SHOOKS RUN

DRAINAGE BASIN PLANNING STUDY

TECHNICAL APPENDIX VOLUME I - HYDROLOGY

prepared for

City of Colorado Springs, Colorado
Department of Planning & Development
City Engineering Division

455 East Pikes Peak Avenue, Suite 200
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Project No. 90-809

WILSON &COMPANY

SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
TECHNICAL APPENDIX

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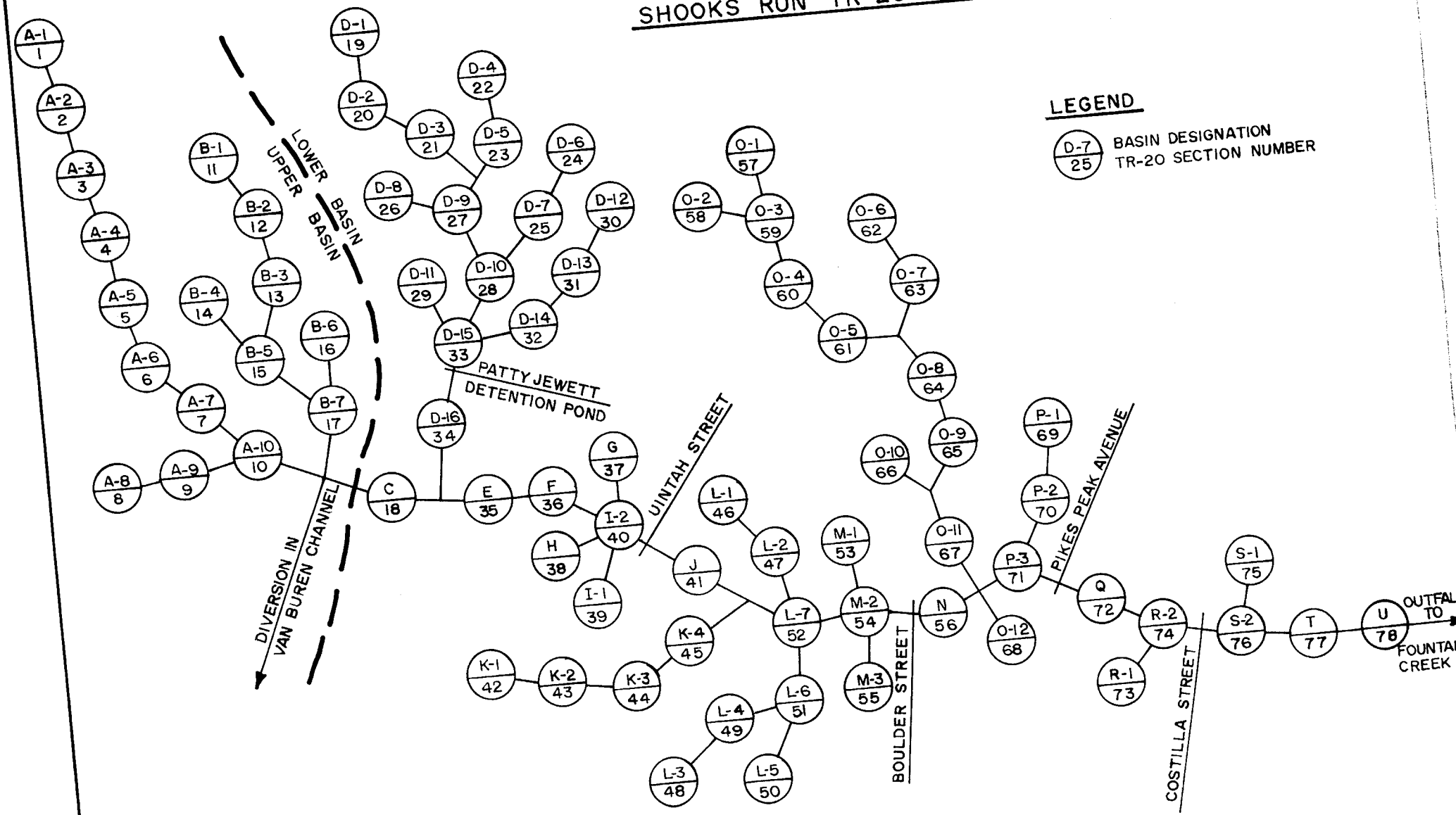
A. TR-20 ROUTING SCHEMATIC

SHOOKS RUN TR-20 ROUTING SCHEMATIC



B. TR-20 EXISTING CONDITION BASIN PARAMETER CALCULATIONS

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PROJ. Shocks Run SHEET 1

SUBJ. TR-20 Existing Basin Parameters OF

TR-20 EXISTING BASIN PARAMETERS

Basin A-1 - A = 65 Ac = 0.102 sq mi

(Section 1) CN ⇒ 20% Open Space, Woods, Good Condition, Soil B + 80% Open Space, Woods, Good Condition, Soil D w/30% Rock Outcrop

$CN_{AVE} = (0.20)(55) + (0.80)(77) = 73$

TC ⇒ 550' overland, forest @ 15.6% $\left(\frac{6564 - 6478}{550}\right) = \frac{1.8(1.1 - 0.15)\sqrt{550}}{\sqrt[3]{15.6}} = 16$

⇒ 1850' natural channel @ 5.3% $\left(\frac{6478 - 6380}{1850}\right) \Rightarrow \left(\frac{1.49}{0.050}\right)\left(\frac{32.0^{2/3}}{22.6}\right)(0.053)^{1/2} = 9$ fps $\Rightarrow \frac{1850}{(9)(60)} = 3$

(trapezoidal section w/3:1 sides, b = 10', and d = 2')

19 min = 0.32 hr

Basin A-2 - A = 60 Ac = 0.094 sq mi

(Section 2) CN ⇒ Open Space, Woods, Good Condition, Soil D w/30% Rock Outcrop

CN = 77

TC ⇒ 600' overland, forest @ 19.8% $\left(\frac{6599 - 6480}{600}\right) = \frac{1.8(1.1 - 0.15)\sqrt{600}}{\sqrt[3]{19.8}} = 15$

⇒ 2400' natural channel @ 5.3% $\left(\frac{6480 - 6354}{2400}\right) = \left(\frac{1.49}{0.050}\right)\left(\frac{32.0^{2/3}}{22.6}\right)(0.053)^{1/2} = 9$ fps $\Rightarrow \frac{2400}{(9)(60)} = 4$

19 min = 0.32 hr

Basin A-3 - A = 108 Ac = 0.169 sq mi

(Section 3) CN ⇒ 10% Open Space, Woods, Good Condition, Soil B + 90% Open Space, Woods, Good Condition, Soil D w/30% Rock Outcrop

$CN_{AVE} = (0.10)(55) + (0.90)(77) = 75$

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SHEET 2

OF

TC => 550' overland, forest @ 8.0% $\left(\frac{6591-6547}{550}\right) = \frac{1.8(1.1-0.15)\sqrt{550}}{\sqrt[3]{8.0}} = 20$

=> 4100' natural channel @ 6.4% $\left(\frac{6547-6283}{4100}\right)$ => $\left(\frac{1.44}{0.050}\right)\left(\frac{32.0}{22.6}\right)^{2/3}(0.064)^{1/2} = 10$ fps => $\frac{4100}{(10)(60)} = 7$

(trapezoidal section w/ 3:1 sides, b=10', and d=2')

$\Sigma T_{min} = 0.45$ hr

Basin A-4 - A= 117 Ac = 0.183 sq mi

(Section 4) CN => 45% Open Space, Woods, Good Condition, Soil D w/ 30% Rock Outcrop + 5% Residential, 1 Unit/Ac, Soil D w/ 30% Rock Outcrop + 10% Residential, 2 Units/Ac, Soil A (Use Soil B) + 40% Residential, 3 Units/Ac, Soil A (Use Soil B)

$CN_{AVE} = (0.45)(77)+(0.05)(84)+(0.10)(76)+(0.40)(72) = 75$

TC => 600' overland forest @ 23.0% $\left(\frac{6598-6460}{600}\right) = \frac{1.8(1.1-0.15)\sqrt{600}}{\sqrt[3]{23.0}} = 15$

=> 1050' natural channel @ 9.5% $\left(\frac{6460-6360}{1050}\right)$ => $\left(\frac{1.49}{0.050}\right)\left(\frac{32.0}{22.6}\right)^{2/3}(0.095)^{1/2} = 12$ fps => $\frac{1050}{(12)(60)} = 1$

(trapezoidal section w/ 3:1 sides, b=10', and d=2')

=> 2800' street @ 3.6% $\left(\frac{6360-6258}{2800}\right)$ => $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.036^{1/2}) = 6$ fps => $\frac{2800}{(6)(60)} = 8$

(½-40' street, d=0.4')

$\Sigma T_{min} = 0.40$ hr

Basin A-5 - A= 62 Ac = 0.097 sq mi

(Section 5) CN = 15% Open Space, Woods, Good Condition, Soil D w/ 30% Rock Outcrop + 50% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) and Soil B + 35% Residential 3 Units/Ac, Soil A (Use Soil B)

$CN_{AVE} = (0.15)(77)+(0.50)(69)+(0.35)(72) = 71$

TC => 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

=> 1300' street @ 4.1% $\left(\frac{6340-6287}{1300}\right)$ => $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.041)^{1/2} = 6$ fps => $\frac{1300}{(6)(60)} = 4$

(½-40' street, d=0.4')

$\Rightarrow$ 1400' - 24" Ave RCP and street @ 2.4% $\left(\frac{6228-6253}{1400}\right)$

- 24" Ave RCP = 11 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.024)^{1/2}$ = 5 fps
  (½-40' street, d = 0.4')

Ave = $\frac{16}{2}$ = 8 fps $\Rightarrow$ $\frac{1400}{(8)(60)}$ = 3

$\Rightarrow$ 1600' grass lined channel @ 1.6% $\left(\frac{6253-6228}{1600}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{36.0}{26.5}\right)^{2/3}(0.016)^{1/2}$ = 6 fps $\Rightarrow \frac{1600}{(6)(60)}$ = 4
(trapezoidal section w/ 4 to 1 sides, b = 10', and d = 2')

23 min = 0.38 hr

Basin A-6 - A = 74 Ac = 0.116 sq mi

(Section 6) CN $\Rightarrow$ 5% Open Space, Woods, Good Condition, Soil D w/ 30% Rock Outcrop + 95% Open Space, Fair Condition Grass Cover, Soil B

$CN_{AVE} = (0.05)(77) + (0.95)(69) = 69$

TC $\Rightarrow$ 500' overland forest @ 13.6% $\left(\frac{6330-6262}{500}\right) = \frac{1.8(1.1-0.15)\sqrt{500}}{\sqrt[3]{13.6}}$ = 16

$\Rightarrow$ 3650' grass swale @ 2.0% $\left(\frac{6262-6190}{3650}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{33.8}{52.1}\right)^{2/3}(0.020)^{1/2}$ = 4 fps $\Rightarrow \frac{3650}{(3)(60)}$ = 15
(triangular section w/ 20 to 1 sides, and d = 1.3')

31 min = 0.52 hr

Basin A-7 - A = 61 Ac = 0.095 sq mi

(Section 7) CN $\Rightarrow$ 80% Open Space, Fair Condition Grass Cover, Soil B + 20% Business, Neighborhood Areas, Soil B

$CN_{AVE} = (0.80)(69) + (0.20)(92) = 74$

TC $\Rightarrow$ 250' overland grass @ 5.6% $\left(\frac{6257-6243}{250}\right) = \frac{1.8(1.1-0.25)\sqrt{250}}{\sqrt[3]{5.6}}$ = 14

$\Rightarrow$ 1300' street @ 3.6% $\left(\frac{6243-6196}{1300}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{25.0}{51.0}\right)^{2/3}(0.036)^{1/2}$ = 11 fps $\Rightarrow \frac{1300}{(11)(60)}$ = 2
(½-100' street, d = 1')

$\Rightarrow$ 1500' - 54" Ave RCP and street @ 1.0% $\left(\frac{6196-6181}{1500}\right)$

- 54" Ave RCP = 12 fps
- Street = $\left(\frac{1.49}{0.106}\right)\left(\frac{25.0}{51.0}\right)^{2/3}(0.010)^{1/2}$ = 6 fps
(½-100' street, d=1')

Ave = $\frac{18}{2}$ = 9 fps $\Rightarrow \frac{1500}{(9)(60)}$ = 3

19 min = 0.32 hr

Basin A-B - A= 64 Ac = 0.100 sq mi

(Section B) CN $\Rightarrow$ 10% Open Space, Fair Condition Grass Cover, Soil B + 20% Residential, 4 Units/Ac, Soil B + 50% Residential, 8 Units/Ac, Soil B + 15% Business, Neighborhood Areas, Soil B + 5% Business, Commercial Areas, Soil B

$CN_{AVE} = (0.10)(69)+(0.20)(75)+(0.50)(85)+(0.15)(92)+(0.05)(92) = 83$

TC $\Rightarrow$ 100' overland, grass @ 2.0% $\left(\frac{6214-6212}{100}\right) = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 400' grass swale @ 0.8% $\left(\frac{6212-6209}{400}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.008)^{1/2} = 1$ fps $\Rightarrow \frac{400}{(1)(60)} = 7$
(triangular section w/ 20 to 1 sides and d=0.5')

$\Rightarrow$ 1450' street @ 1.2% $\left(\frac{6209-6192}{1450}\right) \Rightarrow \left(\frac{1.41}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.012)^{1/2} = 3$ fps $\Rightarrow \frac{1450}{(3)(60)} = 8$
(½-40' street, d=0.4')

$\Rightarrow$ 1300' - 24" Ave RCP and street @ 1.2% $\left(\frac{6192-6177}{1300}\right)$

- 24" Ave RCP = 8 fps
- Street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.012)^{1/2}$ = 3 fps
(½-40' street, d=0.4')

Ave = $\frac{11}{2}$ = 5.5 $\Rightarrow \frac{1300}{(5.5)(60)}$ = 4

31 min = 0.52 hr

Basin A-9 - A = 92 AC = 0.145 sq mi

(Section 9) CN => 5% Open Space, Fair Condition Grass Cover, Soil B + 5% Residential, 2 Units/Ac, Soil B + 55% Residential, 4 Units/Ac, Soil B + 10% Residential, 8 Units/Ac, Soil B + 15% Business, Neighborhood Areas, Soil B + 10% Business, Commercial Areas, Soil B

$CN_{AVE} = (0.05)(69)+(0.05)(70)+(0.55)(75)+(0.10)(85)+(0.15)(92)+(0.10)(92) = 80$

TC => 100' overland grass @ 3.0% $\left(\frac{6234-6231}{100}\right) \Rightarrow \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{3.0}} = 11$

=> 650' grass swale @ 1.7% $\left(\frac{6231-6220}{650}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.017)^{1/2} = 2\text{ fps} \Rightarrow \frac{650}{(2)(60)} = 5$
(triangular section w/ 20 to 1 sides and d = 0.5')

=> 1300' street @ 0.9% $\left(\frac{6220-6208}{1300}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.009)^{1/2} = 3\text{ fps} \Rightarrow \frac{1300}{(3)(60)} = 7$
(½-40' street, d = 0.4')

=> 4700' - 36" Ave RCP and street @ 1.1% $\left(\frac{6208-6157}{4700}\right)$

- 36" Ave RCP - 10 fps
- street $\Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.011)^{1/2} = 3\text{ fps}$
(½-40' street d = 0.4')

Ave = $\frac{13}{2} = 7\text{ fps} \Rightarrow \frac{4700}{(7)(60)} = 11$

34 min = 0.57 hr

Basin A-10 - A = 92 Ac = 0.144 sq mi

(Section 10) CN => 55% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) and Soil B + 35% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 10% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.55)(69)+(0.35)(75)+(0.10)(92) = 73$

TC => 350' overland paved @ 2.9% $\left(\frac{6206-6196}{350}\right) = \frac{1.8(1.1-0.90)\sqrt{350}}{\sqrt[3]{2.9}} = 5$

$\Rightarrow$ 400' grass swale @ 3.8% $\left(\frac{6196-6184}{400}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.038)^{1/2} = 3\text{fps} \Rightarrow \frac{400}{(3)(60)} = 2$
(triangular section w/ 20 to 1 sides and d=0.5')

$\Rightarrow$ 800' street @ 0.19% $\left(\frac{6181-6174}{800}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.009)^{1/2} = 3\text{fps} \Rightarrow \frac{800}{(3)(60)} = 4$
(½-40' street, d=0.4')

$\Rightarrow$ 800' grass swale @ 1.4% $\left(\frac{6174-6163}{800}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{20.0}{40.0}\right)^{2/3}(0.014)^{1/2} = 3\text{fps} \Rightarrow \frac{800}{(3)(60)} = 4$
(triangular section w/ 20 to 1 sides and d=1')

$\Rightarrow$ 1600' street @ 1.29% $\left(\frac{6163-6144}{1600}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.012)^{1/2} = 3\text{fps} \Rightarrow \frac{1600}{(3)(60)} = 9$
(½-40' street, d=0.4')

$\Rightarrow$ 650' - 72" Ave RCP @ 0.16% $\left(\frac{6144-6140}{650}\right) \Rightarrow 12\text{fps} \Rightarrow \frac{650}{(12)(60)} = 1$

25 min = 0.42 hr

Basin B-1 - A = 86 Ac = 0.134 sq mi

(Section 11) CN $\Rightarrow$ 10% Open Space, Woods, Good Condition, Soil D w/ 30% Rock Outcrop + 20% Residential, 1 Unit/Ac, Soil D w/ 30% Rock Outcrop + 15% Residential, 2 Units/Ac, Soil A (Use Soil B) + 35% Residential, 3 Units/Ac, Soil A (Use Soil B) + 20% Residential, 4 Units/Ac, Soil A (Use Soil B)

$CN_{AVE} = (0.10)(77) + (0.20)(84) + (0.15)(70) + (0.35)(72) + (0.20)(75) = 75$

TC $\Rightarrow$ 250' overland forest @ 20.0% $\left(\frac{6480-6430}{250}\right) = \frac{1.8(1.1-0.15)\sqrt{250}}{\sqrt[3]{20.0}} = 10$

$\Rightarrow$ 2400' street @ 4.5% $\left(\frac{6430-6323}{2400}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.045)^{1/2} = 7\text{fps} \Rightarrow \frac{2400}{(7)(60)} = 6$
(½-40' street, d=0.4')

$\Rightarrow$ 900' - 24" Ave. RCP and street @ 2.6% $\left(\frac{6323-6300}{900}\right)$

- 24" Ave RCP - 12 fps
- street $\Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{12.3}{35.7}\right)^{2/3}(0.026)^{1/2} = 7\text{fps}$
(½-70' street, d=0.7')

Ave = $\frac{19}{2}$ = 9.5 fps $\Rightarrow \frac{900}{(9.5)(60)} = 2$

18 min $\Rightarrow$ 0.30 hr

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PROJ. Shooks Run

SHEET 7

SUBJ. TR-20 Existing Basin Parameters

OF

Basin B-2 - A = 52 Ac = 0.081 sq mi

(Section 12) CN => 20% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 5% Residential 2 Units/Ac, Soil A (Use Soil B) + 25% Residential, 3 Units/Ac, Soil A (Use Soil B) + 30% Residential, 4 Units/Ac, Soil A (Use Soil B) + 20% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.20)(69)+(0.05)(70)+(0.25)(72)+(0.30)(75)+(0.20)(92) = 76$

TC => 300' overland, grass @ 9.7% $\left(\frac{6388-6359}{300}\right) = \frac{1.8(1.1-0.25)\sqrt{300}}{\sqrt[3]{9.7}} = 12$

=> 250 grass swale @ 6.8% $\left(\frac{6359-6342}{250}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.068)^{1/2} = 4\text{ fps} \Rightarrow \frac{250}{(4)(60)} = 1$
(triangular section w/ 20 to 1 side and d = 0.5')

=> 1650' street @ 3.8% $\left(\frac{6342-6280}{1650}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.038)^{1/2} = 6\text{ fps} \Rightarrow \frac{1650}{(6)(60)} = 5$
(1/2-40' street, d = 0.4')

=> 300' - 30" RCP and street @ 3.7% $\left(\frac{6280-6269}{300}\right)$

-30" RCP = 16 fps

-street => $\left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.037)^{1/2} = 8\text{ fps}$
(1/2-60' street, d = 0.6')

Ave = $\frac{24}{2} = 12\text{ fps} \Rightarrow \frac{300}{(12)(60)} = 1$

19 min = 0.32 hr

Basin B-3 - A = 84 Ac = 0.131 sq mi

(Section 13) CN => 10% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 5% Residential 3 Units/Ac, Soil A (Use Soil B) + 70% Residential, 4 Units/Ac, Soil A (Use Soil B) + 5% Residential, 8 Units/Ac, Soil A (Use Soil B) + 10% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.10)(69)+(0.05)(72)+(0.70)(75)+(0.05)(85)+(0.10)(92) = 76$

TC => 100' overland, grass @ 4.0% $\left(\frac{6320-6316}{100}\right) = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{4.0}} = 10$

=> 600' grass swale @ 2.8% $\left(\frac{6316-6299}{600}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.028)^{1/2} = 2\text{ fps} \Rightarrow \frac{600}{(2)(60)} = 5$
(triangular section w/ 20 to 1 sides and d = 0.5')

$\Rightarrow$ 1100' street @ 3.5% $\left(\frac{6299-6261}{1100}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.035)^{1/2} = 6\text{fps} \Rightarrow \frac{1100}{6(60)} = 3$
(½-40' street, d = 0.4')

$\Rightarrow$ 3700' - 54" RCP and street @ 1.9% $\left(\frac{6261-6190}{3700}\right)$

- 54" RCP = 17 fps
- street $\Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.019)^{1/2} = 6\text{fps}$
(½-60' street, d = 0.6')

Ave = $\frac{23}{2}$ = 11.5 fps $\Rightarrow \frac{3700}{(11.5)(60)} = 5$

$\Sigma 3_{min} = 0.38$ hr

Basin B-4 - A = 78 Ac = 0.122 sq mi

(section 14) CN $\Rightarrow$ 5% Open Space, Woods, Good Condition, Soil D w/ 30% Rock Outcrop + 35% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 10% Residential, 1 Unit/Ac, Soil D w/ 30% Rock Outcrop + 10% Residential, 2 Units/Ac, Soil A (Use Soil B) + 20% Residential, 3 Units/Ac, Soil A (Use Soil B) + 20% Residential, 4 Units/Ac, Soil A (Use Soil B)

$CN_{AVE} = (0.05)(77) + (0.35)(69) + (0.10)(84) + (0.10)(70) + (0.20)(72) + (0.20)(75) = 73$

TC $\Rightarrow$ 300' overland forest @ 30.0% $\left(\frac{6580-6490}{300}\right) = \frac{1.8(1.1-0.15)\sqrt{300}}{30.0^{1/3}} = 10$

$\Rightarrow$ 450' grass swale @ 22.7% $\left(\frac{6490-6388}{450}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.227)^{1/2} = 7\text{fps} \Rightarrow \frac{450}{(7)(60)} = 1$
(triangular section w/ 20 to 1 sides and d = 0.5')

$\Rightarrow$ 1200' street @ 5.7% $\left(\frac{6388-6320}{1200}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.057)^{1/2} = 8\text{fps} \Rightarrow \frac{1200}{8(60)} = 3$
(½-40' street, d = 0.4')

$\Rightarrow$ 2050' grass swale @ 3.4% $\left(\frac{6320-6250}{2050}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{20.0}{40.0}\right)^{2/3}(0.034)^{1/2} = 4\text{fps} \Rightarrow \frac{2050}{(4)(60)} = 9$
(triangular section w/ 20 to 1 sides and d = 1')

$\Rightarrow$ 250'-24" RCP and street @ 2.0% $\left(\frac{6250-6245}{250}\right)$

- 24" RCP = 10 fps
- street $\Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.020)^{1/2} = 4$ fps
  (½-40' street, d=0.4')

Ave = $\frac{14}{2} = 7$ fps $\Rightarrow \frac{250}{(7)(60)} = 1$

24 min = 0.40 hr

Basin B-5 - A = 66 Ac = 0.103 sq mi

(Section 15) CN $\Rightarrow$ 95% Residential, 4 Units/Ac, Soil A (Use Soil B) + 5% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.95)(75) + (0.05)(92) = 76$

TC $\Rightarrow$ 100' overland grass @ 2.0% $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 1000' street @ 1.0% $\left(\frac{6240-6230}{1000}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.01)^{1/2} = 3$ fps $\Rightarrow \frac{1000}{(3)(60)} = 6$
(½-40' street, d=0.4')

$\Rightarrow$ 3100'-36" Ave RCP @ 1.9% $\left(\frac{6230-6172}{3100}\right)$

- 36" Ave RCP = 13 fps
- street $\Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.019)^{1/2} = 4$ fps
  (½-40' street, d=0.4')

Ave = $\frac{17}{2} = 8.5$ fps $\Rightarrow \frac{3100}{(8.5)(60)} = 6$

24 min = 0.40 hr

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PROJ. Shooks Run SHEET 10

SUBJ. TR-20 Existing Basin Parameters OF

Basin B-6 - A = 69 Ac = 0.108 sq mi

(Section 16) CN => 65% Residential, 4 Units/Ac, Soil A (Use Soil B) + 20% Residential, 8 Units/Ac, Soil A (Use Soil B) + 5% Business, Neighborhood Areas, Soil A (Use Soil B) + 10% Business, Commercial Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.65)(75) + (0.20)(85) + (0.05)(92) + (0.10)(92) = 80$

TC => 100' overland grass @ 2.0% $\pm$ $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

=> 4000' street @ 2.5% $\left(\frac{6279-6178}{4000}\right) \Rightarrow \left(\frac{1.49}{0.0116}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.025)^{1/2} = 5\text{ fps} \Rightarrow \frac{4000}{(5)(60)} = 13$

(½-40' street, d = 0.4')

