UNIT COSTS FOR CONSTRUCTION OF STREET SEWERS

(Unit Prices are in Jamaican Dollars)

LOCATION ZONES	COST PER ACRE
G, F, H, I, L, M N, O, P, Q, R, S T, V, W	166,400
B, C, U	236,600
A & X	283,400
D, E, J, K, A-A	322,400

LATERAL SEWER CONSTRUCTION COSTS/ACRE

	1970 JAMAICAN $	1992 * JAMAICAN $
A	390	50700
B	420	54600
C	410	53300
D	260	33800
E	140	18200
F	200	26000
G	270	35100
H	320	41600
I	440	57200
J	140	18200
K	140	18200
L	140	18200
M	130	16900
N	210	27300
O	210	27300
P	440	57200
Q	440	57200
R	440	57200
S	150	19500
T	540	70200
U	730	94900
V	400	52000
W	570	74100
X	130	16900
Y	280	36400
Z	280	36400
AVERAGE	316	41100

UNIT PRICES FOR PIPE MATERIAL AND RESTORATION

(Unit Prices are per metre of sewer and are in Jamaican Dollars)

Diameter mm	Material	Material Price	Restoration Price Per Metre of Trench Length	
			Open Trench	Solid Sheeting
200	P.V.C.	305	760	610
250	P.V.C.	578	760	610
300	P.V.C.	671	914	760
375	Clay	1022	1095	925
450	Clay	1618	1905	925
525	Clay	2213	1327	1157
600	Clay	2809	1327	1157
675	Clay	4000	1327	1157
750	Clay	4656	1327	1157
825	Clay	5286	1327	1157
900	Clay	5916	1327	1157
975	Clay	6413	1975	1805
1200	Clay	7175	1975	1805
1500	Clay	7806	1975	1805

TABLE XI.3. 5

PRICES FOR MANHOLE CONSTRUCTION

(Unit Prices are per metre of sewer and are in Jamaican Dollars)

DEPTH OF MANHOLE TO PIPE INVERT (m)	PIPE INVERTS BELOW 14.0 m ELEV. AND SOLID SHEATHED TRENCHES	PIPE INVERTS ABOVE 14.0 m ELEV. AND OPEN TRENCHES
	$	$
1.5	14,500	12,000
1.8	17,400	13,000
2.1	20,300	14,500
2.4	23,200	15,500
2.7	26,100	16,700
3.0	29,000	19,000
3.3	31,900	25,000
3.6	34,800	27,000
4.0	37,500	29,500
4.3	40,884	31,800
4.5	43,804	34,000
4.9	46,724	36,500
5.0	49,644	39,000
5.5	52,565	41,500
5.8	55,485	44,000
6.0	58,405	46,000

BASIC UNIT PRICES FOR PLACING SEWERS
CLOSED SHEETING CONSTRUCTION

(Unit Prices are per metre of sewer and are in Jamaican Dollars)

Pipe Size mm	Depth in Ranges 0-2 m	2-3 m	3-3.5 m	3.5-4 m	4-5 m	5-5.5 m	5.5-6 m	6-6.5 m	6.5-7.5 m
200	1136	1234	1381	1725	2070	2513	3103	3744	4482
250	1165	1263	1411	1756	2100	2542	3133	3773	4511
300	1198	1296	1443	1788	2132	2576	3166	3806	4543
375	1224	1322	1470	1815	2159	2602	3193	3832	4570
450	1283	1381	1528	1873	2217	2710	3300	3941	4728
525	1342	1440	1588	1932	2277	2818	3409	4098	4885
600	1400	1499	1657	1991	2385	2927	3566	4255	5043
675	1400	1588	1735	2080	2474	3065	3704	4393	5181
750	1578	1677	1825	2169	2611	3202	3842	4580	5416
900	1726	1906	2103	2546	2989	3678	4367	5105	5991
1050	1893	2090	2336	2877	3419	4108	4846	5633	6519
1200	2041	2286	2582	3222	3861	4639	5474	6363	7364

TABLE XI.3. 3

COST FACTORS FOR PLACING SEWERS

Situation	Ground Condition	Cost Factor For Placing
Sewer Invert Elevations:		
Above 3.0 m	Wet, high groundwater	2.0
Below 3.0 m	Very wet, high groundwater requires continuous dewatering	2.2
3.0 to 8	Wet, requires continuous dewatering	1.8
8 - 14	Intermittent wet	1.4
Above 14	Dry	1.0

and Hunts Bay, and connection directly to the Greenwich syphons in the vicinity of Hunts Bay. The Mid Level Diversion allows for severing the Mid Level Trunk adjacent to Darling Street in the low section of the syphon and extending and connecting it to Darling Street. The attached figures do not include any allowance for engineering, contingency or rehabilitation of existing trunk systems and street sewers.

