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BARR

# Memorandum

**To:** Richard Spiese - VTDEC
**From:** Alec Danielson and Mary Sands – Barr Engineering Co.
**Subject:** Former Chemfab Facility, 1030 Water Street – Building Materials Corrective Actions
**Date:** September 25, 2019
**Project:** 45021004.01
**c:** Chris Angier – SGPP, Kirk Moline – CT Male

This memorandum summarizes the evaluation of building material cleaning alternatives and performance standards for assessing the effectiveness of cleaning during the proposed corrective action at the Former Chemfab Facility located at 1030 Water Street (Site) in the village of North Bennington Vermont. The Site is identified by the Vermont Department of Environmental Conservation (VTDEC) Site Management Section (SMS) as Site #20164630, and work is being completed in accordance with the requirements of a Consent Order between the State of Vermont, Agency of Natural Resources (VTANR) and Saint-Gobain Performance Plastics Corporation (Saint-Gobain), dated April 8, 2019 (Consent Order).

The Evaluation of Corrective Action Alternatives (ECAA), dated January 29, 2019, was submitted to VTDEC and recommended Selected Removal, Offsite Disposal, and Cleaning of perfluorooctanoic acid (PFOA) within residues observed on building materials (e.g., accumulations on the floor, interior walls, and ceilings, etc.) and/or in residues within soft building materials (e.g., substance within the insulation). In the letter from VTDEC, dated June 4, 2019, VTDEC agreed to the approach of Selected Removal, Offsite Disposal, and Cleaning within the Site building and asked for further testing of building cleaning methodologies to assess removal efficiency of PFOA.

The ECAA recommended a visual performance standard because the majority of the PFOA mass is in the insulation or visible residues and can be addressed by removing the insulation and cleaning the hard surfaces to a visible standard. The PFOA mass on hard surfaces following insulation and visible residue removal represents a minor amount of PFOA within the building and is negligible.

## 1.0 Building Cleaning Evaluation

A bench test building cleaning evaluation was conducted on June 26 and 27, 2019, to address VTDEC's comments. The evaluation included four cleaning methods: 1) manual removal, 2) hot water pressure washing, 3) degreaser washing, and 4) a combination of hot water pressure washing and degreaser. The cleaning evaluation was conducted at two discrete locations on the concrete floor and two discrete locations on structural steel surfaces. Cleaning methods were evaluated consistent with the approach provided in ASTM E3106 – Standard Guide for Science-Based and Risk-Based Cleaning Process Development and Validation which relies on visual inspection as a primary component for evaluating cleaning methods.

Residues were removed with each cleaning method, and the visual inspections indicated that hot water pressure washing and the combination of hot water pressure washing and degreaser were the most effective cleaning options. Photographs of the building cleaning evaluation are provided in Attachment A.

During the building cleaning evaluation, VTDEC coordinated with Weston & Sampson to collect pre- and post-cleaning wipe samples for PFOA. Based on cleaning removal efficiencies calculated by Weston & Sampson using the wipe sample results, Weston & Sampson also concluded that hot water pressure washing with the degreaser was the most effective cleaning option. The Weston & Sampson wipe results and analysis are provided in Attachment B.

## 2.0 Mass Removal Estimates

Barr estimated the PFOA mass removed following building material cleaning and removing the insulation to assess the effectiveness of the proposed remedial action and to evaluate a potential performance standard. There are three primary components to the PFOA mass within the Site building materials:

1) the soft building materials (insulation),
2) residues present on the floor, ceiling, and structural steel, and
3) films adsorbed onto hard building material surfaces (as measured by wipe sample results).

A summary of the estimated mass of PFOA removed is provided in Table 1, along with the assumptions associated with the estimates. Results from the evaluation include:

- Based on the complete removal of the insulation (100%), a total mass of approximately 750 grams (less than 2 pounds) of PFOA, associated with PFOA absorbed onto and into the insulation, is estimated to be removed.
- Based on a removal efficiency calculated by Weston & Sampson, 8 to 13 grams are estimated to be removed from cleaning PFOA adsorbed onto hard building materials. Specifically, Weston & Sampson's bench test building cleaning evaluation using the wipe sample results showed the following PFOA removal efficiencies:
    - Based on 60% PFOA removal, approximately 8 grams of PFOA is estimated to be removed
    - Based on 90% PFOA removal, approximately 12 grams of PFOA is estimated to be removed
    - Based on 99% PFOA removal, approximately 13 grams of PFOA is estimated to be removed
- An estimate of the PFOA mass removed by cleaning the residues was not calculated due to uncertainty associated with the extent of the residue. Based on the visible residue removal achieved during the cleaning evaluation (shown in Attachment A), and since residue is visible and distinct, its removal efficiency is likely to approach complete removal (100%).

The mass removal estimates support that the Selected Removal, Offsite Disposal, and Cleaning Option meets the objective of removing PFOA mass from the building. The majority of the PFOA mass is associated with PFOA absorbed onto and within the insulation and within visible residues which will be removed. The remaining PFOA mass on hard surfaces represents a minor amount of PFOA within the building and is negligible.

# 3.0 Performance Standard

Two general approaches to determine an appropriate performance standard for building cleaning were considered: 1) best management practices (BMPs) during implementation, and 2) risk-based criteria. A visual performance standard was proposed in the ECAA as a BMP for implementing the building cleaning and is supported by industry standards (ASTM E3106). Findings from the bench test building cleaning evaluation and mass removal estimates confirm a visual performance standard is an appropriate BMP for implementing the building cleaning corrective action based on:

- the mass removed from soft building materials and visible residues is the predominant source of PFOA mass;
- the visual standard effectively assesses the removal of soft building materials and visible residue; and,
- conclusions from the bench test building cleaning evaluation, which were based on visual inspection, align with results from wipe sampling conducted by Weston & Sampson.

Using wipe sampling alone or as an additional measure to evaluate pre- and post-cleaning conditions is not an effective BMP for building materials because it is not representative of the overall efficacy of the remedy as demonstrated by the negligible component of overall PFOA mass removed.

Additionally, there are no promulgated standards or published risk-based criteria associated with direct contact or inhalation of PFOA on building materials and without this, establishing a wipe sample value as a risk-based performance standard would be arbitrary.

# 4.0 Summary

VTDEC and Saint-Gobain agree that Selected Removal, Offsite Disposal, and Cleaning is the preferred remedy to address the presence of PFOA in the building at the Site. There is also agreement that the most effective cleaning method is the combined use of hot water pressure washing and a degreaser. Site-specific PFOA mass calculations highlight that the vast majority of the PFOA mass (>95%) is eliminated from the building by removing and disposing the insulation and visible residues. Industry standards, such as ASTM E3106, rely on a visual standard to assess cleaning, and this evaluation confirms that it is an appropriate BMP to demonstrate mass removal during building cleaning activities.

In summary, the recommended path forward is to implement Selected Removal, Offsite Disposal, and Cleaning by:

- Using hot water pressure washing on the hard surfaces at the Site and augmenting the pressure washing with a degreaser in discrete areas if pressure washing alone is insufficient, and
- Evaluating the effectiveness of the remedy by visual inspection.

Following review of this memo by VTDEC, a more detailed plan for removing insulation and cleaning hard surfaces will be provided in a Corrective Action Plan that will be submitted to VTDEC SMS for approval.

**Table 1**
**Estimate of PFOA Mass and Removal Quantities**
**Former Chemfab Facility - 1030 Water Street**
**Saint-Gobain Performance Plastics**

| | Pre-Cleaning PFOA Mass (grams) | Removal Efficiency (%) | PFOA Mass Removed (grams) | Removal Efficiency (%) | PFOA Mass Removed (grams) | Removal Efficiency (%) | PFOA Mass Removed (grams) |
|---|---|---|---|---|---|---|---|
| ***Bulk Materials*** | | | | | | | |
| Wall Insulation | 42 | 100% | 42 | -- | -- | -- | -- |
| Ceiling Insulation | 707 | 100% | 707 | -- | -- | -- | -- |
| *Subtotal* | 750 | NA | 749 | -- | -- | -- | -- |
| ***Wipe Samples*** | | | | | | | |
| Floor | 7.0 | 60% | 4.2 | 90% | 6.3 | 99% | 6.9 |
| Ceiling | 3.1 | 60% | 1.9 | 90% | 2.8 | 99% | 3.1 |
| I-beams | 3.1 | 60% | 1.9 | 90% | 2.8 | 99% | 3.1 |
| Wall | 0.22 | 60% | 0.13 | 90% | 0.20 | 99% | 0.22 |
| *Subtotal* | 13 | NA | 8.1 | NA | 12 | NA | 13 |

Assumptions

1. Assumed mass of insulation based on contractor estimate of 10 tons for entire building, split proportionally by surface area for wall and ceiling
2. Assumes insulation samples representative of the insulation on interior and exterior of building
3. Average PFOA concentration for wall insulation based on samples: BL01-A5.0, BL02-A5.0, BL04-A5.0, BL05-A5.0, BL07-A5.0, BL09-A5.0, and BL14-A5.5
4. Average PFOA concentration for ceiling insulation based on samples: BL10-B26.0, BL11-B25.0, and BL12-B28.0
5. Average PFOA floor wipe concentration based on samples: WP15-E, WP16-E, WP17-E, and WP18-E
6. Average PFOA ceiling wipe concentration based on samples: WP10-B35.0, WP11-B42.0, and WP12-B44.5
7. Average PFOA I-beam concentration based on samples: WP01-A8.0, WP01-A16.0, WP01-A23.0, WP02-A8.0, WP02-A16.0, WP02-A23.0, WP04-A8.0, WP04-A16.0, WP04-A23.0, WP05-A8.0, WP05-A16.0, WP05-A23.0, WP07-A8.0, WP07-A16.0, WP07-A23.0, WP09-A8.0, WP09-A16.0, WP09-A23.0, WP10-B11.0, WP10-B23.0, WP10-B33.0, WP11-B16.0, WP11-B24.0, WP11-B41.0,WP12-B15.0, WP12-B30.0, and WP12-B43.0
8. Average PFOA wall concentration based on samples: WP01-A1.5, WPO2-A1.5, WP04-A1.5, WP05-A1.5, WP07-A1.5, and WP09-A1.5

**PHOTO 1**


**PHOTO 2**


**ATTACHMENT A**
**PHOTO DOCUMENTATION**
BENCH TESTING OF CLEANING METHODS
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**PHOTO 3**


**PHOTO 4**


**Caption:** Weston collecting pre-cleaning wipe sample

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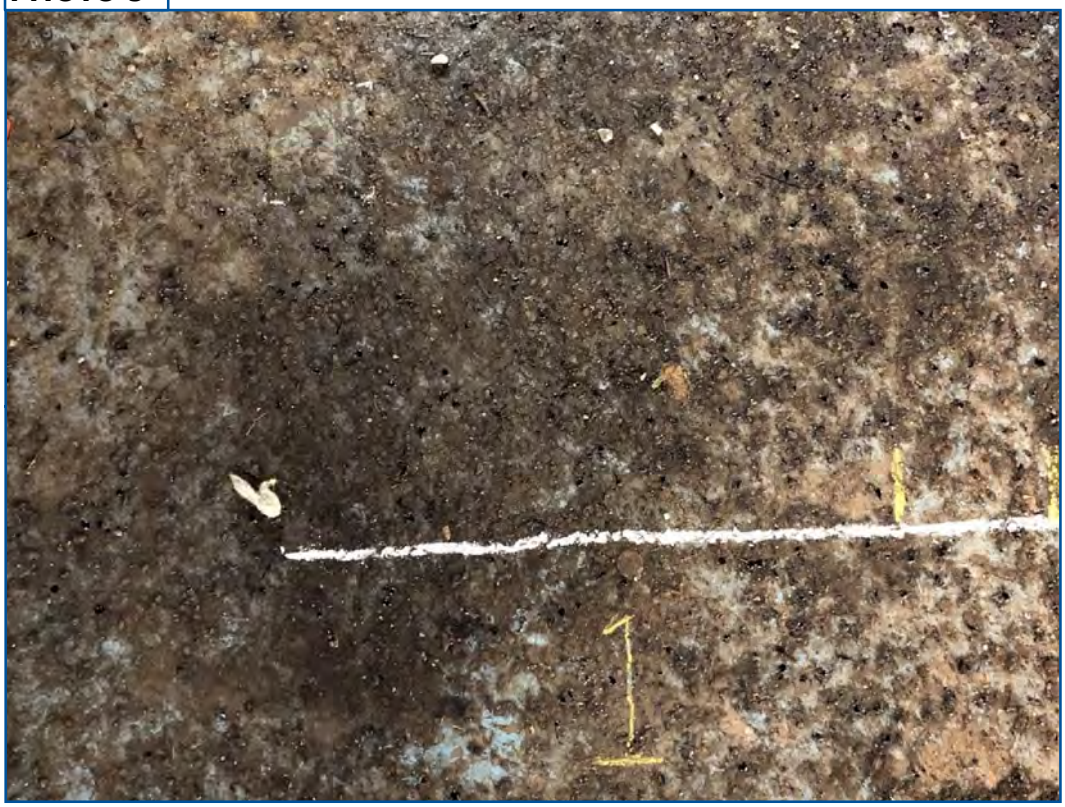
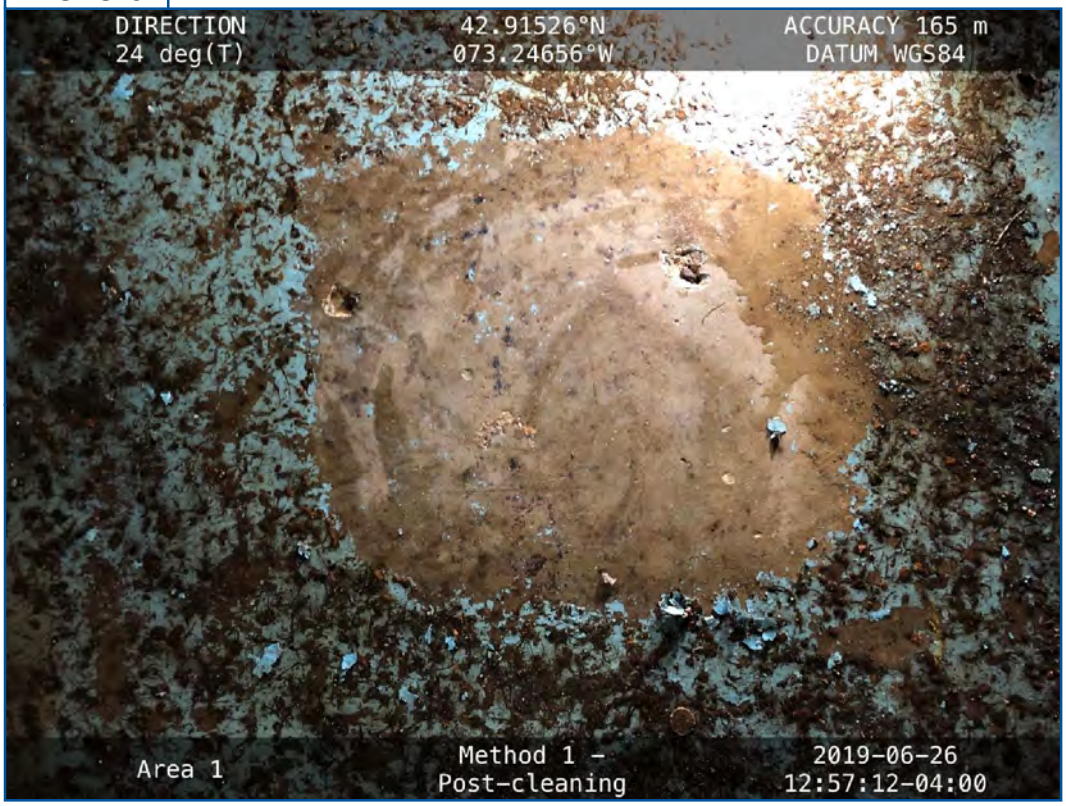
**PHOTO 5**



