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Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for Maywood, New Jersey



U.S. Department of Energy

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JAN 18 8 37 AM '95



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278-0012

JAN 12 1995

David Adler, Site Manager
Former sites Restoration Division
U.S. Department of Energy
P.O. Box 2001
Oak Ridge, TN 37831

Dear Mr. Adler:

Enclosed for your use is a copy of the results of a Focused Investigation conducted by CH2M Hill on behalf of Stepan Company. The purpose of the investigation was to determine both the nature of chromium in leather material and soils on the Stepan Company property, and to further delineate the general horizontal and vertical extent of the leather material.

Of the thirteen test pits, two were inadvertently excavated on DOE property, near the boundary of the Stepan Amended property. Analytic results for these two test pits, TP-5 and TP-11, are included in this report. EPA Region II data validation protocols for hexavalent chromium are very stringent, therefore, the data on the hexavalent chromium is considered rejected. Total chromium values are qualified as estimates.

Please feel free to contact me if there are any questions. I can be reached at (212) 264-3032.

Sincerely,

A handwritten signature in cursive script that reads "AB Carpenter".

Angela B. Carpenter, Project Manager
Federal Facilities Section

Enclosure

cc: N. Marton, NJDEP w/o enc.

TECHNICAL MEMORANDUM**CH2M HILL**

PREPARED FOR: Angela Carpenter / USEPA, Region II

PREPARED BY: Tat Ebihara / CH2M HILL *TE*

COPIES: Jeff Bartlett / Stepan Company
Charlie Riley / Stepan Company
Nick Marton / NJDEP

DATE: October 17, 1994

SUBJECT: Maywood Chemical Company Site, Maywood, Bergen County, New Jersey: Administrative Order on Consent (Index No. II-CERCLA-70104) and Administrative Order (Index No. II-CERCLA-10105) -- *Focused Investigation of Leather Material*

PROJECT: NAE22948.FS.WP

Executive Summary

The purpose of the Focused Investigation was to determine both the nature of chromium in leather material and soils on the Stepan Company property, and to further delineate the general horizontal and vertical extent of the leather material. The Focused Investigation was conducted during July 26-28, 1994. Thirteen (13) test pits were excavated in the areas suspected of containing leather material. A total of twenty-two (22) soil and leather material samples (including two duplicates and two matrix spikes) were collected from selected test pits.

Samples of raw products or filter cakes associated with the former leather processing operation were found to contain total chromium at concentrations ranging from 20,100 mg/kg to 117,000 mg/kg. Chromium detected in soils samples were at least 10 times less than adjacent soil samples, with a maximum concentration of 2,500 mg/kg. The chromium species could not be determined via the x-ray diffraction analysis because crystalline material was not present in the samples.

Sample data indicate that hexavalent chromium may be present in soils surrounding the leather material at very low or non-detectable concentrations less than 3 mg/kg. Data validation for hexavalent chromium analysis appears to warrant that most values be "non-detectable" and "estimated." Hexavalent chromium was detected in the field equipment blank and the sample holding time (24 hours) was exceeded by less than 24 hours for some samples.

Visual observations in test pits suggest that the leather material occurs in localized areas or pockets at shallow depths. Leather material was not encountered below a depth of 2 feet, with the exception of a small, localized pocket in test pit TP-13 where material was encountered at a depth of 4 feet.

Other than isolated, localized pockets of leather material (less than 6 square feet in area), leather material appears to be limited to two areas on the Stepan property:

- **Area near test pit TP-12**--Leather material present in zones of various horizontal extent at 0.5 to 1 foot depth (approximately 5,000 square feet total area).
- **Area west of test pit TP-10**--Leather material, and leather scraps present on the ground surface in this area (approximately 12,000 square feet total area)

The pH of leather material samples ranged from 3.1 to 8.3. This data indicates that the leather material is likely raw leather scrap material received from a leather tannery. The material may have gained a fibrous consistency from a long period of weathering (process operations took place from the 1940s to 1986). Filter cake of digested leather material would have pH in the range of 10 to 12 because of the excess lime used in process operations, however, no leather material with these pH characteristics were encountered during the investigation.

Trivalent chromium is considered insoluble at a pH of 6 or greater. For leather material with pH less than 5, the mobility of chromium may be limited by the diffusion of chromium out of the leather matrix which is expected to be low. Since the leather material is present in unsaturated soil conditions, it is generally not exposed to high levels of soil moisture that would tend to increase opportunities for chromium diffusion out of the leather material matrix.

Oxidation-reduction potential (ORP) data indicates that mild to moderate oxidizing conditions may be present within the leather material. The ORP of the leather material ranged from +334 millivolts (mV) to +705 mV. However, trivalent chromium is only expected to transform to the hexavalent form under extreme oxidizing conditions.

