

June 4, 2008

City of North Olmsted
5200 Dover Center Road
North Olmsted, Ohio 44070

Attn: Kim Wenger, Planning Director

Re: **Biddulph Trail Homes**

25747 Butternut Ridge Road

Kim:

I have enclosed twelve copies of my revised Preliminary Site Engineering Plan (Sheet 4), which has been updated to reflect the easements and latest architectural layout of the 29 homes as depicted on SK-5. Also, I have discussed the storm water management system with the City Engineer, and have clarified some items on the drawing accordingly. I will be prepared to discuss these, and any other questions, at the next Planning Commission meeting on June 11th.

Separately our Storm Water Management Calculations dated October 30, 2007 have been re-submitted for your reference.

ZWICK Engineering



Peter D. Zwick, P.E., P.S.
Partner

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Cc: Ron DiLorenzo, Butternut Ridge Properties, Ltd., LLC
Tom Liggett, Architect, Peggy Brown, Landscape Architect

ZWICK ASSOCIATES INC.
ENGINEERS • LAND SURVEYORS • PLANNERS

8750 STEARNS ROAD
OLMSTED TOWNSHIP, OHIO 44138-1743

PHONE (440) 235-2729 • FAX (440) 235-0604

October 30, 2007

City of North Olmsted
5200 Dover Center Road
North Olmsted, Ohio 44070

Attn: Kim Wenger, Planning Director

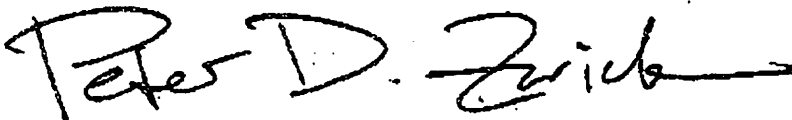
Re: **Biddulph Trail Homes**

25747 Butternut Ridge Road

Kim:

I have enclosed five sets of Preliminary Site Engineering Plans, our preliminary Storm Water Management Calculations and the preliminary Traffic Engineering Report for your review and approval. I have also enclosed our Legal Description of the 10.8 acres to be rezoned, with a List of adjacent (including opposite side of the street) land owners.

ZWICK Engineering



Peter D. Zwick, P.E., P.S.
Partner

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Cc: Ron Dilorenzo, Butternut Ridge Properties, Ltd., LLC with prints
Tom Liggett, Architect, with prints
Peggy Brown, Landscape Architect, with prints

FILE COPY

Project: BIDDULPH TRAIL CLUSTER HOMES
Location: Butternut Ridge West of Columbia Road (Road Route 252)
 City of North Olmsted, Cuyahoga County, Ohio
Calculated By: Christopher E. Sestak E.I. Date: October 24, 2007
Checked By: Peter D. Zwick P.E., P.S. Date: October 24, 2007



PRELIMINARY STORMWATER MANAGEMENT CALCULATIONS
 (Per City of North Olmsted CHAPTER 927 Storm Water Management)

Peter D. Zwick

TOTAL SITE AREA = 10.84 Acres
DISTURBED AREA = 8.0 Acres

Chapter 927 (h) MINIMUM 2" (HARD SURFACE) STORAGE REQUIRED

8.0 Ac. (Residential)
 @ 35% Impervious = 2.80 Ac
TOTAL = 2.80 Ac
 2.80 Ac. x 2⁷/₁₂" x 43,560 = 20,328 (0.5 Acre-Ft)
 Minimum Storage
 Volume Required

Chapter 927 DETERMINATION OF CRITICAL STORM BY "RATIONAL METHOD" VOLUME

Pre Development

1 Year Storm $T_c = 45 \text{ min.}$ $i_{15} = 1.13 \text{ in/hr}$
 3% slope avg. $c = 0.1$
 $Q_{1 \text{ PRE}} = 0.9 \text{ (Ninety Percent)} * c i a = 0.9 * (0.1) * (1.13) * (8.0) = 0.81 \text{ CFS}$
 $Q_{1 \text{ PRE}} = 0.81 \text{ CFS}$

Post Development

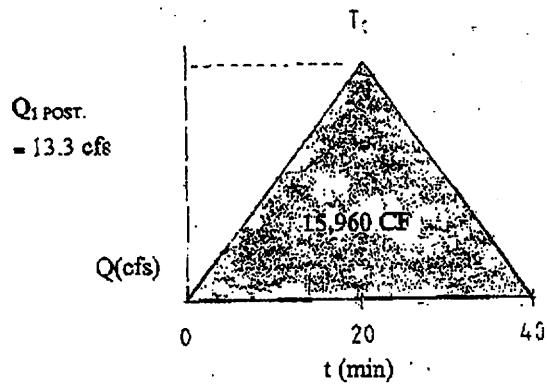
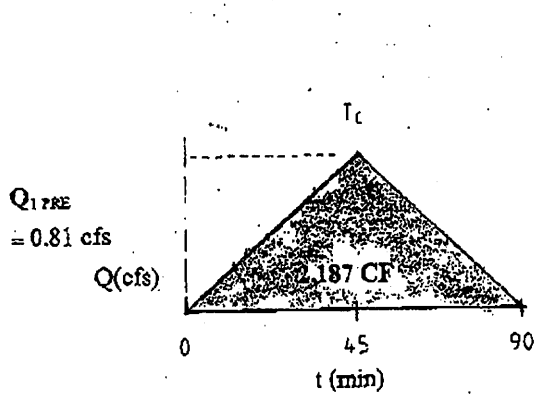
1 Year Storm $T_c = 20 \text{ min.}$ $i_{15} = 2.22 \text{ in/hr}$
 $c = 0.75 \text{ (Cluster Homes)}$
 $Q_{1 \text{ POST}} = c i a = (0.75) * (2.22) * (8.0) = 13.3 \text{ CFS}$
 $Q_{1 \text{ POST}} = 13.3 \text{ CFS}$