25 min = 0.42 hr

Basin B-7 - A = 70 Ac = 0.109

(Section 17) CN => 10% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) and Soil B + 70% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 20% Business, Neighborhood Areas, Soil A (Use Soil B) + Soil B

$CN_{AVE} = (0.10)(69) + (0.70)(75) + (0.20)(92) = 78$

TC => 100' overland grass @ 2.0% $\pm$ $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

=> 2600' street @ 2.3% $\left(\frac{6218-6158}{2600}\right) \Rightarrow \left(\frac{1.49}{0.0116}\right)\left(\frac{2.3}{25.5}\right)^{2/3}(0.023)^{1/2} = 6\text{ fps} \Rightarrow \frac{2600}{(6)(60)} = 7$

(½-50' street, d = 0.5')

=> 1000' grass channel @ 1.1% $\left(\frac{6158-6147}{1000}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{32.0}{22.6}\right)^{2/3}(0.011)^{1/2} = 5\text{ fps} \Rightarrow \frac{1000}{(5)(60)} = 3$

(trapezoidal section w/3 to 1 sides, b = 10', and d = 2')

=> 1100' concrete channel @ 0.6% $\left(\frac{6147-6140}{1100}\right) \Rightarrow \left(\frac{1.49}{0.013}\right)\left(\frac{19.5}{16.1}\right)^{2/3}(0.006)^{1/2} = 10\text{ fps} \Rightarrow \frac{1100}{(10)(60)} = 2$

(trapezoidal section w/2 to 1 sides, b = 10', and d = 1.5')

24 min = 0.40 hr

Basin C - A = 76 Ac = 0.150 sq mi

(Section 18) CN ⇒ 20% Open Space Fair Condition Grass Cover, Soil B + 80% Residential, 4 Units / Ac, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.20)(69) + (0.80)(75) = 74$

TC ⇒ 250' overland, grass @ 3.2% $\left(\frac{6172-6164}{250}\right) = \frac{1.8(1.1-0.25)\sqrt{250}}{\sqrt[3]{3.2}} = 16$

⇒ 600' grass swale @ 1.3% $\left(\frac{6164-6156}{600}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{2.5}{10.0}\right)^{2/3}(0.013)^{1/2} = 2\text{ fps} \Rightarrow \frac{600}{(2)(60)} = 5$
(triangular section w/ 10 to 1 sides and d = 0.5')

⇒ 3750' street @ 1.2% $\left(\frac{6156-6112}{3750}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.012)^{1/2} = 3\text{ fps} \Rightarrow \frac{3750}{(3)(60)} = 21$
(1/2 - 40' street, d = 0.4')

⇒ 1800' grass channel @ 1.0% $\left(\frac{6107-6089}{1800}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{36.0}{216.5}\right)^{2/3}(0.010)^{1/2} = 5\text{ fps} \Rightarrow \frac{1800}{(5)(60)} = 6$
(trapezoidal section w/ 4 to 1 sides, b = 16', and d = 2')

48 min = 0.80 hr

Basin D-1 - A = 50 Ac = 0.078 sq mi

(Section 19) CN ⇒ 20% Open Space, Woods, Good Condition, Soil D w/ 30% Rock Out Crop + 20% Residential, 2 Units / Ac, Soil A (Use Soil B) and Soil B + 20% Residential, 2 Units / Ac, Soil D w/ 30% Rock Out Crop + 35% Residential, 4 Units / Ac, Soil A (Use Soil B) + 5% Business, Neighborhood Areas, Soil B

$CN_{AVE} = (0.20)(77) + (0.20)(70) + (0.20)(85) + (0.35)(75) + (0.05)(92) = 77$

TC ⇒ 450' overland, forest @ 28.4% $\left(\frac{6564-6436}{450}\right) = \frac{1.8(1.1-0.15)\sqrt{450}}{\sqrt[3]{28.4}} = 12$

⇒ 1450' street @ 4.0% $\left(\frac{6436-6378}{1450}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.040)^{1/2} = 6\text{ fps} \Rightarrow \frac{1450}{(6)(60)} = 4$
(1/2 - 40' street, d = 0.4')

⇒ 1350' - 30" Ave RCP and street @ 2.4% $\left(\frac{6378-6345}{1350}\right)$

- 30" Ave RCP = 13 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{12.3}{35.7}\right)^{2/3}(0.024)^{1/2} = 7\text{ fps}$
(1/2 - 20' street, d = 0.7')

Ave = $\frac{20}{2} = 10\text{ fps} \Rightarrow \frac{1350}{(10)(60)} = 2$

18 min = 0.30 hr

Basin D-2 - A=96 Ac = 0.150 sq mi

(Section 20) CN ⇒ 10% Open Space, Woods Good Condition, Soil D w/30% Rock Outcrop + 10% Residential, 2 Units/Ac, Soil A (Use Soil B) + 10% Residential, 2 Units/Ac, Soil D w/30% Rock Outcrop + 55% Residential, 4 Units/Ac, Soil A (Use Soil B) + 15% Business, Neighborhood Areas, Soil D

$CN_{AVE} = (0.10)(77)+(0.10)(70)+(0.10)(85)+(0.55)(75)+(0.10)(95) = 74$

TC ⇒ 600' overland, forest @ 19.8% $\left(\frac{6574-6455}{600}\right) = \frac{1.8(1.1-0.15)\sqrt{600}}{\sqrt[3]{19.8}} = 15$

⇒ 700' street @ 6.1% $\left(\frac{6455-6408}{700}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.061)^{1/2} = 8 \Rightarrow \frac{700}{(8)(60)} = 1$
(1/2 - 40' street, d = 0.4')

⇒ 400' grass swale @ 7.3% $\left(\frac{6408-6379}{400}\right) \Rightarrow \left(\frac{1.49}{0.090}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.073)^{1/2} = 4\text{fps} \Rightarrow \frac{400}{(4)(60)} = 2$
(triangular section w/ 20:1 sides and d=0.5')

⇒ 1050' street @ 3.0% $\left(\frac{6379-6348}{1050}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.030)^{1/2} = 5\text{fps} \Rightarrow \frac{1050}{(5)(60)} = 4$
(1/2 - 40' street, d = 0.4')

⇒ 1300' - 30" Ave RCP and street @ 2.6% $\left(\frac{6348-6314}{1300}\right)$

- 30" Ave RCP = 13 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{12.3}{35.5}\right)^{2/3}(0.026)^{1/2} = 7\text{fps}$
(1/2 - 70' street, d=0.7')

Ave = $\frac{20}{2} = 10\text{fps} \Rightarrow \frac{1300}{(10)(60)} = 2$

t_c min = 0.40 hr

Basin D-3 - A=57 Ac = 0.089 sq mi

(Section 21) CN ⇒ Residential, 4 Units/Ac, Soil A (Use Soil B)

CN = 75

TC ⇒ 100' overland grass @ 2.0% ± = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 1800' street @ 3.0% $\left(\frac{6347-6293}{1800}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.030)^{1/2} = 5\text{fps} \Rightarrow \frac{1800}{(5)(60)} = 6$
(½ - 40' street, d = 0.4')

$\Rightarrow$ 2200' - 30" Ave RCP and street @ 2.9% $\left(\frac{6293-6229}{2200}\right)$

- 30" Ave RCP = 14 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{12.3}{35.7}\right)^{2/3}(0.029)^{1/2} = 8\text{ fps}$
(½ - 70' street, d = 0.1')

Ave = $\frac{22}{2} = 11\text{ fps} \Rightarrow \frac{2200}{(11)(60)} = 3$

2 min = 0.35 hr

Basin D-4 - A = 86 Ac = 0.134 sq mi

(Section 22) CN $\Rightarrow$ Residential, 4 Units / Acre, Soil A (Use Soil B) and Soil B

CN = 75

TC $\Rightarrow$ 250' overland grass @ 6.0% $\left(\frac{6389-6374}{250}\right) = \frac{1.8(1.1-0.25)\sqrt{250}}{\sqrt[3]{6.0}} = 13$

$\Rightarrow$ 3200' street @ 3.6% $\left(\frac{6374-6259}{3200}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.1}{20.5}\right)^{2/3}(0.036)^{1/2} = 6\text{ fps} \Rightarrow \frac{3200}{(6)(60)} = 9$

22 min = 0.37 hr

Basin D-5 - A = 95 Ac = 0.148 sq mi

(Section 23) CN $\Rightarrow$ 5% Open Space Fair Condition Grass Cover, Soil A/Use Soil B) + 80% Residential, 4 Units / Ac, Soil A (Use Soil B) + 10% Business, Neighborhood Areas, Soil A (Use Soil B) + 5% Business, Commercial Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.05)(69) + (0.80)(75) + (0.10)(92) + (0.05)(92) = 77$

TC $\Rightarrow$ 100' overland grass @ 2.0% $\pm$ $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 4250' street @ 2.9% $\left(\frac{6362-6240}{4250}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.029)^{1/2} = 5$ fps $\Rightarrow \frac{4250}{(5)(60)} = 14$
(½-40' street, d=0.4')

$\Rightarrow$ 950' - 48" AVE RCP and grass channel @ 1.4% $\left(\frac{6240-6227}{950}\right)$

- 48" AVE RCP = 14 fps
- grass channel $= \left(\frac{1.49}{0.040}\right)\left(\frac{21.8}{19.5}\right)^{2/3}(0.014)^{1/2} = 5$ fps
(trapezoidal section w/ 3 to 1 sides, b=10', and d=1.5')

Ave $= \frac{19}{2} = 9.5$ fps $\Rightarrow \frac{950}{(9.5)(60)} = 2$

28 min = 0.47 hr

Basin D-6 - A = 62 Ac = 0.097 sq mi

(Section 24) CN $\Rightarrow$ Residential, 4 Units/Ac, Soil A (Use Soil B)

CN = 75

TC $\Rightarrow$ 100' overland grass @ 2.0% $\pm = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 2500' street @ 1.4% $\left(\frac{6276-6241}{2500}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.014)^{1/2} = 4$ fps $\Rightarrow \frac{2500}{(4)(60)} = 10$
(½-40' street, d=0.4')

22 min = 0.37 hr

Basin D-7 - A = 71 Ac = 0.111 sq mi

(Section 25) CN $\Rightarrow$ 90% Residential, 4 Units/Ac, Soil A (Use Soil B) + 5% Business, Neighborhood Areas, Soil A (Use Soil B) + 5% Business, Commercial Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.90)(75) + (0.05)(92) + (0.05)(92) = 77$

TC $\Rightarrow$ 100' overland grass @ 2.0% $\pm = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 1700' street @ 2.6% $\left(\frac{6283-6239}{1700}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.026)^{1/2} = 5$ fps $\Rightarrow \frac{1700}{(5)(60)} = 6$
(½-40' street, d=0.4')

$\Rightarrow$ 2050' - 48" Ave RCP and street @ 0.7% $\left(\frac{6239-6225}{2050}\right)$

- 48" Ave RCP = 10 fps
- Street = $\left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.007)^{1/2} = 3$ fps
(½-50' street, d=0.5')

Ave = $\frac{13}{2} = 6.5$ fps $\Rightarrow \frac{2050}{(6.5)(60)} =$ 5

23 min = 0.38 hr

Basin D-8 - A = 65 Ac = 0.102 sq mi

(Section 26) CN $\Rightarrow$ Residential, 4 Units/Ac, Soil A (Use Soil B)

CN = 75

TC $\Rightarrow$ 100' overland grass @ 2.0% $= \frac{1.8(1.1-0.25)\sqrt{50}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 2850' street @ 3.0% $\left(\frac{6334-6248}{2850}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.030)^{1/2} = 5$ fps $\Rightarrow \frac{2850}{(5)(60)} =$ 10
(½-40' street, d=0.4')

22 min = 0.37 hr

Basin D-9 - A = 69 Ac = 0.108 sq mi

(Section 27) CN $\Rightarrow$ 55% Open Space Fair Condition Grass Cover, Soil A (Use Soil B) + 25% Residential 4 Units/Ac, Soil A (Use Soil B) + 20% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.55)(69) + (0.25)(75) + (0.20)(92) = 75$

TC $\Rightarrow$ 100' overland grass @ 2.0% $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 3100' street @ 3.2% $\left(\frac{6303-6203}{3100}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.032)^{1/2} = 6$ fps $\Rightarrow \frac{3100}{(6)(60)} =$ 9
(½-40' street, d=0.4')

21 min = 0.35 hr

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Basin D-10 - A= 66 Ac = 0.103 sq mi

(Section 28) CN => 15% Open Space Fair Condition Grass Cover, Soil A (Use Soil B) + 40% Residential, 4 Units/Ac, Soil A (Use Soil B) + 10% Business, Neighborhood Areas, Soil A (Use Soil B) + 20% Residential, 4 Units/Ac, Soil C + 10% - Residential, 8 Units/Ac, Soil C, + 5% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.15)(69)+(0.40)(75)+(0.10)(92)+(0.20)(83)+(0.10)(90)+(0.05)(94) = 80$

TC => 100' overland grass @ 2.0%± = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

=> 550' street @ 1.3% $\left(\frac{6229-6222}{550}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.013)^{1/2} = 4\text{fps} \Rightarrow \frac{550}{(4)(60)} = 2$
(½-40' street, d= 0.4')

=> 3150' - 54" Ave RCP and street @ 2.5% $\left(\frac{6222-6143}{3150}\right)$

- 54" Ave RCP = 20 fps

Street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.025)^{1/2} = 5$ fps
(½-40' street, d= 0.4')

Ave = $\frac{25}{2} = 12.5$ fps => $\frac{3150}{(12.5)(60)} = 4$

18 min = 0.30 hr

Basin D-11 - A= 100 Ac = 0.156 sq mi

(Section 29) CN => 90% Residential, 4 Units/Ac, Soil A (Use Soil B) + 5% Residential, 8 Units/Ac, Soil A (Use Soil B) + 5% Business, Commercial Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.90)(75)+(0.05)(85)+(0.05)(92) = 76$

TC => 100' overland grass @ 2.0%± = $\frac{1.8(1.1-0.25)\sqrt{12}}{\sqrt[3]{2.0}} = 12$

=> 3350' street @ 3.8% $\left(\frac{6309-6183}{3350}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.038)^{1/2} = 6\text{fps} \Rightarrow \frac{3350}{(6)(60)} = 9$
(½-40' street, d= 0.4')

$\Rightarrow$ 700' - 48" Ave RCP and street @ 6.2% $\left(\frac{6183-6127}{900}\right)$

- 48" Ave RCP - 28 fps
- Street - $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.062)^{1/2}$ = 8 fps

Ave = $\frac{36}{2}$ = 18 fps $\Rightarrow$ $\frac{900}{(18)(60)}$ = 1

22 min = 0.37 hr

Basin D-12 - A = 100 Ac = 0.156 sq mi

(Section 30) CN $\Rightarrow$ 35% Residential, 4 Units/Ac, Soil A (Use Soil B) + 10% Business, Neighborhood Areas, Soil A (Use Soil B) + 10% Business, Commercial Areas, Soil A (Use Soil B) + 40% Residential, 4 Units/Ac, Soil C, + 5% Business Neighborhood Areas, Soil C

$CN_{AVE} = (0.35)(75) + (0.10)(92) + (0.10)(92) + (0.40)(83) + (0.05)(94) = 83$

TC $\Rightarrow$ 100' overland guess @ 2.0% $\pm$ = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

$\Rightarrow$ 2500' street @ 4.1% $\left(\frac{6277-6175}{2500}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.041)^{1/2}$ = 8
(1/2-60' street, d = 0.6')

$\Rightarrow$ 1000' - 36" RCP and street @ 1.5% $\left(\frac{6175-6160}{1000}\right)$

- 36" RCP = 12 fps
- Street = $\left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.015)^{1/2}$ = 5 fps
(1/2-60' street, d = 0.6')

Ave = $\frac{17}{2}$ = 8.5 fps $\Rightarrow$ $\frac{1000}{(8.5)(60)}$ = 2

22 min = 0.37 hr

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Basin D-13 - A = 102 Ac = 0.159

(Section 31) CN ⇒ 50% Residential, 4 Units/Ac, Soil B + 45% Residential, 4 Units/Ac, Soil C + 5% Residential, 8 Units/Ac, Soil C

$CN_{AVE} = (0.50)(75) + (0.45)(83) + (0.05)(90) = 79$

TC ⇒ 100' overland grass @ 2.0% $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 1900' street @ 2.6% $\left(\frac{6226-6176}{1900}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.026)^{1/2} = 5\text{fps} \Rightarrow \frac{1900}{(5)(60)} = 6$
(½-40' street, d = 0.4')

⇒ 2750'-36" Ave RCP and street @ 1.3% $\left(\frac{6176-6141}{2750}\right)$

-36" Ave RCP = 11 fps

- street $= \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.013)^{1/2} = 4\text{fps}$
(½-40' street, d = 0.4')

Ave $= \frac{15}{2} = 7.5\text{fps} \Rightarrow \frac{2750}{(7.5)(60)} = 6$

24 min = 0.40 hr

Basin D-14 - A = 108 Ac = 0.169

(Section 32) CN ⇒ 70% Residential, 4 Units/Ac, Soil B + 15% Residential, 4 Units/Ac, Soil C + 10% Business, Neighborhood Areas, Soil B + 5% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.70)(75) + (0.15)(83) + (0.10)(92) + (0.05)(94) = 79$

TC ⇒ 100' overland grass @ 2.0% $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 1850' street @ 6.2% $\left(\frac{6259-6144}{1850}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.062)^{1/2} = 8\text{fps} \Rightarrow \frac{1850}{(8)(60)} = 4$
(½-40' street, d = 0.4')

$\Rightarrow$ 2100' - 54" Ave RCP and street @ 0.89% $\left(\frac{6144-6128}{2100}\right)$

- 54" Ave RCP = 11 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.008)^{1/2}$ = 3 fps
  (½-40' street, d = 0.4')

Ave = $\frac{14}{2}$ = 7 fps $\Rightarrow$ $\frac{2100}{(7)(60)}$ = 5

$2l_{min}$ = 0.35 hr

Basin D-15 - A = 100 Ac = 0.156 sq mi

(Section 33) CN $\Rightarrow$ 10% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 25% Open Space, Fair Condition Grass Cover, Soil C + 20% Residential, 4 Units/Ac, Soil C + 5% Residential, 8 Units/Ac, Soil A (Use Soil B) + 25% Business, Neighborhood Areas, Soil A (Use Soil B), Soil B, and Soil C, + 15% Business, Commercial Areas, Soil C

$CN_{AVE} = (0.10)(69) + (0.25)(79) + (0.20)(83) + (0.05)(90) + (0.25)(92) + (0.15)(94) = 85$

TC $\Rightarrow$ 200' overland grass @ 11.0% $\left(\frac{6204-6182}{200}\right) = \frac{1.8(1.1-0.25)\sqrt{200}}{\sqrt[3]{11.0}} = 10$

$\Rightarrow$ 1600' street @ 2.8% $\left(\frac{6182-6137}{1600}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.028)^{1/2} = 5$ fps $\Rightarrow \frac{1600}{(5)(60)} = 5$
(½-40' street, d = 0.4')

$\Rightarrow$ 1850' - 90" RCP and street @ 0.9% $\left(\frac{6137-6120}{1850}\right)$

- 90" RCP = 16 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.009)^{1/2}$ = 4 fps
  (½-60' street, d = 0.6')

Ave = $\frac{20}{2}$ = 10 fps $\Rightarrow$ $\frac{1850}{(10)(60)} = 3$

$\Rightarrow$ 800'-grass lined channel @ 0.5% $\left(\frac{6112-6108}{800}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{56.0}{56.5}\right)^{2/3}(0.005)^{1/2} = 4$ fps $\Rightarrow \frac{800}{(4)(60)} = 3$
(trapezoidal section w/4 to 1 sides, b = 20', d = 2')

$2l_{min}$ = 0.35 hr

Basin D-16 - A= 88Ac = 0.138 sq mi

(Section 34) CN ⇒ 5% Residential, 4 Units/Ac, Soil A (Use Soil B) + 35% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 60% Open Space, Fair Condition Grass Cover, Soil C

$CN_{AVE} = (0.05)(75) + (0.35)(69) + (0.60)(79) = 75$

TC ⇒ 150' overland grass @ 2.7% $\left(\frac{6122-6118}{150}\right)$ ⇒ $\frac{1.8(1.1-0.25)\sqrt{150}}{\sqrt[3]{2.7}} = 13$

⇒ 2800' grass swale @ 1.0% $\left(\frac{6118-6080}{2800}\right)$ ⇒ $\left(\frac{1.49}{0.040}\right)\left(\frac{45.0}{60.1}\right)^{2/3}(0.010)^{1/2} = 3$ fps ⇒ $\frac{2800}{(3)(60)} = 16$
(triangular section w/ 20 to 1 sides, d = 1.5'

29 min = 0.48 hr

Basin E - A= 89 Ac = 0.139 sq mi

(Section 35) CN ⇒ 45% Open Space, Fair Condition Grass Cover, Soil B + 45% Open Space, Fair Condition Grass Cover, Soil C + 5% Residential, 8 Units/Ac, Soil B + 5% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.45)(69) + (0.45)(79) + (0.05)(85) + (0.05)(94) = 76$

TC ⇒ 100' overland grass @ 2.0% ± = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 850' street @ 3.2% $\left(\frac{6145-6118}{850}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.032)^{1/2} = 6$ fps ⇒ $\frac{850}{(6)(60)} = 2$
(½-40' street, d = 0.4')

⇒ 2100' grass swale @ 1.8% $\left(\frac{6118-6080}{2100}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{20.0}{40.0}\right)^{2/3}(0.018)^{1/2} = 3$ fps ⇒ $\frac{2100}{(3)(60)} = 12$
(triangular section w/ 20 to 1 sides, d = 1.0'

26 min = 0.43 hr

Basin F - A= 78Ac = 0.122 sq mi

(Section 36) CN ⇒ 20% Open Space, Fair Condition Grass Cover, Soil C + 40% Residential, 4 Units/Ac, Soil B + 25% Residential, 8 Units/Ac, Soil B + 5% Residential, 8 Units/Ac, Soil C + 5% Business, Neighborhood Areas, Soil C + 5% Business, Commercial Areas, Soil B

$CN_{AVE} = (0.20)(79) + (0.40)(75) + (0.25)(85) + (0.05)(90) + (0.05)(94) + (0.05)(92) = 81$

TC ⇒ 100' overland grass @ 5.0% $\left(\frac{6162-6157}{100}\right)$ ⇒ $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{5.0}} = 9$

⇒ 4050' street @ 1.8% $\left(\frac{6157-6083}{4050}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.018)^{1/2} = 4\text{fps}$ ⇒ $\frac{4050}{(4)(60)} = 17$
(½-40' street, d = 0.4')

⇒ 350' grass swale @ 7.7% $\left(\frac{6083-6056}{350}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{16.0}{16.5}\right)^{2/3}(0.077)^{1/2} = 10\text{fps}$ ⇒ $\frac{350}{(10)(60)} = 1$
(Triangular section w/ 4 to 1 sides, d = 2')

27 min = 0.45 hr

Basin G - A = 82 Ac = 0.128 sq mi

(Section 37) CN ⇒ 75% Residential, 4 Units/Ac, Soil B + 15% Residential, 8 Units/Ac, Soil B + 5% Business, Neighborhood Areas, Soil B + 5% Business, Commercial Areas, Soil B

$CN_{AVE} = (0.75)(75) + (0.15)(85) + (0.05)(92) + (0.05)(92) = 78$

TC ⇒ 100' overland grass @ 2.0% = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 1350' street @ 4.7% $\left(\frac{6194-6131}{1350}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.047)^{1/2} = 7\text{fps}$ ⇒ $\frac{1350}{(7)(60)} = 3$
(½-40' street, d = 0.4')

⇒ 3750' - 42" RCP Ave and street @ 1.7% $\left(\frac{6131-6068}{3750}\right)$

- 42" RCP = 14 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.017)^{1/2} = 4\text{fps}$
(½-40' street, d = 0.4')

Ave = $\frac{18}{2} = 9\text{fps}$ ⇒ $\frac{3750}{(9)(60)} = 7$

22 min = 0.37 hr

Basin H - A = 119 Ac = 0.186 sq mi

(Section 38) CN ⇒ 95% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 5% Business, Neighborhood Areas, Soil B

$CN_{AVE} = (0.95)(75) + (0.05)(92) = 76$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 6750' street @ 1.10% $\left(\frac{6130-6053}{6750}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.011)^{1/2} = 4\text{fps} \Rightarrow \frac{6750}{(4)(60)} = 28$
(½-60' street, d = 0.6')

40 min = 0.67 hr

Basin I-1 - A = 97 Ac = 0.152 sq mi

(Section 39) CN ⇒ 90% Residential, 4 Units / Ac, Soil A (Use Soil B) and Soil B + 10% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.90)(75) + (0.10)(92) = 77$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 4000' street @ 1.0% $\left(\frac{6094-6056}{4000}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.010)^{1/2} = 4\text{fps} \Rightarrow \frac{4000}{(4)(60)} = 17$
(½-60' street, d = 0.6')

⇒ 1100' - 48" RCP and Street @ 0.4% $\left(\frac{6056-6052}{1100}\right)$

- 48" RCP = 7 fps
- street $= \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.004)^{1/2} = 3\text{fps}$
(½-60' street, d = 0.6')

Ave $= \frac{10}{2} = 5\text{fps} \Rightarrow \frac{1100}{(5)(60)} = 4$

33 min = 0.55 hr

Basin I-2 - A = 110 Ac = 0.172 sq mi

(Section 40) CN ⇒ 25% Open Space, Fair Condition Grass Cover, Soil B + 70% Residential, 4 Units / Ac, Soil A (Use Soil B) and Soil B + 5% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.25)(69) + (0.70)(75) + (0.05)(92) = 74$

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TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 2200' street @ 1.6% $\left(\frac{6088-6052}{2200}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.016)^{1/2} = 4$ fps ⇒ $\frac{2200}{(4)(60)} = 9$

