The electronic version of this file/report should have the file name:

Type of document.Spill Number.Year-Month.File *Year-Year* or Report name.pdf

letter._______________.________-______.File spillfile____.pdf

report.hw915146_____.2001___-09-27 INTERIM REMEDIAL.pdf
DESIGN - RECOMMENDED ALTERNATIVE

Project Site numbers will be proceeded by the following:

Municipal Brownfields - b
Superfund - hw
Spills - sp
ERP - e
VCP - v
BCP - c

non-releasable - put .nf.pdf
Example: letter.sp9875693.1998-01.Filespillfile.nf.pdf

New York State Department of Environmental Conservation
625 Broadway, Albany, New York 12233-7017

Erin M. Crotty
Commissioner

TRANSMITTAL MEMORANDUM

RECEIVED
OCT 1 8 2001
NYSDEC - REG. 9
FOIL
_REL _UNREL

TO: Distribution

FROM: Jim Moras
Remedial Section B, Bureau of Western Remedial Action
Division of Hazardous Waste Remediation

RE: **Site Name/ID No.** **Niagara Transformer, Erie County, Site No. 9-15-146**

DATE: October 15, 2001

Please find ☒ attached ☐ under separate cover the following document(s) regarding the subject site:

- ☐ Scope of Work: ________
- ☐ Work Plan: ________
- ☐ RI Report:: ________
- ☐ FS Report: ________
- ☐ Design Documents: ________
- ☐ QAPP: ________
- ☐ PRAP: ________
- ☐ ROD: ________
- ☐ Our Comments Regarding: ________
- ☒ Other: Final Design Analysis Letter Reports.

These are transmitted:

- ☐ For your review/approval. Please provide written comments by ________.
- ☒ For your information/records.

If you have any questions or need additional information, please call ☒ me or ☐ ________ at 518-402-9671.

Remarks: ________

Attachment(s)

Distribution: D. Locey, Region 9
M. Cruden, BCS
C. Dowd, DF&W
C. O'Connor, NYSDOH - Buffalo

ecology and environment engineering, p.c.

BUFFALO CORPORATE CENTER
368 Pleasant View Drive, Lancaster, New York 14086
Tel: 716/684-8060, Fax: 716/684-0844

OCT 1 2001

September 27, 2001

James A. Moras
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7017

Re: **Niagara Transformer Corporation Site No. 9-15-146**
Interim Remedial Design – Task 2 Recommended Alternative
Work Assignment #D003493-28

Ecology & Environment Engineering, P.C., (E & E) was retained by the New York State Department of Environmental Conservation (NYSDEC) under the Standby Contract Assignment No. #D003493-28 to complete Interim Remedial Measure (IRM) design services at the above-referenced site. Three technical memorandums were submitted previously evaluating various alternatives for the IRM. However, the alternatives were limited in scope to specific design elements. The objective of this memorandum is to provide the overall recommended IRM for the site, based on the alternative evaluation completed for the three design elements identified in the Work Plan, and discussions with DEC. The primary objectives of the three design elements as identified in the Work Plan are presented below:

- Reduce the potential for preferential contaminant migration along the existing storm sewer trench material, and infiltration into the storm sewer pipe
- Mitigation of risks associated with surficial PCB contamination in the North/South (N/S) and East/West (E/W) ditches
- Minimize the potential for future contaminant migration into the storm water management system located south of the NTC site

This IRM does not directly address source areas known to exist at the site. This IRM focuses on limiting the potential for migration from source areas and mitigation of risks by eliminating the pathway.

The recommended IRM includes several aspects of the alternatives previously evaluated and consists of the following primary components:

1. Abandon the existing storm sewer system
2. Provide a near-surface storm water collection system
3. Stabilize suspected source area
4. Construct a shallow cut-off wall along the perimeter of the NTC south parking lot
5. Install a storm sewer pipe in the N/S ditch
6. Install a storm sewer pipe in a portion of the E/W ditch
7. Groundwater Monitoring

A brief description of each of the above components is presented below. More detailed descriptions of the components is provided in the design letter reports submitted to DEC under separate covers. The effectiveness, implementability, and cost of the overall IRM for the site are also discussed below. The specifics of pipe sizes, slopes, alignments, and material will be developed during the design stage, following a topographic survey of the N/S and E/W ditches. Preliminary sizing has been completed for purposes of estimating costs.

1. Abandon Existing Storm Sewer System

The existing storm sewer system will be abandoned by installing subsurface dams and grouting the storm sewer pipes. The dams will be constructed of a dry bentonite/sand mixture (10% bentonite: 90% sand) and will extend from beneath the pipe bedding material to the bottom of the pavement. The dry mixture will be directly placed and spread around the pipe, so when hydrated, the bentonite will swell and occupy the pore spaces forming a tight seal around the pipe. When hydrated, the permeability of the mixture has been reported on the order of $1x10^{-9}$ cm/s. The storm sewer pipes will be abandoned in place by filling with a cement-based grout. The proposed locations of the dams are shown in Figure 1.

2. Near Surface Collection of Storm Water

The purpose of the collection system will be to convey storm water off-site, and to isolate surface water runoff from potentially high groundwater levels. To achieve this, storm water runoff from the parking lot south of the main NTC building will be collected in a slotted drainpipe located at the center of the parking lot adjacent to CB B. For the roof water, the existing roof drain located at the center south wall will be re-routed and tied into the existing roof drain along the southwest corner of the building. A new subsurface 12-inch pipe running parallel to the property fence will then direct the roof water to the south and then east to a new catch basin (see Figure 1). The new 12-inch pipe will be installed adjacent to existing hydraulic lines that run from the tank farm to the main NTC building. The roof drains along the east wall of the building would be piped across the driveway to the east, and then combined to a single 12-inch pipe that would discharge to a new catch basin just upstream of the N/S ditch. Finally, a 12-inch pipe extending from CB C to the grassy area at the eastern edge of the driveway, and then running parallel to the east wall of the building will be used to direct surface runoff from the driveway area east of the NTC building. This pipe will then be tied into the roof drain pipe which will eventually discharge into a new catch basin just upstream of the N/S ditch. Figure 1 presents a schematic of the storm system components.

Existing pipes leading to CB B will be cut and pipe ends will be covered with filter fabric. The catch basin grate will be replaced with a manhole cover. The catch basin will be used to monitor water levels beneath the pavement and facilitate removal if necessary.

E & E contacted slotted pipe vendors with respect to the potential of freezing. One manufacturer (Contech) indicated that the slotted pipe is encased in concrete, thus reducing the potential for freezing. The pipes are commonly used in Western New York including the Buffalo/Niagara International Airport.

Although pipe slopes and inverts will be developed during design, it is understood that storm pipes in the parking area are to be kept as shallow as possible to maintain separation from groundwater. Encasing the slotted drain pipes with concrete will help maintain this separation. The storm sewer pipes along the perimeter of the parking lot will be buried with a minimal cover to prevent freezing. Existing storm sewer pipes in the parking lot are estimated to have a minimum cover of 1 to 2 feet, and no freezing problems have been reported. A minimum cover of 1.5 feet will be used during design. The perimeter pipes will be located outside the shallow cut-off wall (see component 4 below) to help prevent contact with water potentially migrating in the parking lot base course. The pipes will have watertight joints to minimize infiltration, and will be underlain with a sand-bentonite bedding mix to prevent potential groundwater migration along the pipe bedding material.

3. Stabilizing Suspected Source Area

This task involves pressure grouting beneath a 225 square-foot portion of the loading dock area, suspected of providing a significant source of PCB release at the site. The cement grout would be injected into the subsurface through 2-inch temporary boreholes located inside the NTC building. Although this area does not represent all of the source area, it is anticipated that this action will immobilize a significant portion of the contamination.

4. Construct Shallow Cut-Off Wall along the Perimeter of the NTC South Parking Lot

The objective of this cut-off wall would be to contain contaminated groundwater, that could potentially reach the pavement's stone sub-base layer due to elimination of existing drainage pathways, from migrating downstream to on and off-site locations. The 6-inch wide cut-off wall would be constructed of bentonite/sand mixture through the base course, assumed at a depth of 12-inches below the pavement. The wall will be tied into the underlying soil, at a depth of 24-inches below the bottom of the pavement. The wall would be located along the perimeter of the parking lot as shown in Figure 1. In the case of groundwater levels reaching the base course, the bentonite will hydrate and fill the void spaces, thus prevent downstream migration of contaminants through the pavement sub-base.

5. Installation of storm sewer pipe in the North/South (N/S) ditch

A new 24-inch storm sewer pipe would be installed along the entire length of the N/S ditch (approximately 325 feet), with ditch sediment concentrations below 15 mg/kg total PCBs buried in place (based on DEC correspondence, August 26, 2001). Contaminated sediments (above 15 mg/kg) at the outfall of the N/S will be excavated and disposed of at an appropriate off-site facility. The pipe would be installed on top of 6-inches of low-permeability bedding material, with an additional 12-inches of low-permeability backfill placed over the pipe. Low-permeability dams would also be installed along the N/S ditch pipe to help prevent potential contaminant migration through the more permeable buried contaminated stone layer left in place. The upstream end of the new storm sewer would be directly connected to a new shallow catch basin just upstream of the existing ditch outfall. The downstream end of the pipe will be tied into a shallow manhole at the confluence with E/W ditch.

6. Installation of a storm sewer pipe in along a portion of the E/W ditch

It is suspected that subsurface contamination exists in isolated locations adjacent to the E/W ditch between the N/S ditch confluence to St. Mary's Cemetery's east property line. There is potential that groundwater from the contaminated locations seeps into the E/W ditch. To minimize contaminant migration into and along the E/W ditch, a 24-inch diameter storm sewer pipe between the N/S ditch confluence to St. Mary's Cemetery's east property line would be installed. The pipe was sized for a peak flow of 27 cubic feet per second (cfs) as shown in Attachment A. Contaminated sediment in the E/W ditch below 15 mg/kg total PCBs would be buried in place under the pipe. The pipe bedding and cover will consist of a low-permeable fill. The upstream end of the pipe will be tied into a manhole that joins both the N/S and E/W ditch pipes. A headwall and a 24-inch culvert in the E/W, just upstream of the manhole, would direct storm water from upstream drainage areas into the manhole and eventually through the E/W ditch pipe.

The proposed pipe would convey storm water from areas upstream and past the suspected areas of subsurface contamination. The pipe will be covered with soil and graded to direct surface runoff, flowing south from the NTC site and St. Adalbert's Cemetery, to the retention pond. Low-permeability dams will also be installed along the new pipe run to eliminate potential contaminant migration along the more permeable buried ditch material.

7. Groundwater Monitoring

Two issues that warrant and require monitoring following construction:

i) **Base course groundwater**: Presently, it is suspected that groundwater is drained from the building source area and paved parking lot by the storm water pipe trenches. By eliminating this drainage pathway, it is possible for groundwater to accumulate and mound in these areas. Mounding of groundwater to the point the pavement base course becomes saturated will jeopardize the pavement's integrity because of freeze-thaw damage. Note that in the absence of any other sources of water, groundwater should move in and out of this area at equal rates, since generally similar hydraulic conditions are expected upgradient and downgradient. Groundwater levels may be monitored in MW-OUT, MW-IN, and CB B. In addition, should dewatering be necessary, this maybe done from the catch basin.

ii) **Railyard Groundwater Contamination**: E & E 2000 additional investigation indicated that groundwater from the site discharges into the E/W ditch during wet periods. The water then travels west along the E/W ditch towards the retention pond. Replacing the ditch with a watertight pipe will prevent this migration, however groundwater migration further south is possible. Two monitoring wells will be installed on the south side of the rail yard to allow monitoring of groundwater in this area.

Effectiveness

It is important to recognize that the recommended IRM does not address the suspected source areas, nor can these areas be reasonably addressed through current technologies. Therefore, the potential will remain for re-contamination and future exposure. This IRM is intended to reduce the potential for migration from the source areas and mitigate current known risks. The components of the IRM together represent a pragmatic approach to achieve this objective. Based on what is known about the site, continued monitoring is recommended to allow timely knowledge of contamination levels at the site.

Abandoning the existing storm sewer system and installing low-permeability clay dams should be effective in eliminating the preferential pathway for contaminant migration from the suspected source area along the trench material. Although the entire trench length is not replaced with the low-permeability material, the dam construction material will have a hydraulic conductivity several orders of magnitude lower than the surrounding material, therefore significantly reducing the likelihood of direct contaminant migration along these routes. In addition, grouting a portion of the suspected source area under the loading dock in the main NTC building, will help in stabilizing the contamination and in minimizing intermittent slug release of PCBs that may travel along the existing trench material. Finally, since groundwater contamination was observed in the perched aquifer during the E & E 2000 investigation, eliminating the relatively deeper subsurface storm sewers would be effective in reducing the potential for groundwater infiltration to be a continual source of PCB release at the site.

The shallow cut-off wall constructed of the bentonite/sand mixture would help in preventing potentially contaminated groundwater travelling through the base course from migrating to downgradient areas. Storm water piping will be located outside the cut-off wall to help separate storm water piping and potentially contaminated groundwater in the parking lot. Groundwater under the pavement could be monitored, and if needed removed, at CB B to evaluate whether significant groundwater accumulation in the base course occurs.

The installation of a relatively shallow storm water collection system as described in component 2 above to replace the existing system would be effective in isolating storm water runoff from potentially high groundwater levels, and in limiting contact of storm water with potential areas of subsurface contamination. The new storm sewer system would provide drainage of storm water away from suspected areas of contamination and into the N/S drainage ditch. Since the new system also separates the roof water from surface runoff before discharge into the N/S ditch, the roof water, found to have low PCB levels during the E & E 2000 investigation, could be easily monitored and sampled. Based on discussion with vendors, freezing problems with the shallow system installation are not anticipated, since the slotted drain-pipes are embedded in concrete.

Discharge from the new on-site storm water system would be discharged into a 24-inch pipe in the N/S ditch. Removal and disposal of highly contaminated ditch material, and burial of the remaining contaminated ditch material under the pipe would be effective in eliminating exposure pathways associated with surficial PCB contamination. Installing a new watertight storm sewer in place of the N/S ditch would limit the potential groundwater infiltration.

Finally, installing a storm sewer pipe along portions of the E/W ditch would be effective in transporting upgradient storm water past the suspected areas of subsurface contamination in the E/W ditch without significant risk of infiltration and exfiltration. Contaminated sediments in the E/W ditch below the 15 mg/kg would be buried in place and overlaid by the pipe. This would also eliminate exposure pathways associated with surficial PCB contamination in the ditch. Although the new storm pipe does not directly address the suspected source areas along the E/W ditch, filling in the ditch with low-permeable fill would limit the ditch from being a groundwater discharge point during wet periods. Groundwater monitoring may be completed to verify that migration is not occurring to the south.

Implementability

The components of the recommended IRM for the site, as presented above, are readily implementable using standard construction methods. Handling of contaminated material during the construction work would require health and safety measures to protect workers and the surrounding areas. The contractor would also be required to maintain site drainage during construction to protect surrounding facilities, especially when abandoning and installing the new system. If contaminated water is encountered, the existing emergency water treatment system could be used to treat the water prior to discharge.

Interruption to NTC operations is anticipated during implementation of some of the recommended IRM components. Although the work could be sequenced to minimize service interruptions to NTC, close coordination with NTC will still be required to maintain NTC operations especially for work to be completed inside or adjacent to the main NTC building.

Coordination will also be required with Conrail and St. Adalbert's Cemetery when installing the storm sewer pipe along the E/W ditch.

E & E anticipates the overall IRM to be completed in 3-4 months, assuming proper coordination with NTC and access to the NTC main building when needed. For a portion of the work, two shifts maybe required to minimize any downtime for the NTC facility.

Cost

The total estimated construction cost for the recommended IRM at the site including a 20% contingency is $226,800. Table 1 presents the cost breakdown of the IRM components. Detailed cost estimates for each individual component are also provided with this submittal. This cost does not include monitoring at the site that DEC may require following implemetation of the IRM. Although HDPE piping has been assumed for the various storm sewer piping, other pipe material and joints will be evaluated during the final design as a more feasible alternative. The pipe sizes and alignment will also be re-evaluated in the final design based on required slopes and design objectives, and following the N/S and E/W ditch survey to be completed in October 2001.

If you have any questions regarding this document, please do not hesitate to call me at (716) 684-8060.

Sincerely,

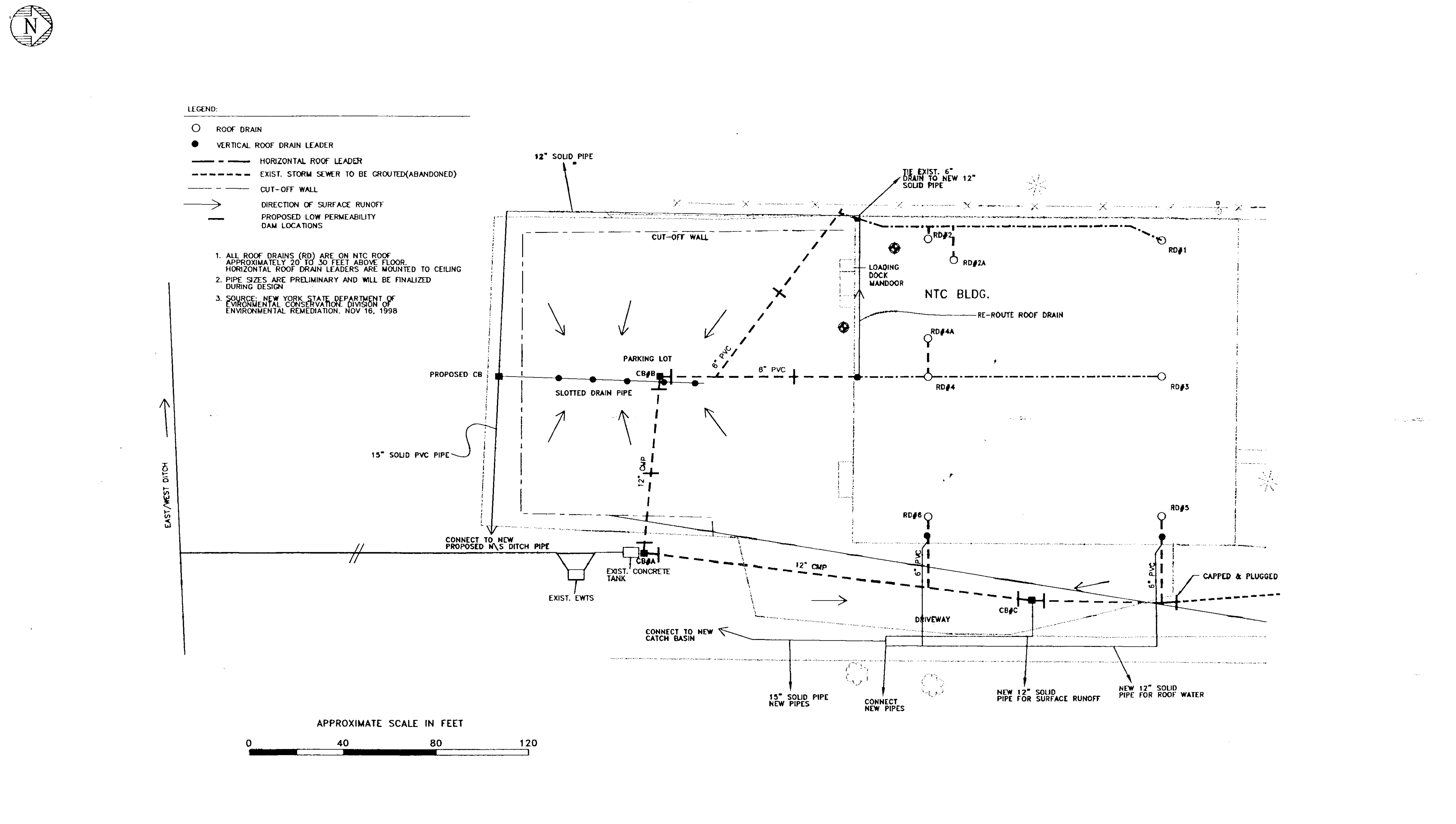
Stephen Blair, P.E.

