CE Group, inc.
LAND USE EVALUATION
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT

Memorandum

To: **Keith Megginson, Chatham County Planning Director**

Cc: **Holland Gaines, The Homestead**

From: Mark P. Ashness, CE Group

Date: December 30, 2003

Re: The Homestead, Additional Information

Keith: In response to your questions regarding additional stormwater treatment and access to adjoining parcels, I would like to offer the following information and clarification:

Stormwater Treatment

All permanent stormwater structures within the WS IV Critical Area will be designed to treat stormwater runoff from the 1 Year, 24 Hour Storm Event rather than just runoff from the first 1" of impervious area. There will likely be 10 –12 structures that will meet this higher standard. All of the other permanent water quality structures within the site will exceed the current County requirements. Depending upon watershed area, we will also consider the use of bio-retention, shallow wetland, and wet ponds where justified. All temporary erosion control structures throughout the project will be oversized to meet the "high quality water standard " as denoted by the NCDENR Land Quality Section.

Access to Adjacent Parcels

One adjacent property owner (Parcel # 17416) expressed concern about access to an abandoned trail that straddles the southwest property boundary. We are prepared to offset the planned 50' external property buffer by 25' from the current property boundary in order to accommodate potential access along this abandoned trail for the (3) parcels on this boundary edge. With regard to Parcels 78010 and 19361 on the western edge, our client is willing to provide an easement through the open meadows at the northern edge of the project in order to allow access from the rotary located on the eastern edge between The Preserve and The Homestead.

Per your request, I am also in the process of identifying additional buffering that we have reflected within our land plan associated with ephemeral streams that are currently not regulated by your ordinances. I will have this map available at the Planning Board Meeting.

Please contact me should you require additional information prior to the meeting.

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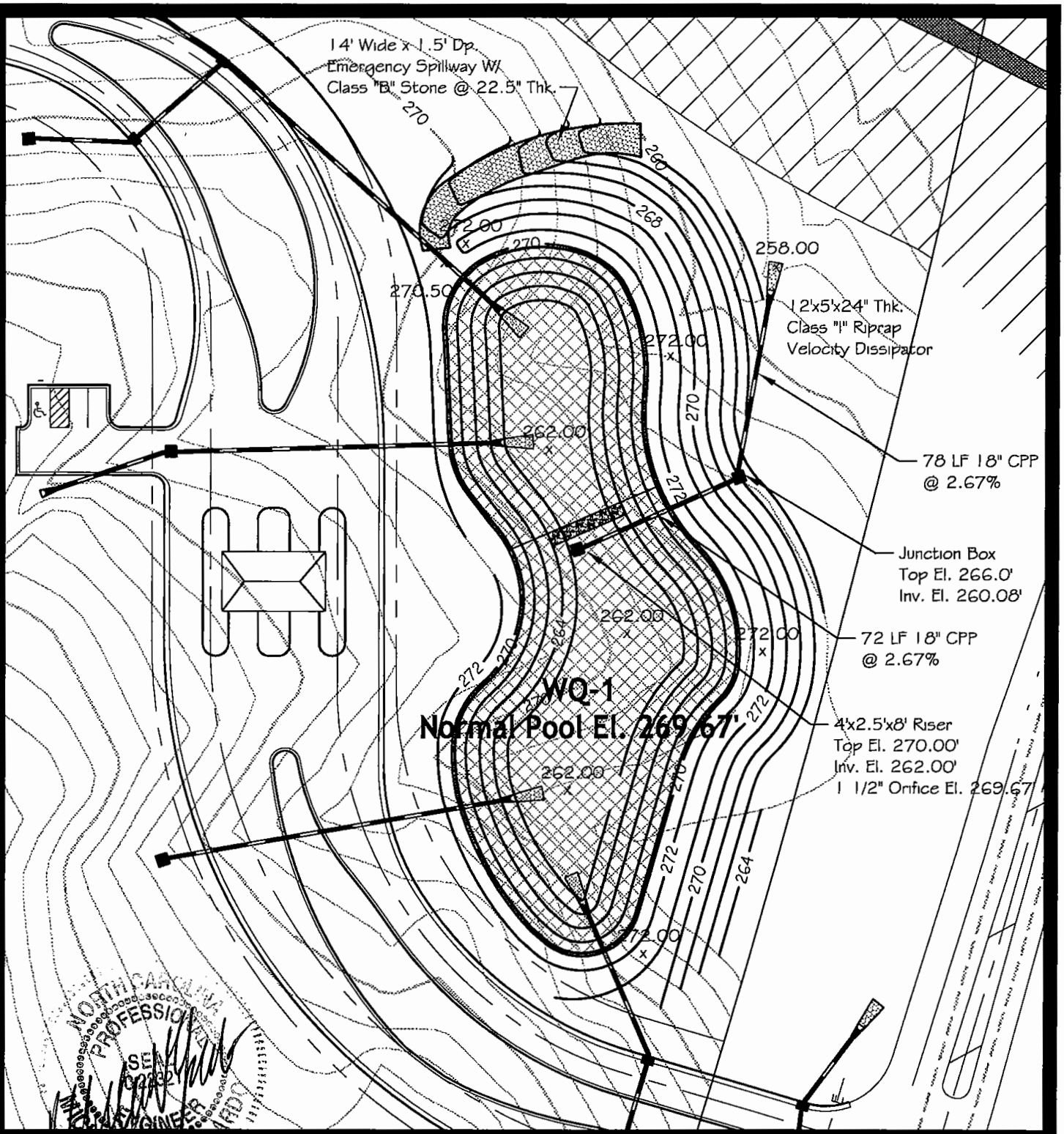
Voice (919) 367-8790 – Fax (919) 367- 8791 – Email mark@cegroupinc.com



