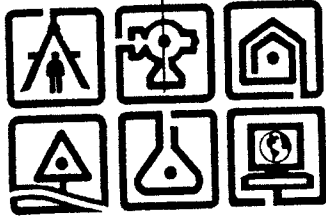


January 1998



Drainage Analysis Report  
for  
*Route 20 @ Stuyvesant Plaza*

Town of Guilderland  
Albany County, New York

2004

*Prepared for:*

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C.T. Male Project No: 97.4011  
Related Drawing No: NA

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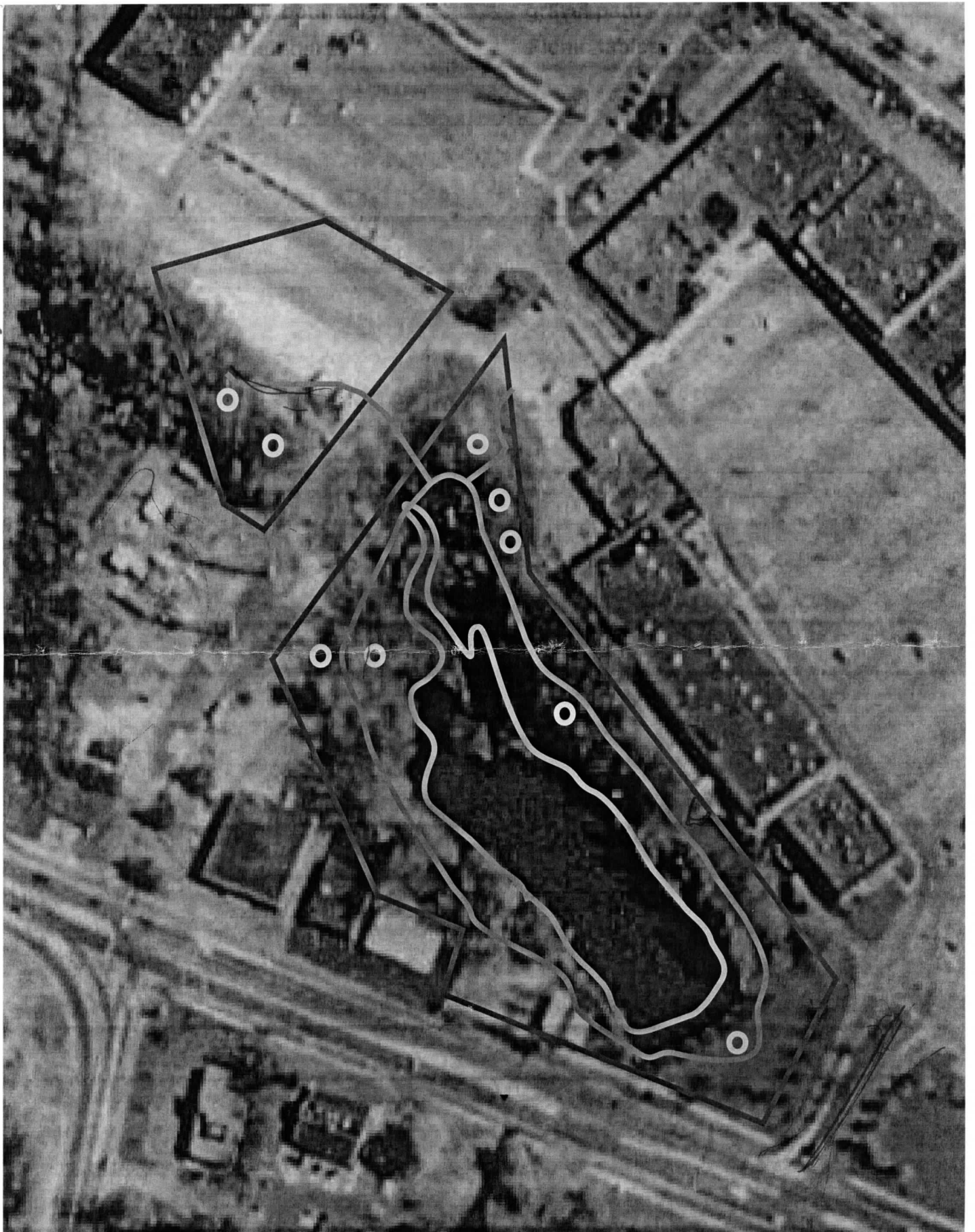
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— approx. property boundary  
— approx. lake boundary

