

DRAINAGE STUDY

PRELIMINARY ENGINEERING ASSESSMENT HIDDEN LAKE ASSOCIATION HADDAM, CONNECTICUT

Prepared for:

Hidden Lake Association
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HRP #HID001.PC

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INTRODUCTION

In accordance with the scope of services outlined by our proposal dated April 3, 2002, a preliminary engineering evaluation was conducted at Hidden Lake. This study was conducted to determine the source of drainage and erosion problems that are affecting certain residences in the immediate vicinity of Hidden Lake, to develop some recommendations for improving the conditions, and to prepare preliminary cost estimates in connection with those suggested improvements.

THE WATERSHED

According to the UCONN Map and Geographic Information Center, Hidden Lake is the receptor of stormwater runoff from a 1.183 square mile watershed area. The watershed area defines an area delineated according to topographic features such as roadways and elevated land that affects the path of rainfall. This particular area is shown on the attached Figure 1. In order to avoid redundancy, reference is made to the 1995 Ecological Study prepared by Priscilla W. Baillie, which provides a detailed description of the flow patterns of the lake.

FIELD VISIT

On May 14, 2002, HRP personnel met on-site with Camile Bair, who was at that time the Vice President of the Lake Association. We observed field conditions in the area surrounding the lake, and discussed with Ms. Bair those specific areas that have experienced flooding.

Since the field visit took place one day after a rainfall storm event, specific problem areas were still wet, flooded, or clogged. We observed areas with failure of existing in-place drainage controls, ponding or trapped stormwater along the roadways, eroded soils and defined channels releasing into the lake. During this field visit, attention was given to those areas that showed the worst of these conditions.

Our field visit included an observation of the masonry dam at the southwestern end of the lake and roadway improvements that were under construction along Hidden Lake Road. We understand that further roadway improvements by the Town are planned along Hidden Lake Road in the vicinity of South Cove, therefore our study will not address the roadway flooding at this location.

CONDITIONS OBSERVED

For discussion purposes, we have divided the Hidden Lake Association roadway system into four areas. These areas are depicted on the attached Figure 2. A discussion of the existing conditions observed, or as described to us, is presented as follows:

Area 1

This area includes the eastern shoreline of the lake, and properties on and accessed by East Shore Drive. We noted several forms of drainage control in place, however they

are not all hydraulically connected. Most of these individual systems do not provide any benefit to directing stormwater directly to the lake, or provide any form of sediment protection or removal. Therefore, the pipes were often clogged by obstructions such as silt and leaves, or collapsed. We observed various types of piping installed at spot locations, including concrete pipe, corrugated plastic, metal, and PVC. Recent roadway improvements hinder sheet flow, thereby trapping stormwater in some specific locations along East Shore Drive. Several drainage swales along this section were eroded and the bottom and sides were unprotected.

Area 2

This area includes the southwestern shoreline along Shore Drive and areas west of the masonry dam. Several drainage structures were noted during the field visit. They appear to be operational and functioning as a hydraulically connected system. In the vicinity where the pipes discharge to the lake, we observed open drainage channels which were well defined, but not protected from erosion.

Area 3

This area includes the northwest shoreline along West Shore Drive from Hidden Lake Road to the beach. It was noted that this area is generally much higher in elevation than the lake. This change in elevation allows stormwater to drain away from individual property owners. Once again, we observed that the drainage swales into the lake were unprotected and showed signs of erosion. The general sizes of the swales indicate that an abundant volume of water discharges during a storm event.

Area 4

This area includes the northerly shoreline and properties situated to the east of West Shore Drive. Portions of this area also are generally higher in elevation than the lake. At the end of West Shore Extension, at a substantially lower elevated area, there is evidence of an inadequate drainage system. The prior storm event created or contributed to an eroded path from a natural swale. Evidence of debris collected on the roadway indicates that the cross culvert at the end of this roadway is probably under capacity or clogged, and that storm-water flows over the roadway to get to the lower elevations. There appears to be a drainage system in place at the intersection of West Shore Drive and West Shore Extension, however, silt and leaves have clogged the system making it inoperable.

RECOMMENDATIONS

General

Many of the drainage problems observed around the lake result from the lack of engineered collection systems, and clogging of pipes and trenches from the migration of silt. In general, we recommend that the lake association develop and implement a regular maintenance program that includes the periodic cleaning of pipe inlets and catch basins. Historically silt migration has been a significant concern at Hidden Lake, and therefore erosion control will be an important factor for controlling runoff.

