CITY OF ALBUQUERQUE

February 20, 2012

Don Briggs, P.E.
Grading & Drainage Engineer/Floodplain Administrator
Bernalillo County Public Works Division.
2400 Broadway SE
Albuquerque, NM 87102

Re: Storm Drain Runoff on La Orilla Rd. NW
City of Albuquerque Project Number 706184 (E12/D025)

Dear Mr. Briggs,

This letter is to inform you that we have reviewed the construction plans for La Orilla Rd. NW (City of Albuquerque Project Number 706184), and it is acceptable to drain the runoff (just west of Via Corta Del Sur on La Orilla Road) into the City of Albuquerque storm system.

If you have any questions, you can contact me at 924-3695.

Sincerely,

Shahab Biazar, P.E.
Senior Engineer, Planning Department.
Development and Building Services

Cc: Jon Niski

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

Capacity of a Double 'A' Storm Drop Inlet

Capacity of the grate:

L = 80" - 2(2"$_{ends}$) - 14(½" $_{middle\ bars}$) – 6" $_{center\ piece}$
= 63"
= 5.25'

W = 25" - 13(½" $_{middle\ bars}$)
= 18.5"
= 1.54'

Area = 5.25' x 1.54'
= 8.09 ft^2

Effective Area = 8.09- 8.09 (0.5 $_{clogging\ factor}$)
= 4.04 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*4.04*sqrt(2*32.2*~~0.67~~ 0.46)
Q = ~~15.93 cfs~~ 13.19

Capacity of the Throat:

L = 11.00'

H = 10 ¾" - 4 ½"
= 6 ¼"
= 0.5208'

Area = 11.0' x ~~0.5208'~~ 0.46
= ~~5.73 ft^2~~ 5.06 at the throat

Weir Equation

Q = CLH^(3/2)
Q = 2.95 * ~~5.73~~ 5.06 * ~~0.67~~ 0.46^(3/2)
Q = ~~9.27 cfs~~ 4.65

Total Capacity:

Q = 15.93$_{grate}$ + 9.27$_{throat}$
Q = 25.20 cfs

4.65 + 5.06

9.71

13.19 + 4.65 = 17.84 sq.

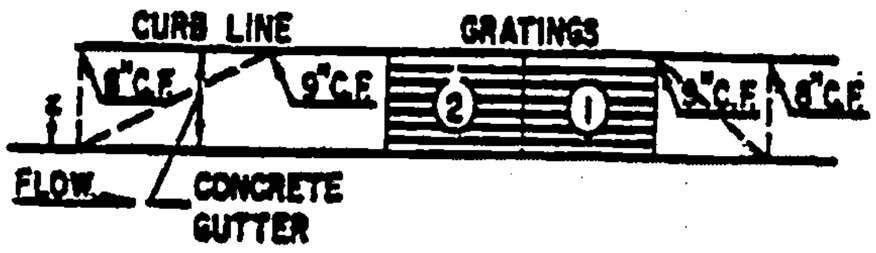
≤ 52.494 − 17.84 = 34.65 sq.

* 0.15 sq.

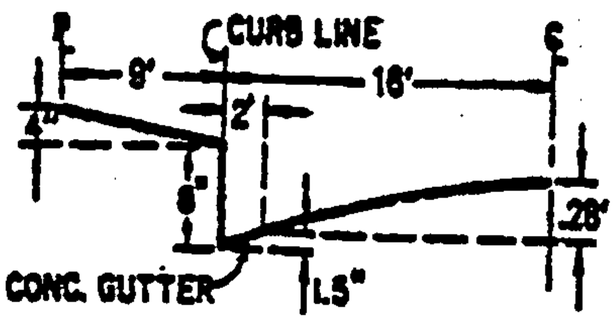
17.33 sq.

