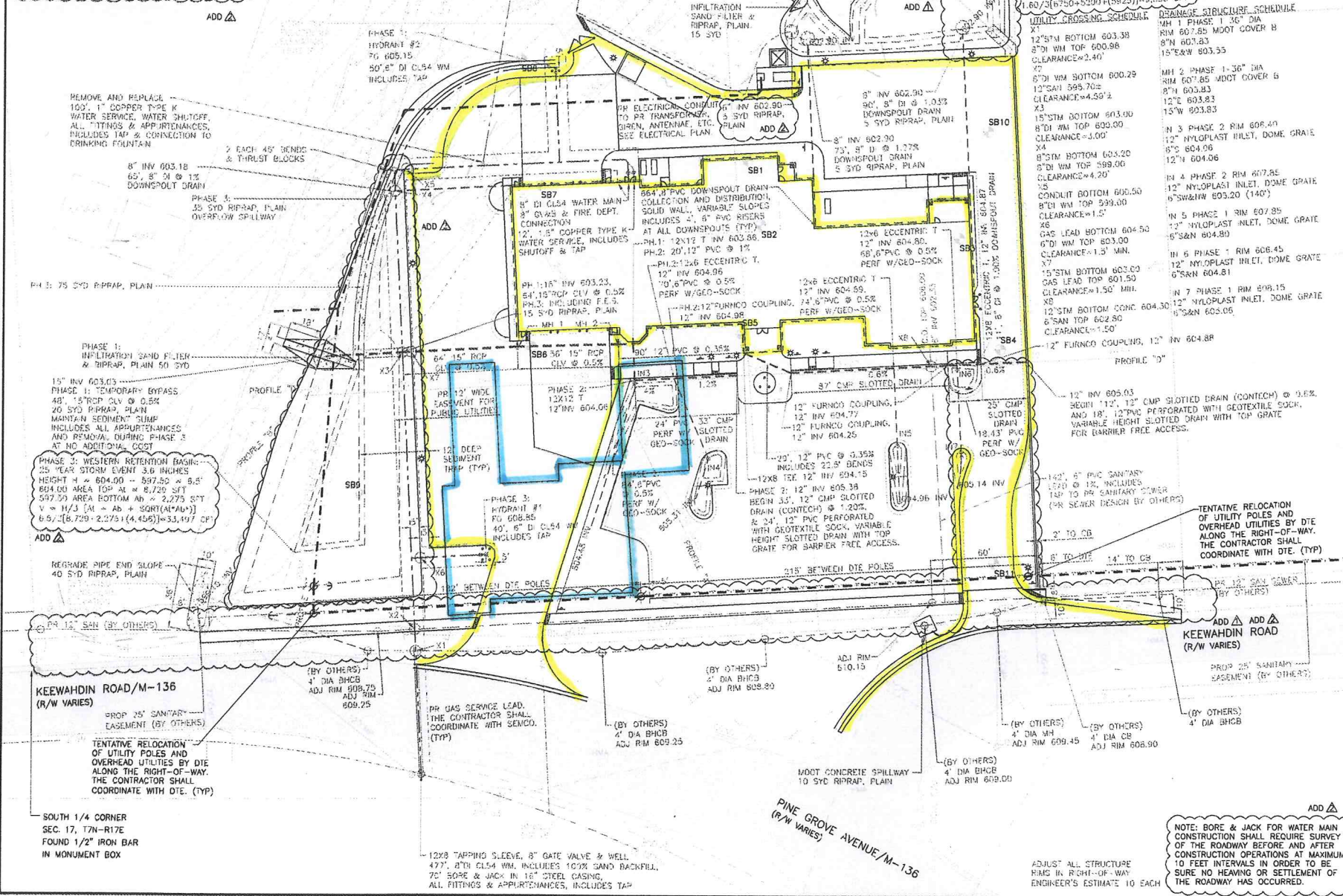


**ENGINEER'S ESTIMATED QUANTITIES (THIS SHEET)**  
THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL QUANTITIES NECESSARY TO COMPLETE THE WORK. ALL ENGINEER'S ESTIMATED QUANTITIES SHALL BE CONSIDERED APPROXIMATE.