Attachments:
A – Hydrologic Analysis
B – Detailed Cost Estimates

cc: Wadie Kawar (E & E)

Table 1
Proposed Alternative Cost Summary

Item	Comments	Units	No. Units	Cost
Abandon Existing Storm Sewer System - Grout Storm Sewer Pipes and Install Low-Permeability Dams		LS	1	$13,300
Near Surface Storm Water Collection System		LS	1	$48,500
Cement-Grout Suspected Source Area		LS	1	$5,500
Cut-Off Wall Construction		LS	1	$7,040
Install Storm Sewer Pipe in N/S ditch	Approximately 325 ft	LS	1	$41,600
Install Storm Sewer Pipe in E/W ditch	Approximately 500 ft	LS	1	$53,400
Groundwater Monitoring	2 Shallow Wells - 10 feet	LS	1	$2,500
Subtotal				**$171,800**
Total Capital Cost				$171,800
Mobilization/Demobilization	Assume 10% of total capital cost			$17,200
Contingency 20%				$37,800
Total Construction Cost				**$226,800**



NO.	DATE	DWN	APP'D	DESCRIPTION
				REVISIONS

ecology and environment engineering, p.c.
International Specialists in the Environment

DESIGNED BY	CHECKED BY
	D. ALBERS/W. KAWAR
DRAWN BY	APPROVED BY
K. KRAJEWSKI	W. KAWAR

FIGURE 1: PROPOSED NEAR SURFACE STORMWATER COLLECTION SYSTEM

SCALE	DATE ISSUED	C.A.D. FILE NO.	DRAWING NO.	REV.
1" = 40'	9/01	NTFIG1B	FIG 1-1	

ATTACHMENT A

F0350793

ecology and environment, inc.

General Computation Sheet

Calculation Set No.	
Preliminary	☐
Final	☐
Void	☐
Sheet 1 of ___	Project No.

Name of Project NTC IRM System ________

Subject Runoff Quantities

Rev.	Completed By	Checked By
	Initials: JPW 6/5/01	Initials: WJK 7/12/01
	Initials: / /	Initials: / /

Objective: Calculate peak discharge for addressing NTC stormwater runoff.

References:
1. Lindeburg, "Civil Engineering Reference Manual"
2. Chow "Handbook of Applied Hydrology"
3. M. Morgante calc file, circa 1994-1995
4. NYS GIS Clearinghouse, www.nysgis.state.ny.us
5. NTC Remedial Design Dwgs, E&E, 1995
6. Wanielista, "Hydrology, Water Quantity and Quality Control" 1997

General Assumptions:
1. Design based on 10yr return period
2. Rational method is an appropriate method for estimating peak discharges because of relatively small drainage areas, no hydrograph requirement, and urban setting.

$$Q = CiA$$

F0350793

ecology and environment, inc.

General Computation Sheet

Calculation Set No.
Preliminary ☐
Final ☐
Void ☐

Sheet 2 of ___ Project No.

Name of Project NTC IRM System ___

Subject Runoff Quantities

Rev.	Completed By		Checked By	
	Initials:	/ /	Initials:	/ /
	Initials:	/ /	Initials:	/ /

SEE SHEETS 6-8 FOR REFERENCE DWGS

AREA #1 - FLOW TO PROPOSED E/W CULVERT INLET

PROPERTY	AREA	DESCRIPTION	C (REF 1)
8	2.4 AC	BUILDING AND PARKING	0.85
7	2.5 AC	1/2 BUILDING/PARK 1/2 UNIMPROVED	0.85 (1.25 AC) 0.3 (1.25 AC)
6.2	1.5 AC	UNIMPROVED	0.3
6.1	~1/2 (3.2 AC)	UNIMPROVED	0.3
	8.0 AC		$\bar{C} = 0.55$

DESCRIPTION BASED ON E&E OBSERVATIONS AND REF (4)

TIME OF CONCENTRATIONS: MANY METHODS ARE AVAILABLE. REF (2) AND (6) WERE REVIEWED AND TRIAL CALCULATIONS WERE PERFORMED. THE BRANSBY WILLIAMS FORMULA SEEMED TO PROVIDE AN AVG. VALUE OF THE DIFFERENT METHODS.

BRANSBY WILLIAMS EQUATION, $t_c = 21.3 L \frac{1}{A^{0.1} S^{0.2}}$

L = LENGTH OF CHANNEL FROM DIVIDE TO OUTLET, mi

A = DRAINAGE AREA, mi^2

S = AVG. SLOPE, ft/ft

$L = 880 ft = 0.167 mi$

$A = 8 AC = 0.0125 mi^2$

$S = \frac{\Delta H}{L} = \frac{(659' - 643')}{880'} = 0.0182 ft/ft$

EL 659' - NE CORNER OF LOT 8

EL 643' - INV OF E/W DITCH: SOUTH END OF LOT 6.1.1

$t_c = 12.3 min$

F0350793

ecology and environment, inc.

General Computation Sheet

Calculation Set No.	
Preliminary ☐	
Final ☐	
Void ☐	
Sheet 3 of ___	Project No.

Name of Project NTC IRM System ______

Subject Runoff Quantities

Rev.	Completed By	Checked By
	Initials: / /	Initials: / /
	Initials: / /	Initials: / /

FROM: BUFFALO, N.Y. IDF CURVE

$F = 10.42$, $D = 12.3\text{ MIN}$ } $i = 3.95\text{ IN/HR}$

RATIONAL METHOD $Q = CiA$

$Q = CiA = 0.55(3.95\text{ IN/HR})\, 8\text{ AC} = 17.4\text{ cfs}$

FLOW TO PROPOSED CULVERT INLET FOR N/S DITCH

ITEM	AREA, AC	DESCRIPTION	C	
N. PLOT	151'×175' 0.60	BLDGS		
LG. BLDG	130×165 0.50			
S. PLOT	160'×145 0.53	ASPHALT		
SM BLDG	35'×125 0.10	PARKING		
ASPHALT DRIVE	40'×335' 0.33			
	2.06 AC		0.85	$\bar{C} = \frac{\Sigma CA}{A_{TOTAL}}$
LOT 6.1	1.4 AC	UNIMPROVED	0.30	
A_{TOT}	3.46 AC			$\bar{C} = 0.63$

t_c CALCULATIONS $L = 614' = 0.1163$

$H = 659 - 647' = 12'$ $S = 0.0195\text{ ft/ft}$

$A = 3.46\text{ ac} = 0.0054\text{ mi}^2$

$\therefore t_c = 9.2\text{ MIN}$

$\therefore i = 4.5\text{ IN/HR}$

F0350793

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General Computation Sheet

Calculation Set No.			
Preliminary ☐			
Final ☐			
Void ☐			
Sheet 4 of ___		Project No.	
Rev.	Completed By		Checked By
	Initials: SBW 6/6/01		Initials: WIK 7/2/01
	Initials: / /		Initials: / /

Name of Project: NTC IRM System: ___

Subject: Runoff Quantities

$Q_{10} = 0.63(4.5 \text{ in/hr})(3.46 \text{ ac}) = \boxed{9.8 \text{ cfs}}$

Peak Q below confluence of E area & NTC area

@ junction E area $t_c = 12.3$ min

NTC area $t_c = 9.2 + 2.5$ min $= 11.7$ min

Assume: vel in pipe = 2 fps

pipe length = 300' $\therefore t_c = \frac{L}{V \times 60} = \frac{300'}{2 \frac{ft}{sec} \times 60 \frac{sec}{min}} = 2.5$ min

$\therefore$ use $t_c = 12.3$ min (larger of two t_c)

10 yr $i = 3.95$ in/hr

Add: SW corner of lot 6.1 $C = 0.3$ $A = 0.38$ ac

$\bar{C} = \frac{(0.3)(0.38 \text{ ac}) + (0.55)(8 \text{ ac}) + (0.63)(3.46 \text{ ac})}{(0.38 \text{ ac} + 8 \text{ ac} + 3.46 \text{ ac})}$

$\bar{C} = 0.57$

$A_{TOT} = 11.84$ ac

$Q_{10} = (0.57)(3.95 \text{ in/hr})(11.84 \text{ ac}) = \boxed{26.7 \text{ cfs}}$

02:000523/DW02_00_90_06-B0045
Fig 2-1.CDR-10/5/98-GRA

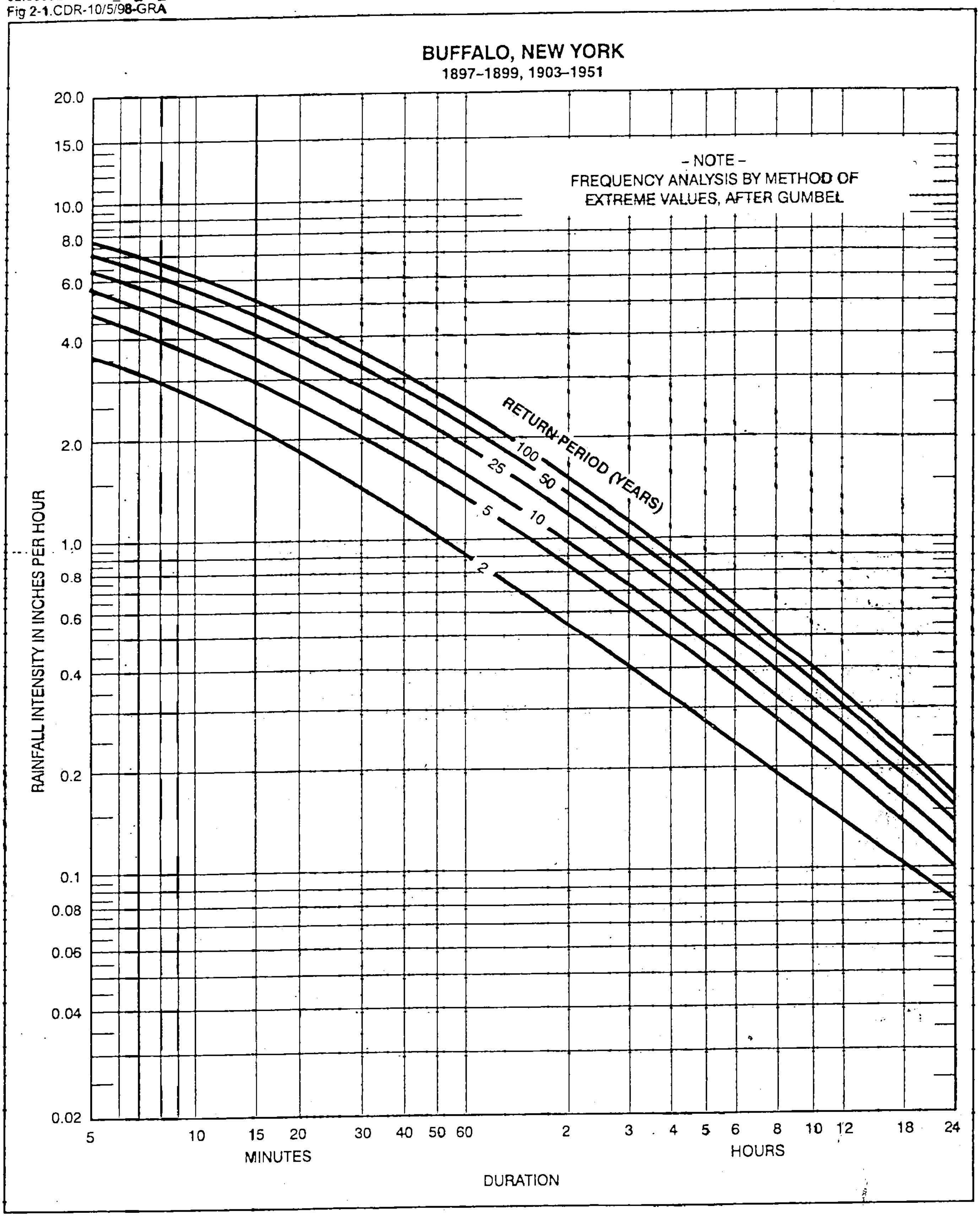
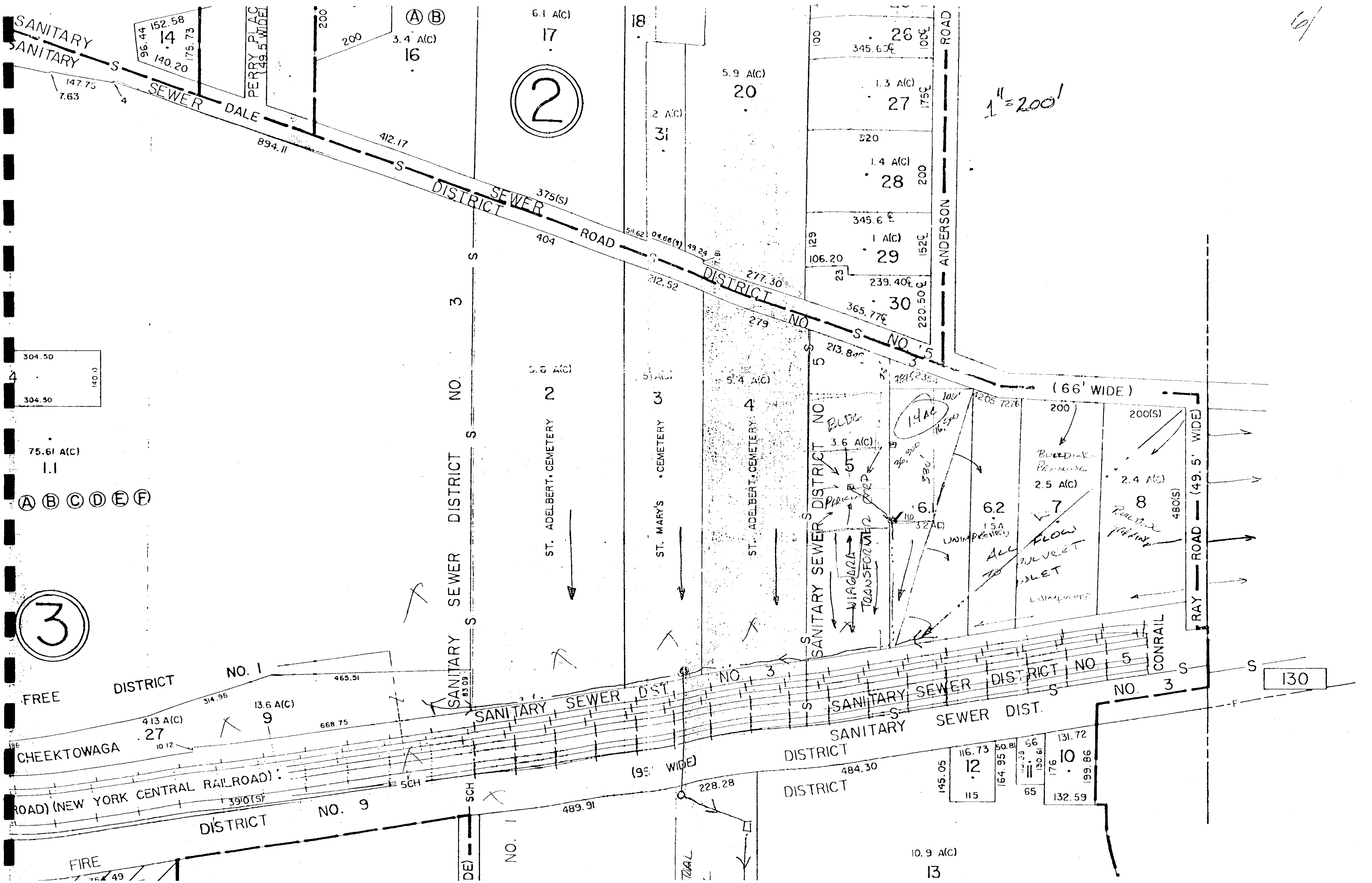
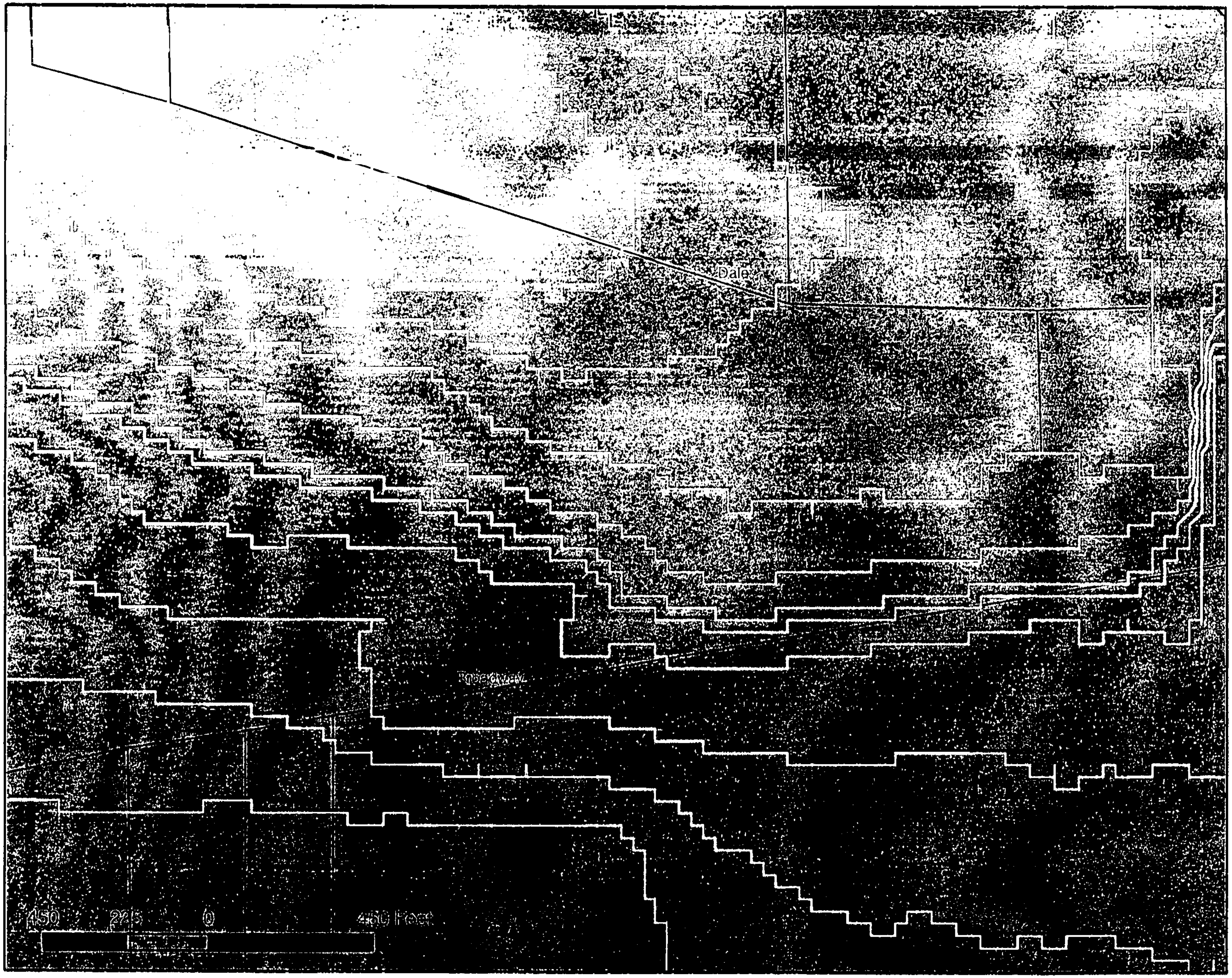


Figure 2-1 INTENSITY DURATION FREQUENCY CURVE



SANITARY SEWER DISTRICT NO. 5
DALE ROAD
ANDERSON ROAD
(66' WIDE)
RAY ROAD (49.5' WIDE)
PERRY PLACE (49.5' WIDE)
SANITARY SEWER DISTRICT NO. 3
ST. ADELBERT CEMETERY
ST. MARY'S CEMETERY
NIAGARA TRANSFORMER CORP
CONRAIL
SANITARY SEWER DISTRICT NO. 5
SANITARY SEWER DIST. NO. 3
SANITARY SEWER DISTRICT
FREE DISTRICT NO. 1
CHEEKTOWAGA
(NEW YORK CENTRAL RAILROAD)
DISTRICT NO. 9
FIRE
(99' WIDE)
75.61 A(C)
1.1
13.6 A(C)
9
4.13 A(C)
27
6.1 A(C)
17
3.4 A(C)
16
14
5.9 A(C)
20
31
1.3 A(C)
27
1.4 A(C)
28
1 A(C)
29
30
26
5.4 A(C)
4
2
3
3.6 A(C)
5
6.1
6.2
2.5 A(C)
7
2.4 A(C)
8
10.9 A(C)
13
12
11
10
130
2
3
1"=200'
61