**Caption:** Area 1 - Method 1 - Pre-Cleaning

**PHOTO 6**



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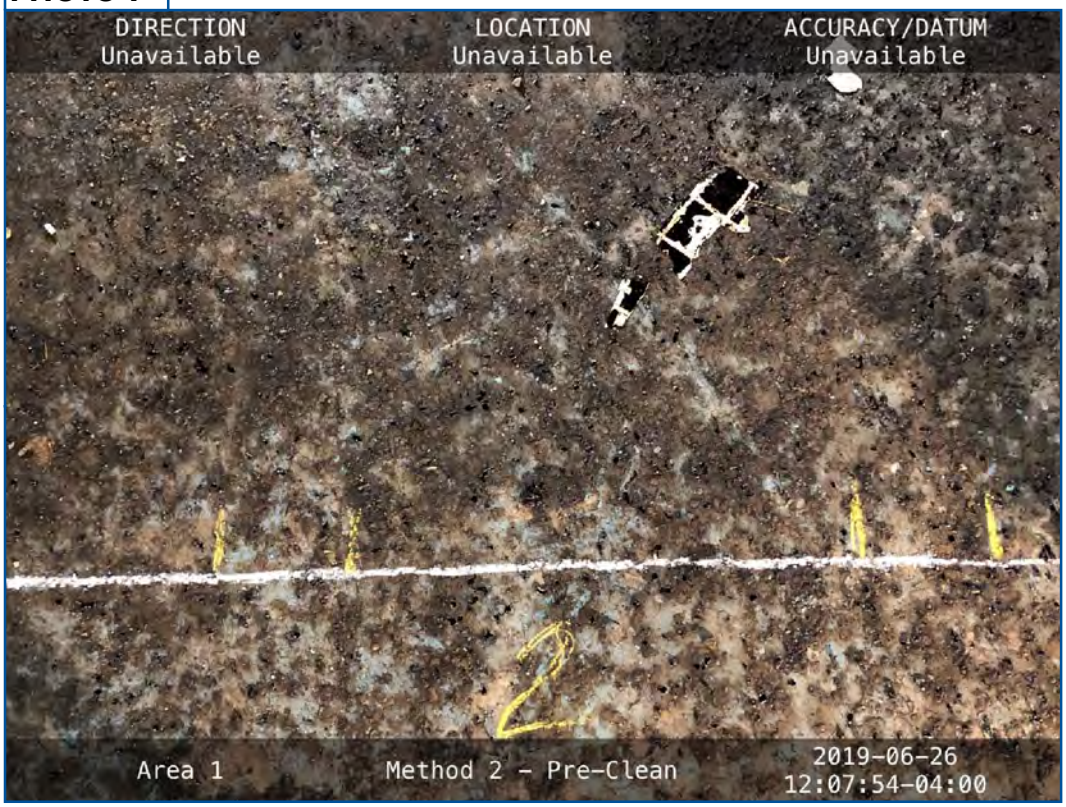


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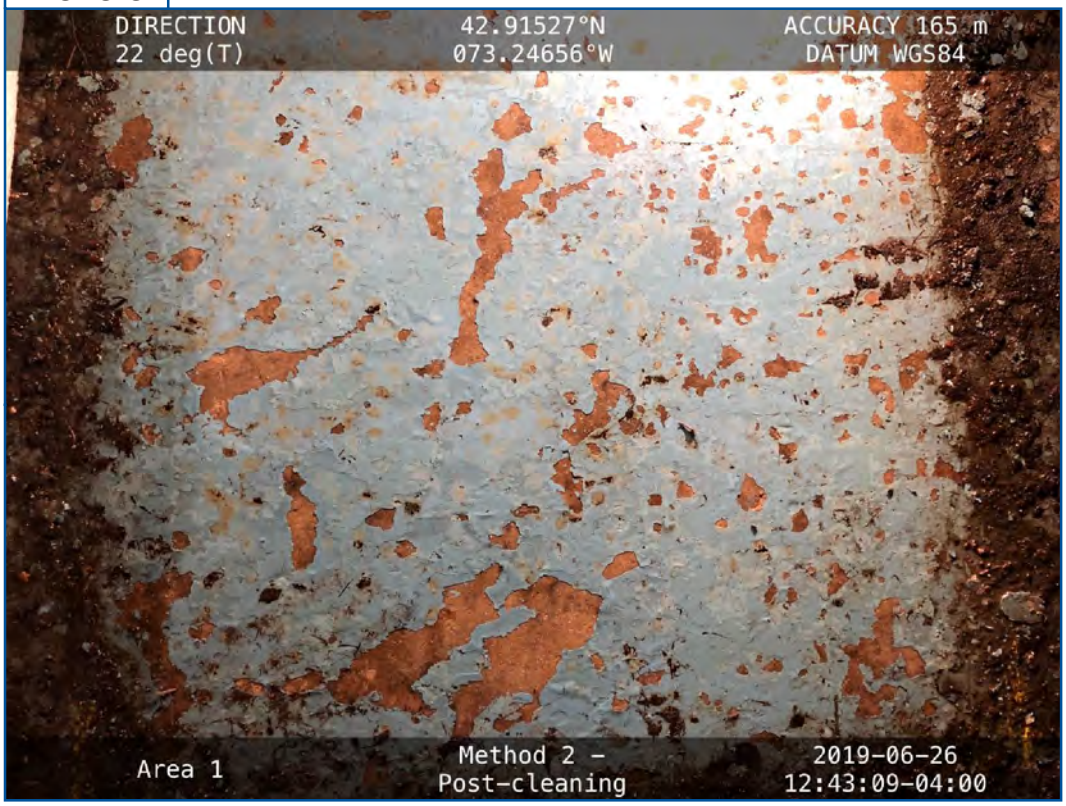

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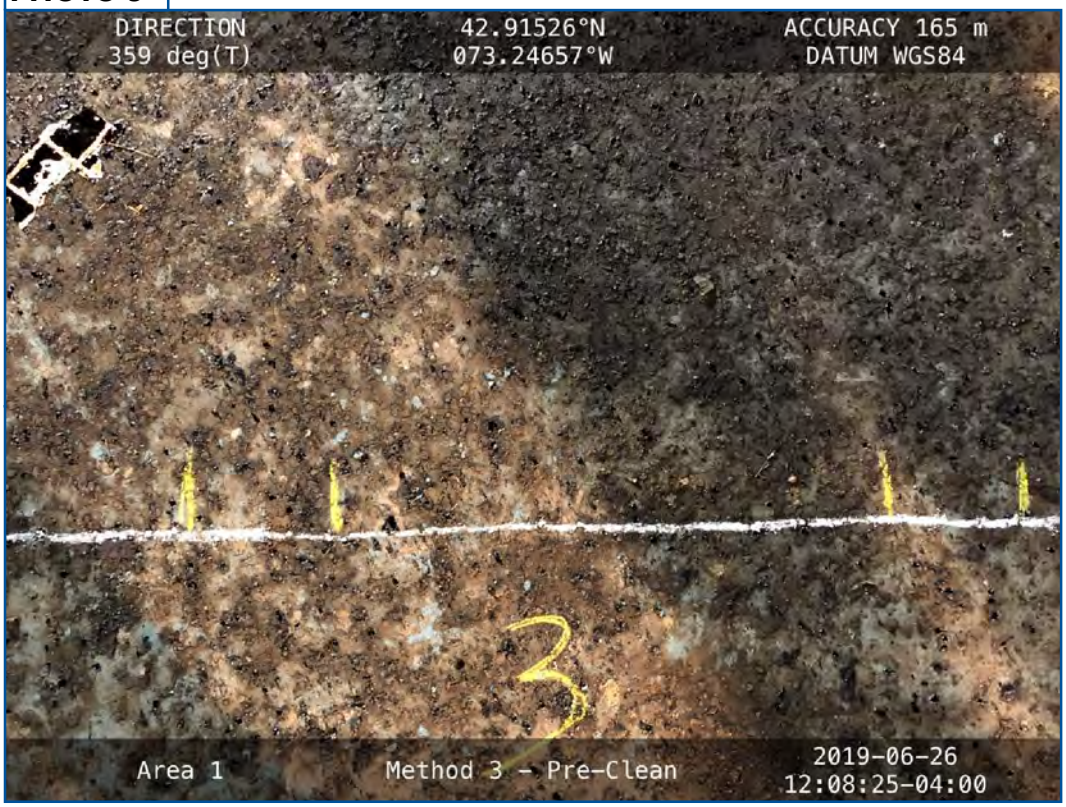


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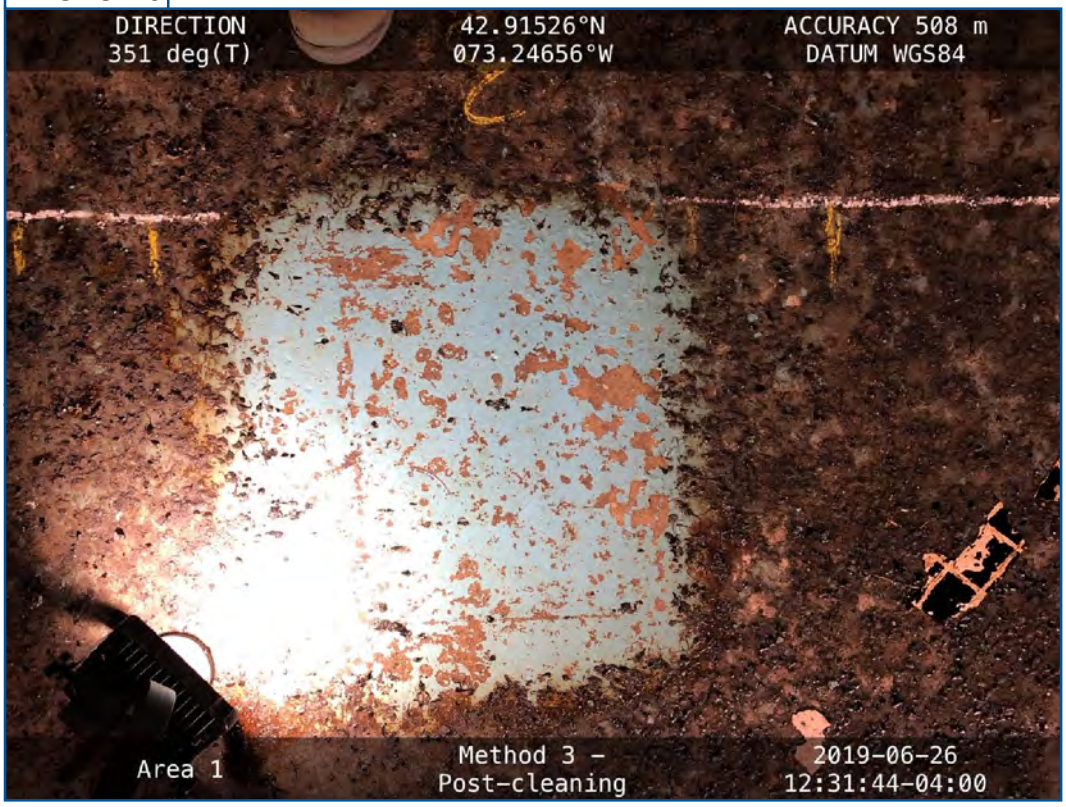

