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September 3, 1985

Everett R. Kennedy, Commissioner
Public Works Department
147 Hampshire Street
Cambridge, Massachusetts 02139

REFERENCE: Area Flooding - August 1, 1985

Dear Commissioner Kennedy:

The following are suggested immediate actions which the City may initiate to possibly reduce the occurrence of flooding in the Sacramento Street area and Columbia Street/Austin Street area during a storm such as occurred on August 1, 1985.

1. Dwellings with open fixtures such as toilets, basins, floor drains, etc. located in basements should be advised to install flap valves, backed up with a manual shut-off valve. This will prevent surcharging from the sewers and/or storm drains into the basements.

2. Perform a manhole inspection of the primary sewer and storm drain systems serving each area to determine if flow obstructions exist. For the Sacramento Street area this would include the sanitary trunk sewer located in Carver Street and Holden Street, and for storm drainage, the combined sewer located in Oxford Street. In the Columbia Street/Austin Street/School Street area, an inspection of the manholes along the area outfall sewers and storm drains located in School Street, Austin Street, Pine Street and Cherry Street should be performed.

3. Clean all catch basins to insure that all debris is removed which could cause problems. This is also true for the catch basins located at the intersection of Beacon Street and Sacramento Street in Somerville. In cooperation with Somerville these catch basins must be kept clean to reduce runoff from the low point in Beacon Street entering Sacramento Street and thereby exacerbating the area flooding problem.

Flooding of basements located within these areas which have open fixtures without flap valves will experience flooding during major short term, high intensity storms such as occurred on August 1, 1985. This storm, equivalent to a 3 hour/50 year frequency produced a runoff which exceeded the City's 5 to 10 year storm system design capacity.

Upgrading the storm systems which serve the two areas in question to handle the runoff from 25 year to 50 year storms would involve considerable construction and therefore expenses. As continuing improvements are made throughout the City the frequency of flooding will be reduced as the systems capacity is increased.

If you have any questions please contact us at any time.

Very truly yours,

CE MAGUIRE, INC.

Robert A Barrows

Robert A. Barrows, P.E.
Senior Project Manager
Project Management Division

RAB:fp

c.c. Cary Snow

REPORT ON INVESTIGATIONS INTO FLOODING
IN THE
SACRAMENTO / CRESENT / CARVER STREETS AREA
FROM
STORM OF JULY 31 - AUGUST 1, 1985

Information assembled and evaluated regarding flooding in the Sacramento / Cresent / Carver Streets area included:

- DPW Trouble Calls
- Comments by DPW Personnel
- Existing Sewerage and Drainage System Plans, and
- Site Reconnaisance

Trouble calls were received during the early morning hours (August 1) from Cresent Street and Wendell Street resulting in DPW personnel cleaning debris from several clogged catch basins. There was general street flooding on Cresent, Sacramento, Carver, Wendell, Hammond and Museum Streets in addition to Beacon Street in Somerville, The area is generally flat and slightly lower in elevation than Oxford Street, Beacon Street and Francis Avenue which surround the area to the west, east, and south, respectively.

The area is served by sanitary sewers, storm drains and combined sewers which are interconnected in a number of locations. In general, the Oxford Street combined sewer, which starts near Forest Street, carries all of the storm drainage and some of the sanitary flows away from the area. Area storm drains ultimately discharge to the Oxford Street combined sewer. This 36"x40" brick sewer (at Sacramento Street) increases in size to 48"x54" at Kirkland Street and discharges to the MDC North Charles Metropolitan Sewer and North Charles Relief Sewer at Plympton Street and Memorial Drive. Flows in excess of the capacity of the MDC sewers are discharged to the Charles River Basin through the Plympton Street overflow. In addition to the Oxford Street area this sewer also receives sanitary and storm flows from

Kirkland Street (full length), Cambridge Street (west of Roberts Road), Broadway (west of Highland Avenue), Harvard Street (west of Dana Street), and Mt. Auburn Street (Dunster Street to Massachusetts Avenue). This is the single largest combined sewer service area (300 acres) in the City.

Sanitary flows from Cresent, Sacramento, Wendell, Gorham, and Museum Streets and portions of Hammond Street discharge to the Roberts Road sanitary sewer via Sacramento, Carver, Irving and Holden Streets. This is a 16"x21" concrete and brick sewer from its high point at Sacramento Street near Oxford Street to Museum Street and increases to 51"x38" where it discharges to the MDC system at the intersection of Hampshire and Portland Streets.