BUFFALO NE, N. Y


Dale
Broadway
450 225 0 450 Feet

ATTACHMENT B

Table 3
Alternative 1.3: Grout Storm Sewer Pipes and Install Low-Permeability Dams

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Clay Dam Construction						
Paved parking area, saw cutting	Assume 10" depth	LF	180	$5.10	$918	02225-760-0010/0020
Pavement removal	24 SF per Clay Dam - 9 total dams	SY	24	$5.85	$140	02220-875-1750
Traffic control	Avg. Laborer	WK	1	$1,525.00	$1,525	01310-700-0160
Excavation	Assume 6' W, 3' D, 1/2 CY Loader/backhoe	CY	27	$3.57	$96	02315-900-0090
Bentonite/Sand Mixture - Ready Mix Delivered to Site	~3 cy per dam	CY	27	$105.00	$2,835	Vendor Quote
Backfill/Compact w/ Vibrating Plate		CY	27	$2.33	$63	17-03-0415 (ECHOS)
Bentonite Grout for Storm Sewers	incl. 50% for Labor	CF	250	$10.65	$2,663	33-23-1801 (ECHOS)
Dewatering - trash pump 8 hr operation		Day	3	131	$393	02240-500-0600
Holding Tank-Rental		Day	4	$45.00	$180	Vendor Quote
Delivery and Pickup of Tank		LS	1	$500.00	$500	Vendor Quote
Paving Restoration-6" thick		SY	24	$48.00	$1,152	02740-300-1080
Subtotal					$10,500	
Characterization and Disposal of Excav. Material						
PCB Analysis - Soil	Assume 2 samples	EA	2	$100.00	$200	Eng. Estimate
Transportation & Disposal of Non-Hazardous Cont. Trench Material	Assume Excav Trench material is Non-Hazardous (<50 ppm), 1.3 ton/cy	Ton	35	$75.00	$2,625	Eng. Estimate - Based on historical site cost
Subtotal					$2,800	
Total Capital Cost					$13,300	
Mobilization/Demobilization	Assume 5% of total capital cost				$700	
Contingency 20%					$2,800	
Total Construction Cost					$16,800	

Notes
1. Reference: RS MEANS "Site Works & Landscape, 2001"
2. No cost is included for fixing the 12"CMP pipe section between CB#A and B
3. Assume excavated trench material is non-hazardous

Table 5
Alternative 2.2 - Near Surface Storm Water Collection System

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Regrading Parking Lot						
Scarify existing pavement	10% parking lot area	SY	240	$1.00	$240	Engineer's Estimate
Asphalt pavement, 2" wearing course	10% parking lot area	SY	240	$4.36	$1,046	ref 1, 02740-300-0380
Asphalt pavement, 1-1/2" binding course	10% parking lot area	SY	240	$2.82	$677	ref 1, 02740-300-0080
Subtotal					$2,000	
Stormwater Collection System						
Modify roof drain Inside NTC Building		LS	1	$2,500.00	$2,500	Eng Estimate
Modify roof drain outside NTC Building	access road drains to road surface	LS	3	$1,500.00	$4,500	Eng Estimate
pavement saw cut for trench	avg 5" depth	LF	700	$2.43	$1,701	ref 1, 02225-760-0010 & 0020
Pavement removal	3 foot trench width, 350'	SY	120	$6.49	$779	ref 1, 02220-875-1750
Disposal of pavement	off-site CD landfill	CY	20	$12.15	$243	ref 1, 02220-875-5600
Trench Excavation	Assume 870', Avg. 2' D, 3'W	CY	195	$5.87	$1,145	ref 1, 02300-900-0050
12" PVC solid pipe		LF	500	$9.94	$4,970	ref 1, 02500-780-2160
15" PVC solid pipe		LF	300	$19.62	$5,886	ref1, 02500-780-2200
Bentonite/Sand Mixture For Bedding - Ready Mix Delivered to Site		CY	30	$105.00	$3,150	Vendor Quote
Off-Site fill incl. Loading	Assume 4	CY	145	$8.85	$1,283	02315-xxx-4010
Hauling Backfill material to site	Use Low Permeability backfill	CY	145	$6.15	$892	02320-200-0500
slotted drain pipe, material only		LF	70	$37.50	$2,625	Agger Supply, Inc
slotted drain pipe, installation only	1 day, 2 person crew	HR	16	$83.00	$1,328	Polycast, Ref 1
Concrete backfill	slotted drain only	CY	10	$68.50	$685	ref 1, 02300-900-0050
Pavement replacement over trench	4" thick, solid pipe only	SY	80	$34.51	$2,761	ref 1, 02740-300-1050
Stabilization Fabric		SY	100	$1.13	$113	02720-200-6000
catch basin, excavation	5' x 5' x 4'	CY	8	$68.50	$548	ref 1, 02300-900-0050
catch basin, stone bedding	5' x 5' x 6"	CY	1	$26.78	$27	ref 1, 02300-900-0050
catch basin	concrete block 4' x 4'	EA	2	$953.00	$1,906	ref 1, 02300-900-0050
catch basin, flowable backfill		CY	3	$61.80	$185	ref 1, 03310-220-4300
frame and cover, 36" x 36"		EA	2	$700.00	$1,400	Eng. Estimate
topsoil	slope mix	SY	66.7	$5.77	$385	ref 1, 02920-340-3800
push spreader seed, fert & mulch	slope mix	SY	600	$1.45	$870	ref 1, 02910 & 02920
Paving Restoration-6" thick		SY	85	$48.00	$4,080	02740-300-1080
Site Cleanup		LS	1	$2,500.00	$2,500	
Subtotal					$46,500	
Total Capital Cost					$48,500	
Mobilization/Demobilization	Assume 5% of total capital cost				$2,500	
Contingency 20%					$10,200	
Total Construction Cost					$61,200	

Notes
Ref 1 - RSMeans, 2000, Heavy Construction Cost Data
All costs from 2000 RSMeans increased by 3% to account for inflation to 2001

Table 7
Alternative 3.1 - Grout Suspected Source Area

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Grouting						
Drill rig and crew		Day	2	$1,525 00	$3,050.00	02110-310-1400
Cement Grout	Assume 225 SF, 4' Deep,0.3 porosity	CF	270	$7.10	$1,917	33-23-1801 (ECHOS)
Subtotal					$5,000	
Restoration						
Conc. Slab Restoration		LS	1	$500 00	$500	
Subtotal					$500	
Total Capital Cost					$5,500	
Mobilization/Demobilization	Assume 5% of total capital cost				$300	
Contingency 20%					$1,200	
Total Construction Cost					$7,000	

Notes
Reference: RS MEANS "Site Works & Landscape, 2001"

Table 8
Alternative 3.2 - Cut-Off Bentonite Sand Wall

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Cut-Off Wall						
Paved parking area, saw cutting	Assume 10" depth	LF	730	$5 10	$3,723	02225-760-0010/0020
Pavement Removal & disposal		LS	1	$500 00	$500	Eng Estimate
Excavate w/ Chain Trencher 6" wide, 24" Deep		LF	365	$0 75	$274	022200-258-0350
Bentonite/Sand Mixture - Ready Mix Delivered to Site	6" W, 24" D ~365 CF	CY	15	$105 00	$1,575	Vendor's Quote
Subtotal					$6,080	
Restoration						
Paving Restoration-6" thick		SY	20	$48 00	$960	02740-300-1080
Subtotal					$960	
Total Capital Cost					$7,040	
Mobilization/Demobilization	Assume 5% of total capital cost				$400	
Contingency 10%					$800	
Total Construction Cost					$8,300	

Notes
Reference: RS MEANS "Site Works & Landscape, 2001"

Table 3
Alternative 3 -Installing a Storm Sewer Pipe in the N/S ditch

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Installation of New Storm Pipe in N/S						
24" HDPE Pipe		LF	325	$66.00	$21,450	02510-850-0900
Bedding Mtrl - Use Bentonite/Sand Mixture	Assume 6" on both sides of pipe + 6" below and top of pipe	CY	75	$105.00	$7,875	Vendor's Quote
Backfill/Compact w/ Vibrating Plate		CY	75	$2.33	$175	17-03-0415 (ECHOS)
Low-permeable - 6" Lifts	Incl. Delivery, spreading, compaction.	CY	275	$19.65	$5,404	33-08-0507 (ECHOS)
Furnish Topsoil, Off-Site		CY	45	$24.82	$1,117	18-05-0301 (ECHOS)
hydroseeding, incl seed, fert & mulch	slope mix	MSF	4	$48.93	$196	02920-510-4600
Bentonite/Sand Mixture - for Dam Construction	Assume 6" on both sides of pipe + 6" below and top of pipe	CY	6	$105.00	$630	Vendor's Quote
Tie-in Fittings		LS	1	$1,500.00	$1,500	Eng. Estimate
Maintain Site Drainage		LS	1	$2,500.00	$2,500	Eng. Estimate
Transportation & Disposal of Contaminated Sediment Material	Assume Non-Hazardous (<50 ppm), 40'L, 5' W,12" D, 1.3 ton/cy	Ton	10	$75.00	$750	Eng. Estimate - Based on historical site cost
Subtotal					**$41,600**	
Total Capital Cost					$41,600	
Mobilization/Demobilization	Assume 5% of total capital cost				$2,100	
Contingency 20%					**$8,800**	
Total Construction Cost					$52,500	

Notes

Reference: RS Means "Site Works & Landscape, 2001"

Table 1
Installation of Stormwater Pipe in E/W Ditch

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Pipe Installation and Site Restoration						
24" HDPE Butt-Fusion Joint Pipe		LF	500	$64.89	$32,445	02510-850-0900
HDPE wye clean outs	1 per 200 ft	EA	2	$2,086.00	$4,172	Eng. Estimate
Manhole - Pre-cast 4' x 4' deep		EA	1	$1,600.00	$1,600	A12.3-710-5820
Concrete Headwall, 24"	at east end of E/W ditch	EA	1	$2,013.65	$2,014	A12.3-750-2000
Bedding Mtrl - Use Bentonite/Sand Mixture	Assume 6" on both sides of pipe + 6" below and top of pipe	CY	80	$105.00	$8,400	Eng. Estimate (see Backup sheet)
Backfill/Compact w/ Vibrating Plate		CY	80	$2.33	$186	17-03-0415 (ECHOS)
Off-Site Low Permeable Fill 6" Lifts	Incl. Delivery, spreading, compaction.	CY	140	$19.65	$2,751	33-08-0507 (ECHOS)
Furnish Topsoil, Off-Site		CY	40	$24.82	$993	18-05-0301 (ECHOS)
hydroseeding, incl seed, fert & mulch	slope mix	MSF	3	$48.93	$147	02920-510-4600
Bentonite/Sand Mixture - for Dam Construction	Assume 6" on both sides of pipe + 6" below and top of pipe	CY	6	$105.00	$630	Vendor's Quote
Subtotal					**$53,400**	
Total Capital Cost					$53,400	
Mobilization/Demobilization	Assume 5% of total capital cost				$2,700	
Contingency 20%					$11,300	
Total Construction Cost					**$68,000**	

Notes

1. Reference - RSMeans, 2000, Heavy Construction Cost Data
2. All costs from 2000 RSMeans increased by 3% to account for inflation to 2001

ecology and environment engineering, p.c.

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September 27, 2001

James A. Moras
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7017

Re: Niagara Transformer Corporation Site No. 9-15-146
Interim Remedial Design – SubTask 2.1
Work Assignment #D003493-28

Ecology & Environment Engineering, P.C., (E & E) was retained by the New York State Department of Environmental Conservation (NYSDEC) under the Standby Contract Assignment No. D003493-28 to complete Interim Remedial Measure (IRM) design services at the above-referenced site. This letter report summarizes the results of the analysis of design alternatives for the abandonment and replacement of the current storm sewer system (Subtask 2.1 in Work Plan). The objective of this task is to reduce the potential for preferential contaminant migration along the existing NTC parking lot storm sewer trench (bedding and stone backfill) material and infiltration into the pipe. Three related subtasks are identified as part of this analysis and alternatives have been evaluated for each as follows:

1. Abandonment of Existing Storm Sewer System
   - Alternative 1.1 - Removal and disposal of the storm sewer pipes, catch basins and trench material
   - Alternative 1.2 - Grout storm sewer pipes and trench with chemical based grout
   - Alternative 1.3 – Grout storm sewer pipes and install low-permeability subsurface dams
2. Site Drainage Improvements
   - Alternative 2.1 - Replacement of existing storm sewer system with equivalent system
   - Alternative 2.2 - Near surface storm water collection system
   - Alternative 2.3 - Rehabilitating the existing storm sewer system
3. Source Stabilization
   - Alternative 3.1- Grout suspected source area
   - Alternative 3.2 – Construct shallow cut-off wall along the perimeter of the NTC south parking lot

1. Abandonment of Existing Storm Sewer System

Alternative 1.1 - Removal and Disposal of the Storm Sewer Pipes, Catch Basins and Trench Material

This alternative involves excavation, removal, and off-site disposal of the existing storm sewer pipes, catch basins, and storm sewer trench material. The storm system currently discharges to the N/S ditch. Approximately 515 linear feet of pipe, consisting of approximately 265 feet of 6-inch PVC and 250 feet of 12-inch corrugated metal pipe, would be removed from the paved parking lot and driveway south and east of the NTC building under this alternative. In addition, all three catch basins would be removed from this area.

The results of the additional investigation completed by E &E in August 2000 indicated that the maximum PCB concentration detected in the soil/sediment of the North/South (N/S) ditch was 39 mg/Kg. Because the existing storm sewer trench is suspected of providing a contaminant pathway, it is presumed that some of the trench material would also be contaminated. For purposes of this alternative and cost estimate, it is assumed that 25 percent of the trench material will be disposed off as TSCA regulated waste (PCB > 50 mg/Kg), 75 percent will be disposed of as non-hazardous waste (PCB >10 mg/Kg). Approximately 290 cubic yards of trench material is estimated to require off-site disposal. Characterizing of the trench material is included in the cost estimate below. E & E assumed that all water collected during construction would be temporarily stored in a holding tank, and then pumped through the existing on-site emergency treatment system (carbon-system). Dewatering costs were also included in the cost estimate. The existing aggregate base course would be used for restoring the pavement area, with additional off-site backfill material brought to the site as needed. Site drainage modifications and restoration is covered under the Site Drainage Improvements section.

<u>Effectiveness:</u> Removing and disposing of the existing storm sewer pipe and trench material, and replacing it with a less permeable clean backfill, would be effective in eliminating the preferential pathway for contaminant migration along the entire length of the trench. Field verification and quality control in this alternative would also help ensure that the existing migration pathways have been removed.

<u>Implementability:</u> Although this alternative is readily implementable using standard construction methods, trench excavation and pipe removal in the parking lot and driveway will cause significant interruption to NTC operations. Coordination with NTC will be needed to ensure minimum service interruption. Handling of contaminated material will also require health and safety measures by the contractor to protect the workers and surrounding areas. Finally, site drainage will need to be maintained during construction and pipe removal. E & E anticipates this work be performed during a 2-3 week period, however a second shift maybe needed. From a constructability perspective, this alternative is considered most effective of the three abandonment alternatives considered because the entire drainage system would be physically removed and replaced. Inspectors will be able to visually verify the installation of backfill, helping to ensure it is installed properly. However, from a logistics point of view this alternative is considered the most difficult of the options considered due to the intrusive nature of the work and the service interruptions to NTC.

<u>Cost:</u> The estimated construction cost for implementing this alternative is $73,700, which includes $42,300 for off-site disposal. Table 1 presents details of this alternative's cost estimate. This cost does not include replacement of the storm sewer pipe or site restoration since this cost is included the site drainage improvement alternatives (See Site Drainage Improvement section).

Alternative 1.2 – Grout Storm Sewer Pipes and Trench with Chemical Based Grout

This alternative involves abandoning the existing storm system by pressure grouting the storm sewer pipes and trench material. All storm sewer pipes would be filled with a cement-based grout. A water reactive chemical grout would be used for the trench and bedding material. To inject the grout into the pipe bedding material, the "Direct Push" method would be used to install temporary 2-inch boreholes at a depth of 2 to 3 feet along the pipe run. Spacing of the boreholes and the number of the boreholes needed would vary depending on subsurface conditions and how easily the grout will flow through the bedding material. Discussions with chemical grout vendors and contractors indicate that injection points could be needed every 1 to 2 feet apart depending on site conditions. Assuming a void ratio of 0.3, E & E estimated that 2,250 cubic feet of void space in the trench material would be grouted, and 250 cubic feet for the existing storm sewers. These quantities may vary, however, according to site conditions and permeability of the trench material.

<u>Effectiveness:</u> This alternative may be effective in eliminating the preferential pathway along the pipe trench material, assuming a tight seal could be achieved around the pipe. Because of the uncertainty in achieving a complete seal during injection, field verification would be needed to ensure that the grout completely surrounds the pipe and fills the void spaces in the trench material. Alternatively, a test area for injection prior to starting the work could be used to evaluate the procedures for grouting the trench material void spaces.

<u>Implementability:</u> This alternative would be readily implementable. Interruption to NTC operations would be expected, but could be minimized if the work is performed in sections. The extent of pavement removal and the number of boreholes will depend on how easily the grout material fills the trench material voids. Site drainage will need to be maintained during implementation as the storm system is being abandoned. E & E anticipates this work to be performed during a 6-8 week period. From a constructability point of view, it will be difficult to attain acceptable assurance that the injected grout has filled all the trench pore space without extensive post construction, intrusive verification. Although this alternative does not involve extensive excavation in the parking area, the period of performance is 3 to 4 times longer than Alternative 1.1, which may be difficult logistically due to the operations of NTC.

<u>Cost:</u> The estimated cost of abandoning the existing sewer system by grouting is $131,000. E & E assumed that temporary boreholes would be placed 1.5 feet apart along both sides of the pipe. Table 2 presents details of the cost estimate for this alternative. This cost does not include replacement of the storm sewer pipe or site restoration since this cost is included the site drainage improvement alternatives (See Site Drainage Improvements Section).

Alternative 1.3 – Grout Storm Sewer Pipes and Install Low Permeability Subsurface Dams

Under this alternative, the storm sewer pipes would be pressure grouted with a cement-based grout, and low permeability subsurface dams would be installed along portions of the existing storm sewer system. The dams would be constructed of a dry bentonite/sand mixture (10% bentonite: 90% sand) and would extend from the bottom of the pipe bedding material to the bottom of pavement. The dams would be constructed by excavation around the pipe (down to bedding material) and then placing the dry mixture. When the bentonite is hydrated, it will swell filling all the pore spaces, and forming a tight seal around the pipe. The dams will be located along portions of the existing pipe trench, primarily in the parking lot south of the NTC building and along the pipe between CB C and A (see Figure 1). E & E assumed that the dam mixture would be delivered to the site as a ready mix to be directly placed in the trench. For purposes of estimating the cost, 9 total dams were assumed, each requiring approximately 3 cy of material.

Effectiveness: This alternative would be effective in eliminating the preferential pathway along the trench material assuming proper construction of the dams. Permeability of the bentonite/sand mixture has been reported on the order of 1×10^{-9} cm/s. This alternative is not as effective as Alternatives 1.1 and 1.2 since the entire trench length will not be addressed. However because the backfill material to be used to construct the dams will be of a hydraulic material several orders of magnitude lower than that of the surrounding material, the likelihood of migration directly along these routes will be significantly reduced. The possibility does exist for migration along the trenches to occur via short-circuiting of the dams. To address this issue more than one dam will be placed along each segment of pipe, thus short circuits simultaneously around both dams must occur in order for groundwater to migrate along the trench bedding.

Implementability: This alternative is readily implementable using standard construction methods. Interruptions to NTC operations would be minimal since the work could be completed in sections. Site drainage will need to be maintained during abandoning of the system. At locations where dams would be constructed, inspectors would be able to visually verify the installation, helping to ensure they are constructed properly. E &E anticipates this work to be completed in 1-2 week period.

Cost:: The estimated construction cost for implementing this alternative is $16,800. Table 3 presents the cost details of this alternative. This cost does not include replacement of the storm sewer pipe or site restoration since this cost is included the site drainage improvement alternatives (See Site Drainage Improvements Section).