— gravel path  
○ Picnic tables or benches

## 1.0 INTRODUCTION

In the Town of Guilderland, frequent flooding conditions have occurred on US Route 20 (Western Avenue) approximately 300 feet west of the intersection with Fuller Road, at the entrance drive into Stuyvesant Plaza. This study was undertaken to better understand the cause(s) of flooding in this area and access possible mitigative measures that can be pursued to reduce the frequency of flooding and eliminate flooding during the two year event.

A Site Location Map showing the area of flooding is included as Appendix A.

## 2.0 METHODOLOGY

The basic methodology utilized in this study is the *United States Department of Agriculture (USDA) Soil Conservation Service's (SCS) Technical Release No. 20 (TR-20)*. The design storm events used to analyze the stormwater run-off have return frequencies of 2-, 10- and 50-years. The calculations performed utilizing the TR-20 methodology were accomplished using a computer software application program known as HydroCAD. For this portion of the analysis, the entire watershed was broken down into eighteen subcatchments.

Precipitation data was obtained from the Northeast Regional Climate Center's (NRCC) *Atlas of Precipitation Extremes for Northeastern United States and Southeastern Canada*, dated 1993 and from the National Weather Service (NWS). The precipitation data obtained from NRCC was used to analyze the 2-, 10- and 50-year events and the NWS data was used to model the flooding that occurred on July 13, 1996. Rainfall used in this study is presented in Appendix B, "Precipitation Data."

The storm events simulated and the associated rainfall amount are as follows:

TABLE 2.0 RAINFALL DATA	
STORM (year)	24-HOUR RAINFALL (inches)
2	2.7
10	3.8
50	5.4

1. Field survey - US Route 20 at Stuyvesant Plaza
2. Northway/I-90 interchange
3. Thruway corridor
4. Crossgates Commons
5. Crossgates Mall

The slopes in the watershed are predominantly mild (less than 5%), with the exception of man-made embankments on the I-87/I-90 Interchange ramps and side slopes into detention basins.

#### 4.0 COMPUTER SIMULATION RESULTS - EXISTING CONDITIONS

The maps and plans identified in Section 3 were also examined to identify what stormwater control mechanisms/improvements exist in the watershed. The information reviewed indicates that the only control of drainage within the watershed on private property occurs at the Crossgates Mall and Crossgates Commons sites via four (4) detention basins. Two (2) of these detention basins are located at the southeast corner of the Mall site and the other two (2) detention basins are located at the Crossgates Commons site. The Crossgates Mall detention facilities also control stormwater generated upland of the mall site. Stormwater generated by other areas within the watershed are generally not controlled. To some extent, however, the McKownville reservoir has limited detention abilities.

The McKownville Reservoir is a Class "A" water body, formerly used as a water supply for Guilderland. The outlet on the McKownville Reservoir contains of a 3' by 5' ID precast concrete structure. Under normal conditions water spills into the structure at elevation 208.5' +/- . There is a valved 6-inch pipe opening at centerline elevation 207.0' +/- which is opened in advance of a forecasted storm event to lower the level of the reservoir to provide additional detention. The inside bottom elevation of this structure is 199.4' +/- . A 24-inch diameter pipe at invert elevation 205.43' is the primary outlet from the structure. The 24-inch diameter pipe drains to a catch basin on the north side of US Route 20. From there, a 3' x 4' box culvert traverses US Route 20 and discharges into a 54-inch diameter pipe on the south side of US Route 20. The 54-inch reduces down to a segment of 36-inch diameter pipe prior to increasing to a 60-inch diameter

pipe. The 60-inch pipe discharges into an open swale that flows into a tributary of the Normanskill.

Complete summary printouts of the computer simulation runs for the existing conditions are presented in Appendix E, "Computer Simulation Runs - Existing Conditions."

