APPENDIX E

Reagent MSDS

-Hydrogen peroxide

-Sodium persulfate

-Ferrous sulfate heptahydrate

MATERIAL SAFETY DATA SHEET

Hydrogen Peroxide (40 to 60%)

MSDS Ref. No.: 7722-84-1-4
Date Approved: 06/03/2008
Revision No.: 11

This document has been prepared to meet the requirements of the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200 and Canada's Workplace Hazardous Materials Information System (WHMIS) requirements.

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Hydrogen Peroxide (40 to 60%)

ALTERNATE PRODUCT NAME(S): Durox® Reg. & LR 50%, Oxypure® 50%, Hi Ox-TG, Hi Ox-SG, Semiconductor Reg & Seg 50%, Standard 50%, Technical 50%, Chlorate Grade 50%, Super D® 50%, OHP 50%, UP-HTP 50%, HTP 50%, HTP 59%

GENERAL USE: Durox® 50% Reg. and LR - meets the Food Chemical Codex requirements for aseptic packaging and other food related applications.

Oxypure® 50%, Hi Ox-TG and Hi Ox-SG - certified by NSF to meet NSF/ANSI Standard 60 requirements for drinking water treatment.

Semiconductor Reg. & Seg. 50% - conforms to ACS and Semi Specs., for wafer etching and cleaning, and applications requiring low residues.

Standard 50% - most suitable for industrial bleaching, processing, pollution abatement and general oxidation reactions.

Technical 50% - essentially free of inorganic metals, suitable for chemical synthesis.

Chlorate Grade 50% - specially formulated for use in chlorate manufacture or processing.

Super D® 50% - meets US Pharmacopoeia specifications for 3% topical solutions when diluted with proper quality water. While manufactured to the USP standards or purity and to FMC's demanding ISO 9002 quality standards, FMC does not claim that its Hydrogen Peroxide is manufactured in accordance with all pharmaceutical cGMP conditions.

OHP 50% - specially formulated for OHP process, advanced oxidation, and activated peroxide applications.

UP-HTP 50% - unstabilized product for semi-conductor applications.

HTP 50% and HTP 59% - specially formulated for aerospace or other special applications.

SynergOx™ - combination of a proprietary catalyst and 50% hydrogen peroxide, at the point of use, for environmental applications.

MANUFACTURER

FMC CORPORATION
FMC Peroxygens
1735 Market Street
Philadelphia, PA 19103
(215) 299-6000 (General Information)
msdsinfo@fmc.com (Email - General Information)

FMC of Canada Ltd.
FMC Peroxygens
PG Pulp Mill Road
Prince George, BC V2N2S6
(250) 561-4200 (General Information)

EMERGENCY TELEPHONE NUMBERS

(281) 474-8750 (Plant: Pasadena, TX, US - Call Collect)
(250) 561-4221 (Plant: Prince George, BC, Canada - Call Collect)
(303) 595-9048 (Medical - U.S. - Call Collect)

For leak, fire, spill, or accident emergencies, call:
(800) 424-9300 (CHEMTREC - U.S.A.)
(613) 996-6666 (CANUTEC - Canada)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

- Clear, colorless, odorless liquid
- Oxidizer.
- Contact with combustibles may cause fire.
- Decomposes yielding oxygen that supports combustion of organic matters and can cause overpressure if confined.
- Corrosive to eyes, nose, throat, lungs and gastrointestinal tract.

POTENTIAL HEALTH EFFECTS: Corrosive to eyes, skin, nose, throat and lungs. May cause irreversible tissue damage to the eyes including blindness.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt.%	EC No.	EC Class
Hydrogen Peroxide	7722-84-1	40 - 60	231-765-0	O, C, Xn; R5- R8-R35-R20/22
Water	7732-18-5	40 - 60	231-791-2	Not classified

4. FIRST AID MEASURES

EYES: Immediately flush with water for at least 15 minutes, lifting the upper and lower eyelids intermittently. See a medical doctor or ophthalmologist immediately.

SKIN: Immediately flush with plenty of water while removing contaminated clothing and/or shoes, and thoroughly wash with soap and water. See a medical doctor immediately.

INGESTION: Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

INHALATION: Remove to fresh air. If breathing difficulty or discomfort occurs and persists, contact a medical doctor.

NOTES TO MEDICAL DOCTOR: Hydrogen peroxide at these concentrations is a strong oxidant. Direct contact with the eye is likely to cause corneal damage especially if not washed immediately. Careful ophthalmologic evaluation is recommended and the possibility of local corticosteroid therapy should be considered. Because of the likelihood of corrosive effects on the gastrointestinal tract after ingestion, and the unlikelihood of systemic effects, attempts at evacuating the stomach via emesis induction or gastric lavage should be avoided. There is a remote possibility, however, that a nasogastric or orogastric tube may be required for the reduction of severe distension due to gas formation.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Flood with water.

FIRE / EXPLOSION HAZARDS: Product is non-combustible. On decomposition releases oxygen which may intensify fire.

FIRE FIGHTING PROCEDURES: Any tank or container surrounded by fire should be flooded with water for cooling. Wear full protective clothing and self-contained breathing apparatus.

FLAMMABLE LIMITS: Non-combustible

SENSITIVITY TO IMPACT: No data available

SENSITIVITY TO STATIC DISCHARGE: No data available

6. ACCIDENTAL RELEASE MEASURES

RELEASE NOTES: Dilute with a large volume of water and hold in a pond or diked area until hydrogen peroxide decomposes. Hydrogen peroxide may be decomposed by adding sodium metabisulfite or sodium sulfite after diluting to about 5%. Dispose according to methods outlined for waste disposal.

Combustible materials exposed to hydrogen peroxide should be immediately submerged in or rinsed with large amounts of water to ensure that all hydrogen peroxide is removed. Residual hydrogen peroxide that is allowed to dry (upon evaporation hydrogen peroxide can concentrate) on organic materials such as paper, fabrics, cotton, leather, wood or other combustibles can cause the material to ignite and result in a fire.

