

June 4, 2008

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

Attn: Kim Wenger, Planning Director

Re: **Biddulph Trail Homes**

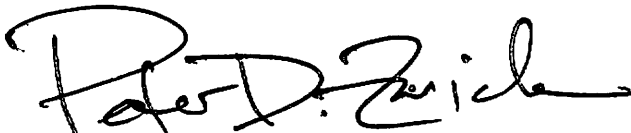
25747 Butternut Ridge Road

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 11<sup>th</sup>.

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

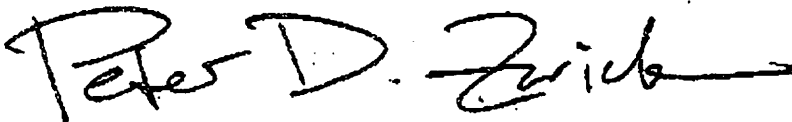
Re: **Biddulph Trail Homes**

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**

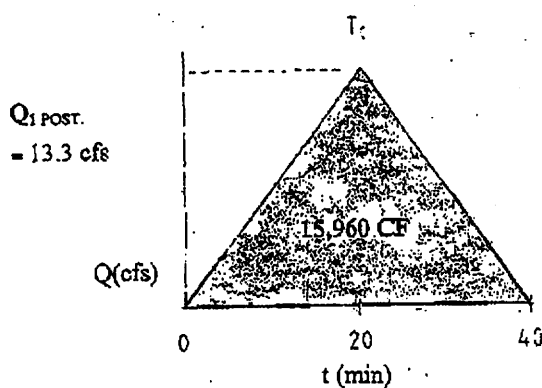
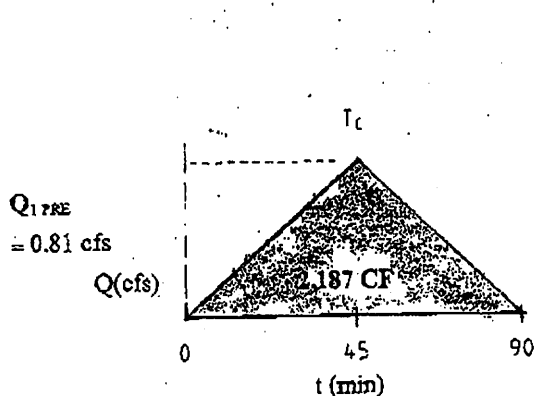
**1 Year Storm**       $T_c = 20 \text{ min.}$        $i_{15} = 2.22 \text{ in/hr}$   
 $c = 0.75 \text{ (Cluster Homes)}$   
 $Q_{1 \text{ POST}} = c i a = (0.75) * (2.22) * (8.0) = 13.3 \text{ CFS}$   
 $Q_{1 \text{ POST}} = 13.3 \text{ CFS}$

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**Chapter 927(f & g) CRITICAL STORM**



