GUTTER LENGTH (ft.) | RUNOFF COEF | CONC. AREA (acres) | GUTTER TIME (min.) | TIME USED (min.) | LONG. SLOPE (ft./ft.) | GUTT. SLOPE (ft./ft.) | PAVT. SLOPE (ft./ft.) | GUTT. WIDTH (ft.) | LOCAL DEPRESS. (ft.) | RAIN FALL (in./hrs.) | INTERCPTD FLOW (cfs.) | BYPASS FLOW (cfs.) | TOTAL FLOW (cfs.) | DEPTH FLOW (ft.) | PAVT. SPREAD (ft.) |     |  |
|---------|-----------|---------------------|-------------|--------------------|--------------------|------------------|-----------------------|-----------------------|-----------------------|-------------------|----------------------|----------------------|-----------------------|--------------------|-------------------|------------------|--------------------|-----|--|
| 325+05  | Begin     |                     |             |                    |                    |                  |                       |                       |                       |                   |                      |                      |                       |                    |                   |                  |                    |     |  |
| 326+14  | CB-3      | 40.00               | 0.00        | 0.00               | 0.00               | 0.00             | 0.0030                | 0.0400                | 0.0400                | 2.00              | 0.0000               | 0.00                 | *****                 | *****              | 0.19              | 0.123            | 3.07               | Sag |  |
| 184+88  | Begin     |                     |             |                    |                    |                  |                       |                       |                       |                   |                      |                      |                       |                    |                   |                  |                    |     |  |
| 326+14  | CB-3      | 150.00              | 0.00        | 0.00               | 0.00               | 0.00             | 0.0030                | 0.0400                | 0.0400                | 2.00              | 0.0000               | 0.00                 | *****                 | *****              | 1.16              | 0.242            | 6.04               | End |  |



### SUMP DATA

Total Flow (cfs) : 1.35

Ponded Depth (ft.) : 0.115

Spread on Pavement (ft.) : 4.29

This information needs filled out in order for the analysis to run correctly

refer to L&D Volume 2, Figure 1103-1





# STORM SEWER SYSTEM

PID : 96425      Date : 06/21/2024      Project : HAM-Vine

Location : Int. of Vine St. & Spring Grove Ave.

Description : Spring Grove Ave System

Designer : BTS

Rainfall Area: C

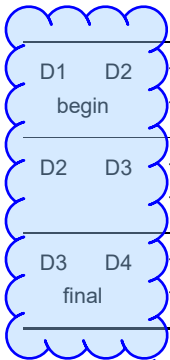
Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 12.00

Tailwater Elevation (ft.): 0.00

| JUNCTION |       | STATION | ΔAREA          | ΔCA  | BEGIN       | RAINFALL  |           | DISCHARGE |           | PIPE        |              |                 | F/L PIPE       | MEAN       | JUST FULL       | FRICT           | HYGR EL.       | COVER          | COVER       | COVER       | INLET TYPE    |
|----------|-------|---------|----------------|------|-------------|-----------|-----------|-----------|-----------|-------------|--------------|-----------------|----------------|------------|-----------------|-----------------|----------------|----------------|-------------|-------------|---------------|
| From     | To    | From To | Σ AREA (acres) | Σ CA | TIME (min.) | (10 yrs.) | (25 yrs.) | (10 yrs.) | (25 yrs.) | DIAM. (in.) | LENGTH (ft.) | SLOPE (ft./ft.) | IN / OUT (ft.) | VEL (fps.) | CAPACITY (cfs.) | SLOPE (ft./ft.) | IN / OUT (ft.) | IN / OUT (ft.) | MINUS HY GR | MINUS CROWN | MANNING'S 'n' |
| D1       | D2    | 188+95  | 0.34           | 0.29 | 3.30        | 7.21      | 7.95      | 2.1       | 2.3       | 12          | 38.0         | 0.0242          | 522.59         | 5.89       | 5.17            | 0.0055          | 523.08         | 525.09         | 2.01        | 1.50        | CB 3A         |
|          | begin | 189+02  | 0.34           | 0.29 |             |           |           |           |           |             |              |                 | 521.67         |            |                 |                 | 522.49         | 525.68         |             |             | 0.015         |
| D2       | D3    | 189+02  | 0.29           | 0.19 | 3.41        | 7.17      | 7.95      | 3.4       | 3.8       | 15          | 4.0          | 0.0400          | 521.25         | 8.01       | 12.04           | 0.0046          | 522.13         | 525.68         | 3.55        | 3.18        | CB 3A         |
|          |       | 189+04  | 0.63           | 0.48 |             |           |           |           |           |             |              |                 | 521.09         |            |                 |                 | 522.11         | 525.57         |             |             | 0.015         |
| D3       | D4    | 189+04  | 0.00           | 0.00 | 3.42        | 7.17      | 7.49      | 3.4       | 3.6       | 30          | 273.0        | 0.0057          | 514.84         | 3.75       | 28.91           | 0.0001          | 515.46         | 525.57         | 10.11       | 8.23        | MH 3          |
|          | final | 191+79  | 0.63           | 0.48 |             |           |           |           |           |             |              |                 | 513.28         |            |                 |                 | 514.84         | 523.78         |             |             | 0.015         |



