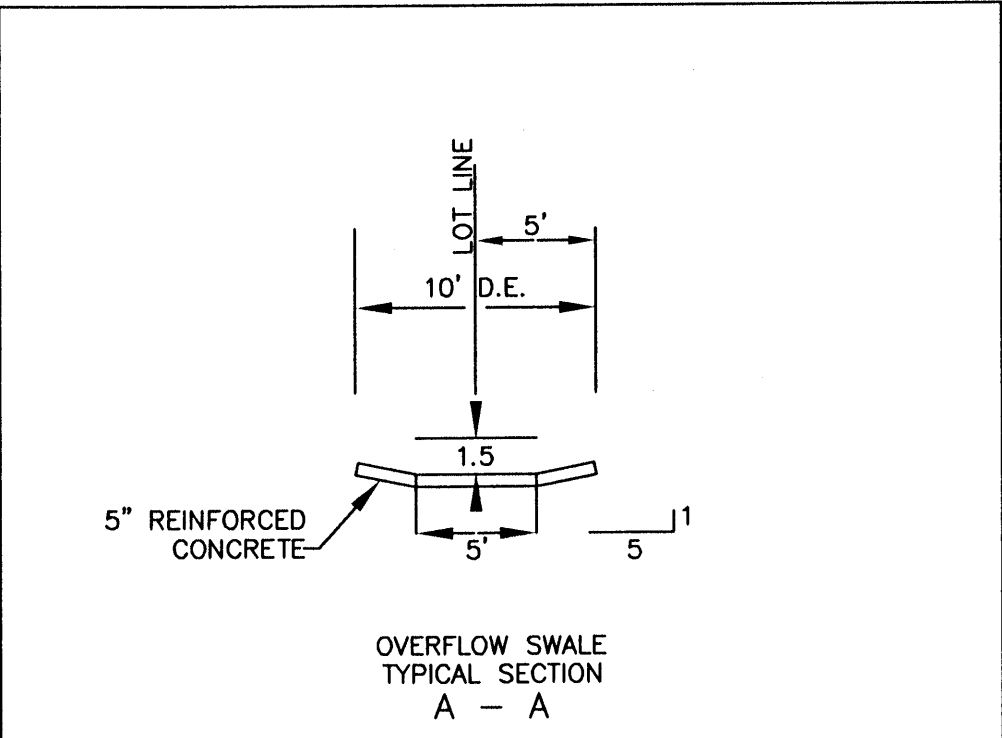


USING
 $Q = A \cdot V = 1.49 \cdot N \cdot A \cdot R^{4/3} \cdot S^{1/2}$
 $RH = A/P$

WHERE
 A = AREA OF FLOW
 P = WETTED PERIMETER
 R = HYDRAULIC RADIUS
 S = CHANNEL SLOPE
 N = MANNING COEFFICIENT = 0.025
 D = DEPTH OF WATER ABOVE CROWN