TABLE XI.3. 1

BASIC UNIT PRICES FOR PLACING SEWERS
OPEN TRENCH CONSTRUCTION

(Unit Prices are per metre of sewer and are in Jamaican Dollars)

Pipe Size mm	Depth in Ranges 0-2 m	2-3 m	3-3.5 m	3.5-4 m	4-5 m	5-5.5 m	5.5-6 m	6-6.5 m	6.5-7.5 m
200	758	823	921	1152	1381	1677	2067	2493	2986
250	788	853	952	1181	1410	1706	2100	2526	3018
300	820	886	984	1214	1443	1738	2132	2559	3052
375	859	926	1024	1253	1483	1778	2172	3137	3084
450	899	964	1062	1292	1522	1818	2211	2638	3130
525	939	1004	1102	1331	1562	1857	2250	2677	3235
600	977	1043	1306	1371	1600	1897	2289	2717	3241
675	1027	1059	1174	1405	1634	1929	2322	2782	3307
750	1076	1142	1240	1470	1700	1995	2389	2880	3436
900	1125	1190	1290	1519	1749	2044	2438	2930	3520
1050	1174	1240	1339	1568	1798	2094	2486	3077	3668
1200	1190	1256	1355	1584	1815	2114	2511	3108	3704

Trunk No. 24 DESIGN FLOW (igpd) 58 n= 0.013

LOCATION	STREET/ROAD		POPULATION		DESIGN FLOW				SEWER DESIGN				PROFILE			
			INDIVIDUAL	CUMMULATIVE	PEAK	SEWAGE	INFILTR.	TOTAL	SLOPE	DIAM.	Q	V	LENGTH		UPPER	LOWER
	FROM	TO	P	P	FACTOR	CFS	% OF FLOW	Q CFS	%	INCHES	CFS	FPS	FT.		INVERT	INVERT
SPANISH			0	0	4.5	0	10	0	0.083333	12	1.027972	1.309518	1200	*	45	44
SPANISH			0	0	4.5	0	10	0	0.136585	12	1.316054	1.676503	4100	**	44	38.4
SPANISH			11905	11905	2.879103	3.691591	10	4.06075	0.136585	21	5.852957	2.434611	4100	**	44	38.4
SPANISH			8460	20365	2.64459	5.800557	10	6.380612	0.136585	24	8.356425	2.661282	4100	**	44	38.4
SPANISH			4975	25340	2.549721	6.958668	10	7.654535	0.136585	24	8.356425	2.661282	4100	**	44	38.4
SPANISH			14805	40145	2.354488	10.18017	10	11.19818	0.125	30	14.4944	2.954272	3200	***	38	34
SPANISH			6788	46933	2.290231	11.5767	10	12.73436	0.125	30	14.4944	2.954272	3200	***	38	34
SPANISH			44504	91437	2.032276	20.01389	10	22.01528	0.125	36	23.56949	3.336092	3200	***	38	34
SPANISH			0	91437	2.032276	20.01389	10	22.01528	0.20625	36	30.27555	4.285287	3200	****	29	22.4
SPANISH			168674	260111	1.69555	47.50029	10	52.25031	0.20625	48	65.20217	5.191256	3200	****	29	22.4
SPANISH			14108	274219	1.680948	49.64538	10	54.60992	0.20625	48	65.20217	5.191256	3200	****	29	22.4
SPANISH			0	274219	1.680948	49.64538	10	54.60992	0.44898	42	67.38034	7.006925	2450		22	11
SPANISH			68274	342493	1.622041	59.83294	10	65.81623	0.595745	42	77.61577	8.071314	2350		11	-3
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					4.5	0	15	0	ERR		ERR	ERR				
					4.5	0	15	0	ERR		ERR	ERR				
					4.5	0	15	0	ERR		ERR	ERR				

NOTES:

* Proposed overflow from Greenwich Syphon Chamber

** 900 feet - 12 inch dia. (Greenwich overflow), 1900 feet - 21 inch dia., and 1300 feet - 24 inch dia.

*** 2700 feet - 30 inch dia., and 500 feet - 36 inch dia.

**** 1400 feet - 36 inch dia., and 1800 feet - 48 inch dia.

XI.3 COST ESTIMATE DEVELOPMENT

To develop estimates for construction of sewage system elements including gravity trunk sewers, forcemains, syphons, street sewers and laterals, unit prices for construction were obtained from our local sub-consultant, Fisher Pryce and Associates. Their unit price cost data are listed in Tables XI.3.1 through XI.3.7, excluding any allowance for contingency or engineering. Tables XI.3.1 and XI.3.2 list unit costs developed for placement of sewers and forcemains as a function of depth of bury and type of installation, for open trench or close sheeting construction. It is anticipated that in densely populated areas, highly commercialized areas or areas with a high groundwater table will require a form of close sheeting for trenching.