In our opinion, Areas 1 and 4 have the most immediate need for improvements. Attached are example details of suggested structural devices, which could be used to impede erosion and decrease the amount of silt flowing into the lake. However, it is important that structures, piping, and erosion control measures be designed as a system, and sized to accommodate the calculated flows. Some surveying will also be required to define site grades and pitch drainage systems appropriately. We recommend that any future drainage systems which are constructed in the vicinity of the lake should be designed by a licensed civil engineer.

Area 1

In Area 1 problems are occurring from individual pipe systems that may be clogged or of inadequate size. Also, discharge to the lake is occurring at several different drainage swales, which promotes silt migration at multiple locations. HRP recommends that an engineered system be designed to replace the existing system of non-connected pipes. The new system could be situated along East Shore Drive, and route storm-water to one or more catch basins and discharge points. Discharge locations could be lined with riprap to prevent scour. In order to decrease the discharge of sediments, catch basins with three-foot sumps and/or a sedimentation chamber could be designed. Also, installation of a subsurface drain with a protected perforated pipe is suggested to eliminate the ponding along the roadway.

Area 2

At this location there is an existing drainage system, and flooding only at certain isolated locations. HRP recommends that this drainage system be cleaned to remove any sediments and leaves and to improve all discharge locations by placing properly sized riprap to prevent erosion. Although it is not an urgent area for improvement, future plans should include replacing the drainage structures with three-foot sump catch basins and/or use of a sedimentation chamber prior to discharge into the lake.

Area 3

In Area 3 we did not observe any specific flooding, but did note the condition of drainage swales. HRP recommends that an engineering review of the drainage swales be performed in the future. This would include a calculation of the runoff volume so that a properly designed riprap scour hole or stilling basin could be constructed, to slow down the velocity of the runoff and decrease erosion.

Area 4

Many of the problems we observed in this area relate to the cleaning and management of the existing drainage system. Several pipes were observed with partial or complete clogging by silt or vegetation. Therefore, we recommend that a condition survey be performed and the pipes first cleaned out. Release points of any culverts should be protected with properly sized riprap to prevent scour. The cross culvert at the end of West Shore Extension should be analyzed and sized correctly to prevent overtopping and erosion of the shoreline. Drainage calculations should be performed and the existing system augmented where necessary with additional piping.

COST OF IMPROVEMENTS

A table is included at the end of this report to present the costs associated with improvements in Areas 1 and 4. Please note that these are preliminary, and could be refined during the design of any such improvements.

Costs shown are estimates for surveying and engineering design only, and do not generally include any evening meetings with the Town.

As a general cost item, we suggest that a routine plan for pipe/basin maintenance and cleaning should be developed. Cleaning of silt and debris from storm pipes using vacuum equipment can be performed generally for less than \$1,000 per day, and this includes a significant length of pipe.

REGULATORY CONSIDERATIONS

In discussion with the Connecticut Department of Environmental Protection (CTDEP), spot improvements around the lake would not require any regulatory approvals. However, the local Inland Wetlands agency may require review and approval of any designs proposed.

As a possible funding opportunity, the Hidden Lake Association should investigate a program set up by the CTDEP Bureau of Water Management – Programs and Activities. The Planning and Standards division offers a Clean Lakes Program that

- Monitors and assesses the trophic condition of recreational lakes
- Develops handbooks and other guidance for local management of lakes and their watersheds
- Administers federal and state funds for studies and remedial actions at eligible projects.
- Provides assistance to local lake authorities

Financial assistance through this program is limited and mostly directed towards public areas. However, in a recent conversation with Mr. Charles Lee of the CTDEP Lakes Management section, he requested your permission to forward a copy of this report for his file should any funding become available for your association. If the association wishes to explore this possibility, submit a copy of this report to:

Planning and Standards
Department of Environmental Protection
Bureau of Water Management
79 Elm Street
Hartford, Connecticut 06106-5127
Attn: Charles Lee

For future reference, his direct telephone number is 860-424-4067.