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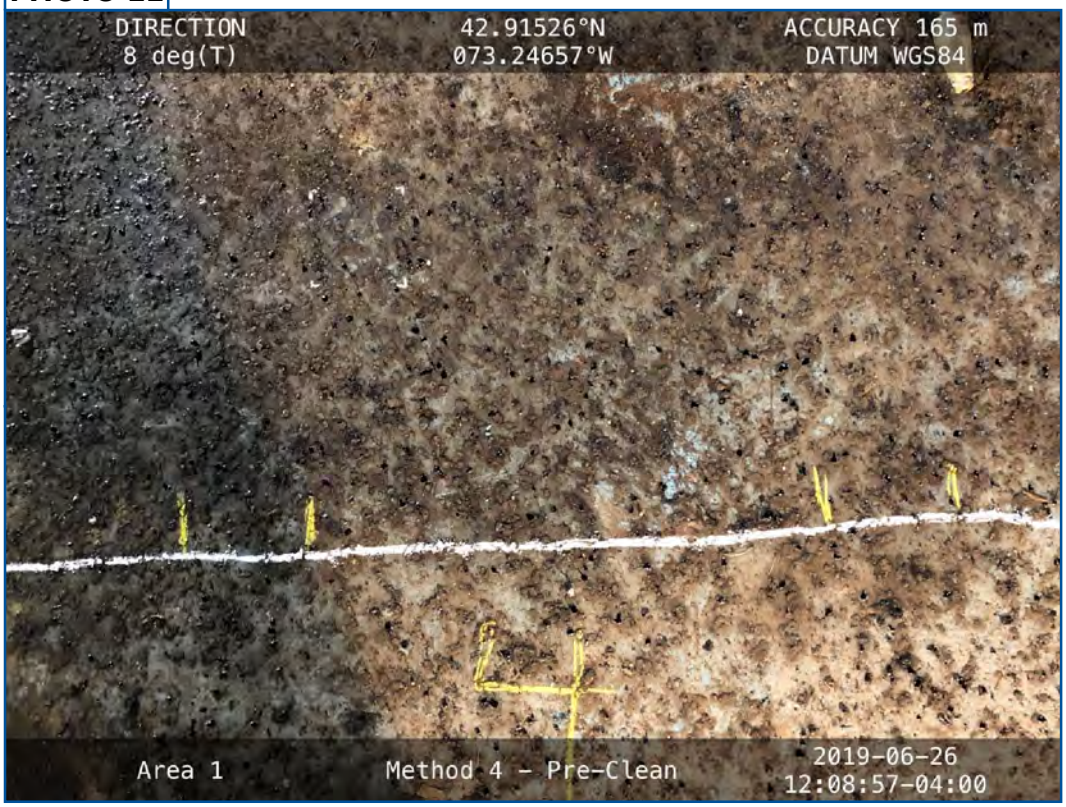


**PHOTO 12**


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**PHOTO 13**

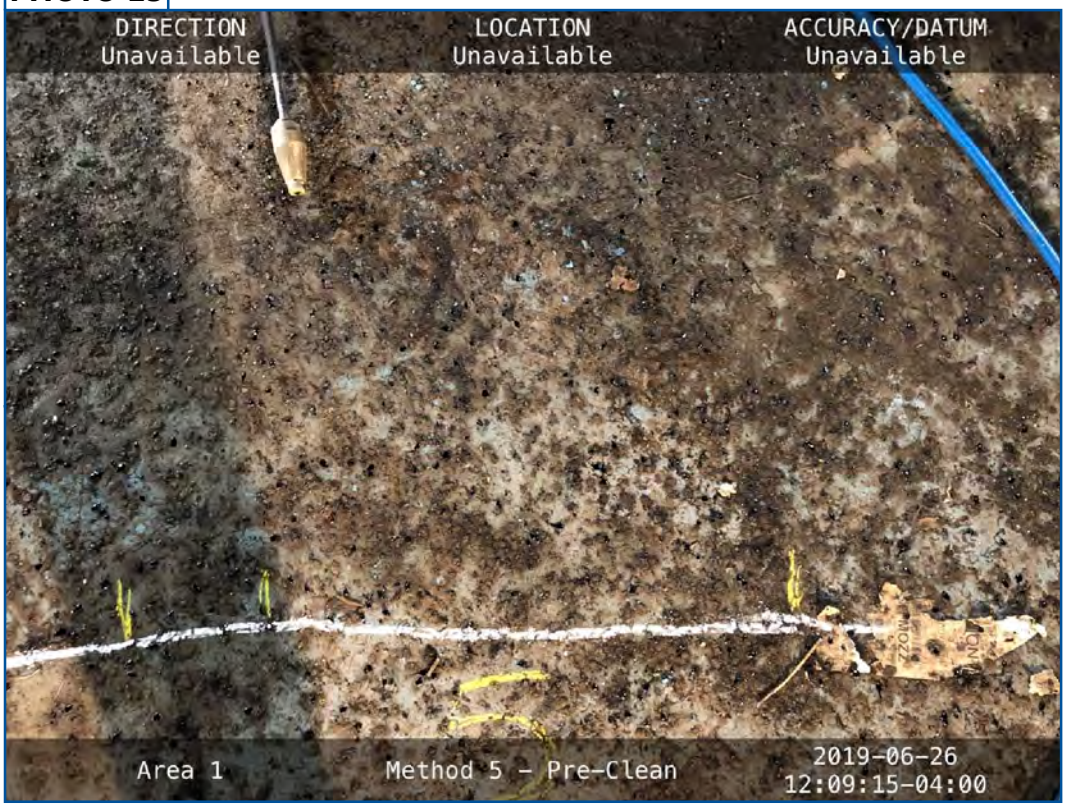


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**PHOTO 15**

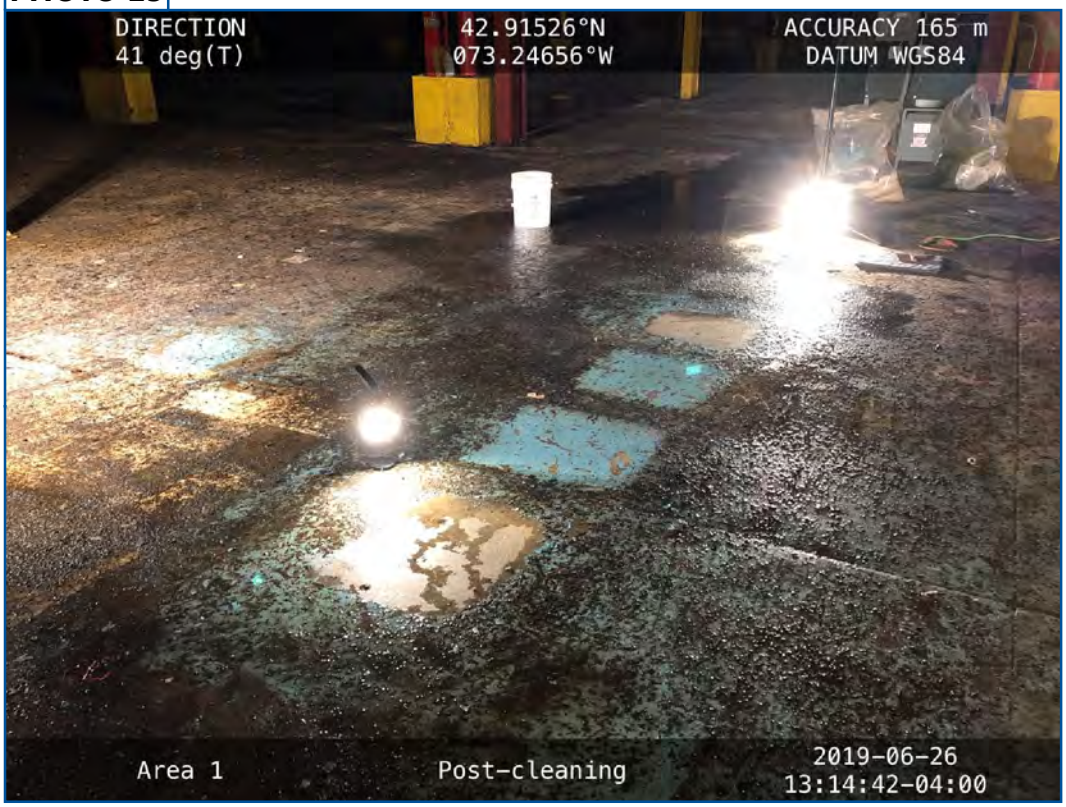


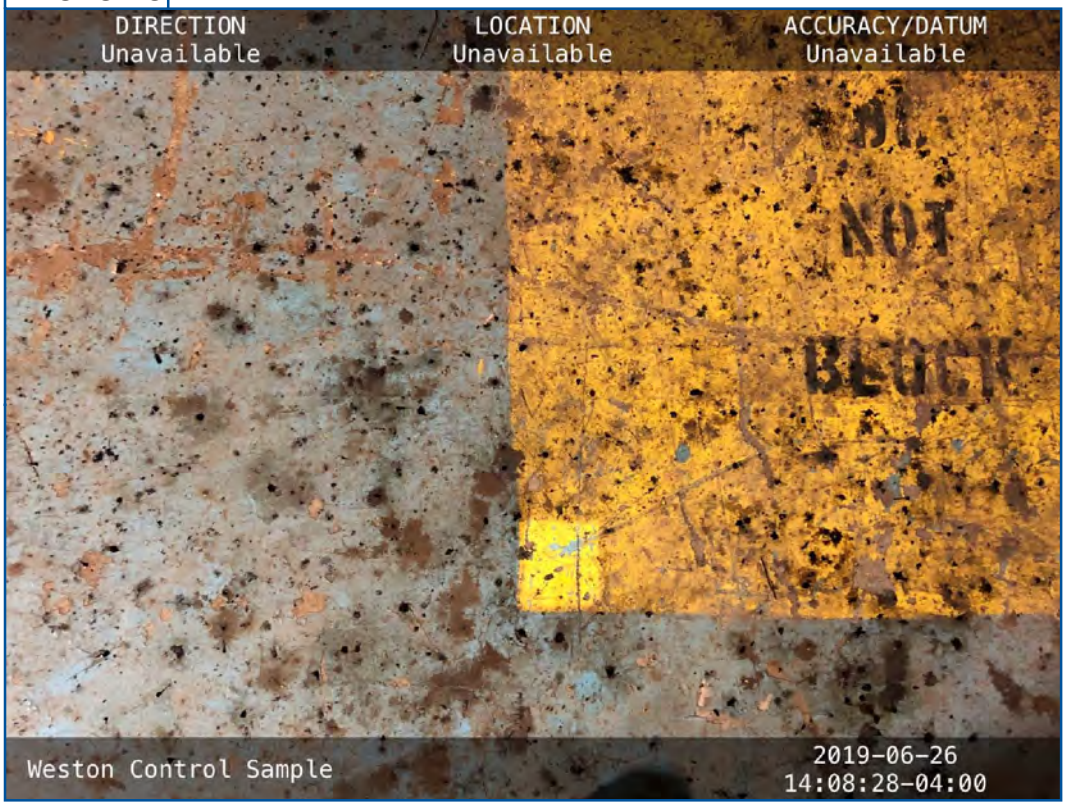

**PHOTO 16**


**Caption:** Weston collecting post-cleaning wipe sample

**PHOTO 17**


**Caption:** Location of Weston control sample on 6/26

**PHOTO 18**




**Caption:** Floor conditions following collection of control sample

**PHOTO 19**


**PHOTO 20**


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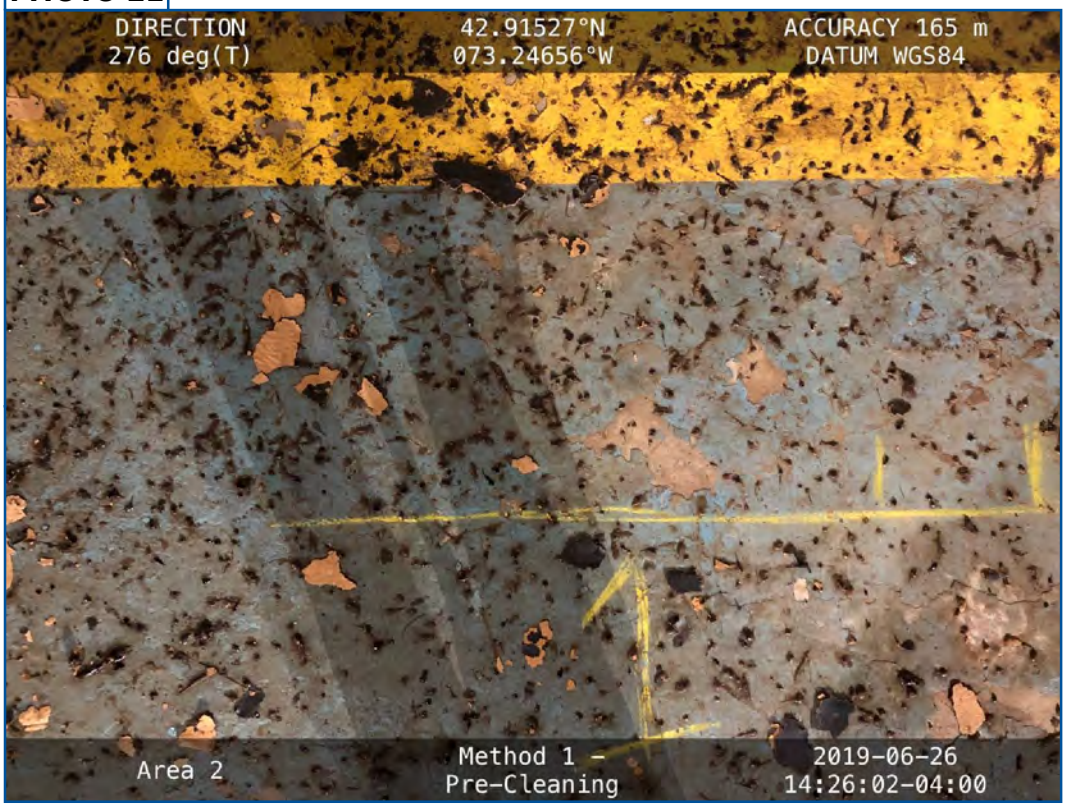
**PHOTO 21**