The following areas have been assumed to require close sheeting construction:

Spanish Town Road, East Queen Street, Victoria Avenue, Windward Road, Hagley Park Road, Maxfield Avenue, Eastwood Park Road, Hope Road, Constant Spring Road, Harbour Street, and Port Royal Street.

Mountain View Avenue, Waterloo Road, South Camp Road, Washington Boulevard, Old Hope Road, Trafalgar Road, Oxford Road, Deanery Road.

The cost factors in Table XI.3.3 are applied to the installation prices to reflect the variable difficulty of construction related to varying groundwater levels and population densities in different areas. The cost factors are correlated by elevation since the depth to the groundwater table decreases, and the density of population and required restoration work generally increase as elevation decreases.

Unit prices for pipe material, restoration and manholes are listed in Tables XI.3.4 and XI.3.5.

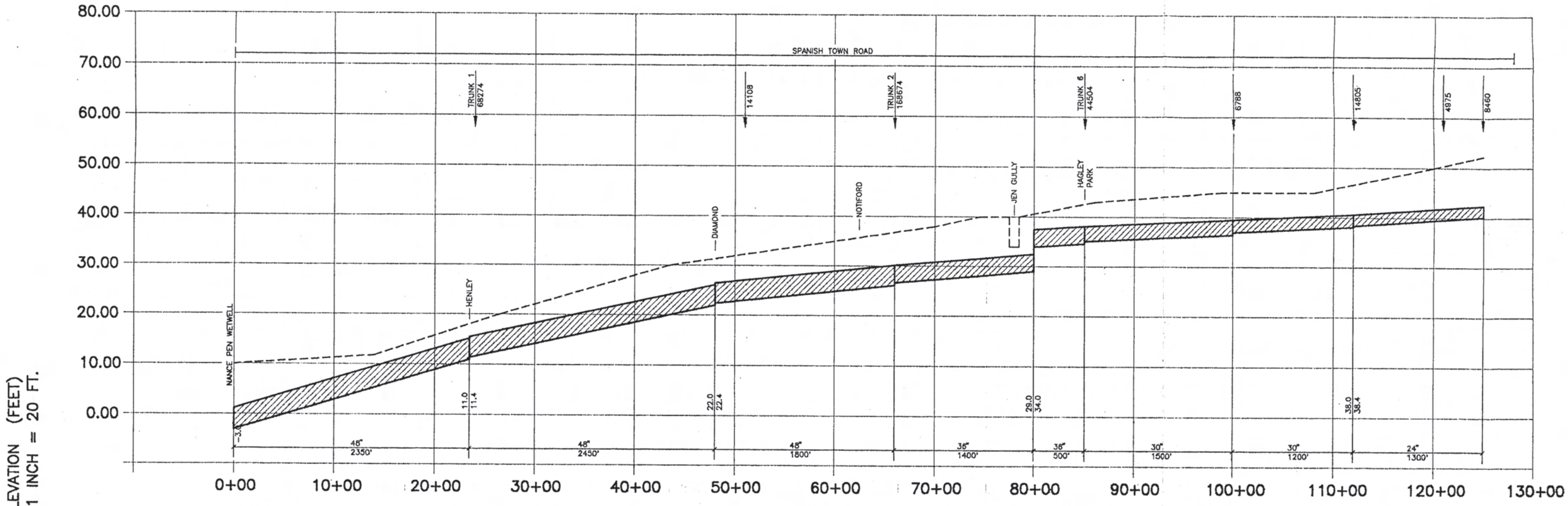
Trunk sewers are considered to be those of 10" diameter and greater and have been estimated on a unit price per metre basis for placement, installation, materials, restoration and manholes, using Tables XI.3.1 through XI.3.5. Street sewers are considered to be 8" in diameter and are estimated on a per acre unit price basis with unit prices as shown in Table XI.3.6. Laterals are 4" in diameter with the exception of industrial, institutional and commercial laterals, which are designed to suit. Lateral prices include only that portion from the property line to the main, excluding any portion of the service on private property itself. However, the cost of service connections within private property has been taken into consideration in the Financial Analysis at Appendix XVII. Costs for lateral sewers are developed on a per acre basis and unit prices are as listed in Table XI.3.7.

Tables XI.3.8 through XI.3.35 contain detailed calculations for estimating costs for individual trunk sewers, and their associated street sewers and laterals. Costs were developed using the unit prices from Tables XI.3.1 through XI.3.7 and do not contain any allowance for contingency or engineering. The number of manholes shown were obtained by dividing the stationing along the sewer line by a minimum spacing of 90 m. Cost factors for placement were determined by contour elevations.