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

$$= 2,187 \text{ ft}^3$$

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

$$= 15,960 \text{ ft}^3$$

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

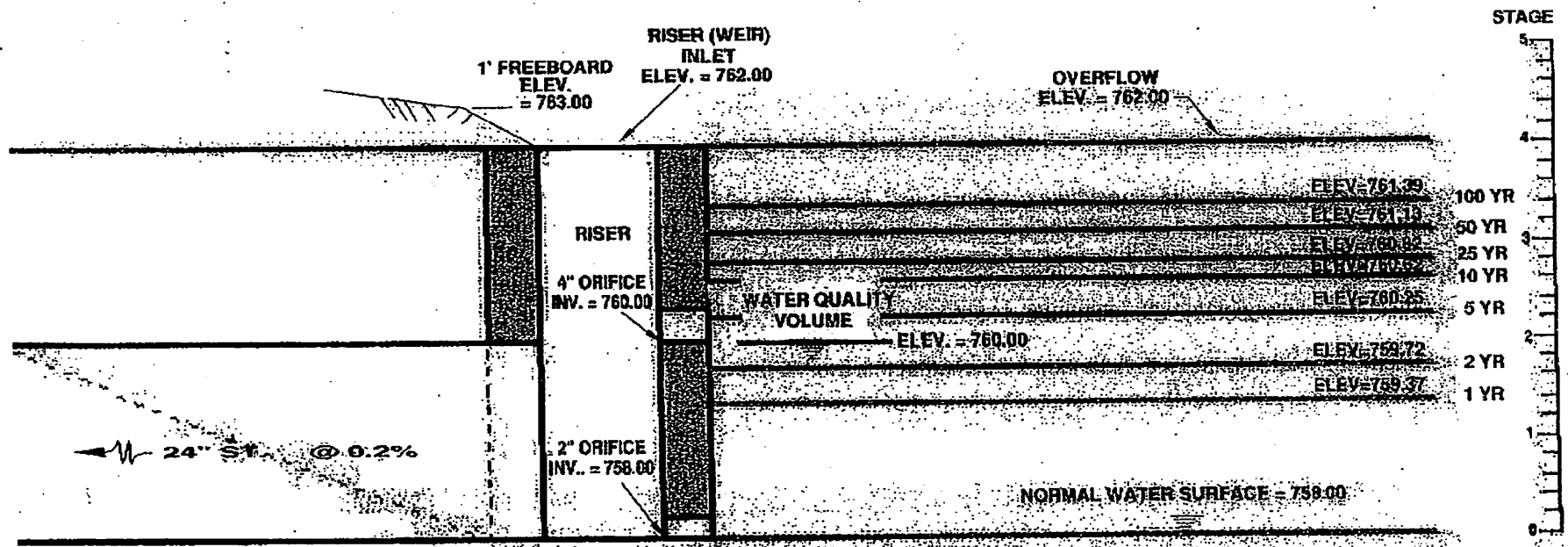
Therefore Critical Storm is 100 Years

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# DETENTION BASIN BIDDULPH TRAIL CLUSTER HOMES

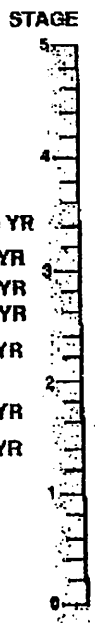


**SECTION**  
NOT TO SCALE

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 8750 STEARNS ROAD, OLMSTED TWP., OHIO 44138-1743 (440) 235-2729  
 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

