

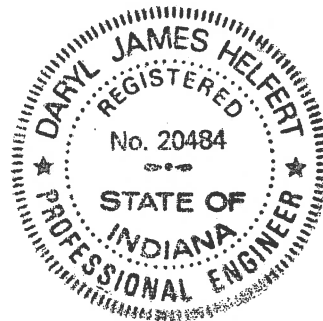
DRAINAGE REPORT
for
THE NORTH GREENS
PHASE 7

Prepared For:

JAGOE LAND CORPORATION
4215 BENTTREE DRIVE
OWENSBORO, KY 42304-3019

By:

MORLEY AND ASSOCIATES, INC.
600 S. E. SIXTH STREET
EVANSVILLE, INDIANA 47713-1222
(812) 464-9585



Daryl J. Helfert

AUGUST 1999

THE NORTH GREENS PHASE 7

The site is located west of Highway 41 and east of Old State Road in Center Township, Vanderburgh County. The 8.26 acre site consists of 20 lots and is adjacent to the Old State, Shady Hills, Greenbriar Hills, Old Petersburg Place and The North Greens Phase 1 subdivisions.

The site consists of flat to rolling ground that is partially wooded and partially previously cultivated. The north and east sides of the site are bounded by an unnamed tributary to Little Pigeon Creek. Part of the site drains to the north-northwest directly to the tributary and part drains to the south to an existing ditch, which flows to the east into the tributary. A portion of the property is subject to high return period flooding. The 100-year floodplain and floodway boundaries are depicted on the enclosed Drainage Plan drawing.

A retention basin will be constructed onsite to provide adequate storm water detention. Storm water runoff will be conveyed to the basin via storm sewers, swales and overland flow. Due to the topography, storm runoff from part of the site will be allowed to exit the property undetained. The total allowable discharge from the site was determined to be 5.84 cfs, which is the peak runoff rate for the 10-year storm under undeveloped conditions. When taking into account the undetained runoff leaving the site, the allowable discharge rate from the retention basin is reduced to 2.30 cfs for a 25-year storm for developed conditions. The required storm water detention volumes from the Form 800 calculations are 26,818 cubic feet and 38,294 cubic feet for the 25 year and 100 year storms, respectively. Utilizing a 12" RCP as the primary spillway outlet at elevation 386.0 feet, the total storage volume provided is 28,838 cubic feet at elevation 387.0 feet for the 25 year storm and 38,347 cubic feet at elevation 387.3 feet for the 100 year storm.

Part of the site is within the designated 100 year flood zone according to the FIRM Panel Number 180256 0025 C, dated August 5, 1991 and revised by a Letter of Map Revision (LOMR), Case Number 95-05-105P, dated September 25, 1995. The revised floodplain and floodway boundaries are depicted on the drainage plan.

As can be seen on the drainage plan, much of the proposed retention basin is located within the defined floodway. Before any construction can occur within the floodway, a Construction in a Floodway permit will have to be obtained from the Indiana Department of Natural Resources, Division of Water. This permit will be obtained and submitted to the drainage board as part of the request for final drainage approval. Because the basin is to be constructed partially within the floodway, the 25-year flood elevations have also been determined and the basin will be constructed so that floodwaters from a 25-year storm cannot backflow into the basin from the tributary.

Based on the most recent soil survey for Vanderburgh County, the following soil types are located on the proposed site: Henshaw silt loam (He); McGary silt loam (Mr); Wilbur silt loam (Wm); and Zipp silty clay (Zp).

TABLE 803

UNDEVELOPED RUNOFF COEFFICIENTS (C_u)

SURFACE TYPE:

WOODLAND, TURFED MEADOWS
ROUGH PASTURE, FALLOW BRUSH:

SLOPE:

| | |
|--------------|----------|
| Less than 2% | C = 0.12 |
| 2% to 5% | C = 0.24 |
| 5+% to 10% | C = 0.36 |
| Over 10% | C = 0.48 |

CULTIVATED FIELDS:

| | |
|--------------|----------|
| Less than 2% | C = 0.20 |
| 2% to 5% | C = 0.35 |
| 5+% to 10% | C = 0.50 |
| Over 10% | C = 0.65 |

TABLE 804

DEVELOPED RUNOFF COEFFICIENTS (C_d)

SURFACE TYPE:

PAVEMENT, ROOFTOP
OTHER IMPERVIOUS SURFACES:

| | |
|--------------|----------|
| Less than 2% | C = 0.92 |
| 2% to 5% | C = 0.94 |
| 5+% to 10% | C = 0.96 |
| Over 10% | C = 0.98 |

LAWNS WITH TURF:

| | |
|--------------|----------|
| Less than 2% | C = 0.15 |
| 2% to 5% | C = 0.25 |
| 5+% to 10% | C = 0.40 |
| Over 10% | C = 0.55 |

ALL WATER SURFACES
BASINS, PONDS & LAKES:

C = 1.00

Table 3.2.4 (cont'd)

Kerby (1959)

$$t_c = K (L N s^{-0.5})^{0.467}$$

where K is equal to 0.83 (US Customary units) or 1.44 (Metric units), L is the length of flow in ft (m), s is the average slope of overland flow, ft/ft (m/m), and N is the retardance roughness coefficient given in Table 3.2.5.

The length used in the equation is the straight-line distance from the most distant point of the watershed to the outlet, measured parallel to the slope of the land until a well-defined channel is reached. Watersheds of less than 10 acres were used to calibrate the model; slopes were less than 1%; N values were 0.8 and less and surface flow dominated (McCuen, 1989).

Izzard (1946)

$$t_c = \frac{K(Bi + c') L^{\frac{1}{3}}}{s^{\frac{1}{3}} i^{\frac{2}{3}}}$$

where K is equal to 41.025 for U.S. customary units (113.391 for metric), B is equal to 0.0007 for U.S customary units (0.00027 for metric), c' is the retardance coefficient given in Table 3.2.7, \bar{i} is the rainfall intensity, in/hr (cm/hr), L is the length of flow path in ft (m), and s is the slope of overland flow path, ft/ft (m/m).

The product of \bar{i} and L must be less than 500 in-ft/hr (390 cm-m/hr) to consider using this formula. In addition, well defined channels should not be present. This method was developed in laboratory experiments for the overland flow on roadway and turf surfaces.

Table 3.2.5
Values of N for Kerby's Formula (Kerby, 1959)

| <u>Type of Surface</u> | <u>N</u> |
|--|----------|
| Smooth impervious surface | 0.02 |
| Smooth bare packed soil | 0.10 |
| Poor grass, cultivated row crops or moderately rough bare surface | 0.20 |
| Deciduous timberland | 0.60 |
| Pasture or Overage grass | 0.40 |
| Conifer timberland, deciduous timberland with deep forest litter or dense grass | 0.80 |

