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SHEET PILE WALL
CONSTRUCTION COMPLETE REPORT

IROQUOIS GAS/WESTWOOD PHARMACEUTICAL SITE
BUFFALO, NEW YORK

Prepared For:

NATIONAL FUEL GAS DISTRIBUTION CORPORATION
10 Lafayette Square
Buffalo, NY 14203

Prepared By:

REMEDIATION TECHNOLOGIES, INC.
1001 West Seneca Street, Suite 204
Ithaca, NY 14850

RETEC Project No. 1-2700-300

MARCH 1997

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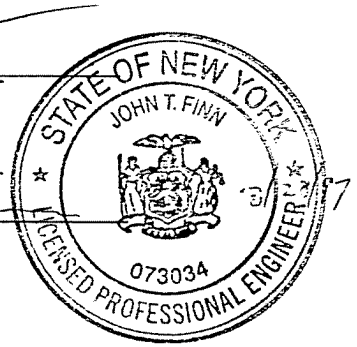
Prepared By: _____

Reviewed By: _____



MARCH 1997

1001 W. Seneca Street
Suite 204
Ithaca, NY 14850
(607) 277-5716
FAX (607) 277-9057

July 7, 1997

Ms. Tanya Alexander
Risk Management Department
National Fuel Gas Distribution Corporation
10 Lafayette Square
Buffalo, NY 14203

RE: Addendum to the Sheet Pile Wall Construction Complete Report dated March 1997

Dear Tanya:

Section 4.0 (Work Remaining) of the above referenced report reads as follows:

Due to winter conditions during installation of the sheet pile wall, the following activities were postponed until May, 1997. These activities will be performed by Sevenson under RETEC's supervision prior to closure of the contract.

- Placement of top soil as required;
- Final grading of disturbed areas, both on the creek bank and on adjoining properties;
- Seeding and mulching of disturbed areas;
- Replacement of trees as required;
- Repair and removal of silt fences and other temporary facilities.

During the weeks of May 12th and 19th, Sevenson completed the remaining work with the exception of replacement of trees (which was beyond their contracted scope of work).

On July 2, 1997, I again visited the site and made the following observations:

- Final grading of disturbed areas, both on the creek bank and on adjoining properties was performed satisfactorily;
- Seeding and mulching (hydroseeding) of disturbed areas was performed satisfactorily;
- Silt fences and other temporary facilities were removed;
- Top soil placement and hydroseeding of the bank slope is patchy but indigenous plant species appear well established and there are no signs of continuing erosion;
- Indigenous plant species have become reestablished throughout the disturbed area north of the pavilion on Buffalo Core property and there are no signs of erosion.

If you have any questions or comments, please do not hesitate to call me.

Regards,
Remediation Technologies, Inc.

Mark Hofferbert
Site Engineer

cc: John Finn - RETEC
Frank Fracassi - Sevenson
File: 1-2700-300

EXECUTIVE SUMMARY

This is the Construction Complete report for the Scajaquada Creek Sheet Pile Wall, Buffalo, New York. The work performed was in compliance with the Remedial Action Work Plans, Sheet Pile Wall Construction, Scajaquada Creek (RETEC, August 1996) and the associated Final Remedial Design, Technical Specifications, Sheet Pile Wall, Scajaquada Creek (RETEC, August 1996).

The purpose of the sheet pile wall was to reduce the sub-surface migration of coal tar from the terrestrial portion of the site to the creek, reduce the migration of groundwater from the creek to the terrestrial portion during terrestrial groundwater treatment operations, and to provide bank stability during future dredging operations.

Remediation Technologies, Inc. (RETEC) was the project engineer and general contractor and provided design engineering and construction oversight during construction activities. Sevenson Environmental Services, Inc. (Sevenson) was the construction sub-contractor. Additional oversight was provided by representatives from the National Fuel Gas Distribution Company (NFG) and the New York State Department of Environmental Conservation (NYSDEC).

The final location and depth of the wall (as-built) is in compliance with the approved Contract Documents. Design changes are limited to the following:

- the west wing wall was moved 12 to 14 feet to the east due to sub-surface obstructions,
- the eastern-most 70 feet were installed along the 574' contour instead of half way up the bank, and
- the eastern wing wall was terminated at the top of the bank to avoid a permanent installation on adjacent property owned by the Buffalo Core Company.

The construction phase began on October 30, 1996, and was completed on December 20, 1996. Because of winter conditions, final site restoration (placement of top soil and grass seed) has been delayed until May, 1997.