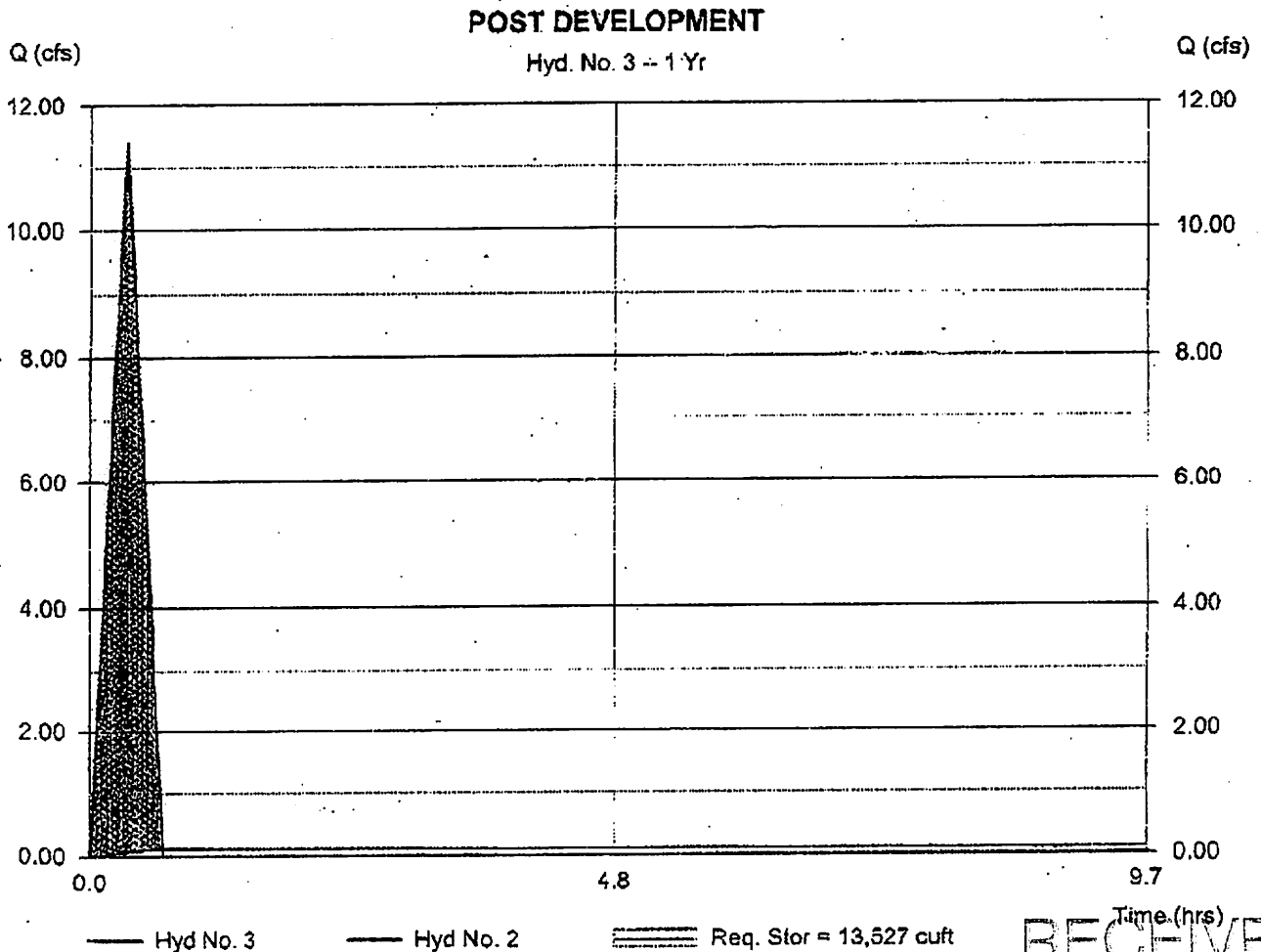
### POST DEVELOPMENT

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

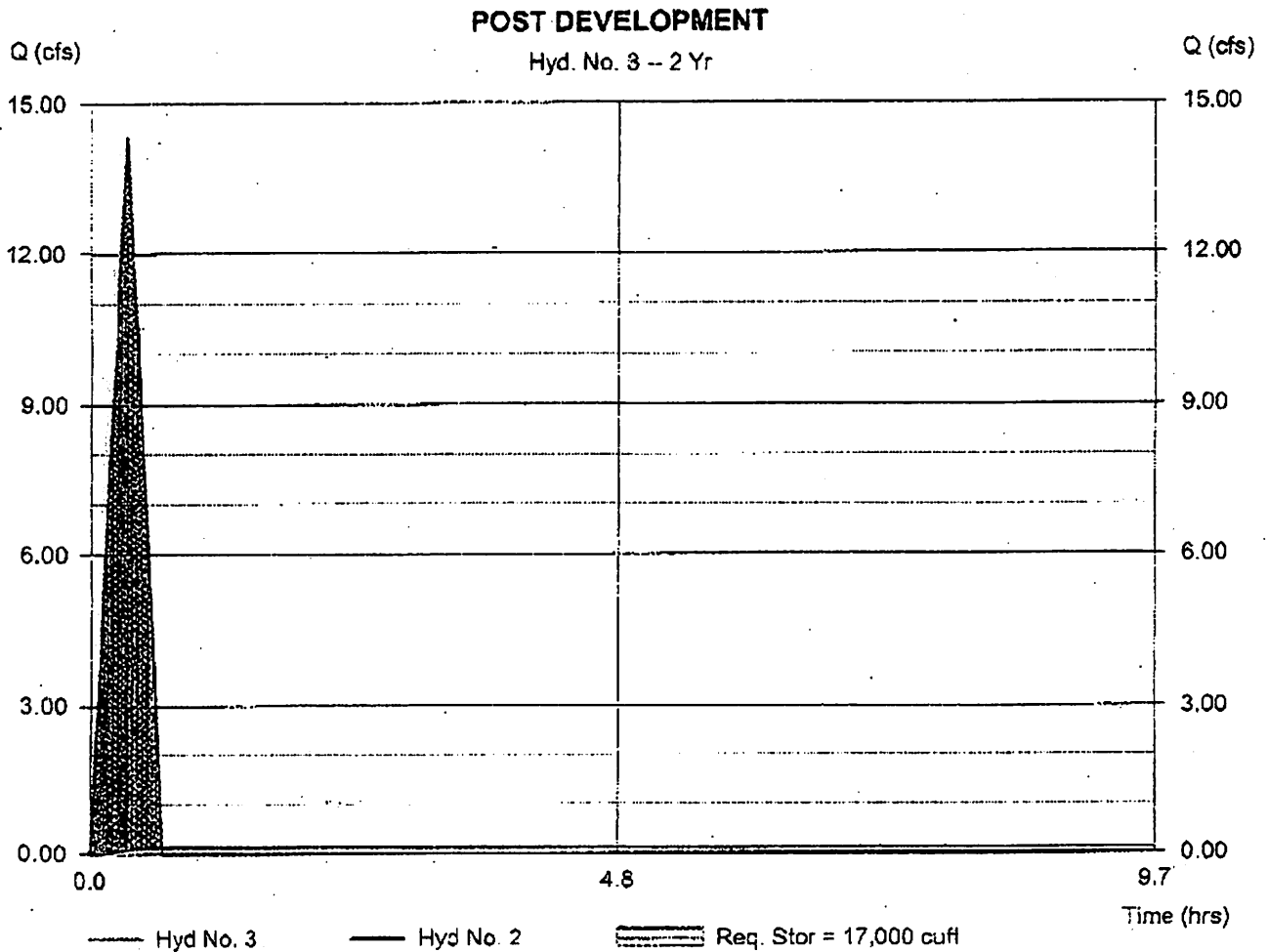