2. Site Drainage Improvements

Alternative 2.1- Replacement of Existing Storm Sewer System with Equivalent System

This alternative involves replacing the existing storm sewer system with an equivalent drainage system. The components of the new system would be located and sized similar to the existing storm water system. Approximately 515 feet of pipe would be replaced, and new connections established with the existing roof drains in the NTC facility. High-density polyethylene piping (HDPE) with butt-fused connections would replace the existing PVC and corrugated metal piping to eliminate any potential for groundwater infiltration. New catch basins would be installed and waterproofed.

A low permeability bedding material (sand-bentonite) would be used around the new storm sewer system. Above the bedding, a low permeability soil (silty-clay) would be compacted.

Effectiveness: Replacing the existing storm sewer piping with new HDPE piping, and using a less permeable trench material, would help minimize the potential for contaminant migration along the storm sewer system trench material. In addition, by using butt-fused pipe the potential for groundwater infiltration into the storm sewer system would be minimized. However the new system would be at the same depth as the current system and thus the potential exists for short-circuiting along this pipe, although it would be significantly reduced from existing conditions.

Implementability: This alternative would be readily implementable using standard construction methods. From a logistical point of view, significant interruption to the NTC operations would be anticipated during installation of the new piping and connections to the existing roof drains. Close coordination with NTC would be required to minimize impacts caused by service interruptions. E & E anticipates this work to be performed during a 4-6 week period.

Cost: Table 4 presents the cost breakdown for this alternative. The total estimated construction cost for implementing this alternative is $51,600. This cost does not include the removal of the existing storm sewer system and trench material as described in Alternative 1.1 under abandonment of existing storm sewer system.

Alternative 2.2 - Near Surface Storm Water Collection System

The purpose of this alternative is to isolate surface water runoff from seasonally high groundwater levels.. To achieve this, storm water runoff from the parking lot south of the main NTC building will be collected in a slotted drainpipe located at the center of the parking lot adjacent to CB B. For the roof water, the existing roof drain located at the center south wall will be re-routed and tied into the existing roof drain along the southwest corner of the building. A new subsurface 12-inch pipe running parallel to the property fence would then direct the roof water to the south and then east to the new catch basin (see Figure 1). The new 12-inch pipe will be installed adjacent to existing hydraulic lines that run from the tank farm to the main NTC building. The location of these lines will have to be field verified prior to construction. The roof drains along the east wall of the building would be piped across the driveway to the east, and then combined to a single 12-inch pipe that would discharge to the N/S ditch. Finally, a 12-inch pipe extending from CB C to the grassy area at the eastern edge of the driveway, and then running parallel to east wall of the building will be used to direct surface runoff from the driveway area east of the NTC building. This pipe will then be tied into the roof drain pipe discharging into the N/S ditch. It is assumed that the existing storm water system would be abandoned and grouted in-place in order to implement this alternative. Figure 1 presents a schematic of Alternative 2.2 components.

The collection system, which would be located approximately 10 feet north of the south end of the parking lot, would consist of slotted drain pipe, a shallow catch basin, and solid pipe to discharge the runoff. CB B will remain in-place to provide a monitoring point for potential groundwater accumulation in the pavement base course due to elimination of existing drainage pathways. A solid watertight cover would be installed to prevent surface runoff from entering the basin. Minimal regrading around the catch basin maybe needed to direct parking lot runoff into the slotted drain pipe. The access road on the east side of the building would not be regraded

Effectiveness: This alternative would be effective at limiting the contact of storm water with potential areas of below grade contamination and seasonal high groundwater levels. The new storm sewer system will provide drainage of storm water away from suspected areas of contamination and into the N/S drainage ditch. The roof water could also be easily inspected, monitored, and sampled prior to mixing with surface runoff.

The proposed system is not anticipated to be in contact with seasonally high groundwater levels. The slotted drainpipes are shallow installations and encased in concrete. The maximum depth for the slotted pipe invert under consideration is 14 inches. The trench bottoms, and therefore the pipe, would be constructed above the groundwater surfaces as observed in October 1999 (E&E, Additional Investigation Report, August 2000). High groundwater levels were reported to be at least 18 inches below ground surface.

The time period for existing groundwater monitoring records is limited and it is possible that extreme wet weather would generate higher than observed groundwater levels that could reach the pipe trench bottom. However, because the pipe trench is backfilled with concrete it is not anticipated groundwater would be able to infiltrate into the pipe or use the trench as preferential pathway.

There is a concern that the near-surface collection system may be susceptible to freezing in the winter, and thus clogging of the pipes. Discussion with the vendor indicated that since the slotted-drain pipes are encased with concrete, freezing has not been an issue with shallow installations in the Buffalo area. For example, the slotted drain pipes are widely used at the Buffalo/Niagara International Airport and freezing problems have not been an issue with these systems. The difference in this application from perhaps other applications of these type of drain systems is that roof drains will be tied in. During winter snow melt from the roof may provide a continuous small flow of water. This continuous flow of water may result in the gradual accumulation of ice in the pipe system. The design developed above would include roof drainage flowing though the open portion of the slotted pipe. Roof water would be conveyed in solid, buried pipes around the perimeter of the parking area.

Implementability: The components of this alternative use traditional construction practices for parking lot asphalt paving and drainage. Most of the work would be around the perimeter of the paved area thus the majority of the parking area would remain functional during construction. NTC operations would be impacted by the implementation of this alternative for 2 to 3 weeks.

Cost: The estimated cost estimate for Alternative 2.2 is $61,200. Details of the cost estimate are presented in Table 5. The following assumptions were used to develop this cost estimate:

- Regrading of parking lot will be minimal. Average depth of new material is 2" wearing course and 1-1/2" binder course.
- Pipe sizes in proposed system are based on existing pipe sizes.
- Excavated aggregate base course under pavement would be reused.

Alternative 2.3 – Rehabilitation of the Existing Storm Sewer System

Under this alternative, the existing storm system would be rehabilitated to minimize groundwater infiltration and contaminant migration along the pipe bedding material. The existing piping would be rehabilitated via cured in-place pipe (CIPP) process (trenchless method) to reduce the potential for groundwater infiltration. Because of the damage sustained to a section of the 12-inch CMP pipe between catch basins A and B during the additional 2000 investigation, 10 feet of the pipe will be completely removed, replaced, and then lined.

In order to eliminate potential contaminant migration from the suspected source area under the building, low-permeability subsurface dams would be installed along the pipe trench material. The dams would be constructed of a dry bentonite/sand mixture (10% bentonite: 90% sand) and would extend from the bottom of the pipe bedding material to the bottom of pavement. The dams would be constructed by excavation around the pipe (down to the bottom bedding material) and then placing the dry mixture. When the Bentonite is hydrated, it will swell filling all the pore spaces, and forming a tight seal around the pipe. The dams will be located along portions of the existing pipe trench, primarily in the parking lot south of the NTC building and along the pipe between CB C and A (see Figure 1). E & E assumed that the dam mixture would be delivered to the site as a ready mix to be directly placed in the trench. For purposes of estimating the cost, 9 total dams were assumed, each requiring approximately 3 cy of material.

Effectiveness: Lining the existing storm sewers and installing low-permeability dams would be effective in minimizing the potential for contaminant migration along the storm sewer system. In addition, the potential for groundwater infiltration into the storm sewer system would be significantly reduced.

Implementability: This alternative would be readily implementable. Minimal interruption to the NTC operations would be anticipated during the work except for replacing the damaged section of the pipe and installing the low-permeability dams. Close coordination with NTC would still be required to minimize impacts caused by service interruptions. E & E anticipates this work to be performed during a 4-6 week period.

Cost: Table 6 presents details of the cost estimate for this alternative. The total estimated construction cost for this alternative is $50,900.

3. Source Stabilization/Containment

Although two alternatives are presented in this section, the second alternative is envisioned to strictly contain potential contaminated groundwater that could reach the pavement base course, not to directly contain the suspected source area under loading dock in the main NTC building.

Alternative 3.1 - Grouting of Suspected Source Area

The additional investigation completed by E &E in May 2000 indicated that a source area exists under the main NTC building, specifically in the loading dock area. It is suspected that this source area is contributing to re-contamination of the N/S ditch. This alternative involves pressure grouting beneath a portion of the loading dock area. A cement-based grout would be injected into the subsurface through 2-inch temporary boreholes located inside the NTC building. E & E estimates that an area of 225 square feet will need to be stabilized in the loading dock area.

Effectiveness: Grouting the suspected source area, beneath the loading dock area, would help in immobilizing the PCBs and limit contact of groundwater with contaminated soils in this specific location. The potential for this portion of the source area to contribute to re-contamination at the site would therefore be reduced. It is unlikely that all the source area will addressed through this work. However, it is believed that a significant portion of the source at the site may be immobilized. Combining this measure with any of the site drainage alternatives should significantly minimize the potential for continuing PCB release at the site.

Implementability: This alternative should be readily implementable, but would required close coordination with NTC especially since the work would be performed within the main NTC building. Completion of this work is expected to require 3-4 days.

Cost: Table 7 presents details of this alternative's cost estimate. The estimated construction cost is $7,000.

Alternative 3.2 – Construct Shallow Cut-off Wall along the Perimeter of the NTC South Parking Lot

The sole objective of this cut-off wall would be to help prevent potential downgradient migration of contaminated groundwater accumulating and travelling through the pavement base course, due to the proposed blockage of existing drainage pathways resulting from implementation of the storm sewer abandonment alternatives. The 6-inch cut-off wall would be constructed of bentonite/sand mixture though the base course, assumed at a depth of 12-inches below the pavement, and will be keyed into the soil subsurface. The wall would be located along the perimeter of the parking lot as shown in Figure 1. In the case of groundwater levels reaching the base course, the bentonite will hydrate and fill the void spaces, thus prevent downstream migration of contaminants.

Effectiveness: Installing a cut-off wall to contain contaminated groundwater that could reach the base course would be effective in eliminating the potential to create a new preferential pathway for contaminant migration along the base course.

Implementability: This alternative should be readily implementable, but would required coordination with. Completion of this work is expected to require 5 days.

Cost: Table 8 presents details of this alternative's cost estimate. The estimated construction cost is $8,300.

2.4 Potential Impact to NTC Building Foundation

One of the primary purposes of this document is to evaluate alternatives that minimize the potential for subgrade storm water sewers to serve as preferential pathways for groundwater migration away from the NTC building. A concern is that groundwater elevations beneath the building could increase when the preferential pathway for groundwater movement is removed and movement is through less permeable soil. Accumulation of water beneath the foundation has the potential to impact the structural integrity of the foundation through swelling of clay and sustained uplift pressure. In addition, near surface groundwater, saturating the parking area pavement will be susceptible to freeze/thaw damage.

Increases in groundwater levels of up to 2 feet should not translate into significant swelling of the clayey soil beneath the foundation. Given the shallow depth of groundwater, it is not physically possible to have this type of sustained groundwater elevation increase. Therefore, the building foundation is not anticipated to be impacted by increased groundwater levels that could possibly result from the implementation of storm sewer remediation alternatives. The rise of groundwater in the parking area could reach a point where the pavement becomes saturated making it susceptible to freeze thaw damage.

A preliminary assessment of existing conditions indicates that groundwater levels on the downgradient side of the NTC building (South) do not increase beyond the parking lot stone base course. The bottom of the base course is approximately one foot below grade. Based groundwater elevations measured at the site groundwater flow through the base course (if occuring) is expected to be limited to the lower one inch of the base course. Implementation of the cutoff wall within the base course material as described as Alternative 3.2 above could act to stop water that would have flowed through the base course. As such in combination with this alternative, monitoring is required to ensure that excessive water accumulation behind the cutoff wall does not occur. Monitoring locations could include MW-IN, MW-OUT and the existing catch basin B if it is left in place.

It should be noted that groundwater should move away from the building (i.e. to the south) at a rate similar to that of groundwater toward the building (i.e. from the north) because of similar hydraulic conditions in both upgradient and downgradient locations. If, through monitoring, a significant increase in groundwater levels or pressures beneath the building is identified, then other sources of water such as broken water mains, process lines, or drains should be investigated.

4. Summary of Alternatives

The table below presents a summary of viable alternative combinations and associated costs that would meet the objective of this task. The alternatives discussed in this report do not significantly address source areas that are suspected of causing recontamination in the N/S and E/W drainage ditches. These alternatives primarily address the contaminant migration pathways identified during the additional investigation. The estimated costs presented below do not include the $7,000 estimated cost for source stabilization in Alternative 3.1, or $8,300 for the parking lot cut-off wall installation.

Alternative #	Alternative Description	Cost (S)
Alt 1.1 & Alt 2.2	Removal and Disposal of Existing Storm Sewer System & Near Surface Storm Water Collection System	134,900
Alt 1.3 & Alt 2.2	Grout Storm Sewer Pipes, Install Low-Permeability Subsurface Dams & Near Surface Storm Water Collection System	78,000
Alt 1.1 & Alt 2.1	Removal and Disposal of Existing Storm Sewer System & Replacement in Kind (watertight-system)	125,300
Alt 2.3	Rehabilitation of the Existing Storm Sewer System	50,900
Alt 1.2 & Alt 2.2	Grouting of Existing Storm Sewer System and Trench w/ Chemical Based-Grout & Near Surface Storm Water Collection of System	192,200

If you have any questions regarding this document, please do not hesitate to call me at (716) 684-8060.

Sincerely,

Stephen Blair, P.E.

cc: Wadie Kawar (E & E)

Table 1

Alternative 1.1: Removal and Disposal of Existing Storm Sewer System

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Pipe Removal and Demolition						
Paved parking area, saw cutting	Assume 10" depth	LF	1030	$5 10	$5,253	02225-760-0010/0020
Pavement removal		SY	286	$5 85	$1,673	02220-875-1750
Traffic control	Avg. Laborer	WK	2	$1,525 00	$3,050	01310-700-0160
ExcavateTrench	Assume 5' W, 4.5' D,1/2 CY Loader/backhoe	CY	430	$3 57	$1,535	02315-900-0090
Pipe Removal , 8" and 12"		LF	515	$5 95	$3,064	02220-875-2900
Remove Exist. Catch basins		EA	3	$149 00	$447	02220-875-0020
Dewatering - trash pump 8 hr operation		Day	3	131	$393	02240-500-0600
Holding Tank-Rental		Day	4	$45 00	$180	Vendor Quote
Delivery and Pickup of Tank		LS	1	$500 00	$500	Vendor Quote
Subtotal					**$16,100**	
Characterization and Disposal of Excav. Material						
PCB Analysis - Soil	Assume 50 samples	EA	50	$100 00	$5,000	Eng. Estimate
Transportation & Disposal of Non-Hazardous Cont. Trench Material	Assume 75% of Trench material isNon-Hazardous (<50 ppm), 1.3 ton/cy	Ton	280	$75.00	$21,000	Eng. Estimate - Based on historical site cost
Transportation & Disposal of Hazardous Cont. Trench Material	Assume 25% of trench material is Hazardous (> 50 ppm), 1.3 ton/cy	Ton	95	$150 00	$14,250	Vendor Quote
Disposal of Pipe/Catch basin etc.					$2,000	Eng. Estimate
Subtotal					$42,300	
Total Capital Cost					$58,400	
Mobilization/Demobilization	Assume 5% of total capital cost				$3,000	
Contingency 20%					$12,300	
Total Construction Cost					$73,700	

Notes

Reference: RS MEANS "Site Works & Landscape, 2001"

Table 2
Alt 1.2: Grout Storm Sewer Pipes and Trench w/ Chemical Based Grout

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Pipe Removal and Demolition						
Drilling and crew - 2 man crew	Assume 30 Boreholes per day, 1.5' spacing,both sides of the pipe	Day	25	$1,525.00	$38,125	02110-310-1400
Water Reactive Chemical Grout	Assume void ratio of 0.3, Unit cost based on 18x expansion of grout	CF	2250	$27.00	$60,750	Vendor Quote ($325 per 5 gallon pale)
Bentonite Grout for Storm Sewers		CF	250	$7.10	$1,775	33-23-1801 (ECHOS)
Subtotal					**$98,900**	
Site Restoration						
Patching Pavement		LS	1	$5,000.00	$5,000	Eng. Estimate
Subtotal					**$5,000**	
Total Capital Cost					$103,900	
Mobilization/Demobilization	Assume 5% of total capital cost				$5,200	
Contingency 20%					$21,900	
Total Construction Cost					**$131,000**	

Notes
Reference: RS MEANS "Site Works & Landscape, 2001"

Table 3
Alternative 1.3: Grout Storm Sewer Pipes and Install Low-Permeability Dams

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Clay Dam Construction						
Paved parking area, saw cutting	Assume 10" depth	LF	180	$5.10	$918	02225-760-0010/0020
Pavement removal	24 SF per Clay Dam - 9 total dams	SY	24	$5.85	$140	02220-875-1750
Traffic control	Avg. Laborer	WK	1	$1,525.00	$1,525	01310-700-0160
Excavation	Assume 6' W, 3' D, 1/2 CY Loader/backhoe	CY	27	$3.57	$96	02315-900-0090
Bentonite/Sand Mixture - Ready Mix Delivered to Site	~3 cy per dam	CY	27	$105.00	$2,835	Vendor Quote
Backfill/Compact w/ Vibrating Plate		CY	27	$2.33	$63	17-03-0415 (ECHOS)
Bentonite Grout for Storm Sewers	incl. 50% for Labor	CF	250	$10.65	$2,663	33-23-1801 (ECHOS)
Dewatering - trash pump 8 hr operation		Day	3	131	$393	02240-500-0600
Holding Tank-Rental		Day	4	$45.00	$180	Vendor Quote
Delivery and Pickup of Tank		LS	1	$500.00	$500	Vendor Quote
Paving Restoration-6" thick		SY	24	$48.00	$1,152	02740-300-1080
Subtotal					$10,500	
Characterization and Disposal of Excav. Material						
PCB Analysis - Soil	Assume 2 samples	EA	2	$100.00	$200	Eng. Estimate
Transportation & Disposal of Non-Hazardous Cont. Trench Material	Assume Excav Trench material is Non-Hazardous (<50 ppm), 1.3 ton/cy	Ton	35	$75.00	$2,625	Eng. Estimate - Based on historical site cost
Subtotal					$2,800	
Total Capital Cost					$13,300	
Mobilization/Demobilization	Assume 5% of total capital cost				$700	
Contingency 20%					$2,800	
Total Construction Cost					$16,800	

Notes
1. Reference: RS MEANS "Site Works & Landscape, 2001"
2. No cost is included for fixing the 12"CMP pipe section between CB#A and B
3. Assume excavated trench material is non-hazardous

Table 4
Alternative 2.1 - Replacement of Existing Storm Sewer System w/ Equivalent

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Pipe Installation and Site Restoration						
6" HDPE Butt-Fusion Joint Pipe		LF	265	$9.35	$2,478	02510-850-0200
12" HDPE Butt-Fusion Joint Pipe		LF	250	$21 00	$5,250	02510-850-0500
Miscellaneous Fittings and tie-ins w/ Roof Drains		LS	1	$3,000 00	$3,000	Eng Estimate
Catch Basin - Pre-cast 6' deep		EA	3	$1,025 00	$3,075	02630-200-1120
Off-Site fill incl. Loading		CY	240	$8 85	$2,124	02315-xxx-4010
Hauling Backfill material to site	Use Low Permeability backfill	CY	240	$6 15	$1,476	02320-200-0500
Bentonite/Sand Mixturefor pipe bedding - Ready Mix Delivered to Site	Assume 5' W, 6" D, 515' L	CY	50	$105 00	$5,250	Vendor Quote
Backfill Trench		CY	430	$0 68	$292	02315-120-2000
Compaction	6" lifts, 4 passes	CY	430	$2 39	$1,028	02315-300-7000
Stabilization Fabric		SY	345	$1 13	$390	02720-200-6000
Paving Restoration-6" thick		SY	345	$48 00	$16,560	02740-300-1080
Subtotal					**$40,900**	
Total Capital Cost					$40,900	
Mobilization/Demobilization	Assume 5% of total capital cost				$2,100	
Contingency 20%					$8,600	
Total Construction Cost					**$51,600**	

Notes
Reference: RS MEANS "Site Works & Landscape, 2001"