OVERFLOW SWALE FLOW CAPACITY USING MANNING FORMULA

$$Q = Va = 1.49 \cdot A \cdot R^{4/3} \cdot S^{1/2}$$

$$= 114.6 \cdot 11.25 \cdot 1.025^{4/3} \cdot 0.025^{1/2}$$

$$= 1321 \text{ S.F.}^2$$

FOR
 d = 1.5 ft
 A = 11.25
 R = 10.83
 P = 1.038

WHEN
 s = 0.02 Q = 72 cfs
 0.01 Q = 58 cfs
 0.005 Q = 42 cfs
 0.0005 Q = 29 cfs

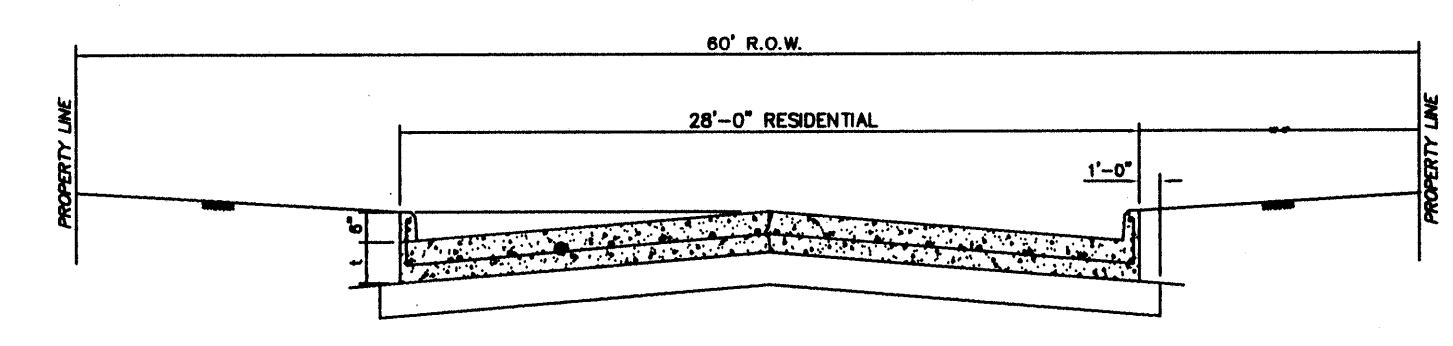
FOR
 d = 1 ft
 A = 6.46
 R = 7.93
 P = 0.81

WHEN
 s = 0.02 Q = 35 cfs
 0.01 Q = 29 cfs
 0.005 Q = 21 cfs
 0.0005 Q = 14 cfs

FOR
 d = 7.5 ft
 A = 4.59
 R = 7.92
 P = 0.81

WHEN
 s = 0.02 Q = 21 cfs
 0.01 Q = 17 cfs
 0.005 Q = 12 cfs
 0.0005 Q = 9 cfs

STREET FLOW CALCULATIONS



USING A DEPTH OF 6" AND A SLOPE OF:

A = 22.0 sq. ft.	P = 42.96 ft.
S = 0.005	Q = 50.0 cfs
S = 0.002	Q = 37.5 cfs
S = 0.001	Q = 28.4 cfs
S = 0.0005	Q = 17.8 cfs

USING A DEPTH OF 1" AND A SLOPE OF:

A = 46.0 sq. ft.	P = 85.9 ft.
S = 0.005	Q = 100.0 cfs
S = 0.002	Q = 75.0 cfs
S = 0.001	Q = 56.8 cfs
S = 0.0005	Q = 35.6 cfs