1.0 Introduction and Background

On June 17, 1994, CH2M HILL acting on behalf of Stepan Company, submitted a Focused Work Plan for Investigation of Leather Waste to USEPA, Region II. The Work Plan was in response to USEPA's comments on the *Draft Feasibility Study (FS) Report* regarding those areas where additional data are needed to further evaluate alternative remedial alternatives.

The presence of leather material has been associated with two areas, referred to as Areas 1 and 2 in the draft FS report and Work Plan, located on the Stepan and Stepan Amended properties. It is believed that the leather materials, which have been found to contain elevated concentrations of chromium, are residuals from the former leather digestion operations on site. Process information and historical data indicate that the chromium in the leather material

was predominantly trivalent chromium, with hexavalent chromium present at substantially lower concentrations. Appendix B of the draft FS summarizes the process history, description, and historical data for the leather material.

The purpose of the Focused Investigation was to sample soils and leather material, to determine:

- The levels of trivalent and hexavalent chromium associated with the leather material
- The compounds with which the chromium is associated
- The chromium concentrations in soils both adjacent to, and at a distance from, leather material
- Soil conditions that may indicate the potential for trivalent chromium to remain in its reduced state

The Focused Investigation was conducted during July 26-28, 1994. Thirteen (13) test pits were excavated in the areas suspected of containing leather wastes or raw leather products. A total of twenty-two (22) soil and leather material samples (including two duplicates and two matrix spikes) were collected from selected test pits.

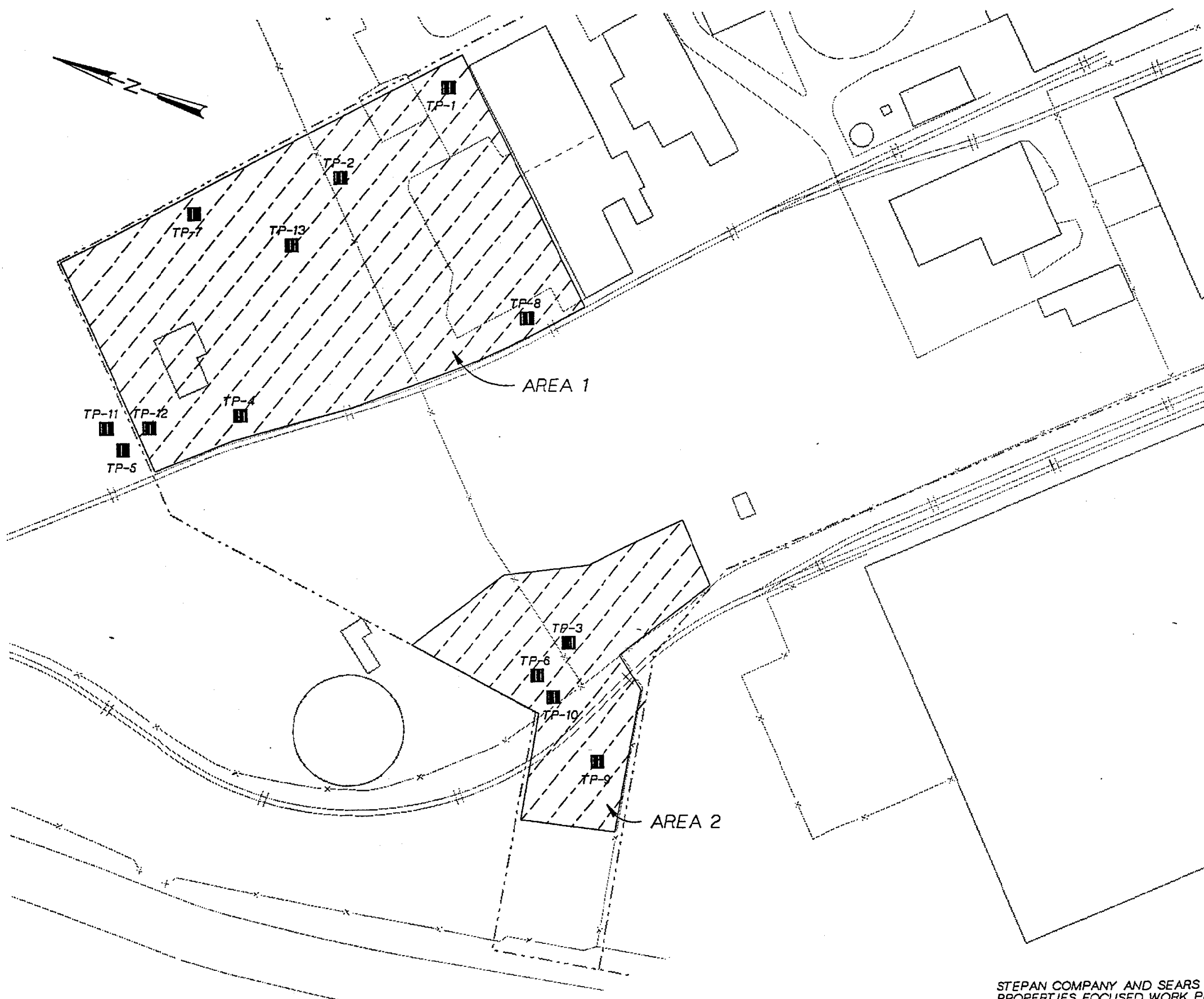
2.0 Field Investigation Methods and Procedures