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Chapter 927(f & g) CRITICAL STORM



$$\text{Volume}_{1 \text{ PRE}} = 0.81 \text{ ft}^3/\text{s} * (2(45 \text{ min.})/2) * (60 \text{ sec.} / 1 \text{ min.}) = 2,187 \text{ ft}^3$$

$$\text{Volume}_{1 \text{ POST}} = 13.3 \text{ ft}^3/\text{s} * (2(20 \text{ min.})/2) * (60 \text{ sec.} / 1 \text{ min.}) = 15,960 \text{ ft}^3$$

$$\% \text{ Increase} = [(15,960 - 2,187) / 2,187] * 100 = 630\% \text{ Increase}$$

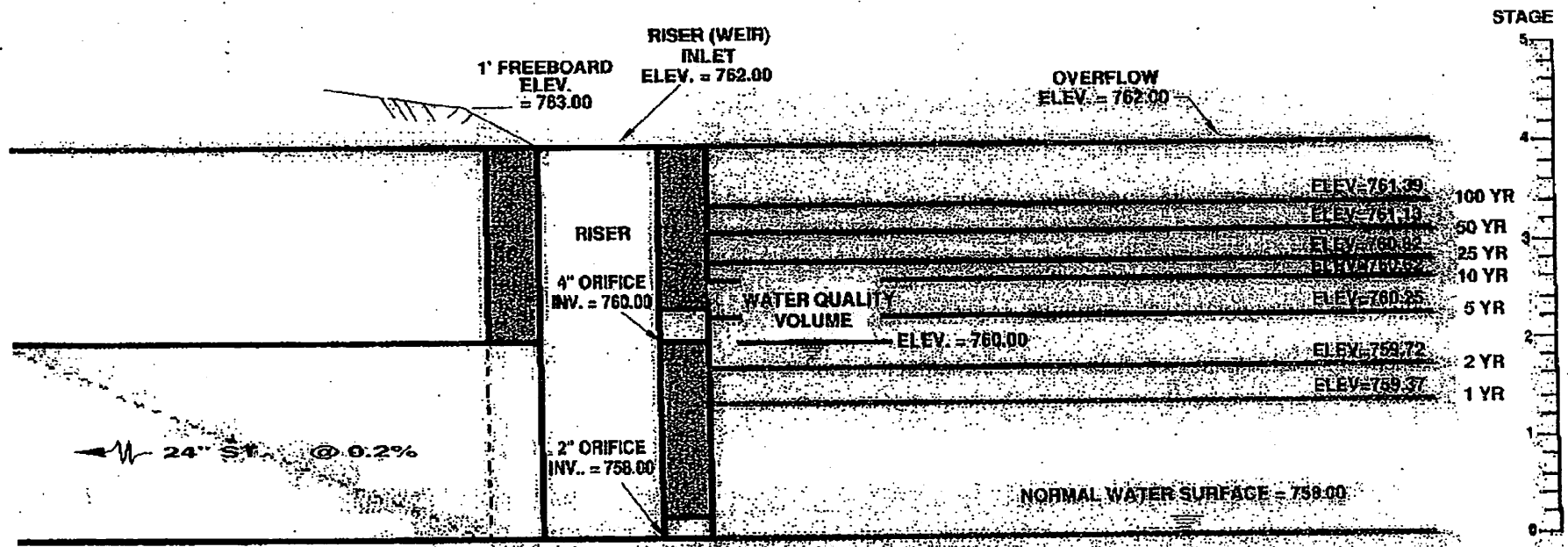
Therefore Critical Storm is 100 Years

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DETENTION BASIN BIDDULPH TRAIL CLUSTER HOMES



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 EMAIL: ZWICK@ENG.OHIOCOXMAIL.COM

DETENTION BASIN STAGE-DISCHARGE RELATIONSHIP

<u>STAGE</u>	<u>ELEV.(FT)</u>	<u>ST. FREQ. (YR)</u>	<u>DISCHARGE(CFS)</u>
3.39	761.39	100	0.64
3.13	761.13	50	0.58
2.82	760.82	25	0.50
2.62	760.62	10	0.44
2.25	760.25	5	0.27
2.00	760.00	WQv	0.14
1.72	759.72	2	0.13
1.37	759.37	1	0.12
0.0	758.00		0.00

DETENTION BASIN STAGE-VOLUME PROVIDED RELATIONSHIP

<u>STAGE</u>	<u>ELEV.(FT)</u>	<u>ST. FREQ. (YR)</u>	<u>VOLUME(CF)</u>	
5.00	763.00		49,500	(1.1 AC. FT)
4.00	762.00	(OVERFLOW)	39,600	(0.90 AC. FT)
3.39	761.39	100	33,603	(0.80 AC. FT)
3.13	761.13	50	30,970	(0.70 AC. FT)
2.82	760.82	25	27,895	(0.64 AC. FT)
2.62	760.62	10	25,980	(0.60 AC. FT)
2.25	760.25	5	22,266	(0.51 AC. FT)
2.00	760.00	WQv	19,800	(0.45 AC. FT)
1.72	759.72	2	17,000	(0.39 AC. FT)
1.37	759.37	1	13,527	(0.31 AC. FT)
0.00	758.00		0	