TABLE 807

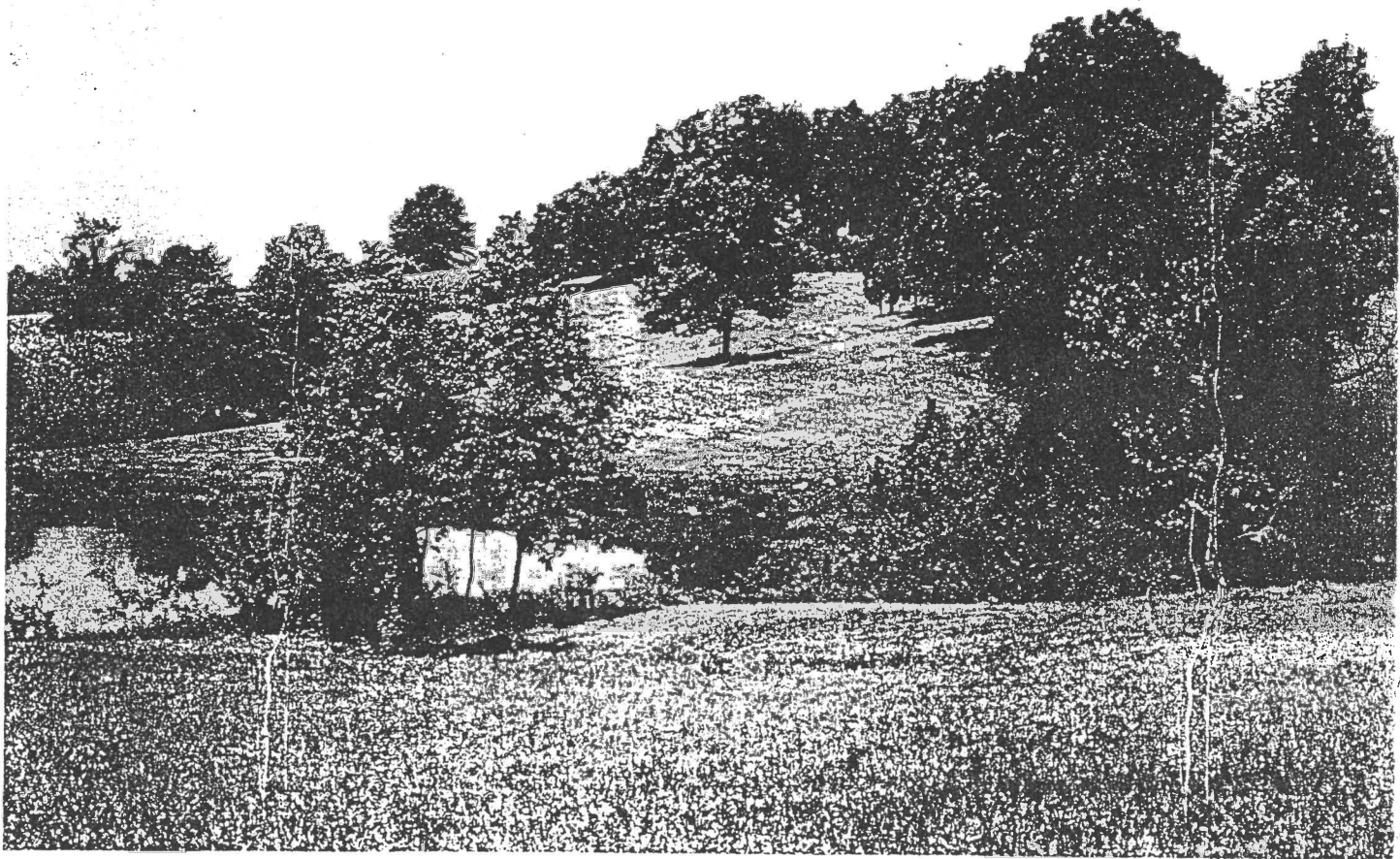
RAINFALL INTENSITY-DURATION-FREQUENCY TABLE FOR EVANSVILLE

INTENSITY IN INCHES PER HOUR

| STORM DURATION | | STORM RETURN PERIOD IN YEARS | | | | |
|----------------|-----|------------------------------|-------|-------|-------|-------|
| | | 5 | 10 | 25 | 50 | 100 |
| 5 | MIN | 6.063 | 6.625 | 7.208 | 7.936 | 8.469 |
| 10 | MIN | 4.863 | 5.380 | 5.925 | 6.616 | 7.126 |
| 15 | MIN | 4.029 | 4.515 | 5.033 | 5.697 | 6.194 |
| 30 | MIN | 2.837 | 3.226 | 3.646 | 4.194 | 4.608 |
| 60 | MIN | 1.549 | 1.819 | 2.078 | 2.412 | 2.663 |
| 2.0 | HRS | 1.053 | 1.230 | 1.400 | 1.620 | 1.785 |
| 3.0 | HRS | 0.774 | 0.899 | 1.019 | 1.175 | 1.291 |
| 4.0 | HRS | 0.632 | 0.736 | 0.836 | 0.965 | 1.062 |
| 5.0 | HRS | 0.524 | 0.606 | 0.684 | 0.785 | 0.861 |
| 6.0 | HRS | 0.453 | 0.522 | 0.589 | 0.676 | 0.741 |
| 7.0 | HRS | 0.399 | 0.459 | 0.516 | 0.591 | 0.647 |
| 8.0 | HRS | 0.358 | 0.412 | 0.463 | 0.530 | 0.581 |
| 9.0 | HRS | 0.323 | 0.370 | 0.415 | 0.472 | 0.516 |
| 10 | HRS | 0.297 | 0.339 | 0.379 | 0.431 | 0.470 |
| 11 | HRS | 0.276 | 0.314 | 0.351 | 0.399 | 0.435 |
| 12 | HRS | 0.259 | 0.296 | 0.331 | 0.376 | 0.410 |
| 13 | HRS | 0.245 | 0.280 | 0.314 | 0.357 | 0.390 |
| 14 | HRS | 0.233 | 0.267 | 0.299 | 0.341 | 0.372 |
| 15 | HRS | 0.220 | 0.252 | 0.281 | 0.320 | 0.349 |
| 16 | HRS | 0.209 | 0.238 | 0.266 | 0.302 | 0.329 |
| 17 | HRS | 0.198 | 0.225 | 0.251 | 0.284 | 0.310 |

SOIL SURVEY OF

Vanderburgh County, Indiana



United States Department of Agriculture
Soil Conservation Service

In cooperation with

Purdue University Agricultural
Experiment Station

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Other information is given in tables as follows:

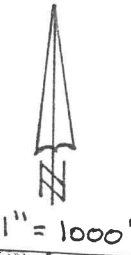
Acreeage and extent, table 1, page 11.
 Predicted yields, table 2, page 40.
 Tree and shrub groups, table 3, page 50.

Wildlife, table 4, page 52.
 Recreation, table 5, page 54.
 Engineering, tables 6, 7, and 8, pages 58, 60, and 66.

| Map symbol | Mapping unit | Described on page | Capability unit | | Tree and shrub group |
|------------|--|-------------------|-----------------|------|----------------------|
| | | | Symbol | Page | Number |
| A1B2 | Alford silt loam, 2 to 6 percent slopes, eroded----- | 11 | IIe-3 | 41 | III |
| A1C2 | Alford silt loam, 6 to 12 percent slopes, eroded----- | 11 | IIIe-3 | 43 | III |
| A1C3 | Alford silt loam, 6 to 12 percent slopes, severely eroded-- | 12 | IVe-3 | 45 | III |
| A1D3 | Alford silt loam, 12 to 18 percent slopes, severely eroded----- | 12 | VIe-1 | 46 | III |
| Ba | Bartle silt loam----- | 15 | IIw-3 | 42 | II |
| Bd | Birds silt loam----- | 16 | IIIw-10 | 44 | I |
| Bo | Bonnie silt loam----- | 16 | IIIw-10 | 44 | I |
| Br | Borrow pits----- | 16 | VIIe-3 | 46 | IV |
| Ev | Evansville silt loam----- | 17 | IIw-1 | 41 | I |
| Gn | Ginat silt loam----- | 17 | IIIw-12 | 45 | I |
| Gu | Gullied land----- | 17 | VIIe-4 | 47 | IV |
| He | Henshaw silt loam----- | 19 | IIw-2 | 42 | II |
| HoA | Hosmer silt loam, 0 to 2 percent slopes----- | 20 | IIw-5 | 43 | II |
| HoB2 | Hosmer silt loam, 2 to 6 percent slopes, eroded----- | 20 | IIe-7 | 41 | II |
| HoB3 | Hosmer silt loam, 2 to 6 percent slopes, severely eroded--- | 20 | IIIe-7 | 43 | II |
| HoC2 | Hosmer silt loam, 6 to 12 percent slopes, eroded----- | 20 | IIIe-7 | 43 | II |
| HoC3 | Hosmer silt loam, 6 to 12 percent slopes, severely eroded-- | 21 | IVe-7 | 45 | II |
| HoD3 | Hosmer silt loam, 12 to 18 percent slopes, severely eroded----- | 21 | VIe-1 | 46 | II |
| Ht | Huntington silty clay loam----- | 22 | I-2 | 41 | III |
| Hu | Huntington fine sandy loam, sandy variant----- | 22 | I-2 | 41 | III |
| IoA | Iona silt loam, 0 to 2 percent slopes----- | 23 | I-1 | 41 | III |
| IoB2 | Iona silt loam, 2 to 6 percent slopes, eroded----- | 23 | IIe-3 | 41 | III |
| Iv | Iva silt loam----- | 23 | IIw-2 | 42 | II |
| Ln | Lindside silty clay loam----- | 24 | I-2 | 41 | III |
| Ma | Made land----- | 24 | VIIe-3 | 46 | IV |
| MkB2 | Markland silt loam, 2 to 6 percent slopes, eroded----- | 24 | IIIe-11 | 43 | II |
| MkC2 | Markland silt loam, 6 to 18 percent slopes, eroded----- | 24 | IVe-11 | 45 | II |
| M1C3 | Markland silty clay loam, 6 to 18 percent slopes, severely eroded----- | 25 | VIe-1 | 46 | II |
| Mr | McGary silt loam----- | 26 | IIIw-6 | 44 | II |
| MuA | Muren silt loam, 0 to 2 percent slopes----- | 27 | I-1 | 41 | III |
| MuB2 | Muren silt loam, 2 to 6 percent slopes, eroded----- | 27 | IIe-3 | 41 | III |
| Nw | Newark silty clay loam----- | 28 | IIw-7 | 43 | I |
| Pa | Patton silty clay loam----- | 28 | IIw-1 | 41 | I |
| PrB | Princeton fine sandy loam, 2 to 6 percent slopes----- | 28 | IIe-11 | 41 | III |
| Ra | Ragsdale silt loam----- | 29 | IIw-1 | 41 | I |
| Rh | Rahm silty clay loam----- | 29 | IIw-7 | 43 | I |
| Rs | Reesville silt loam----- | 30 | IIw-2 | 42 | II |
| ScA | Sciotoville silt loam, 0 to 2 percent slopes----- | 30 | IIw-5 | 43 | II |
| ScB2 | Sciotoville silt loam, 2 to 6 percent slopes, eroded----- | 31 | IIe-7 | 41 | II |
| St | Stendal silt loam----- | 31 | IIw-7 | 43 | I |
| UnB2 | Uniontown silt loam, 2 to 6 percent slopes, eroded----- | 32 | IIe-3 | 41 | III |
| Wa | Wakeland silt loam----- | 32 | IIw-7 | 43 | I |
| Wb | Weinbach silt loam----- | 33 | IIw-3 | 42 | II |
| WeD2 | Wellston silt loam, 12 to 18 percent slopes, eroded----- | 34 | IVe-3 | 45 | III |
| WeD3 | Wellston silt loam, 12 to 18 percent slopes, severely eroded----- | 34 | VIe-1 | 46 | III |
| WeE2 | Wellston silt loam, 18 to 25 percent slopes, eroded----- | 34 | VIe-1 | 46 | III |