The computer simulation results for the 2-, 10- and 50-year storm events are summarized in the following table:

Storm Event (year)	Rainfall (in/24hrs)	McKownville Reservoir $\triangle 10$			US Route 20 Ponding $\triangle 40$		
		Peak Elev (ft)	Discharge (cfs)		Peak Elev (ft)	Discharge (cfs)	
			primary	secondary		primary	secondary
2	2.7	211.0	32.2	23.8	208.5	63.5	0.0
10	3.8	211.3	33.5	121.2	210.3	68.6	116.4
50	5.4	211.7	34.7	281.5	211.2	70.9	335.3
7/13/97	4.22 <sup>(1)</sup>						

(1) Total rainfall occurred over an 18-hour period.

The tabulated results show that the McKownville reservoir spills during a 2-year storm event (i.e., secondary discharge >0.0 cfs) and that the resulting pond in US Route 20 is contained (i.e., not spilling). A more detailed review of the computer simulation results indicates that the existing uncontrolled peak flow from the Fuller Road - Stuyvesant Plaza portion of the watershed (66 cfs) by itself exceeds the capacity of the 36" diameter pipe located downstream from US Route 20. Therefore the flooding on US Route 20 is primarily a result of a "bottleneck" condition created by the inability of the existing 36-inch diameter pipe located behind the dentists office and Burger King to adequately handle the runoff from the Fuller Road - Stuyvesant Plaza portion of the watershed. The capacity of the box culvert is approximately 63 cfs and the capacity of the 36-inch diameter culvert (flowing full without submergence) is approximately 32 cfs.

On a comparative basis, the peak flow rate from the portions of the watershed that drain to McKownville reservoir (which does not include the Fuller Road - Stuyvesant Plaza area and comprises approximately 85 percent of the watershed) totals 62 cfs. This observation is in large part due to the existence of detention basins controlling peak rates of runoff from large impervious areas such as Crossgates Mall and Crossgates Commons. (Refer to Appendix F, "Peak Flow Rates - 2-Year Storm Event.") The results of the computer simulation runs made using the recorded rainfall data for July 13, 1997<sup>4</sup> correspond closely to observed flooding conditions at US Route 20 (ponded water surface elevation = 210.1', i.e. 2.2 feet deep at the center of the road) and McKownville Reservoir (reservoir water surface elevation = 211.2').

The flooding that occurs on US Route 20 is largely due to a combination of the "bottle neck" caused by the 36" diameter pipe downstream of US Route 20 and uncontrolled runoff from subcatchments 40 and 41 (Stuyvesant Plaza and Fuller Road area.) The ponding in US Route 20 continues to increase in depth until the ponded water flows on the ground surface (through a low point located between the dentist office and the Christ Evangelical Lutheran Church), then behind the dentists office and Burger King and shortly thereafter empties into the open stream channel that the piped system discharges to. There is no overland flow during a 2-year event and during the 10-year event the overflow adds approximately 116 cfs to the flows conveyed by the piped system at the discharge location.

## 5.0 IMPROVEMENT ALTERNATIVES INVESTIGATED

Alternative # 1 involves the replacement of the 36-inch-diameter segment, behind the dentist office and the Burger King, with a 54-inch-diameter HDPE, or equivalent. The results of this simulation indicate that this action would significantly reduce flooding in US Route 20 for a 2-year event, but would not significantly reduce flooding during the 10- and 50-year events.

Alternative # 2 involves not only the replacement of the 36-inch-diameter pipe, as indicated in Alternative #1, but also the conversion of the McKownville Reservoir to a detention basin with the runoff from the Stuyvesant Plaza watershed rerouted to the basin. The alternative would (1) eliminate flooding of US Route 20 for both the 2 and 10 year storm events, (2) eliminate overflow from the McKownville basin during the 2-

## C.T. MALE ASSOCIATES, P.C.

year storm event and (depending on the ultimate size of the basin) (3) would not result in an increase in the peak rate of flow in the downstream reach for all storm events.

Complete summaries of the computer simulation runs for the recommended alternatives are presented in Appendix G, "Computer Simulation Runs - Proposed Alternatives."