(½-40' street, d=0.4')

⇒ 700' - 48" RCP and street @ 0.4% $\left(\frac{6052-6049}{700}\right)$

- 48" RCP = 7 fps

- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.004)^{1/2} = 3$ fps

(½-60' street, d=0.6')

Ave = $\frac{10}{2} = 5$ fps ⇒ $\frac{700}{(5)(60)} = 2$

23 min = 0.38 hr

Basin J - A = 98 Ac = 0.153 sq mi

(Section 41) CN ⇒ 90% Residential, 4 Units/Ac, Soil B + 10% Business, Neighborhood Areas, Soil B

$CN_{AVE} = (0.90)(75) + (0.10)(92) = 77$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 5500' street @ 2.6% $\left(\frac{6186-6043}{5500}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.026)^{1/2} = 5$ fps ⇒ $\frac{5500}{(5)(60)} = 18$

(½-40' street, d=0.4')

30 min = 0.50 hr

Basin K-1 - A = 90 Ac = 0.141 sq mi

(Section 42) CN ⇒ 10% Open Space, Fair Condition Grass Cover, Soil B + 80% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 10% Business, Commercial Areas, Soil B

$CN_{AVE} = (0.10)(69) + (0.80)(75) + (0.10)(72) = 76$

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TC => 100' overland grass @ 2.0% ± = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

=> 2350' street @ 0.6% ($\frac{6127-6112}{2350}$) = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.006)^{1/2}$ = 2 fps => $\frac{2350}{(2)(60)}$ = 20
(½-40' street, d=0.4')

=> 2050' -54" Ave RCP and grass swale @ 0.7% ($\frac{6112-6098}{2050}$)

-54" Ave RCP = 10 fps

- grass swale = $\left(\frac{1.49}{0.040}\right)\left(\frac{10.0}{20.1}\right)^{2/3}(0.007)^{1/2}$ = 2 fps
(triangular section w/ 10 to 1 sides and d=1')

Ave = $\frac{12}{2}$ = 6 fps => $\frac{2050}{(6)(60)}$ = 6

38 min = 0.63 hr

Basin K-2 - A = 84 Ac = 0.131 sq mi

(Section 43) CN => 90% Residential, 4 Units/Ac, Soil A (Use Soil B) + 10% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B

CN_{AVE} = (0.90)(75) + (0.10)(92) = 77

TC => 100' overland grass @ 2.0% ± = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

=> 5550' street @ 0.7% ($\frac{6136-6095}{5550}$) = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.007)^{1/2}$ = 3 fps => $\frac{5550}{(3)(60)}$ = 31
(½-40' street, d=0.4')

=> 300' - 27" RCP and street @ 0.7% ($\frac{6095-6093}{300}$)

-27" RCP = 7 fps

- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.007)^{1/2}$ = 3 fps
(1½-40' street, d=0.4')

Ave = $\frac{10}{2}$ = 5 fps => $\frac{300}{(5)(60)}$ = 1

44 min = 0.73 hr

Basin K-3 - A= 59 Ac = 0.092 sq mi

(Section 44) CN ⇒ Residential, 4 Units/Ac, Soil A (Use Soil B)

CN= 75

TC ⇒ 100' overland grass @ 2.0%± = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

⇒ 1050' street @ 1.2% $\left(\frac{6102-6089}{1050}\right)$ = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.012)^{1/2}$ = 3 fps ⇒ $\frac{1050}{(3)(60)}$ = 6

⇒ 2500' - 66" Ave RCP and swale @ 0.9% $\left(\frac{6089-6066}{2500}\right)$

- 66" Ave RCP = 14 fps
- grass swale = $\left(\frac{1.49}{0.040}\right)\left(\frac{10.0}{20.1}\right)^{2/3}(0.009)^{1/2}$ = 2 fps
(triangular section w/ 10 to 1 sides, and d=1')

Ave = $\frac{16}{2}$ = 8 fps ⇒ $\frac{2500}{(8)(60)}$ = 5

23 min = 0.38 hr

Basin K-4 - A= 64 Ac = 0.100 sq mi

(Section 45) CN ⇒ 5% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 75% Residential 4 Units/Ac, Soil A (Use Soil B) + 5% Residential, 4 Units/Ac, Soil C + 15% Business, Neighborhood Areas, Soil A (Use Soil B)

CN_{AVE} = (0.05)(69) + (0.75)(75) + (0.05)(83) + (0.15)(92) = 78

TC ⇒ 100' overland grass @ 2.0%± = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

⇒ 1800' street @ 0.8% $\left(\frac{6053-6039}{1800}\right)$ = $\left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.008)^{1/2}$ = 4 fps ⇒ $\frac{1800}{(4)(60)}$ = 8
(½-60' street, d=0.6')

⇒ 1350' - 24" Ave RCP and street @ 1.0% $\left(\frac{6039-6025}{1350}\right)$

- 24" Ave RCP = 7 fps

- street = $\left(\frac{1.49}{0.0176}\right)\left(\frac{9.01}{30.16}\right)^{2/3}(0.010)^{1/2}$ = 4 fps
(½-60' street, d=0.6')

Ave = $\frac{11}{2}$ = 5.5 fps $\Rightarrow \frac{1350}{(5.5)(60)}$ = 4

t_{4min} = 0.40 hr

Basin L-1 - A = 88 Ac = 0.138 sq mi

(Section 4b) CN $\Rightarrow$ 5% Open Space, Fair Condition Grass Cover, Soil B + 80% Residential, 4 Units/Ac, Soil B + 15% Business, Neighborhood Areas, Soil B

$CN_{AVE} = (0.05)(69) + (0.80)(75) + (0.15)(92) = 77$

TC $\Rightarrow$ 100' overland grass @ 2.0% $\pm$ = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

$\Rightarrow$ 3500' street @ 3.3% $\left(\frac{6259-6145}{3500}\right)$ = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.033)^{1/2}$ = 6 fps $\Rightarrow \frac{3500}{(6)(60)}$ = 10
(½-40' street, d=0.4')

$\Rightarrow$ 2100' - 30" Ave RCP and street @ 2.1% $\left(\frac{6145-6091}{2100}\right)$

- 30" Ave RCP = 13 fps

- street = $\left(\frac{1.49}{0.0176}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.026)^{1/2}$ = 6 fps
(½-50' street, d=0.5')

Ave = $\frac{19}{2}$ = 9.5 fps $\Rightarrow \frac{2100}{(9.5)(60)}$ = 4

t_{6min} = 0.43 hr

Basin L-2 - A = 99 Ac = 0.155 sq mi

(Section 4) CN $\Rightarrow$ Residential, 4 Units/Ac, Soil B

CN = 75

TC $\Rightarrow$ 100' overland grass @ 2.0% $\pm$ = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

$\Rightarrow$ 2000' street @ 2.8% $\left(\frac{6141-6086}{2000}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.028)^{1/2} = 6\text{fps} \Rightarrow \frac{2000}{(6)(60)} = 6$
(½-50' street, d=0.5')

$\Rightarrow$ 2950' - 42" Ave RCP and street @ 1.7% $\left(\frac{6086-6037}{2950}\right)$

- 42" Ave RCP = 14 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.017)^{1/2} = 5\text{fps}$
(½-50' street, d=0.5')

Ave = $\frac{19}{2} = 9.5\text{fps} \Rightarrow \frac{2950}{(9.5)(60)} = 5$

23 min = 0.38 hr

Basin L-3 - A = 86 Ac = 0.134 sq mi

(Section 48) CN $\Rightarrow$ 85% Residential, 4 Units / Ac, Soil A (Use Soil B) + 15% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.85)(75) + (0.15)(92) = 78$

TC $\Rightarrow$ 100' overland grass @ 2.0% $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

$\Rightarrow$ 2000' street @ 0.8% $\left(\frac{6126-6111}{2000}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.008)^{1/2} = 3\text{fps} \Rightarrow \frac{2000}{(3)(60)} = 11$
(½ 40' street, d = 0.4')

$\Rightarrow$ 2600' - 24" Ave RCP @ 0.8% $\left(\frac{6111-6090}{2600}\right)$

- 24" Ave RCP = 7 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.008)^{1/2} = 3\text{fps}$
(1½-40' street, d=0.4'

Ave = $\frac{10}{2} = 5\text{fps} \Rightarrow \frac{2600}{(5)(60)} = 9$

32 min = 0.53 hr

Basin L-4 - A= 53 Ac= 0.083 sq mi

(Section 49) CN ⇒ Residential, 4 Units/Ac, Soil A (Use Soil B)

CN= 75

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 400' street @ 0.5% $\left(\frac{6092-6090}{400}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.005)^{1/2} = 3$ fps ⇒ $\frac{400}{(3)(60)} = 2$
(½-60' street, d=0.6')

⇒ 3600'-30" Ave RCP and street @ 0.9% $\left(\frac{6090-6059}{3600}\right)$

- 30" Ave RCP = 8 fps
- street $= \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.009)^{1/2} = 3$ fps
(½-40' street, d=0.4')

Ave = $\frac{11}{2} = 5.5$ fps ⇒ $\frac{3600}{(5.5)(60)} = 11$

25 min = 0.42 hr

Basin L-5 - A= 77 Ac= 0.120 sq mi

(Section 50) CN ⇒ 80% Residential, 4 Units/Ac, Soil A (Use Soil B) + 20% Business, Neighborhood Areas, Soil A (Use Soil B)

CN = (0.80)(75) + (0.20)(92) = 78

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 7200' street @ 0.9% $\left(\frac{6124-6061}{7200}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{12.3}{35.1}\right)^{2/3}(0.009)^{1/2} = 4$ fps ⇒ $\frac{7200}{(4)(60)} = 30$
(½-70' street, d=0.7')

42 min = 0.70

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Basin L-6 - A = 60 Ac = 0.094 sq mi

(Section 51) CN ⇒ 10% Open Space Fair Condition Grass Cover, Soil A (Use Soil B) + 25% Residential, 4 Units/Ac, Soil A (Use Soil B) + 65% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.10)(69) + (0.25)(75) + (0.65)(92) = 85$

TC ⇒ 100' overland grass @ 2.0% $t = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 600' street @ 0.7% $\left(\frac{6062-6058}{600}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.007)^{1/2} = 3$ fps ⇒ $\frac{600}{(3)(60)} = 3$
(½-60' street, d = 0.6')

⇒ 2300' - 36" Ave RCP and street @ 0.7% $\left(\frac{6058-6041}{2300}\right)$

- 36" Ave RCP = 8 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.007)^{1/2} = 3$ fps
(½-40' street, d = 0.4')

Ave = $\frac{11}{2} = 5.5$ fps ⇒ $\frac{2300}{(5.5)(60)} = 7$

22 min = 0.37 hr

Basin L-7 - A = 89 Ac = 0.139 sq mi

(Section 52) CN ⇒ 70% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 10% Open Space, Fair Condition Grass Cover, Soil C + 15% Residential, 4 Units/Ac, Soil C + 5% Residential, 8 Units/Ac, Soil C

$CN_{AVE} = (0.70)(75) + (0.10)(79) + (0.15)(83) + (0.05)(90) = 77$

TC ⇒ 100' overland grass @ 2.0% $t = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 2400' street @ 0.8% $\left(\frac{6055-6037}{2400}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.008)^{1/2} = 3$ fps ⇒ $\frac{2400}{(3)(60)} = 13$
(½-40' street, d = 0.4')

$\Rightarrow$ 1750' - 42" Ave RCP and street @ 1.1% $\left(\frac{6037-6018}{1750}\right)$

- 42" Ave RCP = 11 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.011)^{1/2}$ = 4 fps
  (½-50' street, d=0.5')

Ave = $\frac{15}{2}$ = 7.5 fps $\Rightarrow \frac{1750}{(7.5)(60)}$ = 4

$\Rightarrow$ 350' grass lined channel @ 1.0% ± $\Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{42.0}{27.6}\right)^{2/3}(0.010)^{1/2}$ = 5 fps $\Rightarrow \frac{350}{(5)(60)}$ = 1
(trapezoidal section w/ 3 to 1 sides, b=15', and d=2')

30 min = 0.50 hr

Basin M-1 - A = 91 Ac = 0.142 sq mi

(Section 53) CN $\Rightarrow$ 10% Open Space, Fair Condition Grass Cover, Soil B + 85% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 5% Business, Neighborhood Areas, Soil B

$CN_{AVE} = (0.10)(69) + (0.85)(75) + (0.05)(92) = 75$

TC $\Rightarrow$ 100' overland grass @ 2.0% ± = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

$\Rightarrow$ 1750' street @ 2.1% $\left(\frac{6087-6050}{1750}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.021)^{1/2}$ = 5 fps $\Rightarrow \frac{1750}{(5)(60)}$ = 6
(½-50' street, d=0.5')

$\Rightarrow$ 3300' - 24" Ave RCP and street @ 1.0% $\left(\frac{6050-6016}{3300}\right)$

- 24" Ave RCP = 7 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.010)^{1/2}$ = 4 fps
  (½-50' street, d=0.5')

Ave = $\frac{11}{2}$ = 5.5 fps $\Rightarrow \frac{3300}{(5.5)(60)}$ = 10

28 min = 0.47 hr

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Basin M-2 - A = 107 Ac = 0.167 sq mi

(Section 54) CN ⇒ 10% Open Space, Fair Condition Grass Cover, Soil C + 55% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 20% Residential, 4 Units/Ac, Soil C + 5% Residential, 8 Units/Ac, Soil C + 10% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.10)(79)+(0.55)(75)+(0.20)(83)+(0.05)(90)+(0.10)(92) = 79$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 1300' street @ 1.8% $\left(\frac{6036-6013}{1300}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.018)^{1/2} = 4\text{fps} \Rightarrow \frac{1300}{(4)(60)} = 5$
(½-40' street, d = 0.4')

⇒ 1100'-24" Ave RCP and street @ 0.5% $\left(\frac{6013-6008\pm}{1100}\right)$

-24" Ave RCP = 5 fps

-Street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.005)^{1/2} = 2\text{ fps}$
(½-40' street, d = 0.4')

Ave = $\frac{7}{2} = 3.5\text{fps} \Rightarrow \frac{1100}{(3.5)(60)} = 5$

⇒ 1150'-natural channel @ 1.2% $\left(\frac{5993-5979}{1150}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{78.0}{33.4}\right)^{2/3}(0.012)^{1/2} = 3\text{fps} \Rightarrow \frac{1150}{(3)(60)} = 6$
(trapezoidal section w/2 to 1 sides, b = 20', and d = 3')

28 min = 0.47 hr

Basin M-3 - A = 79 Ac = 0.123 sq mi

(Section 55) CN ⇒ 20% Residential, 4 Units/Ac, Soil A (Use Soil B) + 60% Business, Neighborhood Areas, Soil A (Use Soil B) + 20% Business, Commercial Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.20)(75)+(0.60)(92)+(0.20)(92) = 89$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 1350' street @ 0.6% $\left(\frac{6056-6048}{1350}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.006)^{1/2} = 3\text{fps} \Rightarrow \frac{1350}{(2)(60)} = 11$
(½-40' street, d = 0.4')

$\Rightarrow$ 4850' - 30" Ave RCP and street @ 1.2% $\left(\frac{6048-5990'}{4850}\right)$

- 30" Ave RCP - 9 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{12.3}{35.1}\right)^{2/3}(0.012)^{1/2}$ = 5 fps
  (1½-70' street, d=0.1')

Ave = $\frac{14}{2}$ = 7 fps $\Rightarrow$ $\frac{4850}{(7)(60)}$ = 12

35 min = 0.58 hr

Basin N - A = 102 Ac = 0.159 sq mi

(Section 56) CN $\Rightarrow$ 15% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 30% Residential, 4 Units/Ac, Soil A (Use Soil B) + 20% Business, Neighborhood Areas, Soil A (Use Soil B) + 35% Business, Commercial Areas, Soil A (Use Soil B)

CN_{AVE} = (0.15)(69) + (0.30)(75) + (0.20)(92) + (0.35)(92) = 83

TC $\Rightarrow$ 100' overland grass @ 2.0% $t = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

$\Rightarrow$ 400' street @ 0.8% $\left(\frac{6024-6021}{400}\right)$ = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.008)^{1/2}$ = 3 fps $\Rightarrow$ $\frac{400}{(3)(60)}$ = 2
(½-40' street, d=0.4')

$\Rightarrow$ 2700' - 24" Ave RCP and street @ 1.1% $\left(\frac{6021-5990'}{2700}\right)$

- 24" Ave RCP = 8 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.011)^{1/2}$ = 4 fps
  (½-60' street, d=0.6')

Ave = $\frac{12}{2}$ = 6 fps $\Rightarrow$ $\frac{2700}{(6)(60)}$ = 8

$\Rightarrow$ 350' riprap lined channel @ 1.1% $\left(\frac{5973-5969}{350}\right)$ = $\left(\frac{1.49}{0.040}\right)\left(\frac{480}{28.9}\right)^{2/3}(0.011)^{1/2}$ = 5 fps $\Rightarrow$ $\frac{350}{(5)(60)}$ = 1
(trapezoidal section w/ 2 to 1 sides, b=20' and d=2')

23 min = 0.38 hr

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OF

Basin O-1 - A = 101 Ac = 0.158 sq mi

(Section 57) CN ⇒ 60% Residential, 4 Units/Ac, Soil A (Use Soil B) + 20% Residential, 8 Units/Ac, Soil A (Use Soil B) + 20% Business, Neighborhood Areas, Soil A (Use Soil B)

$$CN_{AVE} = (0.60)(75) + (0.20)(85) + (0.20)(92) = 80$$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1 - 0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 2450' street @ 1.8% $\left(\frac{6179 - 6136}{2450}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.018)^{1/2} = 4\text{ fps} \Rightarrow \frac{2450}{(4)(60)} = 10$

(½-40' street, d = 0.4')

⇒ 1550' - 36" Ave RCP and street @ 1.4% $\left(\frac{6136 - 6115}{1550}\right)$

- 36" Ave RCP = 11 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.014)^{1/2} = 4\text{ fps}$

(½-40' street, d = 0.4')

Ave = $\frac{15}{2} = 7.5\text{ fps} \Rightarrow \frac{1550}{(7.5)(60)} = 3$

25 min = 0.42 hr

Basin O-2 - A = 68 Ac = 0.106 sq mi

(Section 58) CN ⇒ 70% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B, + 10% Residential, 8 Units/Ac, Soil A (Use Soil B) and Soil B, + 20% Business, Neighborhood Areas, Soil A (Use Soil B)

$$CN_{AVE} = (0.70)(75) + (0.10)(85) + (0.20)(92) = 79$$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1 - 0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 900' street @ 2.4% $\left(\frac{6223 - 6201}{900}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.024)^{1/2} = 5\text{ fps} \Rightarrow \frac{900}{(5)(60)} = 3$

(½-40' street, d = 0.4')

$\Rightarrow$ 1050' - 24" Ave RCP and grass swale @ 4.8% $\left(\frac{6201-6151}{1050}\right)$

- 24" Ave RCP = 16 fps
- grass swale = $\left(\frac{1.49}{0.040}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.048)^{1/2}$ = 3 fps
  (triangular section w/ 20 to 1 sides and d = 0.5')

Ave = $\frac{19}{2}$ = 9.5 fps $\Rightarrow \frac{1050}{(9.5)(60)}$ = 2

$\Rightarrow$ 950' street @ 1.19% $\left(\frac{6151-6140}{950}\right)$ = $\left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.011)^{1/2}$ = 4 fps $\Rightarrow \frac{950}{(4)(60)}$ = 4
(½-60' street, d = 0.6')

21 min = 0.35 hr

Basin O-3 - A = 73 Ac = 0.114 sq mi

(Section 59) CN $\Rightarrow$ 10% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 70% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 20% Residential, 8 Units/Ac, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.10)(69) + (0.70)(75) + (0.20)(85) = 76$

TC $\Rightarrow$ 100' overland grass @ 2.10% $\pm$ = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

$\Rightarrow$ 3000' street @ 4.8% $\left(\frac{6241-6096}{3000}\right)$ = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.048)^{1/2}$ = 7 fps $\Rightarrow \frac{3000}{(7)(60)}$ = 7
(½-40' street, d = 0.4')

19 min = 0.32 hr

Basin O-4 - A = 75 A = 0.117 sq mi

(Section 60) CN $\Rightarrow$ 5% Open Space, Fair Condition Grass Cover, Soil B + 85% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 10% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.05)(69) + (0.85)(75) + (0.10)(92) = 76$

TC $\Rightarrow$ 100' overland grass @ 2.10% $\pm$ = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

$\Rightarrow$ 1600' street @ 5.3% $\left(\frac{6240-6156}{1600}\right)$ = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.053)^{1/2}$ = 7 fps $\Rightarrow \frac{1600}{(7)(60)}$ = 4
(½-40' street, d = 0.4')

$\Rightarrow$ 2450' - 30" Ave RCP and street @ 2.1% $\left(\frac{6156-6089}{2450}\right)$

- 30" Ave RCP = 14 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.021)^{1/2}$ = 5 fps
  (½-40' street, d = 0.4')

Ave = $\frac{19}{2}$ = 9.5 fps $\Rightarrow \frac{2450}{(9.5)(60)}$ = 4

20 min = 0.33 hr

Basin O-5 - A = 83 Ac = 0.130 sq mi

(Section 61) CN $\Rightarrow$ 45% Residential, 4 Units/Ac, Soil B + 55% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.45)(75) + (0.55)(92) = 84$

TC $\Rightarrow$ 100' overland guess @ 2.0% $\frac{1}{2}$ = $\frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ 12

$\Rightarrow$ 2200' street @ 3.5% $\left(\frac{6173-6097}{2200}\right)$ = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.035)^{1/2}$ = 6 fps $\Rightarrow \frac{2200}{(6)(60)}$ = 6
(½-40' street, d = 0.4')

$\Rightarrow$ 2000' - 42" Ave RCP and street @ 1.5% $\left(\frac{6097-6068}{2000}\right)$

- 42" Ave RCP = 13 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.015)^{1/2}$ = 4 fps
  (½-40' street, d = 0.4')

Ave = $\frac{17}{2}$ = 8.5 fps $\Rightarrow \frac{2000}{(8.5)(60)}$ = 4

22 min = 0.37 hr

Basin O-6 – A = 114Ac = 0.178 sq mi

(Section 62) CN ⇒ 30% Residential, 4 Units per Acre, Soil A (Use Soil B) + 70% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.30)(75) + (0.70)(92) = 87$

TC ⇒ 50' overland paved @ 1.0% $= \frac{1.8(1.1 - 0.90)\sqrt{50}}{\sqrt[3]{1.0}} = 3$

⇒ 850' street @ 1.3% $\left(\frac{6151 - 6140}{850}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{16.0}{40.8}\right)^{2/3}(0.013)^{1/2} = 6\text{ fps} \Rightarrow \frac{850}{(6)(60)} = 2$
(½-80' street, d = 0.8')

⇒ 4000' - 36" Ave RCP and Street @ 1.1% $\left(\frac{6140 - 6097}{4000}\right)$

- 36" Ave RCP = 10 fps
- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.011)^{1/2} = 3\text{ fps}$
(½-40' street, d = 0.4')

Ave = $\frac{13}{2} = 6.5\text{ fps} \Rightarrow \frac{4000}{(6.5)(60)} = 10$

15 min = 0.25 hr

Basin O-7 – A = 84Ac = 0.131 sq mi

(Section 63) CN ⇒ 10% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) and Soil B + 5% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 40% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B + 45% Business, Commercial Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.10)(69) + (0.05)(75) + (0.40)(92) + (0.45)(92) = 89$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1 - 0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 2250' street @ 1.4% $\left(\frac{6126 - 6095}{2250}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{12.3}{35.7}\right)^{2/3}(0.014)^{1/2} = 5\text{ fps} \Rightarrow \frac{2250}{(5)(60)} = 8$
(½-70' street, d = 0.7')

$\Rightarrow$ 1500'-36" Ave RCP and street @ 1.7% $\left(\frac{6095-6069}{1500}\right)$

-36" Ave RCP = 12 fps

-street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.017)^{1/2}$ = 4 fps
(½-40' street, d = 0.4')

Ave = $\frac{16}{2}$ = 8 fps $\Rightarrow \frac{1500}{(8)(60)}$ = 3

23 min = 0.38 hr

Basin O-B - A = 68 Ac = 0.1065 sq mi

(Section 64) CN $\Rightarrow$ 15% Open Space, Fair Condition Grass Cover, Soil B + 15% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 10% Residential, 8 Units/Ac, Soil B + 60% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.15)(69) + (0.15)(75) + (0.10)(85) + (0.60)(92) = 85$

TC $\Rightarrow$ 250' overland grass @ 2.0% $\left(\frac{6125-6120}{250}\right) = \frac{1.8(1.1-0.25)\sqrt{250}}{\sqrt[3]{2.0}} = 19$

$\Rightarrow$ 400' grass swale @ 6.3% $\left(\frac{6120-6095}{400}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{5.0}{20.0}\right)^{2/3}(0.063)^{1/2} = 4$ fps $\Rightarrow \frac{400}{(4)(60)} = 2$
(triangular section w/ 20 to 1 sides, and d = 0.5')

$\Rightarrow$ 1550' street @ 1.9% $\left(\frac{6095-6065}{1550}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.019)^{1/2} = 6$ fps $\Rightarrow \frac{1550}{(6)(60)} = 4$
(½-60' street, d = 0.6')

$\Rightarrow$ 550'-48" Ave CMP and street @ 1.1% $\left(\frac{6065-6059}{550}\right)$

-48" Ave CMP - $\left(\frac{1.49}{0.024}\right)\left(\frac{12.6}{12.6}\right)^{2/3}(0.011)^{1/2}$ = 7 fps

-street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.011)^{1/2}$ = 3 fps
(½-40' street, d = 0.4')

Ave = $\frac{10}{2}$ = 5 fps $\Rightarrow \frac{550}{(5)(60)}$ = 2

27 min = 0.45 hr

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Basin O-9 - A = 60 Ac = 0.094 sq mi