SUMMARY

In summary, most of the localized flooding and erosion problems around Hidden Lake are due to inadequately sized or clogged pipe collection systems, and from the lack of collection systems in certain areas. Some suggested improvements include:

- A regular program of cleaning the existing collection systems
- Replacing certain individual pipes with hydraulically connected systems, including reducing the number of discharge points to the lake
- Better control of silt migration, including catch basins with sumps, sedimentation chambers, using collection pipes with geotextile fabric protection, and erosion control measures around outlet structures
- Engineering design where necessary, to size system components for adequate capacity.

HRP would be pleased to provide any further assistance for the Lake association in connection with these suggested improvements, including design assistance.

06/18/2002

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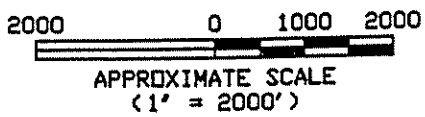
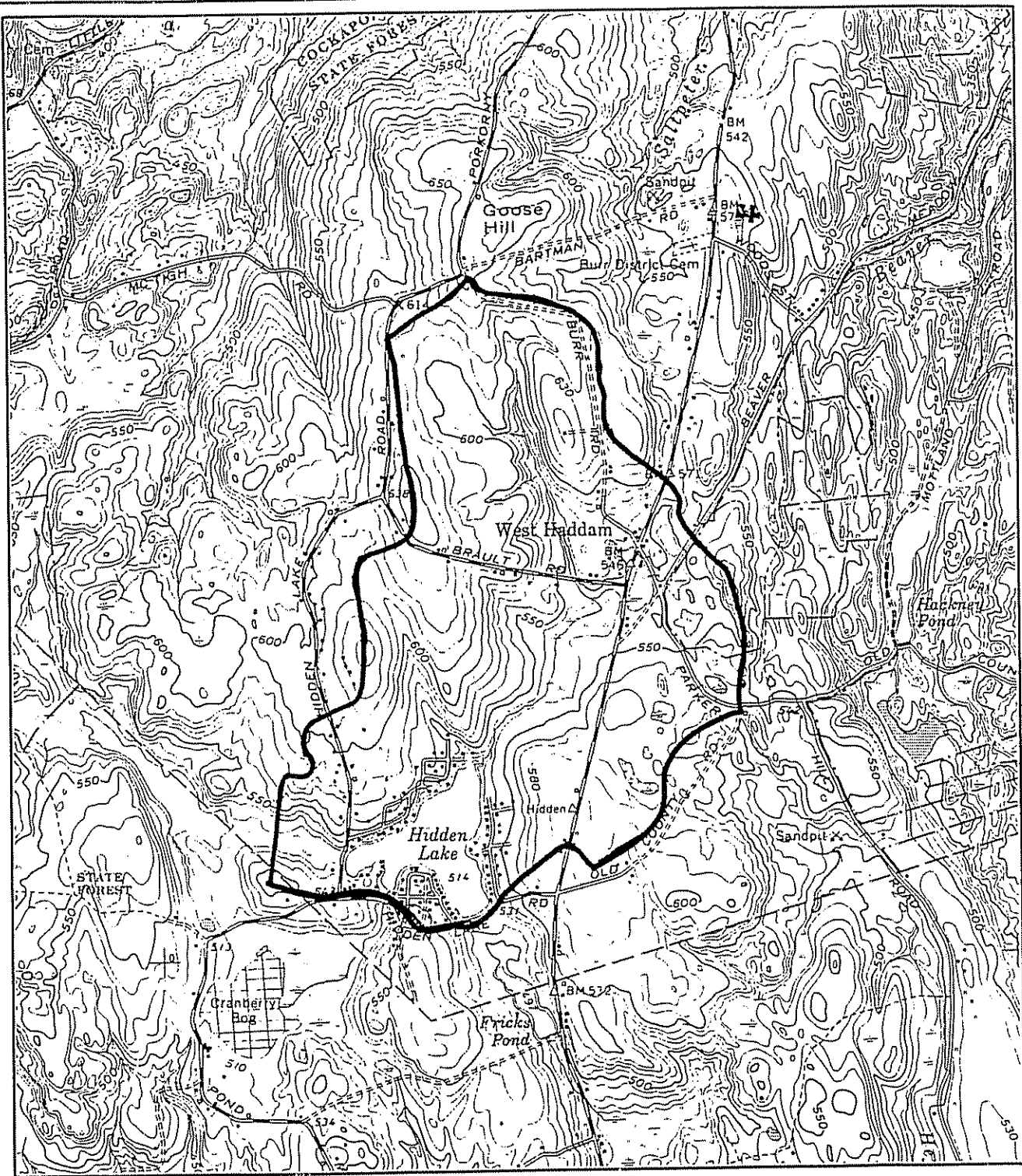
Hidden Lake Association
Haddam, Connecticut