L 6.5
4.65

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

PLATE 22.3 D-6

Capacity of a Single 'A' Storm Drop Inlet

Capacity of the grate:

L = 40" - 2(2"$_{ends}$) - 7(½" $_{middle\ bars}$)
= 32 1/2"
= 2.7083'

W = 25" - 13(½" $_{middle\ bars}$)
= 18.5"
= 1.54'

Area = 2.7083' x 1.54'
= 4.18 ft^2

Effective Area = 4.18- 4.18 (0.5 $_{clogging\ factor}$)
= 2.09 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*2.09*sqrt(2*32.2*0.67)
Q = ~~8.24 cfs~~ 6.85 cfs

Capacity of the Throat:

L = 6.50'

H = 10 ¾" - 4 ½"
= 6 ¼"
= 0.5208'

Area = 6.50' x ~~0.5208'~~
= ~~3.39 ft^2~~ at the throat

Weir Equation

Q = CLH^(3/2)
Q = 2.95 * ~~3.39~~ * ~~0.67~~^(3/2)
Q = ~~5.48 cfs~~ 2.75 cfs

Total Capacity:

Q = 8.24$_{grate}$ + 5.48$_{throat}$
Q = 13.72 cfs

6.85 + 2.75
9.6 cfs

Street Capacity Calculations

La Orilla Road

56' F-F Street Section with 8" curb

Slope= 0.0344

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.001	0.170	0.005	0.000	0.001	0.455	0.005	0.801	0.007
0.02	0.003	0.341	0.009	0.002	0.005	0.722	0.014	0.899	0.017
0.04	0.013	0.681	0.019	0.015	0.029	1.146	0.046	1.010	0.041
0.06	0.029	1.022	0.028	0.043	0.086	1.501	0.090	1.080	0.066
0.08	0.051	1.362	0.038	0.093	0.186	1.819	0.146	1.133	0.094
0.1	0.080	1.703	0.047	0.169	0.338	2.111	0.211	1.176	0.124
0.12	0.115	2.044	0.056	0.275	0.549	2.383	0.286	1.212	0.154
0.125	0.125	2.129	0.059	0.306	0.612	2.449	0.306	1.221	0.162

For water depths greater than 0.125 ft but less than 0.405 ft

Y1=	Y-0.125
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.136	2.384	0.057	0.325	0.650	2.398	0.312	1.172	0.160
0.16	0.226	3.914	0.058	0.546	1.092	2.419	0.387	1.066	0.174
0.20	0.416	5.955	0.070	1.142	2.285	2.748	0.550	1.083	0.222
0.24	0.686	7.995	0.086	2.162	4.323	3.153	0.757	1.134	0.283
0.28	1.036	10.035	0.103	3.694	7.388	3.567	0.999	1.188	0.351
0.32	1.466	12.076	0.121	5.825	11.649	3.974	1.272	1.238	0.423
0.35	1.793	13.423	0.134	7.598	15.196	4.237	1.468	1.269	0.472
0.39	2.411	15.647	0.154	11.232	22.464	4.659	1.817	1.315	0.556
0.41	2.645	16.412	0.161	12.700	25.399	4.801	1.945	1.330	0.585

For water depths greater than 0.405 ft but less than 0.667 ft

Y2=	Y - 0.405
A3=	A2 + Y2*28
P3=	P2 + Y2

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.41	2.785	16.417	0.170	13.837	27.673	4.968	2.037	1.367	0.614
0.44	3.625	16.447	0.220	21.444	42.888	5.916	2.603	1.572	0.782
0.46	**4.094**	**16.463**	**0.249**	**26.247**	**52.494**	**6.411**	**2.928**	**1.672**	**0.875**
0.50	5.305	16.507	0.321	40.354	80.708	7.607	3.803	1.896	1.114
0.55	6.705	16.557	0.405	59.502	119.004	8.874	4.881	2.109	1.388
0.59	7.951	16.601	0.479	78.909	157.818	9.924	5.900	2.268	1.633
0.63	8.945	16.637	0.538	95.890	191.779	10.720	6.754	2.380	1.829
0.67	9.981	16.674	0.599	114.935	229.869	11.515	7.681	2.485	2.034

For water depths greater than 0.667 ft but less than 0.847 ft

Y3=	Y - 0.667
A4=	A3 + 28 * Y3 + 25 * Y3^2
P4=	P3 + SQRT(2501 * Y3^2)

Street Capacity Calculations

La Orilla Road

56' F-F Street Section with 8" curb

Slope= 0.0344

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.010	0.001	0.170	0.005	0.000	0.001	0.455	0.005	0.801	0.007
0.020	0.003	0.341	0.009	0.002	0.005	0.722	0.014	0.899	0.017
0.040	0.013	0.681	0.019	0.015	0.029	1.146	0.046	1.010	0.041
0.060	0.029	1.022	0.028	0.043	0.086	1.501	0.090	1.080	0.066
0.080	0.051	1.362	0.038	0.093	0.186	1.819	0.146	1.133	0.094
0.100	0.080	1.703	0.047	0.169	0.338	2.111	0.211	1.176	0.124
0.120	0.115	2.044	0.056	0.275	0.549	2.383	0.286	1.212	0.154
0.125	0.125	2.129	0.059	0.306	0.612	2.449	0.306	1.221	0.162