Areas for street sewers and laterals are gross areas tributary to each study area in the drainage boundary minus the existing sewered areas as supplied by NWC and shown on the main sewer drawing (Figure 5.1). In calculating areas for estimating costs no allowances were made for parks or other non serviceable areas at this time.

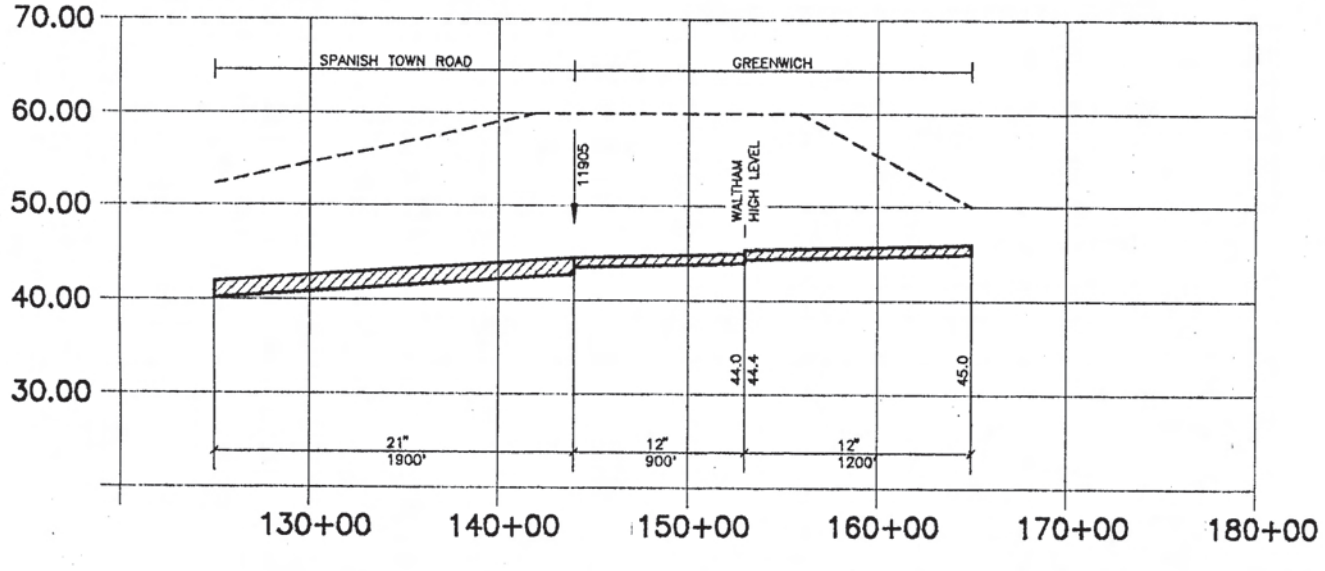
Table XI.3.36 outlines the calculations used to complete the estimates for forcemain and syphon costs. prices for these lines include an allowance for close sheeting construction. Cost factors are applied to the installation costs only. Material costs were provided by Hypresch, Canada. In two cases, Nanse Pen and Darling Street, it is planned to utilize portions of existing forcemains by extending the usable sections.

Table XI.3.37 summarizes the overall capital costs of the sewage collection and transmission system for 100% sewering of the study area as $165,641,000 (1992 U.S. dollars), (J$ 3,644,106,741) excluding lift stations. Two additional costs listed as Hunts Bay Connection and Mid Level Diversion have also been incorporated. The Hunts Bay connection allows for severing of the existing Hunts Bay forcemain between Greenwich



ELEVATION (FEET)
1 INCH = 20 FT.

STATIONS (FEET)
1 INCH = 1000 FT.



STATIONS (FEET)
1 INCH = 1000 FT.

LEGEND :