7. HANDLING AND STORAGE

HANDLING: Wear chemical splash-type monogoggles and full-face shield, impervious clothing, such as rubber, PVC, etc., and rubber or neoprene gloves and shoes. Avoid cotton, wool and leather. Avoid excessive heat and contamination. Contamination may cause decomposition and generation of oxygen gas which could result in high pressures and possible container rupture. Hydrogen peroxide should be stored only in vented containers and transferred only in a prescribed manner (see FMC Technical Bulletins). Never return unused hydrogen peroxide to original container, empty drums should be triple rinsed with water before discarding. Utensils used for handling hydrogen peroxide should only be made of glass, stainless steel, aluminum or plastic.

STORAGE: Store drums in cool areas out of direct sunlight and away from combustibles. For bulk storage refer to FMC Technical Bulletins.

COMMENTS: VENTILATION: Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into the work environment.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
Hydrogen Peroxide	1 ppm (TWA)	1 ppm (PEL) 1.4 mg/m^3 (PEL)	

ENGINEERING CONTROLS: Ventilation should be provided to minimize the release of hydrogen peroxide vapors and mists into the work environment. Spills should be minimized or confined immediately to prevent release into the work area. Remove contaminated clothing immediately and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Use chemical splash-type monogoggles and a full-face shield made of polycarbonate, acetate, polycarbonate/acetate, PETG or thermoplastic.

RESPIRATORY: If concentrations in excess of 10 ppm are expected, use NIOSH/DHHS approved self-contained breathing apparatus (SCBA), or other approved atmospheric-supplied respirator (ASR) equipment (e.g., a full-face airline respirator (ALR)). DO NOT use any form of air-purifying respirator (APR) or filtering facepiece (AKA dust mask), especially those containing oxidizable sorbants such as activated carbon.

PROTECTIVE CLOTHING: For body protection wear impervious clothing such as an approved splash protective suit made of SBR Rubber, PVC (PVC Outershell w/Polyester Substrate), Gore-Tex (Polyester trilaminate w/Gore-Tex), or a specialized HAZMAT Splash or Protective Suite (Level A, B, or C). For foot protection, wear approved boots made of NBR, PVC, Polyurethane, or neoprene. Overboots made of Latex or PVC, as well as firefighter boots or specialized HAZMAT boots are also permitted. DO NOT wear any form of boot or overboots made of nylon or nylon blends. DO NOT use cotton, wool or leather, as these materials react RAPIDLY with higher concentrations of hydrogen peroxide. Completely submerge hydrogen peroxide contaminated clothing or other materials in water prior to drying. Residual hydrogen peroxide, if allowed to dry on materials such as paper, fabrics, cotton, leather, wood or other combustibles can cause the material to ignite and result in a fire.

GLOVES: For hand protection, wear approved gloves made of nitrile, PVC, or neoprene. DO NOT use cotton, wool or leather for these materials react RAPIDLY with higher concentrations of hydrogen peroxide. Thoroughly rinse the outside of gloves with water prior to removal. Inspect regularly for leaks.

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9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR:	Odorless
APPEARANCE:	Clear, colorless liquid
AUTOIGNITION TEMPERATURE:	Non-combustible
BOILING POINT:	110°C (229°F) (40%); 114°C (237°F) (50%)
COEFFICIENT OF OIL / WATER:	Not available
DENSITY / WEIGHT PER VOLUME:	Not available
EVAPORATION RATE:	> 1 (Butyl Acetate = 1)
FLASH POINT:	Non-combustible
FREEZING POINT:	-41.4°C (-42.5°F) (40%); -52°C (-62°F) (50%)
ODOR THRESHOLD:	Not available
OXIDIZING PROPERTIES:	Strong oxidizer
PERCENT VOLATILE:	100
pH:	<= 3.0
SOLUBILITY IN WATER:	100 %

SPECIFIC GRAVITY:	(H_20 = 1) 1.15 @ 20°C/4°C (40%); 1.19 @ 20°C/4°C (50%)
VAPOR DENSITY:	Not available (Air = 1)
VAPOR PRESSURE:	22 mmHg @ 30°C (40%); 18.3 mmHg @ 30°C (50%)

COMMENTS:
pH (1% solution) : 5.0 - 6.0

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	Excessive heat or contamination could cause product to become unstable.
STABILITY:	Stable (heat and contamination could cause decomposition)
POLYMERIZATION:	Will not occur
INCOMPATIBLE MATERIALS:	Reducing agents, wood, paper and other combustibles, iron and other heavy metals, copper alloys and caustic.
HAZARDOUS DECOMPOSITION PRODUCTS:	Oxygen which supports combustion.

COMMENTS: Materials to Avoid : Dirt, organics, cyanides and combustibles such as wood, paper, oils, etc.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS: 70% hydrogen peroxide: Severe irritant (corrosive) (rabbit) [FMC Study Number: ICG/T-79.027]

SKIN EFFECTS: 50% hydrogen peroxide: Severe irritant (corrosive) (rabbit) [FMC Study Number: I89-1079]

DERMAL LD_{50}: 70% hydrogen peroxide: > 6.5 g/kg (rabbit) [FMC Study Number: ICG/T-79.027]

ORAL LD_{50}: 50% hydrogen peroxide: > 225 mg/kg (rat) [FMC Study Number: I86-914]

INHALATION LC_{50}: 50% hydrogen peroxide: > 0.17 mg/l (rat) [FMC Study Number: I89-1080]

TARGET ORGANS: Eye, skin, nose, throat, lungs

ACUTE EFFECTS FROM OVEREXPOSURE: Severe irritant/corrosive to eyes, skin and gastrointestinal tract. May cause irreversible tissue damage to the eyes including blindness. Inhalation of mist or vapors may be severely irritating to nose, throat and lungs.