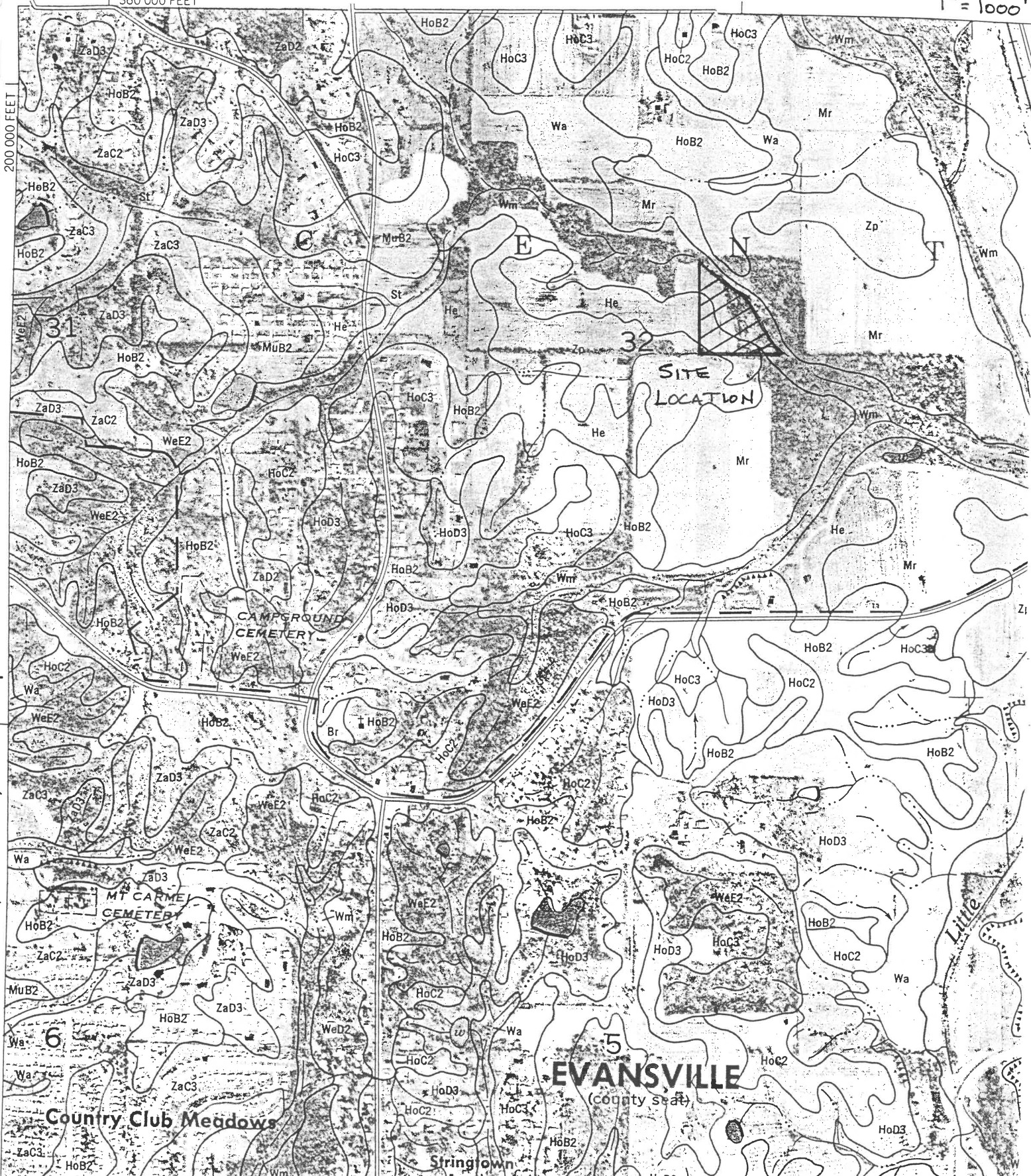
GUIDE TO MAPPING UNITS--Continued

| Map symbol | Mapping unit | Described on page | Capability unit | | Tree and shrub group |
|------------|--|-------------------|-----------------|------|----------------------|
| | | | Symbol | Page | Number |
| WeF | Wellston silt loam, 25 to 50 percent slopes----- | 34 | VIIe-1 | 46 | III |
| WhA | Wheeling loam, 0 to 2 percent slopes----- | 35 | I-1 | 41 | III |
| WhB2 | Wheeling loam, 2 to 6 percent slopes, eroded----- | 35 | IIe-3 | 41 | III |
| Wm | Wilbur silt loam----- | 36 | I-2 | 41 | III |
| Wo | Woodmere silty clay loam----- | 36 | I-2 | 41 | III |
| ZaC2 | Zanesville silt loam, 6 to 12 percent slopes, eroded----- | 37 | IIIe-7 | 43 | II |
| ZaC3 | Zanesville silt loam, 6 to 12 percent slopes, severely eroded----- | 37 | IVe-7 | 45 | II |
| ZaD2 | Zanesville silt loam, 12 to 18 percent slopes, eroded----- | 38 | IVe-7 | 45 | II |
| ZaD3 | Zanesville silt loam, 12 to 18 percent slopes, severely eroded----- | 38 | VIe-1 | 46 | II |
| Zp | Zipp silty clay----- | 38 | IIIw-2 | 44 | I |



360 000 FEET

200 000 FEET



SITE LOCATION

CAMPGROUND CEMETERY

MT CARMEL CEMETERY

Country Club Meadows

EVANSVILLE (county seat)

Stringtown

(Joins sheet 18)

UNDEVELOPED CONDITIONS

Total Area = 8.26 acres = 360,006.6 S.F.

Runoff Coefficients

| <u>Surface Description</u> | <u>Ac.</u> | <u>C</u> | <u>N</u> |
|-----------------------------|------------|-------------|-------------|
| Previously cultivated, 0-2% | 6.67 | 0.20 | 0.20 |
| Woods, 0-2% | 1.59 | <u>0.12</u> | <u>0.60</u> |
| W/d coeff. | | 0.185 | 0.277 |

Time of Concentration

$$L = 450' \quad H = 4.5' \quad S = 0.01$$

$$t_c = 0.827 \left[\frac{(450)(0.277)}{(0.01)^{0.5}} \right]^{0.467} = 23.08 \text{ minutes}$$

Rainfall Intensity, 10 Year Frequency

$$I_{10} = 3.821 \text{ in/hr.}$$

Peak Undeveloped 10 Year Flow

$$Q_{10} = C I_{10} A$$

$$Q_{10} = (0.185)(3.821)(8.26) = \underline{5.84 \text{ cfs}}$$

DEVELOPED CONDITIONS

Average impervious surface per lot

House / garage - 2100 SF

Patio - 150 SF

Driveway - 700 SF

Pavement surface - street and sidewalk

Street - 29' B/C to B/C

Sidewalk - 4' wide

Developed Runoff Coefficients - weighted from sub-basins

$$C = 0.503$$

$$N = 0.276$$

DETENTION REQUIREMENTS

The proposed retention basin will capture storm water runoff from sub-basins 1, 2, 3, 4, 5, 6 and 11. The remaining four sub-basins will be allowed to discharge storm water from the site undetained.