ITEM	UNIT	QUANTITY
INFILTRATION SAND FILTER (PLAN VIEW)	SF	585
SEWER, 6" PVC SOLID WALL	FT	142
SEWER, 6" PVC PERFORATED WITH GEOTEXTILE SOCK	FT	296
SEWER, 6" HDPE PERFORATED WITH GEOTEXTILE SOCK	FT	150
SEWER, 8" PVC SOLID WALL	FT	664
SEWER, 12" PVC SOLID WALL	FT	139
SEWER, 12" PVC PERFORATED WITH GEOTEXTILE SOCK	FT	42
SEWER, 12" CMP SLOTTED DRAIN (CONTECH)	FT	145
SEWER, 15" RCP CLV	EA	1
FLARED END SECTION, CONCRETE, 15 INCH	EA	1
DRAINAGE STRUCTURE, ADJUST	EA	10
DRAINAGE STRUCTURE, COVER	EA	7
DRAINAGE STRUCTURE, 12 INCH DIA (NYLOPLAST)	EA	5
DRAINAGE STRUCTURE, 36 INCH DIA (MAINHOLE)	EA	290
RIPRAP, PLAIN	SF	2
FIRE HYDRANT ASSEMBLY (7" TYPE W/SHUTOFF)	EA	2
FIRE DEPARTMENT CONNECTION	EA	1
GATE VALVE AND BOX, 8 INCH	EA	1
12X8 TAPPING SLEEVE, 8 INCH VALVE AND 60" WELL	EA	1
DUCTILE IRON, 6 INCH	FT	90
DUCTILE IRON, 8 INCH	FT	705
WATER SERVICE, 1" COPPER TYPE K	FT	100
WATER SERVICE, 1-1/2" COPPER TYPE K	FT	12

**NOTE:**  
ALL PAY ITEMS INCLUDE ALL FITTINGS & APPURTENANCES REQUIRED TO COMPLETE THE WORK (TYP)  
ALL WORK SHALL BE CONSIDERED CONSTRUCTED DURING PHASE 1, UNLESS SPECIFIED PHASE 2 (PH. 2) OR PHASE 3 (PH. 3) IN THE PLAN NOTE (TYP)  
THE CONTRACTOR SHALL PREVENT DAMAGE TO ALL PIPES. ALL PIPES SHALL BE CLEANED (AS NECESSARY) AND VIDEO-TAPPED AFTER INSTALLATION, AND AGAIN AFTER ANY AND ALL OTHER CONSTRUCTION OPERATIONS. THE RECORD DOCUMENTATION SHALL BE REVIEWED BY THE OWNER AND THEIR REPRESENTATIVES. ANY DAMAGED PIPES SHALL BE REPAIRED AT NO ADDITIONAL COST TO THE CONTRACTOR PRIOR TO ACCEPTANCE AND PAYMENT. (TYP)



**DRAINAGE CALCULATIONS**  
PER THE RULES OF THE ST. CLAIR COUNTY DRAIN COMMISSIONER (SCDC)

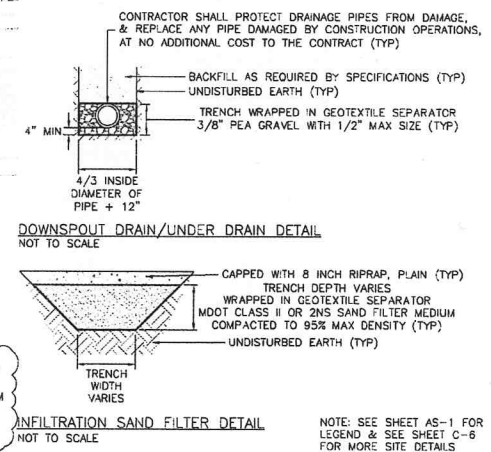
**NORTHEASTERN RETENTION BASIN:**  
TRIBUTARY AREA A = 0.67 ACRES  
AREA IMPERVIOUS SURFACE A-imp = 0.42 ACRES, C = 0.80  
AREA PERVIOUS SURFACE A-perv = 0.25 ACRES, C = 0.20  
WEIGHTED C =  $0.42 \times 0.80 + 0.25 \times 0.20 = 0.43/0.67 = 0.64$   
FIRST FLUSH VOLUME 1" OVER THE SITE: 0.67 ACRES = 2,433 CFT  
ALTERNATE CALCULATION:  $3630 \times A \times C = 3630 \times 0.67 \times 0.64 = 1,557$  CFT  
BANKFULL VOLUME:  $8170 \times C \times A = 8170 \times 0.67 \times 0.64 = 3,504$  CFT  
100-YEAR DETENTION VOLUME:  
ALLOWABLE DISCHARGE  $Q_0 = 0.15$  CFS/ACRE  $\times 0.67$  ACRES = 0.10 CFS  
INITIAL DISCHARGE  $Q_0 = Q_0 / A \times C = 0.10 / 0.67 \times 0.64 = 0.23$  CFS  
TIME OF CONCENTRATION  $T_c = 25 + 5.81 \log(10.3125/0.64) = 185.28$  SEC  
VOLUME PER IMPERVIOUS ACRE:  $V_{imp} = 16,500 \times T_c / (10 + 25) = 40 \times 0.67 \times 185.28 = 12,834$  CFT/AC-IMP  
REQUIRED DETENTION VOLUME  $V = V_{imp} \times A \times C = 12,834 \times 0.67 \times 0.64 = 5,504$  CFT  
PROPOSED STORAGE VOLUME = 9,533 CFT  
9,533 CFT/0.67 ACRES/43,560 SFT/ACRE = 0.327 FT = 3.92 INCHES OVER THE SITE