- PROPOSED PIPE
- EXISTING PIPE
- 4743 DISTRIBUTED POPULATION
- 4743 CONCENTRATED POPULATION

TRUNK 24

NOVEMBER, 1993

Trunk No. 23 | DESIGN FLOW (igpd) 58 | n= 0.013

LOCATION	STREET/ROAD		POPULATION		DESIGN FLOW				SEWER DESIGN				PROFILE			
	FROM	TO	INDIVIDUAL P	CUMMULATIVE P	PEAK FACTOR	SEWAGE CFS	INFILTR. % OF FLOW	TOTAL Q CFS	SLOPE %	DIAM. INCHES	Q CFS	V FPS	LENGTH FT.		UPPER INVERT	LOWER INVERT
CONSTANT			8381	8381	3.030458	2.735464	5	2.872237	2.498567	10	3.461524	6.349802	3490	*	347	259.8
CONSTANT			847	9228	2.989269	2.970978	5	3.119527	0.4	15	4.083462	3.329192	305	*	257.62	256.4
CONSTANT			52115	61343	2.183214	14.42408	5	15.14529	0.907216	24	21.53644	6.858739	970	*	252.5	243.7
CONSTANT			0	61343	2.183214	14.42408	5	15.14529	0.28169	27	16.42899	4.134055	355	**	243.7	242.7
EASTWOOD			6000	67343	2.146951	15.57189	5	16.35049	0.44086	27	20.55302	5.171791	930	**	242.7	238.6
EASTWOOD			2500	69843	2.132942	16.04459	5	16.84682	1.359551	21	18.46592	7.681131	890	**	238.6	226.5
EASTWOOD			0	69843	2.132942	16.04459	5	16.84682	1.357143	21	18.44956	7.674327	1400	***	226.35	207.35
EASTWOOD			1667	71510	2.123924	16.35809	5	17.176	0.4	27	19.57741	4.926296	1025	***	207.1	203
EASTWOOD			26530	98040	2.007084	21.19317	5	22.25283	0.966203	27	30.42701	7.6564	2515	***	202.5	178.2
MAXFIELD			269	98309	2.006102	21.24091	5	22.30296	0.966203	27	30.42701	7.6564	2515	***	202.5	178.2
MAXFIELD			25116	123425	1.926558	25.61015	5	26.89066	0.966203	27	30.42701	7.6564	2515	***	202.5	178.2
MAXFIELD			0	123425	1.926558	25.61015	5	26.89066	1.319588	27	35.55857	8.947662	485	***	176.4	170
MAXFIELD			3389	126814	1.917361	26.18773	5	27.49712	1.731622	24	29.75397	9.475788	4285	***	167.8	93.6
MAXFIELD			34251	161065	1.838768	31.89739	10	35.08713	1.302609	27	35.32907	8.889912	2875	****	85	47.55
MAXFIELD			2305	163370	1.834246	32.27429	10	35.50172	1.302609	30	46.7899	9.536795	2875	****	85	47.55
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					4.5	0	15	0	ERR		ERR	ERR				

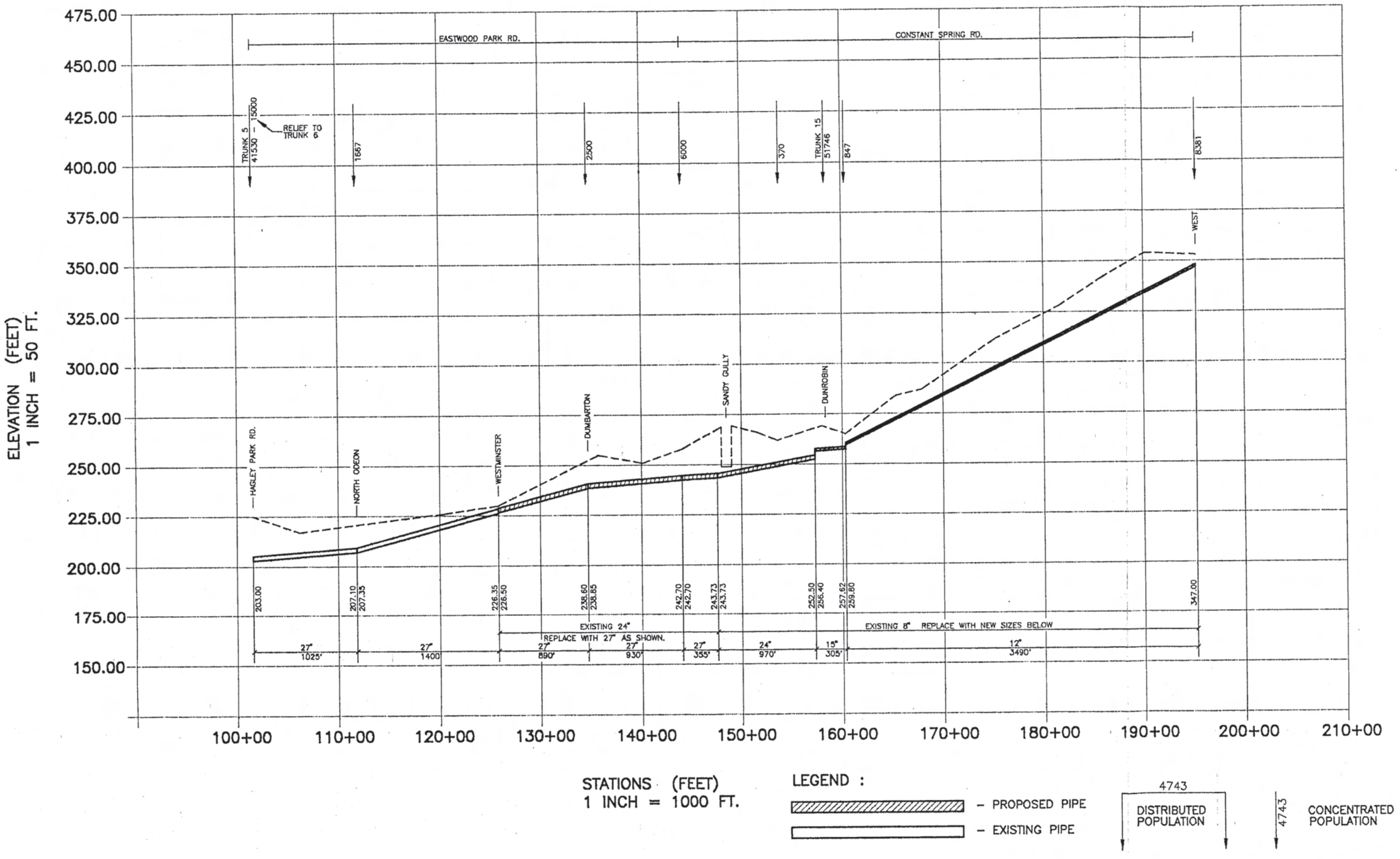
NOTES:

* Existing 8 inch dia. to be replaced by larger pipe diameters

** Existing 24 inch dia. to be replaced by larger pipe diameter

*** Existing 27 inch dia.

**** Existing 33 inch dia.



STATIONS (FEET)
1 INCH = 1000 FT.

LEGEND :

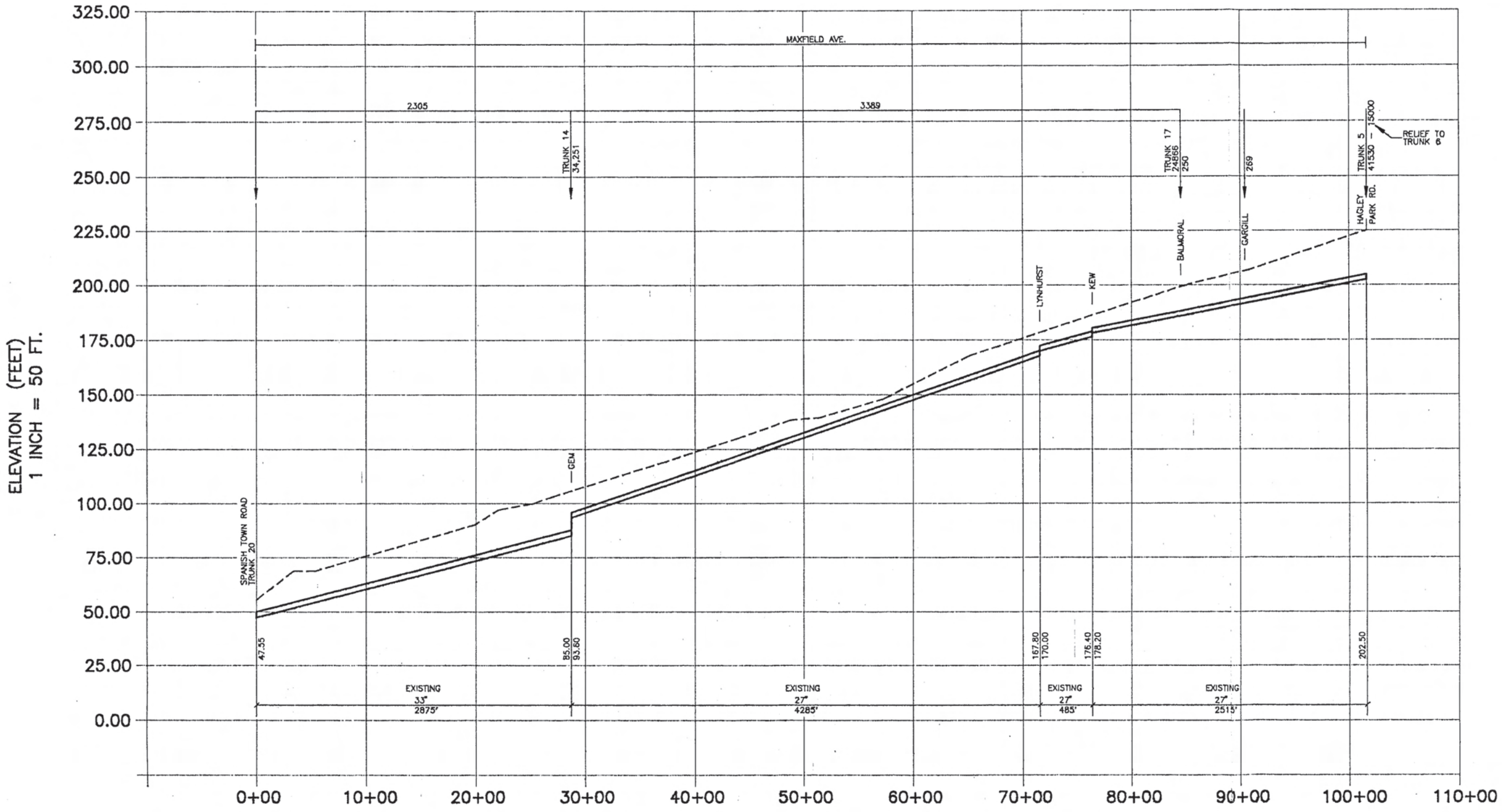
- PROPOSED PIPE
- EXISTING PIPE

4743 DISTRIBUTED POPULATION

4743 CONCENTRATED POPULATION

TRUNK 23B

NOVEMBER, 1993



TRUNK 23A

NOVEMBER, 1993

Trunk No. 22 | DESIGN FLOW (igpd) 58 | n= 0.013

LOCATION	STREET/ROAD		POPULATION		DESIGN FLOW				SEWER DESIGN				PROFILE		
			INDIVIDUAL	CUMMULATIVE	PEAK	SEWAGE	INFILTR.	TOTAL	SLOPE	DIAM.	Q	V	LENGTH	UPPER	LOWER
	FROM	TO	P	P	FACTOR	CFS	% OF FLOW	Q CFS	%	INCHES	CFS	FPS	FT.	INVERT	INVERT
SLIPE ROAD			31069	31069	2.4623002	8.2393924	5	8.651362	1.8	14	7.20664	6.744808			
COVEY			23000	23000	2.591663	6.4199741	10	7.0619715	1.8	14	7.20664	6.744808			
COLBECK					4.5	0	10	0	ERR		ERR	ERR			
COLBECK					4.5	0	10	0	ERR		ERR	ERR			
CARAWINA					4.5	0	10	0	ERR		ERR	ERR			
EAST GULLY					4.5	0	10	0	ERR		ERR	ERR			
HENLEY					4.5	0	15	0	ERR		ERR	ERR			
HENLEY					4.5	0	15	0	ERR		ERR	ERR			
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					4.5	0	15	0	ERR		ERR	ERR			

Trunk No. 20 DESIGN FLOW (igpd) 58 n= 0.013

LOCATION	STREET/ROAD		POPULATION		DESIGN FLOW				SEWER DESIGN				PROFILE			
			INDIVIDUAL	CUMMULATIVE	PEAK	SEWAGE	INFILTR.	TOTAL	SLOPE	DIAM.	Q	V	LENGTH		UPPER	LOWER
	FROM	TO	P	P	FACTOR	CFS	% OF FLOW	Q CFS	%	INCHES	CFS	FPS	FT.		INVERT	INVERT
LINCOLN			434	434	4.005074	0.187209	10	0.20593	0.12	8	0.41839	1.19922	175	*	73.96	73.75
LINCOLN			1500	1934	3.597073	0.74926	10	0.824186	0.238819	10	1.07018	1.96313	1185	*	73.51	70.68
CUMBERLAND			2000	3934	3.339795	1.41508	10	1.556588	0.185075	12	1.53195	1.95153	4690	**	70.68	62
CUMBERLAND			500	4434	3.292937	1.572556	10	1.729811	0.185075	15	2.77761	2.26455	4690	**	70.68	62
