

RETENTION CALCULATIONS

PROPOSED LAKES: ELEVATION	AREA (S.F.)	STORAGE/VOLUME (C.F.)	REMARKS
645	47,530	0	Normal Water Level
646	61,330	54,280	
647	69,280	119,540	
648	77,550	192,920	
648.8	80,862	256,280	Storage Elevation

Storm drainage outlet is existing 54" storm sewer East of proposed "Spring Meadows" and existing ditch North side Long Lake Road.

DRAINAGE AREA:
 Onsite 20.1 Ac.
 Offsite (Proposed "Long Lake Meadows 1, 2, 3 & 4") 64.7 Ac.
 Total 85.4 Ac.

Allowable agricultural flow: $85.4 \times 0.2 = 17.1$ cfs

POND DISCHARGE: Storage Elevation (648.80)

Outlet Orifice (Manhole No. 12)
 Area of Orifice .349 sf
 Orifice Coefficient .60
 Orifice Invert Elevation 640.50
 H.G. at Storage Elevation 648.80
 Head 648.80 - 640.83 = 7.97
 Per Orifice Formula, Flow: 4.74 cfs

Overflow Structure (Special Manhole No. 13)

$Q = CLH^{3/2}$
 $C = 2.63$
 $L = 6$ ft.

6 Ft. Weir, Invert Elevation 647.95
 H.G. at Storage Elevation 648.80
 Head 648.80 - 647.95 = 0.85 ft.
 Flow through Weir 12.36 cfs

Total Pond Discharge, at Storage Elevation = 17.10 cfs

STORAGE REQUIREMENTS:
 Flow into Pond for 85.4 acres @ 0.36 = 30.74

Assume Discharge of Only 4.74 cfs

Per Oakland County Drain Commission Formula:

Maximum Time: 181.31 Min.
 Storage Required: 249,318 cf
 Storage Available to Elevation 648.80 = 256,280 cf

POND DISCHARGE: OVERFLOW ELEVATION (649.10)

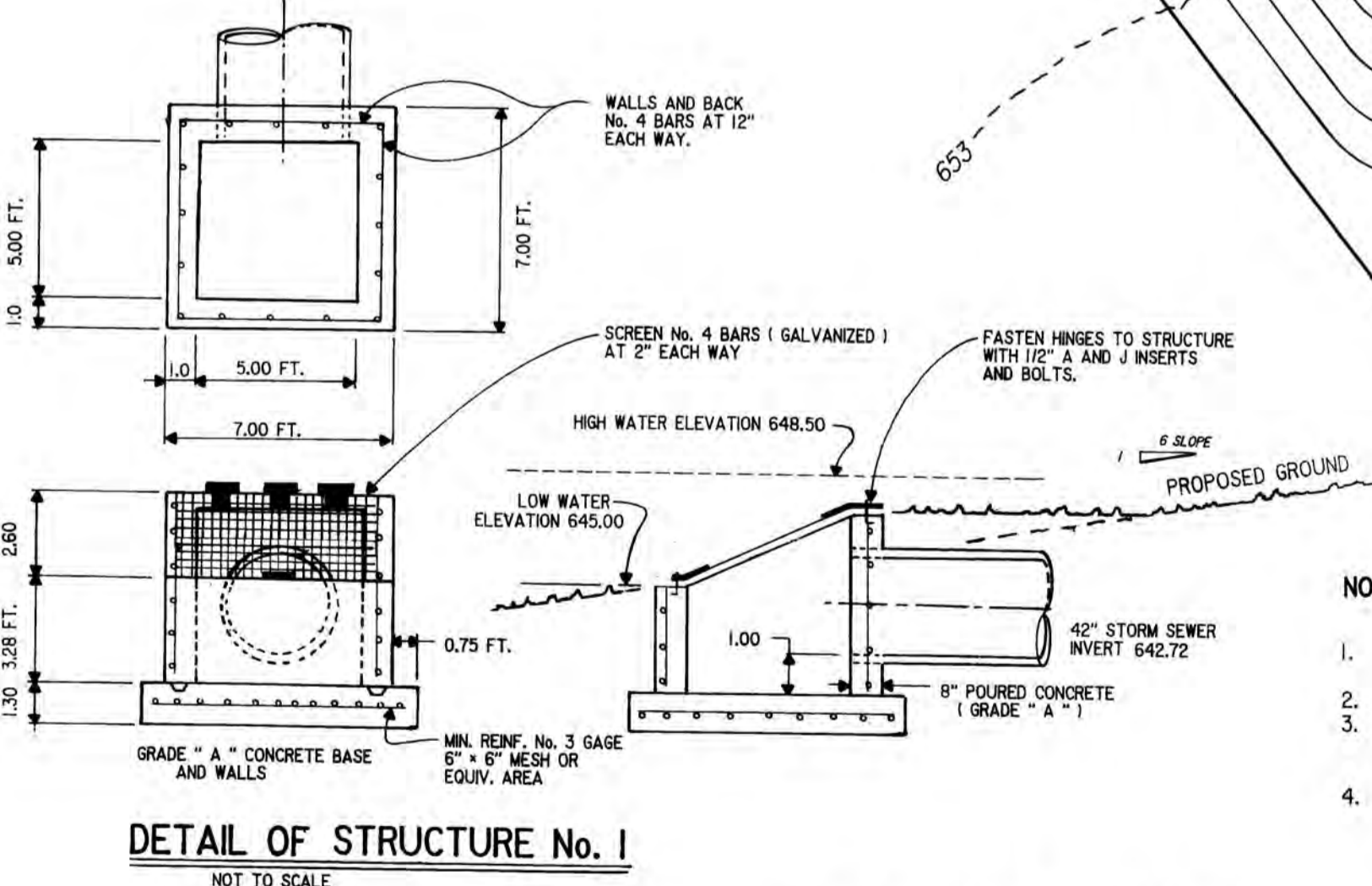
Outlet Orifice (Manhole No. 12)
 Orifice Invert Elevation 640.50
 Center of Flow 640.83
 Head 649.10 - 640.83 = 8.27 ft.
 Per Orifice Formula, Flow: 4.83 cfs