Results of periodic air monitoring demonstrated that there were no concentrations of contaminants above OSHA, NIOSH or ACGIH exposure limits within the workers' breathing zone or outside of the work area. During the cleaning and grouting of the sheet pile joints, however, coal tar residuals and strong odors were encountered, as well as elevated levels of airborne

hydrocarbons in the immediate vicinity of the joint openings. For these reasons RETEC required Sevenson to use respirators and disposable Tyvek suits during certain phases of the grouting work. This was the only operation during the construction of the sheet pile wall that required more than level "D" protection.

Coal tar residuals were also encountered during the initial site clearing when several fallen trees had to be dragged from the creek, thereby disturbing old sediments and generating a moderate sheen. Work on that task was halted until absorbent booms were deployed.

At approximately Station 3+15, an 8" steel pipe (approximate invert elevation 572') was encountered while driving a sheet; a 10 foot section of the pipe was removed and the location recorded as shown on the As-Built Drawings. The pipe was empty except for a small amount of apparent coal tar residual.

Results of ground vibration tests taken periodically during the work indicated that the sheet driving activity was performed within acceptable limits and did not represent a hazard to adjacent buildings.

TABLE OF CONTENTS

1.0 INTRODUCTION

The following document is a construction complete report for the sheet pile wall at the Iroquois Gas/Westwood Pharmaceutical (IG/WP) site along Scajaquada Creek in Buffalo, New York. The work consisted primarily of clearing the site and installation of 462 linear feet of sheet pile wall to a depth of 25 to 35 feet below grade. Remediation Technologies, Inc. (RETEC) was the project engineer and general contractor and provided design engineering and construction oversight during construction activities. Sevenson Environmental Services, Inc. (Sevenson) was the construction sub-contractor. Additional oversight was provided by representatives from the National Fuel Gas Distribution Company (NFG) and the New York State Department of Environmental Conservation (NYSDEC).

Work for this project was performed, and this construction complete report was prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of NFG for the specific application to the riparian portion of the IG/WP site. No other warranty, express or implied, is made. The sheet pile wall will have a limited service life, and its function is dependent upon the effective containment and remedy of contaminated groundwater and non-aqueous-phase liquid associated with the terrestrial site remedy being conducted by others.

1.1 Site Description and Background

The IG/WP site lies in a mixed industrial and residential area of Buffalo, New York on the south bank of the Scajaquada Creek (see Figure 1). The creek is approximately 40 to 50 feet wide in the section adjacent to the IG/WP site with a creek level approximately 20 feet below the top of the south bank. The creek drains southwest into the Black Rock Canal of the Niagara River approximately one-half mile down stream. The primary area of concern is a 1600 foot long stretch of the creek running from the West Avenue Bridge to a location 400 feet north of the New York Central Railroad bridge.

People's Gas Light and Coke Company built a manufactured gas plant at the site around 1897. Iroquois Gas Company, now National Fuel Gas Distribution Company, acquired the property in 1925 and operated the manufactured gas plant until the early 1950s. Gas storage was

Figure 1
Scajaquada Creek

continued on the property until 1972. In 1968, NFG removed or demolished some site structures. Westwood Pharmaceutical, now Westwood-Squibb Pharmaceutical (WSP), purchased the property and demolished the remaining structures in 1972. In 1985, WSP began construction of a second warehouse on the site. During construction, tarry and oily residues were found in the soil and remaining underground structures. Soil and ground water sampling conducted by WSP reportedly indicated that the soil and groundwater were contaminated with chemicals associated with gas manufacturing processes. Groundwater monitoring and creek sediment sampling reportedly indicated that contaminants were moving off-site into the creek.

NYSDEC listed the IG/WP site in the New York State Registry of Inactive Hazardous Waste Disposal Sites in 1989. The New York State Attorney General filed a complaint against WSP in December 1990. WSP performed a Remedial Investigation/Feasibility Study (RI/FS) at the site. In 1993, the complaint against WSP was amended to include NFG as a primary defendant. In the Record of Decision (ROD) dated March 1994, NYSDEC selected a preferred remedial action for the riparian portion of the site. The primary components of the remedy include removal of contaminated sediments from the creek followed by management of the dredged material. In 1995, two Consent Decrees were entered by the court settling the State's

claims, one for implementation of the terrestrial (south bank) remedy, for which WSP is responsible, and one for implementation of the riparian (creek bed and shoreline) remedy, for which NFG is responsible.