(Section 65) CN ⇒ 85% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil E
+5% Residential, 8 Units/Ac, Soil E + 10% Business, Neighborhood Areas, Soil B

$$CN_{AVE} = (0.85)(75) + (0.05)(85) + (0.10)(92) = 77$$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 800' street @ 2.5% $\left(\frac{6088-6068}{800}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.025)^{1/2} = 5\text{fps} \Rightarrow \frac{800}{(5)(60)} = 3$
(½-40' street, d = 0.4')

⇒ 1600' - 36" Ave CMP and street @ 1.4% $\left(\frac{6068-6045}{1600}\right)$

- 36" Ave CMP $= \left(\frac{1.49}{0.024}\right)\left(\frac{7.1}{9.4}\right)^{2/3}(0.014)^{1/2} = 6\text{fps}$

- street $= \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.014)^{1/2} = 4\text{fps}$
(½-40' street, d = 0.4')

Ave $= \frac{10}{2} = 5\text{fps} \Rightarrow \frac{1600}{(5)(60)} = 5$

20 min = 0.33 hr

Basin O-10 - A = 74 Ac = 0.116 sq mi

(Section 66) CN ⇒ 15% Residential, 4 Units/Ac, Soil B + 85% Business, Neighborhood Areas, Soil B

$$CN_{AVE} = (0.15)(75) + (0.85)(92) = 89$$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 2100' street @ 2.8% $\left(\frac{6141-6082}{2100}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.028)^{1/2} = 5\text{fps} \Rightarrow \frac{2100}{(5)(60)} = 7$
(½-40' street, d = 0.4')

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$\Rightarrow$ 1450' - 42" Ave CMP and street @ 1.5% $\left(\frac{6082-6060}{1450}\right)$

- 42" Ave CMP = $\left(\frac{1.49}{0.024}\right)\left(\frac{9.6}{11.0}\right)^{2/3}(0.015)^{1/2}$ = 7 fps

- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.015)^{1/2}$ = 4 fps
(½-40' street, d=0.4')

Ave = $\frac{11}{2}$ = 5.5 fps $\Rightarrow \frac{1450}{(5.5)(60)}$ = 4

23 min = 0.38 hr

Basin O-11-A = 105 Ac = 0.164 sq mi

(Section 67) CN $\Rightarrow$ 70% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 5% Residential, 8 Units/Ac, Soil B + 15% Residential, 4 Units/Ac, Soil C + 10% Business, Neighborhood Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.70)(75) + (0.05)(85) + (0.15)(83) + (0.10)(92) = 78$

TC $\Rightarrow$ 100' overland grass @ 2.0% $t = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}}$ = 12

$\Rightarrow$ 850' street @ 3.6% $\left(\frac{6076-6045}{850}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.036)^{1/2}$ = 6 fps $\Rightarrow \frac{850}{(6)(60)}$ = 2
(½-40' street, d=0.4')

$\Rightarrow$ 4300' - 132" Ave CMP and street @ 1.6% $\left(\frac{6045-5977}{4300}\right)$

- 132" Ave CMP = $\left(\frac{1.49}{0.032}\right)\left(\frac{95.0}{34.6}\right)^{2/3}(0.016)^{1/2}$ = 12 fps

- street = $\left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.016)^{1/2}$ = 4 fps
(½-40' street, d=0.4')

Ave = $\frac{16}{2}$ = 8 fps $\Rightarrow \frac{4300}{(8)(60)}$ = 9

23 min = 0.38 hr

COMP MWH

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Basin O-12 - A= 70 ac = 0.1094 sq mi

(Section 68) CN ⇒ 5% Residential, 4 Units/ac, Soil A (Use Soil B) + 5% Residential, 8 Units/ac, Soil A (Use Soil B) + 30% Business, Neighborhood Areas, Soil A (Use Soil B) + 60% Business, Commercial Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.05)(75)+(0.05)(85)+(0.30)(92)+(0.60)(92) = 91$

TC ⇒ 50' overland paved @ 1.0% ± $= \frac{1.8(1.1-0.90)\sqrt{50}}{\sqrt[3]{1.0}} = 3$

⇒ 400' street @ 1.3% $\left(\frac{6010-6005}{400}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.013)^{1/2} = 4\text{fps} \Rightarrow \frac{400}{(4)(60)} = 2$
(½-40' street, d=0.4')

⇒ 3900' - 30" Ave RCP and street @ 0.1% $\left(\frac{6005-5971}{3900}\right)$

- 30" Ave RCP = 7 fps
- street $= \left(\frac{1.49}{0.016}\right)\left(\frac{25.0}{51.0}\right)^{2/3}(0.009)^{1/2} = 5\text{fps}$
(½-100' street, d=1')

Ave $= \frac{12}{2} = 6\text{fps} \Rightarrow \frac{3900}{(6)(60)} = 11$

16 min = 0.27 hr

Basin P-1 - A= 68 Ac = 0.1063 sq mi

(Section 69) CN ⇒ 25% Open Space, Fair Condition Grass Cover, Soil B + 30% Business, Neighborhood Areas, Soil B, + 30% Open Space, Fair Condition Grass Cover, Soil C + 15% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.25)(69)+(0.30)(92)+(0.30)(79)+(0.15)(94) = 83$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 1050' street @ 1.5% $\left(\frac{6105-6089}{1050}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.015)^{1/2} = 5\text{fps} \Rightarrow \frac{1050}{(5)(60)} = 4$
(½-60' street, d=0.6')

→ 2450' - 30" Ave CMP and grass swale 1.8% $\left(\frac{6089-6046}{2450}\right)$

- 30" Ave CMP = $\left(\frac{1.49}{0.024}\right)\left(\frac{4.9}{7.9}\right)^{2/3}(0.018)^{1/2}$ = 6 fps

- Grass swale = $\left(\frac{1.49}{0.040}\right)\left(\frac{28.8}{48.1}\right)^{2/3}(0.018)^{1/2}$ = 4 fps
(triangular section w/ 20 to 1 sides, and d = 1.2')

Ave = $\frac{10}{2}$ = 5 fps ⇒ $\frac{2450}{(5)(60)}$ = 8

Z_{4min} = 0.40 hr

Basin P-2 - A = 104 Ac = 0.163 sq mi

(Section 70) CN ⇒ 20% Open Space, Fair Condition Grass Cover, Soil B + 15% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 15% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B + 40% Open Space, Fair Condition Grass Cover, Soil C + 10% Business, Neighborhood Areas, Soil C

CN_{AVE} = (0.20)(69) + (0.15)(75) + (0.15)(92) + (0.40)(79) + (0.10)(94) = 80

TC ⇒ 200' overland grass @ 7.5% $\left(\frac{6103-6088}{200}\right)$ = $\frac{1.8(1.1-0.25)\sqrt{200}}{\sqrt[3]{7.5}}$ = 11

⇒ 250' grass swale @ 5.6% $\left(\frac{6088-6074}{250}\right)$ = $\left(\frac{1.49}{0.040}\right)\left(\frac{3.2}{16.0}\right)^{2/3}(0.056)^{1/2}$ = 3 fps ⇒ $\frac{250}{(3)(60)}$ = 1
(triangular section w/ 20 to 1 sides, and d = 0.4')

⇒ 2500' - 30" Ave CMP and grass swale @ 1.5% $\left(\frac{6074-6036}{2500}\right)$

- 30" Ave CMP = $\left(\frac{1.49}{0.024}\right)\left(\frac{4.9}{7.9}\right)^{2/3}(0.015)^{1/2}$ = 6 fps

- Grass swale = $\left(\frac{1.49}{0.040}\right)\left(\frac{33.8}{52.1}\right)^{2/3}(0.015)^{1/2}$ = 3 fps
(triangular section w/ 20 to 1 sides, and d = 1.3')

Ave = $\frac{9}{2}$ = 4.5 fps ⇒ $\frac{2500}{(4.5)(60)}$ = 9

Z_{1min} = 0.35 hr

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Basin P-3 - A = 96 Ac = 0.150 sq mi

(Section 71) CN ⇒ 5% OpenSpace, Fair Condition, Grass Cover, Soil A (Use Soil B) + 30% Business, Neighborhood Areas, Soil A (Use Soil B) + 20% OpenSpace, Fair Condition Grass Cover, Soil C + 25% Residential, 4 Units/Ac, Soil C + 20% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.05)(69) + (0.30)(92) + (0.20)(79) + (0.25)(83) + (0.20)(94) = 86$

TC ⇒ 100' overland grass @ 2.0%± $= \frac{1.8(1.1-.025)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 3300' street @ 1.6% $\left(\frac{6078-6026}{3300}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.016)^{1/2} = 5\text{fps} \Rightarrow \frac{3300}{(5)(60)} = 11$
(½-50' street, d = 0.5')

⇒ 2150' - 48" Ave CMP and grass swale @ 2.3% $\left(\frac{6026-5976}{2150}\right)$

- 48" Ave CMP $= \left(\frac{1.49}{0.024}\right)\left(\frac{12.6}{12.6}\right)^{2/3}(0.023)^{1/2} = 9\text{fps}$

- grass swale $= \left(\frac{1.49}{0.040}\right)\left(\frac{24.2}{44.1}\right)^{2/3}(0.023)^{1/2} = 4\text{fps}$
(Triangular section w/ 20 to 1 sides, d = 1.1')

Ave $= \frac{13}{2} = 6.5\text{fps} \Rightarrow \frac{2150}{(6.5)(60)} = 6$

29 min = 0.48

Basin Q - A = 73 Ac = 0.114 sq mi

(Section 72) CN ⇒ 5% Industrial, Light Areas, Soil A (Use Soil B) + 25% Business, Neighborhood Areas, Soil A (Use Soil B) + 5% Open Space, Fair Condition Grass Areas, Soil C + 60% Residential, 4 Units/Ac, Soil C + 5% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.05)(88) + (0.25)(92) + (0.05)(79) + (0.60)(83) + (0.05)(94) = 86$

TC ⇒ 100' overland grass @ 2.0%± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 1600' street @ 2.6% $\left(\frac{6077-6035}{1600}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.026)^{1/2} = 5\text{fps} \Rightarrow \frac{1600}{(5)(60)} = 5$
(½-40' street, d = 0.4')

$\Rightarrow$2100'-24" Ave RCP and street @ 3.5% $\left(\frac{6035-5962}{2100}\right)$

-24" Ave RCP = 14 fps

-street = $\left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.035)^{1/2}$ = 7 fps
(½-50' street, d=0.5')

Ave = $\frac{21}{2}$ = 10.5 fps $\Rightarrow \frac{2100}{(10.5)(60)}$ = 3

20 min = 0.33 hr

Basin R-1 - A = 96 Ac = 0.150 sq mi

(Section 73) CN $\Rightarrow$ 60% Business, Neighborhood Areas, Soil A (Use Soil B) + 40% Business, Commercial Areas, Soil A (Use Soil B)

$CN_{AVE} = (0.60)(92) + (0.40)(92) = 92$

TC $\Rightarrow$ 100' overland paved @ 1.0% $\pm$ = $\frac{1.8(1.1-0.90)\sqrt{100}}{\sqrt[3]{1.0}}$ = 4

$\Rightarrow$400' street @ 1.0% $\left(\frac{6005-6001}{400}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.010)^{1/2}$ = 4 fps $\Rightarrow \frac{400}{(4)(60)}$ = 2
(½-50' street, d=0.5')

$\Rightarrow$4100'-30" Ave RCP and street @ 1.3% $\left(\frac{6001-5949}{4100}\right)$

-30" Ave RCP = 9 fps

-street = $\left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.013)^{1/2}$ = 5 fps
(½-60' street, d=0.6')

Ave = $\frac{14}{2}$ = 7 fps $\Rightarrow \frac{4100}{(7)(60)}$ = 10

16 min = 0.27 hr

Basin R-2 - A = 73 Ac = 0.114 sq mi

(Section 74) CN $\Rightarrow$ 30% Industrial, Light Areas, Soil A (Use Soil B) + 5% Business, Neighborhood Areas, Soil A (Use Soil B) + 55% Residential, 4 Units/Ac, Soil C + 10% Industrial, Light Areas, Soil C

$CN_{AVE} = (0.30)(88) + (0.05)(92) + (0.55)(83) + (0.10)(91) = 86$

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TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 2600' street @ 4.9% $\left(\frac{6077-5949}{2600}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.049)^{1/2} = 8\text{ fps} \Rightarrow \frac{2600}{(8)(60)} = 5$
(½-50' street, d = 0.5')

⇒ 200'-24" Ave CMP and grass swale @ 1.0% $\left(\frac{5949-5947}{200}\right)$

-24" Ave CMP $= \left(\frac{1.49}{0.024}\right)\left(\frac{3.1}{6.3}\right)^{2/3}(0.010)^{1/2} = 4\text{ fps}$

-grass swale $= \left(\frac{1.49}{0.040}\right)\left(\frac{45.0}{60.1}\right)^{2/3}(0.010)^{1/2} = 3\text{ fps}$
(triangular section w/ 20 to 1 sides, d = 1.5')

Ave $= \frac{7}{2} = 3.5\text{ fps} \Rightarrow \frac{200}{(3.5)(60)} = 1$

18 min = 0.30 hr

Basin S-1 - A = 72 Ac = 0.113 sq mi

(Section 75) CN ⇒ 35% Residential, 4 Units/Ac, Soil A (Use Soil B) + 5% Business, Neighborhood Areas, Soil A (Use Soil B) + 60% Residential, 4 Units/Ac, Soil C

$CN_{AVE} = (0.35)(75) + (0.05)(92) + (0.60)(83) = 81$

TC ⇒ 100' overland grass @ 2.0% ± $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 3200' street @ 3.0% $\left(\frac{6083-5987}{3200}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.030)^{1/2} = 6\text{ fps} \Rightarrow \frac{3200}{(6)(60)} = 9$
(½-50' street, d = 0.5')

⇒ 1500'-30" Ave RCP and street @ 4.7% $\left(\frac{5987-5916}{1500}\right)$

-30" Ave RCP = 18 fps

-street $= \left(\frac{1.49}{0.016}\right)\left(\frac{6.3}{25.5}\right)^{2/3}(0.047)^{1/2} = 8\text{ fps}$
(½-50' street, d = 0.5')

Ave $= \frac{26}{2} = 13\text{ fps} \Rightarrow \frac{1500}{(13)(60)} = 2$

23 min = 0.38 hr

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Basin S-2 - A= 55 Ac = 0.0856 sq mi

(Section 76) CN ⇒ 15% OpenSpace, Fair Condition Grass Cover, Soil A (Use Soil B) +5% Industrial, Light Areas, Soil A (Use Soil B) + 5% Residential, 4 Units/Ac, Soil A (Use Soil B) + 65% Residential, 4 Units/Ac, Soil C + 5% Industrial, Light Areas, Soil C, +5% OpenSpace, Fair Condition Grass Cover, Soil C

$CN_{AVE} = (0.15)(69) + (0.05)(88) + (0.05)(75) + (0.65)(83) + (0.05)(91) + (0.05)(79) = 81$

TC ⇒ 100' overland grass @ 2.0% $= \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 2600' street @ 3.6% $\left(\frac{6081-5987}{2600}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.036)^{1/2} = 8\text{fps} \Rightarrow \frac{2600}{(8)(60)} = 5$
(½-60' street, d=0.6')

⇒ 950'-30" RCP and street @ 6.5% $\left(\frac{5987-5925}{950}\right)$

-30" RCP = 21 fps

-street $= \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.065)^{1/2} = 8\text{ fps}$
(½-40' street, d=0.4'

Ave $= \frac{29}{2} = 14.5\text{fps} \Rightarrow \frac{950}{(14.5)(60)} = 1$

⇒ 1000' natural channel @ 0.9% $\left(\frac{5925-5916}{1000}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{62.5}{31.2}\right)^{2/3}(0.009)^{1/2} = 2\text{fps} \Rightarrow \frac{1000}{(2)(60)} = 8$
(trapezoidal section w/ 2 to 1 sides, b=20', and d=2.5')

26 min = 0.43 hr

Basin T - A= 90 Ac = 0.141 sq mi

(Section 77) CN ⇒ 10% OpenSpace, Fair Condition Grass Cover, Soil A (Use Soil B) + 10% Residential, 4 Units/Ac, Soil A (Use Soil B) + 25% Industrial, Light Areas, Soil A (Use Soil B) + 30% Business, Neighborhood Areas, Soil A (Use Soil B) + 10% Residential, 4 Units/Ac, Soil B + 15% Residential, 4 Units/Ac, Soil C

$CN_{AVE} = (0.10)(69) + (0.10)(75) + (0.25)(88) + (0.30)(92) + (0.10)(75) + (0.15)(83) = 84$

TC ⇒ 100' overland paved @ 1.0% $t = \frac{1.8(1.1-0.90)\sqrt{100}}{\sqrt[3]{1.0}} = 4$

⇒ 1400' street @ 0.7% $\left(\frac{5986-5976}{1400}\right) = \left(\frac{1.49}{0.1016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.007)^{1/2} = 3\text{fps} \Rightarrow \frac{1400}{(3)(60)} = 8$
(½-60' street, d = 0.6')

⇒ 1150' - 24" Ave CMP and street @ 5.3% $\left(\frac{5976-5915}{1150}\right)$

- 24" Ave CMP $= \left(\frac{1.49}{0.1024}\right)\left(\frac{3.1}{6.3}\right)^{2/3}(0.053)^{1/2} = 9\text{ fps}$

- street $= \left(\frac{1.49}{0.1016}\right)\left(\frac{9.0}{30.6}\right)^{2/3}(0.053)^{1/2} = 9\text{fps}$
(½-60' street, d = 0.6')

Ave $= \frac{18}{2} = 9\text{fps} \Rightarrow \frac{1150}{(9)(60)} = 2$

⇒ 950' natural channel @ 0.4% $\left(\frac{5915-5911}{950}\right) = \left(\frac{1.49}{0.1100}\right)\left(\frac{94.5}{35.7}\right)^{2/3}(0.004)^{1/2} = 2\text{fps} \Rightarrow \frac{950}{(2)(60)} = 8$
(trapezoidal section w/ 2 to 1 sides, b = 20', d = 3.5')

$\Sigma t_{min} = 0.37 hr$

Basin U - A = 87 Ac = 0.136 sq mi

(Section 78) CN ⇒ 20% Residential, 4 Units/Ac, Soil A (Use Soil B) + 25% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 20% Industrial, Light Areas, Soil A (Use Soil B) + 15% Residential, 4 Units/Ac, Soil C + 15% Industrial, Light Areas, Soil C + 5% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.20)(75) + (0.25)(69) + (0.20)(88) + (0.15)(83) + (0.15)(91) + (0.05)(94) = 81$

TC ⇒ 100' overland grass @ 2.0% $t = \frac{1.8(1.1-0.25)\sqrt{100}}{\sqrt[3]{2.0}} = 12$

⇒ 700' street @ 1.4% $\left(\frac{6029-6019}{700}\right) = \left(\frac{1.49}{0.1016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.014)^{1/2} = 4\text{fps} \Rightarrow \frac{700}{(4)(60)} = 3$
(½-40' street, d = 0.4')

⇒ 350' - 24" Ave RCP and street @ 1.1% $\left(\frac{6019-6015}{350}\right)$

- 24" Ave RCP = 8 fps

- street $= \left(\frac{1.49}{0.1016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.011)^{1/2} = 3\text{fps}$
(½-40' street, d = 0.4')

Ave $= \frac{11}{2} = 5.5\text{fps} \Rightarrow \frac{350}{(5.5)(60)} = 1$

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$\Rightarrow$ 300' street @ 2.0% $\left(\frac{6015-6009}{300}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.020)^{1/2} = 4\text{fps} \Rightarrow \frac{300}{(4)(60)} = 1$
(½-40' street, d=0.4')

$\Rightarrow$ 550'-30" Ave RCP and street @ 1.3% $\left(\frac{6009-6002}{550}\right)$

-30" Ave RCP = 7 fps

-street $= \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.013)^{1/2} = 4\text{fps}$
(½-40' street, d=0.4')

Ave $= \frac{13}{2} = 6.5\text{fps} \Rightarrow \frac{550}{(6.5)(60)} = 1$

$\Rightarrow$ 1250' street @ 5.5% $\left(\frac{6002-5933}{1250}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{4.0}{20.4}\right)^{2/3}(0.055)^{1/2} = 7\text{fps} \Rightarrow \frac{1250}{(7)(60)} = 3$
(½-40' street, d=0.4')

$\Rightarrow$ 200'-24" Ave RCP and grass swale @ 12.5% $\left(\frac{5933-5908}{200}\right)$

-24" Ave RCP = 24 fps

-grass swale $= \left(\frac{1.49}{0.040}\right)\left(\frac{20.0}{40.0}\right)^{2/3}(0.125)^{1/2} = 8\text{fps}$
(triangular section w/ 20 to 1 sides and d=1')

Ave $= \frac{32}{2} = 16\text{fps} \Rightarrow \frac{200}{(16)(60)} = 1$

$\Rightarrow$ 2050' natural channel @ 1.0% $\left(\frac{5908-5887}{2050}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{78.0}{334}\right)^{2/3}(0.010)^{1/2} = 3\text{fps} \Rightarrow \frac{2050}{(3)(60)} = 11$
(trapezoidal section w/ 2 to 1 sides, b=20', d=3')

33 min = 0.55 hr

C. TR-20 EXISTING CONDITION ROUTING PARAMETER CALCULATIONS

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PROJ. Shooks Run SHEET 1

SUBJ. TR-20 Existing Basin Routing Parameters OF

Routing through Basin A-2

$\Rightarrow$ 500' natural channel @ 5.2% $\left(\frac{6380-6354}{500}\right) = \left(\frac{1.49}{0.080}\right)\left(\frac{32.0}{22.6}\right)^{2/3}(0.052)^{1/2} = 5$ fps
(Trapezoidal Section w/3 to 1 sides, b = 10', and d = 2')

$X = \left(\frac{1.49}{0.080}\right)\left(\frac{0.052^{1/2}}{10^{2/3}}\right) = 0.92$ $\quad m = \log\left[32.0^{5/3}\left(\frac{1}{1+\frac{(2)(2)}{10}\sqrt{1+3^2}}\right)^{2/3}\right] / \log 32.0 = 1.51$

Routing through Basin A-3

$\Rightarrow$ 2300' natural channel @ 3.1% $\left(\frac{6354-6283}{2300}\right) = \left(\frac{1.49}{0.080}\right)\left(\frac{57.0}{29.0}\right)^{2/3}(0.031)^{1/2} = 5$ fps
(Trapezoidal Section w/3 to 1 sides, b = 10', and d = 3')

$X = \left(\frac{1.49}{0.080}\right)\left(\frac{0.031^{1/2}}{10^{2/3}}\right) = 0.71$ $\quad m = \log\left[57.0^{5/3}\left(\frac{1}{1+\frac{(2)(3)}{10}\sqrt{1+3^2}}\right)^{2/3}\right] / \log 57.0 = 1.49$

Routing through Basin A-4

$\Rightarrow$ 550' grass-lined channel @ 4.5% $\left(\frac{6283-6258}{550}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{36.0}{26.5}\right)^{2/3}(0.045)^{1/2} = 10$ fps
(Trapezoidal Section w/4 to 1 sides, b = 10', and d = 2.5')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.045^{1/2}}{10^{2/3}}\right) = 1.70$ $\quad m = \log\left[36.0^{5/3}\left(\frac{1}{1+\frac{(2)(2.5)}{10}\sqrt{1+4^2}}\right)^{2/3}\right] / \log 36.0 = 1.46$

Routing through Basin A-5

$\Rightarrow$ 1800' grass-lined channel @ 1.7% $\left(\frac{6258-6228}{1800}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{66.0}{34.7}\right)^{2/3}(0.017)^{1/2} = 7$ fps
(Trapezoidal Section w/4 to 1 sides, b = 10', and d = 3')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.017^{1/2}}{10^{2/3}}\right) = 1.05$ $\quad m = \log\left[66.0^{5/3}\left(\frac{1}{1+\frac{(2)(3)}{10}\sqrt{1+4^2}}\right)^{2/3}\right] / \log 66.0 = 1.47$

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PROJ. Shooks Run SHEET 2

SUBJ. TR-20 Existing Basin Routing Parameters OF

Routing through Basin A-6

$\Rightarrow$ 1400' grass-lined channel @ 2.1% $\left(\frac{6228-6190}{1400}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{84.0}{62.14}\right)^{2/3}(0.027)^{1/2} = 7$ fps
(Trapezoidal section w/4 to 1 sides, b = 50' ±, and d = 1.5')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.027^{1/2}}{50^{2/3}}\right) = 0.45$ $\quad m = \log\left[84.0^{5/3}\left(\frac{1}{1+\frac{(2)(1.5)}{50}\sqrt{1+4^2}}\right)^{2/3}\right] / \log 84.0 = 1.63$

Routing through Basin A-7

$\Rightarrow$ 1500'-54" Ave RCP and street @ 1.0% $\left(\frac{6196-6181}{1500}\right) = \left(\frac{1.49}{0.0116}\right)\left(\frac{72.0}{120.0}\right)^{2/3}(0.010)^{1/2} = 7$ fps
(Use Street Only $\Rightarrow$ Triangular Section w/50 to 1 sides, and d = 1.2')

$X = \left(\frac{0.94}{0.0116}\right)\left(\frac{0.010^{1/2}}{50^{1/3}}\right) = 1.59$ $\quad m = 1.33$

Routing Basins A-1 thru A-7 through Basin A-10

$\Rightarrow$ 3250'-66" Ave RCP and street @ 1.3% $\left(\frac{6181-6140}{3250}\right) = \left(\frac{1.49}{0.0116}\right)\left(\frac{50.0}{100.0}\right)^{2/3}(0.013)^{1/2} = 7$ fps
(Use Street Only $\Rightarrow$ Triangular Section w/50 to 1 sides, and d = 1.0')