CUMBERLAND			249	4683	3.271244	1.649924	10	1.814916	0.185075	15	2.77761	2.26455	4690	**	70.68	62
GLENMORE			814	5497	3.206612	1.898449	10	2.088294	0.185075	15	2.77761	2.26455	4690	**	70.68	62
GLENMORE			1000	6497	3.137757	2.195629	10	2.415192	0.185075	15	2.77761	2.26455	4690	**	70.68	62
GLENMORE			600	7097	3.100834	2.370174	10	2.607192	0.185075	15	2.77761	2.26455	4690	**	70.68	62
NORTH STREET			2000	9097	2.995404	2.934813	10	3.228295	0.185075	18	4.51671	2.55723	4690	**	70.68	62
NORTH STREET			22135	31232	2.460073	8.275129	10	9.102641	0.196193	24	10.0152	3.18956	3940	***	61.73	54
NORTH STREET			23000	54232	2.231935	13.03659	10	14.34025	0.196193	30	18.1588	3.70115	3940	***	61.73	54
BOND STREET			2500	56732	2.214006	13.52801	10	14.88081	0.068627	36	17.464	2.47191	510	****	53.74	53.39
NELSON			2500	59232	2.196967	14.01544	10	15.41698	0.135786	36	24.5653	3.47704	5192	****	52.72	45.67
GREENWICH			2500	61732	2.18074	14.4991	10	15.94901	0.135786	36	24.5653	3.47704	5192	****	52.72	45.67
TRENCH TOWN			2500	64232	2.16526	14.97919	10	16.47711	0.135786	36	24.5653	3.47704	5192	****	52.72	45.67
TRENCH TOWN			2247	66479	2.151935	15.4078	10	16.94857	0.135786	36	24.5653	3.47704	5192	****	52.72	45.67
TRENCH TOWN			8441	74920	2.106227	16.99534	10	18.69487	0.135786	36	24.5653	3.47704	5192	****	52.72	45.67
SPANISH TOWN			3616	78536	2.088473	17.66544	10	19.43199	0.135786	36	24.5653	3.47704	5192	****	52.72	45.67
SPANISH TOWN			0	78536	2.088473	17.66544	10	19.43199	0.129412	36	23.9818	3.39445	340	****	45.67	45.23
SPANISH TOWN			171633	250169	1.706474	45.97905	10	50.57696	0.062353	42	25.1101	2.61121	1700	!	45.23	44.17
					4.5	0	15	0	ERR		ERR	ERR				
					4.5	0	15	0	ERR		ERR	ERR				
					4.5	0	15	0	ERR		ERR	ERR				
					4.5	0	15	0	ERR		ERR	ERR				
					4.5	0	15	0	ERR		ERR	ERR				