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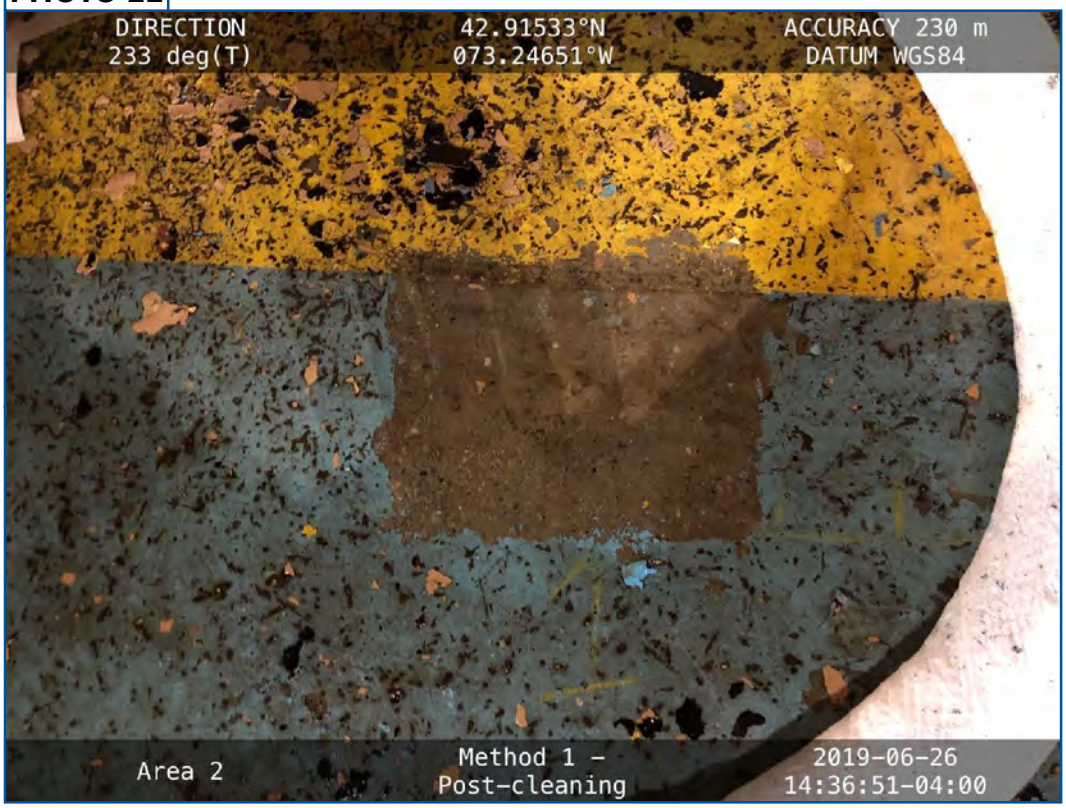


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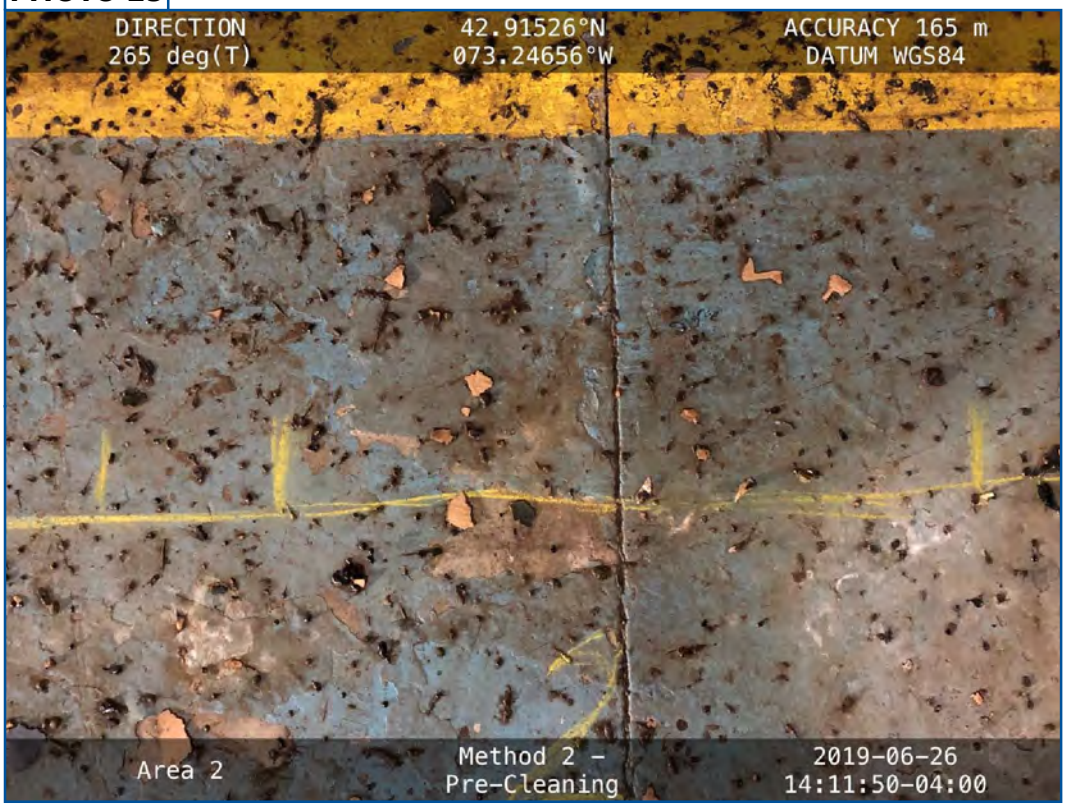
**PHOTO 23**

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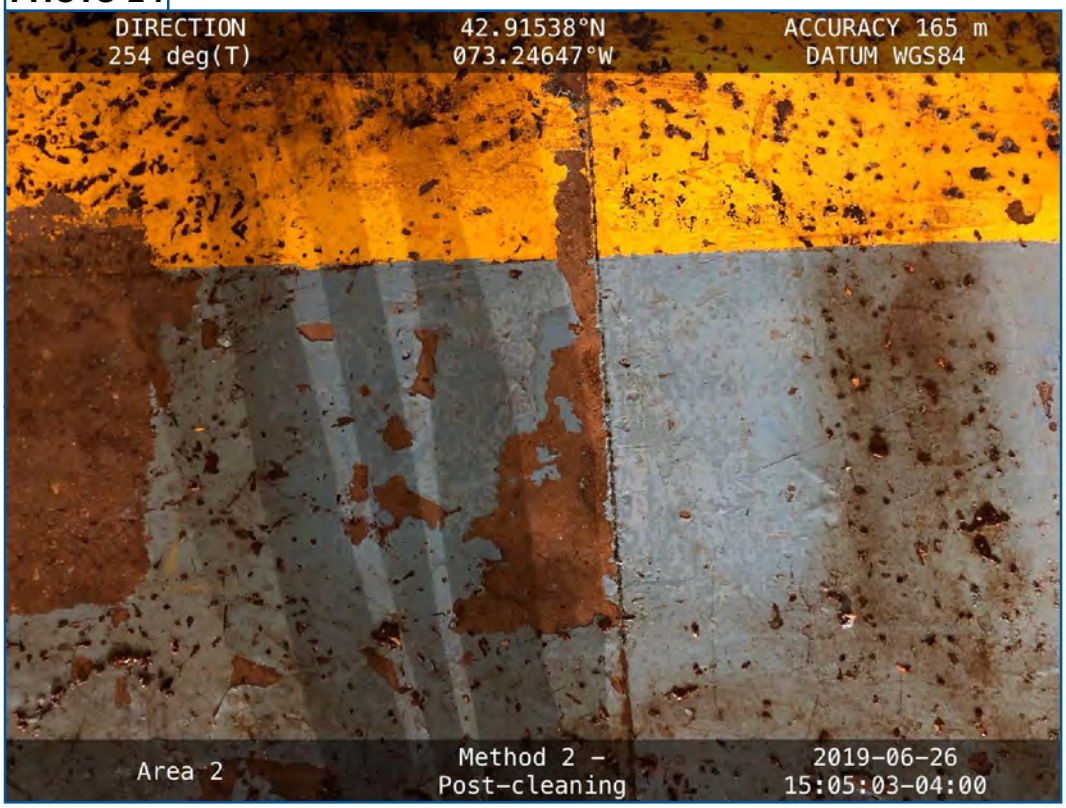


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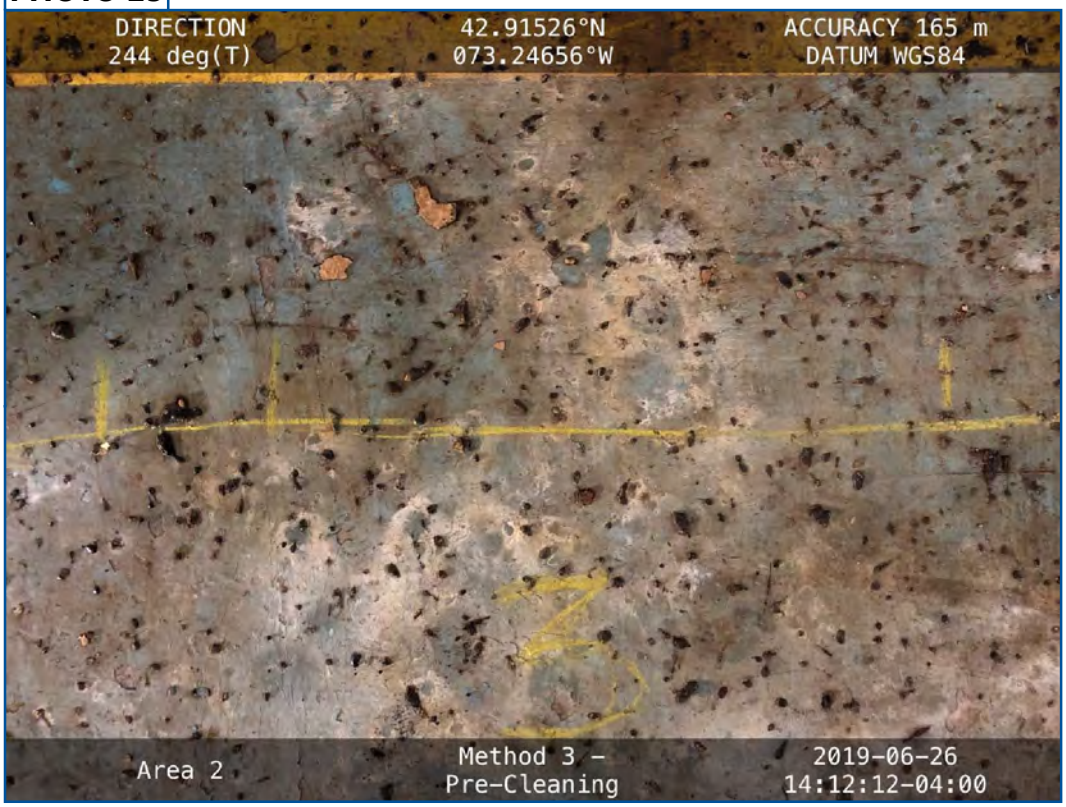
**PHOTO 25**