ESTIMATED COSTS FOR DRAINAGE IMPROVEMENTS**AREA 1**

Item #	Item	Pay Unit	Quantity	Unit Price	Subtotal
1	Catch Basin	Ea.	2	\$ 2,500.00	\$ 5,000.00
2	Sedimentation Chamber	Ea.	1	\$ 3,500.00	\$ 3,500.00
3	Drainage Pipe	L F	600	\$ 35.00	\$ 21,000.00
4	Subsurface Drains with Conduit	L F	500	\$ 30.00	\$ 15,000.00
5	Outlet Protection	C Y	7	\$ 55.00	\$ 385.00
6	Surveying/Engineering Services	L S	1		\$ 6,500.00
Project Total					\$ 51,385.00

AREA 4

Item #	Item	Pay Unit	Quantity	Unit Price	Subtotal
1	Catch Basin	Ea.	2	\$ 2,500.00	\$ 5,000.00
2	Sedimentation Chamber	Ea.	1	\$ 3,500.00	\$ 3,500.00
3	Drainage Pipe	L.F.	600	\$ 35.00	\$ 21,000.00
4	Outlet Protection	C Y	7	\$ 55.00	\$ 385.00
5	Clean Existing Drainage System	DAY	1	\$ 900.00	\$ 900.00
6	Surveying/Engineering Services	L S.	1		\$ 4,500.00
Project Total					\$ 35,285.00

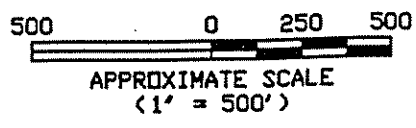
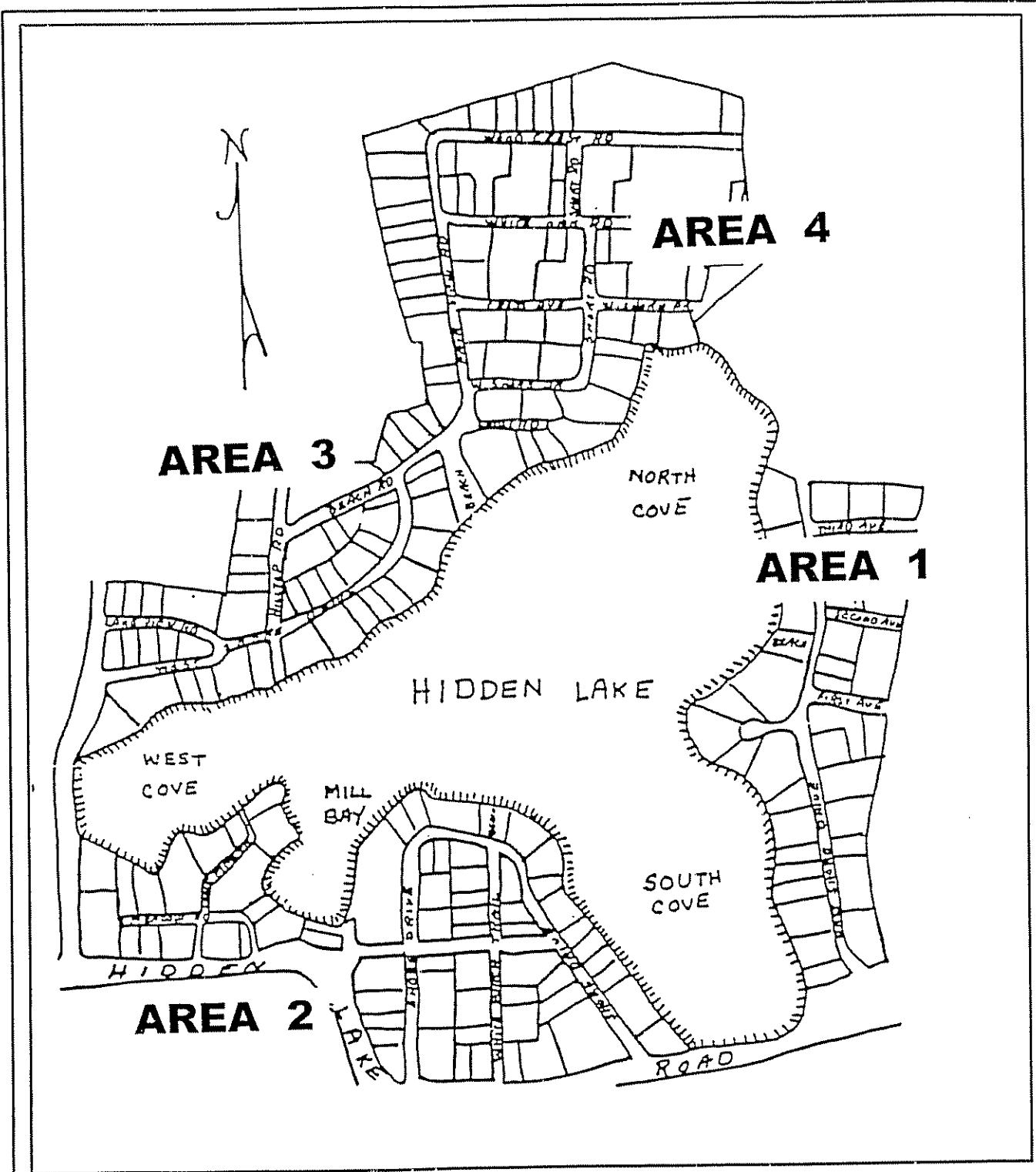