NORTH CAROLINA
PROFESSIONAL
SEAL
ENGINEER
RAFAEL V. ZACCARDO

11/14/05

NORTH

60' 0 60' 120'

SCALE: 1"=60' (Horiz.)

Water Quality Pond Grading

The Homestead - Phase 1
Chatham County, North Carolina

WQ Pond #1 11/14/05 | 1/12

Water Quality Pond Calculations for The Homestead
Chatham County, NC

IMPERVIOUS CALCULATION FOR PERMANENT WATER QUALITY WET POND NO. 1

# Lots	S.F. / Lot	Total	
3	7000	21,000	
Buildings		1,124	s.f.
Roadways		82,639	s.f.
Sidewalks		3,940	s.f.
Total Impervious Area		108,703	s.f.
Total Area =		9.55	ac.
Impervious Area =		2.50	ac.
Impervious Percentage =		26.13%	

The storage volume for the 3" storm (Schueler Method) would be:

Rv = .05+.009 (I)

RV= 0.052

Volume = (Design Rainfall) * (RV)*(Drainage Area)

Volume = 0.124989824 ac.ft.

5,445 cf

5,445 c.f. storage required.

6,533 c.f. required including an additional 20% for sediment storage

8,168 c.f. storage provided.

Storage Provided

Elev.	Area (s.f.)	Incremental Volume (c.f.)	Total Volume (c.f.)	Depth (ft.)
269.67	24,383			
		8,168	**8,168**	
270	**25,119**			0.33

Drawdown calculation

Orifice required for 2-5 Day Drawdown

0.3 ft of storage, 0.2 ft of avg head

1.50 in. Orifice Size — Q2-day= 4,145

Q = 0.024 cfs — Q5-day= 10,364

So, this Orifice will drawdown pond in 3.15 days (This references final volume calc)

Storage depth= 0.33 ft — Intermim Calc. 3.2597546

Average head= 0.16 ft — Orifice Area = 0.0122656 Used for Q

Water Quality Pond Calculations for The Homestead
Chatham County, NC

Peak Flow Q10			
I =	7.22 in/hr.	I =	8.5 in/hr.
C =	0.4	C =	0.4
A =	9.55 Ac.	A =	9.55 Ac.
Q10 = CIA		Q25= CIA	
Q10 =	**27.6 CFS**	**Q25 =**	**32.5 CFS**

Principal Spillway Riser Elevation =	270	
Riser Invert Elevation =	262	
Barrel Invert =	258	
Barrel Length =	76 ft.	
Barrel Size =	18 "CPP	
Kp =	0.0155	
Barrel Area =	1.77 sf	
Q barrel =	18.17 cfs	Capable of Carrying

Block Riser

Length of Riser	4	ft inside dimension
Width of Riser	2.5	ft inside dimension
Width of Weir	13	ft

Q riser =	13.8 cfs	
H =	0.50 ft	H is Weir depth above riser.