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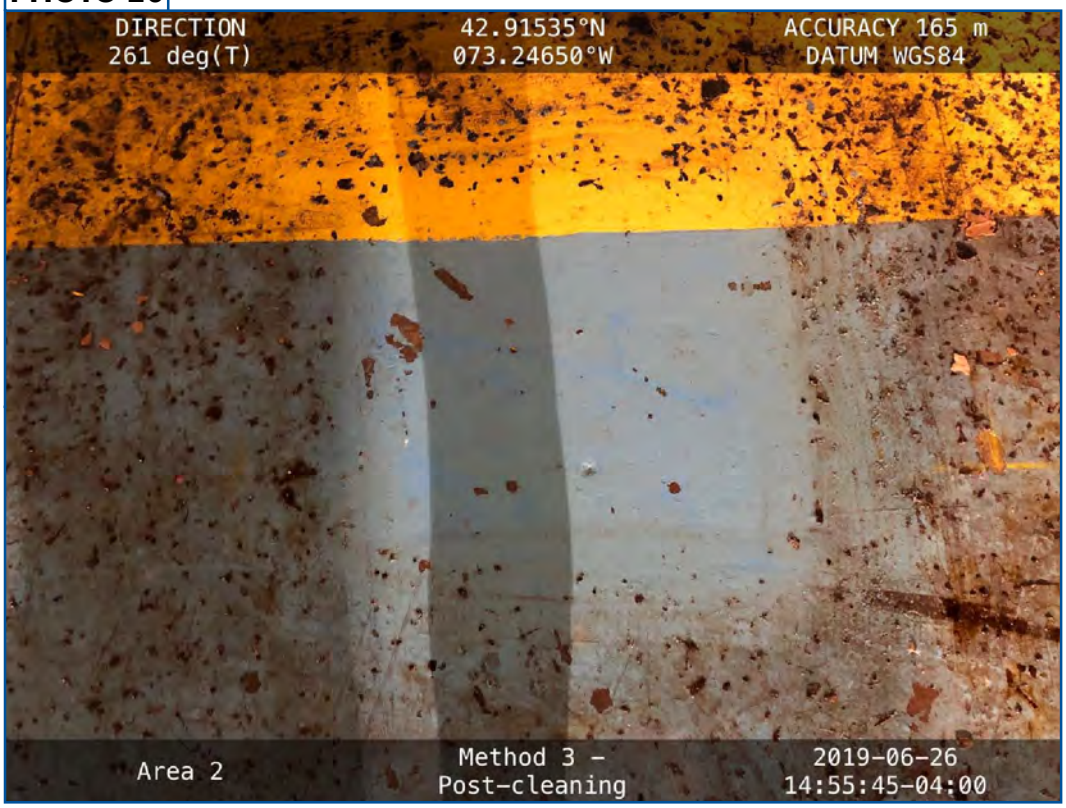

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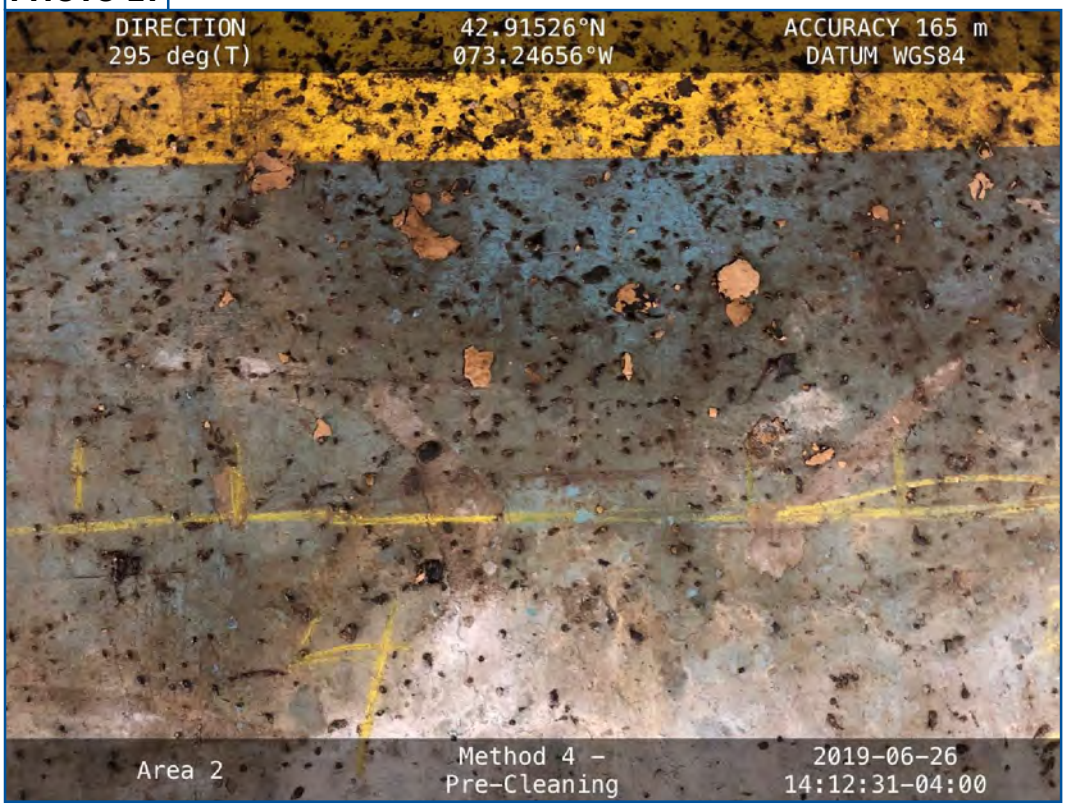


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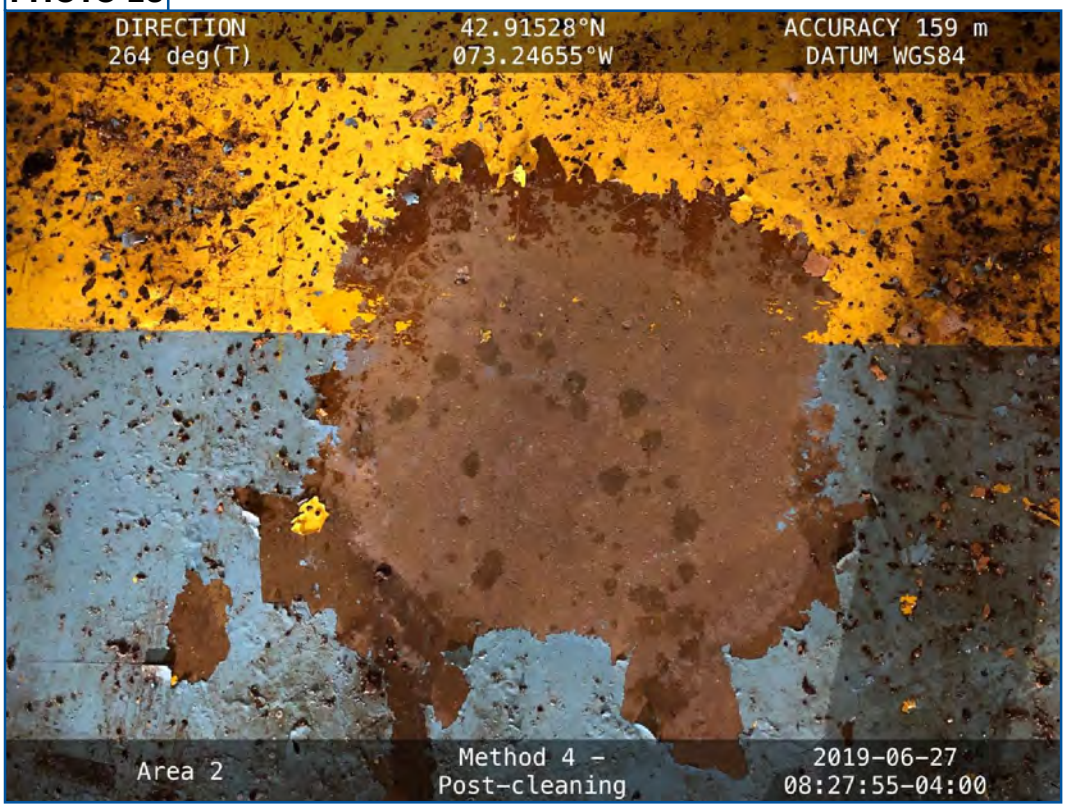

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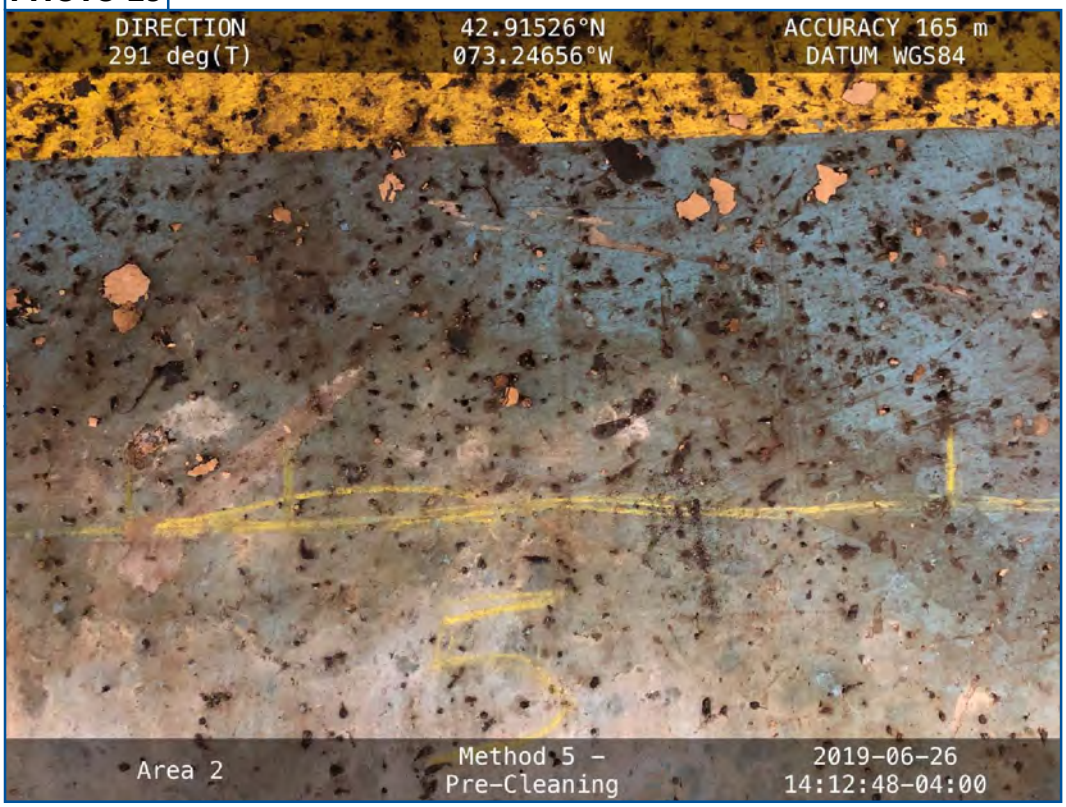