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FIGURE 1
HIDDEN LAKE WATERSHED

HRP PROJECT No. HID001.PC

U.S.G.S. Topographical Map
 Haddam Quadrangle

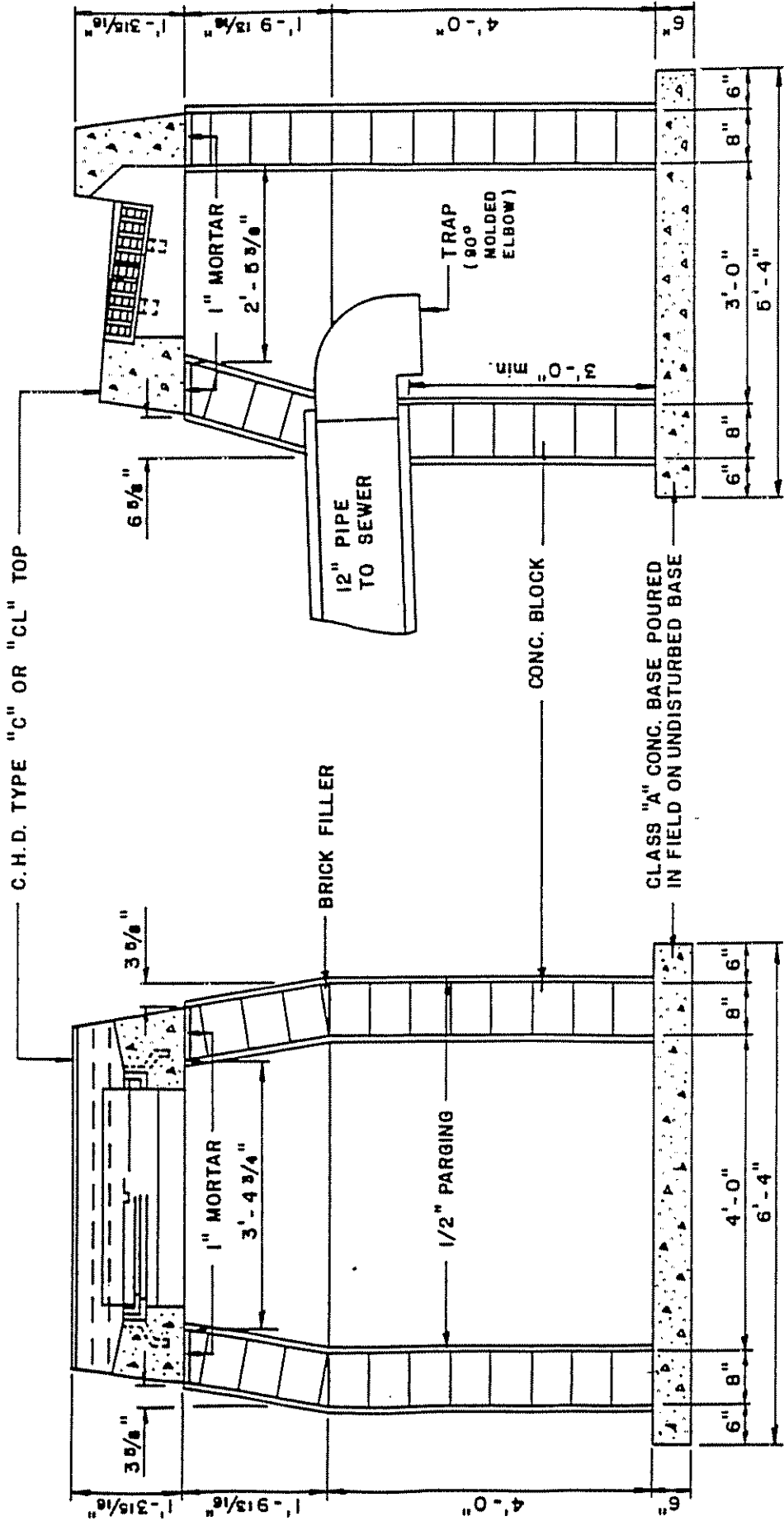


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**FIGURE 2
HIDDEN LAKE STUDY AREAS**

HRP PROJECT No. HID001.PC