EMERGENCY SPILLWAY

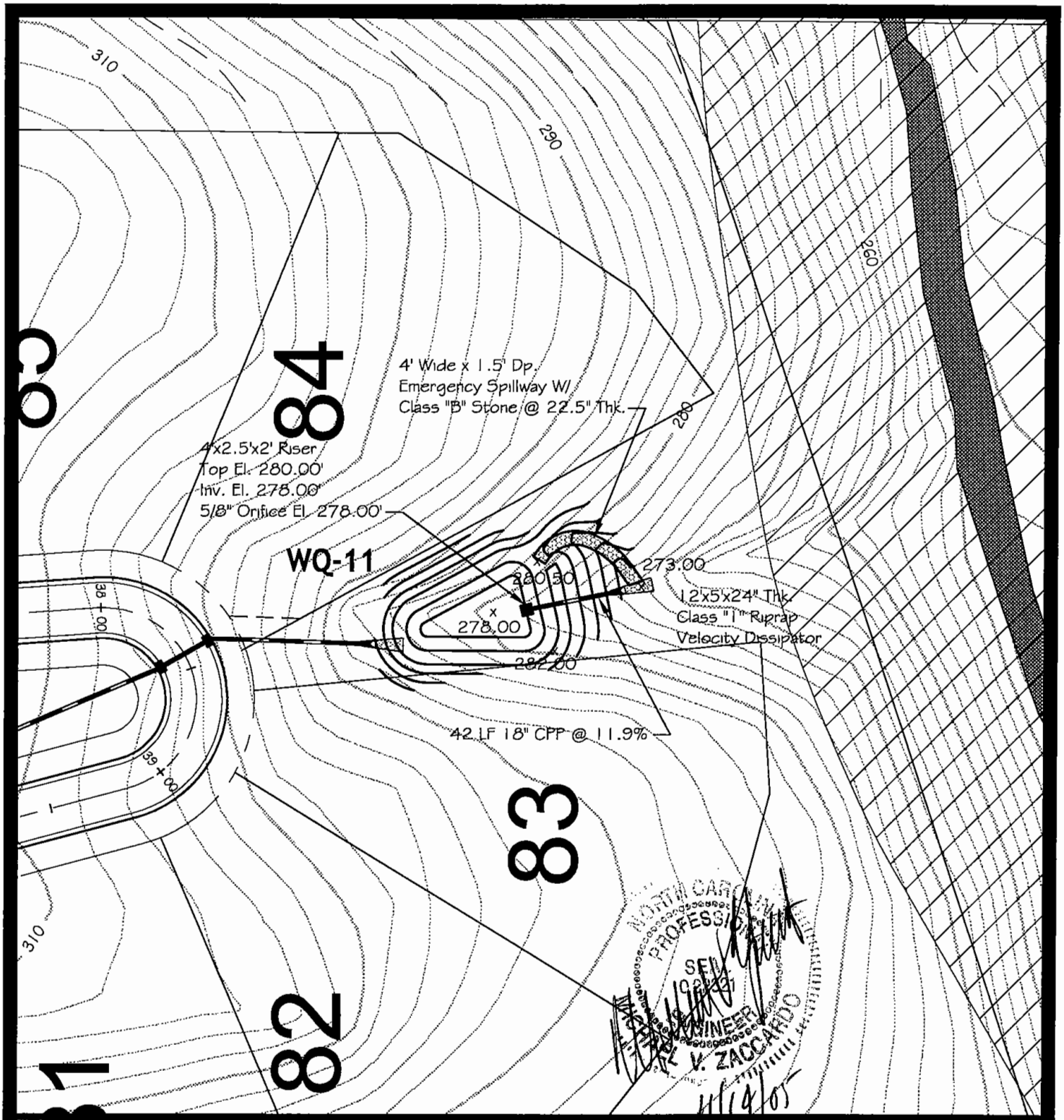
Spillway Elev. =	270.50	
Width =	14	
Depth =	0.5	
Qspillway =	14.8	cfs