CHRONIC EFFECTS FROM OVEREXPOSURE: The International Agency for Research on Cancer (IARC) has concluded that there is inadequate evidence for carcinogenicity of hydrogen peroxide in humans, but limited evidence in experimental animals (Group 3 - not classifiable as to its carcinogenicity to humans). The American Conference of Governmental Industrial Hygienists (ACGIH) has concluded that hydrogen peroxide is a 'Confirmed Animal Carcinogen with Unknown Relevance to Humans' (A3).

CARCINOGENICITY:

Chemical Name	IARC	NTP	OSHA	Other
Hydrogen Peroxide	Not listed	Not listed	Not listed	(ACGIH) Listed (A3, Animal Carcinogen)

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION: Channel catfish 96-hour LC_{50} = 37.4 mg/L
Fathead minnow 96-hour LC_{50} = 16.4 mg/L
Daphnia magna 24-hour EC_{50} = 7.7 mg/L
Daphnia pulex 48-hour LC_{50} = 2.4 mg/L
Freshwater snail 96-hour LC_{50} = 17.7 mg/L
For more information refer to ECETOC "Joint Assessment of Commodity Chemicals No. 22, Hydrogen Peroxide." ISSN-0773-6339, January 1993

CHEMICAL FATE INFORMATION: Hydrogen peroxide in the aquatic environment is subject to various reduction or oxidation processes and decomposes into water and oxygen. Hydrogen peroxide half-life in freshwater ranged from 8 hours to 20 days, in air from 10-20 hrs. and in soils from minutes to hours depending upon microbiological activity and metal contaminants.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: An acceptable method of disposal is to dilute with a large amount of water and allow the hydrogen peroxide to decompose followed by discharge into a suitable treatment system in accordance with all regulatory agencies. The appropriate regulatory agencies should be contacted prior to disposal.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

PROPER SHIPPING NAME:	Hydrogen peroxide, aqueous solutions with more than 40% but not more than 60% hydrogen peroxide.
PRIMARY HAZARD CLASS / DIVISION:	5.1 (Oxidizer)
UN/NA NUMBER:	UN 2014
PACKING GROUP:	II
LABEL(S):	Oxidizer, Corrosive
PLACARD(S):	5.1 (Oxidizer)
ADDITIONAL INFORMATION:	DOT Marking: Hydrogen Peroxide, aqueous solution with more than 40%, but not more than 60% Hydrogen Peroxide, UN 2014 Hazardous Substance/RQ: Not applicable 49 STCC Number: 4918775 DOT Spec: stainless steel/high purity aluminum cargo tanks and rail cars. UN Spec: HDPE drums. Contact FMC for specific details.

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

PROPER SHIPPING NAME:	Hydrogen peroxide, aqueous solutions with not less than 20%, but not more than 60% hydrogen peroxide.

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) / INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

PROPER SHIPPING NAME:	Hydrogen peroxide (40 - 60%) is forbidden on Passenger and Cargo Aircraft, as well as Cargo Only Aircraft.

OTHER INFORMATION:

Protect from physical damage. Keep drums in upright position. Drums should not be stacked in transit. Do not store drum on wooden pallets.

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15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355, APPENDIX A):

Hydrogen Peroxide > 52%, RQ: 1000 lbs. Planning Threshold: 10,000 lbs.

SECTION 311 HAZARD CATEGORIES (40 CFR 370):
Fire Hazard, Immediate (Acute) Health Hazard

SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370):
The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.: None, (conc. <52%) (hydrogen peroxide, 1000 lbs. when conc is >52%)

SECTION 313 REPORTABLE INGREDIENTS (40 CFR 372):
Not listed

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA DESIGNATION & REPORTABLE QUANTITIES (RQ) (40 CFR 302.4):
Unlisted (Hydrogen Peroxide); RQ = 100 lbs.; Ignitability, Corrosivity

TSCA (TOXIC SUBSTANCE CONTROL ACT)

TSCA INVENTORY STATUS (40 CFR 710):
Listed

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
RCRA IDENTIFICATION OF HAZARDOUS WASTE (40 CFR 261):
Waste Number: D001, D002

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Hazard Classification / Division:	C E D2B
Product Identification Number:	2014
Ingredient Disclosure List:	Listed
Domestic Substance List:	All components listed

INTERNATIONAL LISTINGS

Hydrogen peroxide:
China: Listed
Japan (ENCS): (1)-419
Korea: KE-20204
Philippines (PICCS): Listed

HAZARD AND RISK PHRASE DESCRIPTIONS:

EC Symbols:	O	(Oxidizer)
	C	(Corrosive)
	Xn	(Harmful)
EC Risk Phrases:	R5	(Heating may cause an explosion.)
	R8	(Contact with combustible material may cause fire)
	R20/22	(Harmful by inhalation and if swallowed.)
	R35	(Causes severe burns.)

16. OTHER INFORMATION

HMIS

Health	3
Flammability	0
Physical Hazard	1
Personal Protection (PPE)	H

Protection = H (Safety goggles, gloves, apron, the use of a supplied air or SCBA respirator is required in lieu of a vapor cartridge respirator)

HMIS = Hazardous Materials Identification System

Degree of Hazard Code:
4 = Severe
3 = Serious
2 = Moderate
1 = Slight
0 = Minimal

NFPA

Health	3
Flammability	0
Reactivity	1
Special	OX

SPECIAL = OX (Oxidizer)

NFPA (National Fire Protection Association)

Degree of Hazard Code:
4 = Extreme
3 = High
2 = Moderate

1 = Slight
0 = Insignificant

REVISION SUMMARY:
This MSDS replaces Revision #10, dated April 27, 2006.
Changes in information are as follows:
Section 1 (Product and Company Identification)
Section 3 (Composition / Information on Ingredients)
Section 15 (Regulatory Information)
Section 16 (Other Information)

Durox, Oxypure, Super D, SynergOx and FMC Logo - FMC Trademarks

NOTE: NFPA Reactivity is 3 - when greater than 52%

MATERIAL SAFETY DATA SHEET

Sodium Persulfate

MSDS Ref. No.: 7775-27-1
Date Approved: 04/28/2004
Revision No.: 8

This document has been prepared to meet the requirements of the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200; the Canada's Workplace Hazardous Materials Information System (WHMIS) and, the EC Directive, 2001/58/EC.