The Cresent / Sacramento / Carver Streets area is in the upper reaches of both of the sewer systems discussed above. There are several interconnections between the systems through common manholes along Carver Street and in the Holden / Kirkland Street area.

Beacon Street in Somerville is served by sanitary sewers and a 48" combined sewer. The combined sewer increases in size to 72" before discharging to the MDC sewer system at McGrath Highway; flows in excess of the capacity of the MDC sewer flow to the MDC Charles Estuary Pump Station near the old Charles River Dam in Cambridge. This system serves approximately 1,000 acres in the City of Somerville,

Reports from DPW personnel and the MDC have indicated that the Cambridge sewers and the Charles Estuary Pump Station were generally handling the storm flows until shortly after 2:00 a.m. (August 1) when flooding began as a result of the high intensity rainfall from 2:00 to 3:00 a.m.

In the fourteen hour period from 2:00 p.m. July 1 to 4:00 a.m. August 1, a total of 4.6 inches of rain were reported in the Cambridge / Boston area. From 1:00 a.m. to 4:00 a.m. on August 1, 3.6 inches were reported and from 2:00 a.m. to 3:00 a.m., 2 inches fell. The intense

rainfall which fell the night of July 31 / August 1 was equivalent to a 25 to 50 year storm from 10:00 p.m. to 4:00 a.m.

A site inspection of the problem area indicated that there are approximately 30 catch basins serving the general area of flooding within Cambridge. Beacon Street in Somerville has a low point approximately at the intersection of Sacramento Street. Five catch basins serve this area; three of which appears to be restricted with grit and debris. Considering that there are only five catch basins serving the vicinity of the sag on Beacon Street reports of overflows into the Sacramento Street area from Beacon Street seem accurate since the area is also lower than Beacon Street. This condition would be aggravated if the Beacon Street sewer was flowing under surcharged conditions. It appears likely that any storm flows entering Sacramento Street from Somerville were restricted to run-off from Beacon Street itself and the area west of the railroad right-of-way parallel to Beacon Street plus any flows which might have come from the 48" Beacon Street line due to surcharging above street level.

The drain over sewer system in Holden Street appears to have been surcharged as evidenced by the report of a missing manhole cover during the height of the storm. This suggests that the hydraulic grade at this point in the system may have been higher than the ground elevation (Elevation 24±). This area is connected to the upstream Sacramento / Carver Streets area via the Carver Street sanitary sewer and the Kirkland Street combined sewer and storm drain. There were no reports of surcharging to the street level along the lower reach of the Oxford / Plympton Streets sewer on Plympton Street though the sewer was probably surcharged to some degree along this reach.

Based on a time of concentration equal to 60 minutes, rainfall intensity of 2 inches per hour runoff coefficient of .50, and a service area of 300 acres the flow tributary to the Oxford / Plympton Street combined sewer systems has been estimated at approximately 300 cfs during the height of the storm. Possibly a higher runoff was experienced due to the saturated anticedent conditions. The capacity

of the system is approximately 40 cfs under normal conditions and 50 to 60 cfs under surcharged conditions. The surcharge capacity is based on the available hydraulic grade line slope (.0013 ft/ft) between the Charles River Basin and the average ground elevation in the Sacramento Street area.

In consideration of the conditions cited above, it appears that during the height of the storm the hydraulic grade of the sewer systems serving the area rose, due to insufficient capacity, to a point above the ground level (Elevation 24 to 27) in the depressed area of Cresent, Sacramento, Carver and Museum Streets and Beacon Street in Somerville resulting in flooding of streets, yards and basements.

Short term solutions will not prevent flooding from storms in the intensity experienced the night of July 31 / August 1, but flooding from less intense storms might be mitigated by:

- removing any restrictions that might be found in the Oxford / Plympton Street sewer and the Roberts Road sewer,

- reducing overflows into the area from Beacon Street, and

- preventing gutter flows in Oxford Street from entering the area.

When the Oxford / Plympton Streets area is separated the capacity of the new storm drainage systems can be increased over that of the existing systems by:

- removal of sanitary flows,

- increasing pipe sizes,

- eliminating or correcting possible deficiencies at the syphon under the MBTA tunnel at Massachusetts Avenue and/or

- reducing the size of the service area, if possible, by redirecting some storm flows to other discharge points.