Undetained Sub-basins

| <u>No.</u> | <u>Ac.</u> | <u>Dev. Q₂₅</u> |
|------------|-------------|----------------------------|
| 7 | 0.56 | 0.91 |
| 8 | 0.93 | 1.28 |
| 9 | 0.56 | 0.74 |
| 10 | <u>1.04</u> | <u>0.61</u> |
| | 3.09 | 3.54 CFS |

Allowable Discharge Rate for Retention Basin - 25 Year

Peak Undeveloped 10 Year Rate, Undev. Q₁₀ = 5.84 cfs

$$\text{Allow. Dev. Q}_{25} = 5.84 - 3.54 = 2.30 \text{ cfs}$$

Required Detention Volume - from Form 800

$$25 \text{ Year Storm} = 26,818 \text{ cu. ft.}$$

$$100 \text{ Year Storm} = 38,294 \text{ cu. ft.}$$

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800

PROJECT: 99-4377-4 DETENTION FACILITY DESIGN RETURN PERIOD: 100 YRS
 The North Greens Phase 7
 DESIGNER: MORLEY & ASSOC. RELEASE RATE RETURN PERIOD: 10 YRS

WATERSHED AREA: 8.26 ACRES
 TIME OF CONCENTRATION (UNDEVELOPED WATERSHED): 23.08 MINUTES
 RAINFALL INTENSITY (I_u): 3.821 INCHES/HR
 UNDEVELOPED RUNOFF COEFFICIENT (C_u): 0.185
 UNDEVELOPED RUNOFF RATE (O = C_u*I_u*A): 5.84 CFS
 DEVELOPED RUNOFF COEFFICIENT (C_d): 0.503

| RESTRICTED | | | | | |
|---|---|---|---|---|--|
| STORM DURATION T _d (HRS) | RAINFALL INTENSITY I _d (INCH/HR) | INFLOW RATE I(T _d) (C _d *I _d *A) (CFS) | OUTFLOW RATE O (C _u *I _u *A) (CFS) | STORAGE RATE I(T _d)-O (CFS) | REQUIRED STORAGE (T _d)-O)*T _d /12 (ACRE-FT) |
| 0.08 | 8.469 | 35.19 | 2.30 | 32.89 | 0.228 |
| 0.17 | 7.126 | 29.61 | 2.30 | 27.31 | 0.379 |
| 0.25 | 6.194 | 25.73 | 2.30 | 23.43 | 0.488 |
| 0.33 | 5.665 | 23.54 | 2.30 | 21.24 | 0.590 |
| 0.42 | 5.137 | 21.34 | 2.30 | 19.04 | 0.661 |
| 0.50 | 4.608 | 19.15 | 2.30 | 16.85 | 0.702 |
| 0.58 | 4.284 | 17.80 | 2.30 | 15.50 | 0.753 |
| 0.67 | 3.960 | 16.45 | 2.30 | 14.15 | 0.786 |
| 0.75 | 3.636 | 15.10 | 2.30 | 12.80 | 0.800 |
| 0.83 | 3.311 | 13.76 | 2.30 | 11.46 | 0.796 |
| 0.92 | 2.987 | 12.41 | 2.30 | 10.11 | 0.772 |
| 1.00 | 2.663 | 11.06 | 2.30 | 8.76 | 0.730 |
| 1.25 | 2.444 | 10.15 | 2.30 | 7.85 | 0.818 |
| 1.50 | 2.224 | 9.24 | 2.30 | 6.94 | 0.868 |
| 1.75 | 2.005 | 8.33 | 2.30 | 6.03 | 0.879 |
| 2.00 | 1.785 | 7.42 | 2.30 | 5.12 | 0.853 |
| 2.50 | 1.538 | 6.39 | 2.30 | 4.09 | 0.852 |
| 3.00 | 1.291 | 5.36 | 2.30 | 3.06 | 0.766 |
| 4.00 | 1.062 | 4.41 | 2.30 | 2.11 | 0.704 |

| | |
|--------------------------|--------|
| PEAK STORAGE (ACRE/FT): | 0.88 |
| PEAK STORAGE (CUBIC FT): | 38,294 |

RETENTION BASIN - Available Storage Volume

Basin Elevation - Area - Volume Relationship

| | <u>Elevation</u> | <u>Area (SF)</u> | <u>Cumulative Volume (cu. ft.)</u> |
|------|------------------|------------------|------------------------------------|
| Pool | 386.0 | 26,700 | - |
| | 386.5 | 28,825 | 13,881 |
| | 387.0 | 31,000 | 28,838 |
| | 387.5 | 33,325 | 44,919 |
| | 388.0 | 35,550 | 62,138 |

Reg'd 25 Year Storage Elev. = 386.94' \Rightarrow 26,985 cu. ft.

Reg'd 100 Year Storage Elev. = 387.30' \Rightarrow 38,347 cu. ft.

Primary Spillway - 12" RCP, 80' long, 1.0% slope

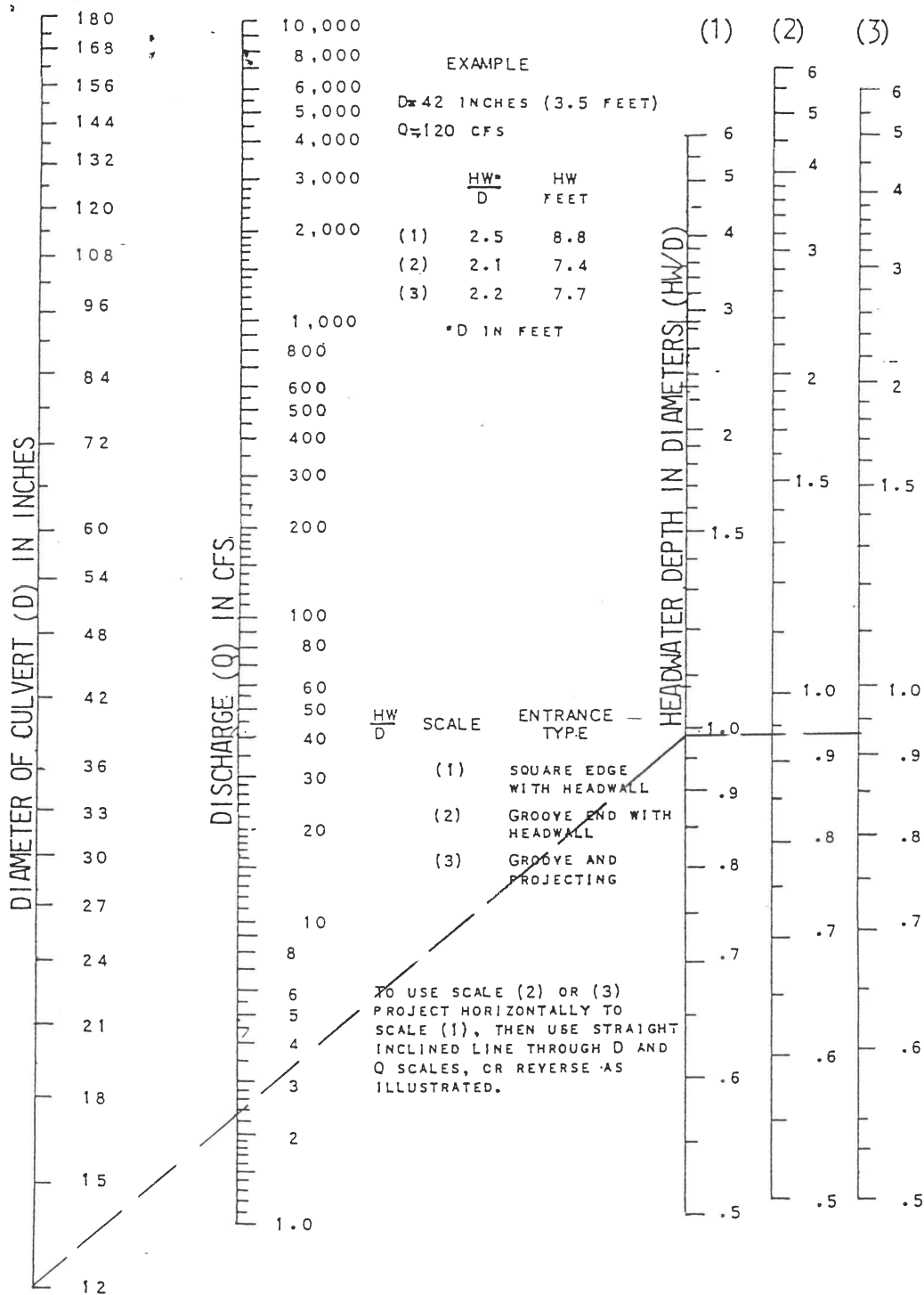
Allowable Discharge = 2.30 cfs

For headwater depth = 1.0' @ Elev. 387.0'

25 Yr. Storage Volume = 28,838 cu. ft.

(25 year storm tailwater elev. = 386.5')