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	Sodium Persulfate
SYNONYMS:	Sodium Peroxydisulfate; Disodium Peroxydisulfate
ALTERNATE PRODUCT NAME(S):	RemedOx™
GENERAL USE:	Polymerization initiator. Etchant and cleaner in manufacture of printed circuit boards. Booster in hair bleaching formulations in cosmetics. Secondary oil recovery systems as a polymerization initiator and a gel breaker.

MANUFACTURER

FMC CORPORATION
Active Oxidants Division
1735 Market Street
Philadelphia, PA 19103
(215) 299-6000 (General Information)

EMERGENCY TELEPHONE NUMBERS

(800) 424-9300 (CHEMTREC - U.S.)
(303) 595-9048 (Medical - Call Collect)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

- White, odorless, crystals
- Oxidizer: Decomposes in storage under conditions of moisture (water/water vapor) and/or excessive heat causing release of oxides of sulfur, nitrogen and oxygen that supports combustion. Decomposition could form a high temperature melt.

POTENTIAL HEALTH EFFECTS: Airborne persulfate dust may be irritating to eyes, nose, lungs, throat and skin upon contact. Exposure to high levels of persulfate dust may cause difficulty in breathing in sensitive persons.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt.%	EC No.	EC Class
Sodium Persulfate	7775-27-1	>99	231-892-1	Not classified as hazardous

4. FIRST AID MEASURES

EYES: Flush with plenty of water. Get medical attention if irritation occurs and persists.

SKIN: Wash with plenty of soap and water. Get medical attention if irritation occurs and persists.

INGESTION: Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

INHALATION: Remove to fresh air. If breathing difficulty or discomfort occurs and persists, contact a medical doctor.

NOTES TO MEDICAL DOCTOR: This product has low oral toxicity and is not irritating to the eyes and skin. Flooding of exposed areas with water is suggested, but gastric lavage or emesis induction for ingestions must consider possible aggravation of esophageal injury and the expected absence of system effects. Treatment is controlled removal of exposure followed by symptomatic and supportive care.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Deluge with water.

FIRE / EXPLOSION HAZARDS: Product is non-combustible. On decomposition releases oxygen which may intensify fire. Presence of water accelerates decomposition.

FIRE FIGHTING PROCEDURES: Do not use carbon dioxide or other gas filled fire extinguishers; they will have no effect on decomposing persulfates. Wear full protective clothing and self-contained breathing apparatus.

FLAMMABLE LIMITS: Non-combustible

SENSITIVITY TO IMPACT: No data available

SENSITIVITY TO STATIC DISCHARGE: No data available

6. ACCIDENTAL RELEASE MEASURES

RELEASE NOTES: Spilled material should be collected and put in approved DOT container and isolated for disposal. Isolated material should be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water and dispose as a hazardous waste. All disposals should be carried out according to regulatory agencies procedures.

7. HANDLING AND STORAGE

HANDLING: Use adequate ventilation when transferring product from bags or drums. Wear respiratory protection if ventilation is inadequate or not available. Use eye and skin protection. Use clean plastic or stainless steel scoops only.

STORAGE: Store (unopened) in a cool, clean, dry place away from point sources of heat, e.g. radiant heaters or steam pipes. Use first in, first out storage system. Avoid contamination of opened product. In case of fire or decomposition (fuming/smoking) deluge with plenty of water to control decomposition. For storage, refer to NFPA Bulletin 430 on storage of liquid and solid oxidizing materials.

COMMENTS: VENTILATION: Provide mechanical general and/or local exhaust ventilation to prevent release of dust into work environment. Spills should be collected into suitable containers to prevent dispersion into the air.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
Sodium Persulfate	0.1 mg/m^3 (TWA)		

ENGINEERING CONTROLS: Provide mechanical local general room ventilation to prevent release of dust into the work environment. Remove contaminated clothing immediately and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Use cup type chemical goggles. Full face shield may be used.

RESPIRATORY: Use approved dust respirator when airborne dust is expected.

PROTECTIVE CLOTHING: Normal work clothes. Rubber or neoprene footwear.

GLOVES: Rubber or neoprene gloves. Thoroughly wash the outside of gloves with soap and water prior to removal. Inspect regularly for leaks.

9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR:	None
APPEARANCE:	White crystals
AUTOIGNITION TEMPERATURE:	Not applicable. No evidence of combustion up to 800°C. Decomposition will occur upon heating.
BOILING POINT:	Not applicable
COEFFICIENT OF OIL / WATER:	Not applicable
DENSITY / WEIGHT PER VOLUME:	Not available
EVAPORATION RATE:	Not applicable (Butyl Acetate = 1)
FLASH POINT:	Non-combustible
MELTING POINT:	Decomposes
ODOR THRESHOLD:	Not applicable
OXIDIZING PROPERTIES:	Oxidizer
PERCENT VOLATILE:	Not applicable
pH:	typically 5.0 - 7.0 @ 25 °C (1% solution)
SOLUBILITY IN WATER:	73 % @ 25 °C (by wt.)
SPECIFIC GRAVITY:	2.6 (H_2O=1)
VAPOR DENSITY:	Not applicable (Air = 1)
VAPOR PRESSURE:	Not applicable

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	Heat and moisture.
STABILITY:	Stable (becomes unstable in presence of heat, moisture and contamination).
POLYMERIZATION:	Will not occur
INCOMPATIBLE MATERIALS:	Acids, alkalis, halides (fluorides, chlorides, bromides), combustible materials, heavy metals, oxidizable materials, reducing agents and organic compounds.