A summary of the pros and cons associated with both alternatives follows:

### **Alternative #1**

Replace the existing 36-inch-diameter corrugated metal pipe (CMP) with a minimum of 54-inch-diameter HDPE pipe or equivalent.

#### Pros

- No work necessary in US Route 20.
- Significant reduction in flooding in US Route 20 for 2-year event.
- No increase in downstream peak rates of flow for 10- and 50-year events.

#### Cons

- Increase in peak rate of flow in downstream channel for 2-year event from 64 cfs to 78 cfs. (However this rate is less than the existing 10-year rate of 185 cfs.)
- Does not eliminate flooding in US Route 20 for 10- and 50-year events.
- McKownville reservoir will continue to spill during 2-year event, which will hydraulically overload the catch basin grates in US Route 20 at the entrance to Stuyvesant Plaza (computed spill depth is 0.5').

### **Alternative #2**

Replace pipe identified in Alternative # 1 and convert McKownville reservoir to a detention basin and reroute runoff from the Stuyvesant Plaza watershed through the basin.

#### Pros

- Minimal work necessary in US Route 20.
- Eliminates flooding in US Route 20 for both 2- and 10-year events.
- No increase in the peak rate of flow in the downstream reach for all storm events.
- McKownville basin will not spill during 2-year event.

#### Cons

- Depends on ability to reroute Stuyvesant Plaza piping to basin.
- Requires outlet structure modifications.



- Requires new piping from outlet structure to box culvert under US Route 20.

## 6.0 CONCLUSIONS

Review of the peak runoff rates tributary to this area indicate that the peak rate of runoff from the Stuyvesant Plaza/Fuller Road portion of the watershed alone exceeds the capacity of the existing piped system. It appears that the high rates of runoff from this portion of the watershed are attributable to a lack of detention facilities.

The primary cause of the flooding that occurs at the study intersection appears to be the existing segment of 36-inch-diameter pipe located behind the dentist's office and Burger King, which is not capable of handling the runoff from this portion of the watershed. As this pipe causes a restriction, it does not allow the undetained flows from Stuyvesant Plaza area to pass through prior to the detained flows from the remainder of the watershed reaching the pipe, resulting in further impact to the drainage system. The pipe segment immediately upstream is 54-inches in diameter and the downstream reach is 60-inches in diameter. The rate of runoff draining to US Route 20 from the Stuyvesant Plaza/Fuller Road watersheds alone, for a 2-year event, far exceeds the capacity of the 36-inch-diameter pipe. The result is ponding on US Route 20. This pond has reached sufficient depth that it spills overland between the dentist's office and the church on the south side of US Route 20.

It is recommended that a more detailed analysis be performed on the proposed alternatives, and develop other alternatives as may be required to improve the stormwater system, in the watershed area.

Respectfully submitted,

C.T. MALE ASSOCIATES, P.C.