### POST DEVELOPMENT

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

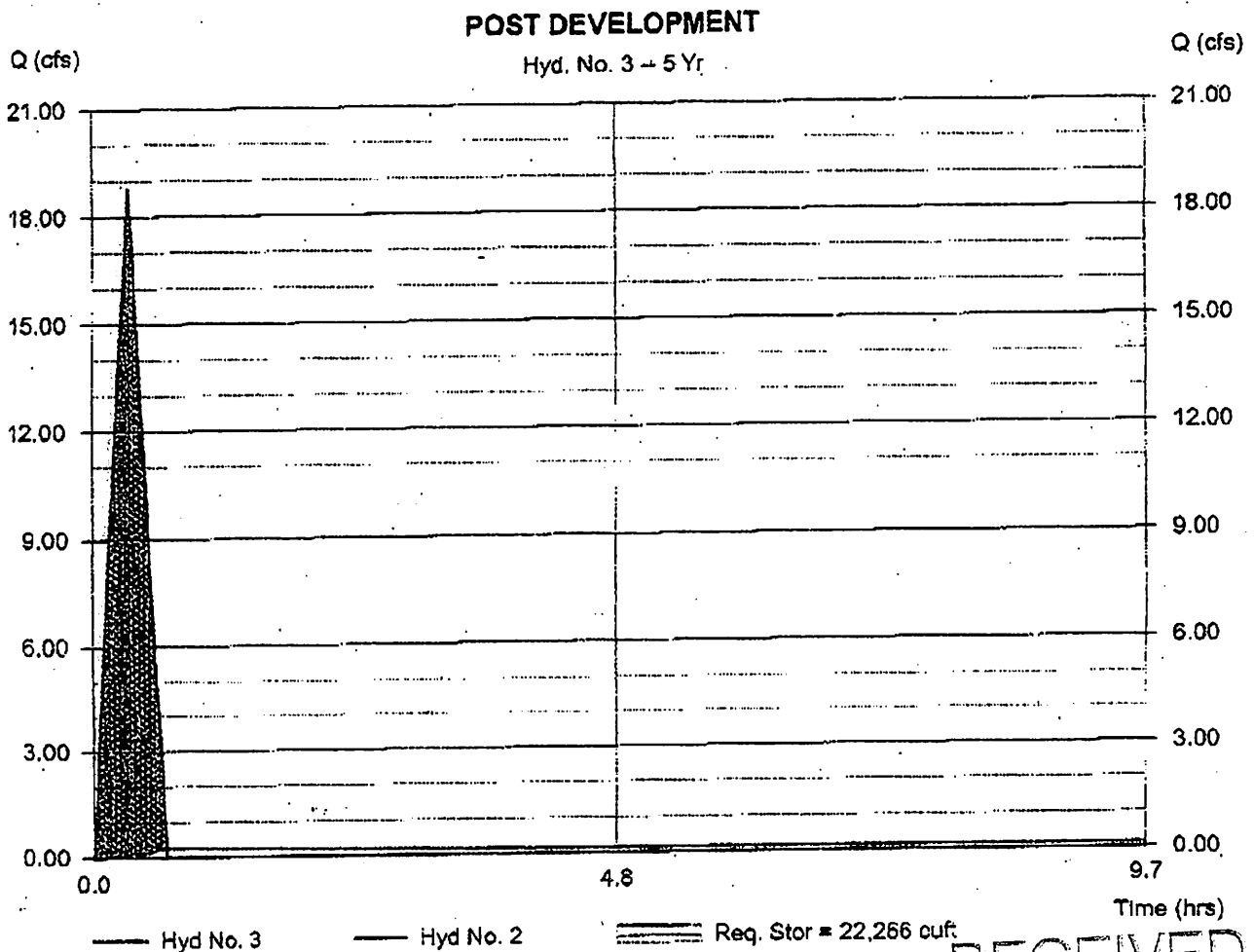
### POST DEVELOPMENT

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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# Hydrograph Plot