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Hydrograph Plot

Inflow Hydrographs by Intelisolve

Monday, Oct 29 2007, 2:48 PM

Hyd. No. 3

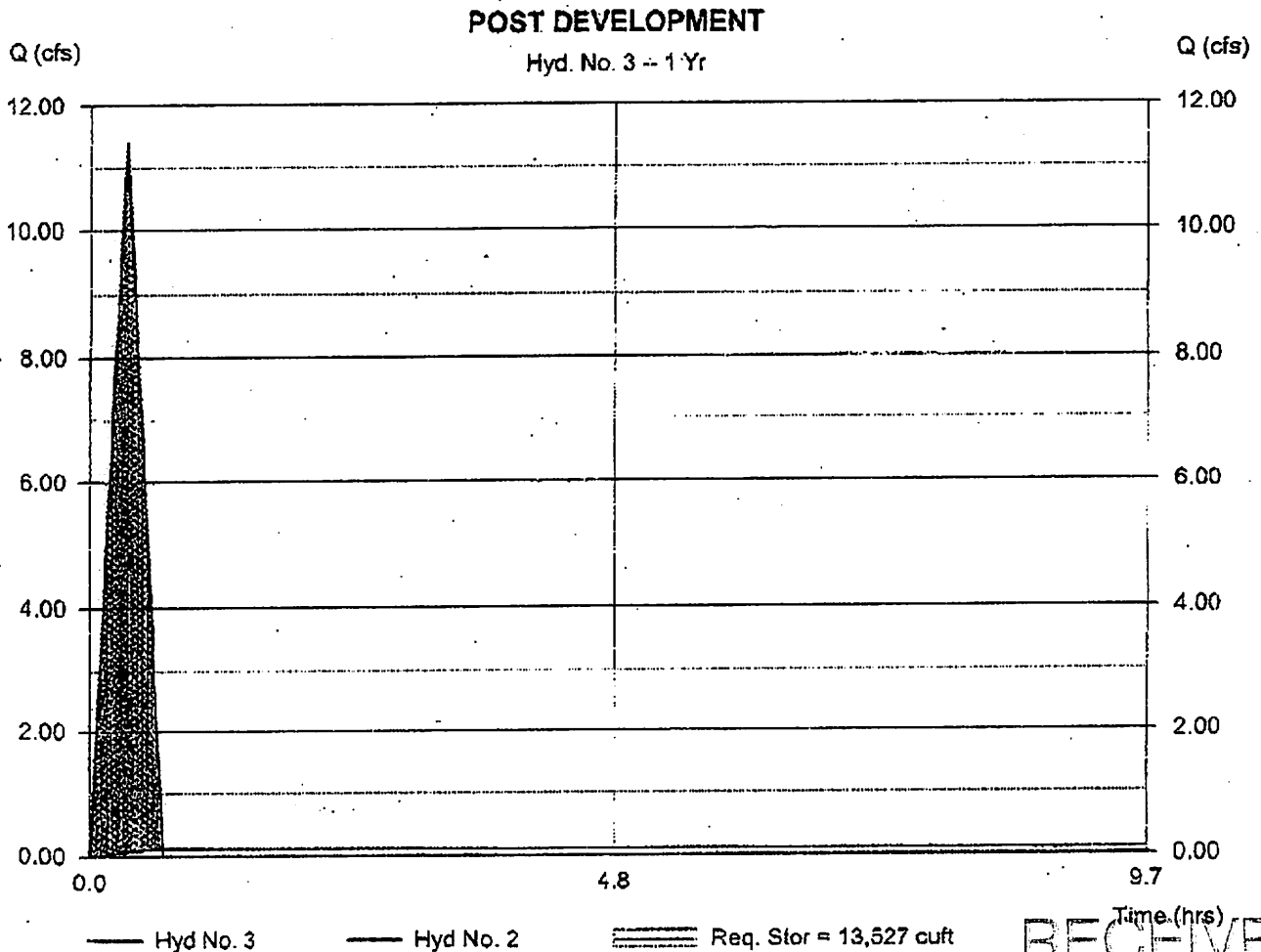
POST DEVELOPMENT

Hydrograph type = Reservoir
 Storm frequency = 1 yrs
 Inflow hyd. No. = 2
 Reservoir name = DETENTION BASIN

Peak discharge = 0.12 cfs
 Time interval = 1 min
 Max. Elevation = 759.37 ft
 Max. Storage = 13,527 cuft

Storage Indication method used.