CHECK

Qspillway + Qbarrel = Q25	**33.0 cfs**	
	pass	

FLOTATION OF RISER @ WQ POND NO. 1

ELEV. @ TOP OF RISER =	8.0
ELEV. @ BOT. =	0.0
H =	8.00 ft
4' x 2.5' I.D. RISER	5'x3.5' O.D.
AREA OF RISER =	17.5 s.f.
VOLUME OF RISER =	140.0 c.f.
DIAMETER OF BARREL =	1.8 ft
AREA OF BARREL =	2.5 s.f.
EXPOSED LENGTH =	3 ft
VOLUME OF BARREL =	7.6 c.f.
WEIGHT OF WATER DISPLACED =	9,212 lb
FACTOR OF SAFETY (10%)	10,134 lb
WEIGHT OF BOX -	11,390 lb
UPWARD FORCE TO OFF SET BOUYANCY	(1,256) lbs
REQUIRED VOLUME OF CONCRETE ANCHOR =	**-14.3 c.f.**
ANTI-FLOTATION PAD REQUIRED	
DEPTH =	0.00 ft
WIDTH =	0.00 ft
LENGTH =	0.00 ft
Total Volume Provided	**0.0 c.f.**



NORTH

60' 0 60' 120'

SCALE: 1"=60' (Horiz.)

Water Quality Pond Grading

The Homestead - Phase 1
Chatham County, North Carolina

WQ Pond #11 11/14/05 | **11/12**

Water Quality Pond Calculations for The Homestead
Chatham County, NC

IMPERVIOUS CALCULATION FOR PERMANENT WATER QUALITY DRY POND NO. 11

# Lots	S.F. / Lot	Total	
5	7000	35,000	
Buildings		-	s.f.
Roadways		21,330	s.f.
Sidewalks		0	s.f.
Total Impervious Area		56,330	s.f.

Total Area = 3.18 ac.
Impervious Area = 1.29 ac.

Impervious Percentage = 40.67%

The storage volume for the 3" storm (Schueler Method) would be:
Rv = .05+.009 (I)
RV= 0.054
Volume = (Design Rainfall) * (RV)*(Drainage Area)
Volume = 0.042659607 ac.ft.
1,858 cf

1,858 c.f. storage required.
2,230 c.f. required including an additional 20% for sediment storage
2,425 c.f. storage provided.

Storage Provided

Elev.	Area (s.f.)	Incremental Volume (c.f.)	Total Volume (c.f.)	Depth (ft.)
278	784			
		2,425	**2,425**	
280	**1,641**			2

Drawdown calculation
Orifice required for 2-5 Day Drawdown
2.0 ft of storage, 1.0 ft of avg head
0.63 in Orifice Size — Q2-day= 1,772
Q = 0.010 cfs — Q5-day= 4,429
So, this Orifice will drawdown pond in 2.52 days (This references final volume calc)

Storage depth= 2.00 ft
Average head= 1.00 ft

Intermim Calc.	8.0249611	
Orifice Area =	0.0021294	Used for Q

Water Quality Pond Calculations for The Homestead
Chatham County, NC

Peak Flow Q10			
I =	7.22 in/hr.	I =	8.5 in/hr.
C =	0.4	C =	0.4
A =	3.18 Ac.	A =	3.18 Ac.
Q10 = CIA		Q25= CIA	
Q10 =	**9.2 CFS**	**Q25 =**	**10.8 CFS**

Principal Spillway Riser Elevation =	280	
Riser Invert Elevation =	278	
Barrel Invert =	273	
Barrel Length =	42 ft.	
Barrel Size =	18 "CPP	
Kp =	0.0155	
Barrel Area =	1.77 sf	
Q barrel =	10.40 cfs	Capable of Carrying

Block Riser

Length of Riser	4 ft	inside dimension
Width of Riser	2.5 ft	inside dimension
Width of Weir	13 ft	
Q riser =	13.8 cfs	
H =	0.50 ft	H is Weir depth above riser.