During development of the Consent Order, a sheet pile wall, which was originally a component of the terrestrial remedy, was transferred to the riparian remedy. Because of scheduling concerns in relation to the installation of a groundwater extraction and treatment system on the terrestrial portion of the site, the design and construction of the sheet pile wall was implemented in advance of the remaining riparian work.

1.2 Sheet Pile Wall Objectives

The objectives of the sheet pile wall can be summarized as follows:

- reduce the sub-surface migration of coal tar from the terrestrial portion of the site to the creek;
- reduce the migration of groundwater from the creek to the terrestrial portion during terrestrial groundwater treatment operations;
- provide bank stability for future dredging operations.

2.0 SUMMARY OF FIELD MODIFICATIONS AND CHANGES

The sheet pile wall construction was performed in substantive compliance with the Workplan, the Contract Drawings and the Contract Specifications. Field conditions did, however, require occasional changes to the Contract Drawings and modifications to the construction methods as detailed in the Workplan. A summary of the design changes and construction methods is provided herein.

- The western wing wall was installed 12 to 14 feet east of the originally designed location. This was necessary due to sub-surface obstructions, primarily concrete debris, in the vicinity of the existing stormwater outfall. Sevenson made a substantive effort to install the wall as shown on the Contract Drawings but was unable to locate a suitable path through the buried debris. As a consequence, 13.2 linear feet (sheets # 9, 10, and 11) were eliminated from the wall at the water's edge and the wing wall was moved to its as-built location.

- The Contract Documents specified sheet piles (excluding wing walls) to be installed on the 574' contour and driven to grade. Actual top elevation of these piles, as-built, varies from 573.32' to 576.90' depending on bank stability and steepness.

- Significant soil subsidence occurred around the sheets during installation, causing up to 18 inches of sheet face to remain exposed after being driven to the appropriate approximate top elevation. This is evident from the exposed steel along the water's edge (see Figure 2). To avoid sharp metal edges and a low top elevation, Sevenson (at the request of RETEC and NFG) backfilled the cavity behind the wall with clean fill rather than cut the sheets off at grade as described in the Contract Documents.

- Due to the high water table, the sheet pile joints were grouted with bentonite pellets ($K=1.5 \times 10^{-9}$ cm/sec) rather than cement grout. The pellets rapidly sank and then swelled, filling all voids. Approximately one 5 gallon bucket of pellets was used per joint; this volume corresponds with the calculated minimum required volume. Prior to backfilling behind the sheets, each joint was inspected and found

Figure 2
Top of wall prior to backfill

to be satisfactorily sealed. Standing water was observed to be puddling behind the wall within two or three days of grouting.

- During construction, it was found that the rip rap at the eastern end of the work area extended to the top of the bank instead of half way up as shown on the Contract Drawings. It was RETEC's decision not to route the wall along the top of the bank because of the additional length of steel required to provide comparable bank stability. As a result, Sevenson was authorized to temporarily remove the rip rap and to continue installing the wall at the 574' contour.

- The eastern wing wall was terminated at the top of the bank rather than extend an additional 20 linear feet onto Buffalo Core property as shown on the Contract Drawing.

3.0 SUMMARY OF SAFETY AND ENVIRONMENTAL ISSUES

Construction of the sheet pile wall was generally defined as a non-hazardous job because of the lack of surface contaminants. Site personnel, therefore, worked in level "D" protection (hard hat, steel toed shoes, safety glasses) but were at all times prepared for level "C" (Tyvek suits, respirators) should the need arise. All personnel working at the project site were required to operate under RETEC's Site-Specific Health and Safety Plan for National Fuel Gas Distribution Corporation, Inactive Hazardous Waste Site, Buffalo, New York (June 1996). The Health and Safety Plan (HASP) was written to meet the requirements of 29 CFR 1926.65.