Hydrograph Volume = 11.955 cuft



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Hydrograph Plot

Flow Hydrographs by Intelisolve

Monday, Oct 29 2007, 2:48 PM

Hyd. No. 3

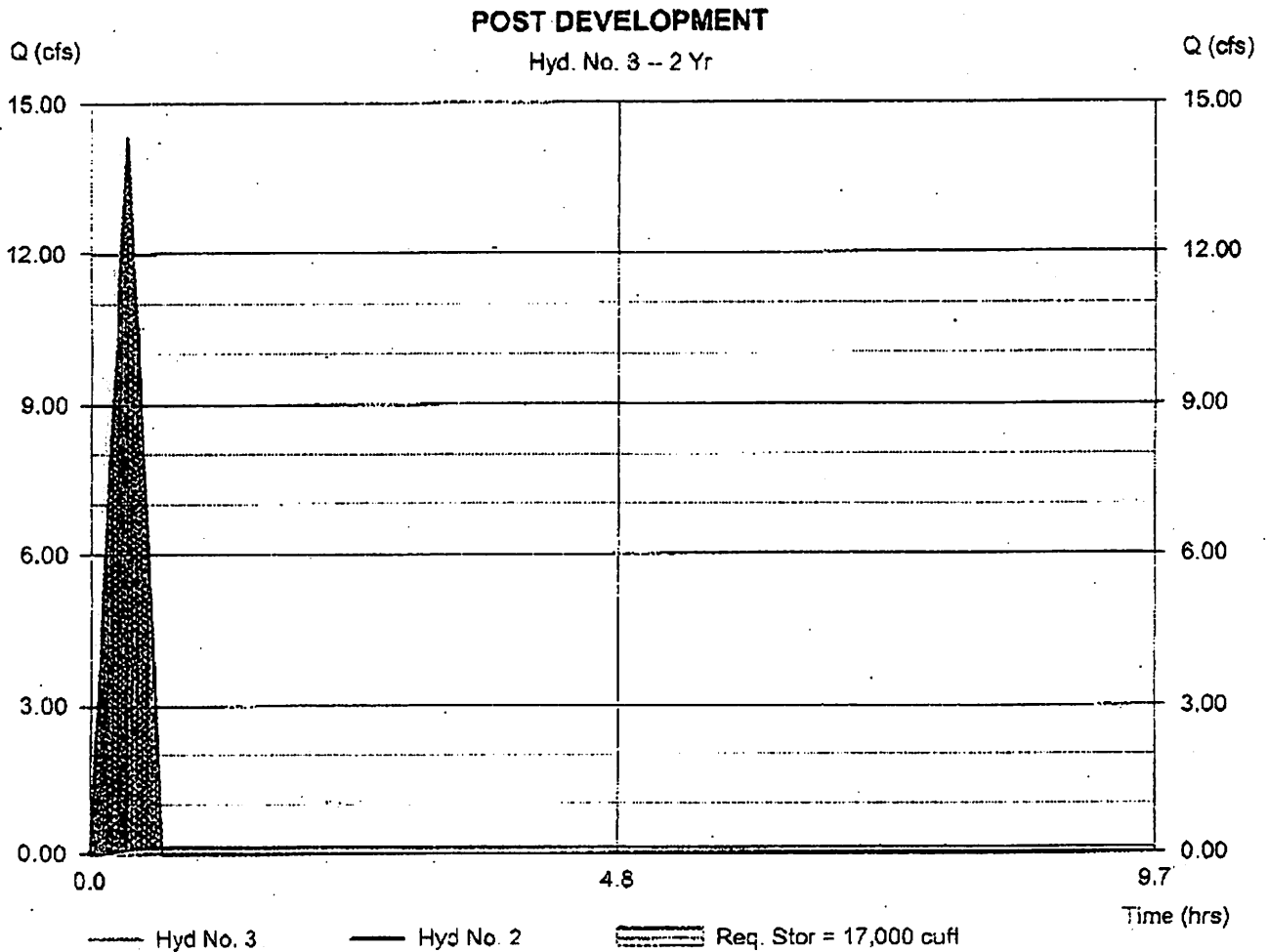
POST DEVELOPMENT

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Inflow hyd. No. = 2
Reservoir name = DETENTION BASIN

Peak discharge = 0.13 cfs
Time interval = 1 min
Max. Elevation = 759.72 ft
Max. Storage = 17.000 cuft

Storage Indication method used.