these can match the plans to make review easier

Per L&D Volume 2, Section 1104.3.4, the minimum time of concentration should be 10 minutes to the first pavement inlet

confirm the flowline matches the plans



# STORM SEWER SYSTEM

PID : 96425      Date : 06/21/2024      Project : HAM-Vine

Location : Int. of Vine St. & Spring Grove Ave.

Description :Vine St System

Designer : BTS

Rainfall Area: C

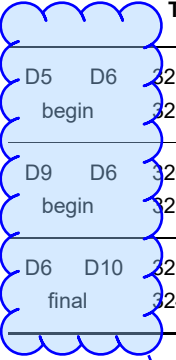
Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 12.00

Tailwater Elevation (ft.): 0.00

| JUNCTION |       | STATION | ΔAREA   | ΔCA  | BEGIN  | RAINFALL            |                     | DISCHARGE           |        | PIPE  |           |        | F/L PIPE | MEAN   | JUST FULL | FRICT  | HYGR EL. | COVER    | COVER | COVER | INLET TYPE |
|----------|-------|---------|---------|------|--------|---------------------|---------------------|---------------------|--------|-------|-----------|--------|----------|--------|-----------|--------|----------|----------|-------|-------|------------|
| From     | To    | From    | Σ AREA  | Σ CA | TIME   | INTENSITY           | (cfs.)              | (cfs.)              | (cfs.) | DIAM. | LENGTH    | SLOPE  | IN / OUT | VEL    | CAPACITY  | SLOPE  | IN / OUT | IN / OUT | MINUS | MINUS | MANNING'S  |
|          |       | To      | (acres) |      | (min.) | (10 yrs.) (25 yrs.) | (10 yrs.) (25 yrs.) | (10 yrs.) (25 yrs.) | (in.)  | (ft.) | (ft./ft.) | (ft.)  | (fps.)   | (cfs.) | (ft./ft.) | (ft.)  | (ft.)    | (ft.)    | HY GR | CROWN | 'n'        |
| D5       | D6    | 325+42  | 0.11    | 0.09 | 1.00   | 8.25                | 9.00                | 0.8                 | 0.9    | 12    | 36.0      | 0.0706 | 522.97   | 6.59   | 8.82      | 0.0008 | 523.19   | 526.22   | 3.03  | 2.25  | CB 6       |
|          | begin | 325+20  | 0.10    | 0.09 |        |                     |                     |                     |        |       |           |        | 520.43   |        |           |        | 521.12   | 526.94   |       |       | 0.015      |
| D9       | D6    | 326+14  | 0.29    | 0.25 | 1.90   | 7.80                | 8.26                | 2.0                 | 2.1    | 15    | 99.0      | 0.0336 | 522.27   | 6.46   | 11.05     | 0.0014 | 522.65   | 526.42   | 3.77  | 2.90  | CB 6       |
|          | begin | 325+20  | 0.39    | 0.35 |        |                     |                     |                     |        |       |           |        | 518.94   |        |           |        | 519.93   | 526.94   |       |       | 0.015      |
| D6       | D10   | 325+20  | 0.00    | 0.00 | 2.16   | 7.69                | 8.26                | 2.7                 | 2.9    | 18    | 75.0      | 0.0021 | 518.94   | 2.52   | 4.52      | 0.0010 | 519.93   | 526.94   | 7.01  | 6.50  | MH 3       |
|          | final | 324+40  | 0.39    | 0.35 |        |                     |                     |                     |        |       |           |        | 518.78   |        |           |        | 519.85   | 526.67   |       |       | 0.015      |



these can match the plans to make review easier