EMERGENCY SPILLWAY

Spillway Elev. =	280.50	
Width =	4	
Depth =	0.5	
Qspillway =	4.2 cfs	

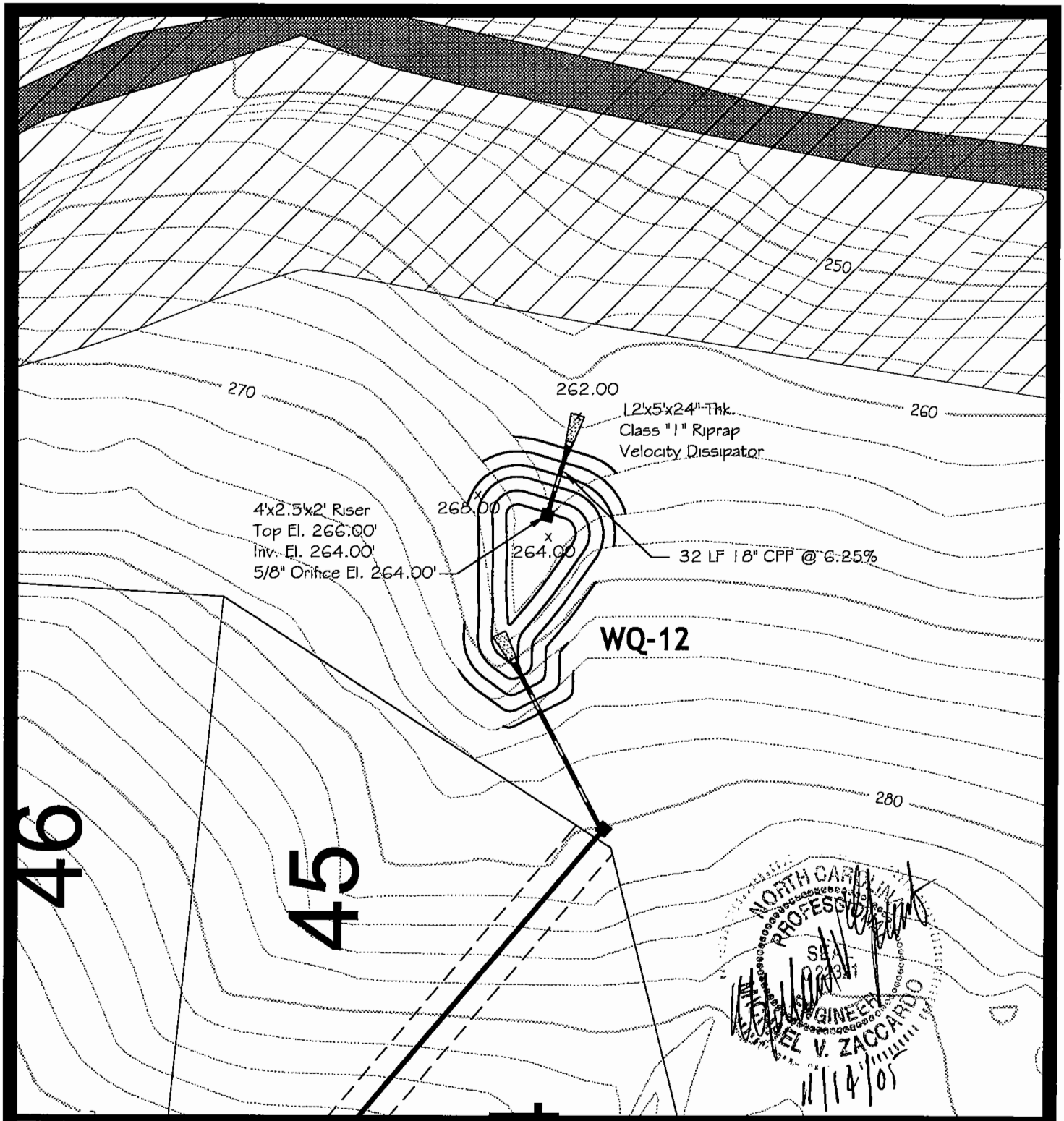
CHECK

Qspillway + Qbarrel = Q25 **14.6 cfs**

pass

FLOTATION OF RISER @ WQ POND NO. 11

ELEV. @ TOP OF RISER =	2.0
ELEV. @ BOT. =	0.0
H =	2.00 ft
4' x 2.5' I.D. RISER	5'x3.5' O.D.
AREA OF RISER =	17.5 s.f.
VOLUME OF RISER =	35.0 c.f.
DIAMETER OF BARREL =	1.8 ft
AREA OF BARREL =	2.5 s.f.
EXPOSED LENGTH =	3 ft
VOLUME OF BARREL =	7.6 c.f.
WEIGHT OF WATER DISPLACED =	2,660 lb
FACTOR OF SAFETY (10%)	2,926 lb
WEIGHT OF BOX -	3,705 lb
UPWARD FORCE TO OFF SET BOUYANCY	(779) lbs
REQUIRED VOLUME OF CONCRETE ANCHOR =	**-8.9 c.f.**
ANTI-FLOTATION PAD REQUIRED	
DEPTH =	0.00 ft
WIDTH =	0.00 ft
LENGTH =	0.00 ft
Total Volume Provided	**0.0 c.f.**



NORTH

60' 0 60' 120'

SCALE: 1"=60' (Horiz.)