For water depths greater than 0.125 ft but less than 0.645 ft

Y1=	Y-0.125
A2=	A1 + 2*Y1 + 28*Y1^2
P2=	P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.130	0.136	2.384	0.057	0.326	0.651	2.399	0.312	1.173	0.160
0.200	0.433	5.955	0.073	1.221	2.441	2.822	0.564	1.112	0.230
0.300	1.333	11.056	0.121	5.271	10.542	3.956	1.187	1.273	0.410
0.400	2.793	16.157	0.173	14.048	28.095	5.030	2.012	1.402	0.618
0.450	3.733	18.707	0.200	20.662	41.324	5.536	2.491	1.454	0.727
0.485	**4.467**	**20.477**	**0.218**	**26.245**	**52.491**	**5.875**	**2.848**	**1.487**	**0.805**
0.550	6.033	23.808	0.253	39.162	78.323	6.492	3.570	1.543	0.956
0.600	7.393	26.359	0.280	51.351	102.703	6.946	4.168	1.580	1.074
0.645	8.736	28.654	0.305	64.160	128.319	7.344	4.737	1.612	1.182

For water depths greater than 0.645 ft but less than 0.667 ft

Y2=	Y - 0.645
A3=	A2 + Y2*28
P3=	P2 + Y2

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.646	8.764	28.895	0.303	64.144	128.287	7.319	4.728	1.605	1.178
0.647	8.792	28.896	0.304	64.484	128.968	7.334	4.745	1.607	1.182
0.650	8.876	28.899	0.307	65.510	131.019	7.380	4.797	1.613	1.193
0.652	8.932	28.901	0.309	66.197	132.394	7.411	4.832	1.617	1.201
0.657	9.072	28.906	0.314	67.927	135.854	7.487	4.919	1.628	1.219
0.660	9.156	28.909	0.317	68.974	137.948	7.533	4.972	1.634	1.230
0.665	9.296	28.914	0.322	70.732	141.465	7.609	5.060	1.644	1.249
0.667	9.352	28.916	0.323	71.441	142.881	7.639	5.095	1.648	1.257

Street Capacity Calculations

La Orilla Road

56' F-F Street Section with 8" curb

Slope= 0.0344

For water depths less than 0.125 feet

Y= Water depth
Area = 8*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.001	0.170	0.005	0.000	0.001	0.455	0.005	0.801	0.007
0.02	0.003	0.341	0.009	0.002	0.005	0.722	0.014	0.899	0.017
0.04	0.013	0.681	0.019	0.015	0.029	1.146	0.046	1.010	0.041
0.06	0.029	1.022	0.028	0.043	0.086	1.501	0.090	1.080	0.066
0.08	0.051	1.362	0.038	0.093	0.186	1.819	0.146	1.133	0.094
0.1	0.080	1.703	0.047	0.169	0.338	2.111	0.211	1.176	0.124
0.12	0.115	2.044	0.056	0.275	0.549	2.383	0.286	1.212	0.154
0.125	0.125	2.129	0.059	0.306	0.612	2.449	0.306	1.221	0.162

For water depths greater than 0.125 ft ~~but less than 0.405 ft~~ ≤ 0.645 ← 56' F-F

32' F-F

Y1= Y-0.125
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.136	2.384	0.057	0.325	0.650	2.398	0.312	1.172	0.160
0.16	0.226	3.914	0.058	0.546	1.092	2.419	0.387	1.066	0.174
0.20	0.416	5.955	0.070	1.142	2.285	2.748	0.550	1.083	0.222
0.24	0.686	7.995	0.086	2.162	4.323	3.153	0.757	1.134	0.283
0.28	1.036	10.035	0.103	3.694	7.388	3.567	0.999	1.188	0.351
0.32	1.466	12.076	0.121	5.825	11.649	3.974	1.272	1.238	0.423
0.35	1.793	13.423	0.134	7.598	15.196	4.237	1.468	1.269	0.472
0.39	2.411	15.647	0.154	11.232	22.464	4.659	1.817	1.315	0.556
~~0.41~~ 0.645	2.645	16.412	0.161	12.700	25.399	4.801	1.945	1.330	0.585