HAZARDOUS DECOMPOSITION PRODUCTS: Oxygen that supports combustion and oxides of sulfur and nitrogen.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS: Non-irritating (rabbit) [FMC Study Number: ICG/T-79.029]

SKIN EFFECTS: Non-irritating (rabbit) [FMC Study Number: ICG/T-79.029]

DERMAL LD_{50}: > 10 g/kg [FMC Study Number: ICG/T-79.029]

ORAL LD_{50}: 895 mg/kg (rat) [FMC Study Number: ICG/T-79.029]

INHALATION LC_{50}: 5.1 mg/l (rat) [FMC I95-2017]

SENSITIZATION: May be sensitizing to allergic persons. [FMC Study Number: ICG/T-79.029]

TARGET ORGANS: Eyes, skin, respiratory passages

ACUTE EFFECTS FROM OVEREXPOSURE: Dust may be harmful and irritating. May be harmful if swallowed.

CHRONIC EFFECTS FROM OVEREXPOSURE: Sensitive persons may develop dermatitis and asthma [Respiration 38:144, 1979]. Groups of male and female rats were fed 0, 300 or 3000 ppm sodium persulfate in the diet for 13 weeks, followed by 5000 ppm for 5 weeks. Microscopic examination of tissues revealed some injury to the gastrointestinal tract at the high dose (3000 ppm) only. This effect is not unexpected for an oxidizer at high concentrations. [Ref. FMC I90-1151, Toxicologist 1:149, 1981].

CARCINOGENICITY:

NTP:	Not listed
IARC:	Not listed
OSHA:	Not listed
OTHER:	ACGIH: Not listed

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION:

Bluegill sunfish, 96-hour LC_{50} = 771 mg/L [FMC Study I92-1250]
Rainbow trout, 96-hour LC_{50} = 163 mg/L [FMC Study I92-1251]
Daphnia, 48-hour LC_{50} = 133 mg/L [FMC Study I92-1252]

Grass shrimp, 96-hour LC_{50} = 519 mg/L [FMC Study I92-1253]

CHEMICAL FATE INFORMATION: Biodegradability does not apply to inorganic substances.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose as a hazardous waste in accordance with local, state and federal regulatory agencies.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

PROPER SHIPPING NAME:	Sodium Persulfate
PRIMARY HAZARD CLASS / DIVISION:	5.1 (Oxidizer)
UN/NA NUMBER:	UN 1505
PACKING GROUP:	III
LABEL(S):	5.1 (Oxidizer)
PLACARD(S):	5.1 (Oxidizer)
MARKING(S):	Sodium Persulfate, UN 1505
ADDITIONAL INFORMATION:	Hazardous Substance/RQ: Not applicable 49 STCC Number: 4918733 This material is shipped in 225 lb. fiber drums, 55 lb. poly bags and 1000 - 2200 lb. IBC's (supersacks).

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

PROPER SHIPPING NAME:	Sodium Persulfate

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) / INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

PROPER SHIPPING NAME:	Sodium Persulfate

OTHER INFORMATION:

Protect from physical damage. Do not store near acids, moisture or heat.

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355, APPENDIX A):
Not applicable

SECTION 311 HAZARD CATEGORIES (40 CFR 370):
Fire Hazard, Immediate (Acute) Health Hazard

SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370):
The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.:
None

SECTION 313 REPORTABLE INGREDIENTS (40 CFR 372):
Not listed

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA DESIGNATION & REPORTABLE QUANTITIES (RQ) (40 CFR 302.4):
Unlisted, RQ = 100 lbs., Ignitability

TSCA (TOXIC SUBSTANCE CONTROL ACT)

TSCA INVENTORY STATUS (40 CFR 710):
Listed

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA IDENTIFICATION OF HAZARDOUS WASTE (40 CFR 261):
Waste Number: D001

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):

Product Identification Number:	1505
Hazard Classification / Division:	Class C (Oxidizer), Class D, Div. 2, Subdiv. B. (Toxic)
Ingredient Disclosure List:	Listed

INTERNATIONAL LISTINGS

Sodium persulfate:
Australia (AICS): Listed
China: Listed
Japan (ENCS): (1)-1131

Korea: KE-12369
Philippines (PICCS): Listed

16. OTHER INFORMATION

HMIS

Health	1
Flammability	0
Physical Hazard	1
Personal Protection (PPE)	J

Protection = J (Safety goggles, gloves, apron & combination dust & vapor respirator)

HMIS = Hazardous Materials Identification System

Degree of Hazard Code:
4 = Severe
3 = Serious
2 = Moderate
1 = Slight
0 = Minimal

NFPA

Health	1
Flammability	0
Reactivity	1
Special	OX

SPECIAL = OX (Oxidizer)

NFPA = National Fire Protection Association

Degree of Hazard Code:
4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant

REVISION SUMMARY:
This MSDS replaces Revision #7, dated March 10, 2004.
Changes in information are as follows:
Section 1 (Product and Company Identification)
Section 16 (Other Information)

FMC Corporation believes that the information and recommendations contained herein (including data and statements) are accurate as of the date hereof. NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be applicable where such product is used in combination with any other materials or in any process. It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Further, since the conditions and methods of use are beyond the control of FMC Corporation, FMC Corporation expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information.