$X = \left(\frac{0.94}{0.0116}\right)\left(\frac{0.013^{1/2}}{50^{1/3}}\right) = 1.82$ $\quad m = 1.33$

Routing Basin A-9

$\Rightarrow$ 2400' - 36" Ave RCP and street @ 0.8% $\left(\frac{6177-6157}{2400}\right) = \left(\frac{1.49}{0.0116}\right)\left(\frac{18.0}{69.0}\right)^{2/3}(0.008)^{1/2} = 4$ fps
(Use Street Only $\Rightarrow$ Triangular Section w/50 to 1 sides, and d = 0.6')

$X = \left(\frac{0.94}{0.0116}\right)\left(\frac{0.008^{1/2}}{50^{1/3}}\right) = 1.43$ $\quad m = 1.33$

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PROJ. Shooks Run SHEET 3

SUBJ. TR-20 Existing Basin Routing Parameters OF

Routing Basins A-8 and A-9 through Basin A-10

$\Rightarrow$ 1450' - 66" Ave RCP and street @ 1.2% $\left(\frac{6157-6140}{1450}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{24.0}{19.6}\right)^{2/3}(0.012)^{1/2} = 14$ fps

(Use 66" RCP Only $\Rightarrow$ Use Trapezoidal Section w/0-to-1 sides, b=4.9', and d=4.9')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.012^{1/2}}{4.9^{2/3}}\right) = 4.35$ $\quad m = \log\left[24.0^{5/3}\left(1+\frac{1}{\frac{(2)(4.9)}{4.9}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 24.0 = 1.44$

Routing through Basin B-2

$\Rightarrow$ 1150' - 30" Ave RCP and street @ 2.7% $\left(\frac{6300-6269}{1150}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{18.0}{60.0}\right)^{2/3}(0.027)^{1/2} = 7$ fps

(Use Street Only $\Rightarrow$ Triangular Section w/50-to-1 sides, and d=0.6')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.027^{1/2}}{50^{1/3}}\right) = 2.62$ $\quad m = 1.33$

Routing through Basin B-3

$\Rightarrow$ 3550' - 54" Ave RCP and street @ 2.2% $\left(\frac{6269-6190}{3550}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{16.0}{16.0}\right)^{2/3}(0.022)^{1/2} = 17.0$ fps

(Use 54" RCP Only $\Rightarrow$ Use Trapezoidal Section w/0-to-1 Sides, b=4.0', and d=4.0')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.022^{1/2}}{4.0^{2/3}}\right) = 6.75$ $\quad m = \log\left[16.0^{5/3}\left(1+\frac{1}{\frac{(2)(4.0)}{4.0}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 16.0 = 1.40$

Routing Basins B-1 thru B-3 through Basin B-5

$\Rightarrow$ 900' - 60" RCP and street @ 2.0% $\left(\frac{6190-6172}{900}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{19.4}{17.6}\right)^{2/3}(0.020)^{1/2} = 17$ fps

(Use 60" RCP Only $\Rightarrow$ Use Trapezoidal Section w/0-to-1 Sides, b=4.4', and d=4.4')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.020^{1/2}}{4.4^{2/3}}\right) = 6.04$ $\quad m = \log\left[19.4^{5/3}\left(1+\frac{1}{\frac{(2)(4.4)}{4.4}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 19.4 = 1.42$

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PROJ. Shooks Run SHEET 4

SUBJ. TR-20 Existing Basin Routing Parameters OF

Routing Basin B-4 through Basin B-5

$\Rightarrow$ 3700' - 36" Ave RCP and street @ 2.0% $\left(\frac{6245-6172}{3700}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{12.5}{50.0}\right)^{2/3}(0.020)^{1/2} = 5$ fps

(Use street Only $\Rightarrow$ Triangular Section w/50-to-1 sides, and d=0.5')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.020^{1/2}}{50^{1/3}}\right) = 2.26$ $\quad m = 1.33$

Routing Basins B-1 thru B-5 through Basin B-7

$\Rightarrow$ 2300' - 60" Ave RCP and street @ 1.4% $\left(\frac{6172-6140}{2300}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{50.5}{110.0}\right)^{2/3}(0.014)^{1/2} = 7$ fps

(Use street Only $\Rightarrow$ Triangular Section w/50-to-1 sides, and d=1.1')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.014^{1/2}}{50^{1/3}}\right) = 1.89$ $\quad m = 1.33$

Routing Basin B-6 through Basin B-7

$\Rightarrow$ 2700' grass channel @ 1.4% $\left(\frac{6178-6140}{2700}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{32.0}{22.6}\right)^{2/3}(0.014)^{1/2} = 6$ fps

(Trapezoidal section w/3-to-1 sides, b=10', and d=2.0')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.014^{1/2}}{10^{2/3}}\right) = 0.95$ $\quad m = \log\left[32.0^{5/3}\left(\frac{1}{H\frac{(2)(2)}{10}\sqrt{1+3^2}}\right)^{2/3}\right] / \log 32.0 = 1.51$

COMP WHT

CK

DATE August 22, 1991

WILSON & COMPANY

LOC

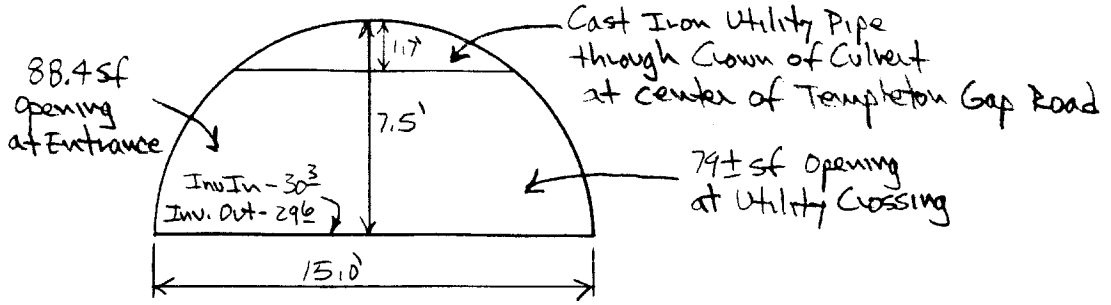
PROJ. Shooks Run

SUBJ. TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 5 OF

Templeton Gap Road Culvat Crossing



Semi-Circular CMP Arch w/ Concrete Bottom

⇒ 88.4sf Opening at Entrance ⇒ Use 13'5" x 8'5" CMPA for Inlet Control ⇒ Hdwall Entrance
⇒ 79±sf Opening at Utility Crossing ⇒ Use 12'6" x 7'11" CMPA for Outlet Control ⇒ $LS_o = 0.1$'

Elev.	Inlet HW	HW/D	Inlet Q	H_o(dc)	H	Outlet HW	Outlet Q	A
30.3	—	—	—	—	—	—	—	—
31.0	0.7	0.08	20	—	—	—	—	2.3
31.5	1.2	0.14	40	—	—	—	—	4.5
32.0	1.7	0.20	60	—	—	—	—	6.8
32.5	2.2	0.26	90	—	—	—	—	10.2
33.0	2.7	0.32	120	—	—	—	—	13.6
33.5	3.2	0.38	160	—	—	—	—	18.1
34.0	3.7	0.44	200	2.4	0.3	2.0	—	22.7
34.5	4.2	0.50	260	2.8	0.4	2.5	—	29.5
35.0	4.7	0.56	320	3.2	0.6	3.1	—	36.3
35.5	5.2	0.62	380	3.5	0.9	3.7	—	43.1
36.0	5.7	0.68	450	3.9	1.3	4.5	—	51.0
36.5	6.2	0.74	520	4.2	1.7	5.2	—	58.9
37.0	6.7	0.80	580	4.5	2.1	5.9	—	65.7
37.5	7.2	0.86	640	4.7	2.6	6.6	—	72.5
38.0	7.7	0.91	700	4.9	3.1	7.3	—	79.3
38.5	8.2	0.97	760	5.2	3.5	8.0	—	86.1
39.0	8.7	1.03	820	5.5	3.9	8.7	800	88.4
39.5	9.2	1.09	880	5.5	4.1	9.2	850	88.5
40.0	9.7	1.15	940	5.6	4.8	9.7	880	88.6
40.5	10.2	1.21	1000	5.8	5.1	10.2	910	88.7
41.0	10.7	1.27	1050	5.9	5.5	10.7	940	88.8
41.5	11.2	1.33	1100	6.0	5.9	11.2	970	88.9
42.0	11.7	1.39	1140	6.1	6.3	11.7	1000	89.0
42.5	12.2	1.45	1180	6.2	6.7	12.2	1030	89.1
43.0	12.7	1.51	1220	6.3	7.1	12.7	1060	89.2

COMP WHT

CK

DATE August 22, 1991

WILSON & COMPANY

LOC

PROJ Shooks Run

SUBJ TR-20 Existing Basin Routing Parameters

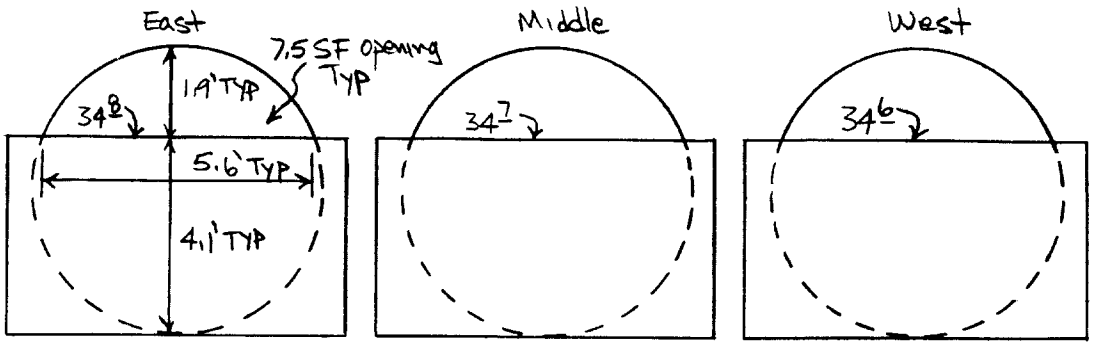
FILE 90-809

SHEET 6

OF

Van Buren Channel Diversion at Templeton Gap Road

Railroad Culvert Crossing



3-72" CMP w/ steel plates across lower portion

⇒ 7.5 sf Opening ⇒ Use Ave. Btwn. 42"x29" CMPA & 49"x33" CMPA for Inlet Control analysis ⇒ Average Inv. = 34.2 ⇒ Overflow = 40.1 (Projecting Entrance)

Elev	HW	HW/D	Q/Barrel	Total Q	A/Barrel	Total A
34.7	—	—	—	—	—	—
35.0	0.3	0.1	1	3	0.2	0.6
35.5	0.8	0.3	5	15	1.2	3.6
36.0	1.3	0.5	11	33	2.6	7.8
36.5	1.8	0.7	20	60	4.8	14.4
37.0	2.3	0.9	26	78	6.1	18.3
37.5	2.8	1.1	35	105	7.5	22.5
38.0	3.3	1.3	41	123	7.5	22.6
38.5	3.8	1.5	49	147	7.5	22.7
39.0	4.3	1.7	55	165	7.5	22.8
39.5	4.8	1.9	60	180	7.5	22.9
40.0	5.3	2.1	64	192	7.5	23.0
40.5	5.8	2.2	68	204	7.5	23.1
41.0	6.3	2.4	72	216	7.5	23.2
41.5	6.8	2.6	75	225	7.5	23.3
42.0	7.3	2.8	78	234	7.5	23.4
42.5	7.8	3.0	81	243	7.5	23.5
43.0	8.3	3.2	84	252	7.5	23.6

COMP WHJ

CK.

DATE August 23, 1991

WILSON & COMPANY

LOC.

PROJ. Shooks Run

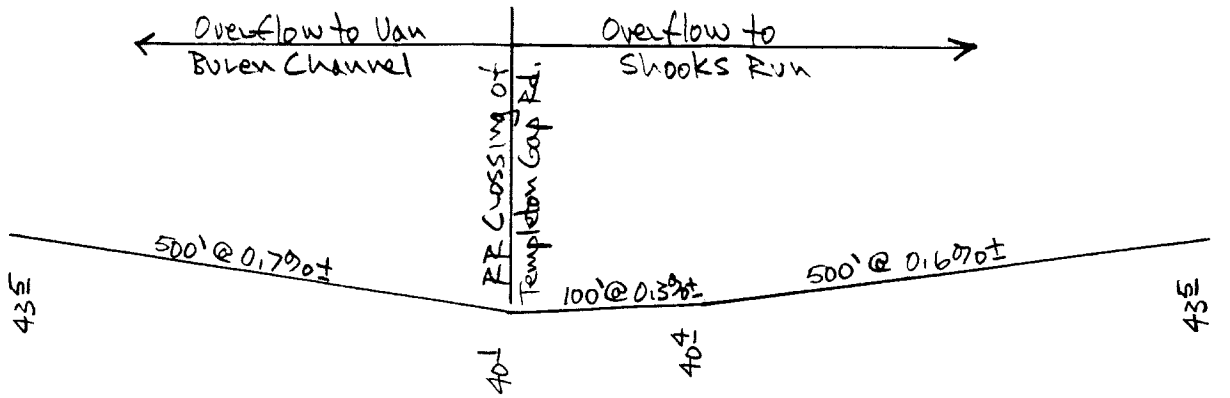
SUBJ. TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 7

OF

Overflow - Railroad and Templeton Gap Road



⇒ Analyze as Simple Weir ⇒ $Q = CLH^{3/2}$ $C = 3.0$

Elev	H	Van Buren L	Van Buren H(Ave)	Van Buren Q	Van Buren A	Shooks West L	Shooks West H(Ave)	Shooks West Q	Shooks West A	Shooks East L	Shooks East H(Ave)	Shooks East Q	Shooks East A	Total Q	Total A
401	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
405	0.4	57	0.2	15	11.4	100	0.25	38	25	17	0.05	1	0.9	54	37.3
410	0.9	129	0.45	117	58.1	100	0.75	195	75	100	0.30	49	30.0	361	163.1
415	1.4	200	0.7	351	140.0	100	1.25	419	125	183	0.55	224	100.7	994	365.7
420	1.9	271	0.95	753	257.5	100	1.75	695	175	267	0.80	573	213.6	2021	646.1
425	2.4	343	1.2	1353	411.6	100	2.25	1013	225	350	1.05	1130	361.5	3496	1004.1
430	2.9	414	1.45	2169	600.3	100	2.75	1368	275	433	1.30	1925	562.9	5462	1438.2

COMP WHH

CK

DATE August 26, 1991

WILSON & COMPANY

LOC

PROJ Shooks Run

SUBJ TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 8

OF

Flow Split Summary

Elev	Van Buren Culvert	Van Buren Overflow	Van Buren Total	Van Buren Area	Shooks Run Culverts	Shooks Run Overflow	Shooks Run Total	Shooks Run Area	Total
30.3	–	–	–	–	–	–	–	–	–
31.0	20	–	–	2.3	–	–	–	–	20
31.5	40	–	–	4.5	–	–	–	–	40
32.0	60	–	–	6.8	–	–	–	–	60
32.5	90	–	–	10.2	–	–	–	–	90
33.0	120	–	–	13.6	–	–	–	–	120
33.5	160	–	–	18.1	–	–	–	–	160
34.0	200	–	–	22.7	–	–	–	–	200
34.5	260	–	–	29.5	–	–	–	–	260
35.0	320	–	–	36.3	3	–	3	0.6	323
35.5	380	–	–	43.1	15	–	15	3.6	395
36.0	450	–	–	51.0	33	–	33	7.8	483
36.5	520	–	–	58.9	60	–	60	14.4	580
37.0	580	–	–	65.7	78	–	78	18.3	658
37.5	640	–	–	72.5	105	–	105	22.5	745
38.0	700	–	–	79.3	123	–	123	22.6	823
38.5	760	–	–	86.1	147	–	147	22.7	907
39.0	800	–	–	88.4	165	–	165	22.8	965
39.5	850	–	–	88.5	180	–	180	22.9	1030
40.0	880	–	–	88.6	192	–	192	23.0	1072
40.5	910	15	925	100.1	204	39	243	49.0	1168
41.0	940	117	1057	146.9	216	244	460	128.2	1517
41.5	970	351	1321	228.9	225	643	868	249.0	2189
42.0	1000	753	1753	346.5	234	1268	1502	412.0	3255
42.5	1030	1353	2583	500.7	243	2143	2386	616.0	4969
43.0	1060	2169	3229	689.5	252	3293	3545	861.5	6774

⇒ Van Buren Channel Upstream of Templeton Gap Road - Conc. Lined $w/b = 6'$, $d = 5.5'$, $z = 1$ to 1, and $s = 0.6\%$

$$v = \left(\frac{1.49}{0.013}\right)\left(\frac{63.3}{21.6}\right)^{2/3}(0.006)^{1/2} = 18.2 \text{ fps} \Rightarrow Q = (18.2)(63.3) = 1152 \text{ cfs}$$

⇒ Van Buren Channel Downstream of Templeton Gap Road - Conc. Lined $w/b = 11'$, $d = 4'$, $z = 1.5$ to 1, and $s = 0.9\%$

$$v = \left(\frac{1.49}{0.013}\right)\left(\frac{68.0}{25.4}\right)^{2/3}(0.009)^{1/2} = 21.0 \text{ fps} \Rightarrow Q = (21.0)(68.0) = 1428 \text{ cfs}$$

COMP (JWH)

CK

DATE August 12, 1991

WILSON & COMPANY

LOC

PROJ Shooks Run

SUBJ. TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 9

OF

Routing Basins A & B through Basin C

$\Rightarrow$ 3850' grass lined channel @ 1.0% $\left(\frac{6129-6089}{3850}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{126.0}{47.1}\right)^{2/3}(0.010)^{1/2} = 7.0$ fps
(trapezoidal section w/ 4 to 1 sides, b = 10', and d = 4.5')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.010^{1/2}}{10^{2/3}}\right) = 0.80$ $\quad m = \log\left[126.0^{5/3}\left(\frac{1}{1+\frac{(2)(4.5)}{10}\sqrt{1+4^2}}\right)^{2/3}\right] / \log 126.0 = 1.45$

Routing Basin D-1 through Basins D-2, D-3, and D-5

$\Rightarrow$ 3700' - 42" dia RCP and street @ 3.2% $\left(\frac{6345-6227}{3700}\right) \Rightarrow \left(\frac{1.49}{0.013}\right)\left(\frac{9.6}{12.4}\right)^{2/3}(0.032)^{1/2} = 17$ fps
(Use 42" RCP dia Only $\Rightarrow$ Use Trapezoidal Section w/ 0 to 1 sides, b = 3.1', and d = 3.1')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.032^{1/2}}{3.1^{2/3}}\right) = 9.64$ $\quad m = \log\left[9.6^{5/3}\left(\frac{1}{1+\frac{(2)(3.1)}{3.1}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 9.6 = 1.34$

Routing Basin D-2 through Basin D-3

$\Rightarrow$ 2300' - 36" dia RCP and street @ 3.7% $\left(\frac{6314-6229}{2300}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{12.5}{50.0}\right)^{2/3}(0.037)^{1/2} = 7$ fps
(Use Street Only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 0.5')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.037^{1/2}}{50^{2/3}}\right) = 3.07$ $\quad m = 1.33$

Routing Basin D-4 through Basin D-5

$\Rightarrow$ 3100' - street @ 1.0% $\left(\frac{6259-6227}{3100}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{40.5}{90.0}\right)^{2/3}(0.010)^{1/2} = 5$ fps
(Triangular Section w/ 50 to 1 sides and d = 0.9')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.010^{1/2}}{50^{2/3}}\right) = 1.59$ $\quad m = 1.33$

Routing Basins D-1 thru D-5 through Basin D-9

$\Rightarrow$ 1750' - grass lined channel @ 1.5% $\left(\frac{6226-6199}{1750}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{89.3}{37.1}\right)^{2/3}(0.015)^{1/2} = 8$ fps
(trapezoidal Section w/ 3 to 1 sides, b = 15', and d = 3.5')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.015^{1/2}}{15^{2/3}}\right) = 0.75$ $\quad m = \log\left[89.3^{5/3}\left(\frac{1}{1+\frac{(2)(3.5)}{15}\sqrt{1+3^2}}\right)^{2/3}\right] / \log 89.3 = 1.53$

COMP WHH

CK

DATE August 13, 1991

WILSON & COMPANY

LOC

PROJ Shooks Run

SUBJ TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 10 OF

Routing Basin D-7

$\Rightarrow$ 2350' - 48" Ave RCP and street @ 0.17% $\left(\frac{6241-6225}{2350}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{32.0}{80.0}\right)^{2/3}(0.007)^{1/2} = 4$ fps
(Use street only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 0.8')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.007^{1/2}}{50^{1/3}}\right) = 1.33$ $\quad m = 1.33$

Routing Basins D-6 & D-7 through Basin D-10

$\Rightarrow$ 3400' - 54" Ave RCP and street @ 2.49% $\left(\frac{6225-6143}{3400}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{40.5}{70.0}\right)^{2/3}(0.024)^{1/2} = 8$ fps
(Use street only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 0.9')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.024^{1/2}}{50^{1/3}}\right) = 2.47$ $\quad m = 1.33$

Routing Basin D-8 through Basin D-9

$\Rightarrow$ 1800' street @ 2.59% $\left(\frac{6248-6203}{1800}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{18.0}{60.0}\right)^{2/3}(0.025)^{1/2} = 7$ fps
(Triangular section w/ 50 to 1 sides, and d = 0.6')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.025^{1/2}}{50^{1/3}}\right) = 2.52$ $\quad m = 1.33$

Routing Basins D-1 thru D-5 and D-8 & D-9 through Basin D-10

$\Rightarrow$ 2250' - 78" Ave CMP and street @ 2.59% $\left(\frac{6199-6143}{2250}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{60.5}{110.0}\right)^{2/3}(0.025)^{1/2} = 10$ fps
(Use Street Only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 1.1')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.025^{1/2}}{50^{1/3}}\right) = 2.52$ $\quad m = 1.33$

Routing Basins D-1 thru D-10 through Basin D-15

$\Rightarrow$ 2900' - 90" Ave CMP and street @ 1.29% $\left(\frac{6143-6108}{2900}\right) \Rightarrow \left(\frac{1.49}{0.016}\right)\left(\frac{112.5}{150.0}\right)^{2/3}(0.012)^{1/2} = 8$ fps
(Use street Only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 1.5')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.012^{1/2}}{50^{1/3}}\right) = 1.75$ $\quad m = 1.33$

COMP

CK

DATE August 13, 1991

WILSON & COMPANY

LOC

PROJ Shooks Run

SUBJ TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 11

OF

Routing Basin D-11 through Basin D-15

$\Rightarrow$ 1200' grass lined channel @ 1.2% $\left(\frac{6122-6108}{1200}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{36.0}{26.5}\right)^{2/3}(0.012)^{1/2} = 5$ fps
(trapezoidal section w/4 to 1 sides, b = 10', and d = 2')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.012^{1/2}}{10^{2/3}}\right) = 0.88$ $\quad m = \log\left[36.0^{5/3}\left(\frac{1}{1+\frac{(2)(2)}{10}\sqrt{1+4^2}}\right)^{2/3}\right] / \log 36.0 = 1.49$

Routing Basin D-13

$\Rightarrow$ 2000' - 54" Ave RCP and Street @ 1.0% $\left(\frac{6160-6141}{2000}\right) \Rightarrow \left(\frac{1.49}{0.013}\right)\left(\frac{16.0}{16.0}\right)^{2/3}(0.010)^{1/2} = 11$ fps
(Use 54" Ave RCP only $\Rightarrow$ Use Trapezoidal Section w/0 to 1 sides, b = 4.0', and d = 4.0')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.010^{1/2}}{4^{2/3}}\right) = 4.55$ $\quad m = \log\left[16.0^{5/3}\left(\frac{1}{1+\frac{(2)(4)}{4}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 16.0 = 1.40$

Routing Basin D-14

$\Rightarrow$ 1700' - 78" Ave RCP and street @ 0.8% $\left(\frac{6141-6128}{1700}\right) \Rightarrow \left(\frac{1.49}{0.013}\right)\left(\frac{33.6}{23.2}\right)^{2/3}(0.008)^{1/2} = 13$ fps
(Use 78" Ave RCP only $\Rightarrow$ Use Trapezoidal Section w/0 to 1 sides, b = 5.8', and d = 5.8')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.008^{1/2}}{5.8^{2/3}}\right) = 3.18$ $\quad m = \log\left[33.6^{5/3}\left(\frac{1}{1+\frac{(2)(5.8)}{5.8}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 33.6 = 1.46$

Routing Basins D-12 thru D-14 through Basin D-15

$\Rightarrow$ 1300' grass lined channel @ 1.5% $\left(\frac{6128-6108}{13}\right) \Rightarrow \left(\frac{1.49}{0.040}\right)\left(\frac{84.0}{38.9}\right)^{2/3}(0.015)^{1/2} = 8$ fps
(trapezoidal section w/4 to 1 sides, b = 10', and d = 3.5')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.015^{1/2}}{10^{2/3}}\right) = 0.98$ $\quad m = \log\left[84.0^{5/3}\left(\frac{1}{1+\frac{(2)(3.5)}{10}\sqrt{1+4^2}}\right)^{2/3}\right] / \log 84.0 = 1.46$