3.1 Contaminant Hazards

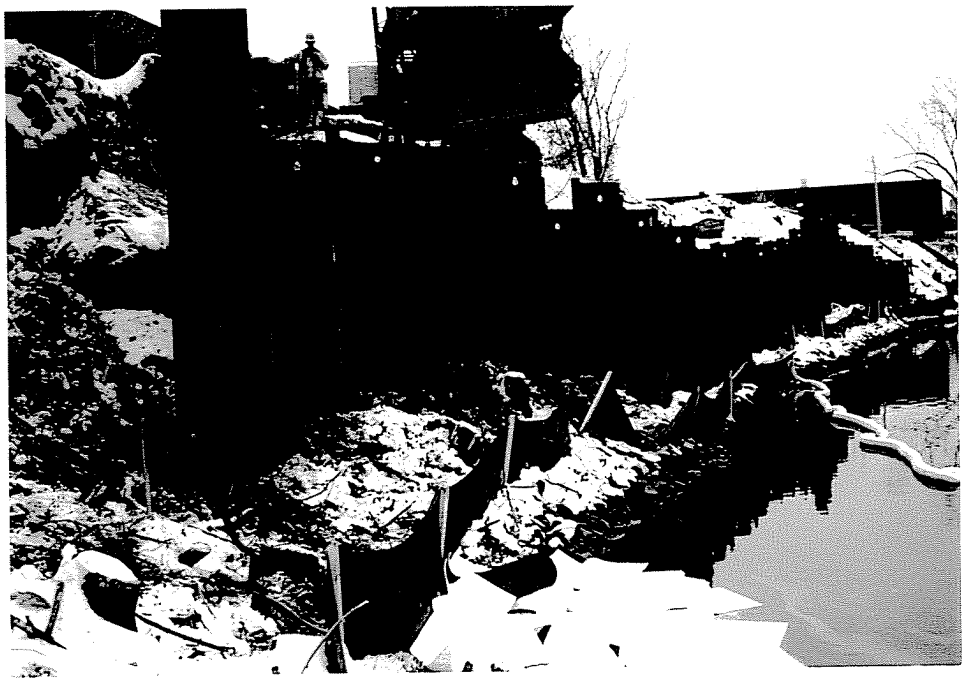
Despite the non-hazardous definition of the work, coal tar residuals were encountered during three phases of the work:

- During clearing and grubbing several fallen trees had to be partially recovered from the creek. A significant sheen developed on the water surface while recovering two or three trees near Station 3+20. Work on that task was halted until absorbent booms could be placed across the creek and the sheen contained.

- At approximately Station 3+15, an abandoned sub-surface 8" steel pipe containing a small quantity of coal tar residual was encountered. As the sheet pile was driven, the pipe kinked and the pipe mouth was raised out of the creek bank sediments (see Figure 3). From 1 to 3 gallons of product was discharged onto the creek bank but the resulting sheen was contained by the absorbent booms. Absorbent pads were used to clean the bank. A 10 foot section of the pipe was removed, cleaned and scrapped, and the sheet pile installation was completed. Station 3+15 is shown on the As-Built Drawings (Appendix C). The invert elevation of the remaining pipe is approximately 572'.

- As expected, coal tar was encountered during jetting (cleaning the sheet pile joints with high pressure air and water) and grouting operations. Because the sheet piles were installed vertically through the entire lens of coal-tar-contaminated soil before tying into the confining clay layer, coal tar seeped into the angle iron at the pile joints. When the joints were jetted clean, any coal tar which had seeped into the joint was brought to the surface. Workers performing this task used a sheet metal

Figure 3
Sheet pile installation and 8" steel pipe



shield to direct any splashed material downward. Because the angle irons were welded to the uphill side of the joints and terminated six inches short of the top of the piles, the ejected liquids were contained away from the creek. The liberal use of absorbent pads and booms also assured that no sheens occurred downstream of the work. Based on photoionization detector (PID) readings during grouting, RETEC required that the workers involved upgrade their personal protective equipment to level "C" (Tyvek suits and respirators equipped with organic vapor cartridges) along certain sections of the wall. The PID readings are summarized as follows but should be viewed as qualitative rather than quantitative values:

Date	Approx Station	PID Reading (ppm total hydrocarbons, typically sustained for less than one minute)			Level C Used ?
		Below Sheet Metal (Ground Level)	Above Sheet Metal (Knee High)	Worker's Breathing Zone	
Nov 22	0+40	0.6	0	0	No
Nov 25	0+60	3	0	0	No
Nov 26	1+20	20	0	0	No
Nov 27	1+60	30	0	0	No
Dec 10	2+25	120	3.8	0	Yes
Dec 13	3+30	100	2	0	Yes
Dec 14	3+40	40	2	0	Yes
Dec 16	3+60	2.5	0.5	0	Yes
Dec 17	3+90	0	0	0	No

To complete the jetting and grouting task, one worker spent a total of four or five days working in level "C". This was the only operation during the construction of the sheet pile wall that required more than level "D" protection. Based on field observations during the jetting and grouting operations, the greatest sub-surface contamination appeared to be located between stations 2+00 and 3+50.