Hidden Lake Association Map



CATCH BASIN DETAIL

NOTES: BAFFLE CONSTRUCTION TO BE OF CAST MATERIAL WITH THRU HOLES ABOVE OUTLET FLOWLINE OR MORTARED CEMENT BLOCKS WITH WEEP HOLES ABOVE OUTLET FLOW LINE.

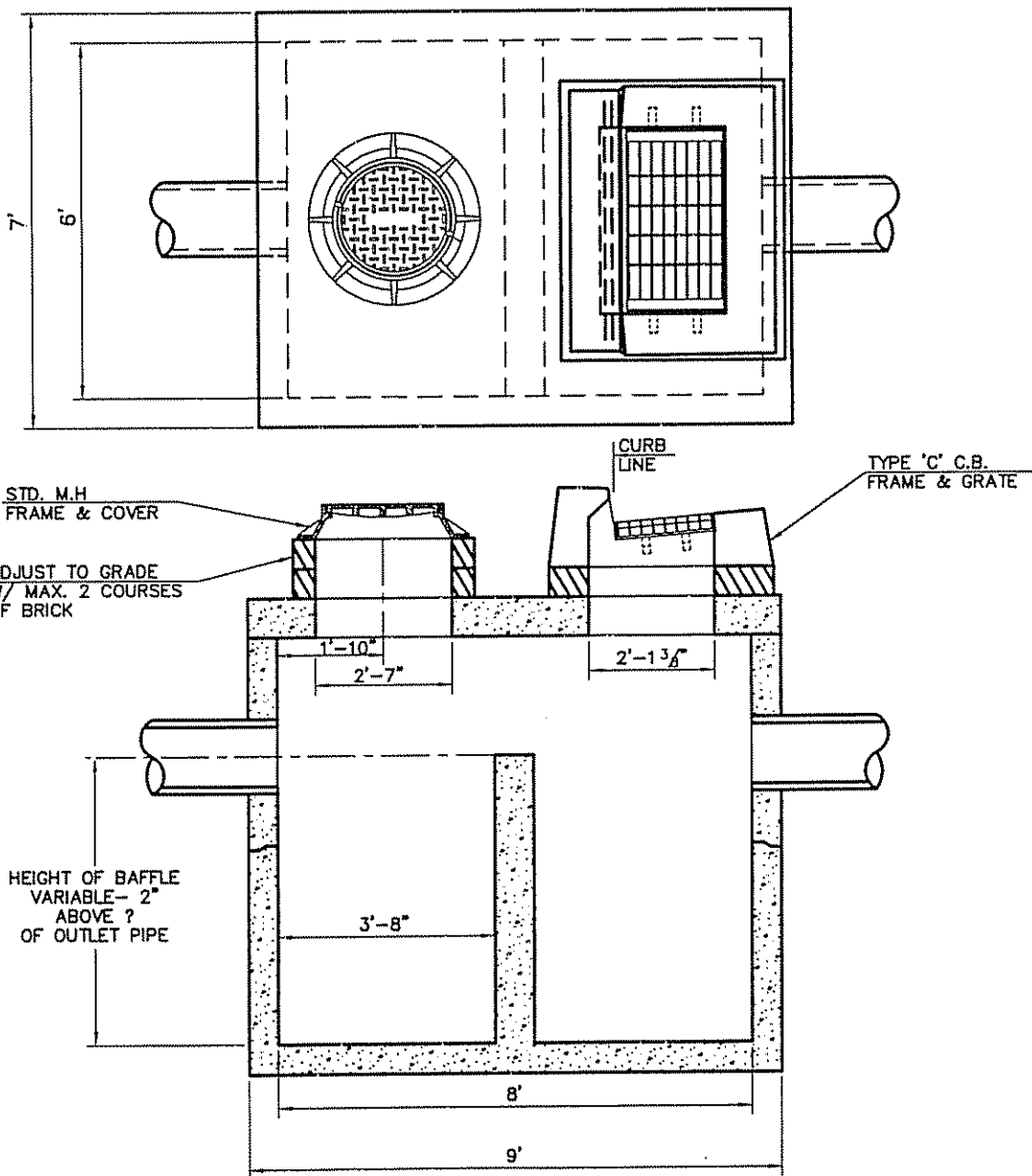
ADJUST MANHOLE FRAME TO SUIT REQUIRED FIELD HEIGHT.