**PHOTO 30**


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**PHOTO 31**

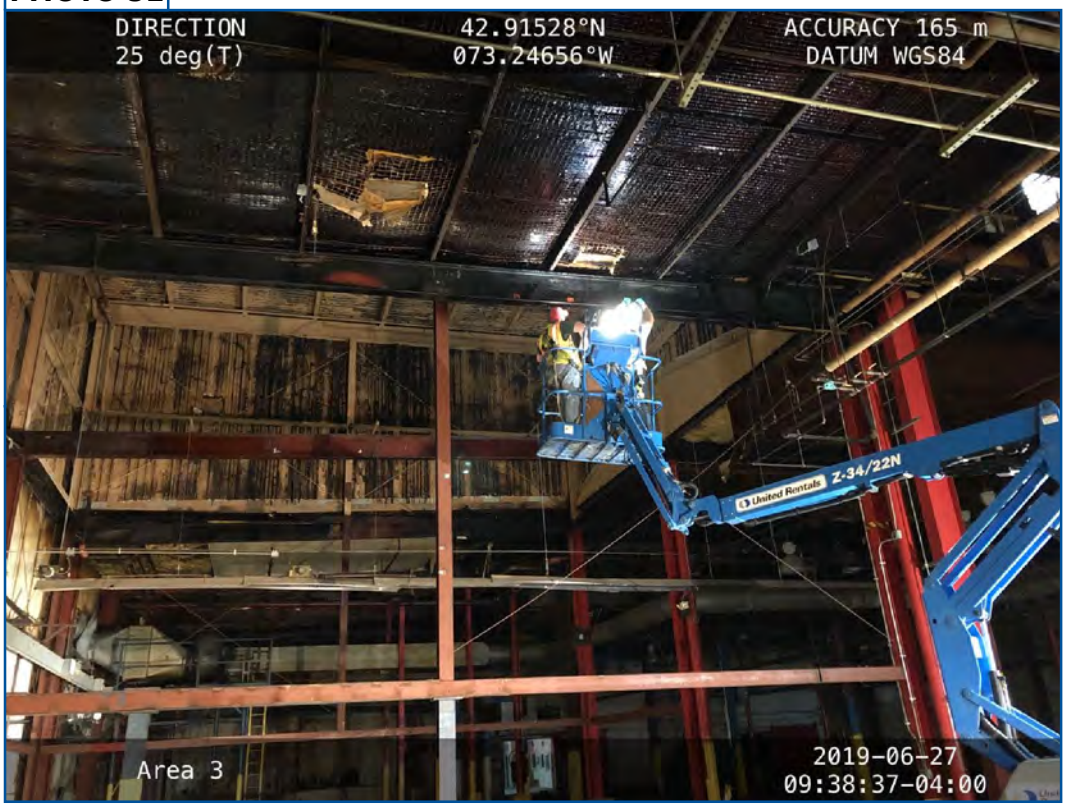


**PHOTO 32**


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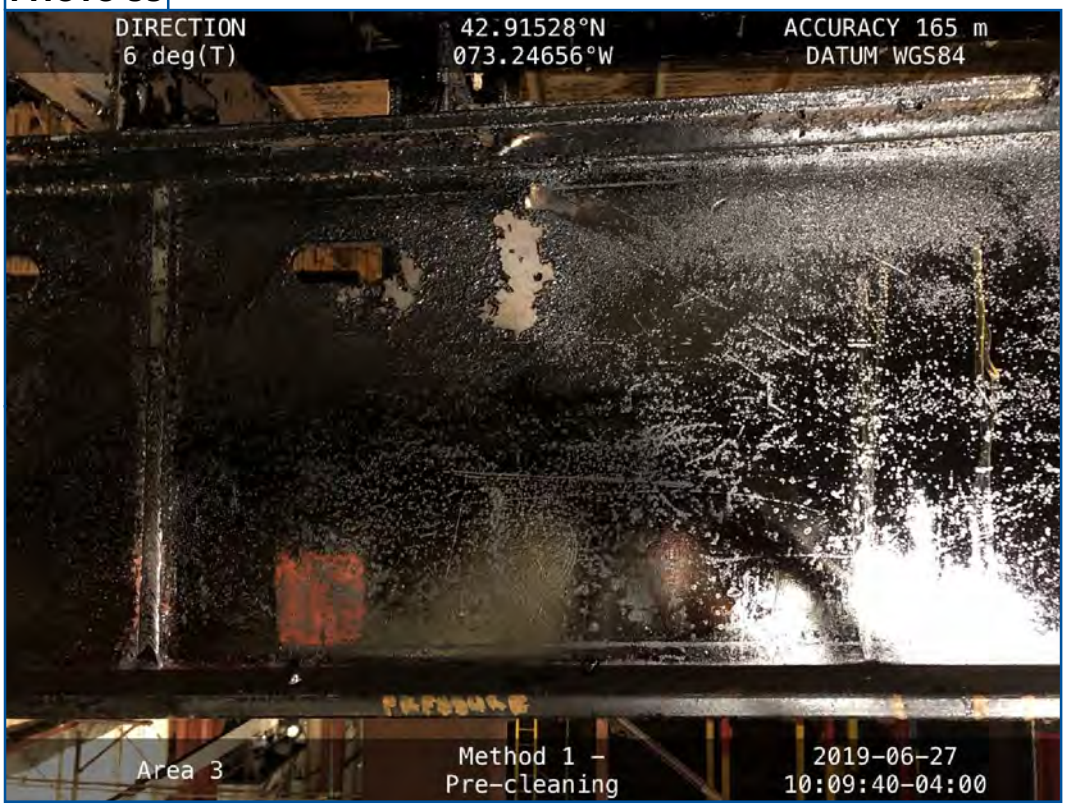
**PHOTO 33**

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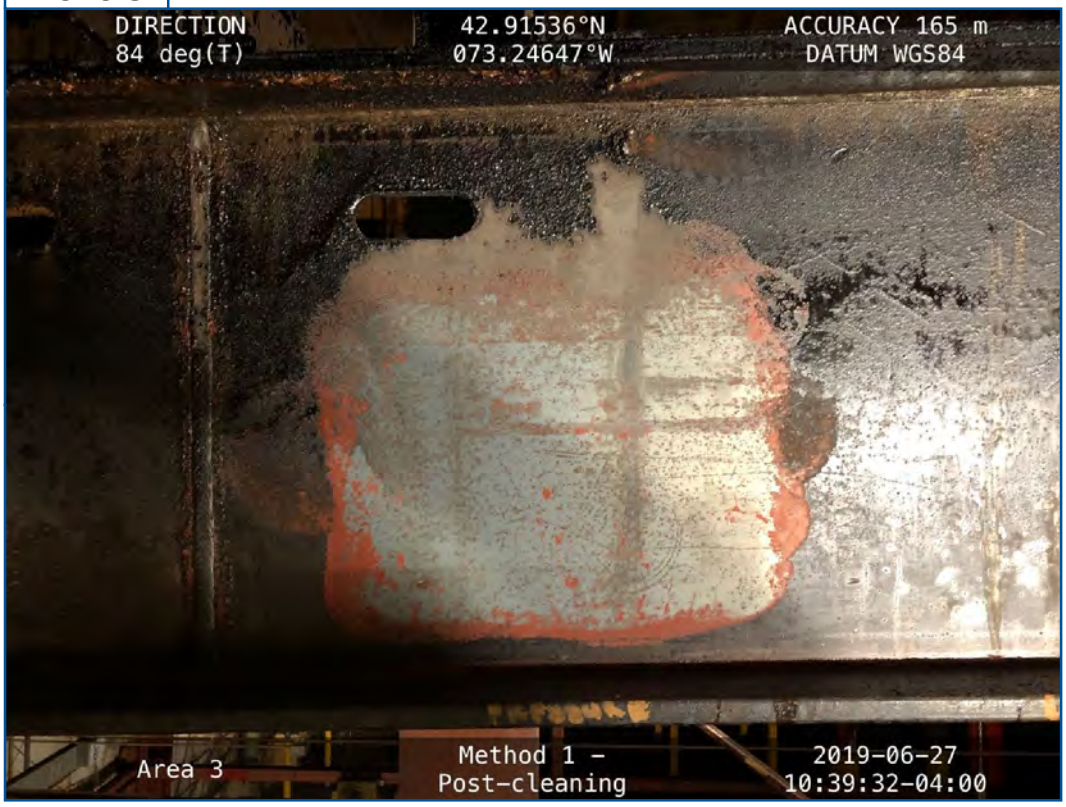


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**PHOTO 35**


**PHOTO 36**

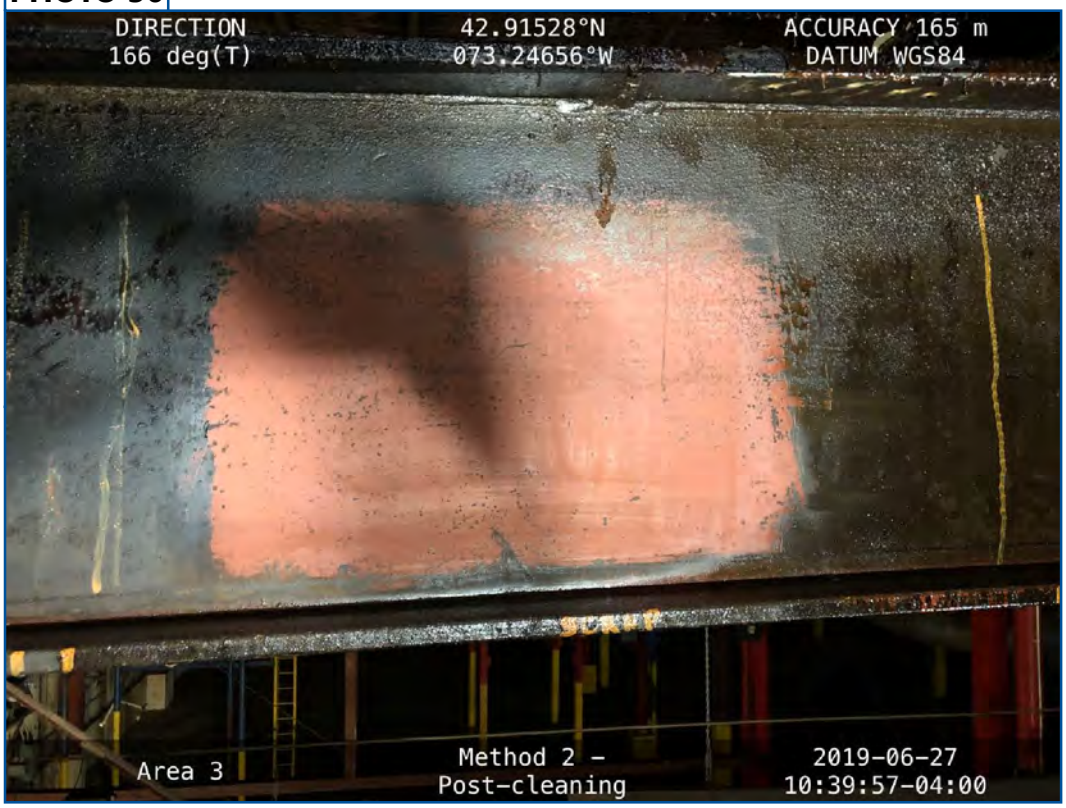


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**PHOTO 37**

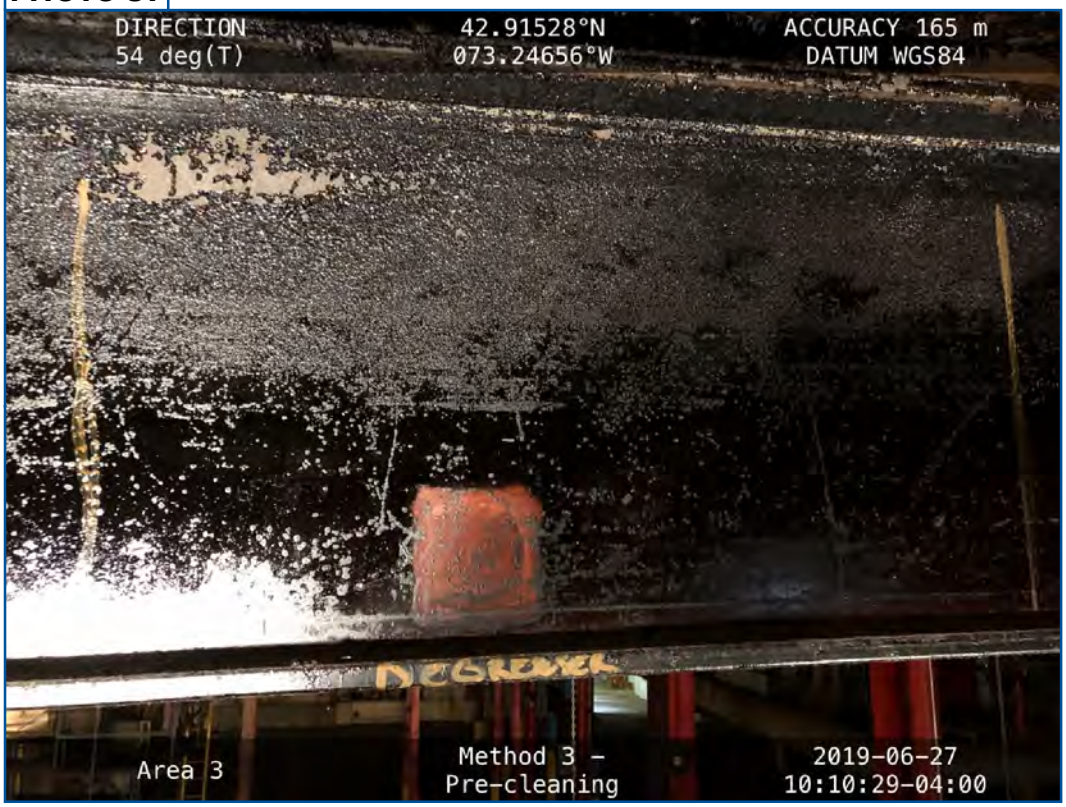


**PHOTO 38**


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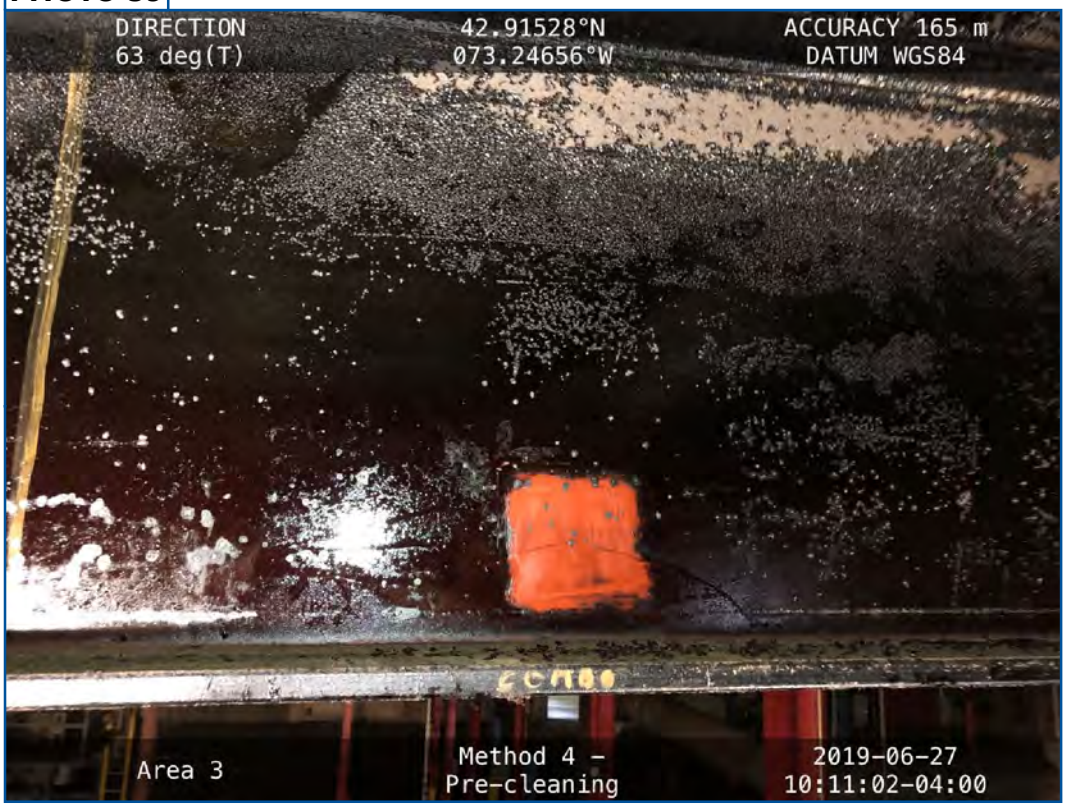
**PHOTO 39**

