CHARLIE POND STUDY
CITY OF ROSEVILLE
MAY 2, 1988
SEH FILE NO. 88045

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Mark L. Lobermeier

DATE: 5/4/88 REG. NO.: 18789

REVIEWED BY: Rocky J. Keehn

DATE: 5/4/88

TABLE OF CONTENTS

INTRODUCTION

As requested we have provided solutions to and/or addressed the following: (1) localized flooding within the Charlie Pond drainage area; (2) problems with Charlie Pond as described in the Grass Lake WMO plan, and (3) concerns of Lake Owasso residents regarding the effects of Charlie Pond on Lake Owasso. Also provided are high water and free board elevations for the proposed solutions.

LOCALIZED DRAINAGE PROBLEMS WITHIN THE CHARLIE POND DRAINAGE DISTRICT

BACKYARDS ON WEST SIDE OF MILLWOOD AVENUE

The backyard storage required for the lots located on the west side of Millwood Avenue, south of Brenner Avenue, is 0.4 acre-feet per inlet (see Drawing 1). About 4 acres contribute runoff to each inlet. If a single storage area is provided, the necessary storage volume is 0.8 acre-feet. This storage volume can be provided in a drainage swale with moderate side slopes. Because of the topography, the swale would need to be located near the middle of several lots, thus the aesthetics would be as important as the volume requirement. The assumed maximum ponding depth was three feet. Critical elevations of all homes should be surveyed to assure that no property damage occurs.

A second option involves the construction of a diversion swale at the base of the hill on the west side. The swale would divert northerly to Brenner Avenue. The runoff would flow easterly to Millwood Avenue and be captured by the catch basins at the intersection. This would reduce the amount of flow that contributes directly to the low points in the backyards. An example of this type of drainage swale is given in the Soil Conservation Services (SCS) Urban Runoff, Erosion and Sediment Control Handbook. A copy of the appropriate section is included in Appendix A.

Recommendation

We recommend that the drainage swale be graded across all the backyards to the inplace flared-end section of the storm sewer located just west and south of the Millwood Avenue and Brenner Avenue intersection. The swale would detain the runoff from the area. The swale/detention area would need to provide 0.8 acre-feet of storage. When a final grading plan is provided, the storage should be verified.

FLOODING AT MILLWOOD AVENUE LOW POINT

The localized flooding at the low point on Millwood Avenue, between Brenner Avenue and Victoria Avenue (see Drawing 1), is a result of both an undersized storm sewer and the water elevations on Charlie Pond. Ideally, localized runoff is drained quickly from the streets before ponding elevations affect the hydraulic gradient of the storm sewer. This is not the case at this location.

The initial ponding is a result of a limited capacity of the 12-inch RCP line from the catch basins, and "backwater" effects of the undersized 18-inch RCP from the intersection of Millwood Avenue and Brenner Avenue. When the downstream pipe flow is reduced enough to allow for drainage of the low point, Charlie Pond is at a higher stage, creating a second backwater effect in the storm sewer. The water still cannot totally drain until the levels on Charlie Pond subside. These two effects cause the flooding time observed at the low point.

The most effective solution is to divert the flow captured by the inlets into the 24-inch line discharging from Charlie Pond. This could be accomplished by either a direct connection (eliminating the existing connection to the storm sewer in Millwood Avenue that flows into Charlie Pond) or making an overflow where low runoff volumes discharge into the existing storm sewer to Charlie Pond and high runoff over flows into the 24-inch outlet line from Charlie Pond. The major concern of this alternative is the reaction of the Lake Owasso residents. When the existing storm sewer was constructed, there was several letters of opposition submitted to the City. This public "outcry" may occur again with this alternative.

To reduce the problem without changing the existing drainage patterns, the entire storm sewer from the low point to Charlie Pond would need to be increased in size. This is the most costly and probably least feasible alternative.