100 Yr. Storage Volume = 38,347 cu. ft.



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

FIG. 7-430.01 F

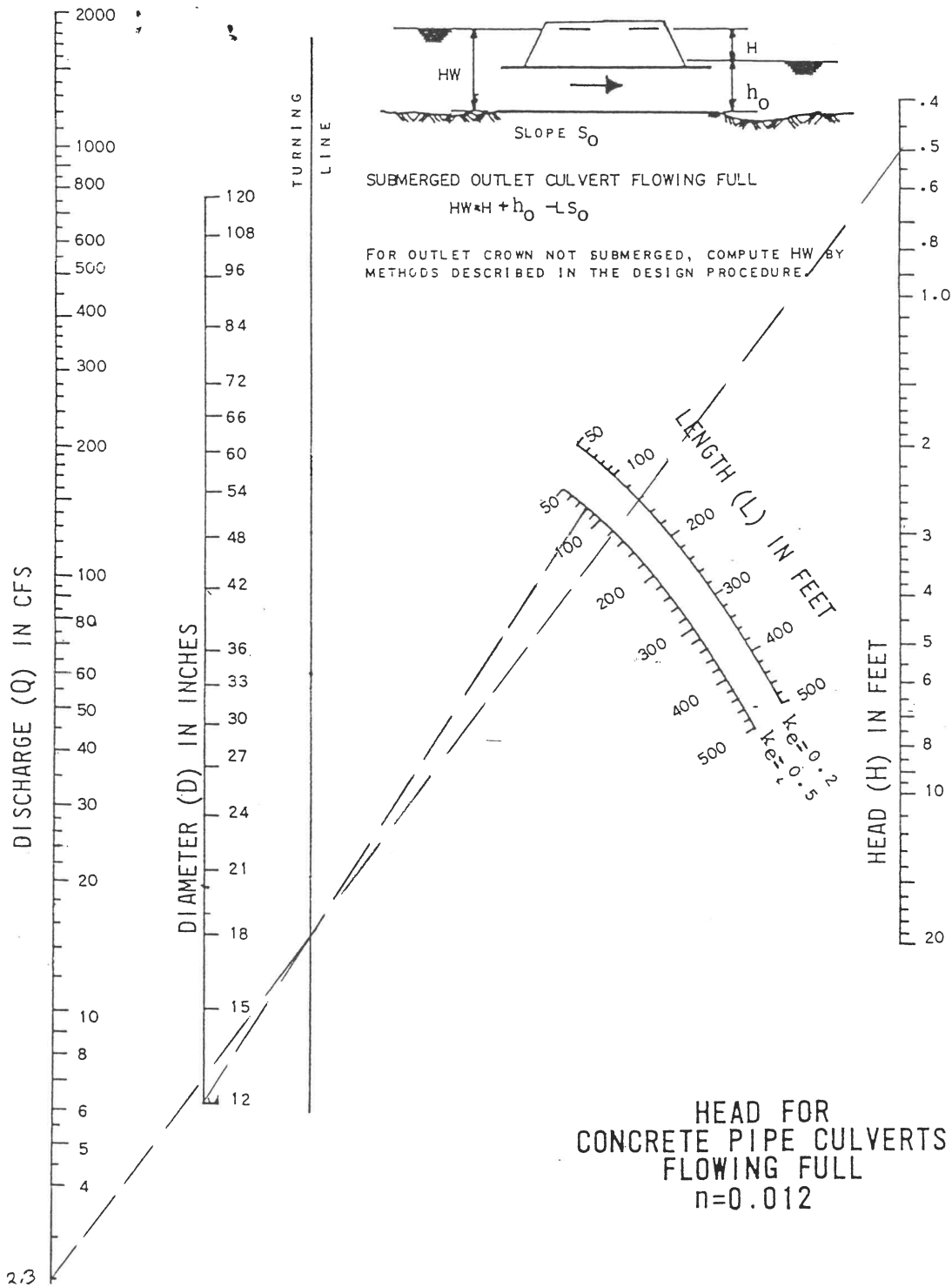
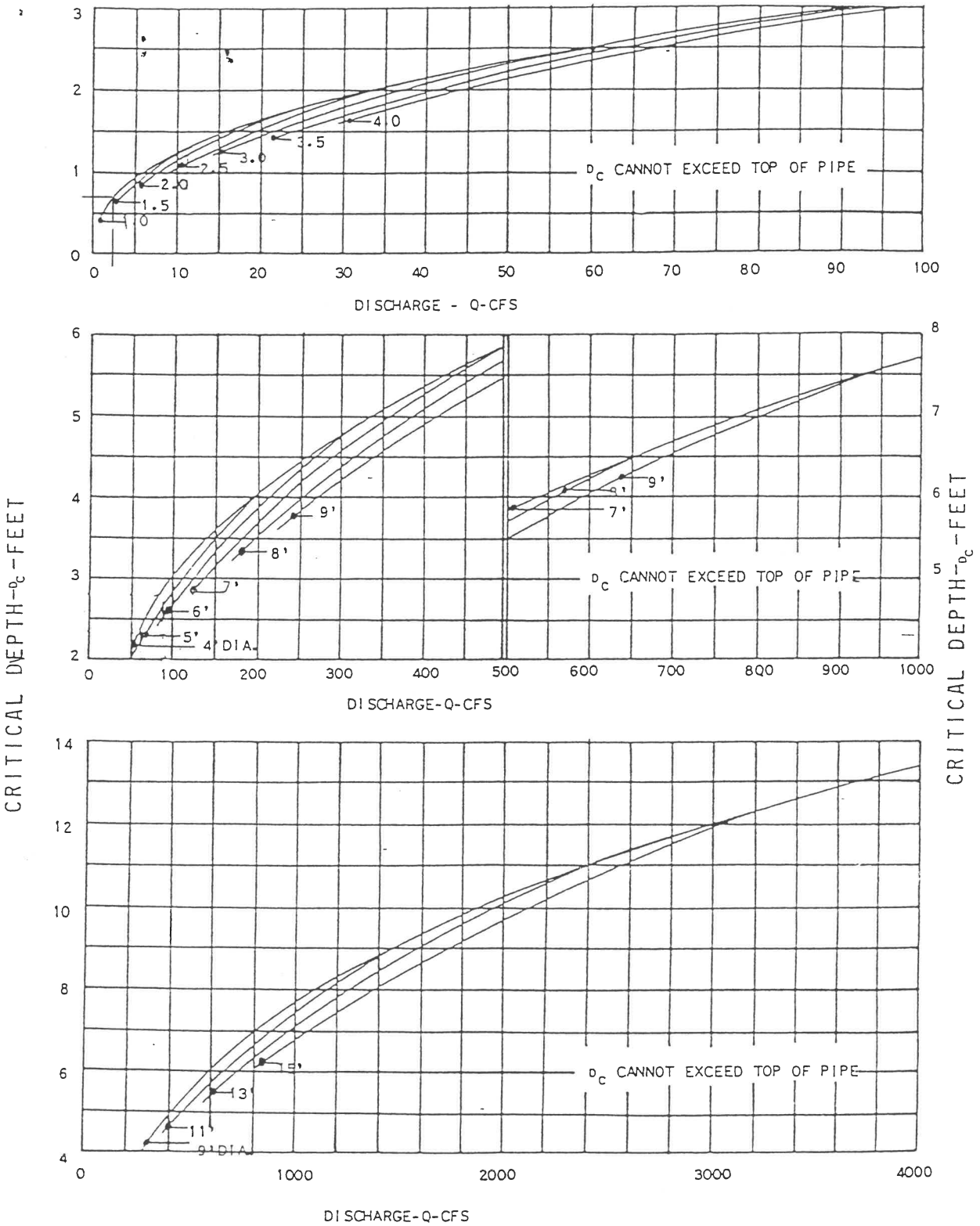
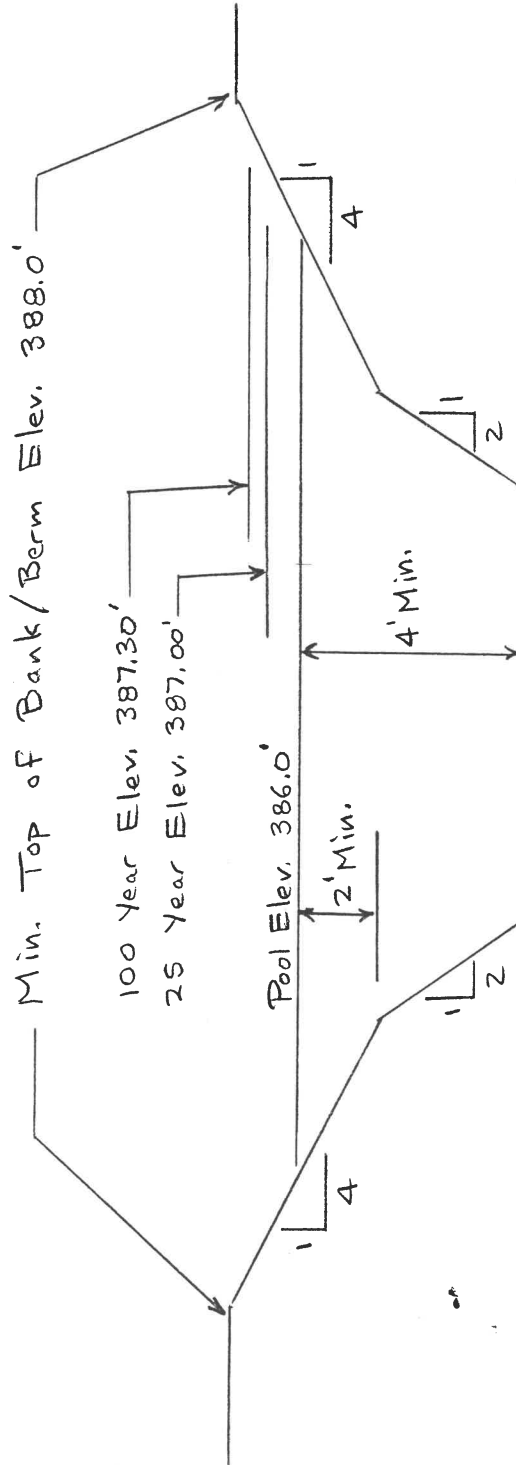