Hydrograph Volume = 14,589 cuft



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Hydrograph Plot

Flow Hydrographs by Intelisolve

Monday, Oct 29 2007, 2:49 PM

Hyd. No. 3

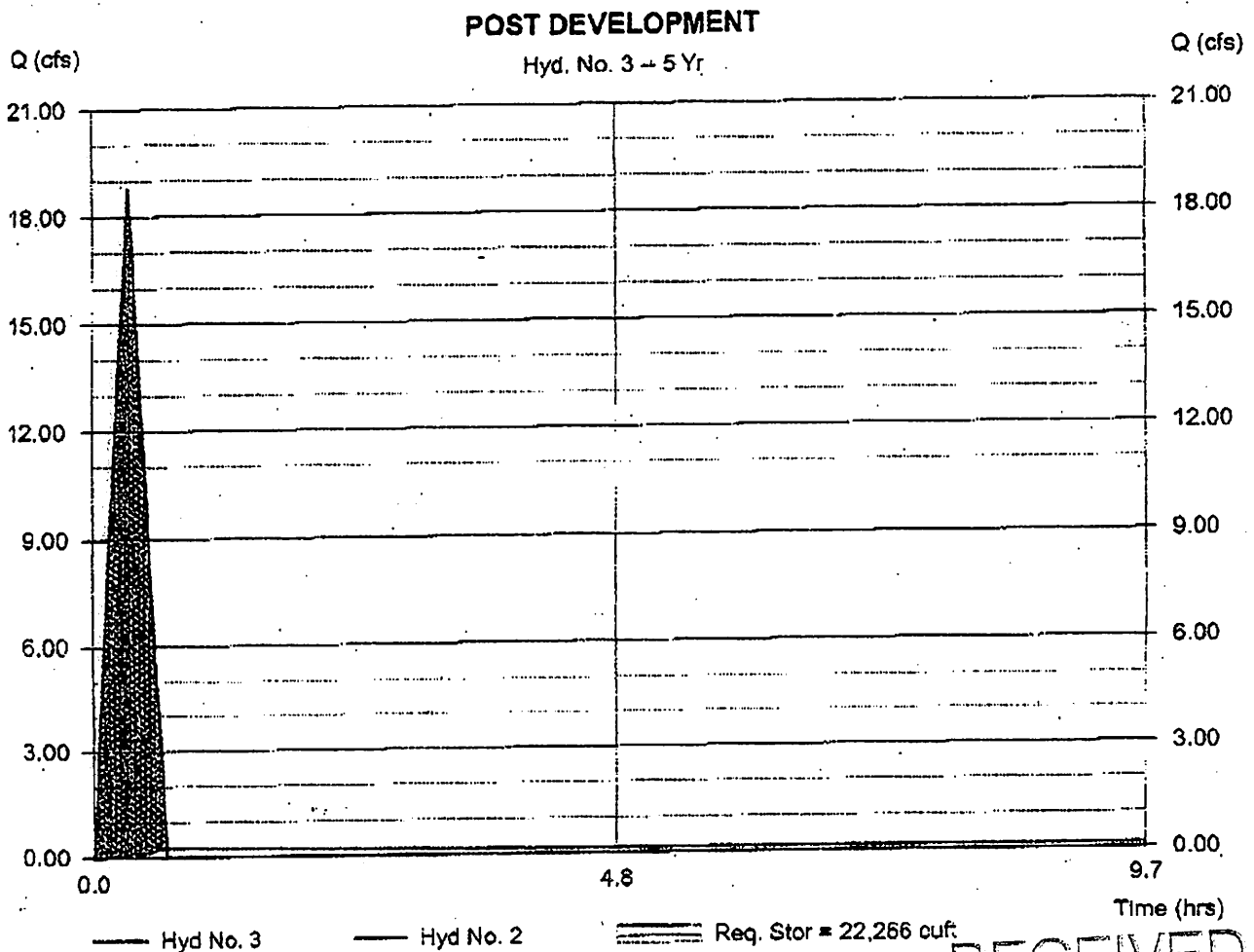
POST DEVELOPMENT

Hydrograph type = Reservoir
Storm frequency = 5 yrs
Inflow hyd. No. = 2
Reservoir name = DETENTION BASIN

Peak discharge = 0.27 cfs
Time interval = 1 min
Max. Elevation = 760.25 ft
Max. Storage = 22,266 cuft

Storage Indication method used.

Hydrograph Volume = 18,378 cuft



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Flow Hydrographs by Intellisolve

Monday, Oct 29 2007, 2:50 PM

Hyd. No. 3

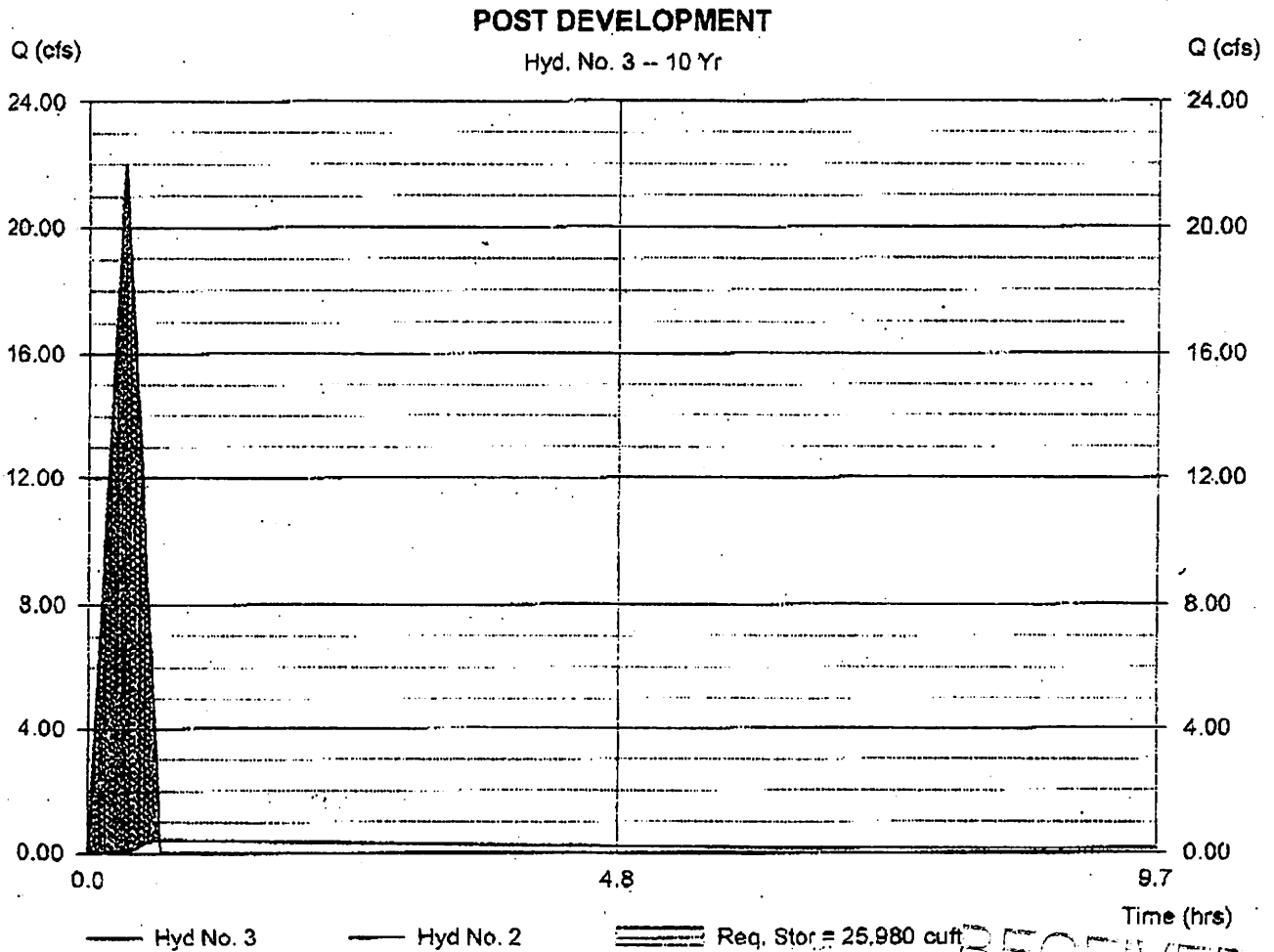
POST DEVELOPMENT

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Inflow hyd. No. = 2
Reservoir name = DETENTION BASIN