3.2 Mechanical Hazards

Due to the nature of the project, the heavy equipment, and the site access limitations, significant caution had to be exercised throughout the course of the work. Several specific issues are outlined below:

- Special clamps were fabricated to handle sheet piles during their off loading and transfer about the site. Because of the added weight of the angle iron to one edge of the sheets, the "pelican" hooks typically used for this work left the load unbalanced and precarious.

- Overhead power lines on Westwood-Squibb property were avoided. Behind the Buffalo Core building, a power pole was relocated to provide the clearance necessary between the crane and a low voltage power line feeding a billboard.

- Because of concerns about bank stability on one portion of the Westwood-Squibb property, Sevenson installed a temporary sheet pile wall part way up the bank and

backfilled to grade with clean imported gravel. This provided an extended and stable crane pad for work around station 3+50. Behind the Buffalo Core building, wooden crane pads and a 6" gravel base were used for extra stability.

- A 6-ton vibratory hammer was used to drive the sheet piles. A primary concern during the project was, therefore, avoiding damage to adjacent structures by ground vibration. OZA Inspections, Inc., of Lewiston, NY, performed periodic ground and air vibration monitoring during the work. Based on their data, OZA was satisfied that the sheet driving activity was performed within acceptable limits and did not represent a hazard to adjacent buildings. The highest ground velocity recorded was 0.169 inches per second; the cautionary limit is 0.500 inches per second. OZA's summary reports are included as Appendix B.

4.0 WORK REMAINING

Due to winter conditions during installation of the sheet pile wall, the following activities were postponed until May, 1997. These activities will be performed by Sevenson under RETEC's supervision prior to closure of the contract.

- Placement of top soil as required;
- Final grading of disturbed areas, both on the creek bank and on adjoining properties;
- Seeding and mulching of disturbed areas;
- Replacement of trees as required;
- Repair and removal of silt fences and other temporary facilities.

5.0 REFERENCES

RETEC, August 1996, Remedial Action Work Plans, Sheet Pile Wall Construction, Scajaquada Creek.

RETEC, August 1996, Final Remedial Design, Technical Specifications, Sheet Pile Wall, Scajaquada Creek, Buffalo, New York.

RETEC, June 1996, Site-Specific Health and Safety Plan for National Fuel Gas Distribution Corporation, Inactive Hazardous Waste Site, Buffalo, New York.

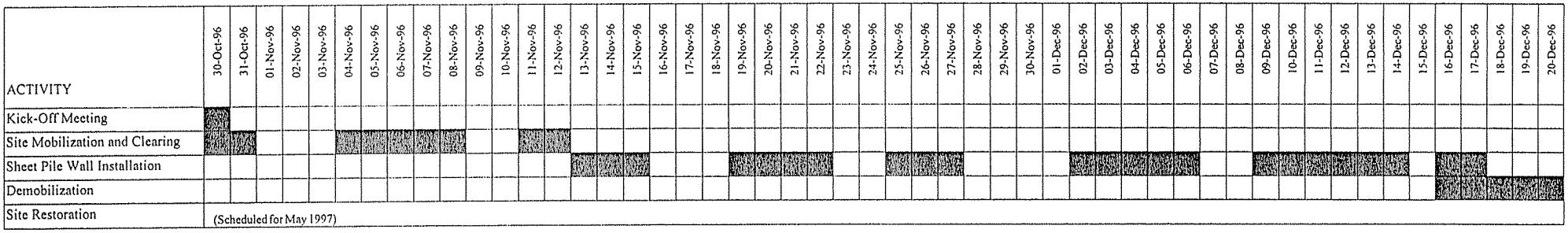
APPENDIX A

CONSTRUCTION SCHEDULE

SCAJAQUADA CREEK SHEET PILE WALL CONSTRUCTION PROGRESS

NATIONAL FUEL GAS

RETEC Project Number 1-2700-300



APPENDIX B

SUMMARY OF
GROUND AND AIR VIBRATION MONITORING RESULTS

P.O. BOX 125, LEWISTON, N.Y.
14092 - 0125

OZA Inspections Inc.

(716) 832-9513

November 22, 1996

TO: Sevenson Enviormental Services, Inc.
2749 Lockport Road
Niagara Falls, New York 14304

ATTN: Mr. Russ Harris

RE: Ground & Air Vibration Results → 11/13, 11/15, 11/21
Westwood-Squibb Site
100 Forest Avenue
Buffalo, New York 14213

OZA File No. 7893

Mr. Harris:

OZA Inspections attended to the above site where you firm was conducting sheet piling activities along the south bank of Scajaquada Creek. Ground and air vibration readings were taken at various locations at the site.