Table 5

Alternative 2.2 - Near Surface Storm Water Collection System

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Regrading Parking Lot						
Scarify existing pavement	10% parking lot area	SY	240	$1.00	$240	Engineer's Estimate
Asphalt pavement, 2" wearing course	10% parking lot area	SY	240	$4.36	$1,046	ref 1, 02740-300-0380
Asphalt pavement, 1-1/2" binding course	10% parking lot area	SY	240	$2.82	$677	ref 1, 02740-300-0080
Subtotal					$2,000	
Stormwater Collection System						
Modify roof drain Inside NTC Building		LS	1	$2,500.00	$2,500	Eng. Estimate
Modify roof drain outside NTC Building	access road drains to road surface	LS	3	$1,500.00	$4,500	Eng. Estimate
pavement saw cut for trench	avg 5" depth	LF	700	$2.43	$1,701	ref 1, 02225-760-0010 & 0020
Pavement removal	3 foot trench width, 350'	SY	120	$6.49	$779	ref 1, 02220-875-1750
Disposal of pavement	off-site CD landfill	CY	20	$12.15	$243	ref 1, 02220-875-5600
Trench Excavation	Assume 870', Avg. 2' D, 3'W	CY	195	$5.87	$1,145	ref 1, 02300-900-0050
12" PVC solid pipe		LF	500	$9.94	$4,970	ref 1, 02500-780-2160
15" PVC solid pipe		LF	300	$19.62	$5,886	ref1, 02500-780-2200
Bentonite/Sand Mixture For Bedding - Ready Mix Delivered to Site		CY	30	$105.00	$3,150	Vendor Quote
Off-Site fill incl. Loading	Assume 4	CY	145	$8.85	$1,283	02315-xxx-4010
Hauling Backfill material to site	Use Low Permeability backfill	CY	145	$6.15	$892	02320-200-0500
slotted drain pipe, material only		LF	70	$37.50	$2,625	Agger Supply, Inc
slotted drain pipe, installation only	1 day, 2 person crew	HR	16	$83.00	$1,328	Polycast, Ref 1
Concrete backfill	slotted drain only	CY	10	$68.50	$685	ref 1, 02300-900-0050
Pavement replacement over trench	4" thick, solid pipe only	SY	80	$34.51	$2,761	ref 1, 02740-300-1050
Stabilization Fabric		SY	100	$1.13	$113	02720-200-6000
catch basin, excavation	5' x 5' x 4'	CY	8	$68.50	$548	ref 1, 02300-900-0050
catch basin, stone bedding	5' x 5' x 6"	CY	1	$26.78	$27	ref 1, 02300-900-0050
catch basin	concrete block 4' x 4'	EA	2	$953.00	$1,906	ref 1, 02300-900-0050
catch basin, flowable backfill		CY	3	$61.80	$185	ref 1, 03310-220-4300
frame and cover, 36" x 36"		EA	2	$700.00	$1,400	Eng. Estimate
topsoil	slope mix	SY	66.7	$5.77	$385	ref 1, 02920-340-3800
push spreader seed, fert & mulch	slope mix	SY	600	$1.45	$870	ref 1, 02910 & 02920
Paving Restoration-6" thick		SY	85	$48.00	$4,080	02740-300-1080
Site Cleanup		LS	1	$2,500.00	$2,500	
Subtotal					$46,500	
Total Capital Cost					$48,500	
Mobilization/Demobilization	Assume 5% of total capital cost				$2,500	
Contingency 20%					$10,200	
Total Construction Cost					$61,200	

Notes

Ref 1 - RSMeans, 2000, Heavy Construction Cost Data

All costs from 2000 RSMeans increased by 3% to account for inflation to 2001

Table 6
Alt 2.3 - Rehabilitation of the Existing Storm Sewer System

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Pipe Lining and Grouting						
Pipe Lining (CIPP) and Cleaning - 515' pipe	incl. Fixing 12" CMP Pipe	LS	1	$35,000.00	$35,000	Roy's Plumbing
Excavation	Assume 6' W, 3' D, 1/2 CY Loader/backhoe	CY	27	$3.57	$96	02315-900-0090
Bentonite/Sand Mixture - Ready Mix Delivered to Site	~3 cy per dam	CY	27	$105.00	$2,835	Vendor Quote
Backfill/Compact w/ Vibrating Plate		CY	27	$2.33	$63	17-03-0415 (ECHOS)
Paving Restoration-6" thick		SY	24	$48.00	$1,152	02740-300-1080
Site Cleanup		LS	1	$1,500.00	$1,152	
Subtotal					**$40,298**	
Total Capital Cost					$40,298	
Mobilization/Demobilization	Assume 5% of total capital cost				$2,100	
Contingency 20%					$8,500	
Total Construction Cost					**$50,900**	

Notes
Reference: RS MEANS "Site Works & Landscape, 2001"

Table 7
Alternative 3.1 - Grout Suspected Source Area

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Grouting						
Drill rig and crew		Day	2	$1,525.00	$3,050.00	02110-310-1400
Cement Grout	Assume 225 SF, 4' Deep,0.3 porosity	CF	270	$7.10	$1,917	33-23-1801 (ECHOS)
Subtotal					$4,970	
Restoration						
Conc. Slab Restoration		LS	1	$500.00	$500	
Subtotal					$500	
Total Capital Cost					$5,470	
Mobilization/Demobilization	Assume 5% of total capital cost				$300	
Contingency 20%					$1,200	
Total Construction Cost					$7,000	

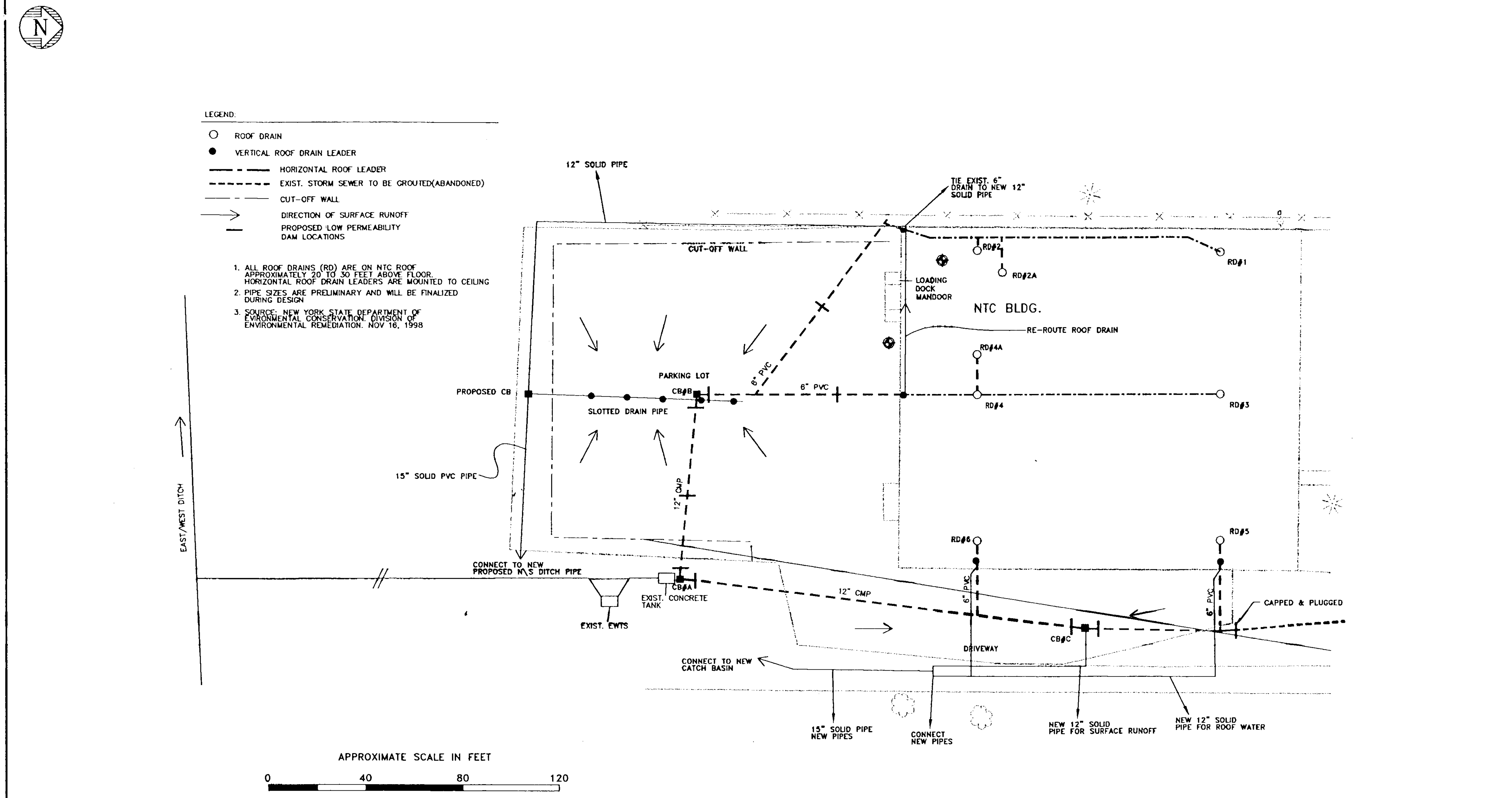
Notes

Reference: RS MEANS "Site Works & Landscape, 2001"

Table 8
Alternative 3.2 - Cut-Off Bentonite Sand Wall

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Cut-Off Wall						
Paved parking area, saw cutting	Assume 10" depth	LF	730	$5.10	$3,723	02225-760-0010/0020
Pavement Removal & disposal		LS	1	$500.00	$500	Eng Estimate
Excavate w/ Chain Trencher 6" wide, 24" Deep		LF	365	$0.75	$274	022200-258-0350
Bentonite/Sand Mixture - Ready Mix Delivered to Site	6" W, 24" D ~365 CF	CY	15	$105.00	$1,575	Vendor's Quote
Subtotal					**$6,080**	
Restoration						
Paving Restoration-6" thick		SY	20	$48.00	$960	02740-300-1080
Subtotal					**$960**	
Total Capital Cost					$7,040	
Mobilization/Demobilization	Assume 5% of total capital cost				$400	
Contingency 10%					$800	
Total Construction Cost					**$8,300**	

Notes
Reference: RS MEANS "Site Works & Landscape, 2001"



NO.	DATE	DWN	APP'D	DESCRIPTION
REVISIONS				

ecology and environment engineering, p.c.
International Specialists in the Environment

DESIGNED BY	CHECKED BY
	D. ALBERS/W. KAWAR
DRAWN BY	APPROVED BY
K. KRAJEWSKI	W. KAWAR

FIGURE 1: PROPOSED NEAR SURFACE STORMWATER COLLECTION SYSTEM

SCALE	DATE ISSUED	C.A.D. FILE NO.	DRAWING NO.	REV.
1" = 40'	9/01	NTFIG18	FIG 1-1	

ecology and environment engineering, p.c.

BUFFALO CORPORATE CENTER
368 Pleasant View Drive, Lancaster, New York 14086
Tel: 716/684-8060, Fax: 716/684-0844

| 2001

September 27, 2001

James A. Moras
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7017

Re: **Niagara Transformer Corporation Site No. 9-15-146**
Interim Remedial Design – SubTask 2.2
Work Assignment #D003493-28

Ecology & Environment Engineering, P.C., (E & E) was retained by the New York State Department of Environmental Conservation (NYSDEC) under the Standby Contract Assignment No. #D003493-28 to complete Interim Remedial Measure (IRM) design services at the above-referenced site. This letter report summarizes the evaluation completed for the remediation of the North/South (N/S) and East/West (E/W) drainage ditches (Subtask 2.2 in Work Plan). The results of the additional investigation (E & E, 2000) indicated sediment PCB contamination in the N/S and E/W ditches ranging from 1.78 to 39 mg/kg. The maximum PCB concentration was detected in a sediment sample collected at the outfall of the N/S ditch. The objective of this design task is to mitigate risks associated with surficial contamination in the N/S and E/W ditches. Three alternatives were evaluated for this task as follows:

- Alternative 1 – Excavate contaminated ditch material, on-site cleaning and re-use of the stone
- Alternative 2 – Removal and off-site disposal of contaminated ditch material and replacing with new material.
- Alternative 3 - Installing a storm sewer pipe in the N/S ditch

Alternative 1 - Excavate contaminated ditch material, on-site cleaning and re-use of the stone

This alternative involves excavating the contaminated ditch material in the N/S and E/W ditches, on-site cleaning of the stone, and reusing the cleaned stone for lining the ditch. Contaminated sediments generated from the washing and cleaning process would be characterized and disposed of at an appropriate landfill. For purposes of estimating material volumes in the drainage ditches, E & E assumed that a 12-inch sediment layer and a 12-inch stone layer, placed approximately 3 feet on each side of the ditch centerline, would be removed from the N/S ditch. For the E/W ditch, only a 12-inch stone layer would be excavated, cleaned and re-used.

On-site cleaning of the trench material (consisting primarily of stone with some amount of intermixed sediment) would require excavating and stockpiling contaminated trench material, pressure washing the material to remove sediments, collection of the sediment and wastewater, off-site disposal of the sediments, and on-site treatment of waste water using the EWTS. A pressure wash cleaning area would be constructed at the site consisting of one 20-cubic yard lined roll-off box. A front-end loader would haul the stockpiled trench material to the cleaning area, where pressure washing of the trench material would be performed. Once the trench material is deemed clean (no entrapped sediments) by inspection, the clean trench material would be stockpiled. Water collected water from the washing operation would be pumped through the existing emergency water treatment system (carbon system) and discharged to the ditch. Accumulated sediment material in the lined box would be characterized for appropriate off-site disposal. Since the sediment sample results did not show any PCB contamination above the 50 mg/kg in the N/S and E/W ditches (E & E additional Investigation, 2000), E & E assumed that the sediments from the cleaning process would be disposed of as non-hazardous material at an appropriate landfill. This material may require some bulking prior to shipment, because of low solids content. The volume of sediment actually recovered is expected to be small. The N/S ditch would be restored by placing geotextile over the finished excavation, and backfilling with a 12-inch layer of low-permeability material and the cleaned stone. In the E/W ditch, geotextile would be placed underlying a 6-inch stone layer placed 2 feet on each side of the ditch centerline.

<u>Effectiveness:</u> Since contamination in the N/S and E/W ditches is likely attributed to PCBs adsorbed to the sediments, then removing the sediments from the stone material would be effective in limiting exposure risks to surficial PCB contamination. Field verification and confirmation that the stone is clean would be a concern in evaluating the effectiveness of the cleaning process. In addition, although this alternative addresses risks associated with existing contamination in the drainage ditches, seasonal discharge of contaminated groundwater to the N/S and E/W ditches, as observed during the additional investigation 2000, may still provide a potential source of continued PCB release to the ditches. Although this is expected to be at a relatively small rate of discharge, accumulation of PCBs within the highly organic sediments that accumulate in the ditch may result in conditions similar to those observed currently, and would require additional remediation in the future.

<u>Implementability:</u> This alternative would be implementable using standard construction methods. However, because of the limited available space at the site, this alternative maybe difficult to implement. Handling of contaminated sediments and wastewater generated from the cleaning process would require health and safety measures to protect workers and surrounding areas. Verification sampling of the stone material beyond visual inspection is also a concern since it would be difficult to collect a representative sample from the material. Site drainage would need to be maintained during remediation work. E & E anticipates this work to be performed during a 3-4 week period.

<u>Cost:</u> The estimated construction cost for implementing this alternative is $98,100. Table 1 presents details of this alternative's cost estimate.

Alternative 2 – Removal and off-site disposal of contaminated ditch material, and replacing with new material

This alternative involves excavation of the contaminated sediments and stone in the N/S and E/W ditches, off-site disposal, and replacement with clean material. Cleanup criteria assumed for the contaminated soil/sediment was 1 mg/kg for the top 12 inches, and 10 mg/kg below 12 inches. Based on the sampling results of the additional investigation (E & E, 2000), sediment contamination above the 1 mg/kg cleanup criteria was observed throughout the N/S ditch. For purposes of estimating material quantities to be excavated and disposed, E & E assumed that 12-inches of sediment would be removed from the N/S ditch. The lateral extent of the excavation is approximately 3 feet on each side of the ditch centerline. In the E/W ditch, the lateral extent of the excavation was assumed to be 4 feet total. Since the sediment sample results did not show PCB contamination above 50 mg/kg in the N/S and E/W ditches, E &E assumed that the excavated material will be disposed of as non-hazardous material at an appropriate landfill. It is expected that dewatering or bulking of this material will not be necessary.

Restoring of the N/S ditch will be completed by placing geotextile over the finished excavation, backfill with 12-inches of low-permeability backfill and a 12-inch stone layer installed 3 feet on each side of the ditch centerline. Topsoil and seeding of the side slopes would also be completed. At the E/W ditch, a 6-inch layer of stone material would be placed 2 feet on each side of the ditch centerline.

Effectiveness: Removal of the contaminated sediments and placement of clean backfill material will be effective in eliminating risk exposure to surficial PCB contamination at the site. However, similar to Alternative 1, this alternative does not address the seasonal discharge of contaminated groundwater to the ditches, which may result in recontamination of the ditches.

Implementability: This alternative is implementable using standard construction methods and materials. Handling of contaminated material would require health and safety measures to protect workers and the surrounding area. Interruption to NTC operations should be minimal, since the area of interest is away from the main NTC building. Site drainage would need to be maintained during remediation of the ditch. Remediation of the N/S and E/W ditches is anticipated to last approximately 1-2 months.

Cost: The estimated cost of this alternative is $41,700. Table 2 presents details of the cost estimate for this alternative.

Alternative 3 –Installation of a new storm sewer pipe in the N/S Ditch

Under this alternative, contaminated sediment and stone in the N/S ditch below 15 mg/kg total PCBs will be buried in place (based on DEC correspondence, August 26, 2001), and a new storm sewer pipe would be installed along the entire length of the N/S ditch (approximately 325 feet). Contaminated sediments (above 15 mg/kg) at the outfall of the N/S will be excavated and disposed of at an appropriate off-site facility. Dewatering or bulking of these sediments is not expected to be necessary.

In order to size the new pipe in the N/S ditch, the rational method was used to estimate the peak discharge into the N/S ditch from upstream drainage areas for a 10-year storm return period. The results of the analysis showed a peak flow of 9.8 cubic feet per second (cfs) (see Attachment A). Based on this flow, a 24-inch high-density polyethylene pipe (HDPE), with butt-fused connections, would be needed in the N/S ditch. The pipe would be installed on top of 6-inches of low-permeability bedding material, with an additional 12-inches of low-permeability backfill placed over the pipe. Low permeability dams will also be installed along the N/S ditch pipe to contain potential contaminant migration that may travel through the more permeable buried contaminated rip-rap layer.

The upstream end of the new storm sewer would be directly connected to a shallow catch basin just upstream of the existing ditch outfall.

Currently an emergency water treatment system (EWTS) is in operation at the site. This system may remain at the site at the discretion of the NYSDEC. In order to maintain operation of the existing emergency water treatment system (EWTS), the pump and insertion heater would be placed in catch basin A, which is located just immediately upstream of the concrete tank. The influent piping to the treatment building would also need to be modified. The discharge pipe from the EWTS would tap into the new storm sewer pipe at a downstream location.

Effectiveness: Removal and disposal of highly contaminated ditch material, and burial of the remaining waste material under the pipe will be effective in limiting risks associated with exposure to surficial PCB contamination. Groundwater infiltration would also be minimized with a watertight storm sewer. Filling the N/S ditch with low-permeability backfill, installing the pipe and low-permeability dams would also eliminate the potential for the N/S ditch to act as a contaminant migration pathway from groundwater discharge into the ditch.

Implementability: This alternative is implementable using standard construction methods and materials. No significant interruption to the NTC operations is anticipated during the remediation work. Handling of contaminated material would require health and safety measures to protect workers and the surrounding area. Site drainage would need to be maintained during remediation and during the installation of the new storm sewer pipe. E & E anticipates the work to be completed during 1-2 months period.

Cost: Table 3 presents the details for this alternative's cost estimate. The total estimated construction cost for this alternative is $52,500.

4. Summary of Alternatives

Table 4-1 presents a summary of the alternative combinations and associated costs that would meet the objective of this design task.