The field program followed the methods and procedures outlined in the Work Plan. As part of the Work Plan, a maximum of twelve (12) test pits were planned. One additional test pit (total of 13) was excavated to adequately characterize the limits of leather material encountered. Also, one additional leather material sample (total of 6) was collected.

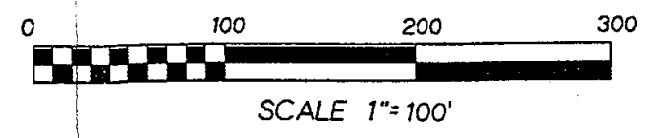
2.1 Excavation

Test pits were excavated with a Case 580k Backhoe, capable of excavating to the required maximum depth of 4 feet below grade. The approximate locations of the test pits are shown in Figure 1. Organic vapors and radiological monitoring data were collected before, during, and after test pit excavation. Excavated soils were stockpiled on the ground surface adjacent to each test pit. Test pits were excavated to a maximum depth of four feet below grade. Leather material and soil samples were collected from selected test pits. The surface area of the test pits ranged from 30 to 226 square feet.

When leather material was encountered in the sidewall of the test pit, as in pits TP-9, TP-10, TP-11, and TP-12, the excavation was extended to fully expose the leather material. The test pit excavations were backfilled with the excavated material, compacted with the backhoe bucket, and regraded. Photographs were taken of each test pit location.



LEGEND:
 ■ TP-23 APPROXIMATE TEST PIT LOCATION
 ▨ FORMER PROCESS AREAS FOR PROTEIN EXTRACTION FROM LEATHER



STEPAN COMPANY AND SEARS AND ADJACENT PROPERTIES FOCUSED WORK PLAN MAYWOOD, NEW JERSEY

FIGURE 1 APPROXIMATE TEST PIT LOCATIONS FOCUSED LEATHER MATERIAL INVESTIGATION

The suspected presence of utility lines required test pit TP-6 to be moved southwest of its proposed location. The location of TP-4 was moved west of its proposed location because part of an old concrete foundation occupied the proposed area. Test Pits TP-5 and TP-11 were excavated on DOE property, near the boundary of the Stepan Amended property.

2.2 Equipment Decontamination

The backhoe bucket was scraped clean of visible material after each excavation. The backhoe was scraped and wiped visibly clean before leaving the site. At the completion of the test pitting the backhoe was surveyed for total and removable alpha and beta/gamma contamination prior to release from the site. Stainless steel bowls and trowels were all decontaminated by Lisano Laboratories (West Paterson, New Jersey), in accordance with the EPA Region II Quality Assurance Manual (October 1989).

2.3 Soil and Leather Sampling

Six (6) leather material samples were collected to determine the chromium (trivalent and hexavalent species) in the matrix. Although five leather material samples were specified in the Work Plan, an additional leather material sample was included for analysis because the sampled material appeared to be distinct from the other leather material samples. Five (5) soil adjacent samples (soil within 3 feet of observed leather material), and five (5) soil distant samples (soil greater than 3 feet from observed leather material) were collected to characterize the impact of the leather material on chromium levels in the surrounding soil.

2.3.1 Analytical Parameters

The 6 leather material and 10 soil samples were analyzed for the following parameters:

- Hexavalent chromium
- Total chromium
- pH
- Oxidation reduction potential (ORP)

Trivalent chromium can be determined by taking the difference between total chromium and hexavalent chromium. In addition, two leather material samples were collected for analysis by x-ray diffraction to determine compounds with which chromium is associated. Samples collected for x-ray diffraction analysis were not analyzed for pH, ORP, hexavalent or total chromium.