For water depths greater than ~~0.405~~ 0.645 ft but less than 0.667 ft

Y2= Y - ~~0.405~~ 0.645
A3= A2 + Y2*28
P3= P2 + Y2

Depth (ft)	Area (ft^2	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
6.5 ~~0.41~~	2.785	16.417	0.170	13.837	27.673	4.968	2.037	1.367	0.614
0.44	3.625	16.447	0.220	21.444	42.888	5.916	2.603	1.572	0.782
0.46	**4.094**	**16.463**	**0.249**	**26.247**	**52.494**	**6.411**	**2.928**	**1.672**	**0.875**
0.50	5.305	16.507	0.321	40.354	80.708	7.607	3.803	1.896	1.114
0.55	6.705	16.557	0.405	59.502	119.004	8.874	4.881	2.109	1.388
0.59	7.951	16.601	0.479	78.909	157.818	9.924	5.900	2.268	1.633
0.68	8.945	16.637	0.538	95.890	191.779	10.720	6.754	2.380	1.829
0.67	9.981	16.674	0.599	114.935	229.869	11.515	7.681	2.485	2.034

For water depths greater than 0.667 ft but less than 0.847 ft

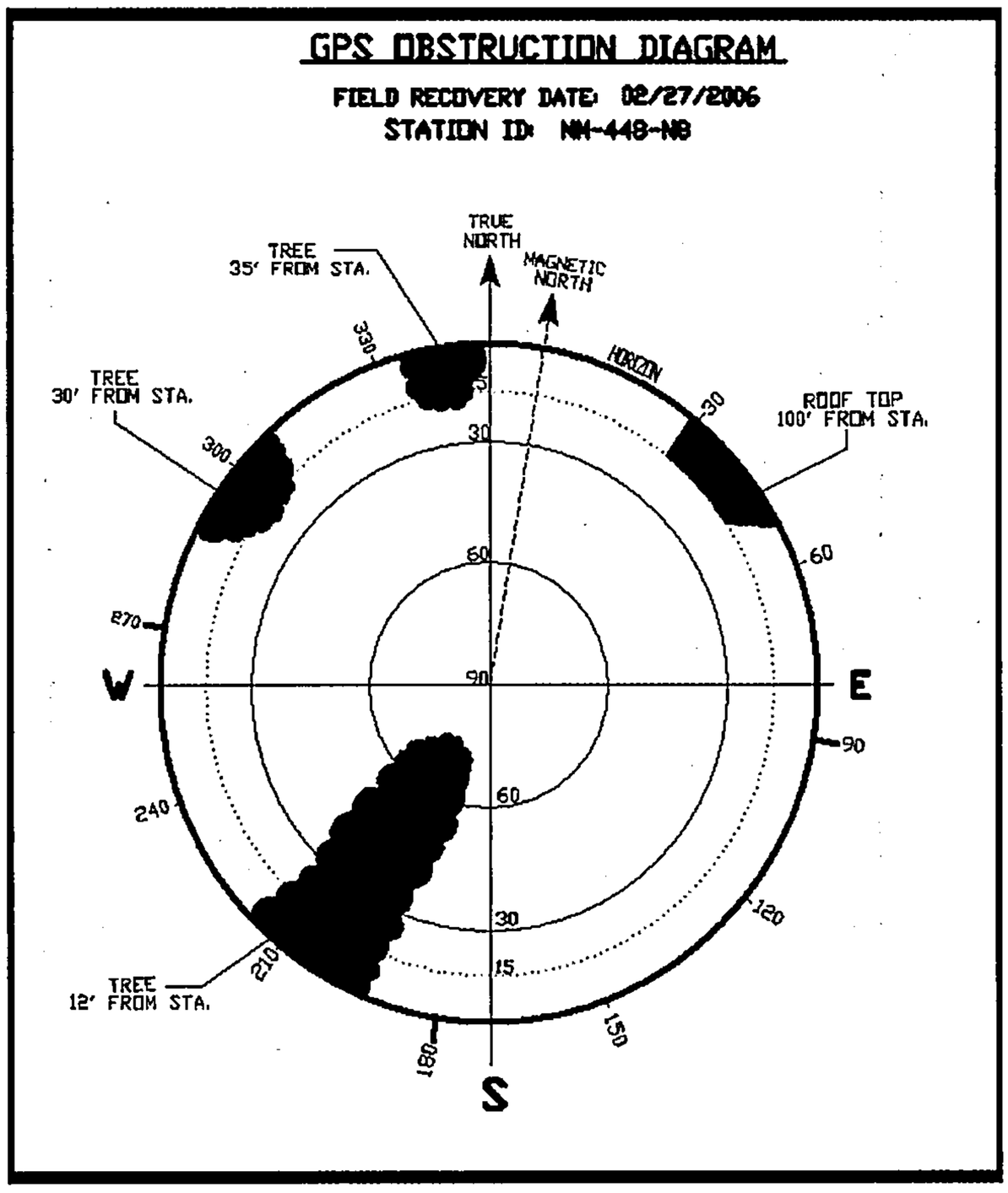
Y3= Y - 0.667
A4= A3 + 28 * Y3 + 25 * Y3^2
P4= P3 + SQRT(2501 * Y3^2)