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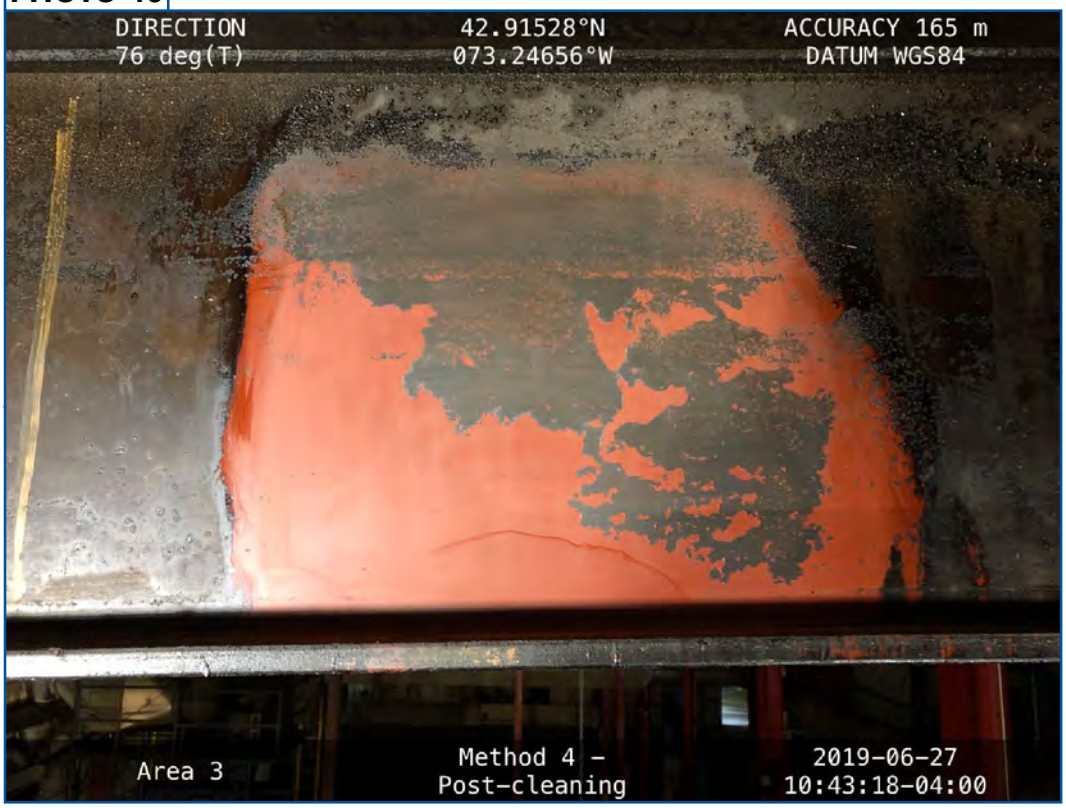

**PHOTO 41**


**PHOTO 42**

**PHOTO 43**


**PHOTO 44**

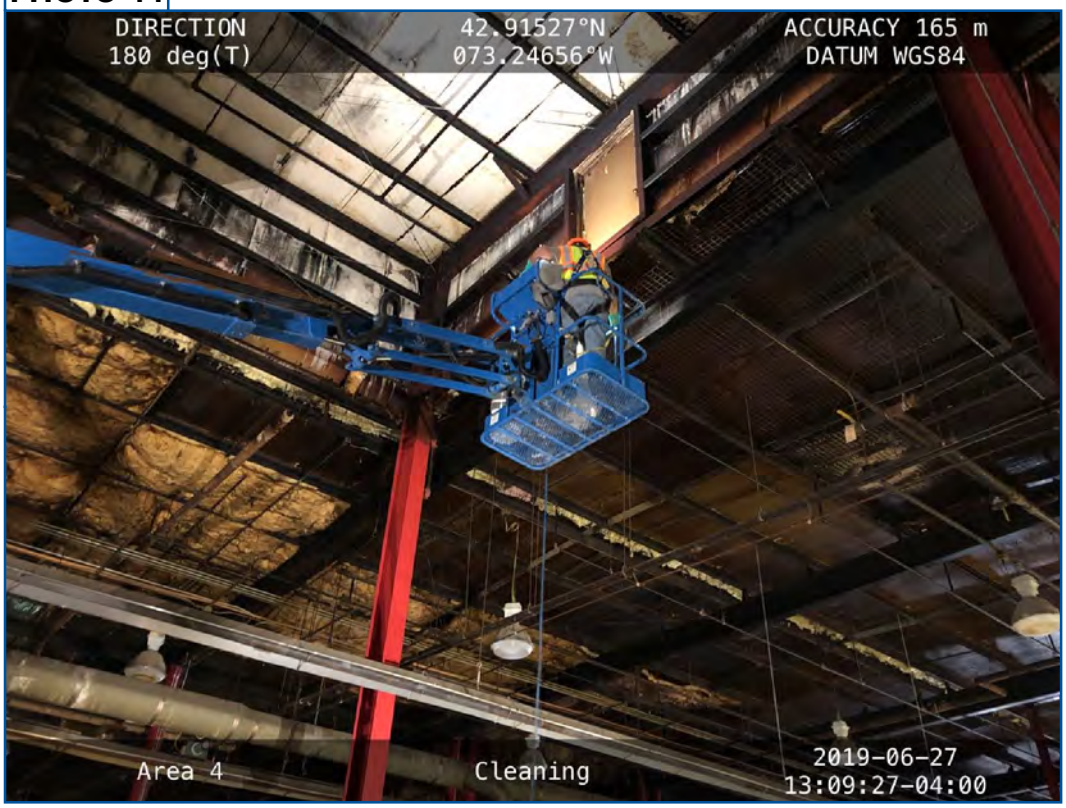


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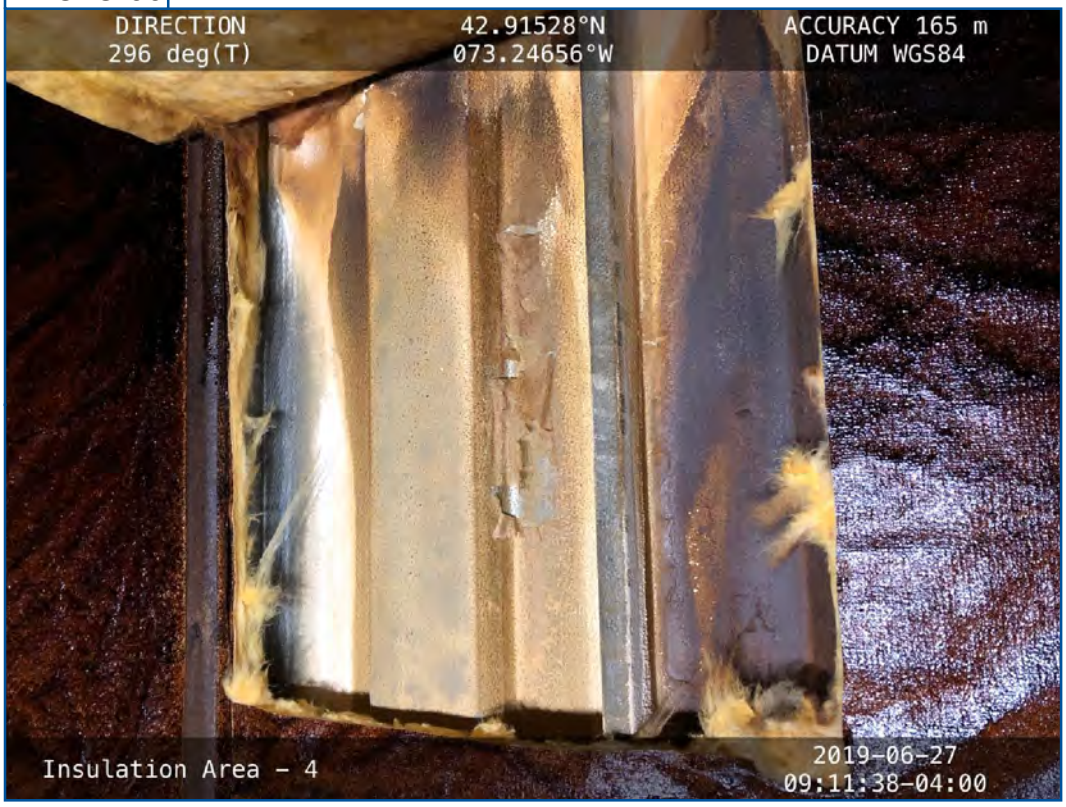
**PHOTO 65**


**PHOTO 66**

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98 South Main Street, Suite 2, Waterbury, VT 05676
Tel: 802.244.5051

# TASK ORDER REQUEST FORM

| | | | | | | |
|---|---|---|---|---|---|---|
| PROJECT NAME: | VTDEC – St. Gobain Wipe Sampling | | | | | |
| LOCATION: | 1030 Water Street, North Bennington, VT | | | | | |
| TASK DESCRIPTION: *(check one)* | | Phase I ESA | | Supplemental Phase II ESA | | Groundwater Monitoring |
| | | ECAA | | CAP | X | Wipe Sampling |
| TO: | Richard Spiese, Vermont Department of Environmental Conservation | | | | | |
| FROM: | Steven LaRosa, Weston & Sampson Engineers, Inc. | | | | | |
| DATE: | 08/05/2019 | | | | | |

Weston & Sampson has completed collection and analysis of wipe samples from multiple surfaces in the St. Gobain facility located at 1030 Water Street in North Bennington as approved in our 06/25/19 task order. The work included collection of samples prior to and after cleaning efforts of discrete concrete floor and steel I-Bean roof support materials. The intent of the surface wipe sampling was to determine the effectiveness of various cleaning methods. In addition several "control", field blank, equipment blank and neighboring room samples were collected.

## SCOPE OF WORK

The wipe samples were collected on June 26 and 27, 2019. The owners contractor selected an area of concrete floor and ceiling I-beam that appeared to be uniformly stained. The flooring area was divided it into 4 roughly 2 foot by 2 foot cleaning test sections. The I-beam test area was roughly 1 foot by 6 feet divided into 4 cleaning test sections.

Four (4) cleaning methods were tested. The methods utilized by the owners contractor were 1) physical scraping with warm water and nylon pads, 2) pressure washing, 3) physical scraping with a degreaser and woven pads and 4) combined pressure washing followed by degreaser.

Pre-cleaning wipe samples were obtained from each test section. Each wipe sample was collected by generally following the EPA Lead Dust Sampling Technician Field Guide. Samples were collected from 10cm x 10cm (100 $cm^2$/4"x4") areas with a PFAS free gauze impregnated with methanol. The sample area was wiped horizontally in an S-shaped motion, the wipe folded dirty side in, the area wiped vertically, the dirty side folded in again and a final wipe preformed concentrating on the edges of the sample area. The wipe was placed in its shipping container, sealed and labelled. A duplicate pre-cleaning sample was obtained from the "scrape" test section.

Following cleaning of each test section, a post-cleaning wipe sample was collected. The post cleaning sample was collected from directly adjacent to the pre-cleaning sample location. The sample collection method was the same as the pre-cleaning sample. A duplicate post-cleaning sample was collected from the "degreaser" test section.

A “control” sample was collected from a 4” x 4” area of the concrete floor from an area distal to the cleaning test area. A total of three (3) wipe samples were collected sequentially from this single location of concrete to determine PFAS sampling efficiency of each media.

Two (2) samples were collected from the “common area” in the 940 Water Street building (wall and I-Beam). The areas sampled appeared to be “original” building surfaces of brick and painted steel.

An equipment blank was collected by wiping the decontaminated plastic template used to define the 4”x4” sampling areas.

A Field Blank was collected by opening a wipe in the airspace of the cleaning/sampling area, refolding and placing back in the shipping container.

Pictures of the sampling and cleaning areas are included in the attached photo log.

Each sample was analyzed at SGS North America utilizing their proprietary extraction and analyses method 537M ID. The laboratory results are attached. The data has been summarized in Table 1 along with summaries of the PFAS reduction between pre and post cleaning.

## RESULTS

Three PFAS were identified above reporting limits in the wipe samples: Perfluorohexanoic acid (PFHxA), Perfluoroheptanoic acid (PFHpA) and Perfluorooctanoic acid (PFOA). PFOA was consistently the highest concentrations reported. Several other PFAS were reported at estimate concentrations below the reporting limits.

The trip blank data indicate a PFOA concentration of 0.005 ug/wipe, several orders of magnitude less than the concentrations reported in the surface wipe samples. The field blank reported higher PFOA concentration of 0.053 ug/wipe, also well below the surface wipe results but above the trip blank concentration. This is likely due to PFOA presence in the interior air on dust. The concentrations of PFOA in the trip and field blanks are not sufficient to impact the usability of the surface wipe samples as indicators of cleaning method effectiveness.