**WESTERN RETENTION BASIN:**  
TOTAL ON-SITE TRIBUTARY AREA A = 2.30 ACRES  
AREA IMPERVIOUS SURFACE A-imp = 1.70 ACRES, C = 0.80  
AREA PERVIOUS SURFACE A-perv = 0.60 ACRES, C = 0.20  
WEIGHTED C =  $1.70 \times 0.80 + 0.60 \times 0.20 = 1.65/2.30 = 0.71$   
FIRST FLUSH VOLUME: 1" OVER THE SITE: 2.30 ACRES = 8,349 CFT  
ALTERNATE CALCULATION:  $3630 \times A \times C = 3630 \times 2.30 \times 0.71 = 5,928$  CFT  
BANKFULL VOLUME:  $8170 \times C \times A = 8170 \times 2.30 \times 0.71 = 13,342$  CFT  
100-YEAR DETENTION VOLUME:  
ALLOWABLE DISCHARGE  $Q_0 = 0.15$  CFS/ACRE  $\times 2.30$  ACRES = 0.35 CFS  
INITIAL DISCHARGE  $Q_0 = Q_0 / A \times C = 0.35 / 2.30 \times 0.71 = 0.21$  CFS  
TIME OF CONCENTRATION  $T_c = 25 + 5.81 \log(10.3125/0.64) = 185.28$  SEC  
VOLUME PER IMPERVIOUS ACRE:  $V_{imp} = 16,500 \times T_c / (10 + 25) = 40 \times 2.30 \times 185.28 = 14,816$  CFT/AC-IMP  
REQUIRED DETENTION VOLUME  $V = V_{imp} \times A \times C = 14,816 \times 2.30 \times 0.71 = 24,516$  CFT  
PROPOSED STORAGE VOLUME = 33,497 CFT  
33,497 CFT/2.30 ACRES/43,560 SFT/ACRE = 0.334 FT = 4.01 INCHES OVER THE SITE

**PER MDO, SAND FILTER INFILTRATION FROM SURFACE WATER TO GROUND WATER:**

**WESTERN RETENTION BASIN:**  
2.30 ACRES  $\times 3.6$  INCHES OVER SITE = 30,056 CFT  
30,056 CFT INFILTRATE WITHIN 72 HOURS  
PROVIDED 33,497 CFT / 72 HOURS / 3,600 SEC/HR = 0.13 CFS  
SAND K=10<sup>-3</sup> GAL/DAY/SFT / 7,4808 GAL/CFT / 86,400 SEC/DAY = 0.0015 CFS/SFT  
PLAN VIEW AREA OF SAND FILTER = 0.13 CFS / 0.0015 CFS/SFT = 86 SFT AVERAGE  
TOTAL AREA = 2  $\times 86 = 172$  SFT

**NORTHEASTERN RETENTION BASIN:**  
0.67 ACRES  $\times 3.6$  INCHES OVER SITE = 8,756 CFT  
8,756 CFT INFILTRATE WITHIN 72 HOURS  
PROVIDED 9,533 CFT / 72 HOURS / 3,600 SEC/HR = 0.0368 CFS  
SAND K=10<sup>-3</sup> GAL/DAY/SFT / 7,4808 GAL/CFT / 86,400 SEC/DAY = 0.0015 CFS/SFT  
PLAN VIEW AREA OF SAND FILTER = 0.0368 CFS / 0.0015 CFS/SFT = 24.5 SFT AVERAGE  
TOTAL AREA = 2  $\times 24.5 = 49$  SFT



**HURON CONSULTANTS**  
ENGINEERS & SCIENTISTS

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CHARTER TOWNSHIP

3720 KEEWAHNIN ROAD  
FORT GRATIOT, MI 48059  
TEL: 810.385.4489  
FAX: 810.385.9010

**3 WORKING DAYS**  
800-482-7171

**Know what's below.**  
Call before you dig.

**PROJECT NAME:**  
FORT GRATIOT  
CHARTER TOWNSHIP  
MUNICIPAL CENTER

**PROJECT LOCATION:**  
SECS 16&17, 7N, R17E  
FORT GRATIOT TOWNSHIP  
SAINT CLAIR COUNTY

Drawn By: TDP  
Checked By: SKS  
Approved By: EJO

**REVISIONS:**  
1. 2013-11-25  
2. 2013-12-03  
3. 2013-12-05  
4. 2013-12-18  
5. 2014-01-20  
6. 2014-02-03  
7. 2014-02-12  
8. 2014-02-24 ADD  
9. 2014-02-28 ADD

**SCALE VERIFICATION:**  
SCALE: 1"=30'

**HC PROJECT NO:**  
13-10672

**HC DRAWING NO:**  
UP1

C-3