2.3.2 Sampling Procedures

Samples were collected using laboratory-decontaminated stainless-steel bowls and trowels. Samples collected from the backhoe bucket consisted of sample material that had not

contacted the bucket. Samples were collected with trowels and placed into a stainless-steel bowl. Samples were then homogenized within the stainless-steel bowl using a trowel, and then placed in laboratory-decontaminated jars. Not all leather material samples were capable of being homogenized. Those leather material samples were collected directly from either the excavation of the backhoe bucket, and placed into sample jars.

Samples being analyzed for hexavalent and total chromium, pH, and ORP were shipped daily, with ice, via overnight courier to Huntingdon Engineering & Environmental, Inc., of St. Louis, Missouri (formerly TCT St. Louis). The samples collected for x-ray diffraction were shipped at the end of the field program via overnight courier to Ricerca, Inc., of Painesville, Ohio.

2.3.3 QA/QC Samples

The same type of QA/QC samples and frequencies, collected during the RI were collected during the Focused Investigation. They were as follows:

- **Equipment Rinse Blank** - One equipment rinse blank was prepared for the total and hexavalent chromium. The blank was prepared by pouring demonstrated analyte-free water over a decontaminated stainless steel bowl and trowel, and collecting this water in the appropriate containers. The equipment rinse blanks were preserved accordingly, nitric acid (HNO₃) for total chromium. No preservative was added for hexavalent chromium, however both blanks were placed immediately on ice.
- **Field Duplicate** - One duplicate sample (distant soil), was collected and sent to Huntington Laboratories for total and hexavalent chromium, pH, and ORP analyses.
- **Matrix Spike (MS)** - Two MSs, one for soil and one for leather material, were collected and analyzed for total and hexavalent chromium.

2.4 Field Monitoring

Field monitoring for organic vapors and radiological contamination was conducted throughout the test-pit program. The monitoring was conducted in accordance with health and safety procedures. A TMA OVM, Model 580B with a 10.0 eV lamp was used to monitor for organic vapors. An Eberline, Model ESP-1 with an AC-3 probe, and a Ludlum, Model 3 with a 44-9 pancake probe were used to monitor for radiological contamination.

3.0 Results

3.1 Field Observations and Results

Table 1 summarizes the results of the test pit operations conducted during the focused investigation. Leather material was encountered in six of thirteen test pits (TP-5, TP-9, TP-10, TP-11, TP-12, and TP-13). Visual observations and locations of leather material is summarized in Table 1. The leather material in the test pits was a blue, fibrous (or "stringy") material, except for test pit TP-13. Test pit TP-13 contained blue-gray silt-like material that may also have been associated with leather processing operations.

Leather material was encountered at shallow depths of less than 1.5 feet, except for test pit TP-13. In test pit TP-13, a localized pocket of leather material was encountered 4 feet below grade; the extent of this pocket was delineated to be 12 square feet total area. The leather materials were encountered in small pockets which were delineated during the test pit operation, except for test pit TP-5 which contained approximately 90 square feet of leather material.