Water Quality Pond Grading

The Homestead - Phase 1
Chatham County, North Carolina

WQ Pond #12 11/14/05 | **12/12**

Water Quality Pond Calculations for The Homestead
Chatham County, NC

IMPERVIOUS CALCULATION FOR PERMANENT
WATER QUALITY DRY POND NO. 12

# Lots	S.F. / Lot	Total	
4	7000	28,000	
Buildings		-	s.f.
Roadways		19,575	s.f.
Sidewalks		0	s.f.
Total Impervious Area		47,575	s.f.
Total Area =		2.9	ac.
Impervious Area =		1.09	ac.
Impervious Percentage =		37.66%	

The storage volume for the 3" storm (Schueler Method) would be:
Rv = .05+.009 (I)
RV= 0.053
Volume = (Design Rainfall) * (RV)*(Drainage Area)
Volume = 0.038707386 ac.ft.
1,686 cf

1,686 c.f. storage required.
2,023 c.f. required including an additional 20% for sediment storage
2,934 c.f. storage provided.

Storage Provided

Elev.	Area (s.f.)	Incremental Volume (c.f.)	Total Volume (c.f.)	Depth (ft.)
264	949			
		2,934	**2,934**	
266	**1,985**			2

Drawdown calculation
Orifice required for 2-5 Day Drawdown
2.0 ft of storage, 1.0 ft of avg head
0.63 in Orifice Size
Q = 0.010 cfs
So, this Orifice will drawdown pond in 2.28 days

Q2-day= 1,772
Q5-day= 4,429
(This references final volume calc)

Storage depth= 2.00 ft
Average head= 1.00 ft

Intermim Calc. 8.0249611
Orifice Area = 0.0021294 Used for Q

Water Quality Pond Calculations for The Homestead
Chatham County, NC

Peak Flow Q10			
I =	7.22 in/hr.	I =	8.5 in/hr.
C =	0.4	C =	0.4
A =	2.90 Ac.	A =	2.90 Ac.
Q10 = CIA		Q25= CIA	
Q10 =	**8.4 CFS**	**Q25 =**	**9.9 CFS**

Principal Spillway Riser Elevation =	266	
Riser Invert Elevation =	264	
Barrel Invert =	262	
Barrel Length =	32 ft.	
Barrel Size =	18 "CPP	
Kp =	0.0155	
Barrel Area =	1.77 sf	
Q barrel =	10.36 cfs	Capable of Carrying

Block Riser

Length of Riser	4	ft inside dimension
Width of Riser	2.5	ft inside dimension
Width of Weir	13	ft
Q riser =	9.9	cfs
H =	0.40	ft H is Weir depth above riser.

EMERGENCY SPILLWAY

Spillway Elev. =	0.00	
Width =	0	
Depth =	0	
Qspillway =	0.0	cfs

CHECK

Qspillway + Qbarrel = Q25 **10.4 cfs**

pass

FLOTATION OF RISER @ WQ POND NO. 12

ELEV. @ TOP OF RISER =	2.0
ELEV. @ BOT. =	0.0
H =	2.00 ft
4' x 2.5' I.D. RISER	5'x3.5' O.D.
AREA OF RISER =	17.5 s.f.
VOLUME OF RISER =	35.0 c.f.
DIAMETER OF BARREL =	1.8 ft
AREA OF BARREL =	2.5 s.f.
EXPOSED LENGTH =	3 ft
VOLUME OF BARREL =	7.6 c.f.
WEIGHT OF WATER DISPLACED =	2,660 lb
FACTOR OF SAFETY (10%)	2,926 lb
WEIGHT OF BOX -	3,705 lb
UPWARD FORCE TO OFF SET BOUYANCY	(779) lbs
REQUIRED VOLUME OF CONCRETE ANCHOR =	**-8.9 c.f.**
ANTI-FLOTATION PAD REQUIRED	
DEPTH =	0.00 ft
WIDTH =	0.00 ft
LENGTH =	0.00 ft
Total Volume Provided	**0.0 c.f.**