The OZA-216 recording seismograph was utilized in the Strip Mode and Instant Recording Mode at this site.

In the Strip Mode the OZA-216 continually records sheet piling activity. After each four second observation window (the "x" axis), the seismograph graphically imprints the maximum value of Peak Particle Velocity (PPV - the "y" axis) achieved in that time window. The continuing strip chart shows an entire event or series thereof. Ambient readings are taken at periods of little or no activity so as to obtain a baseline of activity for each site.

In the Instant Recording Mode the seismograph is triggered by the lowest peak of ground or air vibration as dictated by the operator. The other effects are also recorded as soon as the unit is triggered.

In such situations, OZA Inspections applies an upper, cautionary limit of 0.50 inches per second (PPV) as a recommended limit of vibration. This limit has been established over many years of research into the effects created by vibrational machinery on adjacent grounds and structures.

The recorded air (dB) readings were acquired as close as possible (30 feet) to the active drive hammer. The highest reading attained was 114 db. When the microphone was removed to the side wall of the building (80 feet), the microphone was not able to achieve a trigger level which means the noise was less than 110 db. This is far below any level of air overpressure or concussion that could result in structural damage.

OZA Inspections is satisfied that the sheet driving activity by your firm was performed within accepted limits and does not represent a hazard to adjacent buildings.

A summary of the recordings from the site is attached as well as the seismograms for your review.

Should you have any further questions, please do not hesitate to contact the writer.

Sincerely,

OZA INSPECTIONS INC.

Robert M. Lamb

Robert M. Lamb

TEST #	Distance To Monitor (Ft)	Distance to Building (Ft)	Air (Db)	Ground (PPV)	
1	30	80	112	0.27	
2	30	80	114	0.11	
3	30	80	110	0.14	
4	80	80	N.T.	0.08	
5	80	80	N.T.	0.08	
6	80	80	N.T.	0.08	
7	80	80	N.T.	0.08	
8	80	80	N.T.	0.08	
9	80	80	N.T.	0.08	
10	80	80		0.062	Ambient
11	80	80		0.055	
12	80	80		0.031	
13	80	80		0.055	
14	100	100		0.043	
15	100	100		0.039	
16	100	100		0.066	
17	100	100		0.039	
18	100	100		0.031	Ambient
19	100	100		0.007	
20	100	100		0.004	
21	60	90		0.015	Ambient
22	60	90		0.059	
23	80	80		0.106	
24	80	80		0.078	
25	80	80		0.082	

26	80	80	0.094

N.T. = No Trigger (Below Trigger Level)

P.O. BOX 125, LEWISTON, N.Y.
14092 - 0125

OZA Inspections Inc.

(716) 832-9513

December 18, 1996

TO: Sevenson Enviormental Services, Inc.
2749 Lockport Road
Niagara Falls, New York 14304

ATTN: Mr. Russ Harris

RE: Ground & Air Vibration Results ⟶ 11/26
Westwood-Squibb Site
100 Forest Avenue
Buffalo, New York 14213

OZA File No. 7893

Mr. Harris:

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In such situations, OZA Inspections applies an upper, cautionary limit of 0.50 inches per second (PPV) as a recommended limit of vibration. This limit has been established over many years of research into the effects created by vibrational machinery on adjacent grounds and structures.

Enc.

The recorded air (dB) readings were acquired as close as possible (30 feet) to the active drive hammer. The highest reading attained was 114 db. When the microphone was removed to the side wall of the building (80 feet), the microphone was not able to achieve a trigger level which means the noise was less than 110 db. This is far below any level of air overpressure or concussion that could result in structural damage.

OZA Inspections is satisfied that the sheet driving activity by your firm was performed within accepted limits and does not represent a hazard to adjacent buildings.

A summary of the recordings from the site is attached as well as the seismograms for your review.

Should you have any further questions, please do not hesitate to contact the writer.

Sincerely,

OZA INSPECTIONS INC.