Flow Hydrographs by Intellisolve

Monday, Oct 29 2007, 2:50 PM

## Hyd. No. 3

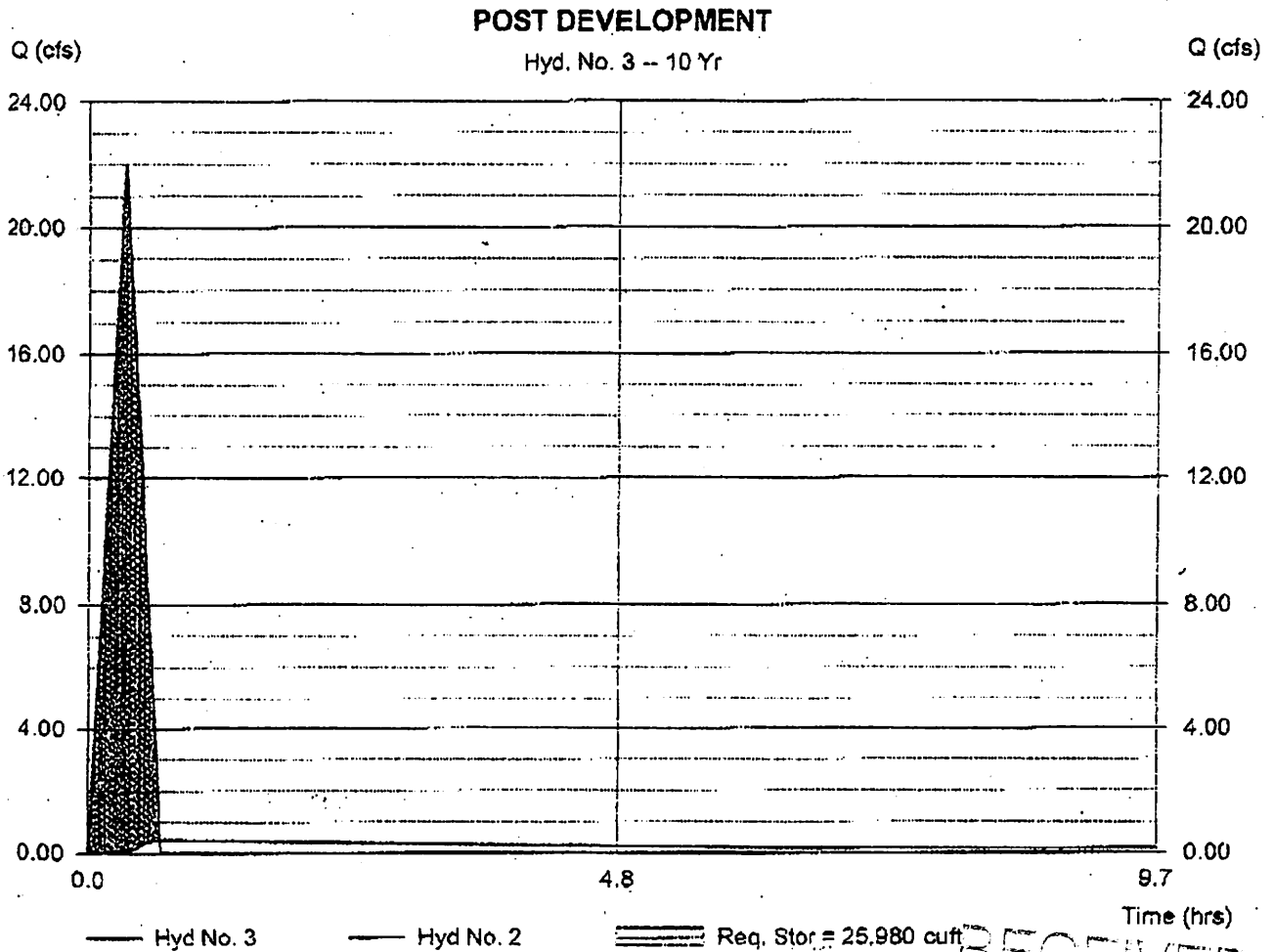
### POST DEVELOPMENT

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

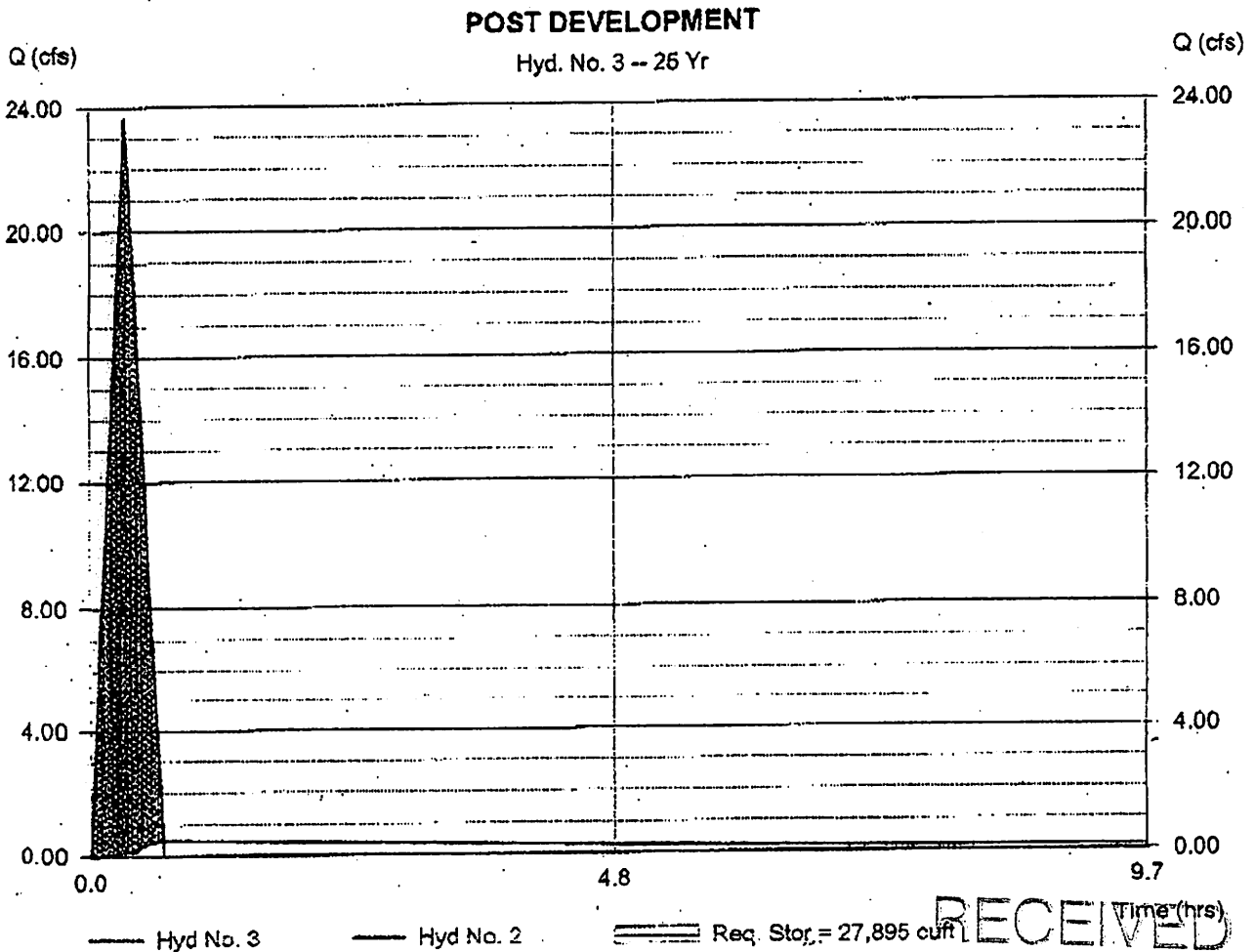