011 08/18/06 FERROUS SULFATE ALL GRADES

PRODUCT NAME: FERROUS SULFATE ALL GRADES

MSDS NUMBER: MZF1804

DATE ISSUED: 9/12/2005

SUPERSEDES: 8/23/2004

ISSUED BY: 008614

==========

FERROUS SULFATE

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1. PRODUCT IDENTIFICATION

Distributed by:
Univar USA Inc.
17425 NE Union Hill Road
Redmond, WA 98052
425-889-3400

SYNONYMS: FERROUS SULPHATE; IRON SULFATE; SULFURIC ACID, IRON (2+) SALT (1:1),
CAS NO: 7720-78-7 (Anhydrous)
7782-63-0 (Heptahydrate)
17375-41-6 (Monohydrate)
MOLECULAR WEIGHT: NOT APPLICABLE TO MIXTURES.
CHEMICAL FORMULA: FESO4 . XH2O

==========

2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT	CAS NO	PERCENT	HAZARDOUS
FERROUS SULFATE ANHYDROUS	7720-78-7	100%	YES
FERROUS SULFATE HEPTAHYDRATE	7782-63-0	100%	YES
FERROUS SULFATE MONOHYDRATE	17375-41-6	100%	YES

==========

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE LIVER.

POTENTIAL HEALTH EFFECTS

INHALATION:
CAUSES IRRITATION TO THE RESPIRATORY TRACT. SYMPTOMS MAY INCLUDE COUGHING, SHORTNESS OF BREATH.

INGESTION:
LOW TOXICITY IN SMALL QUANTITIES BUT LARGER DOSAGES MAY CAUSE NAUSEA, VOMITING, DIARRHEA, AND BLACK STOOL. PINK URINE DISCOLORATION IS A STRONG INDICATOR OF IRON POISONING. LIVER DAMAGE, COMA, AND DEATH FROM IRON POISONING HAS BEEN RECORDED. SMALLER DOSES ARE MUCH MORE TOXIC TO CHILDREN.

SKIN CONTACT:
CAUSES IRRITATION TO SKIN. SYMPTOMS INCLUDE REDNESS, ITCHING, AND PAIN.

EYE CONTACT:
CAUSES IRRITATION, REDNESS, AND PAIN.

CHRONIC EXPOSURE:
SEVERE OR CHRONIC FERROUS SULFATE POISONINGS MAY DAMAGE BLOOD VESSELS. LARGE CHRONIC DOSES CAUSE RICKETS IN INFANTS. CHRONIC EXPOSURE MAY CAUSE LIVER EFFECTS. PROLONGED EXPOSURE OF THE EYES MAY CAUSE DISCOLORATION.

AGGRAVATION OF PRE-EXISTING CONDITIONS:
PERSONS WITH PRE-EXISTING SKIN DISORDERS OR EYE PROBLEMS, OR IMPAIRED LIVER, KIDNEY OR RESPIRATORY FUNCTION MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF THE SUBSTANCE.

==========

4. FIRST AID MEASURES

INHALATION:
REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. GET MEDICAL ATTENTION.

INGESTION:
INDUCE VOMITING IMMEDIATELY AS DIRECTED BY MEDICAL PERSONNEL. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. GET MEDICAL ATTENTION.

SKIN CONTACT:
IMMEDIATELY FLUSH SKIN WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES. REMOVE CONTAMINATED CLOTHING AND SHOES. GET MEDICAL ATTENTION. WASH CLOTHING BEFORE REUSE. THOROUGHLY CLEAN SHOES BEFORE REUSE.

EYE CONTACT:
IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, LIFTING LOWER AND UPPER EYELIDS OCCASIONALLY. GET MEDICAL ATTENTION IMMEDIATELY.

==========

5. FIRE FIGHTING MEASURES

FIRE:
NOT CONSIDERED TO BE A FIRE HAZARD.

EXPLOSION:
NOT CONSIDERED TO BE AN EXPLOSION HAZARD.

FIRE EXTINGUISHING MEDIA:
USE ANY MEANS SUITABLE FOR EXTINGUISHING SURROUNDING FIRE.

SPECIAL INFORMATION:
USE PROTECTIVE CLOTHING AND BREATHING EQUIPMENT APPROPRIATE FOR THE SURROUNDING FIRE.

==========

6. ACCIDENTAL RELEASE MEASURES

VENTILATE AREA OF LEAK OR SPILL. WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT AS SPECIFIED IN SECTION 8. SPILLS: PICK UP AND PLACE IN A SUITABLE CONTAINER FOR RECLAMATION OR DISPOSAL, USING A METHOD THAT DOES NOT GENERATE DUST. US REGULATIONS (CERCLA) REQUIRE REPORTING SPILLS AND RELEASES TO SOIL, WATER AND AIR IN EXCESS OF REPORTABLE QUANTITIES. THE TOLL FREE NUMBER FOR THE US COAST GUARD NATIONAL RESPONSE CENTER IS (800) 424-8802.

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7. HANDLING AND STORAGE

KEEP IN A WELL CLOSED CONTAINER STORED UNDER COLD TO WARM CONDITIONS, 2 TO 40 C, (36 TO 104F). PROTECT AGAINST PHYSICAL DAMAGE. ISOLATE FROM INCOMPATIBLE SUBSTANCES. CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTY SINCE THEY RETAIN PRODUCT RESIDUES (DUST, SOLIDS); OBSERVE ALL WARNINGS AND PRECAUTIONS LISTED FOR THE PRODUCT.

==========

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

AIRBORNE EXPOSURE LIMITS:
-ACGIH THRESHOLD LIMIT VALUE (TLV):
1 MG/M3 (TWA) SOLUBLE IRON SALT AS FE

VENTILATION SYSTEM:
A SYSTEM OF LOCAL AND/OR GENERAL EXHAUST IS RECOMMENDED TO KEEP EMPLOYEE EXPOSURES BELOW THE AIRBORNE EXPOSURE LIMITS. LOCAL EXHAUST VENTILATION IS GENERALLY PREFERRED BECAUSE IT CAN CONTROL THE EMISSIONS OF THE CONTAMINANT AT ITS SOURCE, PREVENTING DISPERSION OF IT INTO THE GENERAL WORK AREA. PLEASE REFER TO THE ACGIH DOCUMENT, "INDUSTRIAL VENTILATION, A MANUAL OF RECOMMENDED PRACTICES", MOST RECENT EDITION, FOR DETAILS.