Another alternative is to increase the storm sewer capacity from the intersection of Millwood Avenue and Brenner Avenue to Charlie Pond. This could be done with a new, parallel storm sewer line or by replacing the existing storm sewer with a larger diameter pipe. The alternative reduces the effects of the backwater to the low point on Millwood Avenue and would decrease the ponding depths at this location. This alternative would also supplement the previously described diversion of water to Brenner Avenue from the properties on the west side of Millwood Avenue. Eight catch basins at this intersection allow for capture of the runoff and could adequately handle runoff if the storm sewer capacity is increased.

The final option is a "do nothing" alternative. The ponding on Millwood Avenue is an inconvenience, yet appears not to create property damage. Flooding may temporarily restrict home access of residents. In this location, this is not a significant problem since there is access on this section of Millwood Avenue from both Victoria Avenue and Brenner Avenue. The occasional flooding of the street may be acceptable when compared to the cost of the storm sewer replacements required to solve the problem.

Recommendation

We also recommended the "do nothing" option. The costs of the solutions are greater than the benefits.

PROBLEMS IDENTIFIED IN GRASS LAKE WMO (DRAFT VERSION)

SHORT CIRCUITING OF THE INFLOW PIPE

The problem of short circuiting in Charlie Pond can be remedied by adding a structure which separates the inlet and outlet pipes on the south end of the pond.

A distance of 75 feet is required to settle particles that could be suspended in the runoff from the inflow pipe. Based on this length, four options were considered: (1) one row of sheet piling, (2) riprap berm, (3) a berm with a common borrow core, riprap slopes, and a top width wide enough for pedestrian access to the end of the berm, and (4) a berm with a common borrow core, and riprap slopes, and no access. The location of the modifications are shown in Drawing 2.

Recommendation

It is recommended that the berm with the walkway be constructed. Safety and maintenance are the two reasons we feel access to the end of the berm should be provided.

Some of the safety concerns we have identified are:

1. People will want to go out on the berm whether the trail is there or not.

2. A fence could be added to which may prevent access but would only work when the pond was not iced. It may also encourage people to climb over or go around via the water.

3. The berm may become a point people want to reach when there is thin ice cover on the pond.

If the berm is not properly maintained by mowing, trash removal, and replacement of displaced riprap it will become an eyesore. We feel that with trees and a observation area, the berm could enhance the ponds aesthetic value instead of detract from it.

CHARLIE POND OUTLET

To increase the amount of storm water detention volume the existing outlet needs to be modified. Five outlet configurations were studied and are depicted in Drawing 3. The hydraulic and hydrologic results are shown in Appendix B, Tables B-1 and B-2.

Recommendation

Outlet configuration "C" as shown in Drawing 3 should be used to modify the existing structure to provide better detention of smaller recurrence interval storms. This design provides for three inlet flows (12-inch orifice at 894.0, 1 by 6 foot opening at 897.0 and the grated top opening at 898.0) thus giving several alternative inlets in case one or more plug.

LAKE OWASSO RESIDENTS CONCERNS

Residents along Lake Owasso would like all the runoff, into Charlie Pond, to be stored until after the storm has ended. The total contributing drainage area is 366 acres (see Drawing 4). Of the total area, 302 acres (82%) are located in Shoreview and 64 acres (18%) in Roseville. Total retention of runoff from this drainage area in Charlie Pond was looked at.

SLUICE GATE AT CURRENT CHARLIE POND OUTLET

The effects of a sluice gate at the existing outlet was first studied. The gate would control the outlet rate from the pond. It was assumed to be located at elevation 894.0 with a grated overflow at 898.0. If the gate is opened, the pond has a normal water surface elevation of 894.0 and if closed 898.0.

Three scenario's were analyzed. These were: (1) gate closed, overflow plugged, and beginning pond elevation at 894.0, (2) gate closed, overflow cleared, and beginning pond elevation at 894.0, and (3) gate closed, overflow cleared, and beginning elevation at 898.0. Leaving the gate open causes a ponding elevation similar to those using outlet configuration "D" (see Drawing 3).