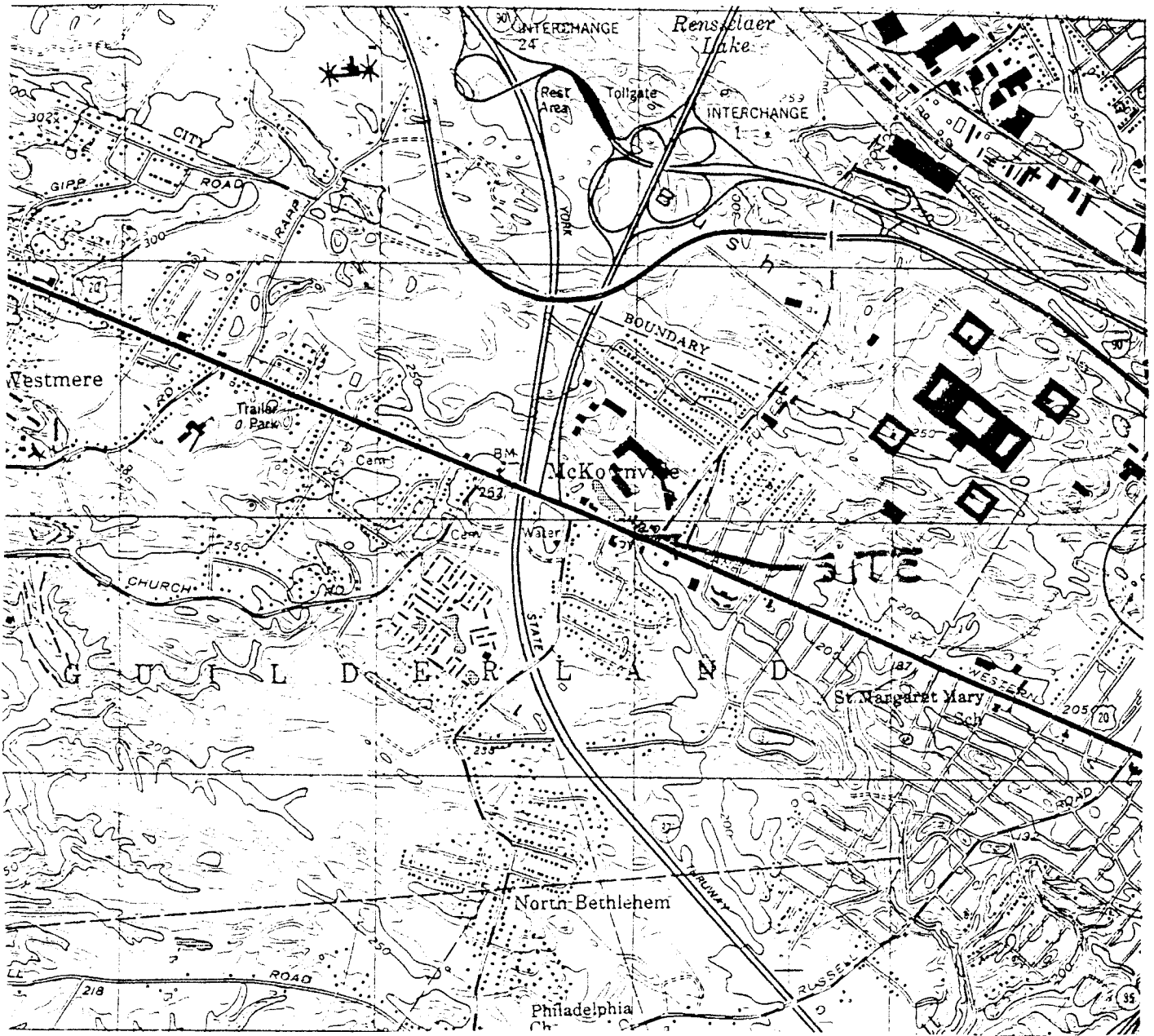
*T. James Houston*

T. James Houston, P.E.  
Senior Project Engineer

REVIEWED AND APPROVED BY:

*Frank Fazio*

Frank Fazio, P.E.  
Project Manager



MAP REFERENCE:

USGS Albany Quadrangle



# APPENDIX A

## C.T. MALE ASSOCIATES, P.C.

50 CENTURY HILL DRIVE, P.O. BOX 727, LATHAM, NY 12110  
 (518) 786-7400 • FAX (518) 786-7299

Engineering • Land Surveying • Building Systems • Landscape Architecture  
 Environmental Services • Computer Services



## SITE LOCATION MAP

Drainage Analysis Report  
 Route 20 @ Styvesant Plaza

Town of Guilderland

Albany County, N.Y.