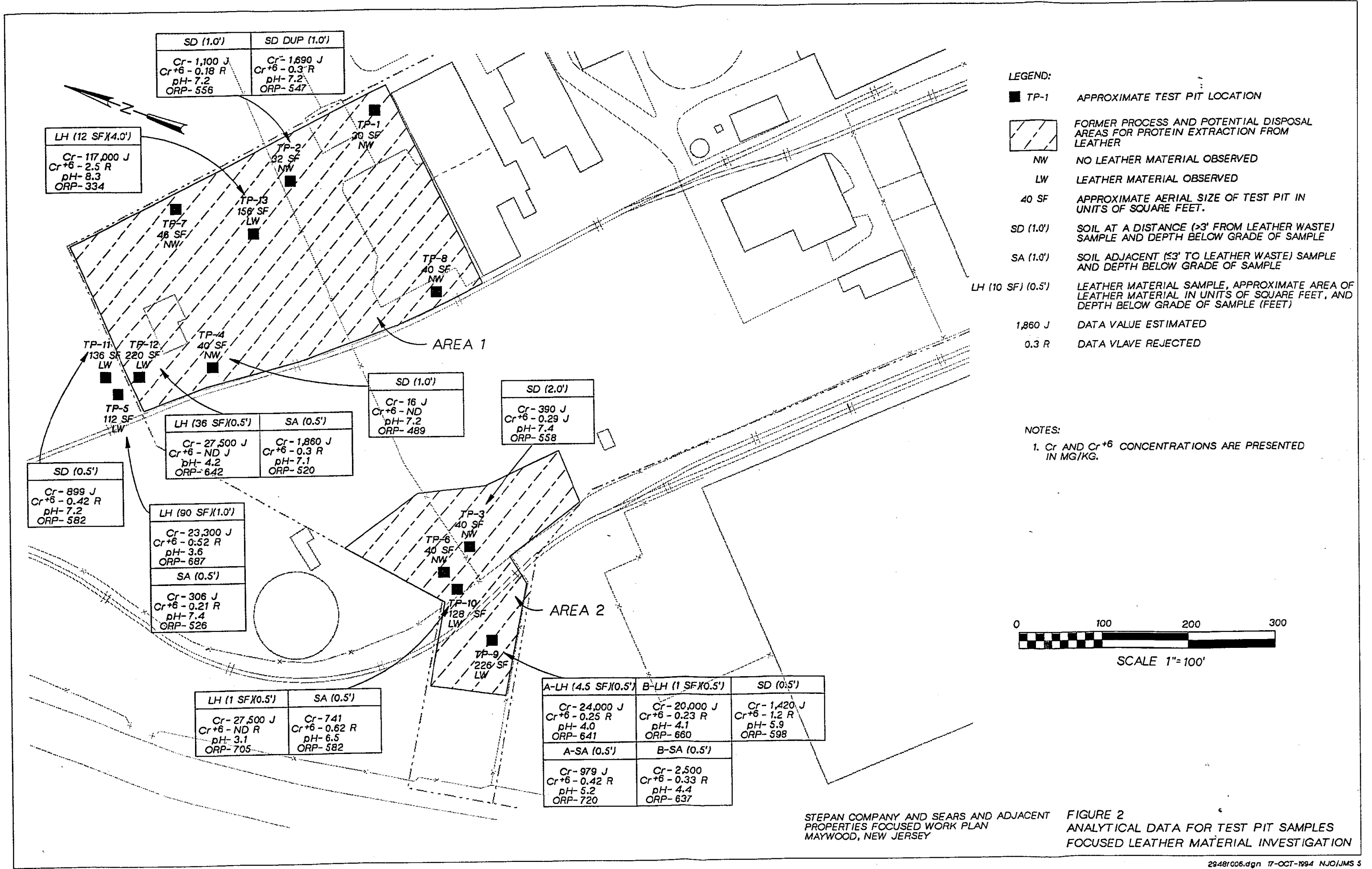
To further delineate the extent of the leather material in the area of test pit TP-5, test pits TP-11 and TP-12 were excavated northeast and southeast of TP-5, respectively. Pockets of leather material were found in both TP-11 and TP-12. Both TP-5 and TP-11 were inadvertently excavated on DOE property, within 30 feet of the Stepan Amended property boundary.

In addition to material encountered within test pits, leather material was also found at the ground surface along the fence south, and adjacent to, test pit TP-10 (Figure 1). This area was approximately 110 feet long and 3 to 4 feet wide. The leather material appeared weathered (dark green-blue). In addition, scraps of leather as large as 3"x18"x0.1" were visible on the surface. TP-10 was excavated on the north side of the fence. A leather material sample and a soil-adjacent sample were collected from TP-10.

3.2 Analytical Results

The analytical results are summarized in Table 2 and Figure 2. Because all the CRI standards were outside of the control limits established for USEPA Region II for total chromium, total chromium results have been qualified as estimated.

Fourteen out of 17 hexavalent chromium results were rejected based on USEPA Region II standards. These results are discussed in section 3.2.2.



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FIGURE 2 ANALYTICAL DATA FOR TEST PIT SAMPLES FOCUSED LEATHER MATERIAL INVESTIGATION

Table 1
Stepan Company
Focused Investigation Test Pit Summary

Test Pit #	Approximate Area of Test Pit (SF)	Maximum Depth of Test Pit (FBG)	Approximate Area of Leather Material (SF)	Approximate Thickness of Leather Material (ft)	Depth Leather Material Encountered (FBG)	Visual Observations	Sample Summary
1	30	4	NW	NW	NW	No leather material observed.	-----
2	32	4	NW	NW	NW	No leather material observed.	TP-2-SD TP-2D-SD
3	40	3.5	NW	NW	NW	No leather material observed.	TP-3-SD
4	40	4	NW	NW	NW	No leather material observed.	TP-4-SD
5	112	3	90	0.75	0	Waste encountered in 80 percent of the excavation area. Located on DOE property.	TP-5-LH TP-5-SA
6	40	4	NW	NW	NW	No leather material observed.	-----
7	46	4	NW	NW	NW	No leather material observed.	-----
8	40	3	NW	NW	NW	No leather material observed.	-----
9	226	3	5.5	0.2	0.5	Leather material encountered sporadically in excavation. Small quantities of leather material may have been included in soil samples.	TP-9A-LH TP-9A-SA TP-9B-LH TP-9B-SA TP-9-SD
10	128	3	3	0.3	0.5	One small pocket of leather material encountered; extent delineated.	TP-10-LH TP-10-SA
11	136	3	1	1	0.5	Located on DOE property .	TP-11-SD
12	220	1	36	0.33	0.5	Leather material encountered in 16 percent of the excavation area.	TP-12-LH TP-12-SA
13	156	5	12	1	4	One small pocket of leather material encountered and extent delineated. Silt-like filter cake material sampled.	TP-13-LH

Notes:

NW - No leather material observed

LH - Leather material

SA - Adjacent soil (within 3 ft of observed leather material).