FIG. 7-430.01 W



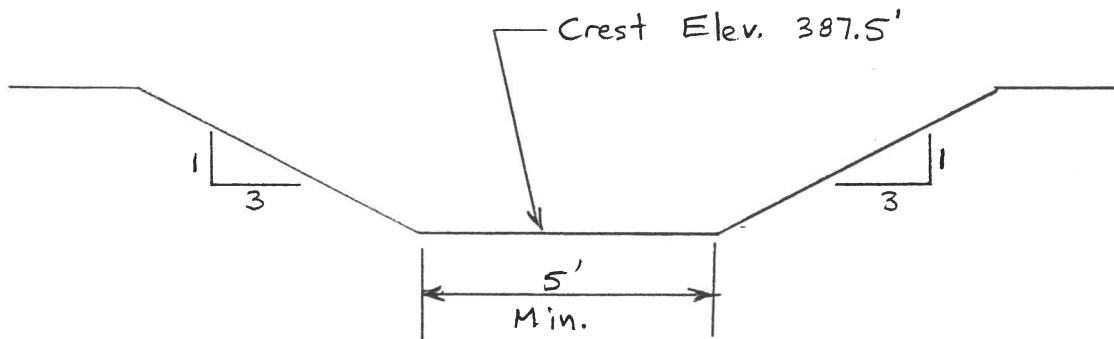
CRITICAL DEPTH
CIRCULAR PIPE

FIG. 7-430.01 L



RETENTION BASIN
TYPICAL SECTION

EMERGENCY OVERFLOW



MORLEY AND ASSOCIATES INC.
 STORM SEWER DESIGN SHEET - RATIONAL METHOD

PROJECT THE NORTH GREENS PHASE 7

OUR PROJECT # 99-4377-4

DATE: 8/6/99

MANNINGS n 0.011

DESIGN PERIOD 25 YEARS

| LINE NO. | UPSTREAM STRUCTURE | PIPE # | DOWNSTREAM STRUCTURE | LENGTH (ft) | Cj | Aj (ac.) | SUM | | Tj (min) | Tcum (min) | I (in/hr) | Q (cfs) | PIPE DIA. (in) | PIPE SLOPE (ft/ft) | PIPE CAP. (cfs) | VELOCITY (ft/sec) | TRAVEL TIME (min) |
|----------|--------------------|--------|----------------------|-------------|-------|----------|------|------|----------|------------|-----------|---------|----------------|--------------------|-----------------|-------------------|-------------------|
| | | | | | | | CjAj | CjAj | | | | | | | | | |
| 1 | 100 | 101 | 102 | 29 | 0.667 | 0.16 | 0.11 | 0.11 | 9.04 | 9.04 | 6.171 | 0.66 | 12 | 0.0050 | 2.98 | 3.79 | 0.13 |
| 1 | 102 | 103 | 104 | 131 | 0.600 | 0.40 | 0.24 | 0.35 | 12.40 | 12.40 | 5.497 | 1.91 | 12 | 0.0050 | 2.98 | 3.79 | 0.58 |
| 1 | 104 | 105 | 106 | 52 | - | - | 0.00 | 0.35 | - | 12.98 | 5.394 | 1.87 | 12 | 0.0050 | 2.98 | 3.79 | 0.23 |
| 2 | 107 | 108 | 109 | 29 | 0.708 | 0.22 | 0.16 | 0.16 | 10.09 | 10.09 | 5.909 | 0.92 | 12 | 0.0050 | 2.98 | 3.79 | 0.13 |
| 2 | 109 | 110 | 111 | 40 | 0.619 | 0.31 | 0.19 | 0.35 | 13.24 | 13.24 | 5.347 | 1.86 | 12 | 0.0050 | 2.98 | 3.79 | 0.18 |
| 2 | 111 | 112 | 113 | 144 | - | - | 0.00 | 0.35 | - | 13.42 | 5.316 | 1.85 | 12 | 0.0050 | 2.98 | 3.79 | 0.63 |
| 2 | 113 | 114 | 115 | 24 | - | - | 0.00 | 0.35 | - | 14.05 | 5.203 | 1.81 | 12 | 0.0050 | 2.98 | 3.79 | 0.11 |
| 3 | 116 | 117 | 118 | 29 | 0.641 | 0.86 | 0.55 | 0.55 | 16.17 | 16.17 | 4.925 | 2.71 | 12 | 0.0080 | 3.76 | 4.80 | 0.10 |
| 3 | 118 | 119 | 120 | 148 | 0.668 | 0.63 | 0.42 | 0.97 | 13.98 | 16.27 | 4.915 | 4.78 | 15 | 0.0100 | 7.63 | 6.22 | 0.40 |

The North Greens Phase 7
Project No. 4377-4

Developed Drainage Sub-Basins

| | | | | |
|----------------|------------|--------------|---------------|--------------------|
| Sub-basin No.: | 1 | Total Area = | 17,424 S.F. = | 0.40 Ac. |
| Surface | | | | |
| Structures | 1.25 Total | 2,100 S.F. = | 2,625 S.F. = | 0.06 Ac. 0.92 0.02 |
| Drives | 2.5 Total | 700 S.F. = | 1,750 S.F. = | 0.04 Ac. 0.92 0.02 |
| Pavement | 255 L.F. | 14.5 Width = | 3,698 S.F. = | 0.08 Ac. 0.92 0.02 |
| Patios | 0 Total | 150 S.F. = | 0 S.F. = | 0.00 Ac. 0.92 0.02 |
| Sidewalks | 255 L.F. | 4 Width = | 1,020 S.F. = | 0.02 Ac. 0.92 0.02 |
| Lawn (0-2%) | | S.F. = | | 0.00 Ac. 0.15 0.40 |
| Lawn (2-5%) | | 8,332 S.F. = | | 0.19 Ac. 0.25 0.40 |
| Lawn (5-10%) | | S.F. = | | 0.00 Ac. 0.40 0.40 |
| Lawn (>10%) | | S.F. = | | 0.00 Ac. 0.55 0.40 |
| Water | | S.F. = | | 0.00 Ac. 1.00 0.00 |
| Misc. | | S.F. = | | 0.00 Ac. |

| | |
|--------------|----------------|
| Weighted c = | 0.600 |
| Weighted N = | 0.202 |
| L = | 200 Ft. |
| H = | 3.0 Ft. |
| S = | 0.0150 Ft./Ft. |
| tc = | 12.40 Minutes |
| I(25) = | 5.497 In./Hr. |
| Q(25) = | 1.32 CFS |

(Min. 5 minutes)

Developed Drainage Sub-Basins

| | | | | |
|----------------|----------|--------------|--------------|--------------------|
| Sub-basin No.: | 2 | Total Area = | 6,970 S.F. = | 0.16 Ac. |
| Surface | | | | |
| Structures | 0 Total | 2,100 S.F. = | 0 S.F. = | 0.00 Ac. 0.92 0.02 |
| Drives | 0 Total | 700 S.F. = | 0 S.F. = | 0.00 Ac. 0.92 0.02 |
| Pavement | 240 L.F. | 14.5 Width = | 3,480 S.F. = | 0.08 Ac. 0.92 0.02 |
| Patios | 0 Total | 150 S.F. = | 0 S.F. = | 0.00 Ac. 0.92 0.02 |
| Sidewalks | 240 L.F. | 4 Width = | 960 S.F. = | 0.02 Ac. 0.92 0.02 |
| Lawn (0-2%) | | S.F. = | | 0.00 Ac. 0.15 0.40 |
| Lawn (2-5%) | | 2,530 S.F. = | | 0.06 Ac. 0.25 0.40 |
| Lawn (5-10%) | | S.F. = | | 0.00 Ac. 0.40 0.40 |
| Lawn (>10%) | | S.F. = | | 0.00 Ac. 0.55 0.40 |
| Water | | S.F. = | | 0.00 Ac. 1.00 0.00 |
| Misc. | | S.F. = | | 0.00 Ac. |

| | |
|--------------|----------------|
| Weighted c = | 0.677 |
| Weighted N = | 0.158 |
| L = | 150 Ft. |
| H = | 3.0 Ft. |
| S = | 0.0200 Ft./Ft. |
| tc = | 9.04 Minutes |
| I(25) = | 6.171 In./Hr. |
| Q(25) = | 0.67 CFS |