NOTES:

* Existing 15 inch dia.

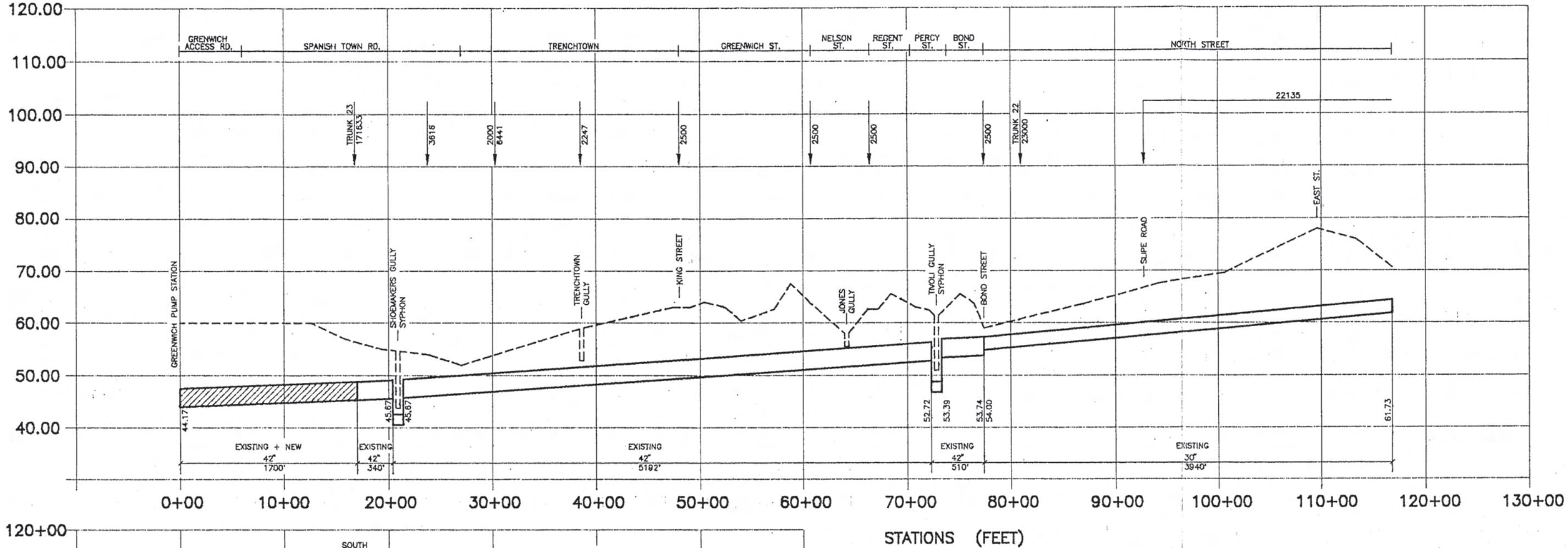
** Existing 18 inch dia.

*** Existing 30 inch dia.

**** Existing 42 inch dia.

! Existing 42 inch dia., to be twinned with new 42 inch dia.

TRUNK 20
NOVEMBER, 1993



NOTES:

TWIN 1700 FEET OF 42" DIA. SEWER FROM SHOEMAKERS GULLY TO GREENWICH TRANSFER STATION
ALL OF REMAINING SEWERS ARE EXISTING.

LEGEND :

- PROPOSED PIPE
- EXISTING PIPE

4743 DISTRIBUTED POPULATION

4743 CONCENTRATED POPULATION

TRUNK 20

NOVEMBER, 1993