Results of a 100-year storm analysis are given in Table B-3. Only scenario 2 would provide adequate protection. If the gate is not opened after every storm to drain the pond to a normal water surface water elevation of 894.0, flooding problems will occur in Charlie Pond when a 100-year storm occurs. This requires a high degree of maintenance by the City.

Recommendation

The option of placing a gated outlet at Charlie Pond should not be considered for the following reasons:

(1) If left open, this option will not provide water quality improvements as recommended by the Grass Lake WMO.

(2) If left closed, flooding problems will occur unless the pond elevation at the beginning of the 100-year storm is at or less than elevation 894.0.

(3) This option requires that the pond be drained after every storm, creating a maintenance cost to the city.

(4) This option does not protect for successive storms.

SHOREVIEW/ROSEVILLE BERM

An alternative to placing a control at the Charlie Pond outlet is to build a berm and overflow structure between Shoreview and Roseville across the wetland. There are several acre-feet of storage in the Shoreview wetland that cannot be used due to its higher elevation relative to Charlie Pond. A berm would allow a better utilization of available storage.

The proposed berm contains an outlet structure and emergency overflow. Drawing 5 shows the proposed berm configuration, location, and outlet structure. The structure consists of a gated outlet, which allows the pond to be lowered, and an overflow pipe, which delays the peak flow, allowing Charlie Pond to handle a 100-year storm in the event the gate is left closed. The overflow berm prevents flooding of residents on the Shoreview side of the wetland.

The berm is constructed of clay material with 5:1 sideslopes and a 10-foot minimum top width. The 10 foot top provides for a walk/bike path and vehicle access for maintenance (see Drawing 6). The overflow area of the berm will initially be covered with a wood fiber blanket which protects against erosion until adequate vegetation is established.

The 100-year storm results for the detention area behind the berm and Charlie Pond are given in Table B-4. The results indicate that rainfall events up to the 100-year recurrence interval can be partially or totally detained without causing flooding problems in Roseville or Shoreview.

Recommendation

If residents wish to hold back the storm runoff from this area, it should be done by constructing a berm between the upstream wetland and Charlie Pond. The berm and outflow structure will provide for the total retainment that is wanted by Lake Owasso residents withut adversely effecting areas in Roseville adjacent to Charlie Pond. If the berm is constructed, the proposed outlet configuration for Charlie Pond should also be built to provide for water quality improvement.