SD - Distant soil (greater than 3 ft from leather material).

SF - Square Feet

FBG - Feet below grade

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Table 2
Stepan Company
Focused Investigation
Analytical Results of Test Pit Samples

Page 1 of 2

Parameters	TP-2-SD (1.0')	TP-2D-SD (1.0')	TP-3-SD (2.0')	TP-4-SD (1.0')	TP-5-LH (1.0')	TP-5-SA (0.5')	TP-9A-LH (0.5')	TP-9A-SA (0.5')	TP-9B-LH (0.5')
Chromium total (mg/kg)	1,100 J	1,690 J	390 J	16 J	23,300 J	308 J	24,000 J	979 J	20,100 J
Chromium (VI) (mg/kg)	0.18 R	0.3 R	0.29 J	ND	0.52 R	0.21 R	0.25 R	0.42 R	0.23 R
pH	7.2	7.2	7.4	7.2	3.8	7.4	4.0	5.2	4.1
ORP (mV)	558	547	558	489	687	528	641	720	660

Notes:

- SA - Adjacent soil sample (within 3 feet of observed leather material)
- SD - Distant soil sample (greater than 3 feet from observed leather material)
- LH - Leather material sample
- (1.0') - Sample depth (e.g., 1-foot) below grade
- ND - Analyte was not detected at the detection limit used for the analysis
- J - Data value estimated
- R - Data rejected

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**Table 2
Stepan Company
Focused Investigation
Analytical Results of Test Pit Samples**

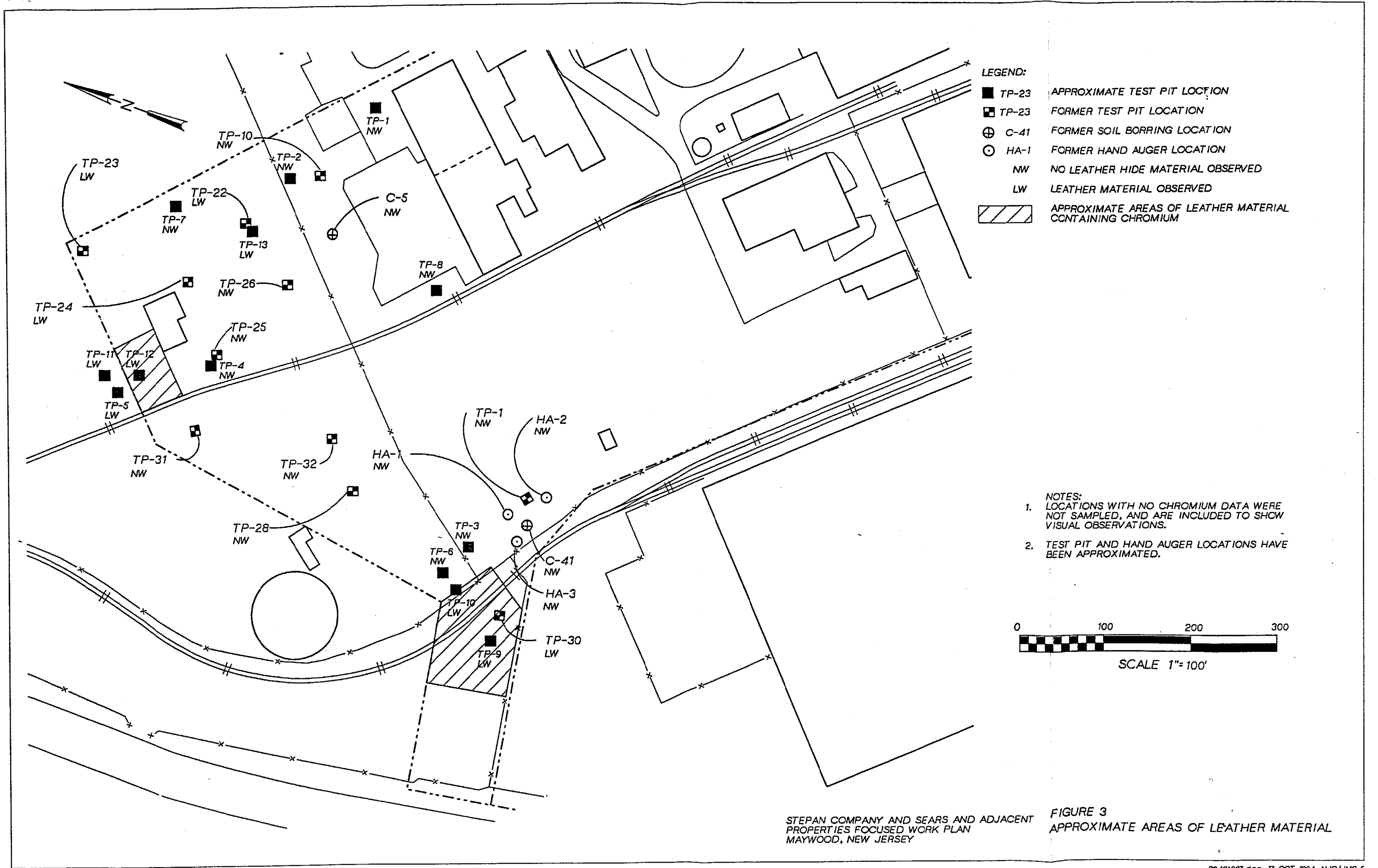
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Parameters	TP-9B-SA (0.5')	TP-9-SD (0.5')	TP-10-LH (0.5')	TP-10-SA (0.5')	TP-11-SD (0.5')	TP-12-LH (0.5')	TP-12-SA (0.5')	TP-13-LH (4.5')	TP-FB (ug/l)
Chromium total (ppm)	2,500 J	1,420 J	27,500 J	741 J	899 J	27,500 J	1,860 J	117,000 J	ND J
Chromium (VI) (ppm)	0.33 R	1.2 R	ND R	0.62 R	0.42 R	ND J	0.3 R	2.5 R	21.3
pH	4.4	5.9	3.1	6.5	7.2	4.2	7.1	8.3	---
ORP (mV)	637	598	705	582	529	642	520	334	---