Peak discharge = 0.44 cfs
Time Interval = 1 min
Max. Elevation = 760.62 ft
Max. Storage = 25,980 cuft

Storage Indication method used.

Hydrograph Volume = 21,600 cuft



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Hydrograph Plot

Drainflow Hydrographs by Intelisolve

Monday, Oct 29 2007, 2:50 PM

Hyd. No. 3

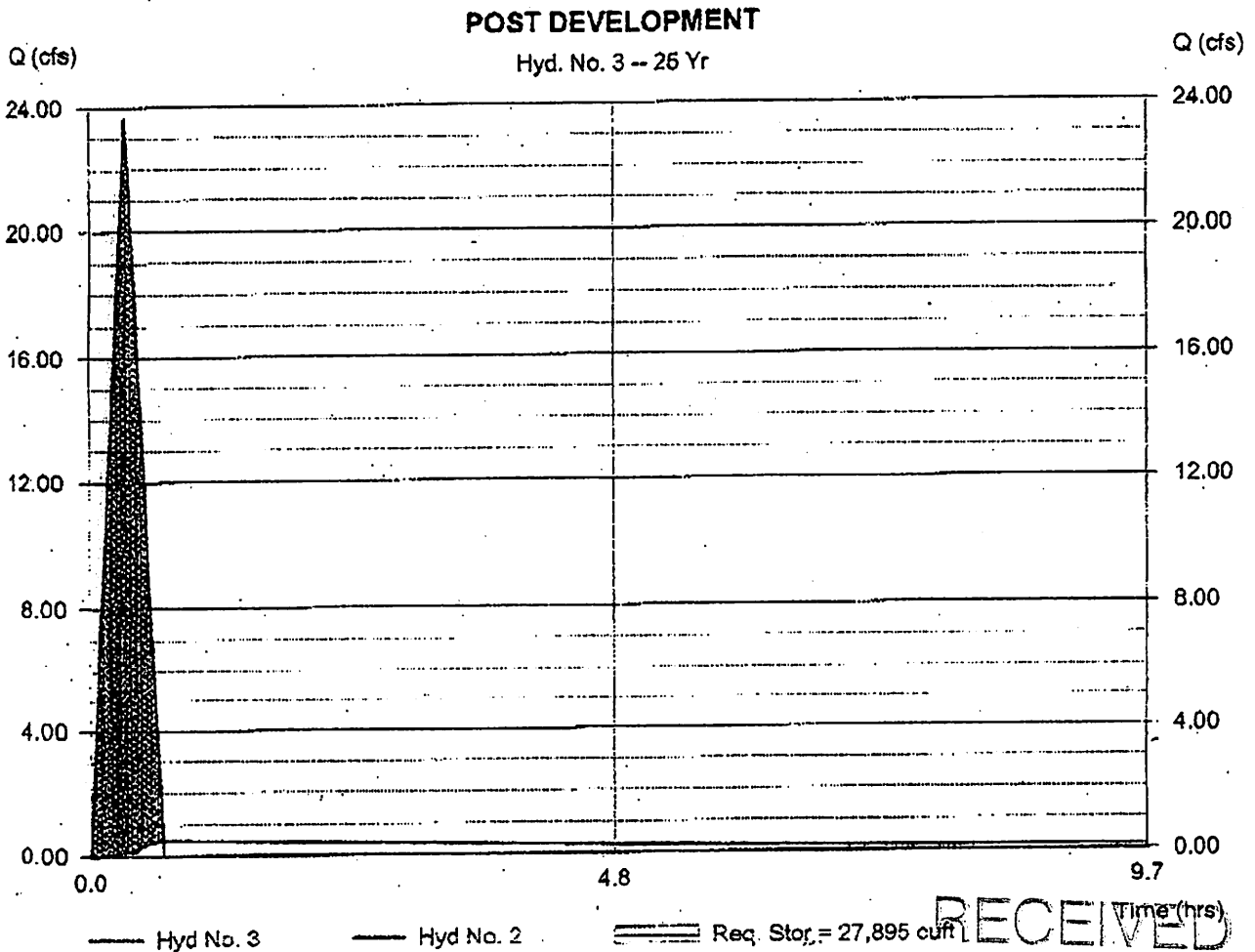
POST DEVELOPMENT

Hydrograph type = Reservoir
 Storm frequency = 25 yrs
 Inflow hyd. No. = 2
 Reservoir name = DETENTION BASIN

Peak discharge = 0.50 cfs
 Time interval = 1 min
 Max. Elevation = 760.82 ft
 Max. Storage = 27,895 cuft

Storage Indication method used.