CONSTRUCTION JOINT OT BE SEALED WITH 1" DIA. BUTYL RUBBER OR EQUIVALENT.

DESIGN LOADING - AASHO HS20-44.

STEEL REINFORCEMENT - ASTM A-615 GRADE 60, 1" MIN. COVER.

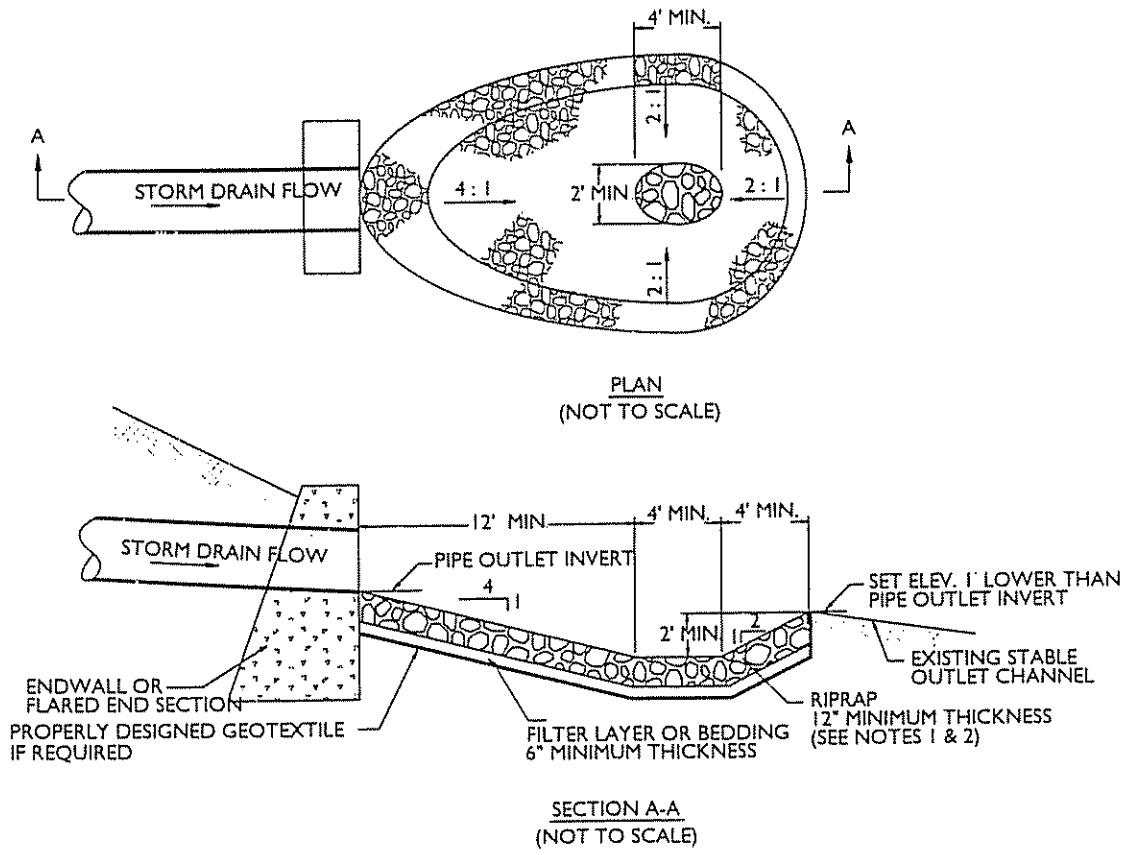
CONCRETE MINIMUM STRENGTH - 5,000 P.S.I. ● 28 DAYS