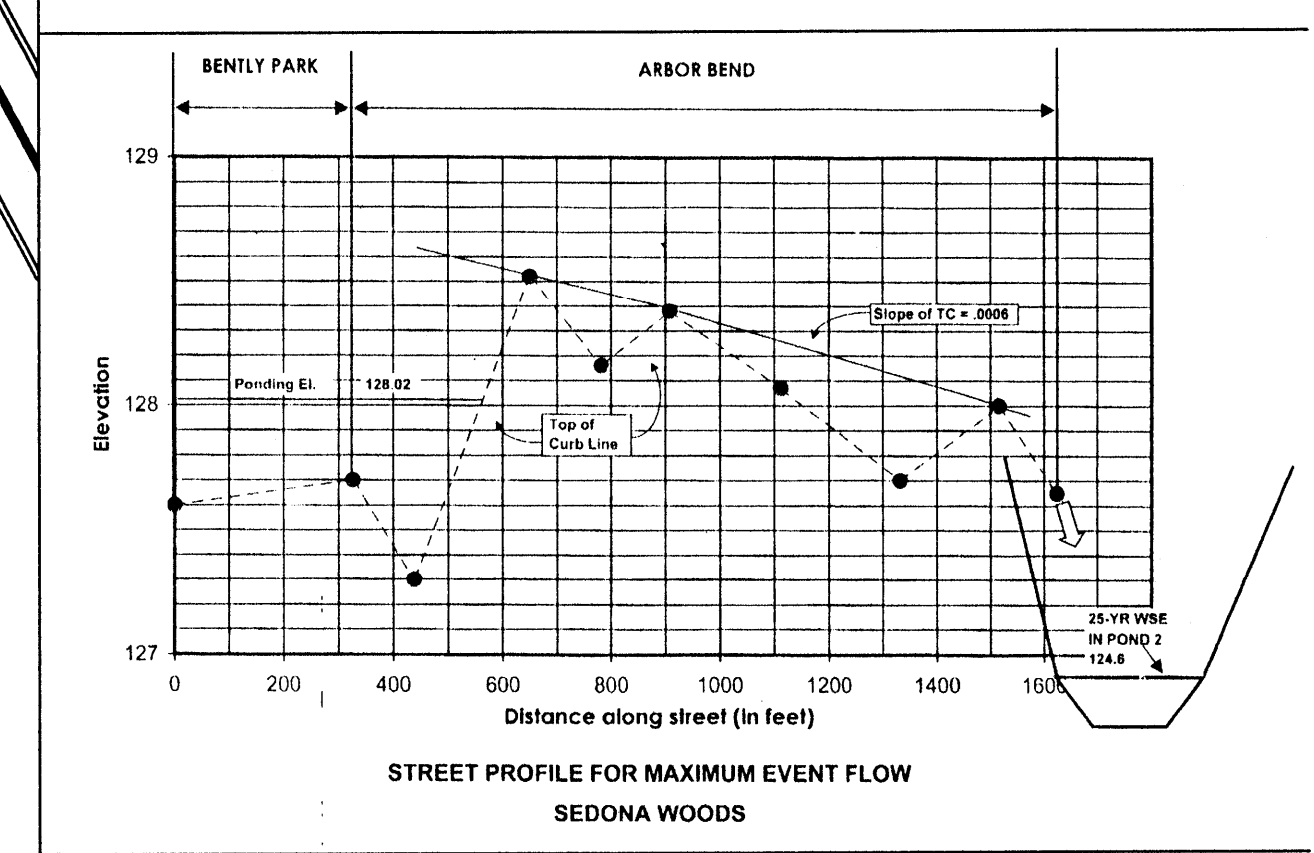
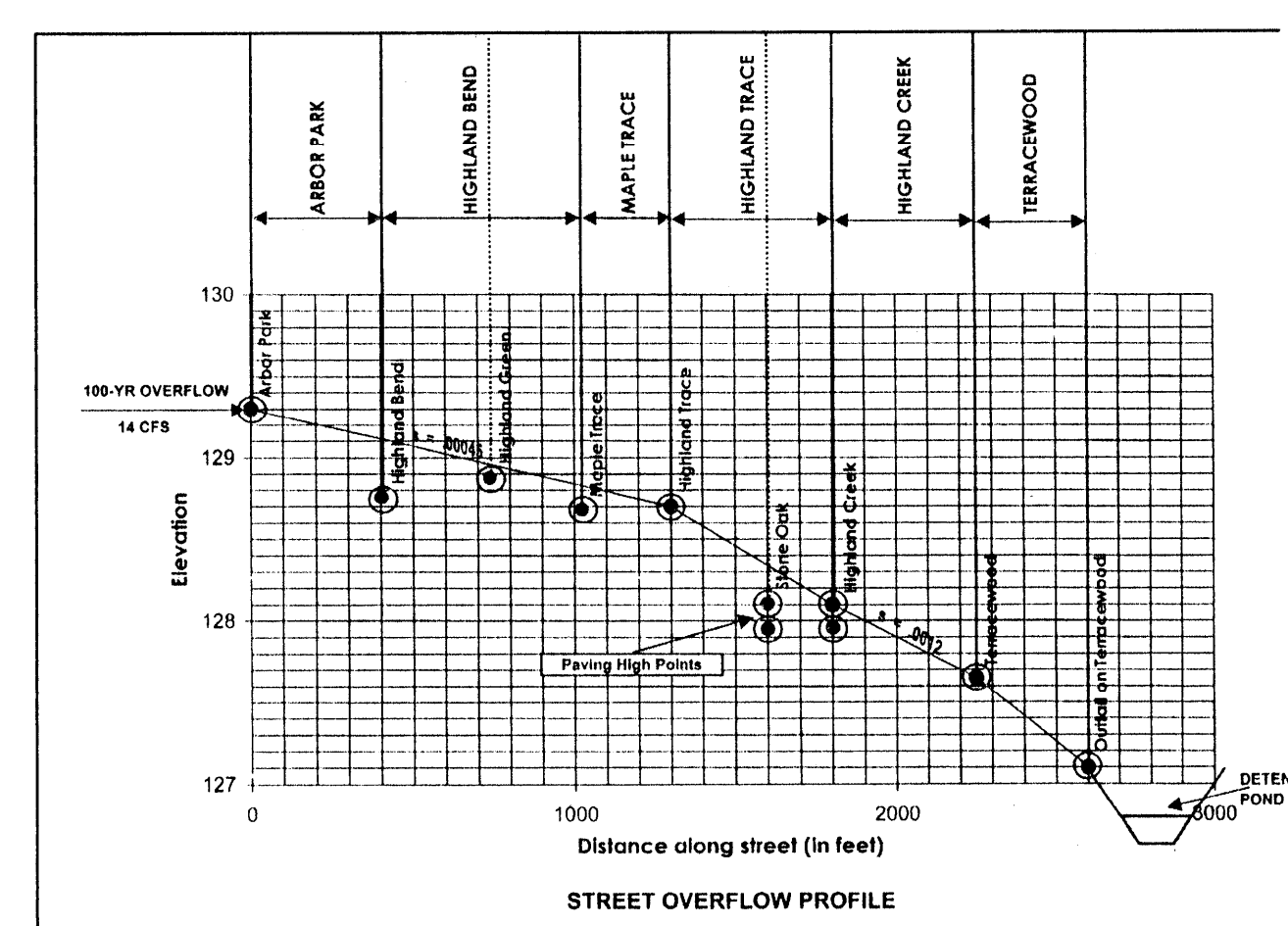
USING A DEPTH OF 6" AND A SLOPE OF:

A = 34.0 sq. ft.	P = 65.3 ft.
S = 0.005	Q = 80.3 cfs
S = 0.002	Q = 60.2 cfs
S = 0.001	Q = 45.1 cfs
S = 0.0005	Q = 29.7 cfs

USING A DEPTH OF 1.2" AND A SLOPE OF:

A = 88.0 sq. ft.	P = 163.3 ft.
S = 0.005	Q = 180.1 cfs
S = 0.002	Q = 135.1 cfs
S = 0.001	Q = 101.3 cfs
S = 0.0005	Q = 67.5 cfs

STREET CROSS SECTION



2A.P. 1/6/2000

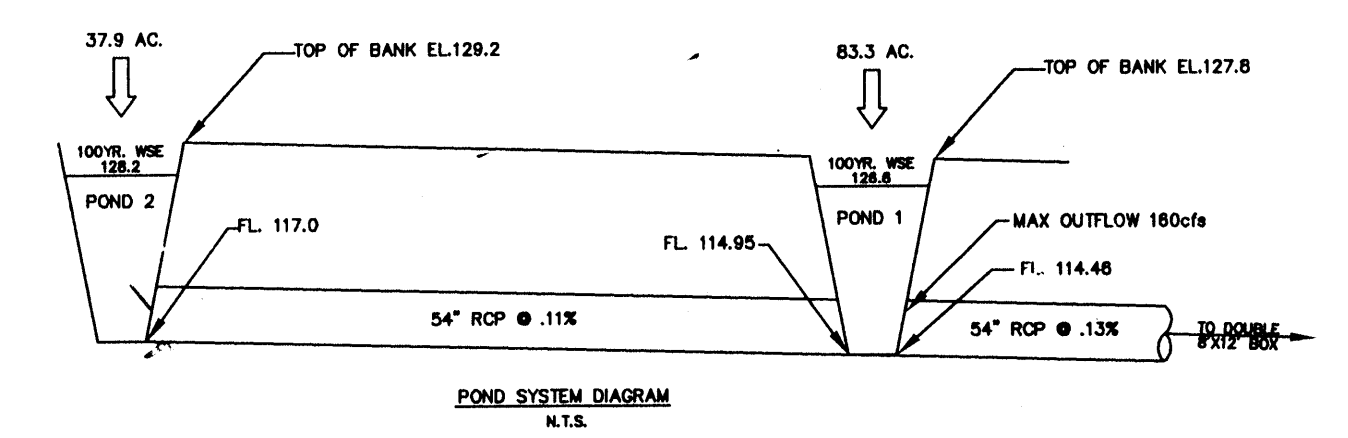
DEVELOPED TRACTS DRAINAGE TO SCHROEDER ROAD