The “Control” samples indicate that PFAS concentrations remained in the same order of magnitude despite sampling the same 10cm x 10 cm block repeatedly. The final sample “Control 3” had the highest PFOA concentration at approximately 85 ug/wipe. This may be due to the template used to define the wipe area sliding slightly or liberation of debris due to repeated solvent exposure.

The concrete floor sample results show an approximate 77% reduction in PFOA concentrations to between 4 and 62 ug/wipe. The one exception is the degreaser area where little PFOA was observed initially and a greater concentration reported after cleaning. The duplicate floor sample was obtained before cleaning from the physically scraped area. The duplicate reported PFAS at approximately twice the original sample (326 ug/wipe vs 166 ug/wipe)

The vertical surface of the I-Beams had lower initial PFOA concentrations and much lower post cleaning concentrations between 0.5 and 4 ug/wipe, equating to an average 94% PFOA concentration reduction. The steel also appeared to be cleaner overall due to its non porous surface and vertical orientation. A duplicate sample was collected after cleaning from the degreaser area and showed excellent correlation

to the original sample.

The “common room” in the adjoining building reported PFOA concentrations of 0.175 ug/wipe from the brick wall and 0.488 ug/wipe from the ceiling I-beam. The photographs of the sample locations attached do show some debris/dirt was removed from each location by the solvent wipes.

## CONCLUSIONS

The cleaning efforts utilized on both the concrete floor and I beam test locations all showed reductions of PFAS concentrations in surface wipe samples. The effectiveness of the cleaning on the concrete floor was less than the painted, vertical surface of the i-beam. This is likely due to the higher concentrations of PFAS in the debris and the porous nature of the concrete. Heavy foot traffic and spillage of materials on the floor may also have resulted in penetration of contaminated materials into the concrete matrix. The combination cleaning method of pressure washing and degreasing appears to have been the most effective tested.

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# TABLE 1
# WIPE SAMPLE RESULTS

| Analyte | CAS # | Units | FLOOR - AREA 1 SCRAPE | | FLOOR - AREA 1 PRESSURE WASH | | FLOOR - AREA 1 DEGREASER | | FLOOR - AREA 1 COMBINATION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | BEFORE | AFTER | BEFORE | AFTER | BEFORE | AFTER | BEFORE | AFTER |
| Perfluorobutanoic acid (PFBA) | 375-22-4 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluoropentanoic acid (PFPeA) | 2706-90-3 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorohexanoic acid (PFHxA) | 307-24-4 | ug/wipe | **1.41** | ND/< 0.25 | **1.88** | ND/< 0.10 | **0.609** | ND/< 0.10 | **1.17** | ND/< 0.050 |
| Perfluoroheptanoic acid (PFHpA) | 375-85-9 | ug/wipe | **2.83** | **0.436 J** | **4.47** | **0.180 J** | **1.17** | **0.203** | **1.82** | ND/< 0.050 |
| Perfluorooctanoic acid (PFOA) | 335-67-1 | ug/wipe | **162** | **61.8** | **113** | **26.9** | **6.01 J** | **24.5** | **232** | **4.13** |
| Perfluorononanoic acid (PFNA) | 375-95-1 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorodecanoic acid (PFDA) | 335-76-2 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluoroundecanoic acid (PFUnA) | 2058-94-8 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorododecanoic acid (PFDoA) | 307-55-1 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorotridecanoic acid (PFTrDA) | 72629-94-8 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorotetradecanoic acid (FTeDA) | 376-06-7 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorobutanesulfonic acid (PFBS) | 375-73-5 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluoropentanesulfonic acid (PFPeS) | 2706-91-4 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorohexanesulfonic acid (PFHxS) | 355-46-4 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluoroheptanesulfonic acid (PFHpS) | 375-92-8 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorooctanesulfonic acid (PFOS) | 1763-23-1 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | **0.279 J** | ND/< 0.050 |
| Perfluorononanesulfonic acid (PFNS) | 68259-12-1 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorodecanesulfonic acid (PFDS) | 335-77-3 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| Perfluorooctanesulfonamide (PFOSA) | 754-91-6 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| N-Methylperfluorooctanesulfonamidoacetic acid (N-MeFOSAA) | 2355-31-9 | ug/wipe | ND/< 13 | ND/< 0.63 | ND/< 25 | ND/< 0.25 | ND/< 13 | ND/< 1.3 | ND/< 13 | ND/< 0.13 |
| N-Ethylperfluorooctanesulfonamidoacetic acid (N-EtFOSAA) | 2991-50-6 | ug/wipe | ND/< 13 | ND/< 0.63 | ND/< 25 | ND/< 0.25 | ND/< 13 | ND/< 1.3 | ND/< 13 | ND/< 0.13 |
| 4:2 Fluorotelomer sulfonate (4:2 FTS) | 757124-72-4 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| 6:2 Fluorotelomer sulfonate (6:2 FTS) | 27619-97-2 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |
| 8:2 Fluorotelomer sulfonate (8:2 FTS) | 39108-34-4 | ug/wipe | ND/< 0.50 | ND/< 0.25 | ND/< 0.50 | ND/< 0.10 | ND/< 0.25 | ND/< 0.10 | ND/< 0.25 | ND/< 0.050 |

**Notes:**

ND/<1.0 the compound was not detected above the indicated method detection limit

J: compound detected above the method detection limit but below the reporting limit estimated value

**BOLD:** analyte present above detection limit

| | | | | | | |
|---|---|---|---|---|---|---|
| Perfluorooctanoic acid (PFOA) | % Reduction | 62% | 76% | -308% | 98% | |

| | | | |
|---|---|---|---|
| Perfluorooctanoic acid (PFOA) | Floor Before Average | 128.25 | 77% |
| | Floor After Average | 29.33 | |
| | Truss Before Average | 65.80 | 94% |
| | Truss After Average | 4.08 | |

TABLE 1
WIPE SAMPLE RESULTS

| Analyte | CAS # | Units | IRON TRUSS SCRAPE | | IRON TRUSS PRESSURE WASH | | IRON TRUSS DEGREASER | | IRON TRUSS COMBINATION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | BEFORE | AFTER | BEFORE | AFTER | BEFORE | AFTER | BEFORE | AFTER |
| Perfluorobutanoic acid (PFBA) | 375-22-4 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluoropentanoic acid (PFPeA) | 2706-90-3 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorohexanoic acid (PFHxA) | 307-24-4 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluoroheptanoic acid (PFHpA) | 375-85-9 | ug/wipe | ND/< 0.50 | ND/< 0.020 | **0.564 J** | ND/< 0.020 | **0.622 J** | **0.0594 J** | **0.258 J** | **0.0759 J** |
| Perfluorooctanoic acid (PFOA) | 335-67-1 | ug/wipe | **40.9** | **6.03** | **51.2** | **0.541** | **130** | **4.80** | **41.1** | **4.93** |
| Perfluorononanoic acid (PFNA) | 375-95-1 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorodecanoic acid (PFDA) | 335-76-2 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluoroundecanoic acid (PFUnA) | 2058-94-8 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorododecanoic acid (PFDoA) | 307-55-1 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorotridecanoic acid (PFTrDA) | 72629-94-8 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorotetradecanoic acid (FTeDA) | 376-06-7 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorobutanesulfonic acid (PFBS) | 375-73-5 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluoropentanesulfonic acid (PFPeS) | 2706-91-4 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorohexanesulfonic acid (PFHxS) | 355-46-4 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluoroheptanesulfonic acid (PFHpS) | 375-92-8 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorooctanesulfonic acid (PFOS) | 1763-23-1 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorononanesulfonic acid (PFNS) | 68259-12-1 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorodecanesulfonic acid (PFDS) | 335-77-3 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| Perfluorooctanesulfonamide (PFOSA) | 754-91-6 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| N-Methylperfluorooctanesulfonamidoacetic acid (N-MeFOSAA) | 2355-31-9 | ug/wipe | ND/< 1.3 | ND/< 0.050 | ND/< 2.5 | ND/< 0.050 | ND/< 6.3 | ND/< 0.13 | ND/< 1.3 | ND/< 0.13 |
| N-Ethylperfluorooctanesulfonamidoacetic acid (N-EtFOSAA) | 2991-50-6 | ug/wipe | ND/< 1.3 | ND/< 0.050 | ND/< 2.5 | ND/< 0.050 | ND/< 6.3 | ND/< 0.13 | ND/< 1.3 | ND/< 0.13 |
| 4:2 Fluorotelomer sulfonate (4:2 FTS) | 757124-72-4 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| 6:2 Fluorotelomer sulfonate (6:2 FTS) | 27619-97-2 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |
| 8:2 Fluorotelomer sulfonate (8:2 FTS) | 39108-34-4 | ug/wipe | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.020 | ND/< 0.50 | ND/< 0.050 | ND/< 0.25 | ND/< 0.050 |

**Notes:**

ND/<1.0 the compound was not detected above the indicated method detection limit

J: compound detected above the method detection limit but below the reporting limit estimated value

**BOLD:** analyte present above detection limit

| | | | | | |
|---|---|---|---|---|---|
| Perfluorooctanoic acid (PFOA) | % Reduction | 85% | 99% | 96% | 88% |

| | |
|---|---|
| Perfluorooctanoic acid (PFOA) | Floor Before Average |
| | Floor After Average |
| | Truss Before Average |
| | Truss After Average |

TABLE 1
WIPE SAMPLE RESULTS

| Analyte | CAS # | Units | DUPLICATE FLOOR SCRAPE BEFORE | DUPLICATE IRON TRUSS DEGREASER AFTER | COMMON ROOM WALL | COMMON ROOM CEILING | CONTROL 1 | CONTROL 2 | CONTROL 3 | EQUIPMENT BLANK | FIELD BLANK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Perfluorobutanoic acid (PFBA) | 375-22-4 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluoropentanoic acid (PFPeA) | 2706-90-3 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorohexanoic acid (PFHxA) | 307-24-4 | ug/wipe | **1.11** | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | **0.200** | ND/< 0.0010 | ND/< 0.0010 |
| Perfluoroheptanoic acid (PFHpA) | 375-85-9 | ug/wipe | **2.23** | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | **1.20** | ND/< 0.50 | **0.443** | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorooctanoic acid (PFOA) | 335-67-1 | ug/wipe | **323** | **3.79** | **0.175** | **0.488** | **75.6** | **47.7** | **84.7** | **0.00539** | **0.0536** |
| Perfluorononanoic acid (PFNA) | 375-95-1 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorodecanoic acid (PFDA) | 335-76-2 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluoroundecanoic acid (PFUnA) | 2058-94-8 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorododecanoic acid (PFDoA) | 307-55-1 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | **0.0576 J** | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorotridecanoic acid (PFTrDA) | 72629-94-8 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorotetradecanoic acid (FTeDA) | 376-06-7 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | **0.0975 J** | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorobutanesulfonic acid (PFBS) | 375-73-5 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluoropentanesulfonic acid (PFPeS) | 2706-91-4 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorohexanesulfonic acid (PFHxS) | 355-46-4 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluoroheptanesulfonic acid (PFHpS) | 375-92-8 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorooctanesulfonic acid (PFOS) | 1763-23-1 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorononanesulfonic acid (PFNS) | 68259-12-1 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorodecanesulfonic acid (PFDS) | 335-77-3 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| Perfluorooctanesulfonamide (PFOSA) | 754-91-6 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| N-Methylperfluorooctanesulfonamidoacetic acid (N-MeFOSAA) | 2355-31-9 | ug/wipe | ND/< 13.0 | ND/< 0.13 | ND/< 0.0025 | ND/< 0.13 | ND/< 13 | ND/< 1.3 | ND/< 2.5 | ND/< 0.0025 | ND/< 0.0025 |
| N-Ethylperfluorooctanesulfonamidoacetic acid (N-EtFOSAA) | 2991-50-6 | ug/wipe | ND/< 13.0 | ND/< 0.13 | ND/< 0.0025 | ND/< 0.13 | ND/< 13 | ND/< 1.3 | ND/< 2.5 | ND/< 0.0025 | ND/< 0.0025 |
| 4:2 Fluorotelomer sulfonate (4:2 FTS) | 757124-72-4 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| 6:2 Fluorotelomer sulfonate (6:2 FTS) | 27619-97-2 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |
| 8:2 Fluorotelomer sulfonate (8:2 FTS) | 39108-34-4 | ug/wipe | ND/< 0.50 | ND/< 0.050 | ND/< 0.0010 | ND/< 0.050 | ND/< 0.50 | ND/< 0.50 | ND/< 0.10 | ND/< 0.0010 | ND/< 0.0010 |

**Notes:**

ND/<1.0 the compound was not detected above the indicated method detection limit

J: compound detected above the method detection limit but below the reporting limit estimated value

**BOLD:** analyte present above detection limit

| Perfluorooctanoic acid (PFOA) | % Reduction |
|---|---|

| Perfluorooctanoic acid (PFOA) | Floor Before Average |
|---|---|
| | Floor After Average |
| | Truss Before Average |
| | Truss After Average |

# Photograph Log
Water Street Facility

Photo #1
Concrete Floor Sampling Area

Photo #2
Concrete Floor Being Cleaned

# Photograph Log
Water Street Facility

**Photo #3**
I-Beam Test Area – Pre Cleaning, after Sampling

**Photo #4**
I-Beam Test Area – Post Cleaning

**Photo #65**
Common Room Wall

# Photograph Log
Water Street Facility

Photo #6
Common Room I-Beam