COMP WMD

CK

DATE January 8, 1992

WILSON & COMPANY

LOC

PROJ. Shocks Run

SUBJ TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 12 Rev

OF

Patty Jewett Detention Pond

Revised Based on Field Survey by City Engineering Division

December 1991

Outlet

2-48" CMP ⇒ Headwall Entrance ⇒ $LS_0 = 0.2'$

Elev.	Inlet HW	Hw/D	Inlet Q	Ho(dc)	H	Outlet HW	Outlet Q	Total Q
04.5	—	—	—	—	—	—	—	—
05.0	0.5	0.13	5	0.4	0.1	0.3	—	10
06.0	1.5	0.38	15	1.4	0.1	1.3	—	30
07.0	2.5	0.63	35	1.7	0.3	1.8	—	70
08.0	3.5	0.88	60	2.3	0.7	2.3	—	120
09.0	4.5	1.13	85	2.8	1.5	4.1	—	170
10.0	5.5	1.38	105	3.1	2.3	5.2	—	210
11.0	6.5	1.63	125	3.3	3.3	6.4	—	250
12.0	7.5	1.88	140	3.5	4.1	7.4	—	280
13.0	8.5	2.13	155	3.6	5.1	8.5	155	310
13.5	9.0	2.25	160	3.6	5.6	9.0	160	320
14.0	9.5	2.38	165	3.7	6.0	9.5	165	330
14.5	10.0	2.50	170	3.7	6.5	10.0	170	340
15.0	10.5	2.63	175	3.8	6.9	10.5	175	350
15.5	11.0	2.75	180	3.8	7.4	11.0	180	360
16.0	11.5	2.88	185	3.9	7.8	11.5	185	370
16.5	12.0	3.00	190	3.9	8.3	12.0	190	380
17.0	12.5	3.13	195	4.0	8.7	12.5	195	390
17.5	13.0	3.25	200	4.0	9.2	13.0	200	400
18.0	13.5	3.38	205	4.0	9.7	13.5	205	410
18.5	14.0	3.50	210	4.0	10.2	14.0	210	420
19.0	14.5	3.63	215	4.0	10.7	14.5	215	430
19.5	15.0	3.75	220	4.0	11.2	15.0	220	440
20.0	15.5	3.88	225	4.0	11.7	15.5	225	450

COMP WHT

CK

DATE January 8, 1992

WILSON & COMPANY

LOC

PROJ Shooks Run

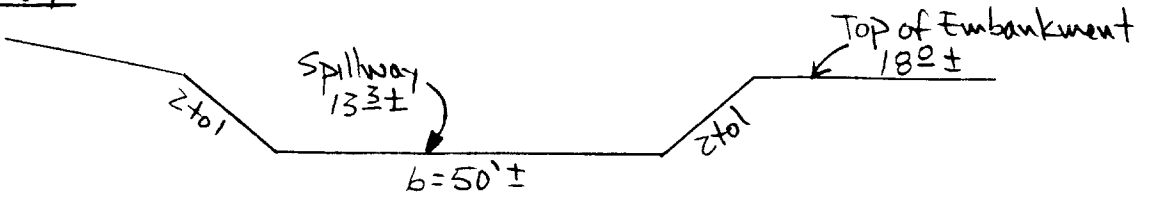
SUBJ TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 13 Rev

OF

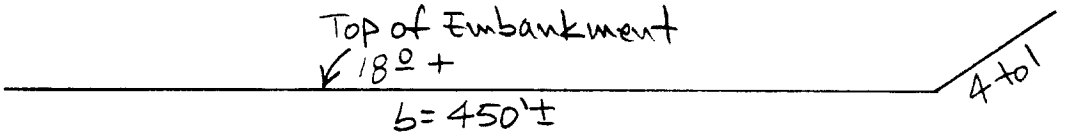
Spillway



⇒ Analyze as Simple Weir ⇒ $Q = CLH^{3/2}$ $C = 3.0$

Elev	H	L	Q
13.3	—	—	—
13.5	0.2	50.4	15
14.0	0.7	51.4	90
14.5	1.2	52.4	205
15.0	1.7	53.4	355
15.5	2.2	54.4	535
16.0	2.7	55.4	735
16.5	3.2	56.4	970
17.0	3.7	57.4	1225
17.5	4.2	58.4	1510
18.0	4.7	59.4	1815
18.5	5.2	60.4	2150
19.0	5.7	61.4	2505
19.5	6.2	62.4	2890
20.0	6.7	63.4	3300

Embankment Overflow



⇒ Analyze as Simple Weir ⇒ $Q = CLH^{3/2}$ $C = 3.0$

Elev	H	L	Q
18.0	—	—	—
18.5	0.5	451	480
19.0	1.0	452	1355
19.5	1.5	453	2495
20.0	2.0	454	3850

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Patty Jewett Detention Pond - Stage/Storage/Discharge Summary

Elev.	Surface Area(Ac)	Total Volume(AF)	Outlet	Spillway	Embankment Overflow	Total Discharge
04.5	—	—	—	—	—	—
05.0	0.35	0.09	10	—	—	10
06.0	1.04	0.78	30	—	—	30
07.0	1.61	2.11	70	—	—	70
08.0	2.18	4.00	120	—	—	120
09.0	2.53	6.36	170	—	—	170
10.0	2.87	9.06	210	—	—	210
11.0	3.22	12.10	250	—	—	250
12.0	3.57	15.50	280	—	—	280
13.0	3.89	19.23	310	—	—	310
13.5	4.04	21.21	320	15	—	335
14.0	4.20	23.27	330	90	—	420
14.5	4.33	25.40	340	205	—	545
15.0	4.46	27.60	350	355	—	705
15.5	4.59	29.86	360	535	—	895
16.0	4.72	32.22	370	735	—	1105
16.5	4.88	34.62	380	970	—	1350
17.0	5.04	37.10	390	1225	—	1615
17.5	5.19	39.65	400	1510	—	1910
18.0	5.35	42.29	410	1815	—	2225
18.5	5.75	45.06	420	2150	480	3050
19.0	6.15	48.01	430	2505	1355	4290
19.5	6.55	51.21	440	2890	2495	5825
20.0	6.95	54.59	450	3300	3850	7600

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Routing Basin D-16

$\Rightarrow$ 2450' grass lined channel @ 0.7% $\left(\frac{6108-6090}{2450}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{300.0}{71.8}\right)^{2/3}(0.007)^{1/2} = 8$ fps
(Trapezoidal section w/ 4 to 1 sides, $b = 10'$, and $d = 7.5'$)

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.007^{1/2}}{10^{2/3}}\right) = 0.67$ $\quad m = \log\left[300.0^{5/3}\left(\frac{1}{1+\frac{(2)(7.5)}{10}\sqrt{1+4^2}}\right)^{2/3}\right] / \log 300.0 = 1.44$

Routing Basin E

$\Rightarrow$ 1250' concrete lined channel @ 1.0% $\left(\frac{6084-6071}{1250}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{119.0}{29.8}\right)^{2/3}(0.010)^{1/2} = 29$ fps
(Trapezoidal section w/ 1 to 1 sides, $b = 10'$, and $d = 7'$)

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.010^{1/2}}{10^{2/3}}\right) = 2.47$ $\quad m = \log\left[119.0^{5/3}\left(\frac{1}{1+\frac{(2)(7)}{10}\sqrt{1+1^2}}\right)^{2/3}\right] / \log 119.0 = 1.51$

Routing Basin F

$\Rightarrow$ 700' natural channel @ 1.1% $\left(\frac{6071-6057-6' \text{ Drop}}{700}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{598.0}{78.1}\right)^{2/3}(0.011)^{1/2} = 6$ fps
(Trapezoidal section w/ 2 to 1 sides, $b = 20'$, and $d = 13'$)

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.011^{1/2}}{20^{2/3}}\right) = 0.21$ $\quad m = \log\left[598.0^{5/3}\left(\frac{1}{1+\frac{(2)(13)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 598.0 = 1.52$

Routing Basins A thru F through Basin I-2

$\Rightarrow$ 2650' natural channel @ 1.1% $\left(\frac{6057-6027}{2650}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{598.0}{78.1}\right)^{2/3}(0.011)^{1/2} = 6$ fps
(trapezoidal section w/ 2 to 1 sides, $b = 20'$, and $d = 13'$)

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.011^{1/2}}{20^{2/3}}\right) = 0.21$ $\quad m = \log\left[598.0^{5/3}\left(\frac{1}{1+\frac{(2)(13)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 598.0 = 1.52$

Routing Basin G through Basin I-2

$\Rightarrow$ 1050' natural channel @ 1.2% $= \left(\frac{1.49}{0.100}\right)\left(\frac{78.0}{33.4}\right)^{2/3}(0.012)^{1/2} = 3$ fps
(trapezoidal section w/ 2 to 1 sides, $b = 20'$, and $d = 3'$)

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.012^{1/2}}{20^{2/3}}\right) = 0.22$ $\quad m = \log\left[78.0^{5/3}\left(\frac{1}{1+\frac{(2)(3)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 78.0 = 1.59$

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Routing Basin H through Basin I-2

$\Rightarrow$ 650' natural channel @ 1.12% $= \left(\frac{1.49}{0.100}\right)\left(\frac{78.0}{33.4}\right)^{2/3}(0.012)^{1/2} = 3$ fps
(trapezoidal section w/2 to 1 sides, b=20', and d=3')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.012^{1/2}}{20^{2/3}}\right) = 0.22$ $\quad m = \log\left[78.0^{5/3}\left(\frac{1}{1+\frac{(2)(3)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 78.0 = 1.59$

Routing Basin I-1 through Basin I-2

$\Rightarrow$ 1800' - 48" Ave RCP and street @ 0.15% (min) $= \left(\frac{1.49}{0.016}\right)\left(\frac{32.0}{80.0}\right)^{2/3}(0.005)^{1/2} = 4$ fps
(Use street only $\Rightarrow$ Triangular Section w/50 to 1 sides and d=0.8')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.005^{1/2}}{50^{1/3}}\right) = 1.13$ $\quad m = 1.33$

Routing Basin J

$\Rightarrow$ 1700' - natural channel @ 1.09% $\left(\frac{6027-6010}{1700}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{598.0}{78.1}\right)^{2/3}(0.010)^{1/2} = 6$ fps
(trapezoidal section w/2 to 1 sides, b=20', and d=13')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.010^{1/2}}{20^{2/3}}\right) = 0.20$ $\quad m = \log\left[598.0^{5/3}\left(\frac{1}{1+\frac{(2)(13)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 598.0 = 1.52$

Routing Basin K-2

$\Rightarrow$ 500' - 60" RCP and grass swale @ 1.09% $\left(\frac{6098-6093}{500}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{19.4}{17.6}\right)^{2/3}(0.010)^{1/2} = 12$ fps
(Use 60" RCP Only $\Rightarrow$ Use Trapezoidal Section w/0 to 1 sides, b=4.4', and d=4.4')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.010^{1/2}}{4.4^{2/3}}\right) = 4.27$ $\quad m = \log\left[19.4^{5/3}\left(\frac{1}{1+\frac{(2)(4.4)}{4.4}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 19.4 = 1.42$

Routing Basin K-3

$\Rightarrow$ 2750' - 66" Ave RCP and grass swale @ 1.09% $\left(\frac{6093-6066}{2750}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{24.0}{19.6}\right)^{2/3}(0.010)^{1/2} = 13$ fps
(Use 66" Ave RCP Only $\Rightarrow$ Use Trapezoidal Section w/0 to 1 sides, b=4.9', and d=4.9')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.010^{1/2}}{4.9^{2/3}}\right) = 3.97$ $\quad m = \log\left[24.0^{5/3}\left(\frac{1}{1+\frac{(2)(4.9)}{4.9}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 24.0 = 1.44$

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Routing Basin K-4

$\Rightarrow$ 2800'-66" Ave RCP and grass swale @ 1.09% $\left(\frac{6066-6033}{2800}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{24.0}{19.16}\right)^{2/3}(0.010)^{1/2} = 13$ fps
(Use 66" RCP Only $\Rightarrow$ Use Trapezoidal Section w/0 to 1 sides, b = 4.9', and d = 4.9')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.010^{1/2}}{4.9^{2/3}}\right) = 3.97$ $\quad m = \log\left[24.0^{5/3}\left(\frac{1}{1+\frac{(2)(4A)}{4.9}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 24.0 = 1.44$

Routing Basins A thru K through Basin L-7

$\Rightarrow$ 1250'-natural channel @ 1.1% $\left(\frac{6010-5996}{1250}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{750.0}{87.1}\right)^{2/3}(0.011)^{1/2} = 7$ fps
(Trapezoidal section w/ 2 to 1 sides, b = 20', and d = 15')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.011^{1/2}}{20^{2/3}}\right) = 0.21$ $\quad m = \log\left[750.0^{5/3}\left(\frac{1}{1+\frac{(2)(15)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 750.0 = 1.52$

Routing Basin L-2

$\Rightarrow$ 4050'-42" Ave CMP and street @ 2.10% $\left(\frac{6091-6019}{4050}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{18.0}{60.10}\right)^{2/3}(0.020)^{1/2} = 6$ fps
(Use street only $\Rightarrow$ Triangular section w/ 50 to 1 sides and d = 0.6')

$X = \left(\frac{0.99}{0.016}\right)\left(\frac{0.020^{1/2}}{50^{1/3}}\right) = 2.26$ $\quad m = 1.33$

Routing Basin L-4

$\Rightarrow$ 3600'-30" Ave RCP and street @ 0.99% $\left(\frac{6090-6059}{3600}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{32.0}{80.0}\right)^{2/3}(0.009)^{1/2} = 5$ fps
(Use street only $\Rightarrow$ Triangular section w/ 50 to 1 sides and d = 0.8'

$X = \left(\frac{0.99}{0.016}\right)\left(\frac{0.009^{1/2}}{50^{1/3}}\right) = 1.51$ $\quad m = 1.33$

Routing Basins L-3 and L-4 through Basin L-6

$\Rightarrow$ 2100'-36" Ave RCP and street @ 0.99% $\left(\frac{6059-6041}{2100}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{40.5}{90.0}\right)^{2/3}(0.009)^{1/2} = 5$ fps
(Use street only $\Rightarrow$ Triangular section w/ 50 to 1 sides and d = 0.9'

$X = \left(\frac{0.99}{0.016}\right)\left(\frac{0.009^{1/2}}{50^{1/3}}\right) = 1.51$ $\quad m = 1.33$

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Routing Basin L-5 through Basin L-6

$\Rightarrow$ 2600' - 36" Ave RCP and street @ 0.8% $\left(\frac{6061-6041}{2600}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{24.5}{70.0}\right)^{2/3}(0.008)^{1/2} = 4$ fps

(Use street Only $\Rightarrow$ Triangular Section w/ 50 to 1 sides, and d = 0.7')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.008^{1/2}}{50^{1/3}}\right) = 1.43$ $\quad m = 1.33$

Routing Basins L-3 thru L-6 through Basin L-7

$\Rightarrow$ 2700' - 42" Ave RCP and street @ 0.9% $\left(\frac{6041-6018}{2700}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{60.5}{110}\right)^{2/3}(0.009)^{1/2} = 6$ fps

(Use street Only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 1.1')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.009^{1/2}}{50^{1/3}}\right) = 1.51$ $\quad m = 1.33$

Routing Basin M-1 through Basin M-2

$\Rightarrow$ 650' - 36" Ave RCP and street @ 4.0% $\left(\frac{6016-5990}{650}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{18.0}{60.0}\right)^{2/3}(0.040)^{1/2} = 8$ fps

(Use street only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 0.6')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.040^{1/2}}{50^{1/3}}\right) = 3.19$ $\quad m = 1.33$

Routing Basins A thru L through Basin M-2

$\Rightarrow$ 1800' - natural channel @ 0.9% $\left(\frac{5996-5979}{1800}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{832.0}{97.6}\right)^{2/3}(0.009)^{1/2} = 6$ fps

(trapezoidal section w/ 2 to 1 sides, b = 20' and d = 1.6')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.009^{1/2}}{20^{2/3}}\right) = 0.19$ $\quad m = \log\left[832.0^{5/3}\left(\frac{1}{1+\frac{(2)(1.6)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 832.0 = 1.52$

Routing Basin N

$\Rightarrow$ 1900' - riprap channel @ 0.9% $\left(\frac{5979-5962}{1900}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{462.0}{69.2}\right)^{2/3}(0.009)^{1/2} = 13$ fps

(trapezoidal section w/ 2 to 1 sides, b = 20', and d = 1.1')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.009^{1/2}}{20^{2/3}}\right) = 0.48$ $\quad m = \log\left[462.0^{5/3}\left(\frac{1}{1+\frac{(2)(1.1)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 462.0 = 1.53$

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Routing Basin O-1 through Basin O-3

$\Rightarrow$ 1350' - 60" RCP and street @ 1.49% $\left(\frac{6115-6096}{1350}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{19.4}{17.6}\right)^{2/3}(0.014)^{1/2} = 14$ fps

(Use 60" RCP Only $\Rightarrow$ Trapezoidal Section w/0 to 1 sides, b = 4.4', and d = 4.4'

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.014^{1/2}}{4.4^{2/3}}\right) = 5.05$ $\quad m = \log\left[19.4^{5/3}\left(\frac{1}{1+\frac{(2)(4.4)}{4.4}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 19.4 = 1.42$

Routing Basin O-2 through Basin O-3

$\Rightarrow$ 1900' - 30" Ave RCP and street @ 2.39% $\left(\frac{6140-6096}{1900}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{12.5}{50.0}\right)^{2/3}(0.023)^{1/2} = 6$ fps

(Use street only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 0.5')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.023^{1/2}}{50^{1/3}}\right) = 2.42$ $\quad m = 1.33$

Routing Basins O-1 thru O-3 through Basin O-4

$\Rightarrow$ 1200' - 2 - 60" RCP and street @ 0.16% $\left(\frac{6096-6089}{1200}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{19.4}{17.6}\right)^{2/3}(0.006)^{1/2} = 9$ fps

(Use 60" RCP only $\Rightarrow$ Trapezoidal Section w/ 0 to 1 sides, b = 4.4', and d = 4.4')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.006^{1/2}}{4.4^{2/3}}\right) = 3.31$ $\quad m = \log\left[19.4^{5/3}\left(\frac{1}{1+\frac{(2)(4.4)}{4.4}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 19.4 = 1.42$

Routing Basins O-1 thru O-4 through Basin O-5

$\Rightarrow$ 1800' - 2 - 66" RCP and street @ 1.29% $\left(\frac{6089-6068}{1800}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{24.0}{19.6}\right)^{2/3}(0.012)^{1/2} = 14$ fps

(Use 66" RCP Only $\Rightarrow$ Trapezoidal Section w/ 0 to 1 sides, b = 4.9', and d = 4.9')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.012^{1/2}}{4.9^{2/3}}\right) = 4.35$ $\quad m = \log\left[24.0^{5/3}\left(\frac{1}{1+\frac{(2)(4.9)}{4.9}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 24.0 = 1.44$

Routing Basin O-7

$\Rightarrow$ 1400' - 54" Ave RCP and street @ 2.09% $\left(\frac{6097-6069}{1400}\right) = \left(\frac{1.49}{0.013}\right)\left(\frac{16.0}{16.0}\right)^{2/3}(0.020)^{1/2} = 16$ fps

(Use 54" Ave RCP Only $\Rightarrow$ Trapezoidal Section w/ 0 to 1 sides, b = 4.0', and d = 4.0')

$X = \left(\frac{1.49}{0.013}\right)\left(\frac{0.020^{1/2}}{4.0^{2/3}}\right) = 6.43$ $\quad m = \log\left[16.0^{5/3}\left(\frac{1}{1+\frac{(2)(4.0)}{4.0}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 16.0 = 1.40$

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Routing Basins O-1 thru O-7 through Basin O-8

$\Rightarrow$ 1250' - 48" Ave CMP and street @ 0.8% $\left(\frac{6069-6059}{1250}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{128.0}{160.0}\right)^{2/3}(0.008)^{1/2} = 7$ fps

(Use street only $\Rightarrow$ Triangular Section w/ 50 to 1 sides and d = 1.6')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.008^{1/2}}{50^{1/3}}\right) = 1.43 \qquad m = 1.33$

Routing Basins O-1 thru O-8 through Basin O-9

$\Rightarrow$ 1600' - 48" Ave CMP and street @ 0.9% $\left(\frac{6059-6045}{1600}\right) = \left(\frac{1.49}{0.016}\right)\left(\frac{128.0}{160.0}\right)^{2/3}(0.009)^{1/2} = 8$ fps

(Use street only $\Rightarrow$ Triangular Section w/ 50 to 1 sides, and d = 1.6')

$X = \left(\frac{0.94}{0.016}\right)\left(\frac{0.009^{1/2}}{50^{1/3}}\right) = 1.51 \qquad m = 1.33$

Routing Basins O-1 thru O-10 through Basin O-11

$\Rightarrow$ 4300' - 132" Ave CMP and street @ 1.6% $\left(\frac{6045-5977}{4300}\right) = \left(\frac{1.49}{0.082}\right)\left(\frac{94.0}{38.8}\right)^{2/3}(0.016)^{1/2} = 11$ fps

(Use 132" Ave CMP only $\Rightarrow$ Trapezoidal Section w/ 0 to 1 sides, b = 9.7, d = 9.7)

$X = \left(\frac{1.49}{0.082}\right)\left(\frac{0.016^{1/2}}{9.7^{2/3}}\right) = 1.29 \qquad m = \log\left[94.0^{5/3}\left(\frac{1}{1+\frac{(2)(9.7)}{9.7}\sqrt{1+0^2}}\right)^{2/3}\right] / \log 94.0 = 1.51$

Routing Basin P-2

$\Rightarrow$ 1500' - grass lined channel @ 0.7% $\left(\frac{6046-6036}{1500}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{43.8}{25.8}\right)^{2/3}(0.007)^{1/2} = 4$ fps

(trapezoidal section w/ 3 to 1 sides, b = 10', and d = 2.5')

$X = \left(\frac{1.49}{0.040}\right)\left(\frac{0.007^{1/2}}{10^{2/3}}\right) = 0.67 \qquad m = \log\left[43.8^{5/3}\left(\frac{1}{1+\frac{(2)(2.5)}{10}\sqrt{1+3^2}}\right)^{2/3}\right] / \log 43.8 = 1.50$

Routing Basins P-1 and P-2 through Basin P-3

$\Rightarrow$ 2950' - 48" Ave CMP and grass swale @ 2.7% $\left(\frac{6036-5955}{2950}\right) = \left(\frac{1.49}{0.040}\right)\left(\frac{45.0}{60.1}\right)^{2/3}(0.027)^{1/2} = 5$ fps

(Use grass swale only $\Rightarrow$ Triangular section w/ 20 to 1 sides, d = 1.5')

$X = \left(\frac{0.94}{0.040}\right)\left(\frac{0.027^{1/2}}{20^{1/3}}\right) = 1.42 \qquad m = 1.33$

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Routing Basins A thru O through Basin P-3

$\Rightarrow 650' - 20' \times 10'$ Conc. Arch and grassswale @ 1.1% $\left(\frac{5962-5955}{650}\right) = \left(\frac{1.49}{0.1040}\right)\left(\frac{367.5}{210.1}\right)^{2/3}(0.011)^{1/2} = 6$ fps
(Use grassswale only $\Rightarrow$ Tuangular section w/3:1 sides, d=3.5')

$X = \left(\frac{0.94}{0.1040}\right)\left(\frac{0.011^{1/2}}{30^{1/3}}\right) = 0.79 \qquad m = 1.33$

Routing Basin Q

$\Rightarrow 1300'$-natural channel @ 0.5% $\left(\frac{5955-5949}{1300}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{1302.0}{113.9}\right)^{2/3}(0.005)^{1/2} = 5$ fps
(trapezoidal section w/2:1 sides, b=20', and d=21')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.005^{1/2}}{20^{2/3}}\right) = 0.14 \qquad m = \log\left[1302.0^{5/3}\left(\frac{1}{1+\frac{(2)(21)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 1302.0 = 1.50$

Routing Basin R-2

$\Rightarrow 1500'$-natural channel @ 1.2% $\left(\frac{5949-5931}{1500}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{1008.0}{100.5}\right)^{2/3}(0.012)^{1/2} = 8$ fps
(trapezoidal section w/2:1 sides, b=20', d=18')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.012^{1/2}}{20^{2/3}}\right) = 0.22 \qquad m = \log\left[1008.0^{5/3}\left(\frac{1}{1+\frac{(2)(18)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 1008.0 = 1.51$

Routing Basin S-2

$\Rightarrow 1450'$-natural channel @ 1.0% $\left(\frac{5931-5916}{1450}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{1008.0}{100.5}\right)^{2/3}(0.010)^{1/2} = 7$ fps
(trapezoidal section w/2:1 sides, b=20', d=18')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.010^{1/2}}{20^{2/3}}\right) = 0.20 \qquad m = \log\left[1008.0^{5/3}\left(\frac{1}{1+\frac{(2)(18)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 1008.0 = 1.51$

Routing Basin T

$\Rightarrow 1050'$-natural channel @ 0.6% $\left(\frac{5916-5910}{1050}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{1302.0}{113.9}\right)^{2/3}(0.006)^{1/2} = 6$ fps
(trapezoidal section w/2:1 sides, b=20', d=21')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.006^{1/2}}{20^{2/3}}\right) = 0.16 \qquad m = \log\left[1302.0^{5/3}\left(\frac{1}{1+\frac{(2)(21)}{20}\sqrt{1+2^2}}\right)^{2/3}\right] / \log 1302.0 = 1.50$

COMP WWH

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DATE September 4, 1991

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PROJ Shooks Run

SUBJ TR-20 Existing Basin Routing Parameters

FILE 90-809

SHEET 22

OF

Routing Basin U

$\Rightarrow$ 2450'-natural channel @ 0.9% $\left(\frac{5910-5887}{2450}\right) = \left(\frac{1.49}{0.100}\right)\left(\frac{1008.0}{100.5}\right)^{2/3}(0.009)^{1/2} = 7$ fps

(trapezoidal section w/2 to 1 sides, b = 20', d = 18')

$X = \left(\frac{1.49}{0.100}\right)\left(\frac{0.009^{1/2}}{20^{2/3}}\right) = 0.19$ $\quad m = \log\left[1008.0^{5/3}\left(\frac{1}{1+\left(\frac{2X/B}{20}\right)\sqrt{1+2^2}}\right)^{2/3}\right] / \log 1008.0 = 1.51$

D. TR-20 FUTURE CONDITION BASIN PARAMETER CALCULATIONS

COMP MHT

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DATE September 5, 1991

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PROJ Shooks Run

SUBJ TR-20 Future Basin Parameters

FILE 90-809

SHEET 1

OF

TR-20 FUTURE BASIN PARAMETERS

Only the subbasins where basin parameters are anticipated to change due to future development are included. All other subbasins are anticipated to remain unchanged with existing basin parameters. The basin routing parameters for future development conditions are also anticipated to remain unchanged from existing conditions.