Notes:

- SA - Adjacent soil sample (within 3 feet of observed leather material)
- SD - Distant soil sample (greater than 3 feet from observed leather material)
- LH - Leather material sample
- (1.0') - Sample depth (e.g., 1-foot) below grade
- ND - Analyte was not detected at the detection limit used for the analysis
- J - Data value estimated
- R - Data rejected

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FIGURE 3 APPROXIMATE AREAS OF LEATHER MATERIAL

3.2.1 Total Chromium

Total chromium results for leather material, adjacent soils, and distant soils are discussed below:

- **Leather Material**--Total chromium results in leather material samples ranged from 20,100 mg/kg (TP-9B) to 117,000 mg/kg (TP-13).
- **Adjacent Soils**--Concentrations of total chromium detected in adjacent soil samples ranged from 306 mg/kg (TP-5) to 2,500 mg/kg (TP-9B). Soil samples collected from test pit TP-9 may have included small pieces of leather material that would have increased the levels of chromium detected in those samples.
- **Distant Soils**--Distant soil samples were found to contain total chromium at concentrations ranging from 16 mg/kg (TP-4) to 1,690 mg/kg (TP-2 [duplicate]). Chromium encountered in these samples are likely from small residual concentrations of leather material from historical leather processing operations in the area.

3.2.2 Hexavalent Chromium

Fourteen out of the 17 soil and leather material hexavalent chromium results were rejected (Table 2) according to the application of USEPA Region II standards. The three results which were not rejected include two non-detects (TP-4-distant soil, and TP-12-leather material) and an estimated concentration of 0.29 mg/kg (TP-3-distant soil). Chromium results were rejected because either (1) the sample holding time of 24 hours was exceeded, and/or (2) the field blank was contaminated.

Although most data were rejected, hexavalent chromium results for leather material, adjacent soil, and distant soil are summarized below:

- **Leather material**--Hexavalent chromium ranged from ND to 2.5 mg/kg.
- **Adjacent soil**-- Hexavalent chromium ranged from 0.21 mg/kg to 0.62 mg/kg
- **Distant soil**-- Hexavalent chromium ranged from ND to 1.2 mg/kg

All hexavalent chromium analyses were performed within 48 hours. The 24-hour sample holding time was not met because of the time required to ship samples to the laboratory, located in St. Louis, Missouri (the laboratory was selected because they had analyzed the majority of the RI samples, and can accept mixed waste samples and are approved by EPA). Federal Express did not deliver one shipment of samples until several hours past the 24-hour holding time. A 48-hour holding time may be acceptable for these samples, if this is the case, then data should be qualified as "estimated - J" versus "rejected."