The Sacramento / Cresent / Carver Streets area presents special problems due to its low elevation in relation to surrounding areas, the potential for flooding from Beacon Street area overflows, and the relatively dense property development. Though an enlarged, separated storm drainage system should service this area under most normal storm flow conditions, special consideration for the less frequent high intensity storms might include:

- preventing flow from higher areas from entering the flood prone area,

- oversizing some storm drains to provide additional storage,

- providing off-line storage large storms in low open areas or below grade, and/or

- providing pumping facilities to protect the localized flood prone area.

CITY OF CAMBRIDGE

CAMBRIDGE, MASSACHUSETTS 02139
TEL. 498-9011

EXECUTIVE DEPARTMENT
ROBERT W. HEALY
City Manager

RICHARD C. ROSSI
DEPUTY CITY MANAGER

September 9, 1985

Dear

Re: Flooding - August 1, 1985
Sacramento/Crescent/Carver Streets Area

At my request Commissioner of Public Works Everett R. Kennedy has conducted an investigation into circumstances that resulted in street and basement flooding in your area. The City's Engineering Consultants, who have been working on sewer improvements since 1968, worked with Mr. Kennedy and insure a complete review of all factors and have forwarded a preliminary report to the City.

The conclusions reached included the following:

1. The rainfall that fell on the night of July 31/August 1 was equivalent to a 25 to 50 year storm.

2. The storm sewer system (basin, piping, etc.) was not adequate to carry off the amount of rainfall that fell during the period from 10 P.M. to 4 A.M.

3. The situation was further aggrevated by overflows from Beacon Street in Somerville developing a "pond" which involved both communities simultaneously.

4. The sanitary sewer system, separate from the storm sewer system, was flooded by surface water, causing it to become overloaded.

These conclusions, obviously, are recognized by those homeowners who sustained damage during this particular storm.

This area is part of Phase VI sewer separation program scheduled in the FY86 budget for design work in FY87, and construction to begin during FY88. It will require a bond issue at approximately seven million dollars and will involve construction work from the Cambridge City line to the Charles River. This schedule was approved by the City Council during its review of the FY86 budget, effective July 1, 1985.

Short term solutions will not prevent flooding from storms of the intensity experienced the night of July 31/August 1, but flooding from less intense storms might be mitigated by:

(1) removing any restrictions that might be found in any sewers in the area.

(2) reducing overflows into the area from Beacon Street and

(3) preventing gutter flows in Oxford Street from entering the area

These recommendations are currently being implemented by the Department of Public Works, and should be completed this fall.

The City Council will review the current schedule of sewer improvements in your area. Because of the magnitude of the proposed work, and the estimated cost with the effect upon the budget, any change of programming will have to be weighed against other desirable and/or essential projects.

I am certain that any review will take place this fall and any change in current fiscal schedules dictated will be addressed by my office immediately.

Very truly yours,

Robert W. Healy,
City Manager

RWH/b

CITY OF CAMBRIDGE

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TEL. 498-9011

EXECUTIVE DEPARTMENT
ROBERT W. HEALY
City Manager

RICHARD C. ROSSI
DEPUTY CITY MANAGER

September 9, 1985

To the Honorable, the City Council:

Enclosed are two preliminary responses from both C.E. Maguire and the Commissioner of Public Works relative to the flooding situation during the exceptionally heavy storm of August 1, 1985, in the Crescent Street and Cherry Street areas.

The Crescent, Sacramento, Carver Street areas are scheduled for Phase VI sewer separation with design work in FY87 and construction in FY88. Short term solutions are being implemented by the Public Works Department.

The Cherry Street area has already been separated and a program of dwelling visitation by the Plumbing Inspector will begin the week of September 16th. The purpose of this program will be to individually advise those occupants of units with open fixtures below ground level of the need for back-flow prevention valves and possibly the need for manual shut-off valves inasmuch as the system is functioning.

There is obviously an interrelationship between the Cambridge system and the MDC system and given the severity of the storm, the MDC system wassurcharged and thus, also, was the Cambridge system. When this happens and there are fixtures below ground level, backup inevitably occurs.

The engineers and the Public Works Department will continue to work on short and long term solutions.

Very truly yours,

Robert W. Healy,
City Manager

RWH/b

9/30/85 - PLACED ON FILE

Agenda # 20 #17

S-704

RE: to the flooding of the Crescent Street and Cherry Street areas of the City during the August 1, 1985 Storm.

In City Council,

September 9, 1985

9/9/1985

Tabled Motion

of

Mayor Dudley

9/30/85

CWTS

[redacted]

Placed on File