Hydrograph Volume = 23.325 cuft



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Hydrograph Plot

Drawflow Hydrographs by Intetisolve

Monday, Oct 29 2007, 2:51 PM

Hyd. No. 3

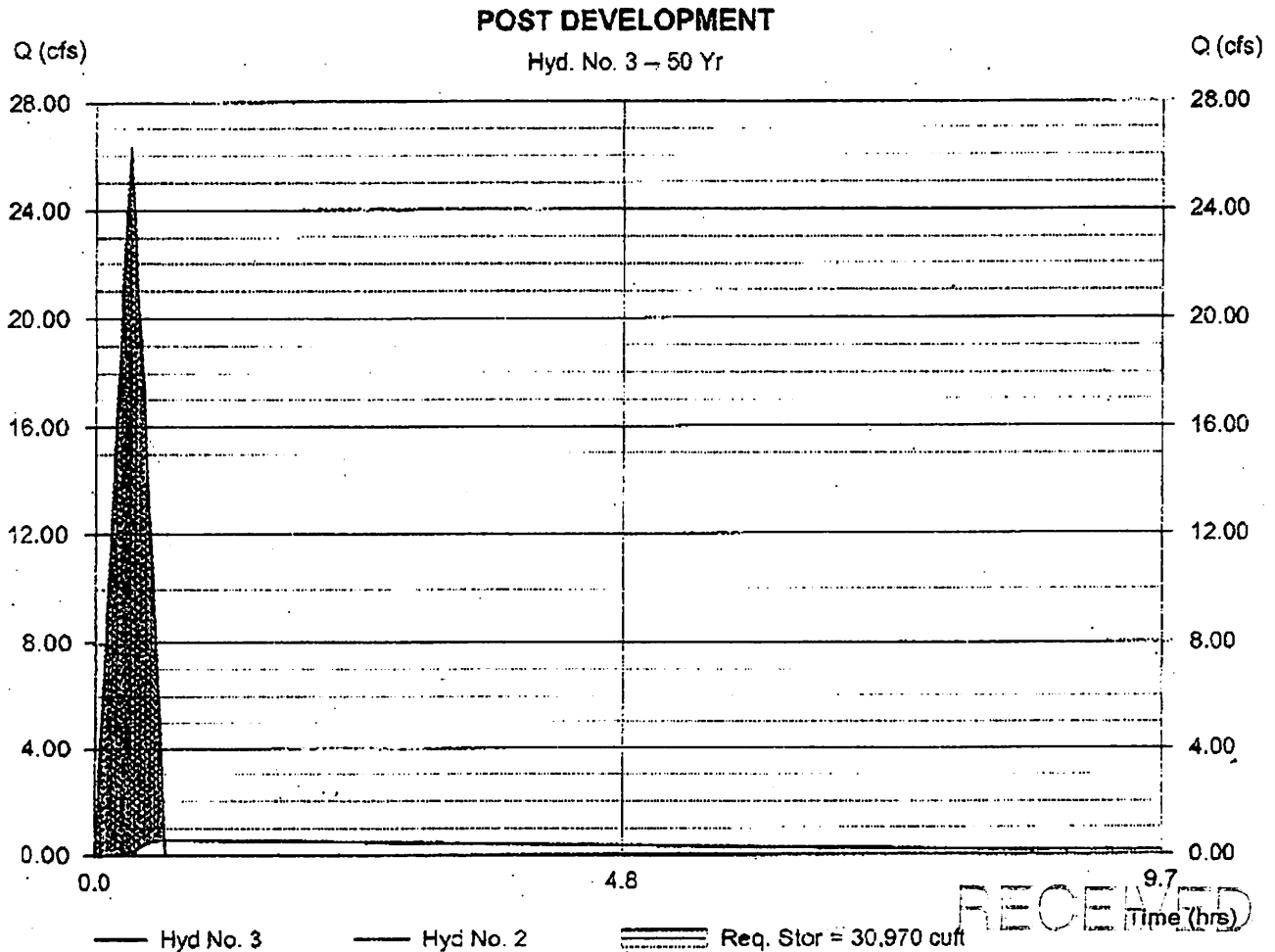
POST DEVELOPMENT

Hydrograph type = Reservoir
Storm frequency = 50 yrs
Inflow hyd. No. = 2
Reservoir name = DETENTION BASIN

Peak discharge = 0.58 cfs
Time interval = 1 min
Max. Elevation = 761.13 ft
Max. Storage = 30,970 cuft

Storage indication method used.