Basin A-6 - A=74 Ac = 0.1156 sq mi

(Section 6) CN ⇒ 5% Open Space, Woods, Good Condition, Soil D w/30% Rock Outcop + 80% Open Space, Fair Condition Glass Cover, Soil B + 5% Residential, 8 Units/Ac, Soil B + 10% Business, Neighborhood Areas, Soil B

$CN_{AVE} = (0.05)(77) + (0.80)(69) + (0.05)(85) + (0.10)(92) = 73$

TC ⇒ 31 min = 0.52 hr (same as Existing Basin Parameters)

Basin A-7 - A= 61 Ac = 0.095 sq mi

(Section 7) CN = 55% Residential, 8 Units/Ac, Soil B + 45% Business, Neighborhood Areas, Soil B

$CN_{AVE} = (0.55)(85) + (0.45)(92) = 88$

TC = 19 min = 0.32 hr (Same as Existing Basin Parameters)

Basin A-8 - A = 64 Ac = 0.100 sq mi

(Section 8) CN ⇒ 5% Open Space, Fair Condition, Glass Cover, Soil B + 20% Residential, 4 Units/Ac, Soil B + 50% Residential, 8 Units/Ac, Soil B + 20% Business, Neighborhood Areas, Soil B + 5% Business, Commercial Areas, Soil B

$CN_{AVE} = (0.05)(69) + (0.20)(75) + (0.50)(85) + (0.20)(92) + (0.05)(92) = 84$

TC ⇒ 31 min = 0.52 hr (Same as Existing Basin Parameters)

Basin A-9 - A = 93 Ac = 0.145 sq mi

(Section 9) CN ⇒ 5% Residential, 2 Units/Ac, Soil B + 55% Residential, 4 Units/Ac, Soil B + 15% Residential, 8 Units/Ac, Soil B + 15% Business, Neighborhood Areas, Soil B + 10% Business, Commercial Areas, Soil B

$CN_{AVE} = (0.05)(70) + (0.55)(75) + (0.15)(85) + (0.15)(92) + (0.10)(92) = 81$

TC ⇒ 34 min = 0.57 hr (Same as Existing Basin Parameters)

Basin A-10 - A = 92 Ac = 0.144 sq mi

(Section 10) CN ⇒ 15% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) and Soil B + 75% Residential, 4 Units/Ac, Soil A (Use Soil B) and Soil B + 10% Business, Neighborhood Areas, Soil A (Use Soil B) and Soil B

$CN_{AVE} = (0.15)(69) + (0.75)(75) + (0.10)(92) = 76$

TC ⇒ 25 min = 0.42 hr (Same as Existing Basin Parameters)

Basin D-15 - A = 100 Ac = 0.156 sq mi

(Section 33) CN ⇒ 5% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 25% Open Space Fair Condition, Grass Cover, Soil C + 20% Residential, 4 Units/Ac, Soil C + 10% Residential, 8 Units/Ac, Soil A (Use Soil B) + 25% Business, Neighborhood Areas, Soil A (Use Soil B), Soil B, and Soil C + 15% Business, Commercial Areas, Soil C

$CN_{AVE} = (0.05)(69) + (0.25)(79) + (0.20)(83) + (0.10)(90) + (0.25)(92) + (0.15)(94) = 86$

TC ⇒ 21 min = 0.35 hr (Same as Existing Basin Parameters)

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SUBJ. TR-20 Future Basin Parameters

FILE 90-809

SHEET 3

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Basin P-3 - A = 76 Ac = 0.1150 sq mi

(Section 71) CN ⇒ 35% Business, Neighborhood Areas, Soil A (Use Soil B) + 10% Open Space, Fair Condition Grass Cover, Soil C + 25% Residential, 4 Units/Ac, Soil C + 30% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.35)(92) + (0.10)(79) + (0.25)(83) + (0.30)(94) = 89$

TC ⇒ 29 min = 0.48 hr (Same as Existing Basin Parameters)

Basin Q - A = 73 Ac = 0.114 sq mi

(Section 72) CN ⇒ 5% Industrial, Light Areas, Soil A (Use Soil B) + 25% Business, Neighborhood Areas, Soil A (Use Soil B) + 60% Residential, 4 Units/Ac, Soil C + 10% Business, Neighborhood Areas, Soil C

$CN_{AVE} = (0.05)(88) + (0.25)(92) + (0.60)(83) + (0.10)(94) = 87$

TC ⇒ 20 min = 0.33 hr (Same as Existing Basin Parameters)

Basin S-2 - A = 55 Ac = 0.0865 sq mi

(Section 76) CN ⇒ 10% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 10% Industrial, Light Areas, Soil A (Use Soil B) + 5% Residential, 4 Units/Ac, Soil A (Use Soil B) + 65% Residential, 4 Units/Ac, Soil C + 10% Industrial, Light Areas, Soil C

$CN_{AVE} = (0.10)(69) + (0.10)(88) + (0.05)(75) + (0.65)(83) + (0.10)(91) = 83$

TC = 26 min = 0.43 hr (Same as Existing Basin Parameters)

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PROJ Shooks Run

SUBJ TR-20 Future Basin Parameters

FILE 90-809

SHEET 4

OF

Basin U - A = 87 Ac = 0.136 sq mi

(Section 78) CN ⇒ 20% Residential, 4 Units/Ac, Soil A (Use Soil B) + 5% Open Space, Fair Condition Grass Cover, Soil A (Use Soil B) + 40% Industrial, Light Areas, Soil A (Use Soil B) + 15% Residential, 4 Units/Ac, Soil C + 15% Industrial, Light Areas, Soil C + 5% Business, Neighborhood Areas, Soil C

$$CN_{AVE} = (0.20)(75) + (0.05)(69) + (0.40)(88) + (0.15)(83) + (0.15)(91) + (0.05)(94) = 84$$

TC = 33 min = 0.55 hr (Same as Existing Basin Parameters)

E. TR-20 ANALYSIS
EXISTING CONDITION

```
**********80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY**********

JOB TR-20                                          SUMMARY   NOPLOTS          10
TITLE     SHOOKS RUN 80-809  TYPE IIA DISTRIBUTION  EXISTING CONDITION        20
TITLE     PASS 1=10-YEAR 24-HOUR   PASS 2=100-YEAR 24-HOUR  SHKEX-4.DAT      30
 5 RAINFL 7              0.25                                                 40
 8            0.0000    0.0005    0.0015    0.0030    0.0045                 50
 8            0.0060    0.0080    0.0100    0.0120    0.0143                 60
 8            0.0165    0.0188    0.0210    0.0233    0.0255                 70
 8            0.0278    0.0320    0.0390    0.0460    0.0530                 80
 8            0.0600    0.0750    0.1000    0.4000    0.7000                 90
 8            0.7250    0.7500    0.7650    0.7800    0.7900                100
 8            0.8000    0.8100    0.8200    0.8250    0.8300                110
 8            0.8350    0.8400    0.8450    0.8500    0.8550                120
 8            0.8600    0.8638    0.8675    0.8713    0.8750                130
 8            0.8788    0.8825    0.8863    0.8900    0.8938                140
 8            0.8975    0.9013    0.9050    0.9088    0.9115                150
 8            0.9148    0.9180    0.9210    0.9240    0.9270                160
 8            0.9300    0.9325    0.9350    0.9375    0.9400                170
 8            0.9425    0.9450    0.9475    0.9500    0.9525                180
 8            0.9550    0.9575    0.9600    0.9625    0.9650                190
 8            0.9675    0.9700    0.9725    0.9750    0.9775                200
 8            0.9800    0.9813    0.9825    0.9838    0.9850                210
 8            0.9863    0.9875    0.9888    0.9900    0.9913                220
 8            0.9925    0.9938    0.9950    0.9963    0.9975                230
 8            0.9988    1.0000    1.0000    1.0000    1.0000                240
 9 ENDTBL                                                                   250
 2 XSECTN   17             1.0      40.1                                A 10
 8                        30.3       0.0       0.0                     A 20
 8                        31.0      20.0       2.7                     A 30
 8                        32.0      60.0       6.8                     A 40
 8                        33.0     120.0      13.6                     A 50
 8                        34.0     200.0      22.7                     A 60
 8                        35.0     320.0      36.2                     A 70
 8                        36.0     450.0      51.0                     A 80
 8                        36.5     520.0      58.9                     A 90
 8                        37.0     580.0      65.7                     A100
 8                        37.5     640.0      72.5                     A110
 8                        38.0     700.0      79.3                     A120
 8                        38.5     760.0      86.1                     A130
 8                        39.0     800.0      88.4                     A140
 8                        39.5     850.0      88.5                     A150
 8                        40.0     880.0      88.6                     A160
 8                        40.5     925.0     100.1                     A170
 8                        41.0    1057.0     146.9                     A180
 8                        41.5    1321.0     228.9                     A190
 8                        42.0    1753.0     346.5                     A200
 8                        42.5    2583.0     500.7                     A210
```

```
9 ENDTBL                                                                A220
2 XSECTN    18              1.0      40.1                               A230
8                          34.7       0.0       0.0                    A240
8                          35.0       3.0       0.6                    A250
8                          35.5      15.0       3.6                    A260
8                          36.0      33.0       7.8                    A270
8                          36.5      60.0      14.4                    A280
8                          37.0      78.0      18.3                    A290
8                          37.5     105.0      22.5                    A300
8                          38.0     123.0      22.6                    A310
8                          38.5     147.0      22.7                    A320
8                          39.0     165.0      22.8                    A330
8                          39.5     180.0      22.9                    A340
8                          40.0     192.0      23.0                    A350
8                          40.5     243.0      49.0                    A360
8                          41.0     460.0     128.2                    A370
8                          41.5     868.0     249.0                    A380
8                          42.0    1502.0     412.0                    A390
8                          42.5    2386.0     616.0                    A400
9 ENDTBL                                                                A410
3 STRUCT      32                                                        B 10
8                        6104.5       0.0       0.0                    B 20
8                        6106.0      30.0       0.8                    B 30
8                        6107.0      70.0       2.1                    B 40
8                        6108.0     120.0       4.0                    B 50
8                        6109.0     170.0       6.4                    B 60
8                        6110.0     210.0       9.1                    B 70
8                        6111.0     250.0      12.1                    B 80
8                        6112.0     280.0      15.5                    B 90
8                        6113.0     310.0      19.2                    B100
8                        6113.5     335.0      21.2                    B110
8                        6114.0     420.0      23.3                    B120
8                        6114.5     545.0      25.4                    B130
8                        6115.0     705.0      27.6                    B140
8                        6115.5     895.0      29.9                    B150
8                        6116.0    1105.0      32.2                    B160
8                        6116.5    1350.0      34.6                    B170
8                        6117.0    1615.0      37.1                    B180
8                        6117.5    1910.0      39.7                    B190
8                        6118.0    2225.0      42.3                    B200
8                        6118.5    3050.0      45.1                    B210
9 ENDTBL                                                                B220
6 RUNOFF 1   1       1    0.102      73.0     0.32                      260
6 REACH  3   2   1   2    500.0      0.92     1.51                      270
6 RUNOFF 1   2       3    0.094      77.0     0.32                      280
6 ADDHYD 4   2   2 3 1                                                  290
```

```
 6 REACH  3   3   1   2    2300.0      0.71      1.49                    300
 6 RUNOFF 1   3       3     0.169      75.0      0.45                    310
 6 ADDHYD 4   3   2 3 1                                                  320
 6 REACH  3   4   1   2     550.0      1.70      1.46                    330
 6 RUNOFF 1   4       3     0.183      75.0      0.40                    340
 6 ADDHYD 4   4   2 3 1                                                  350
 6 REACH  3   5   1   2    1800.0      1.05      1.47                    360
 6 RUNOFF 1   5       3     0.097      71.0      0.38                    370
 6 ADDHYD 4   5   2 3 1                                                  380
 6 REACH  3   6   1   2    1400.0      0.45      1.63                    390
 6 RUNOFF 1   6       3     0.116      69.0      0.52                    400
 6 ADDHYD 4   6   2 3 1                                                  410
 6 REACH  3   7   1   2    1500.0      1.59      1.33                    420
 6 RUNOFF 1   7       3     0.095      74.0      0.32                    430
 6 ADDHYD 4   7   2 3 1                                                  440
 6 RUNOFF 1   8       2     0.100      83.0      0.52                    450
 6 REACH  3   9   2   3    2400.0      1.43      1.33                    460
 6 RUNOFF 1   9       2     0.145      80.0      0.57                    470
 6 ADDHYD 4   9   3 2 4                                                  480
 6 REACH  3  10   1   2    3250.0      1.82      1.33                    490
 6 REACH  3  10   4   3    1450.0      4.35      1.44                    500
 6 ADDHYD 4  10   2 3 1                                                  510
 6 RUNOFF 1  10       2     0.144      73.0      0.42                    520
 6 ADDHYD 4  10   1 2 3                                                  530
 6 RUNOFF 1  11       1     0.134      75.0      0.30                    540
 6 REACH  3  12   1   2    1150.0      2.62      1.33                    550
 6 RUNOFF 1  12       1     0.081      76.0      0.32                    560
 6 ADDHYD 4  12   2 1 4                                                  570
 6 REACH  3  13   4   1    3550.0      6.75      1.40                    580
 6 RUNOFF 1  13       2     0.131      76.0      0.38                    590
 6 ADDHYD 4  13   1 2 4                                                  600
 6 RUNOFF 1  14       2     0.122      73.0      0.40                    610
 6 REACH  3  15   4   1     900.0      6.04      1.42                    620
 6 REACH  3  15   2   4    3700.0      2.26      1.33                    630
 6 ADDHYD 4  15   1 4 2                                                  640
 6 RUNOFF 1  15       1     0.103      76.0      0.40                    650
 6 ADDHYD 4  15   2 1 4                                                  660
 6 RUNOFF 1  16       2     0.108      80.0      0.42                    670
 6 REACH  3  17   4   1    2300.0      1.89      1.33                    680
 6 REACH  3  17   2   4    2700.0      0.95      1.51                    690
 6 ADDHYD 4  17   1 4 2                                                  700
 6 RUNOFF 1  17       1     0.109      78.0      0.40                    710
 6 ADDHYD 4  17   2 1 4                                                  720
 6 ADDHYD 4  17   3 4 1                                                  730
 6 DIVERT 6  17   1 7 2                0.59       18.                    740
 6 REACH  3  18   2   3    3850.0      0.80      1.45                    750
```

```
 6 RUNOFF 1  18       2     0.150      74.0     0.80                    760
 6 ADDHYD 4  18   3 2 1                                                  770
 6 RUNOFF 1  19       2     0.078      77.0     0.30                    780
 6 RUNOFF 1  20       3     0.150      74.0     0.40                    790
 6 REACH  3  21   3   4  2300.0       3.07     1.33                    800
 6 RUNOFF 1  21       3     0.089      75.0     0.35                    910
 6 ADDHYD 4  21   4 3 5                                                  820
 6 RUNOFF 1  22       3     0.134      75.0     0.37                    830
 6 REACH  3  23   3   4  3100.0       1.59     1.33                    840
 6 RUNOFF 1  23       3     0.148      77.0     0.47                    850
 6 ADDHYD 4  23   4 3 6                                                  860
 6 REACH  3  23   2   3  3700.0       9.61     1.34                    870
 6 ADDHYD 4  23   6 3 2                                                  880
 6 ADDHYD 4  23   5 2 3                                                  890
 6 RUNOFF 1  24       2     0.097      75.0     0.37                    900
 6 REACH  3  25   2   4  2350.0       1.33     1.33                    910
 6 RUNOFF 1  25       2     0.111      77.0     0.38                    920
 6 ADDHYD 4  25   4 2 6                                                  930
 6 RUNOFF 1  26       2     0.102      75.0     0.37                    940
 6 REACH  3  26   2   4  1800.0       2.52     1.33                    950
 6 RUNOFF 1  27       2     0.108      75.0     0.35                    960
 6 ADDHYD 4  27   4 2 5                                                  970
 6 REACH  3  27   3   2  1750.0       0.75     1.53                    980
 6 ADDHYD 4  27   5 2 3                                                  990
 6 REACH  3  28   6   2  3400.0       2.47     1.33                   1000
 6 RUNOFF 1  28       4     0.103      80.0     0.30                   1010
 6 ADDHYD 4  28   2 4 5                                                 1020
 6 REACH  3  28   3   4  2250.0       2.52     1.33                   1030
 6 ADDHYD 4  28   5 4 2                                                 1040
 6 RUNOFF 1  29       3     0.156      76.0     0.37                   1050
 6 RUNOFF 1  30       4     0.156      83.0     0.37                   1060
 6 REACH  3  31   4   5  2000.0       4.55     1.40                   1070
 6 RUNOFF 1  31       4     0.159      79.0     0.40                   1080
 6 ADDHYD 4  31   5 4 6                                                 1090
 6 REACH  3  32   6   4  1700.0       3.18     1.46                   1100
 6 RUNOFF 1  32       5     0.169      79.0     0.35                   1110
 6 ADDHYD 4  32   4 5 6                                                 1120
 6 REACH  3  33   2   4  2900.0       1.75     1.33                   1130
 6 RUNOFF 1  33       5     0.156      85.0     0.35                   1140
 6 ADDHYD 4  33   4 5 2                                                 1150
 6 REACH  3  33   3   4  1200.0       0.88     1.49                   1160
 6 REACH  3  33   6   3  1300.0       0.98     1.46                   1170
 6 ADDHYD 4  33   2 4 5                                                 1180
 6 ADDHYD 4  33   3 5 2                                                 1190
 6 RESVOR 2    33 2   3  6105.0                                        1200
 6 REACH  3  34   3   2  2450.0       0.67     1.44                   1210
```

```
 6 RUNOFF 1  34      3     0.138      75.0      0.48                    1220
 6 ADDHYD 4  34   2 3 4                                                 1230
 6 ADDHYD 4  34   1 4 2                                                 1240
 6 REACH  3  35   2   1   1250.0      2.47      1.51                    1250
 6 RUNOFF 1  35      2     0.139      76.0      0.43                    1260
 6 ADDHYD 4  35   1 2 3                                                 1270
 6 REACH  3  36   3   1    700.0      0.21      1.52                    1280
 6 RUNOFF 1  36      2     0.122      81.0      0.45                    1290
 6 ADDHYD 4  36   1 2 3                                                 1300
 6 RUNOFF 1  37      1     0.128      78.0      0.37                    1310
 6 RUNOFF 1  38      2     0.186      76.0      0.67                    1320
 6 RUNOFF 1  39      4     0.152      77.0      0.55                    1330
 6 REACH  3  40   4   5   1800.0      1.13      1.33                    1340
 6 RUNOFF 1  40      4     0.172      74.0      0.38                    1350
 6 ADDHYD 4  40   5 4 6                                                 1360
 6 REACH  3  40   3   4   2650.0      0.21      1.52                    1370
 6 REACH  3  40   1   3   1050.0      0.22      1.59                    1380
 6 REACH  3  40   2   5    650.0      0.22      1.59                    1390
 6 ADDHYD 4  40   6 3 1                                                 1400
 6 ADDHYD 4  40   5 1 3                                                 1410
 6 ADDHYD 4  40   4 3 1                                                 1420
 6 REACH  3  41   1   2   1700.0      0.20      1.52                    1430
 6 RUNOFF 1  41      1     0.153      77.0      0.50                    1440
 6 ADDHYD 4  41   2 1 3                                                 1450
 6 RUNOFF 1  42      1     0.141      76.0      0.63                    1460
 6 REACH  3  43   1   2    500.0      4.27      1.42                    1470
 6 RUNOFF 1  43      1     0.131      77.0      0.73                    1480
 6 ADDHYD 4  43   2 1 4                                                 1490
 6 REACH  3  44   4   1   2750.0      3.97      1.44                    1500
 6 RUNOFF 1  44      2     0.092      75.0      0.38                    1510
 6 ADDHYD 4  44   1 2 4                                                 1520
 6 REACH  3  45   4   1   2800.0      3.97      1.44                    1530
 6 RUNOFF 1  45      2     0.100      78.0      0.40                    1540
 6 ADDHYD 4  45   1 2 4                                                 1550
 6 ADDHYD 4  45   3 4 1                                                 1560
 6 RUNOFF 1  46      2     0.138      77.0      0.43                    1570
 6 REACH  3  47   2   3   4050.0      2.26      1.33                    1580
 6 RUNOFF 1  47      2     0.155      75.0      0.38                    1590
 6 ADDHYD 4  47   3 2 4                                                 1600
 6 RUNOFF 1  48      2     0.134      78.0      0.53                    1610
 6 REACH  3  49   2   3   3600.0      1.51      1.33                    1620
 6 RUNOFF 1  49      2     0.083      75.0      0.42                    1630
 6 ADDHYD 4  49   3 2 5                                                 1640
 6 RUNOFF 1  50      2     0.120      78.0      0.70                    1650
 6 REACH  3  51   5   3   2100.0      1.51      1.33                    1660
 6 REACH  3  51   2   5   2600.0      1.43      1.33                    1670
```

```
 6 ADDHYD 4  51   3 5 2                                                  1680
 6 RUNOFF 1  51       3     0.094      85.0      0.37                    1690
 6 ADDHYD 4  51   2 3 5                                                  1700
 6 REACH  3  52   5   2    2700.0       1.51      1.33                    1710
 6 RUNOFF 1  52       3     0.139      77.0      0.50                    1720
 6 ADDHYD 4  52   2 3 5                                                  1730
 6 ADDHYD 4  52   4 5 2                                                  1740
 6 REACH  3  52   1   3    1250.0       0.21      1.52                    1750
 6 ADDHYD 4  52   2 3 1                                                  1760
 6 RUNOFF 1  53       2     0.142      75.0      0.47                    1770
 6 REACH  3  54   1   3    1800.0       0.19      1.52                    1780
 6 REACH  3  54   2   1     550.0       3.19      1.33                    1790
 6 RUNOFF 1  54       4     0.167      79.0      0.47                    1800
 6 ADDHYD 4  54   1 4 2                                                  1810
 6 ADDHYD 4  54   3 2 1                                                  1820
 6 RUNOFF 1  55       2     0.123      89.0      0.58                    1830
 6 ADDHYD 4  55   1 2 3                                                  1840
 6 REACH  3  56   3   1    1900.0       0.48      1.53                    1850
 6 RUNOFF 1  56       2     0.159      83.0      0.38                    1860
 6 ADDHYD 4  56   1 2 3                                                  1870
 6 RUNOFF 1  57       1     0.158      80.0      0.42                    1880
 6 RUNOFF 1  58       2     0.106      79.0      0.35                    1890
 6 REACH  3  59   1   4    1350.0       5.05      1.42                    1900
 6 REACH  3  59   2   5    1900.0       2.42      1.33                    1910
 6 ADDHYD 4  59   4 5 1                                                  1920
 6 RUNOFF 1  59       2     0.114      76.0      0.32                    1930
 6 ADDHYD 4  59   1 2 4                                                  1940
 6 REACH  3  60   4   1    1200.0       3.31      1.42                    1950
 6 RUNOFF 1  60       2     0.117      76.0      0.33                    1960
 6 ADDHYD 4  60   1 2 4                                                  1970
 6 REACH  3  61   4   1    1800.0       4.35      1.44                    1980
 6 RUNOFF 1  61       2     0.130      84.0      0.37                    1990
 6 ADDHYD 4  61   1 2 4                                                  2000
 6 RUNOFF 1  62       1     0.178      97.0      0.25                    2010
 6 REACH  3  63   1   2    1400.0       6.43      1.40                    2020
 6 RUNOFF 1  63       1     0.131      89.0      0.38                    2030
 6 ADDHYD 4  63   2 1 5                                                  2040
 6 ADDHYD 4  63   4 5 1                                                  2050
 6 REACH  3  64   1   2    1250.0       1.43      1.33                    2060
 6 RUNOFF 1  64       1     0.106      85.0      0.45                    2070
 6 ADDHYD 4  64   2 1 4                                                  2080
 6 REACH  3  65   4   1    1600.0       1.51      1.33                    2090
 6 RUNOFF 1  65       2     0.091      77.0      0.33                    2100
 6 ADDHYD 4  65   1 2 4                                                  2110
 6 RUNOFF 1  66       1     0.116      89.0      0.38                    2120
 6 ADDHYD 4  66   1 4 2                                                  2130
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 6 REACH  3  67   2   1    4300.0      1.29      1.51                    2140
 6 RUNOFF 1  67       2     0.164      78.0      0.38                    2150
 6 ADDHYD 4  67   1 2 4                                                  2160
 6 RUNOFF 1  68       1     0.109      91.0      0.27                    2170
 6 ADDHYD 4  68   4 1 2                                                  2180
 6 ADDHYD 4  68   3 2 1                                                  2190
 6 RUNOFF 1  69       2     0.106      83.0      0.40                    2200
 6 REACH  3  70   2   3    1500.0      0.67      1.50                    2210
 6 RUNOFF 1  70       2     0.163      80.0      0.35                    2220
 6 ADDHYD 4  70   3 2 4                                                  2230
 6 REACH  3  71   4   2    2950.0      1.42      1.33                    2240
 6 RUNOFF 1  71       3     0.150      86.0      0.48                    2250
 6 ADDHYD 4  71   2 3 4                                                  2260
 6 REACH  3  71   1   2     650.0      0.79      1.33                    2270
 6 ADDHYD 4  71   4 2 1                                                  2280
 6 REACH  3  72   1   2    1300.0      0.14      1.50                    2290
 6 RUNOFF 1  72       1     0.114      86.0      0.33                    2300
 6 ADDHYD 4  72   2 1 3                                                  2310
 6 RUNOFF 1  73       1     0.150      92.0      0.27                    2320
 6 RUNOFF 1  74       2     0.114      86.0      0.30                    2330
 6 ADDHYD 4  74   1 2 4                                                  2340
 6 REACH  3  74   3   1    1500.0      0.22      1.51                    2350
 6 ADDHYD 4  74   4 1 2                                                  2360
 6 RUNOFF 1  75       1     0.113      81.0      0.38                    2370
 6 RUNOFF 1  76       3     0.086      81.0      0.43                    2380
 6 ADDHYD 4  76   1 3 4                                                  2390
 6 REACH  3  76   2   1    1450.0      0.20      1.51                    2400
 6 ADDHYD 4  76   4 1 2                                                  2410
 6 REACH  3  77   2   1    1050.0      0.16      1.50                    2420
 6 RUNOFF 1  77       2     0.141      84.0      0.37                    2450
 6 ADDHYD 4  77   1 2 3                                                  2460
 6 REACH  3  78   3   1    2450.0      0.19      1.51                    2470
 6 RUNOFF 1  78       2     0.136      81.0      0.55                    2480
 6 ADDHYD 4  78   1 2 3                                                  2490
   ENDATA                                                               2500
 7 INCREM 6             0.05                                           2510
 7 COMPUT 7 001   078   0.0          3.10        1.0    7 2  01  01     2520
   ENDCMP 1                                                             2530
 7 INCREM 6             0.05                                           2540
 7 COMPUT 7 001   078   0.0          4.50        1.0    7 2  01  02     2550
   ENDCMP 1                                                             2560
   ENDJOB 2                                                             2570
```