Overflow Structure (Special Manhole No. 13)

At elevation 649.10 Weir acts as an Orifice

Orifice Coefficient = .60
 7.2 Ft. Orifice, Invert Elevation 647.95
 Center of Flow 648.53
 Head 649.10 - 648.53 = .57 ft.
 Flow through Orifice 26.17 cfs

TOTAL POND DISCHARGE, AT OVERFLOW ELEVATION 649.10 = 31.00 cfs

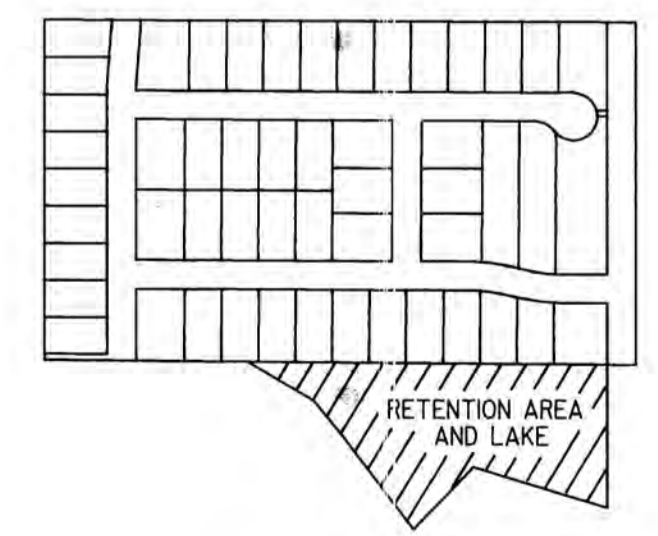


- NOTES**
- THE SIDE SLOPES OF RETENTION AREA SHALL BE SODDED OR SEEDED ABOVE ELEV. 645.00.
 - SIDE SLOPES OF RETENTION AREA TO BE 6 ON 1.
 - UNIT PRICE FOR RETENTION AREA IS TO INCLUDE ALL NECESSARY GRADING, EXCAVATION, SEEDING OR SODDING.
 - EXCAVATION TO BE SPREAD ON SITE AS DIRECTED BY THE ENGINEER.

LEGAL DESCRIPTION OF EASEMENT FOR STORM SEWER, RETENTION AND SURFACE DRAINAGE IN PART OF PROPOSED PARK OF PROPOSED "LONG LAKE MEADOWS" SUB.:

Part of the Southwest 1/4 of Section 12, T.2N., R.11E., City of Troy, Oakland County, Michigan, being more particularly described as follows: Beginning at a point which is Due West 102.38 ft. along the South line of Section 12 and N00°29'41"E 60.00 ft. from the South 1/4 corner of Section 12, T.2N., R.11E.; thence, Due West 300.00 ft. along a line parallel to and 60.00 ft. North of the South line of Section 12; thence N17°11'21"E 290.00 ft.; thence N46°46'16"W 180.00 ft.; thence N52°59'59"E 240.00 ft.; thence N50°44'34"E 100.00 ft.; thence N31°09'19"E 160.00 ft.; thence S00°29'41"W 745.00 ft. along the boundary of proposed "Spring Meadows Sub." to the point of beginning. Containing 3.587 Acres

- BENCH MARKS**
- Arrow on hydrant located 32 ft. +/- South of the centerline of East Long Lake Road, 380 ft. +/- East of the Southeast property line. ELEVATION: 650.28
 - P.K. Nail in the North side of utility pole located 32 ft. +/- North of the centerline of East Long Lake Road, 215 ft. +/- West of the Southeast property line. ELEVATION: 649.89
 - Arrow on hydrant located 32 ft. +/- South of the centerline of East Long Lake Road, 95 ft. +/- East of the Southwest property line. ELEVATION: 653.81
 - P.K. Nail in the North side of utility pole located 31 ft. +/- North of the centerline of East Long Lake Road, 81 ft. +/- East of the Southwest property line. ELEVATION: 651.51
 - Arrow on hydrant located 32 ft. +/- South of the centerline of East Long Lake Road, 391 ft. +/- West of the Southwest property line. ELEVATION: 655.47



LOCATION MAP NOT TO SCALE



REV.	REV. 5-15-87 PER CITY
REV.	REV. 4-29-87 PER CITY
REV. 7-14-87 PER CITY	REV. 9-26-90 RET. CALC.
MCS ASSOCIATES, INC. Civil Engineering and Surveying 35520 Mound Road Sterling Heights, Michigan 48310 Telephone 978-1310	
SPRING MEADOWS SUB. PART OF THE SOUTH 1/2 OF SEC. 12, T.2N., R.11E., CITY OF TROY, OAKLAND COUNTY, MICHIGAN	
DATE MAR. 2, 1987	SCALE 1" = 30'
DRAWN BY T.K., S.V.	SHEET 9 OF 10 SHEETS
CHECKED BY G.R., D.B.	DRAWING NO. S-86-431
RETENTION AREA AND LAKE	