GBA	PROJECT	SHEET NO.	TOTAL SHEETS
GEORGE BUTLER ASSOCIATES, INC. Engineers / Architects / Landscape Architects / Planners	84 LUMBER DETENTION CALC's & STORM PROFILES	5	9
	PROJECT NO.: 87-5126	DATE: Nov. 87	
	REVISIONS:		

STATE OF MISSOURI JOHN LEINTZ BARRON NUMBER E-22572 REGISTERED PROFESSIONAL ENGINEER

DETENTION BASIN COMPUTATIONS

Stage vs. Storage

Elev.	sq. in.	sq. ft.	cu. ft.	storage vol. (cu. ft.)
496	7.05	11,280		19,348
			9,680	
495		8,080		9,668
			6,480	
494	3.05	4,880		3,188
			2,880	
493	0.55	880		308
			308	
492.18		0		0

Maximum Proposed Discharge from detention facility -

25 Year existing discharge from site -

3.75 Ac. @ 2.15 cfs/ac = 8.06 c.f.s.

25 Year offsite discharge routed thru site (future) -

0.80 Ac. @ 4.43 cfs/ac = 3.54 c.f.s.

25 Year developed onsite discharge that can't be intercepted by detention basin -

1.80 Ac. @ 3.61 cfs/ac = 6.50 c.f.s.

Maximum allowable discharge from detention basin -

Q = 8.06 + 3.54 - 6.50 = 5.10 c.f.s.

Maximum inflow to detention basin -

2.06 Ac. @ 3.61 cfs/ac = 7.44 c.f.s.

Maximum inflow (25 Year) Q = 7.44 + 3.54 = 10.98 c.f.s.

Required Detention Volume

(10.98 -5.10) x 1800 = 10,566 cu. ft.

Stage	Volume (cu. ft.)
496	19,348
X	10,566
495	9,668

$\frac{898}{9680}$ = .09'

25 Year W.S. Elev. = 495.09

Outfall pipe inlet ℄ = 492.30 h = HW - ℄ - d/2

Try 10" pipe $Q = CA\sqrt{2gh}$ h = 495.09 - 492.30 - .83/2 = 2.38'

$= 0.62\pi\frac{(10/12)^2}{4}\sqrt{2(32.2)(2.38)}$ = 4.19 c.f.s.

We are voluntarily storing an additional 0.91 c.f.s.

$Q_{max.}$ = 5.10 c.f.s.

$Q_{additional}$ = 5.10 - 4.19 = 0.91 c.f.s.

$V_{additional}$ = 0.91(1800)= 1,638 cu. ft.

V_{total} = 10566 + 1638 = 12,204 cu. ft.

Now find revised basin storage

$\frac{2536}{9680} = 0.26$

25 Year revised W.S. Elev. = 495.26

Recheck outflow from 10" pipe

h = 495.26 - 492.30 - 0.83/2 = 2.55'

$Q = .62\pi\frac{(10/12)^2}{4}\sqrt{2(32.2)(2.55)}$ = 4.33 c.f.s.

Now find 15 Year W.S. Elevation for the tailwater elevation for the the storm sewer design.

Q_{25} = 10.98 c.f.s.

$Q_{15} = \frac{10.98}{1.15}$ = 9.55 c.f.s.

Try 495.02

Available Head = 495.02 - 492.30 - .83/2 - 2.31'

$Q_{max.} = .62\pi\frac{(10/12)^2}{4}\sqrt{2(32.2)(2.31)}$ = 4.12 c.f.s.

V = 9668 + .02(19348-9668) = 9862 cu. ft.

$V_{req'd}$ = (9.55-4.12) = 9810 cu. ft.

9862 ≈ 9810

15 Year W.S. Elevation = 495.02

Now design 100 Year Emergency Spillway

Use a standard area inlet and set sill elevation at 25 Year W.S. elevation of 495.26

$Q_{100} = Q_{15}$ x 1.39 = 9.55 x 1.39 = 13.27 c.f.s.

Divide Q by since that is the number of openings.

$Q = \frac{13.27}{4}$ = 3.31 c.f.s.