REVIEW AGENCIES

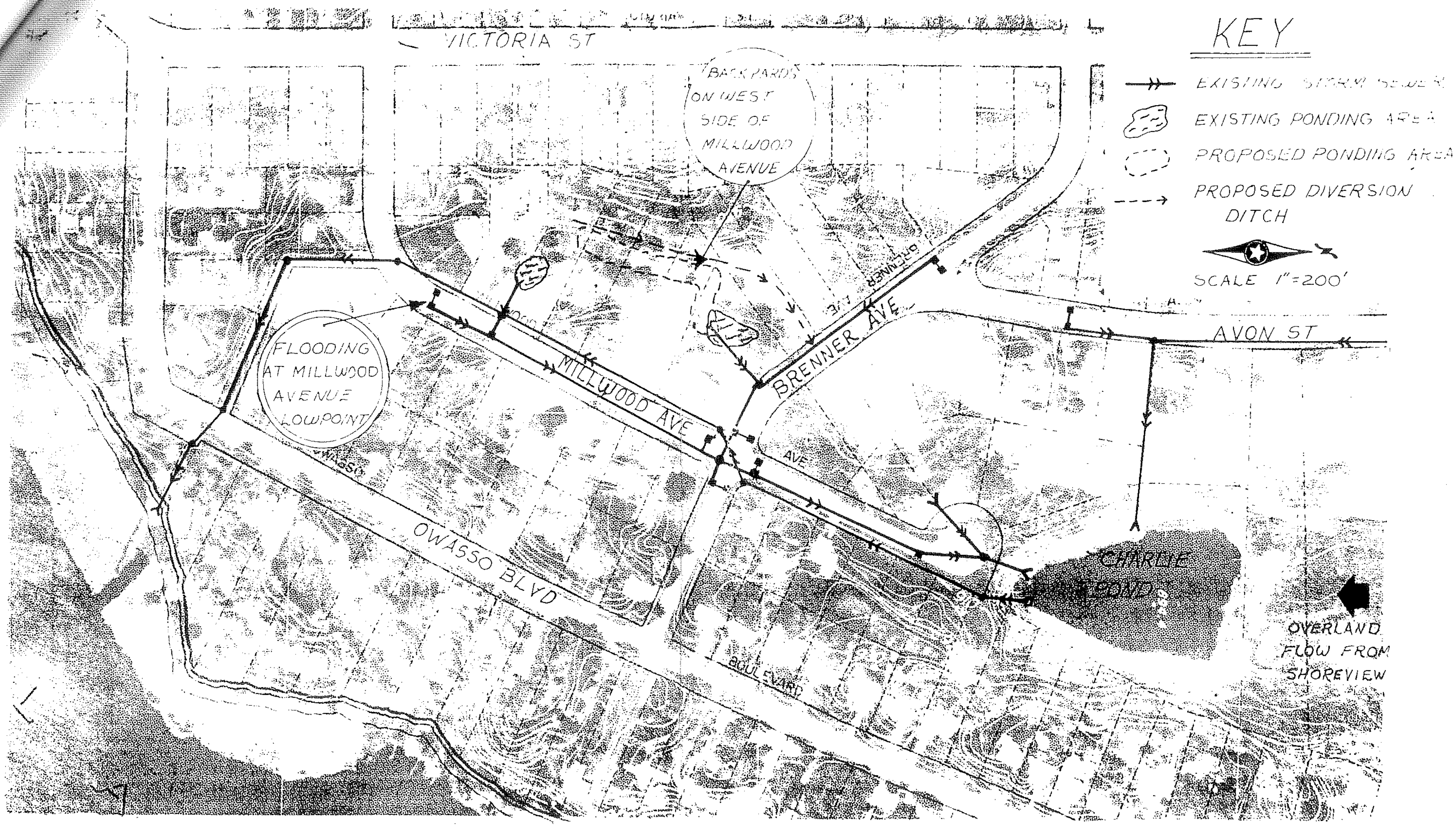
The wetland in Shoreview is not a DNR protected wetland. Since the DNR does not have jurisdiction, improvements need to be coordinated with the Corps of Engineers. This report should also be reviewed by the Grass Lake Watershed and the City of Shoreview.

COST ESTIMATES

The cost of each proposed component is given in Table 1. The total cost estimate includes construction cost plus 10 percent construction cost contingencies and 25 percent engineering. The engineering is assumed to be higher due to the small size of each component of the project and the fact that design approval is required by Roseville, Shoreview, and the Grass Lake Watershed.

TABLE 1. COST ESTIMATES

PROBLEMS IDENTIFIED IN GRASS LAKE WMO	
Inlet/Outlet Separation	
Option 1 - Sheet Pile	$41,300
Option 2 - Riprap Berm	$14,000
Option 3 - Riprap Covered Berm With Access	$ 8,800
Option 4 - Riprap Covered Berm Without Access	$ 7,400
Charlie Pond Outlet	
All Options	$ 1,700
Recommended Project	
Option 3 and Outlet Configuration "C"	$10,500
LAKE OWASSO RESIDENTS CONCERNS	
Shoreview/Roseville Berm	
Berm, Outlet Structure, Overflow	$41,300
Recommended Solution	
Shoreview/Roseville Berm Plus Charlie Pond Outlet	$51,800



LOCALIZED DRAINAGE PROBLEMS WITHIN THE CHARLIE POND DRAINAGE AREA	SEH ENGINEERS ■ ARCHITECTS ■ PLANNERS	ROSEVILLE, MN CHARLIE POND STUDY	FILE NO. 88045 DRG NO. 1