LEGEND

- DRAINAGE BOUNDARY POND 2
- DRAINAGE BOUNDARY POND 1

DETENTION SUMMARY Pond 1 (in conjunction with Pond 2)		DETENTION SUMMARY Pond 2 (in conjunction with Pond 1)	
1. Area Served = 83.3 acres	2. Detention Storage Rate = Cs = 0.48	1. Area Served = 57.9 acres	2. Detention Storage Rate = Cs = 0.40
3. Detention Storage Volume Required = 38.1 acre-feet	4. Detention Storage Volume Provided = 39.76 acre-feet	3. Detention Storage Volume Required = 13.5 acre-feet	4. Detention Storage Volume Provided = 15.1 acre-feet
5. Maximum Design Water Surface Elevation = 126.57	6. Maximum Outflow Rate Allowed = 175 cfs (1)	5. Maximum Design Water Surface Elevation = 128.20	6. Maximum Outflow Rate Allowed = 70 cfs
7. Maximum Outflow Rate Provided = 160 cfs	8. Restrictor Size = 54 inches	7. Maximum Outflow Rate Provided = 58.76 cfs	8. Restrictor Size = 54 inches

Note (1) Maximum outflow for Pond 1 and Pond 2 combined



Rev.	Date	Description	App.
PRIVATE UTILITY LINES SHOWN			
		La. Waterwall	12/29/99
		Reliant Energies, Inc./ENTEX	
		Mike Bolin	12/29/99
		SOUTHWESTERN BELL TELEPHONE CO.	
		Valid for One Year Only	
		La. Waterwall	12/29/99
		Reliant Energies, Inc./HL&P, CO.	
		Approval Only for Crossing Underground	
		Ductlines Unless Noted. Valid at Time of Review Only.	
CITY OF HOUSTON			
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING			
REVIEWED BY		CITY FUNDED PUBLIC WORKS	
Privately Funded Public Works		City Funded Public Works	
WATER		PROJECT MANAGER	
WASTEWATER		CONSTRUCTION	
STORM WATER		CHIEF ENGINEER	
STREET AND BRIDGE		OTHER APPROVAL	
TRAFFIC AND TRANSPORTATION		SPONSOR DEPARTMENT	
CITY ENGINEER		DATE	
[Signature]		1/1/2000	
DIRECTOR OF PUBLIC WORKS AND ENGINEERING		DATE	
SUBMITTED:		DESIGNED BY: BOBBY WILSON	
SCALE: 1" = 200'		DRAWN BY: BILL DORRIS	
DATE: OCTOBER 1999		SHEET NO. 3 OF 11 SHEETS	
SURVEY BY:		CITY DWG. NO. ARDLAOT.DWG	
F B NO: 481			
HARRIS COUNTY MUD 191 DETENTION FACILITIES to serve HIGHLAND TIMBERS SECTION 1 & 2 OVERALL AREA DRAINAGE			
PCI		PROVIDENT CONSULTING, INC.	
HOUSTON, TEXAS 77008		(713)802-1019	