Drafter: TJH

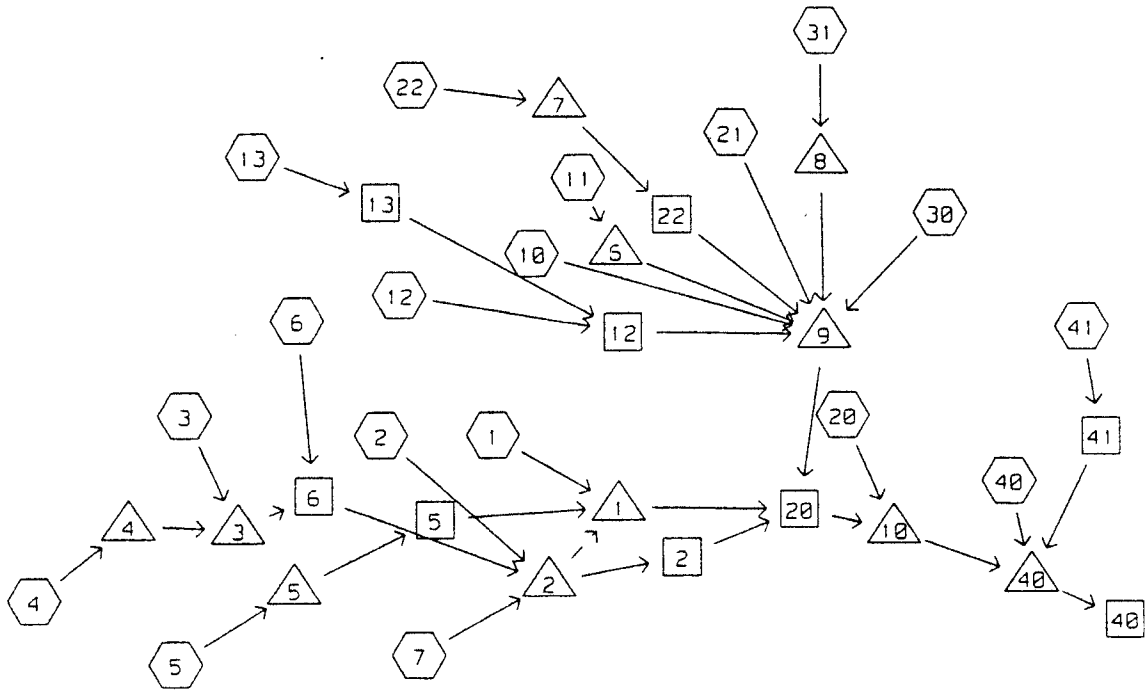
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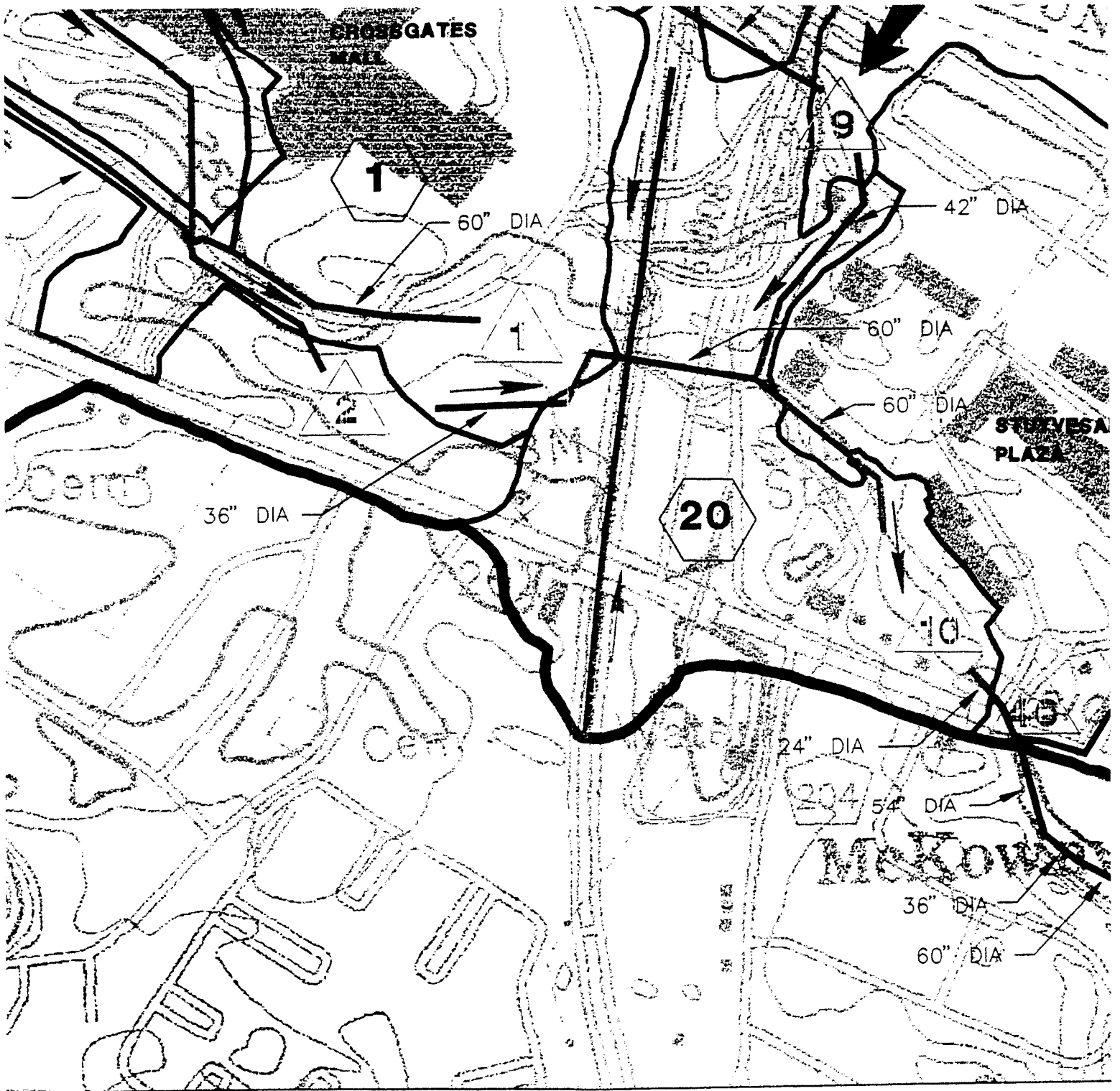
Scale: 1" = 2000'