(Min. 5 minutes)

The North Greens Phase 7
Project No. 4377-4

Developed Drainage Sub-Basins

Sub-basin No.: 3 Total Area = 13,504 S.F. = 0.31 Ac.

| Surface | | | | | | C | N |
|--------------|------------|-------|---------|-------|--------|----------|-----------|
| Structures | 1.25 Total | 2,100 | S.F. = | 2,625 | S.F. = | 0.06 Ac. | 0.92 0.02 |
| Drives | 2.5 Total | 700 | S.F. = | 1,750 | S.F. = | 0.04 Ac. | 0.92 0.02 |
| Pavement | 165 L.F. | 14.5 | Width = | 2,393 | S.F. = | 0.05 Ac. | 0.92 0.02 |
| Patios | 0 Total | 150 | S.F. = | 0 | S.F. = | 0.00 Ac. | 0.92 0.02 |
| Sidewalks | 165 L.F. | 4 | Width = | 660 | S.F. = | 0.02 Ac. | 0.92 0.02 |
| Lawn (0-2%) | | | S.F. = | | | 0.00 Ac. | 0.15 0.40 |
| Lawn (2-5%) | | 6,076 | S.F. = | | | 0.14 Ac. | 0.25 0.40 |
| Lawn (5-10%) | | | S.F. = | | | 0.00 Ac. | 0.40 0.40 |
| Lawn (>10%) | | | S.F. = | | | 0.00 Ac. | 0.55 0.40 |
| Water | | | S.F. = | | | 0.00 Ac. | 1.00 0.00 |
| Misc. | | | S.F. = | | | 0.00 Ac. | |

| | |
|--------------|----------------|
| Weighted c = | 0.619 |
| Weighted N = | 0.191 |
| L = | 240 Ft. |
| H = | 3.5 Ft. |
| S = | 0.0146 Ft./Ft. |
| tc = | 13.24 Minutes |
| I (25) = | 5.347 In./Hr. |
| Q (25) = | 1.03 CFS |

(Min. 5 minutes)

Developed Drainage Sub-Basins

Sub-basin No.: 4 Total Area = 9,583 S.F. = 0.22 Ac.

| Surface | | | | | | C | N |
|--------------|----------|-------|---------|-------|--------|----------|-----------|
| Structures | 1 Total | 2,100 | S.F. = | 2,100 | S.F. = | 0.05 Ac. | 0.92 0.02 |
| Drives | 2 Total | 700 | S.F. = | 1,400 | S.F. = | 0.03 Ac. | 0.92 0.02 |
| Pavement | 165 L.F. | 14.5 | Width = | 2,393 | S.F. = | 0.05 Ac. | 0.92 0.02 |
| Patios | 0 Total | 150 | S.F. = | 0 | S.F. = | 0.00 Ac. | 0.92 0.02 |
| Sidewalks | 165 L.F. | 4 | Width = | 660 | S.F. = | 0.02 Ac. | 0.92 0.02 |
| Lawn (0-2%) | | | S.F. = | | | 0.00 Ac. | 0.15 0.40 |
| Lawn (2-5%) | | 3,031 | S.F. = | | | 0.07 Ac. | 0.25 0.40 |
| Lawn (5-10%) | | | S.F. = | | | 0.00 Ac. | 0.40 0.40 |
| Lawn (>10%) | | | S.F. = | | | 0.00 Ac. | 0.55 0.40 |
| Water | | | S.F. = | | | 0.00 Ac. | 1.00 0.00 |
| Misc. | | | S.F. = | | | 0.00 Ac. | |

| | |
|--------------|----------------|
| Weighted c = | 0.708 |
| Weighted N = | 0.140 |
| L = | 200 Ft. |
| H = | 3.5 Ft. |
| S = | 0.0175 Ft./Ft. |
| tc = | 10.09 Minutes |
| I (25) = | 5.909 In./Hr. |
| Q (25) = | 0.92 CFS |

(Min. 5 minutes)

The North Greens Phase 7
Project No. 4377-4

Developed Drainage Sub-Basins

Sub-basin No.: 5 Total Area = 27,443 S.F. = 0.63 Ac.

| Surface | | | | | | C | N |
|--------------|------|-------|--------|---------|-------|-------------|---------------|
| Structures | 2.75 | Total | 2,100 | S.F. = | 5,775 | S.F. = 0.13 | Ac. 0.92 0.02 |
| Drives | 5 | Total | 700 | S.F. = | 3,500 | S.F. = 0.08 | Ac. 0.92 0.02 |
| Pavement | 425 | L.F. | 14.5 | Width = | 6,163 | S.F. = 0.14 | Ac. 0.92 0.02 |
| Patios | 0 | Total | 150 | S.F. = | 0 | S.F. = 0.00 | Ac. 0.92 0.02 |
| Sidewalks | 425 | L.F. | 4 | Width = | 1,700 | S.F. = 0.04 | Ac. 0.92 0.02 |
| Lawn (0-2%) | | | | S.F. = | | 0.00 | Ac. 0.15 0.40 |
| Lawn (2-5%) | | | 10,305 | S.F. = | | 0.24 | Ac. 0.25 0.40 |
| Lawn (5-10%) | | | | S.F. = | | 0.00 | Ac. 0.40 0.40 |
| Lawn (>10%) | | | | S.F. = | | 0.00 | Ac. 0.55 0.40 |
| Water | | | | S.F. = | | 0.00 | Ac. 1.00 0.00 |
| Misc. | | | | S.F. = | | 0.00 | Ac. |

| | |
|--------------|----------------|
| Weighted c = | 0.668 |
| Weighted N = | 0.163 |
| L = | 325 Ft. |
| H = | 5.0 Ft. |
| S = | 0.0154 Ft./Ft. |
| tc = | 13.98 Minutes |
| I(25) = | 5.215 In./Hr. |
| Q(25) = | 2.20 CFS |

(Min. 5 minutes)

Developed Drainage Sub-Basins

Sub-basin No.: 6 Total Area = 37,462 S.F. = 0.86 Ac.

| Surface | | | | | | C | N |
|--------------|-----|-------|--------|---------|-------|-------------|---------------|
| Structures | 4 | Total | 2,100 | S.F. = | 8,400 | S.F. = 0.19 | Ac. 0.92 0.02 |
| Drives | 8 | Total | 700 | S.F. = | 5,600 | S.F. = 0.13 | Ac. 0.92 0.02 |
| Pavement | 425 | L.F. | 14.5 | Width = | 6,163 | S.F. = 0.14 | Ac. 0.92 0.02 |
| Patios | 0 | Total | 150 | S.F. = | 0 | S.F. = 0.00 | Ac. 0.92 0.02 |
| Sidewalks | 425 | L.F. | 4 | Width = | 1,700 | S.F. = 0.04 | Ac. 0.92 0.02 |
| Lawn (0-2%) | | | | S.F. = | | 0.00 | Ac. 0.15 0.40 |
| Lawn (2-5%) | | | 15,599 | S.F. = | | 0.36 | Ac. 0.25 0.40 |
| Lawn (5-10%) | | | | S.F. = | | 0.00 | Ac. 0.40 0.40 |
| Lawn (>10%) | | | | S.F. = | | 0.00 | Ac. 0.55 0.40 |
| Water | | | | S.F. = | | 0.00 | Ac. 1.00 0.00 |
| Misc. | | | | S.F. = | | 0.00 | Ac. |

| | |
|--------------|----------------|
| Weighted c = | 0.641 |
| Weighted N = | 0.178 |
| L = | 400 Ft. |
| H = | 6.0 Ft. |
| S = | 0.0150 Ft./Ft. |
| tc = | 16.17 Minutes |
| I(25) = | 4.925 In./Hr. |
| Q(25) = | 2.71 CFS |

(Min. 5 minutes)

The North Greens Phase 7
Project No. 4377-4

Developed Drainage Sub-Basins

Sub-basin No.: 7 Total Area = 24,394 S.F. = 0.56 Ac.

| Surface | | | | | | C | N |
|--------------|---------|-------------|---|------------|---|----------|-----------|
| Structures | 2 Total | 2,100 S.F. | = | 4,200 S.F. | = | 0.10 Ac. | 0.92 0.02 |
| Drives | 0 Total | 700 S.F. | = | 0 S.F. | = | 0.00 Ac. | 0.92 0.02 |
| Pavement | 0 L.F. | 14.5 Width | = | 0 S.F. | = | 0.00 Ac. | 0.92 0.02 |
| Patios | 4 Total | 150 S.F. | = | 600 S.F. | = | 0.01 Ac. | 0.92 0.02 |
| Sidewalks | 0 L.F. | 4 Width | = | 0 S.F. | = | 0.00 Ac. | 0.92 0.02 |
| Lawn (0-2%) | | S.F. | = | | = | 0.00 Ac. | 0.15 0.40 |
| Lawn (2-5%) | | 19,594 S.F. | = | | = | 0.45 Ac. | 0.25 0.40 |
| Lawn (5-10%) | | S.F. | = | | = | 0.00 Ac. | 0.40 0.40 |
| Lawn (>10%) | | S.F. | = | | = | 0.00 Ac. | 0.55 0.40 |
| Water | | S.F. | = | | = | 0.00 Ac. | 1.00 0.00 |
| Misc. | | S.F. | = | | = | 0.00 Ac. | |

| | |
|--------------|----------------|
| Weighted c = | 0.382 |
| Weighted N = | 0.325 |
| L = | 440 Ft. |
| H = | 5.5 Ft. |
| S = | 0.0125 Ft./Ft. |
| tc = | 23.36 Minutes |
| I(25) = | 4.260 In./Hr. |
| Q(25) = | 0.91 CFS |