PERSONAL RESPIRATORS (NIOSH APPROVED):
IF THE EXPOSURE LIMIT IS EXCEEDED, A HALF-FACE DUST/MIST RESPIRATOR MAY BE WORN FOR UP TO TEN TIMES THE EXPOSURE LIMIT OR THE MAXIMUM USE CONCENTRATION SPECIFIED BY THE APPROPRIATE REGULATORY AGENCY OR RESPIRATOR SUPPLIER, WHICHEVER IS LOWEST. A FULL-FACE PIECE DUST/MIST RESPIRATOR MAY BE WORN UP TO 50 TIMES THE EXPOSURE LIMIT, OR THE MAXIMUM USE CONCENTRATION SPECIFIED BY THE APPROPRIATE REGULATORY AGENCY, OR RESPIRATOR SUPPLIER, WHICHEVER IS LOWEST. FOR EMERGENCIES OR INSTANCES WHERE THE EXPOSURE LEVELS ARE NOT KNOWN, USE A FULL-FACEPIECE POSITIVE-PRESSURE, AIR-SUPPLIED RESPIRATOR. WARNING: AIR-PURIFYING RESPIRATORS DO NOT PROTECT WORKERS IN OXYGEN-DEFICIENT ATMOSPHERES.

SKIN PROTECTION:
WEAR IMPERVIOUS PROTECTIVE CLOTHING, INCLUDING BOOTS, GLOVES, LAB COAT, APRON OR COVERALLS, AS APPROPRIATE, TO PREVENT SKIN CONTACT.

EYE PROTECTION:
USE CHEMICAL SAFETY GOGGLES AND/OR FULL FACE SHIELD WHERE DUSTING OR SPLASHING OF SOLUTIONS IS POSSIBLE. MAINTAIN EYE WASH FOUNTAIN AND QUICK-DRENCH FACILITIES IN WORK AREA.

==========

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:
WHITE TO SLIGHTLY YELLOW TINGED POWDER.

ODOR:
ODORLESS.

SOLUBILITY:
SOLUBLE IN WATER.

DENSITY:
NO INFORMATION FOUND.

PH:
NO INFORMATION FOUND.

BOILING POINT:
NOT APPLICABLE.

MELTING POINT:
500C (932F)

VAPOR DENSITY (AIR=1):
NO INFORMATION FOUND.

VAPOR PRESSURE (MM HG):
NO INFORMATION FOUND.

EVAPORATION RATE (BUAC=1):
NO INFORMATION FOUND.

% VOLATILES BY VOLUME @ 21C (70F):

0

==========

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER ORDINARY CONDITIONS OF USE AND STORAGE.

HAZARDOUS DECOMPOSITION PRODUCTS:
BURNING MAY PRODUCE SULFUR OXIDES.

HAZARDOUS POLYMERIZATION:
WILL NOT OCCUR.

INCOMPATIBILITIES:
ALKALIS, SOLUBLE CARBONATES, AND OXIDIZING MATERIALS. REACTS IN MOIST AIR TO FORM FERRIC SULFATE.

CONDITIONS TO AVOID:
MOISTURE.

==========

11. TOXICOLOGICAL INFORMATION

FERROUS SULFATE HEPTAHYDRATE: ORAL MOUSE LD50: 1520 MG/KG, INVESTIGATED AS A MUTAGEN. FERROUS SULFATE ANHYDROUS: ORAL RAT LD50: 319 MG/KG; INVESTIGATED AS A MUTAGEN, TUMORIGEN, REPRODUCTIVE EFFECTOR.

--------/CANCER LISTS/----------

---NTP CARCINOGEN---

INGREDIENT	KNOWN	ANTICIPATED	IARC CATEGORY
FERROUS SULFATE	NO	NO	NONE

==========

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE:
NO INFORMATION FOUND.

ENVIRONMENTAL TOXICITY:
NO INFORMATION FOUND.

==========

13. DISPOSAL CONSIDERATIONS

WHATEVER CANNOT BE SAVED FOR RECOVERY OR RECYCLING SHOULD BE MANAGED IN AN APPROPRIATE AND APPROVED WASTE DISPOSAL FACILITY. PROCESSING, USE OR CONTAMINATION OF THIS PRODUCT MAY CHANGE THE WASTE MANAGEMENT OPTIONS. STATE AND LOCAL DISPOSAL REGULATIONS MAY DIFFER FROM FEDERAL DISPOSAL REGULATIONS.

DISPOSE OF CONTAINER AND UNUSED CONTENTS IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REQUIREMENTS.

==========

14. TRANSPORT INFORMATION

NON BULK
NOT REGULATED.

BULK
SHIPPING NAME: ENVIRONMENTALLY HAZARDOUS SUBSTNCES, SOLID, N.O.S.
CLASS: 9
UN NUMBER: UN3077
PACKING GROUP: III
RQ: 1000 LBS

==========

15. REGULATORY INFORMATION

--------/CHEMICAL INVENTORY STATUS - PART 1/----------

INGREDIENT	TSCA	EC	JAPAN	AUSTRALIA
FERROUS SULFATE (7720-78-7)	YES	YES	YES	YES

--------/CHEMICAL INVENTORY STATUS - PART 2/----------

		--CANADA--		
INGREDIENT	KOREA	DSL	NDSL	PHIL.
FERROUS SULFATE (7720-78-7)	YES	YES	NO	YES

-------/FEDERAL, STATE & INTERNATIONAL REGULATIONS - PART 1/----------

	-SARA 302-		------SARA 313-----	
INGREDIENT	RQ	TPQ	LIST	CHEMICAL CATG
FERROUS SULFATE (7720-78-7)	NO	NO	NO	NO

--------/FEDERAL, STATE & INTERNATIONAL REGULATIONS - PART 2/----------

		-RCRA-	-TSCA-
INGREDIENT	CERCLA	261.33	8(D)
FERROUS SULFATE (7720-78-7)	1000	NO	NO

CHEMICAL WEAPONS CONVENTION: NO TSCA 12(B): NO CDTA: NO
SARA 311/312: ACUTE: YES CHRONIC: YES FIRE: NO PRESSURE: NO
REACTIVITY: NO (MIXTURE / SOLID)

AUSTRALIAN HAZCHEM CODE: NONE ALLOCATED.
POISON SCHEDULE: NONE ALLOCATED.