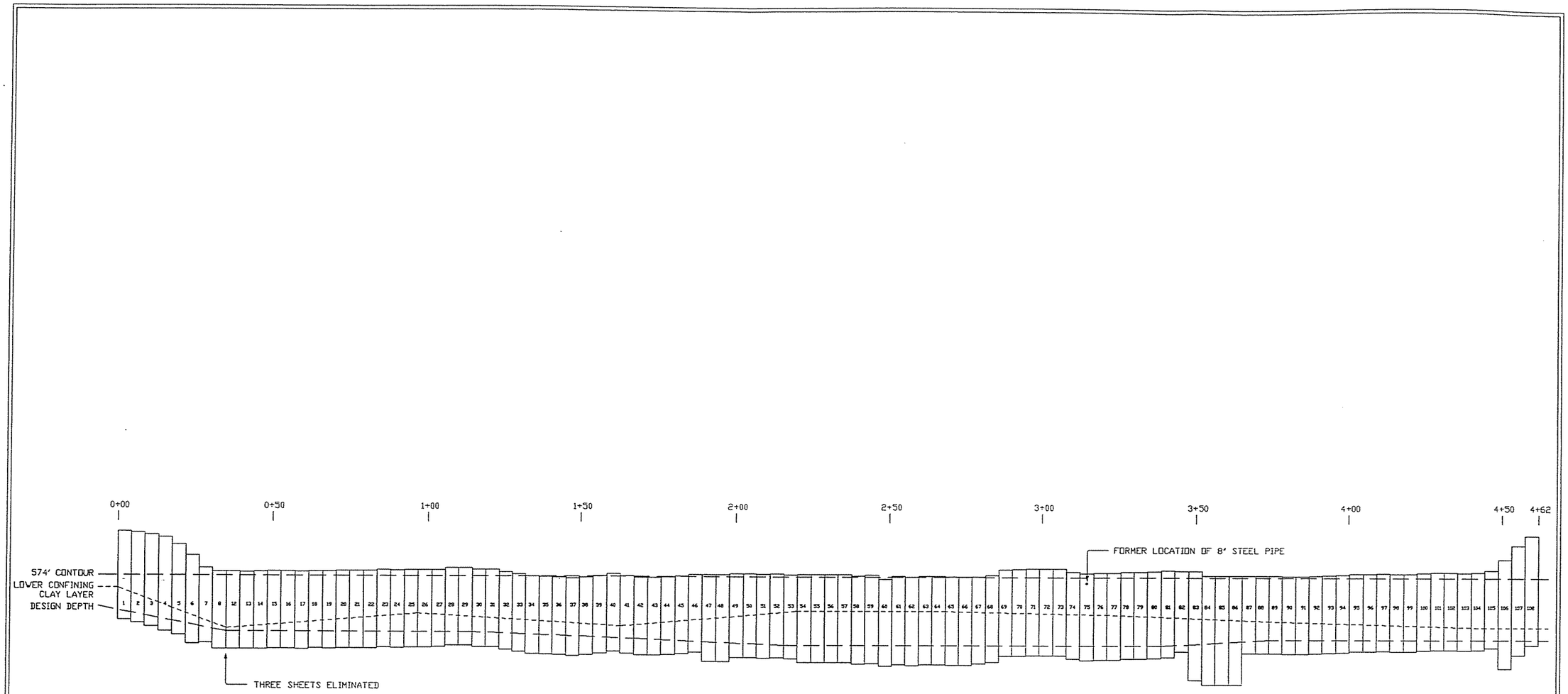
Robert M. Lamb

Robert M. Lamb

Test #	Distance To Monitor (FT)	Distance to Building (FT)	Ground Vibration (PPV)
1	60	85	0.031 Background Ambient
2	60	85	0.102
3	60	85	0.035
4	70	90	0.110
5	70	90	0.082
6	70	90	0.125
7	60	100	0.141
8	60	100	0.031
9	50	110	0.169
10	50	110	0.090
11	50	110	0.078

APPENDIX C

AS-BUILT DRAWINGS



TOP ELEVATIONS SURVEYED BY KING ENGINEERS.

SHEET PILE LENGHTS FIELD VERIFIED BY RETEC.

0 20 40 60 80 100

SCALE (feet)