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD. RAINTABLES ADDED. ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

EXECUTIVE CONTROL OPERATION INCREM MAIN TIME INCREMENT = .05 HOURS RECORD ID 2510

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 1 TO XSECTION 79 RECORD ID 2520
STARTING TIME = .00 RAIN DEPTH = 3.10 RAIN DURATION= 1.00 RAIN TABLE NO.= 7 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 1 MAIN TIME INCREMENT = .05 HOURS

*** WARNING REACH 2 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 4 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 6 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 7 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 10 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 12 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 13 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 15 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 23 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 27 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 31 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 32 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 33 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 35 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 36 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 43 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 44 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 45 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 54 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 55 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 59 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 60 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 61 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 63 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 64 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 65 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 71 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 77 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 1 RECORD ID 2530

EXECUTIVE CONTROL OPERATION INCREM MAIN TIME INCREMENT = .05 HOURS RECORD ID 2540

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 1 TO XSECTION 78 RECORD ID 2550
STARTING TIME = .00 RAIN DEPTH = 4.50 RAIN DURATION= 1.00 RAIN TABLE NO.= 7 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 2 MAIN TIME INCREMENT = .05 HOURS

*** WARNING REACH 2 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 4 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 5 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 6 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 7 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 10 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 12 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 13 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 15 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 23 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 27 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 28 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 31 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 32 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 33 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 33 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 35 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 36 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 40 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 43 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 44 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 45 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 52 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 54 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 56 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 59 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 60 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 61 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 63 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 64 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 65 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 67 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 71 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 72 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 74 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 76 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 77 ATT-KIN COEFF.(C) GREATER THAN 0.667. CONSIDER REDUCING MAIN TIME INCREMENT ***

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 2 RECORD ID 2560

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID 2570

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID		STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1														
XSECTION	1	RUNOFF	.10	7	2	.05	.0	3.10	24.00	.78	---	6.10	69.79	684.2
XSECTION	2	REACH	.10	7	2	.05	.0	3.10	24.00	.78	---	6.10	69.79	684.2
XSECTION	2	RUNOFF	.09	7	2	.05	.0	3.10	24.00	.98	---	6.09	82.84	881.3
XSECTION	2	ADDHYD	.20	7	2	.05	.0	3.10	24.00	.88	---	6.10	152.57	778.4
XSECTION	3	REACH	.20	7	2	.05	.0	3.10	24.00	.87	---	6.20	132.49	676.0
XSECTION	3	RUNOFF	.17	7	2	.05	.0	3.10	24.00	.87	---	6.17	109.05	645.3
XSECTION	3	ADDHYD	.37	7	2	.05	.0	3.10	24.00	.87	---	6.19	240.17	658.0
XSECTION	4	REACH	.37	7	2	.05	.0	3.10	24.00	.87	---	6.19	240.17	658.0
XSECTION	4	RUNOFF	.18	7	2	.05	.0	3.10	24.00	.87	---	6.14	124.48	680.2
XSECTION	4	ADDHYD	.55	7	2	.05	.0	3.10	24.00	.87	---	6.17	361.84	660.3
XSECTION	5	REACH	.55	7	2	.05	.0	3.10	24.00	.87	---	6.24	351.59	641.6
XSECTION	5	RUNOFF	.10	7	2	.05	.0	3.10	24.00	.69	---	6.14	51.28	528.7
XSECTION	5	ADDHYD	.64	7	2	.05	.0	3.10	24.00	.84	---	6.23	394.51	611.6
XSECTION	6	REACH	.64	7	2	.05	.0	3.10	24.00	.84	---	6.30	389.93	604.5
XSECTION	6	RUNOFF	.12	7	2	.05	.0	3.10	24.00	.60	---	6.23	42.51	366.5
XSECTION	6	ADDHYD	.76	7	2	.05	.0	3.10	24.00	.81	---	6.29	430.76	566.9
XSECTION	7	REACH	.76	7	2	.05	.0	3.10	24.00	.80	---	6.36	421.29	553.6
XSECTION	7	RUNOFF	.09	7	2	.05	.0	3.10	24.00	.83	---	6.10	69.48	731.4
XSECTION	7	ADDHYD	.86	7	2	.05	.0	3.10	24.00	.81	---	6.35	445.45	520.4
XSECTION	8	RUNOFF	.10	7	2	.05	.0	3.10	24.00	1.34	---	6.19	94.66	946.6
XSECTION	9	REACH	.10	7	2	.05	.0	3.10	24.00	1.33	---	6.37	94.48	944.8
XSECTION	9	RUNOFF	.14	7	2	.05	.0	3.10	24.00	1.15	---	6.23	108.45	747.9
XSECTION	9	ADDHYD	.25	7	2	.05	.0	3.10	24.00	1.22	---	6.29	184.60	753.5
XSECTION	10	REACH	.86	7	2	.05	.0	3.10	24.00	.80	---	6.46	414.73	484.5
XSECTION	10	REACH	.25	7	2	.05	.0	3.10	24.00	1.22	---	6.29	184.60	753.5
XSECTION	10	ADDHYD	1.10	7	2	.05	.0	3.10	24.00	.90	---	6.43	572.66	520.1
XSECTION	10	RUNOFF	.14	7	2	.05	.0	3.10	24.00	.79	---	6.16	83.46	579.6
XSECTION	10	ADDHYD	1.24	7	2	.05	.0	3.10	24.00	.89	---	6.41	612.51	492.0
XSECTION	11	RUNOFF	.13	7	2	.05	.0	3.10	24.00	.88	---	6.08	107.76	804.2
XSECTION	12	REACH	.13	7	2	.05	.0	3.10	24.00	.88	---	6.14	106.13	792.0
XSECTION	12	RUNOFF	.08	7	2	.05	.0	3.10	24.00	.93	---	6.09	67.22	829.9
XSECTION	12	ADDHYD	.22	7	2	.05	.0	3.10	24.00	.90	---	6.12	170.45	792.8

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 13	REACH	.22	7	2	.05	.0	3.10	24.00	.89	---	6.19	166.91	776.3
XSECTION 13	RUNOFF	.13	7	2	.05	.0	3.10	24.00	.93	---	6.12	97.93	747.6
XSECTION 13	ADDHYD	.35	7	2	.05	.0	3.10	24.00	.91	---	6.17	259.90	751.2
XSECTION 14	RUNOFF	.12	7	2	.05	.0	3.10	24.00	.78	---	6.14	72.41	593.5
XSECTION 15	REACH	.35	7	2	.05	.0	3.10	24.00	.91	---	6.17	259.90	751.2
XSECTION 15	REACH	.12	7	2	.05	.0	3.10	24.00	.77	---	6.28	59.45	487.3
XSECTION 15	ADDHYD	.47	7	2	.05	.0	3.10	24.00	.87	---	6.18	311.19	664.9
XSECTION 15	RUNOFF	.10	7	2	.05	.0	3.10	24.00	.93	---	6.14	74.75	725.7
XSECTION 15	ADDHYD	.57	7	2	.05	.0	3.10	24.00	.88	---	6.17	383.82	672.2
XSECTION 16	RUNOFF	.11	7	2	.05	.0	3.10	24.00	1.15	---	6.14	97.61	903.8
XSECTION 17	REACH	.57	7	2	.05	.0	3.10	24.00	.88	35.34	6.26	363.64	636.8
XSECTION 17	REACH	.11	7	2	.05	.0	3.10	24.00	1.15	32.45	6.26	87.10	806.5
XSECTION 17	ADDHYD	.68	7	2	.05	.0	3.10	24.00	.92	36.01	6.26	450.72	663.8
XSECTION 17	RUNOFF	.11	7	2	.05	.0	3.10	24.00	1.03	---	6.13	89.52	821.2
XSECTION 17	ADDHYD	.79	7	2	.05	.0	3.10	24.00	.94	36.52	6.24	522.49	663.1
XSECTION 17	ADDHYD	2.03	7	2	.05	.0	3.10	24.00	.90	41.02	6.31	1069.88	526.3
XSECTION 17	DIVERT	1.20	7	2	.05	.0	3.10	24.00	1.41	39.97	6.31	878.49	732.4
XSECTION 18	DIVERT	.83	7	2	.05	.0	3.10	24.00	.17	39.97	6.31	191.40	229.6
XSECTION 18	REACH	.83	7	2	.05	.0	3.10	24.00	.17	38.75	6.48	155.95	187.1
XSECTION 18	RUNOFF	.15	7	2	.05	.0	3.10	24.00	.82	---	6.41	58.95	393.0
XSECTION 18	ADDHYD	.98	7	2	.05	.0	3.10	24.00	.27	40.21	6.47	213.68	217.3
XSECTION 19	RUNOFF	.08	7	2	.05	.0	3.10	24.00	.99	---	6.08	70.79	907.6
XSECTION 20	RUNOFF	.15	7	2	.05	.0	3.10	24.00	.93	---	6.14	95.42	636.2
XSECTION 21	REACH	.15	7	2	.05	.0	3.10	24.00	.92	---	6.23	90.24	601.6
XSECTION 21	RUNOFF	.09	7	2	.05	.0	3.10	24.00	.99	---	6.11	65.58	736.9
XSECTION 21	ADDHYD	.24	7	2	.05	.0	3.10	24.00	.94	---	6.17	146.88	614.6
XSECTION 22	RUNOFF	.13	7	2	.05	.0	3.10	24.00	.88	---	6.12	95.53	712.9
XSECTION 23	REACH	.13	7	2	.05	.0	3.10	24.00	.97	---	6.26	77.64	579.4
XSECTION 23	RUNOFF	.15	7	2	.05	.0	3.10	24.00	.99	---	6.17	104.69	707.3
XSECTION 23	ADDHYD	.28	7	2	.05	.0	3.10	24.00	.93	---	6.21	178.28	632.2
XSECTION 23	REACH	.08	7	2	.05	.0	3.10	24.00	.98	---	6.15	68.57	879.1
XSECTION 23	ADDHYD	.36	7	2	.05	.0	3.10	24.00	.94	---	6.19	243.32	675.9
XSECTION 23	ADDHYD	.60	7	2	.05	.0	3.10	24.00	.90	---	6.18	389.81	650.9
XSECTION 24	RUNOFF	.10	7	2	.05	.0	3.10	24.00	.98	---	6.12	69.16	712.9
XSECTION 25	REACH	.10	7	2	.05	.0	3.10	24.00	.87	---	6.25	57.15	599.1
XSECTION 25	RUNOFF	.11	7	2	.05	.0	3.10	24.00	.98	---	6.12	88.32	795.7

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID		STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1														
XSECTION	25	ADDHYD	.21	7	2	.05	.0	3.10	24.00	.93	---	6.17	136.96	658.4
XSECTION	26	RUNOFF	.10	7	2	.05	.0	3.10	24.00	.88	---	6.12	72.72	712.9
XSECTION	26	REACH	.10	7	2	.05	.0	3.10	24.00	.87	---	6.21	69.84	674.9
XSECTION	27	RUNOFF	.11	7	2	.05	.0	3.10	24.00	.88	---	6.11	79.58	736.9
XSECTION	27	ADDHYD	.21	7	2	.05	.0	3.10	24.00	.88	---	6.15	142.45	678.3
XSECTION	27	REACH	.60	7	2	.05	.0	3.10	24.00	.90	---	6.25	380.86	635.8
XSECTION	27	ADDHYD	.81	7	2	.05	.0	3.10	24.00	.89	---	6.23	506.49	626.1
XSECTION	28	REACH	.21	7	2	.05	.0	3.10	24.00	.93	---	6.29	123.01	591.4
XSECTION	28	RUNOFF	.10	7	2	.05	.0	3.10	24.00	1.15	---	6.07	110.31	1070.9
XSECTION	28	ADDHYD	.31	7	2	.05	.0	3.10	24.00	1.00	---	6.15	195.71	629.3
XSECTION	28	REACH	.81	7	2	.05	.0	3.10	24.00	.89	---	6.30	495.09	612.0
XSECTION	28	ADDHYD	1.12	7	2	.05	.0	3.10	24.00	.92	---	6.28	663.51	592.4
XSECTION	29	RUNOFF	.16	7	2	.05	.0	3.10	24.00	.93	---	6.12	118.58	760.1
XSECTION	30	RUNOFF	.16	7	2	.05	.0	3.10	24.00	1.34	---	6.10	176.87	1133.9
XSECTION	31	REACH	.16	7	2	.05	.0	3.10	24.00	1.34	---	6.16	176.00	1129.2
XSECTION	31	RUNOFF	.16	7	2	.05	.0	3.10	24.00	1.09	---	6.13	138.54	871.3
XSECTION	31	ADDHYD	.31	7	2	.05	.0	3.10	24.00	1.21	---	6.14	313.62	995.6
XSECTION	32	REACH	.31	7	2	.05	.0	3.10	24.00	1.21	---	6.14	313.62	995.6
XSECTION	32	RUNOFF	.17	7	2	.05	.0	3.10	24.00	1.09	---	6.10	158.65	938.8
XSECTION	32	ADDHYD	.48	7	2	.05	.0	3.10	24.00	1.17	---	6.13	468.62	968.2
XSECTION	33	REACH	1.12	7	2	.05	.0	3.10	24.00	.92	---	6.38	631.89	564.2
XSECTION	33	RUNOFF	.16	7	2	.05	.0	3.10	24.00	1.49	---	6.09	200.93	1288.0
XSECTION	33	ADDHYD	1.28	7	2	.05	.0	3.10	24.00	.99	---	6.34	705.56	552.9
XSECTION	33	REACH	.16	7	2	.05	.0	3.10	24.00	.93	---	6.19	114.86	736.3
XSECTION	33	REACH	.48	7	2	.05	.0	3.10	24.00	1.17	---	6.19	463.91	958.6
XSECTION	33	ADDHYD	1.43	7	2	.05	.0	3.10	24.00	.98	---	6.31	793.44	554.1
XSECTION	33	ADDHYD	1.92	7	2	.05	.0	3.10	24.00	1.03	---	6.24	1216.53	634.9
STRUCTURE	33	RESVOR	1.92	7	2	.05	.0	3.10	24.00	1.02	6115.34	6.49	834.88	435.7
XSECTION	34	REACH	1.92	7	2	.05	.0	3.10	24.00	1.02	---	6.61	795.06	415.0
XSECTION	34	RUNOFF	.14	7	2	.05	.0	3.10	24.00	.87	---	6.19	83.96	608.4
XSECTION	34	ADDHYD	2.05	7	2	.05	.0	3.10	24.00	1.01	---	6.60	823.36	400.9
XSECTION	34	ADDHYD	3.04	7	2	.05	.0	3.10	24.00	.77	---	6.58	1017.58	335.0
XSECTION	35	REACH	3.04	7	2	.05	.0	3.10	24.00	.77	---	6.58	1017.58	335.0
XSECTION	35	RUNOFF	.14	7	2	.05	.0	3.10	24.00	.93	---	6.16	97.10	698.6
XSECTION	35	ADDHYD	3.18	7	2	.05	.0	3.10	24.00	.78	---	6.57	1046.73	329.5
XSECTION	36	REACH	3.18	7	2	.05	.0	3.10	24.00	.78	---	6.63	1042.49	328.2

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
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A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 36	RUNOFF	.12	7	2	.05	.0	3.10	24.00	1.21	---	6.15	113.67	931.7
XSECTION 36	ADDHYD	3.30	7	2	.05	.0	3.10	24.00	.79	---	6.62	1071.74	324.9
XSECTION 37	RUNOFF	.13	7	2	.05	.0	3.10	24.00	1.04	---	6.11	109.97	859.1
XSECTION 38	RUNOFF	.19	7	2	.05	.0	3.10	24.00	.92	---	6.31	96.65	519.6
XSECTION 39	RUNOFF	.15	7	2	.05	.0	3.10	24.00	.98	---	6.23	96.40	634.2
XSECTION 40	REACH	.15	7	2	.05	.0	3.10	24.00	.97	---	6.35	87.71	577.1
XSECTION 40	RUNOFF	.17	7	2	.05	.0	3.10	24.00	.83	---	6.13	112.72	655.3
XSECTION 40	ADDHYD	.32	7	2	.05	.0	3.10	24.00	.90	---	6.19	173.13	534.3
XSECTION 40	REACH	3.30	7	2	.05	.0	3.10	24.00	.79	---	6.76	999.30	303.0
XSECTION 40	REACH	.13	7	2	.05	.0	3.10	24.00	1.03	---	6.21	101.36	791.9
XSECTION 40	REACH	.19	7	2	.05	.0	3.10	24.00	.92	---	6.39	94.85	510.0
XSECTION 40	ADDHYD	.45	7	2	.05	.0	3.10	24.00	.93	---	6.20	274.29	606.8
XSECTION 40	ADDHYD	.64	7	2	.05	.0	3.10	24.00	.93	---	6.24	347.75	545.1
XSECTION 40	ADDHYD	3.94	7	2	.05	.0	3.10	24.00	.81	---	6.73	1133.36	287.9
XSECTION 41	REACH	3.94	7	2	.05	.0	3.10	24.00	.81	---	6.83	1111.59	282.1
XSECTION 41	RUNOFF	.15	7	2	.05	.0	3.10	24.00	.98	---	6.19	104.41	682.1
XSECTION 41	ADDHYD	4.09	7	2	.05	.0	3.10	24.00	.82	---	6.82	1133.35	277.1
XSECTION 42	RUNOFF	.14	7	2	.05	.0	3.10	24.00	.92	---	6.28	76.50	542.6
XSECTION 43	REACH	.14	7	2	.05	.0	3.10	24.00	.92	---	6.28	76.50	542.6
XSECTION 43	RUNOFF	.13	7	2	.05	.0	3.10	24.00	.97	---	6.35	67.99	519.0
XSECTION 43	ADDHYD	.27	7	2	.05	.0	3.10	24.00	.95	---	6.31	143.39	527.2
XSECTION 44	REACH	.27	7	2	.05	.0	3.10	24.00	.95	---	6.38	141.73	521.1
XSECTION 44	RUNOFF	.09	7	2	.05	.0	3.10	24.00	.88	---	6.13	64.44	700.4
XSECTION 44	ADDHYD	.36	7	2	.05	.0	3.10	24.00	.93	---	6.30	175.76	482.9
XSECTION 45	REACH	.36	7	2	.05	.0	3.10	24.00	.93	---	6.37	174.56	479.6
XSECTION 45	RUNOFF	.10	7	2	.05	.0	3.10	24.00	1.03	---	6.13	82.12	821.2
XSECTION 45	ADDHYD	.46	7	2	.05	.0	3.10	24.00	.95	---	6.27	226.11	487.3
XSECTION 45	ADDHYD	4.55	7	2	.05	.0	3.10	24.00	.83	---	6.79	1235.71	271.4
XSECTION 46	RUNOFF	.14	7	2	.05	.0	3.10	24.00	.98	---	6.15	102.72	744.4
XSECTION 47	REACH	.14	7	2	.05	.0	3.10	24.00	.98	---	6.30	85.87	622.3
XSECTION 47	RUNOFF	.16	7	2	.05	.0	3.10	24.00	.88	---	6.13	108.56	700.4
XSECTION 47	ADDHYD	.29	7	2	.05	.0	3.10	24.00	.92	---	6.18	177.18	604.7
XSECTION 48	RUNOFF	.13	7	2	.05	.0	3.10	24.00	1.03	---	6.21	93.53	698.0
XSECTION 49	REACH	.13	7	2	.05	.0	3.10	24.00	1.03	---	6.38	76.42	570.3
XSECTION 49	RUNOFF	.08	7	2	.05	.0	3.10	24.00	.88	---	6.15	55.18	664.8
XSECTION 49	ADDHYD	.22	7	2	.05	.0	3.10	24.00	.97	---	6.27	114.71	528.6

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SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 50	RUNOFF	.12	7	2	.05	.0	3.10	24.00	1.03	---	6.32	68.51	570.9
XSECTION 51	REACH	.22	7	2	.05	.0	3.10	24.00	.97	---	6.40	107.87	497.1
XSECTION 51	REACH	.12	7	2	.05	.0	3.10	24.00	1.02	---	6.49	61.29	510.8
XSECTION 51	ADDHYD	.34	7	2	.05	.0	3.10	24.00	.99	---	6.43	167.42	496.8
XSECTION 51	RUNOFF	.09	7	2	.05	.0	3.10	24.00	1.48	---	6.09	117.97	1255.0
XSECTION 51	ADDHYD	.43	7	2	.05	.0	3.10	24.00	1.09	---	6.26	218.59	507.2
XSECTION 52	REACH	.43	7	2	.05	.0	3.10	24.00	1.09	---	6.42	208.71	484.2
XSECTION 52	RUNOFF	.14	7	2	.05	.0	3.10	24.00	.98	---	6.19	94.85	682.4
XSECTION 52	ADDHYD	.57	7	2	.05	.0	3.10	24.00	1.06	---	6.30	282.56	495.7
XSECTION 52	ADDHYD	.86	7	2	.05	.0	3.10	24.00	1.02	---	6.24	447.55	518.6
XSECTION 52	REACH	4.55	7	2	.05	.0	3.10	24.00	.83	---	6.86	1228.48	269.8
XSECTION 52	ADDHYD	5.42	7	2	.05	.0	3.10	24.00	.86	---	6.79	1431.67	264.3
XSECTION 53	RUNOFF	.14	7	2	.05	.0	3.10	24.00	.87	---	6.18	87.98	619.6
XSECTION 54	REACH	5.42	7	2	.05	.0	3.10	24.00	.86	---	6.88	1425.27	263.1
XSECTION 54	REACH	.14	7	2	.05	.0	3.10	24.00	.87	---	6.18	87.98	619.6
XSECTION 54	RUNOFF	.17	7	2	.05	.0	3.10	24.00	1.09	---	6.17	133.62	800.1
XSECTION 54	ADDHYD	.31	7	2	.05	.0	3.10	24.00	.99	---	6.17	221.63	717.2
XSECTION 54	ADDHYD	5.73	7	2	.05	.0	3.10	24.00	.86	---	6.85	1462.28	255.4
XSECTION 55	RUNOFF	.12	7	2	.05	.0	3.10	24.00	1.78	---	6.21	149.22	1213.2
XSECTION 55	ADDHYD	5.85	7	2	.05	.0	3.10	24.00	.88	---	6.55	1518.02	259.6
XSECTION 56	REACH	5.85	7	2	.05	.0	3.10	24.00	.88	---	6.62	1515.25	259.1
XSECTION 56	RUNOFF	.16	7	2	.05	.0	3.10	24.00	1.34	---	6.11	177.68	1117.5
XSECTION 56	ADDHYD	6.01	7	2	.05	.0	3.10	24.00	.89	---	6.60	1548.56	257.8
XSECTION 57	RUNOFF	.16	7	2	.05	.0	3.10	24.00	1.15	---	6.14	142.80	903.8
XSECTION 58	RUNOFF	.11	7	2	.05	.0	3.10	24.00	1.09	---	6.10	99.51	938.8
XSECTION 59	REACH	.16	7	2	.05	.0	3.10	24.00	1.15	---	6.14	142.80	903.8
XSECTION 59	REACH	.11	7	2	.05	.0	3.10	24.00	1.09	---	6.18	94.33	889.9
XSECTION 59	ADDHYD	.26	7	2	.05	.0	3.10	24.00	1.13	---	6.16	235.45	891.9
XSECTION 59	RUNOFF	.11	7	2	.05	.0	3.10	24.00	.93	---	6.09	94.61	829.9
XSECTION 59	ADDHYD	.38	7	2	.05	.0	3.10	24.00	1.07	---	6.13	323.80	856.6
XSECTION 60	REACH	.38	7	2	.05	.0	3.10	24.00	1.07	---	6.13	323.80	856.6
XSECTION 60	RUNOFF	.12	7	2	.05	.0	3.10	24.00	.93	---	6.10	94.70	809.4
XSECTION 60	ADDHYD	.50	7	2	.05	.0	3.10	24.00	1.03	---	6.12	416.74	841.9
XSECTION 61	REACH	.50	7	2	.05	.0	3.10	24.00	1.03	---	6.12	416.74	841.9
XSECTION 61	RUNOFF	.13	7	2	.05	.0	3.10	24.00	1.41	---	6.10	155.17	1193.6
XSECTION 61	ADDHYD	.63	7	2	.05	.0	3.10	24.00	1.11	---	6.12	570.66	913.1