Proj. No. 97.4011



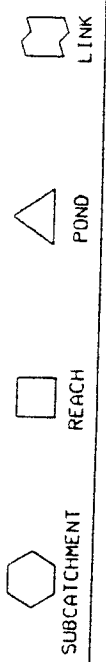
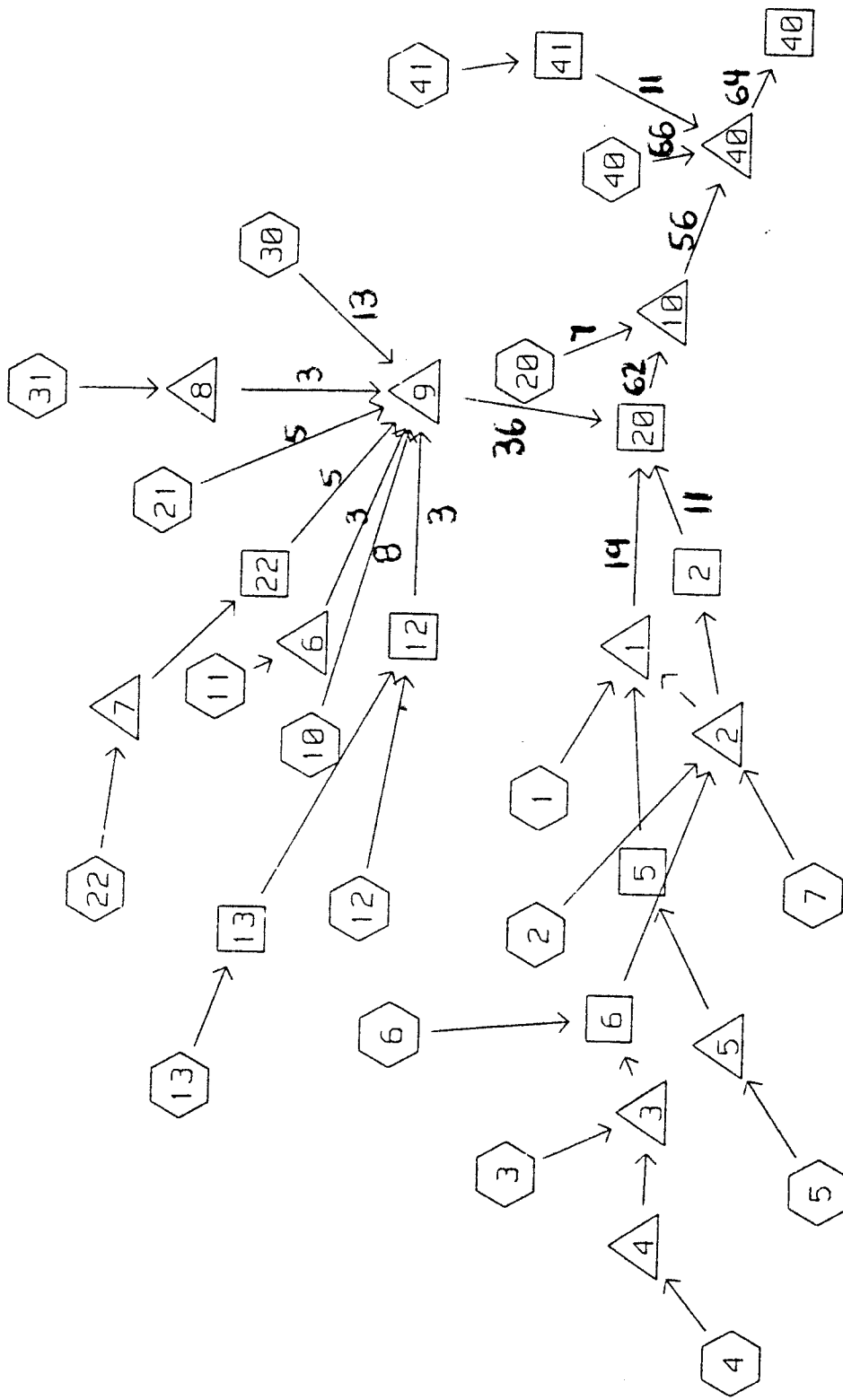
WATERSHED ROUTING