SEDIMENTATION STRUCTURE

N.T.S.

Figure OP-3 Configuration of Outlet Protection using a Riprap Stilling Basin



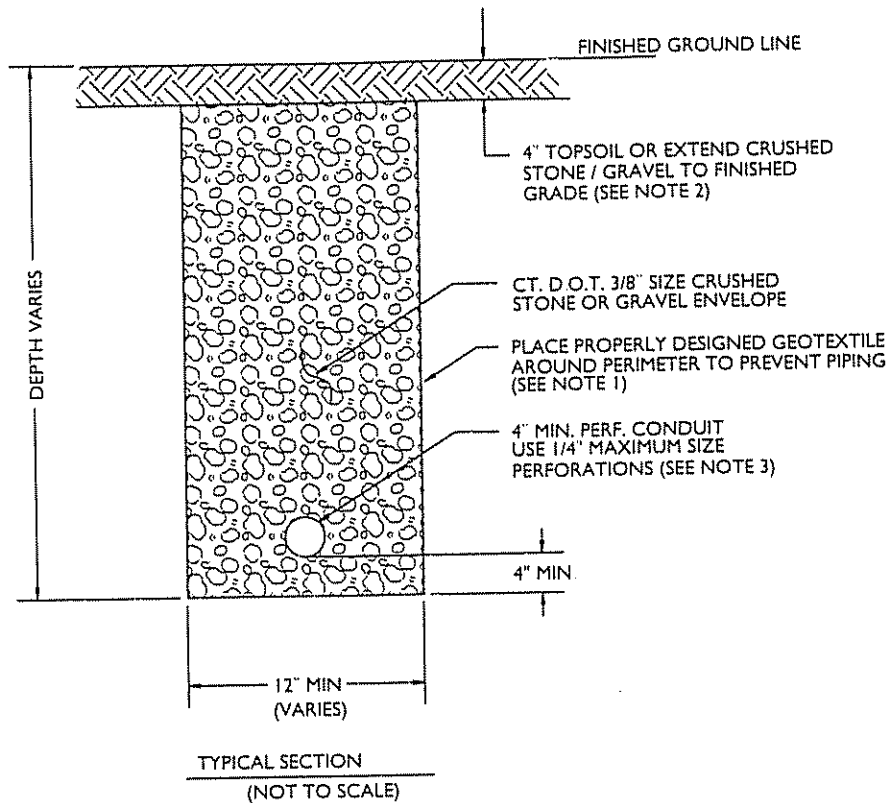
NOTES:

1. RIPRAP SIZE AND THICKNESS SHALL BE ADJUSTED UPWARD AS THE STORM DRAIN SIZE AND OUTLET VELOCITY INCREASE. SEE PLANNING CONSIDERATIONS SECTION FOR DESIGN REFERENCES.
2. CONSIDER THE APPLICATION OF CEMENTIOUS GROUT IN THE RIPRAP TO PREVENT VANDALISM AND FACILITATE SEDIMENT AND DEBRIS CLEANOUT.

Outlet Protection (OP)

Source: USDA-NRCS

**Figure SD-12. Subsurface Drain with Geotextile
(Soils with Intermediate to High Piping Potential)**



NOTES:

- 1 THE SELECTED GEOTEXTILE SHALL BE DESIGNED SPECIFICALLY TO PREVENT PIPING OF ADJACENT SOILS INTO THE COARSE AGGREGATE
- 2 IF SURFACE WATER IS TO BE INTERCEPTED, EXTEND COARSE AGGREGATE TO THE GROUND SURFACE
- 3 CONDUIT MAY BE HEAVY DUTY PERFORATED HIGH DENSITY POLYETHYLENE OR SPECIALLY DRILLED P.V.C.

Source: USDA-NRCS