Alternative #	Alternative Description	Cost ($)
Alt 1	Excavate contaminated ditch material, on-site cleaning and re-use of the stone	98,100
Alt 2	Removal and off-site disposal of contaminated ditch material, and replacing with new material	41,700
Alt 3	Removal and disposal of contaminated ditch material, and installation of a new storm sewer pipe	52,500

If you have any questions regarding this document, please do not hesitate to call me at (716) 684-8060.

Sincerely,

Stephen Blair, P.E.

Attachments
A – Hydrologic Analysis

cc: Wadie Kawar (E & E)

Table 1

Alternative 1 - Excavate Contaminated Ditch Material, On-Site Cleaning and Reuse of Stone

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Stockpile/Decon Area Const. And Demo.						
Temporary ditch crossing	south of NTC: 24" culvert and backfill	EA	1	$1,000 00	$1,000	Eng. Estimate
Excavate shallow pad (sloped)	1' with dozer, 50 ft x 50 ft	CY	93	$1 56	$145	Ref 1, 02300-410-3020
60 mil HDPE liner	add 50% for < 100K sf	SF	2500	$2 07	$5,175	Ref 1, 02660-400-0200
Select granular fill, operations layer	6 inches	CY	47	$11 64	$547	ref 1, 02300-130-0200
sump pump and pipe to onsite WWTP	for rainwater.	EA	1	$700 00	$700	Eng. Estimate
PCB Analysis - operations layer	assume 3 samples	EA	3	$100 00	$300	Eng. Estimate
Backfill area with stripped soil	assume ops layer is clean	CY	93	$1 56	$145	Ref 1, 02300-410-3020
push spreader seed, fert & mulch	slope mix	SY	300	$1 45	$435	ref 1, 02910 & 02920
Subtotal					$8,450	
Excavate, Stockpile, Decon and Backfill onsite						
Excavate sediment/stone - N/ S Ditch	Cost includes 15% for Loading	CY	100	$2.28	$228.00	02315-400-1500
Excavate stone - E/ W Ditch	Cost includes 15% for Loading	CY	85	$2.28	$193.80	02315-400-1500
Pressurecleaner rental		WK	2	$100.00	$200	Eng. Estimate
20 CY Box and Liner rental		WK	2	$100 00	$200	Eng. Estimate
Pressure Clean Stone	assume 2 wks for FE Loader and 3 laborers + 50%	HR	240	$230 00	$55,200	Ref 1 crew rates
sump pump and pipe to onsite WWTP	from 20cy box liner	EA	1	$700 00	$700	Eng. Estimate
purchase and install 4 carbon drums	2 at start of project and 2 at end	EA	4	$500 00	$2,000	Vendor's Quote
Dispose of 4 carbon drums		EA	4	$350 00	$1,400	Vendor's Quote
Geotextile		SY	670	$1 83	$1,226	ref 1, 02600-400-0110
Off-Site fill incl. Loading - N/S		CY	25	$8 85	$221	02315-xxx-4010
Hauling Backfill material to site - N/S		CY	25	$6 15	$154	02320-200-0500
Backfill ditch and Place Stone		CY	160	$0 68	$109	02315-120-2000
Maintain Site Drainage		LS	1	$2,500 00	$2,500	Eng. Estimate
Subtotal					**$64,340**	
Characterization and Disposal of Sediment/ Box and Liner						
PCB Analysis - sediment in liner	assume 5 samples	EA	10	$100 00	$1,000	Eng. Estimate
20 CY Box and Liner disposal	non-haz	CY	20	$75 00	$1,500	Eng. Estimate
Transportation & Disposal of Contaminated Sediment Material	Assume Non-Hazardous (<50 ppm), 1.3 ton/cy	Ton	33	$75 00	$2,475	Eng. Estimate - Based on historical site cost
Subtotal					$4,980	
Total Capital Cost					$77,770	
Mobilization/Demobilization	Assume 5% of total capital cost				$3,900	
Contingency 20%					$16,400	
Total Construction Cost					$98,100	

Notes

1. Reference 1, RSMeans, Heavy Construction Cost Data, 2000
2. All costs from Reference 1 adjusted to 2001 price by assuming 3% annual inflation rate
3. Reference: RS Means "Site Works & Landscape, 2001"

Table 2
Alternative 2 - Removal and Off-Site Disposal of Contaminated Ditch Material

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Excavation of Sediment/Rip-Rap						
Excavate sediment/rip-rap - N/ S Ditch	Cost includes 15% for Loading	CY	100	$2 28	$228 00	02315-400-1500
Excavate sediment/rip-rap - E/ W Ditch	Cost includes 15% for Loading	CY	85	$2 28	$193 80	02315-400-1500
Subtotal					$430	
Characterization and Disposal of Excav. Material						
PCB Analysis - Soil	Assume 10 samples	EA	10	$100 00	$1,000	Eng. Estimate
Transportation & Disposal of Contaminated Sediment Material	Assume Non-Hazardous (<50 ppm), 1.3 ton/cy	Ton	33	$75 00	$2,475	Eng. Estimate - Based on historical site cost
Transportation & Disposal of Contaminated RipRap	Assume Non-Hazardous (<50 ppm), 1 6 ton/cy	Ton	256	$75 00	$19,200	Eng. Estimate - Based on historical site cost
Subtotal					$22,680	
Ditch Restoration						
Off-Site fill incl. Loading - N/S		CY	25	$8.85	$221	02315-xxx-4010
Hauling Backfill material to site - N/S		CY	25	$6 15	$154	02320-200-0500
Geotextile - N/S ditch		SY	180	$1.13	$203	02720-200-6000
Rip-Rap - N/S ditch		CY	75	$37 50	$2,813	02370-300-0100
Backfill ditch and Place Stone		CY	100	$0 68	$68	02315-120-2000
hydroseeding, incl seed, fert & mulch	slope mix	MSF	2	$47 50	$95 00	02920-510-4600
Rip-Rap - E/Wditch		CY	85	$37 50	$3,188	02370-300-0100
Geotextile - E/W ditch		SY	490	$1 13	$554	02720-200-6000
Backfill ditch		CY	85	$0 68	$58	02315-120-2000
Maintain Site Drainage		LS	1	$2,500 00	$2,500	Eng. Estimate
Subtotal					$9,860	
Total Capital Cost					$32,970	
Mobilization/Demobilization	Assume 5% of total capital cost				$1,700	
Contingency 20%					$7,000	
Total Construction Cost					$41,700	

Notes
Reference: RS Means "Site Works & Landscape, 2001"

Table 3

Alternative 3 -Installing a Storm Sewer Pipe in the N/S ditch and Removal and Off-Site Disposal of Highly Contaminated Material

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Installation of New Storm Pipe in N/S						
24" HDPE Pipe		LF	325	$66 00	$21,450	02510-850-0900
Bedding Mtrl - Use Bentonite/Sand Mixture	Assume 6" on both sides of pipe + 6" below and top of pipe	CY	75	$105 00	$7,875	Vendor's Quote
Backfill/Compact w/ Vibrating Plate		CY	75	$2 33	$175	17-03-0415 (ECHOS)
Low-permeable - 6" Lifts	Incl. Delivery, spreading, compaction.	CY	275	$19 65	$5,404	33-08-0507 (ECHOS)
Furnish Topsoil, Off-Site		CY	45	$24 82	$1,117	18-05-0301 (ECHOS)
hydroseeding, incl seed, fert & mulch	slope mix	MSF	4	$48 93	$196	02920-510-4600
Bentonite/Sand Mixture - for Dam Construction	Assume 6" on both sides of pipe + 6" below and top of pipe	CY	6	$105 00	$630	Vendor's Quote
Tie-in Fittings		LS	1	$1,500 00	$1,500	Eng. Estimate
Maintain Site Drainage		LS	1	$2,500 00	$2,500	Eng. Estimate
Transportation & Disposal of Contaminated Sediment Material	Assume Non-Hazardous (<50 ppm), 40'L, 5' W,12" D, 1.3 ton/cy	Ton	10	$75 00	$750	Eng. Estimate - Based on historical site cost
Subtotal					**$41,600**	
Total Capital Cost					**$41,600**	
Mobilization/Demobilization	Assume 5% of total capital cost				**$2,100**	
Contingency 20%					**$8,600**	
Total Construction Cost					$52,500	

Notes

Reference: RS Means "Site Works & Landscape, 2001"

ATTACHMENT A

E0350793

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General Computation Sheet

Calculation Set No.		
Preliminary ☐		
Final ☐		
Void ☐		
Sheet 1 of ___	Project No.	
Rev.	Completed By	Checked By
☒	Initials: SPW 6/5/01	Initials: WJK 7/18/01
	Initials: / /	Initials: / /

Name of Project: NTC IRM System ______

Subject: RUNOFF QUANTITIES

OBJECTIVE: CALCULATE PEAK DISCHARGE FOR ADDRESSING NTC STORMWATER RUNOFF.

REFERENCES
1. LINDEBURG, "CIVIL ENGINEERING REFERENCE MANUAL"
2. CHOW, "HANDBOOK OF APPLIED HYDROLOGY"
3. M. MORCANTE CALC FILE, CIRCA 1994-1995
4. NYS GIS CLEARINGHOUSE, WWW.NYSGIS.STATE.NY.US
5. NTC REMEDIAL DESIGN DWGS, E&E, 1995
6. WANIELISTA, "HYDROLOGY, WATER QUANTITY AND QUALITY CONTROL" 1997

GENERAL ASSUMPTIONS:
1. DESIGN BASED ON 10 YR RETURN PERIOD
2. RATIONAL METHOD IS AN APPROPRIATE METHOD FOR ESTIMATING PEAK DISCHARGES BECAUSE OF RELATIVELY SMALL DRAINAGE AREAS, NO HYDROGRAPH REQUIREMENT, AND URBAN SETTING.

$$Q = CiA$$

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General Computation Sheet

Calculation Set No.	
Preliminary	☐
Final	☐
Void	☐
Sheet 2 of ___	Project No.

Name of Project NTC IRM System ______

Subject Runoff Quantities

Rev.	Completed By	Checked By
	Initials: / /	Initials: / /
	Initials: / /	Initials: / /

SEE SHEETS 6-8 FOR REFERENCE DWGS

AREA #1 – FLOW TO PROPOSED E/W CULVERT INLET

PROPERTY	AREA	DESCRIPTION	C (REF 1)
8	2.4 AC	BUILDING AND PARKING	0.85
7	2.5 AC	1/2 BUILDING/PARK 1/2 UNIMPROVED	0.85 (1.25 AC) 0.3 (1.25 AC)
6.2	1.5 AC	UNIMPROVED	0.3
6.1	~1/2 (3.2 AC)	UNIMPROVED	0.3
	8.0 AC		$\bar{C} = 0.55$

DESCRIPTION BASED ON E&E OBSERVATIONS AND REF (4)

TIME OF CONCENTRATIONS: MANY METHODS ARE AVAILABLE. REF (2) AND (6) WERE REVIEWED AND TRIAL CALCULATIONS WERE PERFORMED. THE BRANSBY WILLIAMS FORMULA SEEMED TO PROVIDE AN AVG. VALUE OF THE DIFFERENT METHODS.

BRANSBY WILLIAMS EQUATION, $t_c = 21.3 L \frac{1}{A^{0.1} S^{0.2}}$

L = LENGTH OF CHANNEL FROM DIVIDE TO OUTLET, mi

A = DRAINAGE AREA, mi^2

S' = AVG. SLOPE, ft/ft

$L = 880 ft = 0.167 mi$

$A = 8 AC = 0.0125 mi^2$

$S = \frac{\Delta H}{L} = \frac{(659' - 643')}{880'} = 0.0182 ft/ft$

EL 659' – NE CORNER of LOT 8

EL 643 – INV of E/W DITCH. SOUTH END of LOT 6.1.1

$t_c = 12.3 MIN$

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General Computation Sheet

Calculation Set No.	
Preliminary	☐
Final	☐
Void	☐
Sheet 3 of ___	Project No.

Name of Project NTC IRM System ______

Subject Runoff Quantities

Rev.	Completed By	Checked By
X	Initials: / /	Initials: / /
	Initials: / /	Initials: / /

From: Buffalo, N.Y. IDF curve

$F = 10\,yr$, $D = 12.3\,min$ } $i = 3.95\,in/hr$

Rational Method $Q = CiA$

$Q = CiA = 0.55(3.95\,in/hr)\,8\,ac = $ **17.4 cfs**

Flow to proposed culvert inlet for N/S ditch

Item	Area, ac	Description	C
N. Plot	151'×175' 0.60	Bldgs & Asphalt Parking	
Lg Bldg	130×165 0.50		
S. Plot	180'×145' 0.53		
Sm Bldg	35'×125 0.10		
Asphalt Drive	40'×335' 0.33		
	2.06 ac		0.85
Lot 6.1	1.4 ac	unimproved	0.30
A_{TOT}	3.46 ac		

$\bar{C} = \frac{\Sigma CA}{A_{TOTAL}}$

$\bar{C} = 0.63$

t_c calculations $L = 614' = 0.1163$

$H = 659' - 647' = 12'$ $S = 0.0195\,ft/ft$

$A = 3.46\,ac = 0.0054\,mi^2$

$\therefore t_c = 9.2\,min$

$\therefore i = 4.5\,in/hr$

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General Computation Sheet

Calculation Set No.	
Preliminary	☐
Final	☐
Void	☐
Sheet 4 of ___	Project No.

Name of Project NTC IRM System ___

Subject Runoff Quantities

Rev.	Completed By	Checked By
	Initials: SBW 6/6/01	Initials: WJK 7/12/01
	Initials: / /	Initials: / /

$Q_{10} = 0.63(4.5\ in/hr)(3.46\ ac) = 9.8\ cfs$

// PEAK Q BELOW CONFLUENCE OF E AREA & NTC AREA

@ JUNCTION E AREA $t_c = 12.3$ MIN

NTC AREA $t_c = 9.2 + 2.5$ MIN $= 11.7$ MIN

ASSUME: VEL IN PIPE = 2 fps

PIPE LENGTH = 300' $\therefore t_c = \frac{L}{V \times 60} = \frac{300'}{2\ ft/sec \times 60\ sec/min} = 2.5$ MIN

$\therefore$ USE $t_c = 12.3$ MIN (LARGER OF TWO t_c)

10 YR $i = 3.95$ in/HR

ADD: SW CORNER OF LOT 6.1 $C = 0.3$ $A = 0.38$ ac

$\bar{C} = \frac{(0.3)(0.38\ ac) + (0.55)(8\ ac) + (0.63)(3.46\ ac)}{(0.38\ ac + 8\ ac + 3.46\ ac)}$