WATERSHED DELINEATION  
 SUBCATCHMENT DELINEATION  
 DRAINAGE SWALE  
 STORM DRAIN

T.JAMES HOUSTON 63518		DATE	REVISIONS RECORD/ E
	①		
	②		
	③		
	④		
	⑤		
	⑥		
	⑦		



Drainage Diagram for RT 20 DRAINAGE STUDY - EXISTING COND, 82 YR  
 Prepared by C. T. Male Associates, PC  
 HydroCAD 4.51 000410 (c) 1986-1996 Applied Microcomputer Systems

**Pond and Park @ McKIA Reservoir**

**Corridor Study Item:**

TRL-9: Redevelop McKownville Reservoir – include benches, picnic areas, walking paths suitable for a park.

**Areas of Concern:**

1. How much property is still owned by the Town/Water District?
2. What's the status of the lease(s) to Stuyvesant Plaza: ( main entrance; rear parking lot; irrigation sprinkler water supply)?
3. Future use of Filter Building?

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**Pond and Park**

**Areas of Concern: (cont'd)**

4. Use as a "fill and draw" stormwater retention basin?
5. Effectiveness of upstream SW retention basins?
6. "Bottleneck" in stormwater drains south of Western Ave. (thru Christ Lutheran property; back of BK, etc.)
7. Impact of increased stormwater flow on downstream drainage structures (Cross St., Town of Bethlehem, etc.)
8. Impact of future Exec Park development?
9. ....

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**Park and Pond Subcommittee Activities:**

1. Walked reservoir property.
2. Discussed stormwater concerns w/ NYSDOT Alb Co Resident Engineer (telcon 1/28/03): Their concern "ends" at the south end of the Box culvert under Western Ave. They acknowledge the restriction in the downstream culverts.
3. Discussed pond and drainage concerns w/ W. West, Supt of Water and Sewers (mtg 1/29/03); reviewed available property maps; awaiting available stormwater study.
4. Inquired of D. Cropsey (telcon 1/29/03) re status of leases or sales to Stuyvesant Plaza of W.D. property. Status uncertain; DC to confirm.

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