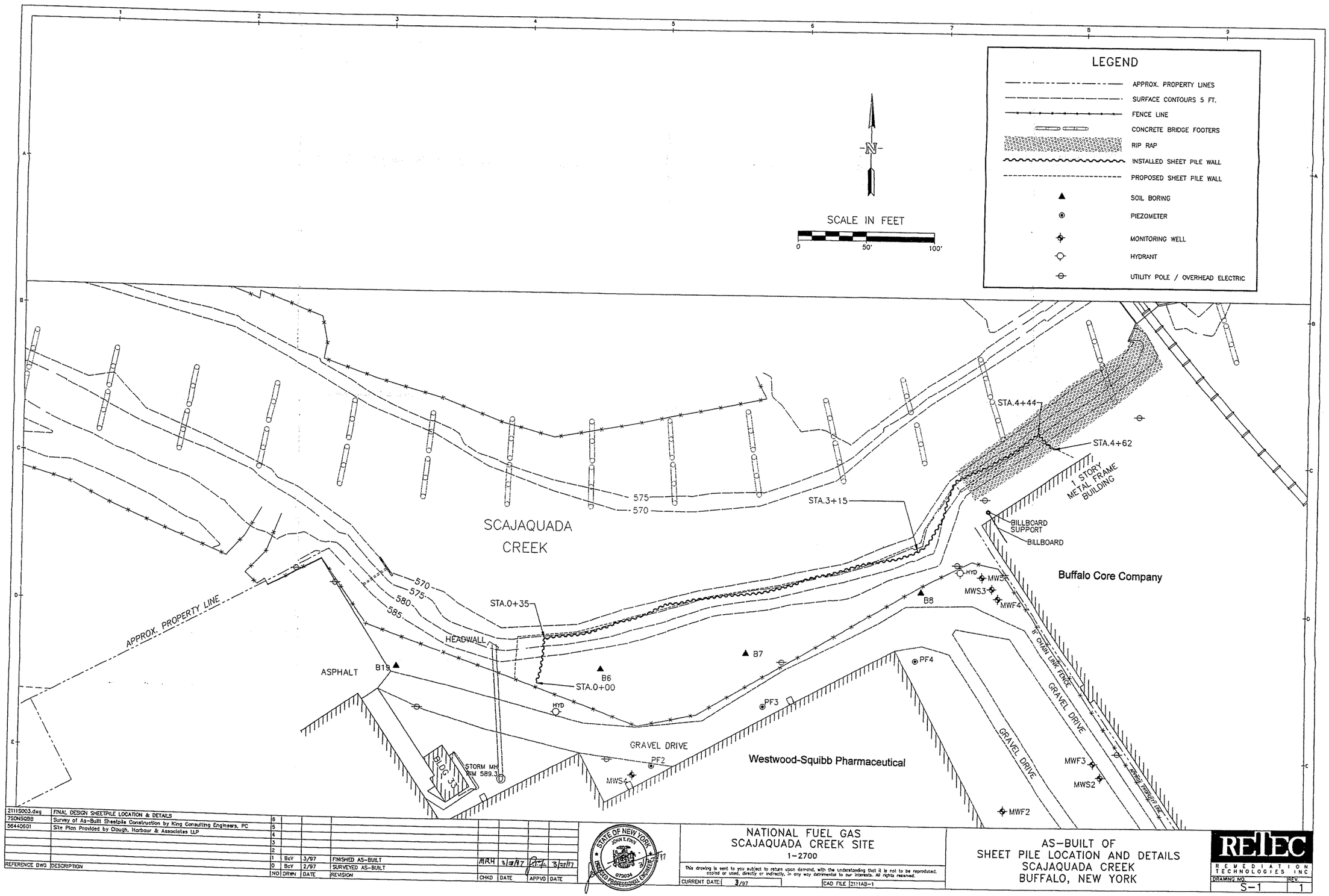
AUTOSKETCH FILE:	mrh C:\nfg2700\profile.skd	0	MRH	1/31/97	
		NO	DRWN	DATE	REVISION

NATIONAL FUEL GAS COMPANY
BUFFALO, NEW YORK

SCAJAQUADA CREEK SHEET PILE WALL

AS-BUILT PROFILE

RETEC



REFERENCE DWG	DESCRIPTION	NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
2111S003.dwg	FINAL DESIGN SHEETPILE LOCATION & DETAILS	6							
750N508B	Survey of As-Built Sheetpile Construction by King Consulting Engineers, PC	5							
56440501	Site Plan Provided by Clough, Harbour & Associates LLP	4							
		3							
		2							
		1	BcV	3/97	FINISHED AS-BUILT	MRH	3/27/97		3/27/97
		0	BcV	2/97	SURVEYED AS-BUILT				

STATE OF NEW YORK JOHN T. FOX 072024 LICENSED PROFESSIONAL ENGINEER 3/27/97

NATIONAL FUEL GAS
SCAJAQUADA CREEK SITE
1-2700

CURRENT DATE: 3/97 CAD FILE 2111AB-1

AS-BUILT OF
SHEET PILE LOCATION AND DETAILS
SCAJAQUADA CREEK
BUFFALO, NEW YORK

REMEDIATION TECHNOLOGIES INC

DRAWING NO. S-1 REV. 1