Hexavalent chromium was detected in the field blank at a concentration of 21.3 µg/L raises a concern for all hexavalent chromium results. Total chromium was not detected in the field

equipment blank. This discrepancy cannot be discounted, since all species of chromium should be detected in the total chromium analysis. These data could have been the result of laboratory error, including the possible introduction of hexavalent chromium into the field blank sample or confusion of laboratory sample identification numbers. If hexavalent chromium was introduced in to the field blank by the laboratory environment, hexavalent chromium could have been introduced into leather material and soil samples.

EPA Region II data validation procedures are very stringent for hexavalent chromium. Using generic validation guidelines and professional judgment, CH2M HILL recommends that all hexavalent chromium data, except for sample TP13LH, be qualified at "U", not detected. Additionally, all data analyzed after the 24-hour holding time would add a "J - estimated" qualifier. Most of the samples would therefore be qualified as "UJ", but none would be rejected.

Whether or not laboratory contamination may have been introduced into the samples, hexavalent chromium concentrations for all leather material and soil samples were below the New Jersey soil cleanup criteria of 10 mg/kg. The maximum hexavalent chromium concentration was leather material sample from test pit TP-13 at 2.5 mg/kg.

3.2.3 pH

The pH results for leather material, adjacent soils, and distant soils are discussed below:

- **Leather material**--pH ranged from 3.1 to 8.3
- **Adjacent soil**--pH ranged from 4.4 to 7.4
- **Distant soil**--pH ranged from 5.9 to 7.4

The pH data indicates that the leather material is likely raw leather scrap material received from a leather tannery. The material may have gained a fibrous consistency from a long period of weathering (process operations took place from the 1940s to 1986). Filter cake of digested leather material would have pH in the range of 10 to 12 because of the excess lime used in process operations, however, no leather material with these pH characteristics were encountered during the investigation.

Trivalent chromium is considered insoluble at a pH of 6 or greater. For leather material with pH less than 5, mobility of chromium is expected to be relatively limited since diffusion of chromium out of the leather matrix is expected to be low. In addition, the leather material is present above the water table in unsaturated soil conditions. Although pH of the leather material is similar to low pH soils, acidity of the material may be also be low, which would alleviate concern that low pH conditions would persist within the leather material matrix.

3.2.4 ORP

Total chromium results for leather material, adjacent soils, and distant soils are discussed below:

- **Leather material**--ORP ranged from +334 mV to +705 mV
- **Adjacent soil**--ORP ranged from +520 mV to +720 mV
- **Distant soil**--ORP ranged from +489 mV to +598 mV

Oxidation-reduction potential (ORP) data indicates that mild oxidizing conditions may be present within the leather material matrix. Under these conditions, trivalent chromium would not be expected to transform to hexavalent chromium. Extreme oxidizing conditions are generally necessary to overcome the activation energy for trivalent chromium to transform to hexavalent chromium.

3.2.5 Chromium Species Determination

X-ray diffraction analysis was attempted on one of the submitted samples. Because the sample of leather scraps was not in crystalline form, chromium species determination by x-ray diffraction was not feasible.

Total and hexavalent chromium analysis indicates that chromium present in the leather material is predominately in the trivalent form. This is the expected form of chromium in tanned leather material used as raw product for the former leather digestion process. Process conditions for leather digestion involving excess lime and pH in the range of 10 to 12 also suggests that chromium would remain in the trivalent form.

4.0 Conclusions

Test pits excavated during the Focused Investigation, along with previous RI test pits, soil borings, and hand auger borings, allowed for further lateral and horizontal delineation of the leather material. Approximate areas of leather material other than localized pockets less than 6 square feet in area are shown in Figure 3. The leather material was predominantly encountered as small localized areas (as opposed to a continuous layer) at shallow depths below the surface, generally less than 3 feet. Additional data may be needed to determine the exact extent of the leather material in the two areas identified in Figure 3 in the vicinity of TP-12 and TP-9.

The leather material samples contained total chromium at elevated levels up to 117,000 mg/kg. The total chromium concentrations detected in leather material samples were up ten times greater than concentrations detected in both adjacent and distant soil samples. These results indicate that the leather material, versus soils, contains most of the residual chromium present at the site from historical leather processing operations. Although the hexavalent chromium data are questionable, the maximum detected hexavalent chromium concentration was 2.5 mg/kg, which is less the New Jersey soil cleanup criteria of 10 mg/kg.

The pH and chromium results indicate that the leather material encountered in test pits is likely raw leather product used for the former leather digestion process operation from the 1940s to 1986. Raw leather product was apparently stored on the ground and has weathered over time.