$\bar{C} = 0.57$

$A_{TOT} = 11.84$ ac

$Q_{10} = (0.57)(3.95\ in/hr)(11.84\ ac) = 26.7\ cfs$

5/

02:000523/DW02_00_90_06-B0045
Fig 2-1.CDR-10/5/98-GRA

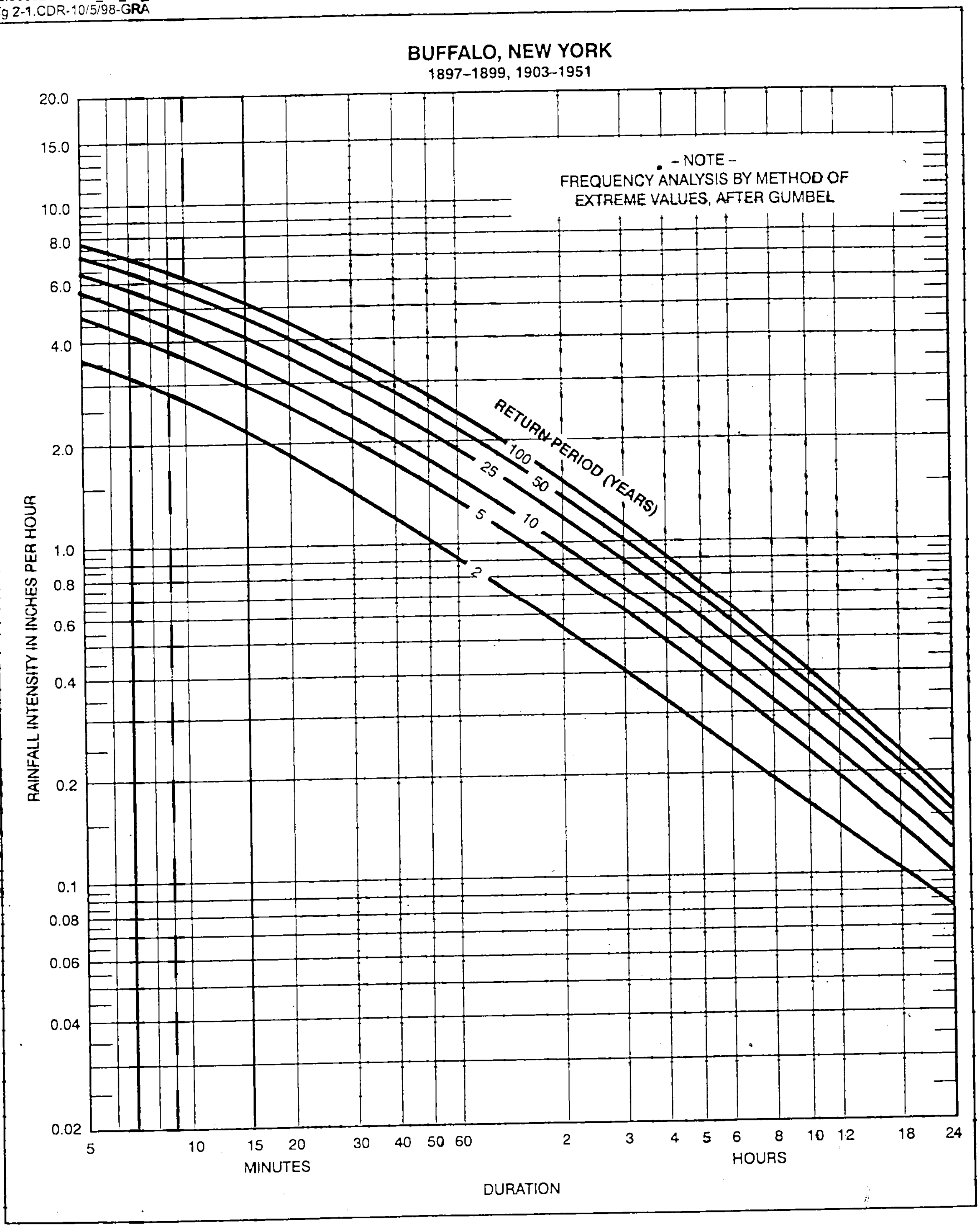
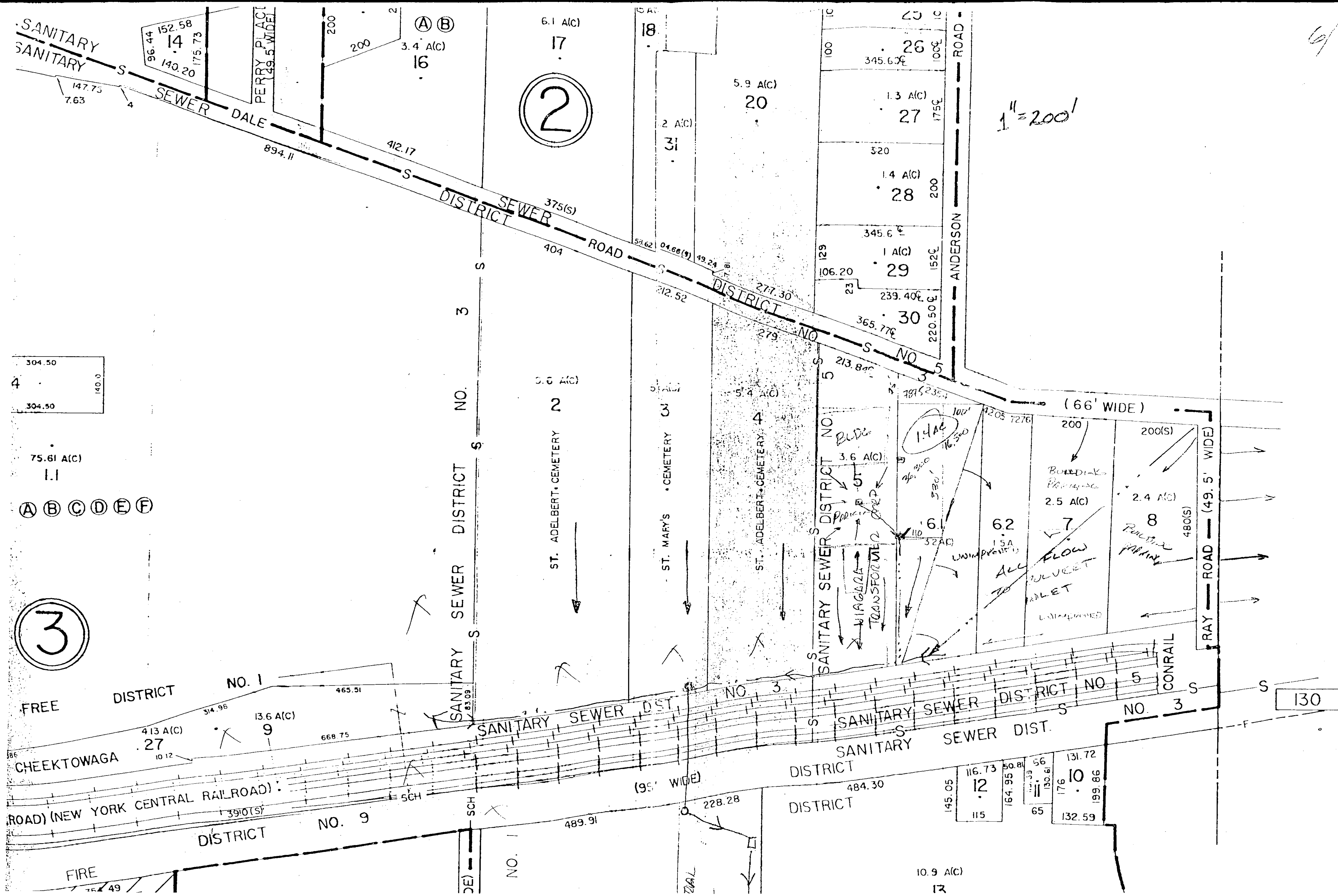
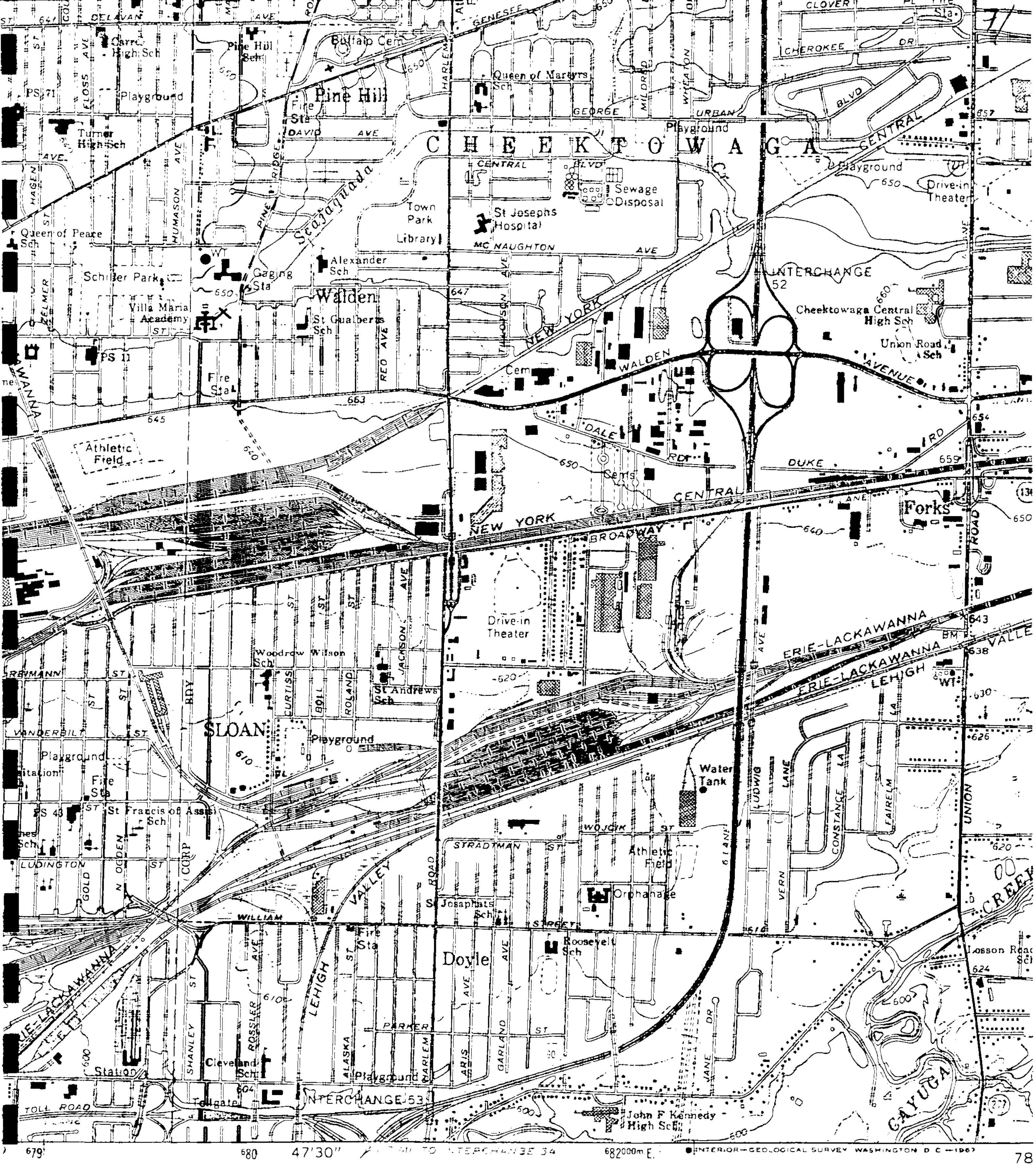


Figure 2-1 INTENSITY DURATION FREQUENCY CURVE


61
1" = 200'
SANITARY SEWER DISTRICT NO. 3
DALE ROAD
SANITARY SEWER DISTRICT NO. 5
PERRY PLACE (49.5' WIDE)
ANDERSON ROAD
(66' WIDE)
RAY ROAD (49.5' WIDE)
ST. ADELBERT CEMETERY
ST. MARY'S CEMETERY
FREE DISTRICT NO. 1
CHEEKTOWAGA
(NEW YORK CENTRAL RAILROAD)
CONRAIL
(99' WIDE)
FIRE DISTRICT NO. 9
130
2
3
ALL FLOW TO INLET
NIAGARA TRANSFORMER CORP
BLDG
PARKING
UNIMPROVED
1.4 AC
75.61 A(C)
3.6 A(C)
2.5 A(C)
2.4 A(C)
5.9 A(C)
10.9 A(C)
13.6 A(C)



1 MILE

4000 5000 6000 7000 FEET

1 KILOMETER

1" = 2000'

FEET
LEVEL

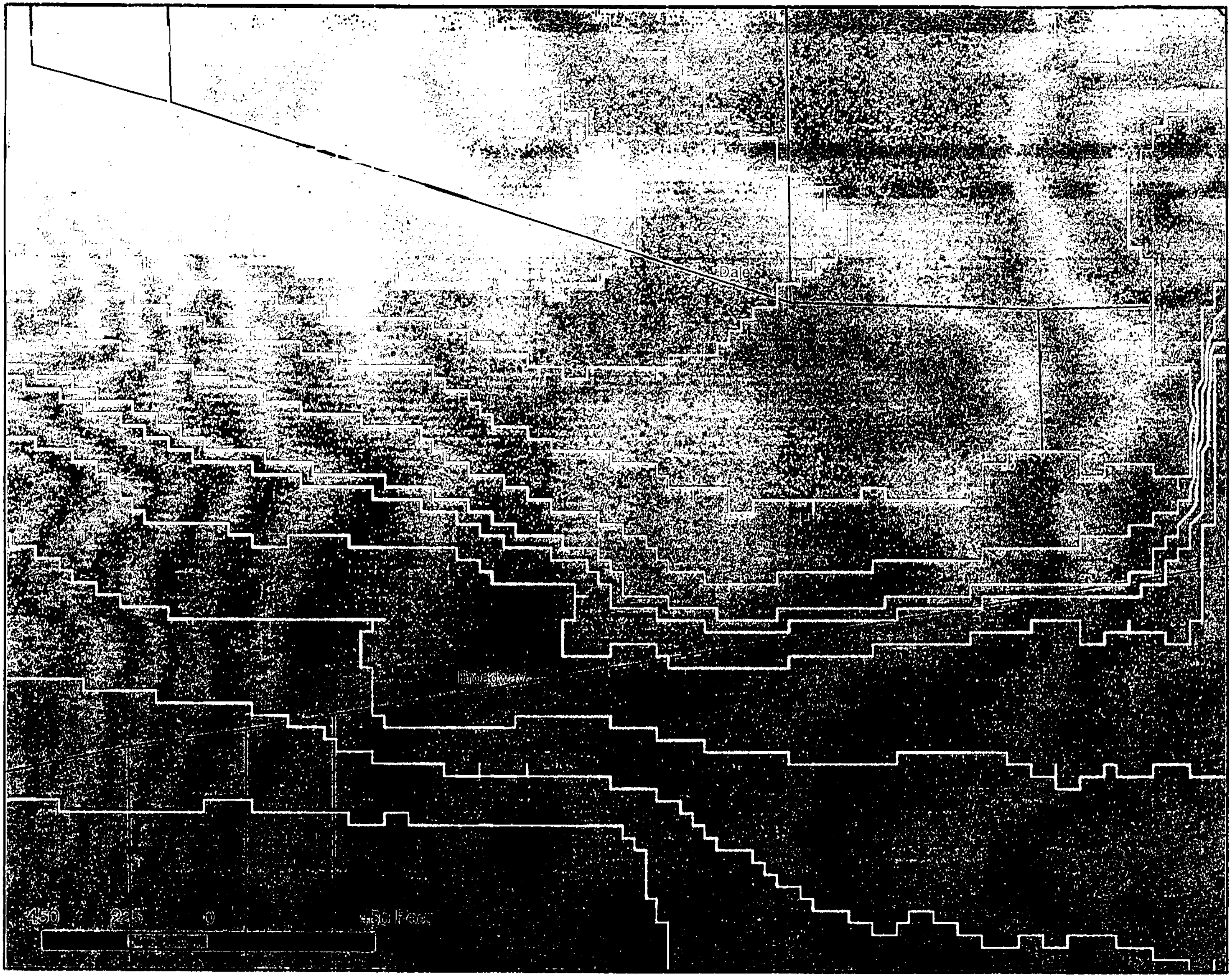
ROAD CLASSIFICATION

Heavy-duty Light-duty
Medium-duty Unimproved dirt

Interstate Route U. S. Route State Rout

NEW YORK

BUFFALO NE, N. Y



60

ecology and environment engineering, p.c.

BUFFALO CORPORATE CENTER
368 Pleasant View Drive, Lancaster, New York 14086
Tel: 716/684-8060, Fax: 716/684-0844

| 2001

September 27, 2001

James A. Moras
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7017

Re: **Niagara Transformer Corporation Site No. 9-15-146**
Interim Remedial Design – SubTask 2.3
Work Assignment #D003493-28

Ecology & Environment Engineering, P.C., (E & E) was retained by the New York State Department of Environmental Conservation (NYSDEC) under the Standby Contract Assignment No. D003493-28 to complete Interim Remedial Measure (IRM) design services at the above-referenced site. This letter report summarizes the evaluation completed for the preliminary design of installing storm sewer in the East/West ditch (Subtask 2.3 in Work Plan). The objective of this design element is to minimize the potential for future contaminant migration into the stormwater management system located south of the NTC site. The system primarily consists of a stone lined ditch (E/W ditch) which discharges into a retention pond located west of the site. It should be noted that Subtask 2.3 does not address the suspected subsurface contamination adjacent to the E/W ditch. A single alternative has been evaluated under the present subtask.

Alternative 1 – Design of Stormwater Sewers in E/W Ditch

It is suspected that subsurface contamination exists in isolated locations adjacent to the E/W ditch between the north/south (N/S) ditch confluence to St. Mary's Cemetery's east property line. Specifically, PCB contamination exists on the rail yard property (southwest corner of NTC property), just north of the rail tracks, and along the St. Adalbert's cemetery. There is potential that groundwater from the contaminated locations seep into the E/W ditch. Alternative 1 addresses the potential of contaminant migration to the stormwater management system. The alternative includes installing 24-inch diameter, butt-fused HDPE pipe between the N/S ditch confluence to St. Mary's Cemetery's east property line (approximately 500 feet). Existing contaminated sediment and stone in the ditch below 15 mg/kg will be buried in place (based on DEC correspondence, August 26, 2001).

The hydrologic analysis used to determine the runoff quantity for the 10-year storm is presented in Attachment A. The pipe was sized for a peak flow of 27 cubic feet per second (cfs). The pipe bedding and cover will consist of a low-permeable fill. The proposed HDPE pipe would convey stormwater from areas upstream and past the suspected areas of subsurface contamination. Using fused HDPE pipe significantly minimizes of groundwater infiltration into and stormwater exfiltration from the stormsewer pipe. The potential for a preferential contaminant pathway along the pipe bedding would be addressed by replacing tradition stone or sand with low-permeable fill. The pipe will be covered with soil and graded to direct surface runoff, flowing south from the NTC site and St. Adalbert's Cemetery, to the retention pond. Low-permeability dams will also be installed along the new pipe run to eliminate potential contaminant migration along the more permeable buried ditch material.

<u>Effectiveness:</u> The components of this alternative would be effective in transporting upgradient stormwater past the suspected areas of subsurface contamination without significant risk of infiltration and exfiltration. Using low-permeable soils for pipe bedding and cover material would minimize the potential for contaminants to migrate along the pipe bedding towards the retention pond.

This alternative does not directly address the suspected source areas along the E/W ditch. Currently the E/W ditch serves as groundwater discharge during periods of high groundwater, locally influencing groundwater flow directions. Once filled with low-permeability material, the E/W will no longer serve this purpose, and groundwater migrating from suspected source areas will likely continue in a southerly direction off-site. Assuming a hydraulic conductivity of $2x10^{-4}$ ft/min (RI), porosity of 0.3, and a hydraulic gradient of 0.01 ft/ft, the velocity of groundwater movement through the site has been estimated at about 0.01 ft/day. Assuming similar conditions beneath the railroad and beyond, a similar groundwater velocity may be expected in this off-site area. PCBs will travel much slower than the groundwater due to sorption and associated retardation. It is possible that further migration from the site will not be significant. It is recommended that in conjunction with this alternative, a series of shallow well points be installed at the water table on the south side of the tracks to enable the Department to monitor for further migrations of site-related contamination.

<u>Implementability:</u> This alternative is implementable using standard construction methods and materials. Permission to access portions of the Conrail right-of-way and St. Adalbert's Cemetery during implementation of this alternative would be required. It is anticipated that approximately 2 weeks would be required to complete this alternative.

<u>Cost:</u> The estimated construction cost for implementing the components of Alternative 1, including a 20% contingency is $68,000. Table 1 presents details of the cost estimate for this alternative. Although the cost is based on using HDPE piping, other pipe material and joints will be evaluated in the final design (based on required slopes, etc.) to achieve a more cost-effective solution.

If you have any questions regarding this document, please do not hesitate to call me at (716) 684-8060.

Sincerely,

Stephen Blair, P.E.

Attachments
A – Hydrologic Analysis

cc: Wadie Kawar (E&E)

Table 1
Installation of Stormwater Pipe in E/W Ditch

Item	Comments	Units	No. Units	Cost/Unit	Cost	Reference
Pipe Installation and Site Restoration						
24" HDPE Butt-Fusion Joint Pipe		LF	500	$64.89	$32,445	02510-850-0900
HDPE wye clean outs	1 per 200 ft	EA	2	$2,086.00	$4,172	Eng. Estimate
Manhole - Pre-cast 4' x 4' deep		EA	1	$1,600.00	$1,600	A12.3-710-5820
Concrete Headwall, 24"	at east end of E/W ditch	EA	1	$2,013.65	$2,014	A12.3-750-2000
Bedding Mtrl - Use Bentonite/Sand Mixture	Assume 6" on both sides of pipe + 6" below and top of pipe	CY	80	$105.00	$8,400	Eng. Estimate (see Backup sheet)
Backfill/Compact w/ Vibrating Plate		CY	80	$2.33	$186	17-03-0415 (ECHOS)
Off-Site Low Permeable Fill 6" Lifts	Incl. Delivery, spreading, compaction.	CY	140	$19.65	$2,751	33-08-0507 (ECHOS)
Furnish Topsoil, Off-Site		CY	40	$24.82	$993	18-05-0301 (ECHOS)
hydroseeding, incl seed, fert & mulch	slope mix	MSF	3	$48.93	$147	02920-510-4600
Bentonite/Sand Mixture - for Dam Construction	Assume 6" on both sides of pipe + 6" below and top of pipe	CY	6	$105.00	$630	Vendor's Quote
Subtotal					**$53,338**	
Total Capital Cost					$53,338	
Mobilization/Demobilization	Assume 5% of total capital cost				$2,700	
Contingency 20%					$11,300	
Total Construction Cost					**$68,000**	

Notes

1. Reference - RSMeans, 2000, Heavy Construction Cost Data
2. All costs from 2000 RSMeans increased by 3% to account for inflation to 2001

ATTACHMENT A

F0350793

ecology and environment, inc.

General Computation Sheet

Calculation Set No.		
Preliminary ☐		
Final ☐		
Void ☐		
Sheet 1 of ___	Project No.	
Rev.	Completed By	Checked By
	Initials: SPW 6/5/01	Initials: WJK 7-12-01
	Initials: / /	Initials: / /

Name of Project NTC IRM System ______

Subject Runoff Quantities

OBJECTIVE: CALCULATE PEAK DISCHARGE FOR ADDRESSING NTC STORMWATER RUNOFF.

REFERENCES ① LINDEBURG, "CIVIL ENGINEERING REFERENCE MANUAL"
② CHOW, "HANDBOOK OF APPLIED HYDROLOGY"
③ M. MORGANTE CALC FILE, CIRCA 1994-1995
④ NYS GIS CLEARINGHOUSE, WWW.NYSGIS.STATE.NY.US
⑤ NTC REMEDIAL DESIGN DWGS, E&E, 1995
⑥ WANIELISTA, "HYDROLOGY, WATER QUANTITY AND QUALITY CONTROL" 1997

GENERAL ASSUMPTIONS: ① DESIGN BASED ON 10 YR RETURN PERIOD
② RATIONAL METHOD IS AN APPROPRIATE METHOD FOR ESTIMATING PEAK DISCHARGES BECAUSE OF RELATIVELY SMALL DRAINAGE AREAS, NO HYDROGRAPH REQUIREMENT, AND URBAN SETTING.

$$Q = CiA$$

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General Computation Sheet

Calculation Set No.	
Preliminary	☐
Final	☐
Void	☐
Sheet 2 of ___	Project No.

Name of Project NTC IRM System ______

Subject RUNOFF QUANTITIES

Rev.	Completed By	Checked By
	Initials: / /	Initials: / /
	Initials: / /	Initials: / /

SEE SHEETS 6-8 FOR REFERENCE DWGS

AREA #1 - FLOW TO PROPOSED E/W CULVERT INLET

PROPERTY	AREA	DESCRIPTION	C (REF 1)
8	2.4 AC	BUILDING AND PARKING	0.85
7	2.5 AC	1/2 BUILDING/PARK 1/2 UNIMPROVED	0.85 (1.25 AC) 0.3 (1.25 AC)
6.2	1.5 AC	UNIMPROVED	0.3
6.1	~1/2 (3.2 AC)	UNIMPROVED	0.3
	8.0 AC		$\bar{C} = 0.55$

DESCRIPTION BASED ON E&E OBSERVATIONS AND REF (4)

TIME OF CONCENTRATIONS: MANY METHODS ARE AVAILABLE. REF (2) AND (6) WERE REVIEWED AND TRIAL CALCULATIONS WERE PERFORMED. THE BRANSBY WILLIAMS FORMULA SEEMED TO PROVIDE AN AVG. VALUE OF THE DIFFERENT METHODS.