Hydrograph Volume = 26,127 cuft



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Hydrograph Plot

Hydroflow Hydrographs by intellisolve

Monday, Oct 29 2007, 2:51 PM

Hyd. No. 3

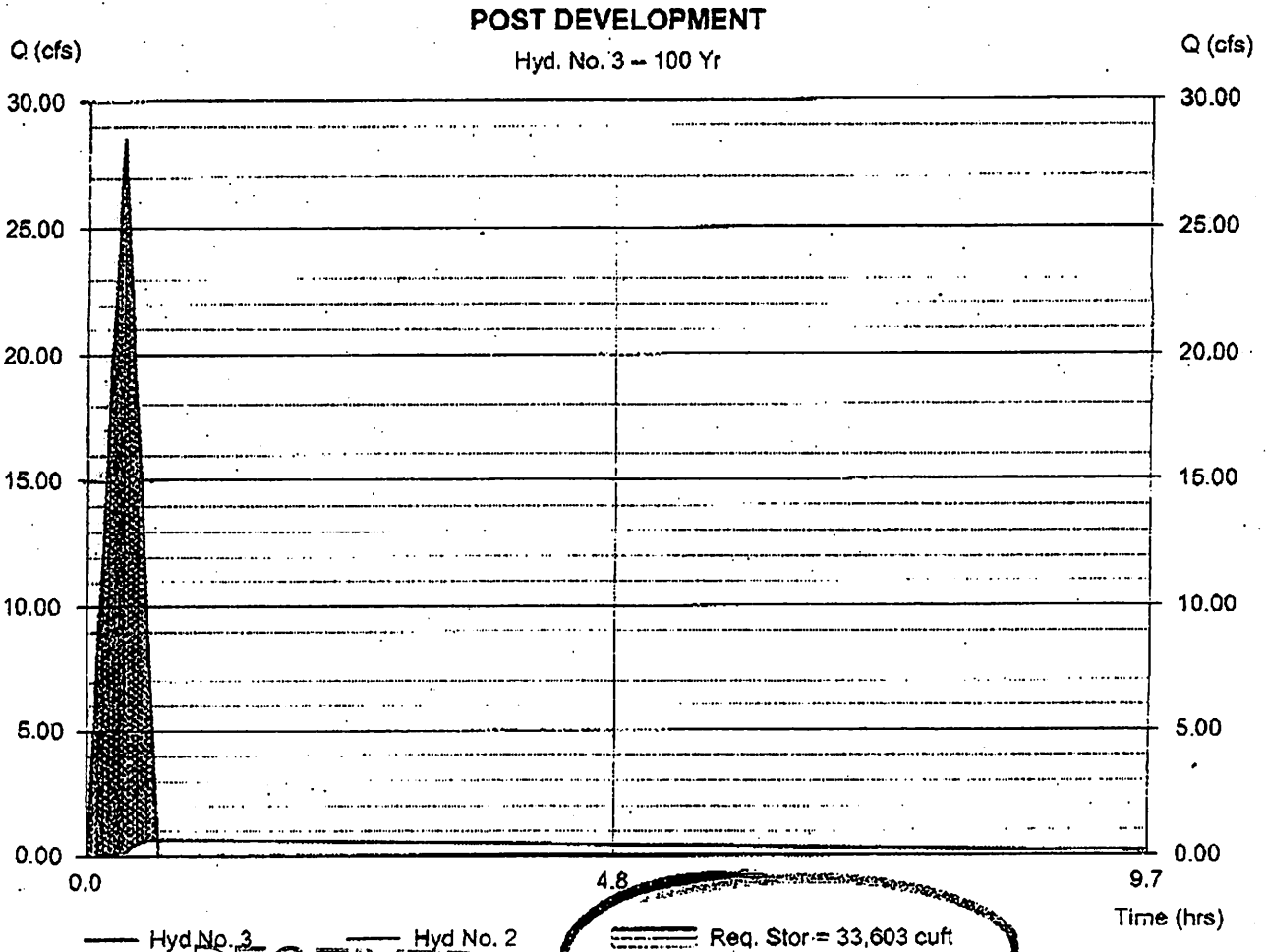
POST DEVELOPMENT

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Inflow hyd. No. = 2
Reservoir name = DETENTION BASIN

Peak discharge = 0.64 cfs
Time interval = 1 min
Max. Elevation = 761.39 ft
Max. Storage = 33,603 cuft

Storage indication method used.

Hydrograph Volume = 28,548 cuft



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MAX.

Water Quality Volume (WQ_v)

$WQ_v = 1.2 \times C \times A \times P$

C=Runoff Coefficient A=area draining into BMP in acres P=0.75 inch precipitation depth

20% Additional Volume Required for sediment storage

DISTURBED AREA

AREA DRAINING INTO BASIN = 8.0 Acres

BASIN (8.0 Acres)

C=0.75 for Cluster Homes

$WQ_v = 1.2 \times (0.75) \times (8.0) \times (0.75/12) = 0.45 \text{ Ac-Ft}$

Total WQ_v REQUIRED = 0.45 Acre-feet or 19,602 CF

Volume PROVIDED from Elevation 760.00 to 758.00 = 19,800 CF > Required

Drawdown Time = 24 Hrs

$Q_{MAX} = \text{Volume} / 24\text{hr} \times 3600 \text{ sec/hr}$

$Q_{MAX} = 19,602 / 24\text{hr} \times 3600 \text{ sec/hr} = 0.23 \text{ C.F.S.}$

$Q_{MAX} = 0.23 \text{ C.F.S.}$

Restrictor (Drain Outlet Pipe) for Water Quality

$Q_{ORIFICE} = 0.6 \times A_o \times [2 \times g \times (H - (DIA/2))]^{1/2}$ $g=32.2 \text{ ft/s}$ $H=2.0'$ (H=Elev.=760.00-758.00)

$Q_{2" DIA} = 0.6 \times [3.14(2"/12")^2 / 4] \times [2(32.2 \times (2.0' - (2"/12")/2))]^{1/2} = \underline{0.14 \text{ C.F.S.}}$

$Q_{2.5" DIA} = 0.6 \times [3.14(2.5"/12")^2 / 4] \times [2(32.2 \times (2.0' - (2.5"/12")/2))]^{1/2} = 0.22 \text{ C.F.S.}$

$Q_{3" DIA} = 0.6 \times [3.14(3"/12")^2 / 4] \times [2(32.2 \times (2.0' - (3"/12")/2))]^{1/2} = 0.32 \text{ C.F.S.}$

$Q_{4" DIA} = 0.6 \times [3.14(4"/12")^2 / 4] \times [2(32.2 \times (2.0' - (4"/12")/2))]^{1/2} = 0.57 \text{ C.F.S.}$

$Q_{(2.5" DIA)} \text{ PROVIDED} = 0.22 \text{ C.F.S.}$ **USE 2.5" ORIFICE**

OK