(Min. 5 minutes)

Developed Drainage Sub-Basins

Sub-basin No.: 8 Total Area = 40,511 S.F. = 0.93 Ac.

| Surface | | | | | | C | N |
|--------------|------------|-------------|---|------------|---|----------|-----------|
| Structures | 2.75 Total | 2,100 S.F. | = | 5,775 S.F. | = | 0.13 Ac. | 0.92 0.02 |
| Drives | 0 Total | 700 S.F. | = | 0 S.F. | = | 0.00 Ac. | 0.92 0.02 |
| Pavement | 0 L.F. | 14.5 Width | = | 0 S.F. | = | 0.00 Ac. | 0.92 0.02 |
| Patios | 5.5 Total | 150 S.F. | = | 825 S.F. | = | 0.02 Ac. | 0.92 0.02 |
| Sidewalks | 0 L.F. | 4 Width | = | 0 S.F. | = | 0.00 Ac. | 0.92 0.02 |
| Lawn (0-2%) | | S.F. | = | | = | 0.00 Ac. | 0.15 0.40 |
| Lawn (2-5%) | | 33,911 S.F. | = | | = | 0.78 Ac. | 0.25 0.40 |
| Lawn (5-10%) | | S.F. | = | | = | 0.00 Ac. | 0.40 0.40 |
| Lawn (>10%) | | S.F. | = | | = | 0.00 Ac. | 0.55 0.40 |
| Water | | S.F. | = | | = | 0.00 Ac. | 1.00 0.00 |
| Misc. | | S.F. | = | | = | 0.00 Ac. | |

| | |
|--------------|----------------|
| Weighted c = | 0.359 |
| Weighted N = | 0.338 |
| L = | 600 Ft. |
| H = | 7.0 Ft. |
| S = | 0.0117 Ft./Ft. |
| tc = | 27.95 Minutes |
| I(25) = | 3.836 In./Hr. |
| Q(25) = | 1.28 CFS |

(Min. 5 minutes)

The North Greens Phase 7
Project No. 4377-4

Developed Drainage Sub-Basins

Sub-basin No.: 9 Total Area = 24,394 S.F. = 0.56 Ac.

| Surface | | | | C | N |
|--------------|---------|-------------|--------------|------------|-----------|
| Structures | 1 Total | 2,100 S.F. | = 2,100 S.F. | = 0.05 Ac. | 0.92 0.02 |
| Drives | 0 Total | 700 S.F. | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Pavement | 0 L.F. | 14.5 Width | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Patios | 2 Total | 150 S.F. | = 300 S.F. | = 0.01 Ac. | 0.92 0.02 |
| Sidewalks | 0 L.F. | 4 Width | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Lawn (0-2%) | | S.F. | = | 0.00 Ac. | 0.15 0.40 |
| Lawn (2-5%) | | 12,994 S.F. | = | 0.30 Ac. | 0.25 0.40 |
| Lawn (5-10%) | | S.F. | = | 0.00 Ac. | 0.40 0.40 |
| Woods | | 9,000 S.F. | = | 0.21 Ac. | 0.12 0.60 |
| Water | | S.F. | = | 0.00 Ac. | 1.00 0.00 |
| Misc. | | S.F. | = | 0.00 Ac. | |

| | |
|--------------|----------------|
| Weighted c = | 0.268 |
| Weighted N = | 0.436 |
| L = | 150 Ft. |
| H = | 2.0 Ft. |
| S = | 0.0133 Ft./Ft. |
| tc = | 15.97 Minutes |
| I(25) = | 4.943 In./Hr. |
| Q(25) = | 0.74 CFS |

(Min. 5 minutes)

Developed Drainage Sub-Basins

Sub-basin No.: 10 Total Area = 45,302 S.F. = 1.04 Ac.

| Surface | | | | C | N |
|--------------|---------|-------------|----------|------------|-----------|
| Structures | 0 Total | 2,100 S.F. | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Drives | 0 Total | 700 S.F. | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Pavement | 0 L.F. | 14.5 Width | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Patios | 0 Total | 150 S.F. | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Sidewalks | 0 L.F. | 4 Width | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Lawn (0-2%) | | S.F. | = | 0.00 Ac. | 0.15 0.40 |
| Lawn (2-5%) | | S.F. | = | 0.00 Ac. | 0.25 0.40 |
| Lawn (5-10%) | | S.F. | = | 0.00 Ac. | 0.40 0.40 |
| Woods | | 45,302 S.F. | = | 1.04 Ac. | 0.12 0.60 |
| Water | | S.F. | = | 0.00 Ac. | 1.00 0.00 |
| Misc. | | S.F. | = | 0.00 Ac. | |

| | |
|--------------|----------------|
| Weighted c = | 0.120 |
| Weighted N = | 0.600 |
| L = | 150 Ft. |
| H = | 3.0 Ft. |
| S = | 0.0200 Ft./Ft. |
| tc = | 16.86 Minutes |
| I(25) = | 4.861 In./Hr. |
| Q(25) = | 0.61 CFS |

(Min. 5 minutes)

The North Greens Phase 7
Project No. 4377-4

Developed Drainage Sub-Basins

Sub-basin No.: 11 Total Area = 111,078 S.F. = 2.55 Ac.

| Surface | | | | C | N |
|--------------|---------|-------------|--------------|------------|-----------|
| Structures | 4 Total | 2,100 S.F. | = 8,400 S.F. | = 0.19 Ac. | 0.92 0.02 |
| Drives | 0 Total | 700 S.F. | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Pavement | 0 L.F. | 14.5 Width | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Patios | 8 Total | 150 S.F. | = 1,200 S.F. | = 0.03 Ac. | 0.92 0.02 |
| Sidewalks | 0 L.F. | 4 Width | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Lawn (0-2%) | | S.F. | = | 0.00 Ac. | 0.15 0.40 |
| Lawn (2-5%) | | 50,378 S.F. | = | 1.16 Ac. | 0.25 0.40 |
| Lawn (5-10%) | | S.F. | = | 0.00 Ac. | 0.40 0.40 |
| Woods | | S.F. | = | 0.00 Ac. | 0.12 0.60 |
| Water | | 51,100 S.F. | = | 1.17 Ac. | 1.00 0.00 |
| Misc. | | S.F. | = | 0.00 Ac. | |

| | |
|--------------|----------------|
| Weighted c = | 0.653 |
| Weighted N = | 0.183 |
| L = | 200 Ft. |
| H = | 6.0 Ft. |
| S = | 0.0300 Ft./Ft. |
| tc = | 10.08 Minutes |
| I(25) = | 5.911 In./Hr. |
| Q(25) = | 9.84 CFS |

(Min. 5 minutes)

Developed Drainage Sub-Basins

Sub-basin No.: Total Area = 0 S.F. = Ac.

| Surface | | | | C | N |
|--------------|---------|------------|----------|------------|-----------|
| Structures | 0 Total | 2,100 S.F. | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Drives | 0 Total | 700 S.F. | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Pavement | 0 L.F. | 14.5 Width | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Patios | 0 Total | 150 S.F. | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Sidewalks | 0 L.F. | 4 Width | = 0 S.F. | = 0.00 Ac. | 0.92 0.02 |
| Lawn (0-2%) | | S.F. | = | 0.00 Ac. | 0.15 0.40 |
| Lawn (2-5%) | | S.F. | = | 0.00 Ac. | 0.25 0.40 |
| Lawn (5-10%) | | S.F. | = | 0.00 Ac. | 0.40 0.40 |
| Woods | | S.F. | = | 0.00 Ac. | 0.12 0.60 |
| Water | | S.F. | = | 0.00 Ac. | 1.00 0.00 |
| Misc. | | S.F. | = | 0.00 Ac. | |

| | |
|--------------|-----------------|
| Weighted c = | #DIV/0! |
| Weighted N = | #DIV/0! |
| L = | 0 Ft. |
| H = | 0.0 Ft. |
| S = | #DIV/0! Ft./Ft. |
| tc = | #DIV/0! Minutes |
| I(25) = | 0.000 In./Hr. |
| Q(25) = | #DIV/0! CFS |

(Min. 5 minutes)

TYPICAL SWALE SECTION