BRANSBY WILLIAMS EQUATION, $t_c = 21.3 L \frac{1}{A^{0.1} S^{0.2}}$

L = LENGTH OF CHANNEL FROM DIVIDE TO OUTLET, mi

A = DRAINAGE AREA, mi^2

S = AVG. SLOPE, ft/ft

$L = 880 ft = 0.167 mi$

$A = 8 AC = 0.0125 mi^2$

$S = \frac{\Delta H}{L} = \frac{(659' - 643')}{880'} = 0.0182 ft/ft$

EL 659' - NE CORNER OF LOT 8

EL 643 - INV OF E/W DITCH: SOUTH END OF LOT 6.1

$t_c = 12.3 min$

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General Computation Sheet

Calculation Set No.			
Preliminary ☐			
Final ☐			
Void ☐			
Sheet 3 of ___		Project No.	
Rev.	Completed By		Checked By
	Initials: / /		Initials: / /
	Initials: / /		Initials: / /

Name of Project NTC IRM System ______

Subject Runoff Quantities

FROM: BUFFALO, N.Y. IDF CURVE

F = 10.42 } i = 3.95 in/hr
D = 12.3 min }

RATIONAL METHOD Q = CiA

Q = CiA = 0.55 (3.95 in/hr) 8 ac = 17.4 cfs

FLOW TO PROPOSED CULVERT INLET FOR N/S DITCH

ITEM	AREA, AC	DESCRIPTION	C	
N. PLOT	151' x 175' 0.60	BLDGS		
LG. BLDG	130' x 165' 0.50			
S. PLOT	160' x 145' 0.53			
SM BLDG	35' x 125' 0.10	ASPHALT		
ASPHALT DRIVE	40' x 355' 0.33	PARKING		
	2.06 AC		0.85	$\bar{C} = \frac{\Sigma CA}{A_{TOTAL}}$
LOT 6-1	1.4 AC	UNIMPROVED	0.30	
A_{TOT}	3.46 AC			$\bar{C} = 0.63$

t_c CALCULATIONS L = 614' = 0.1163

H = 659' − 647' = 12' S = 0.0195 ft/ft

A = 3.46 ac = 0.0054 mi²

∴ t_c = 9.2 min

∴ i = 4.5 in/hr

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General Computation Sheet

Calculation Set No.	
Preliminary	☐
Final	☐
Void	☐
Sheet 4 of ___	Project No.

Name of Project: NTC IRM System: ___

Subject: Runoff Quantities

Rev.	Completed By	Checked By
	Initials: SBW 6/6/01	Initials: WJK 7/2/01
	Initials: / /	Initials: / /

$Q_{10} = 0.63(4.5 \text{ in/HR})(3.46 \text{ ac}) = $ **9.8 cfs**

// PEAK Q BELOW CONFLUENCE OF E AREA & NTC AREA

@ JUNCTION E AREA $t_c = 12.3$ MIN

NTC AREA $t_c = 9.2 + 2.5$ MIN $= 11.7$ MIN

ASSUME: VEL IN PIPE = 2 fps

PIPE LENGTH = 300' $\therefore t_c = \frac{L}{V \times 60} = \frac{300'}{\frac{2 ft}{sec} \times \frac{60 sec}{min}} = 2.5$ MIN

$\therefore$ USE $t_c = 12.3$ MIN (LARGER OF TWO t_c)

10 yr $i = 3.95$ in/HR

ADD: SW CORNER OF LOT 6.1 $C = 0.3$ $A = 0.38$ ac

$$\bar{C} = \frac{(0.3)(0.38 ac) + (0.55)(8 ac) + (0.63)(3.46 ac)}{(0.38 ac + 8 ac + 3.46 ac)}$$

$\bar{C} = 0.57$

$A_{TOT} = 11.84$ ac

$Q_{10} = (0.57)(3.95 \text{ in/HR})(11.84 \text{ ac}) = $ **26.7 cfs**

02:000523/DW02_00_90_06-B0045
Fig 2-1.CDR-10/5/98-GRA

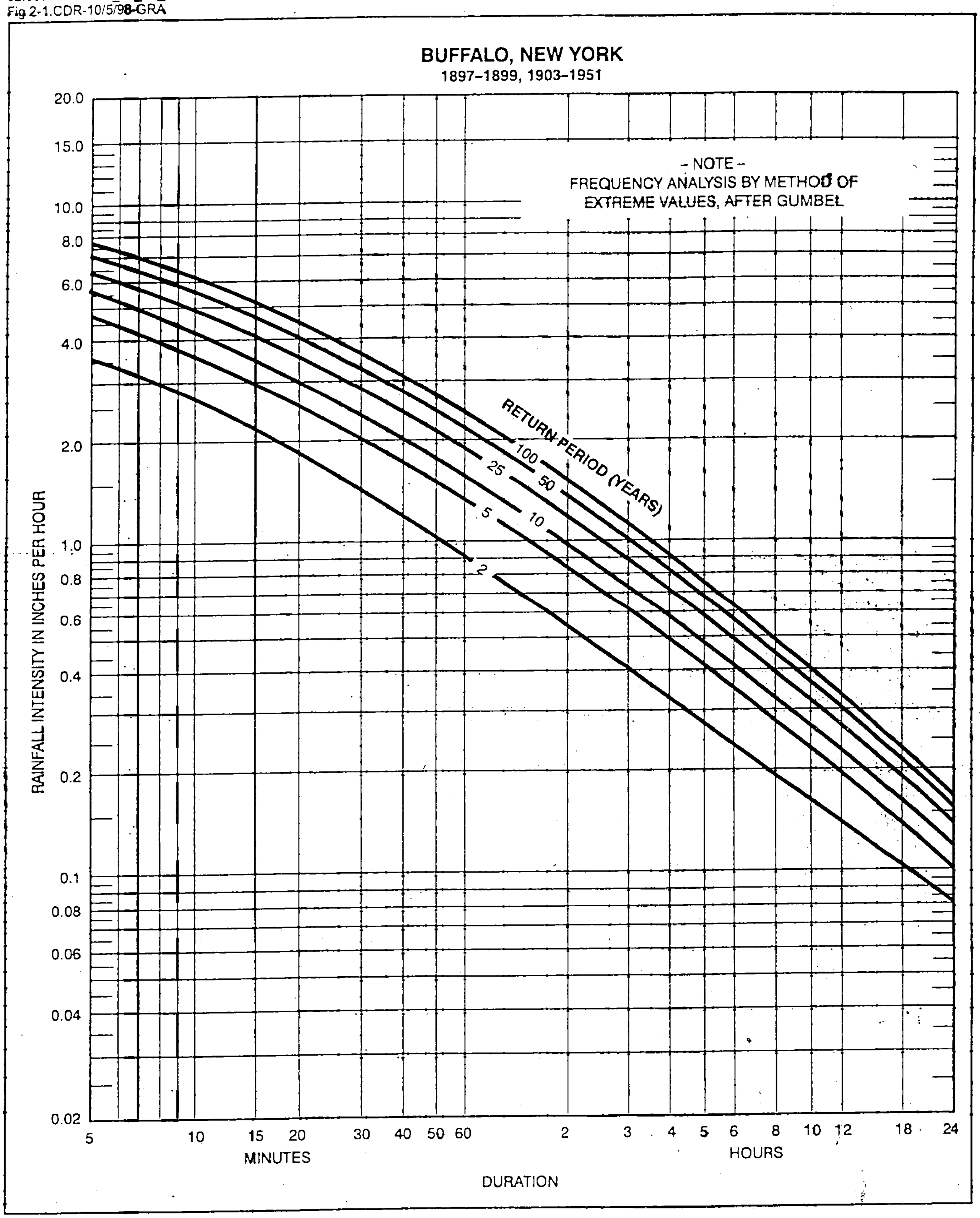
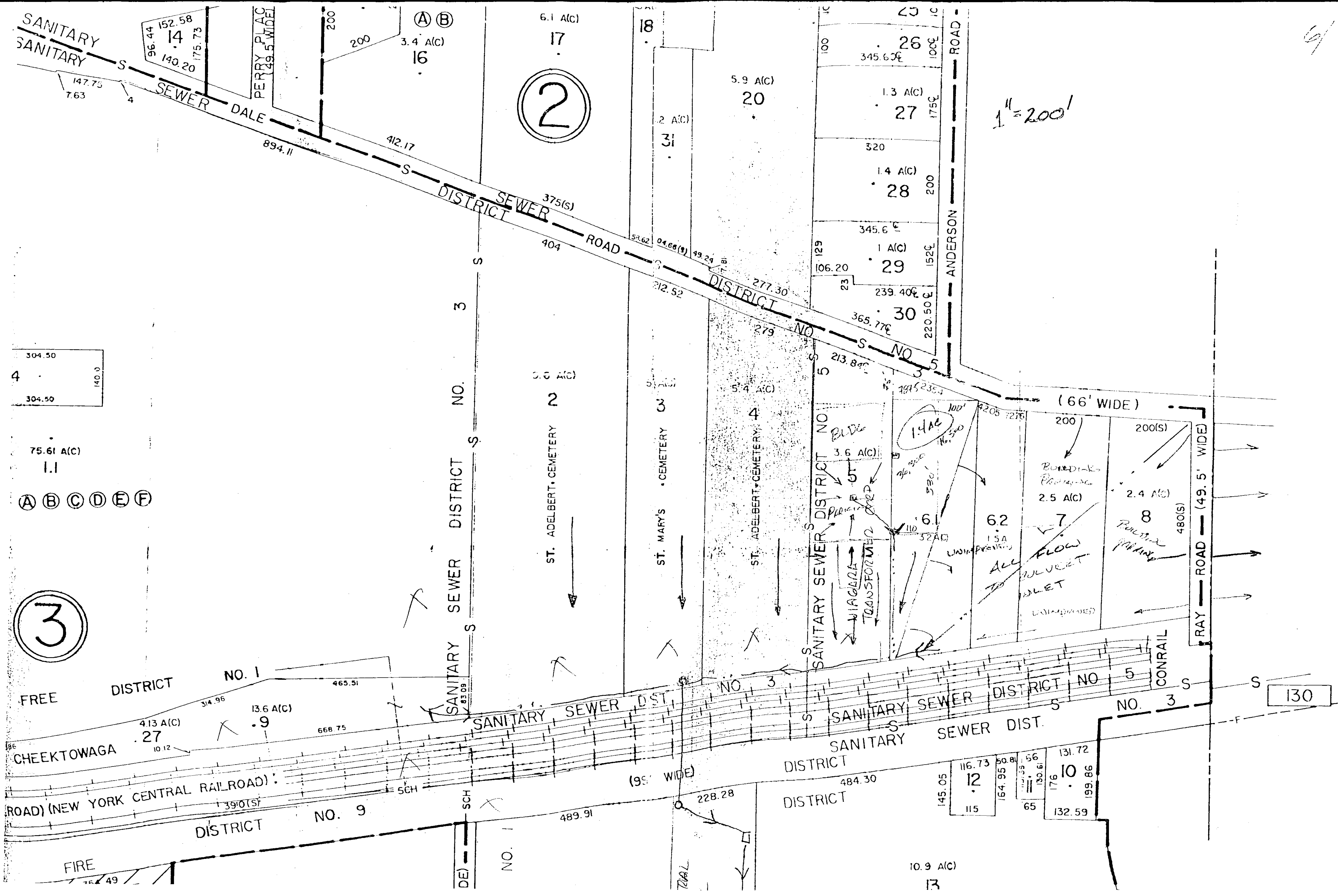
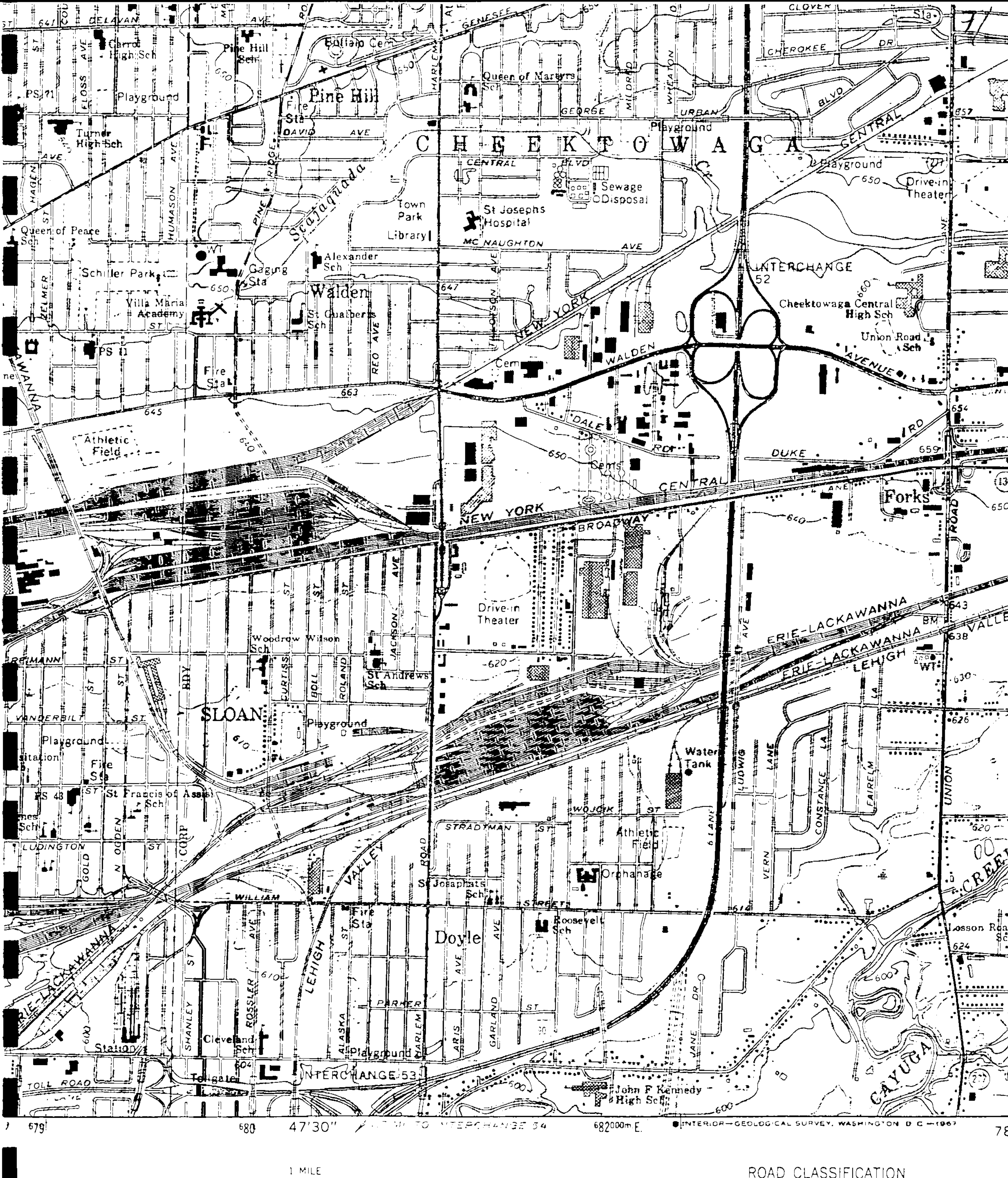


Figure 2-1 INTENSITY DURATION FREQUENCY CURVE



SANITARY SEWER DISTRICT NO. 3
SANITARY SEWER DISTRICT NO. 5
SANITARY SEWER DIST. NO. 3
DALE ROAD
(66' WIDE)
ANDERSON ROAD
RAY ROAD (49.5' WIDE)
PERRY PLACE (49.5' WIDE)
ST. ADELBERT CEMETERY
ST. MARY'S CEMETERY
FREE DISTRICT NO. 1
CHEEKTOWAGA
ROAD) (NEW YORK CENTRAL RAILROAD)
CONRAIL
FIRE DISTRICT NO. 9
SANITARY DISTRICT DISTRICT
(99' WIDE)
2
3
130
1"=200'
75.61 A(C)
1.1
13.6 A(C)
9
4.13 A(C)
27
3.6 A(C)
5
2.5 A(C)
7
2.4 A(C)
8
6.2
6.1
1.4 AC
5.4 A(C)
4
5.9 A(C)
20
6.1 A(C)
17
3.4 A(C)
16
14
18
31
1.3 A(C)
27
1.4 A(C)
28
1 A(C)
29
30
26
25
10.9 A(C)
13
12
11
10
NIAGARA TRANSFORMER CORP
ALL FLOW TO CULVERT INLET



1 MILE

4000 5000 6000 7000 FEET

1 KILOMETER

1" = 2000'

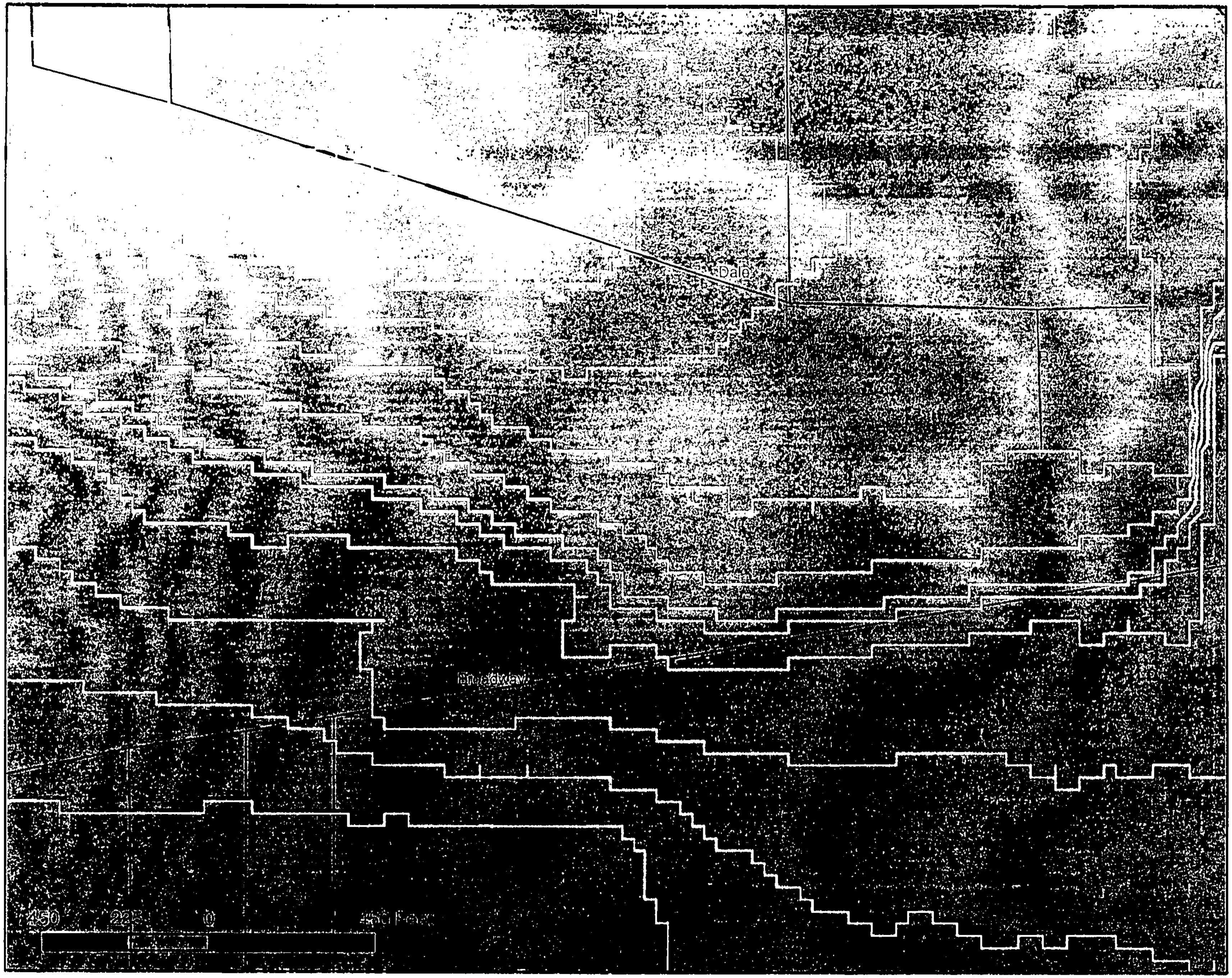
10 FEET
LEVEL

NEW YORK

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
Interstate Route — U.S. Route — State Route

BUFFALO NE, N. Y


Dale
Broadway
450 225 0 450 Feet