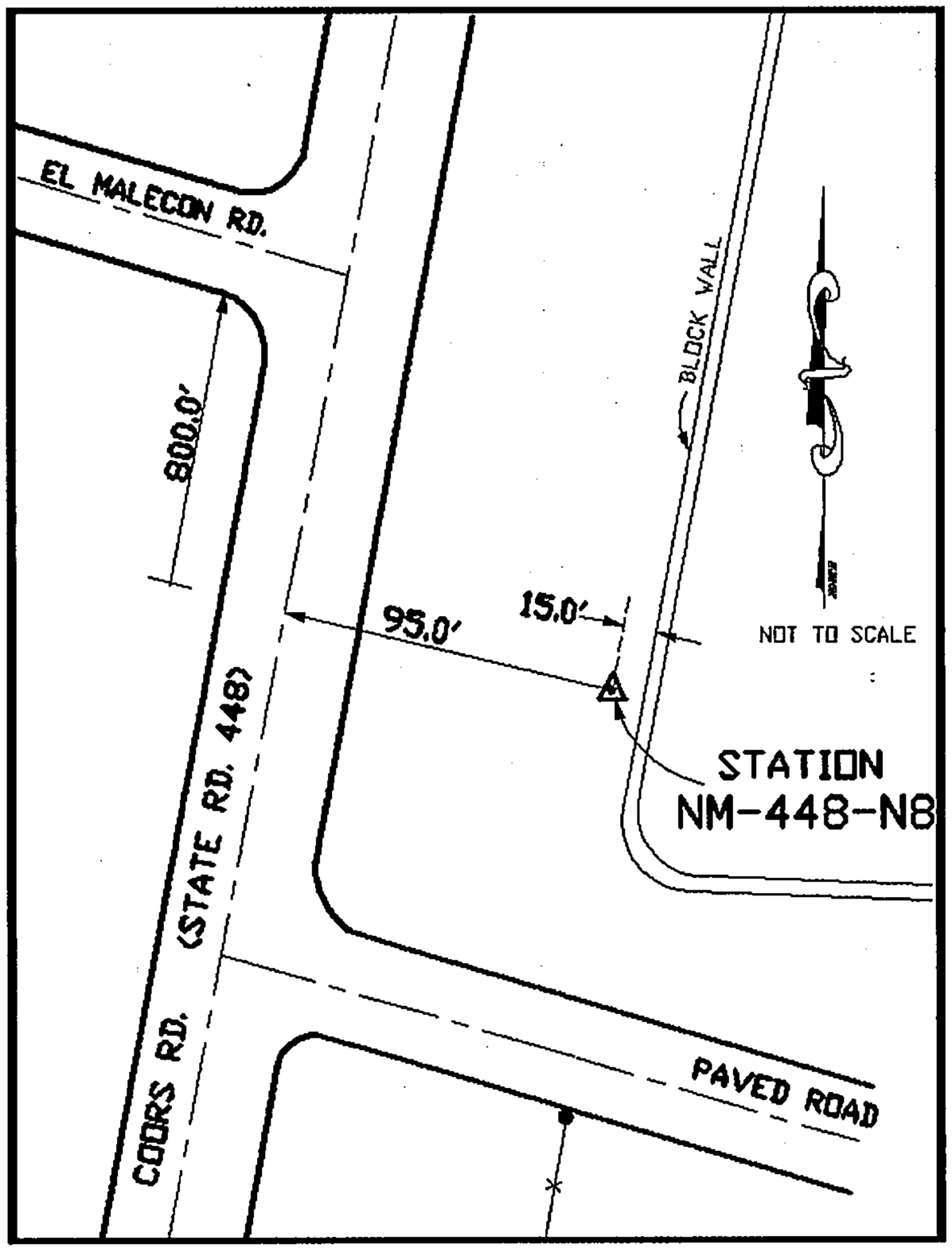
Control Station Data

Station Name: NM_448_N8

Status: Active

City of Albuquerque, New Mexico
Department of Municipal Development
Construction Services Division
Survey Section





Description:
The station is located 5.4 miles north of downtown Albuquerque.