Find area of a 5' x 6" inlet opening

A = 5(.5) = 2.50 ft.²

$Q = CA\sqrt{2gh}$

$3.31 = .62\ (2.50)\sqrt{2(32.2)\ h}$

h = .07'

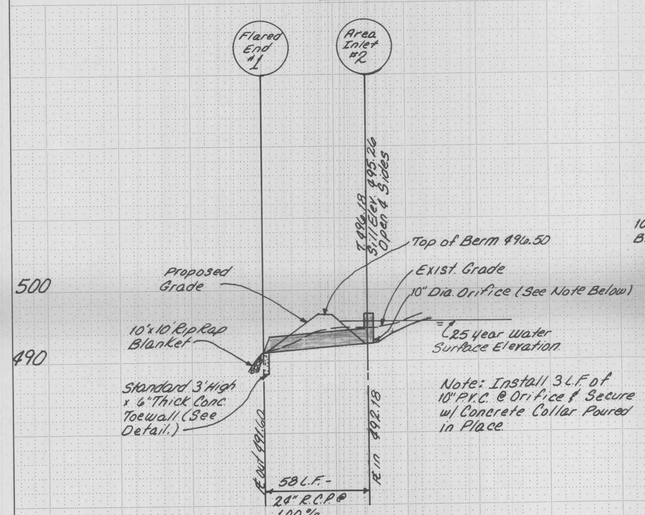
h = HW - ℄ - d/2

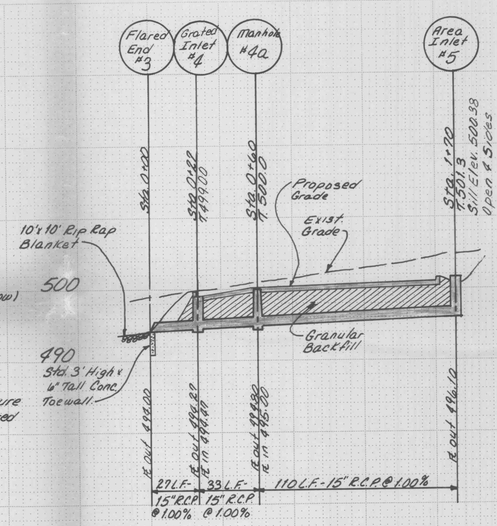
.07 = HW-495.26-.5/2

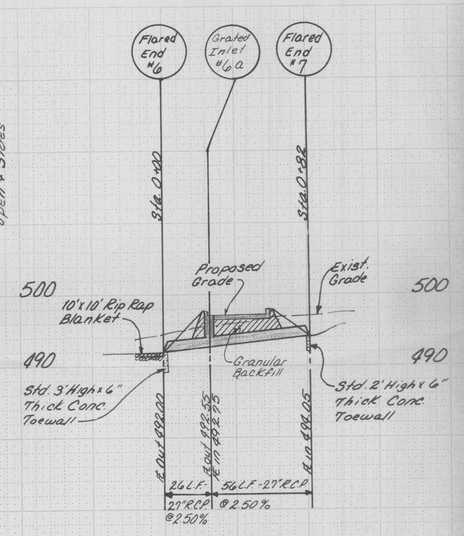
HW = 495.58

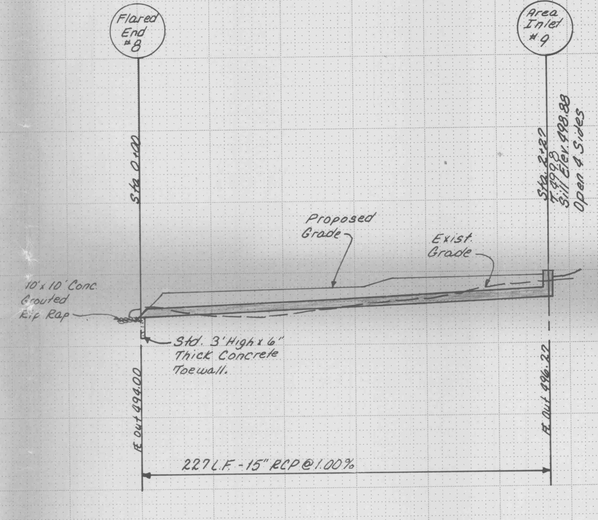
So a 4 way inlet will backup water in the detention basin to Elevation 495.58, we will make top of berm 496.50 to be conservative.

100 Year W.S. Elevation = 495.58









Scale: 1" = 10' Vert.
1" = 40' Horiz.

Detention Basin Water Surface Elevations

100 Year	495.58
25 Year	495.26
15 Year	495.02