DRAINAGE ANALYSIS
OCEAN PINES SUBDIVISION
BOURNE, MA

Prepared for:
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12/2/98

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Introduction:

The following design report is an analysis of the stormwater drainage system for the existing Ocean Pines Subdivision development located off Route 3A, Sagamore, Massachusetts.

The project consists of 5.8 acres of tributary land discharging into an open space/drainage easement area.

Method of Calculation:

In analyzing the storm runoff rate for the proposed drainage system, the "Rational Method" was utilized to determine peak runoff rates. The Rational Method is an analysis procedure based on the equation Q=CiA. In this equation, the product, Q is equal to the expected peak rate of flow measured in cubic feet per seconds (cfs). The variable "C" is a hydrologic runoff coefficient, ranging from 0.1 to 0.9, depending on the land cover type, soil type and land use. The variable "I" is the rainfall intensity for the specific area in inches per hour. The rainfall intensity for a specific area is dependent on the time of concentration for the drainage basin being analyzed. The variable "A" is the total drainage basin's area. This area is equal to the total amount of land hydraulically tributary to a specific design point.

The proposed drainage basin has been designed for a ten-year frequency storm in accordance with the Town of Bourne Subdivision Rules and Regulations.

Existing Conditions:

The drainage tributary area consists of a portion of the existing roadway (Route 3A), the existing Ocean Pines Drive, the portion of Ocean Pines Drive now under construction, a portion of a future roadway to be called Wildwood Lane, open space areas, multiple dwelling units and single family house lots completed and under construction.

An isolated vegetated wetland area has been flagged at the location of the existing outfall. Within this isolated wetland is an area of standing water which supports aquatic plant life. In reviewing the original drainage design, it was found that the existing drainage area is not constructed in conformance with the approved plans. This area has been cleared and is sparsely vegetated.

Proposed Conditions:

It is proposed to design a new outfall and retention basin system in the area of the existing isolated wetland area within the open space.

In order to mitigate potential impacts to the existing wetland area, a drainage system has been designed to "filter" runoff prior to entering the wetland area with standing water and the lower retention/infiltration basin area. Primary treatment will be

handled in the sediment forebay/shallow marsh system. This area shall be 6" to 8" deep below the outlets vegetated with cattails and underline by existing silt loam soil which will retain standing water. This area shall have two (2) outlets: 1) a grass "bio filter" swale to the eastern portion of the isolated area; and (2) a riprap channel outlet to the lower retention/infiltration basin.

This system has been designed to meet the performance standards of the Stormwater Management Act as close as possible. Although, it is our opinion that these standards do not apply to this project.

Conclusion:

It is our opinion that the drainage system has been designed to mitigate potential impacts to the existing wetland area and proposed retention/infiltration basin. The calculations that were performed are conservative due to the fact that no credit was utilized for storage volume in the sediment forebay basin. Furthermore, the basin is designed with 1.2' of freeboard in the event that the leaching pits become clogged or a storm greater than the design storm is encountered.

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JOB OCEAN PINES DRIVE
SHEET NO. 1 OF 3
CALCULATED BY DFB DATE 12/2/98
CHECKED BY DATE
SCALE

DRAINAGE TRIBUTARY AREAS

D.A. #1

C=.90	(LAWNS) C=.20	(WOODS) C=.10	(LOTS) C=.40	TOTAL
1.69	0.75	0.55	0.80	3.79

$$\text{WT "C"} = \frac{(.9)(1.69)+(.75)(.20)+(.10)(.55)+(.4)(.8)}{3.79} = 0.54$$

D.A. #2

C=.90	C=.20	C=.10	C=.40	TOTAL
0.21	0.81	0.61	0.41	2.04

$$\text{WT "C"} = \frac{(.9)(.21)+(.2)(.81)+(.10)(.61)+(.4)(.41)}{2.04} = 0.28$$

COMBINED AREAS FOR RETENTION BASIN:

5.83 ACRES C = 0.45

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SHEET NO. 2 OF 3
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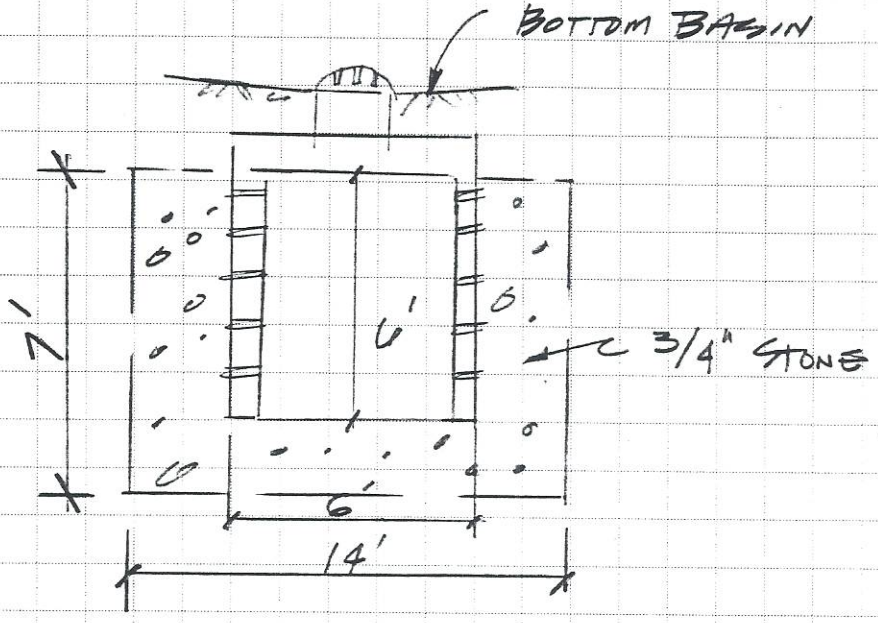
OUTFLOW CALCULATIONS



LEACHING PIT
CROSS-SECTION

AREA:
BOT: $\pi(7)^2 = 153.94$
SIDES: $\pi(14)(7) = 307.88$

TOTAL/PIT = 462 S.F.

VOLUME:
PIT: $\pi(3)^2(6) = 170$ C.F.
STONE: $\pi(7)^2(7) - \pi(3)^2(6)$
$= 908(.45) = 409$
TOTAL = 579 C.F./PIT

USE 2 PITS
AREA = (2)(462) = 924 S.F.
VOLUME = (2)(579) = 1158 S.F.

OUTFLOW CALCULATION:

PERCOLATION RATE = 2 MIN/INCH (USE 8 MIN/INCH)

$$Q_{OUT} = \frac{924 \text{ S.F.}}{(8 \text{ MIN/INCH})(60 \text{ SEC/MIN})(12 \text{ INCH}/=)} = 0.16 \text{ C.F.S.}$$

CATCHMENT AREA DESIGN SHEET

JOB NO. _____

PROJECT NAME OCEAN PINES

SHEET 3 OF 3 SHEETS

STREET OCEAN PINES DRIVE TOWN BOURNE

AREA NO. 1

12/2/98

I 10 year storm = (170)/((23) + t)

CA = (0.45)(5.83) = 2.62

Q out to elev 58 = (5000) SF / (40 min/in)(60 sec/min)(12 in/ft) = 0.17 CFS

Q OUT PITS = 0.16 CFS ; TOTAL = 0.33

CATCHMENT AREA VOLUME

ELEV	AREA	AVG AREA	LIFT	VOLUME	CUM. VOL.
58	5000				1158
60	6800	5900	2'	11,300	12,958
62	8500	7650	2'	15,300	28,258

REQUIRED VOLUME

CA	I	Q in	Q out	Q total	TIME	VOLUME
2.62	5.15	13.50	0.33	13.17	10	7902
2.62	3.21	8.40		8.07	30	14,526
2.62	2.05	5.37		5.04	60	18,144
2.62	1.19	3.11		2.78	120	20,016 ←
2.62	0.65	1.69		1.36	240	19,584
2.62	0.45	1.16	↓		360	
					540	
					720	
					960	
					1200	

VOLUME VERIFICATION

REQUIRED VOLUME = 20,016

- VOL. @ ELEV 60 = 12,958

PARTIAL VOL. PER LIFT 60-62 = 7058

MAXIMUM WATER ELEVATION = 60.9

CATCHMENT AREA GRADES

TOP ELEVATION = 62.1

BOTTOM ELEVATION = 58.0

PLYMOUTH DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
PLATE 7