To reach the station from the intersection of Montano Road and Coors Boulevard NW travel north on Coors Boulevard 1.05 miles to the station on the right.

The station mark is an NMSHC survey control brass disc set in a concrete post flush with the ground and is stamped "STA NM448-N8".

For more information contact the Geodetic Surveyor Cliff Wilkie at 505-768-3609 or Cwilkie@cabq.gov.

NAD 83 Position

Datum: NAD 83
Projection: New Mexico State Plane
Zone: Central

Latitude: 35 - 9 - 46.90266
Longitude: 106 - 40 - 37.51231
Ellipsoidal Height (meters): 1509.196

Order: 1 **Class:** 1

Ground to Grid Factor: 0.999682367
Mapping Angle: -0_14_45.47

Northing (US survey feet): 1514900.643
Easting (US survey feet): 1512770.226

Northing (meters): 461742.639
Easting (meters): 461093.287

NAVD 1988 Elevation
Datum: NAVD 1988

Orthometric Height (US survey feet): 5021.651
Order: 2 **Class:** 1

Azimuth Orientation
No azimuth data available

Capacity of a Single 'A' Storm Drop Inlet

Capacity of the grate:

L = 40" - 2(2"$_{ends}$) - 7(½" $_{middle\ bars}$)
= 32 1/2"
= 2.7083'

W = 25" - 13(½" $_{middle\ bars}$)
= 18.5"
= 1.54'

Area = 2.7083' x 1.54'
= 4.18 ft^2

Effective Area = 4.18- 4.18 (0.5 $_{clogging\ factor}$)
= 2.09 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*2.09*sqrt(2*32.2*0.67)
Q = 8.24 cfs

Capacity of the Throat:

L = 6.50'

H = 10 ¾" - 4 ½"
= 6 ¼"
= 0.5208'

Area = 6.50' x 0.5208'
= 3.39 ft^2 at the throat

Weir Equation

Q = CLH^(3/2)
Q = 2.95 * 3.39 * 0.67^(3/2)
Q = 5.48 cfs

Total Capacity:

$Q = 8.24_{grate} + 5.48_{throat}$
Q = 13.72 cfs

Capacity of a Double 'A' Storm Drop Inlet

Capacity of the grate:

L = 80" - 2(2"$_{ends}$) - 14(½"$_{middle\ bars}$) – 6"$_{center\ piece}$
= 63"
= 5.25'

W = 25" - 13(½"$_{middle\ bars}$)
= 18.5"
= 1.54'

Area = 5.25' x 1.54'
= 8.09 ft^2

Effective Area = 8.09- 8.09 (0.5 $_{clogging\ factor}$)
= 4.04 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*4.04*sqrt(2*32.2*0.67)
Q = 15.93 cfs

Capacity of the Throat:

L = 11.00'

H = 10 ¾" - 4 ½"
= 6 ¼"
= 0.5208'

Area = 11.0' x 0.5208'
= 5.73 ft^2 at the throat

Weir Equation

Q = CLH^(3/2)
Q = 2.95 * 5.73 * 0.67^(3/2)
Q = 9.27 cfs

Total Capacity:

$Q = 15.93_{grate} + 9.27_{throat}$
Q = 25.20 cfs

TAYLOR RANCH DRAINAGE PLAN
Modified by Eastling and Associates, Inc.
1992, 1994, and 1997
HydroIeqY Worksheet Used in
Caastrect AHYMO Model

Scale 1" = 200'

Notes:
Basins 2OP2) and 2OP3) enter
La Ch'Pk Storm Sewer at Manhole
S-42. North Court Pond assumed
extended onto Basin 4(2SHP)
approximately 1.5 acres in area.
Final cituation volume to be
determined when 2SHP developed.

SHEET INDEX
NEXT SHEET