### POST DEVELOPMENT

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

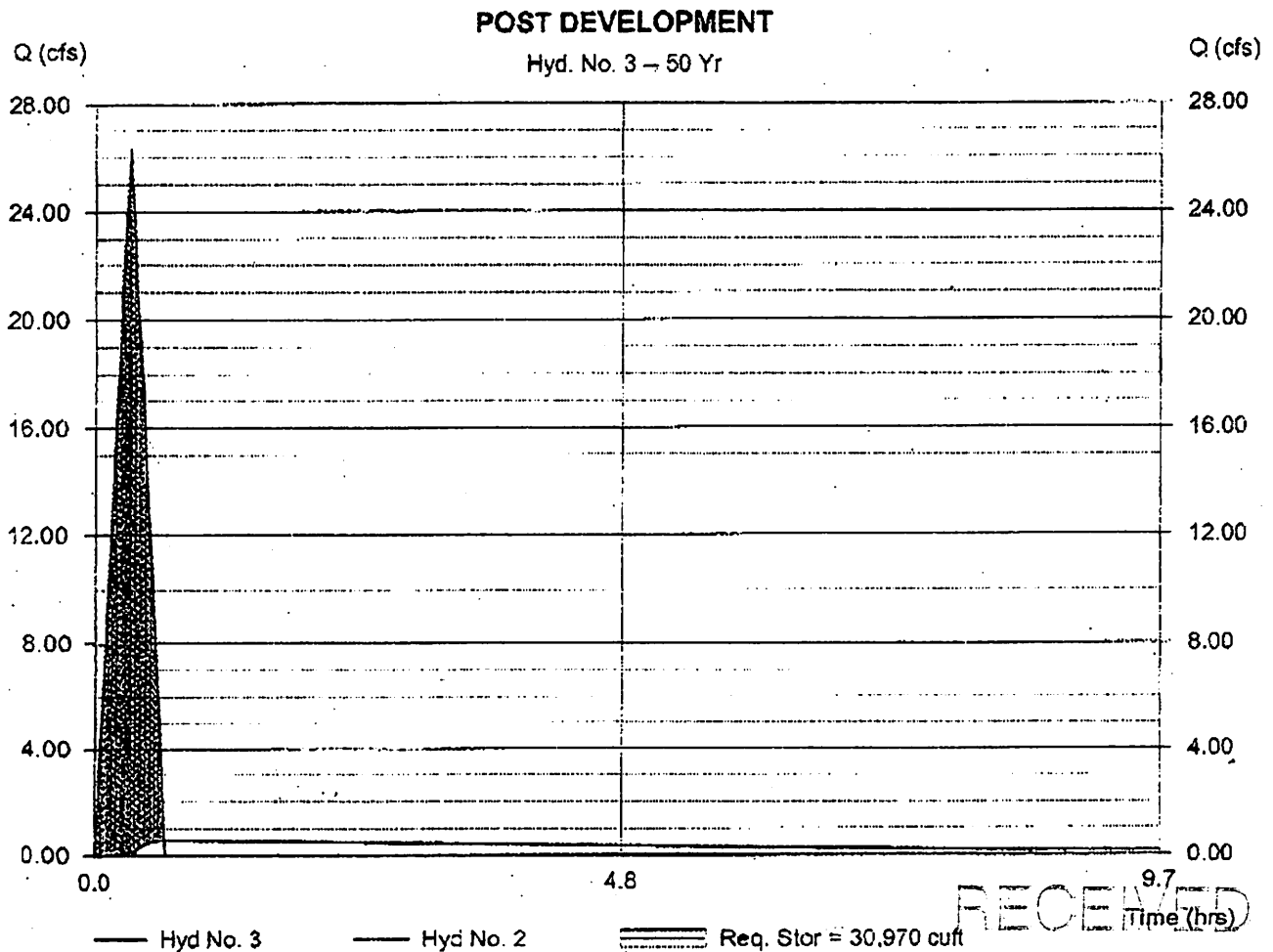
### POST DEVELOPMENT

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

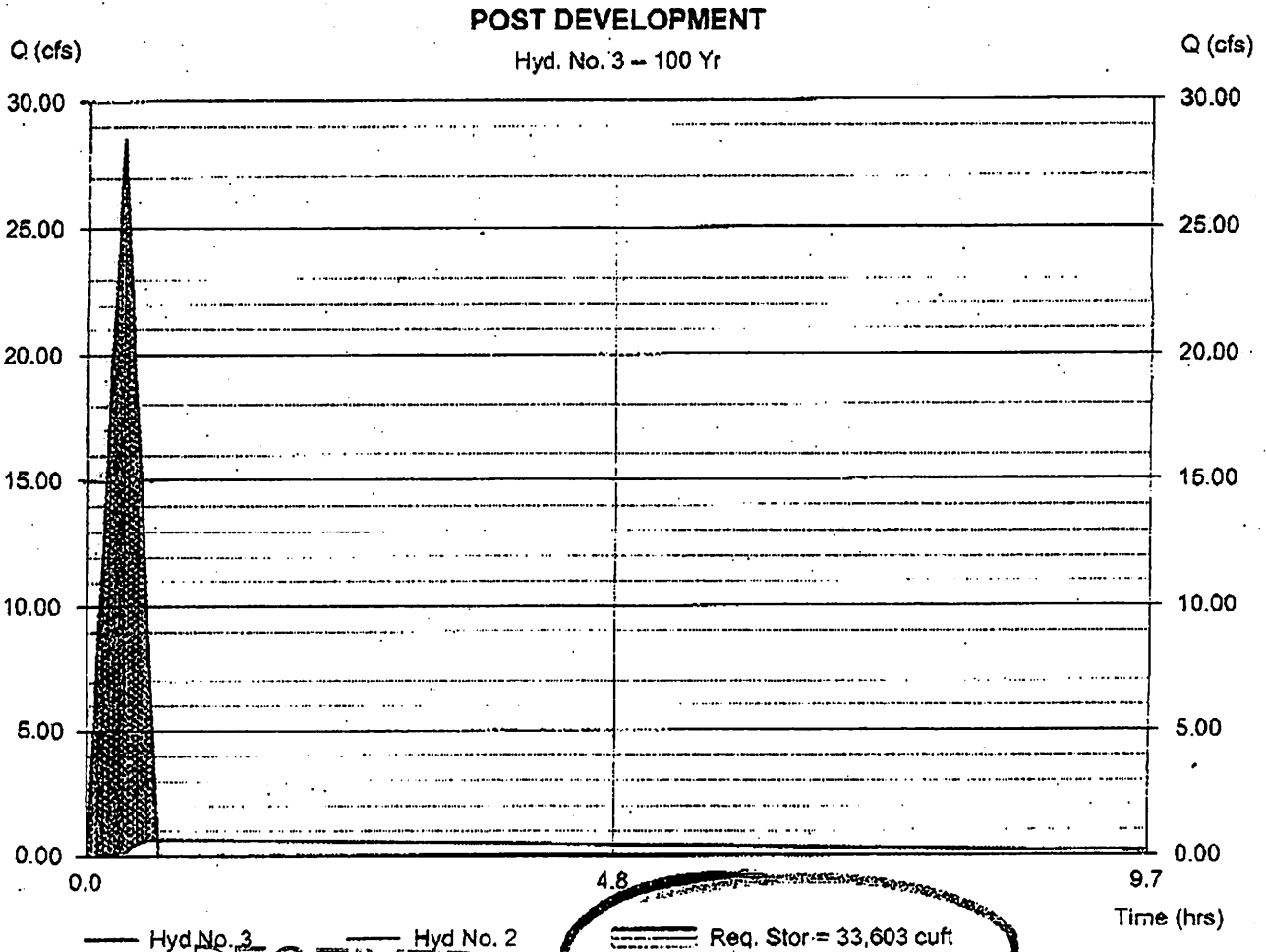
## POST DEVELOPMENT

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<sub>v</sub>)**

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

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<sub>v</sub> 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*