WHMIS: THIS MSDS HAS BEEN PREPARED ACCORDING TO THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL OF THE INFORMATION REQUIRED BY THE CPR.

==========

16. OTHER INFORMATION

NFPA RATINGS:
HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

---------- FOR ADDITIONAL INFORMATION ----------
CONTACT: MSDS COORDINATOR UNIVAR USA INC.
DURING BUSINESS HOURS, PACIFIC TIME (425)889-3400
---------- NOTICE ----------

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* * * E N D O F M S D S * * *

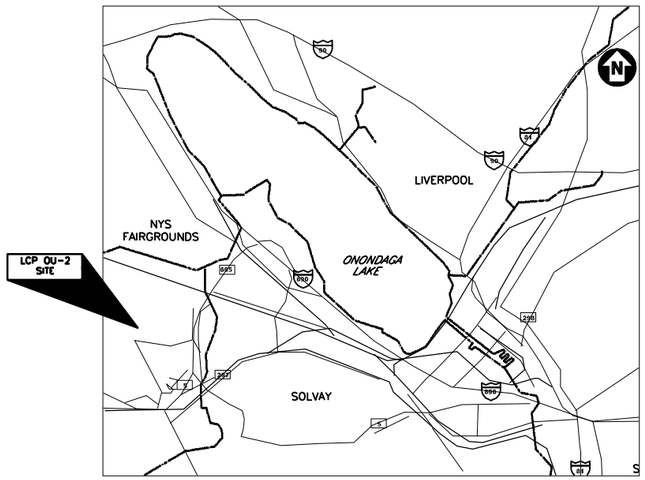
based on estimates above. Total reagent injection of 300,000 gals peroxide plus ~85,000 gals catalyst solution agree with the multiple estimates presented above.

ERFS also recommends a follow-on site wide treatment (3rd round) using sodium persulfate activated by peroxide and iron. This treatment is expected to require less oxidizer volume and ERFS estimates that 75,000 gallons of 5% activated (using iron in the mix tank) persulfate plus 30,000 to 45,000 gallons of low concentration (2% - 5%) hydrogen peroxide activator will be applied in Event 3. This treatment scope may be revised based on interim sampling results.

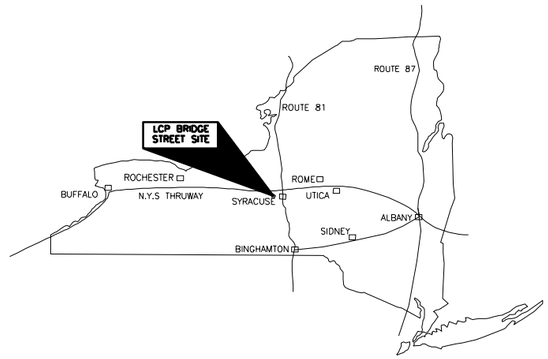
APPENDIX B

DESIGN DRAWINGS

DRAFT DESIGN REVIEW
LCP BRIDGE STREET SITE (OU-2)
SYRACUSE, NEW YORK



SITE LOCATION MAP
NOT TO SCALE



N.Y. STATE MAP
NOT TO SCALE

DRAWING INDEX

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	IN PROGRESS	5/24/12	JR	ERW	TCD

DRAWN BY: JR	DATE: 5/24/12	SEAL
CHECKED BY: ERW	DATE: 5/24/12	
APPROVED BY: TCD	DATE: 5/24/12	
PROJECT MGR: TCD	DATE: 5/24/12	

PARSONS
COMMERCIAL TECHNOLOGY GROUP
OFFICE: 301 PLAINFIELD ROAD, SYRACUSE, NY 13212, (315) 451-9560

JOB: 446893
WBS: 04200

PROJECT TITLE: LCP OU-2 REMEDIAL DESIGN
NAKOH PROPERTY SOIL REMOVAL
SYRACUSE, NEW YORK

DRAWING TITLE: TITLE SHEET AND DRAWING INDEX

SCALE: NONE (IF PRINTED ON 22x34 SHEET)

DRAWING NO.: 446893-G-001
REV.: A

FILE NAME: P:\HONEYWELL - SYR\446893 - LCP OU-2 REMEDIAL DESIGN\10.0 TECHNICAL CATEGORIES\10.2 CAD\DESIGN\GENERAL\446893-G001.DWG
PLOT DATE: 7/11/2012 9:26 AM PLOTTED BY: RUSSO, JILL

LCP OU-2 SITE LIMITS

Now or Formerly
Property of
Matlow Company, Inc.
Tax Parcel No. 27-4-1.1
Liber 4045 - Page 45

Now or Formerly
Property of
Nicholas N. Vitto
Tax Parcel No. 27-3-10.5
Liber 4833 - Page 141

Now or Formerly
Property of
Hanlin Group, Inc.
Tax Parcel No. 27-3-10.1
Liber 3594 - Page 49

LCP OU-2

LCP OU-1

FORMER PEROXIDE BUILDING

FORMER COMPRESSOR BUILDING

NAKOH BUILDING

WEST FLUME

LEGEND:

- NMW-1S — MONITORING WELL LOCAITON
- PSB-5 — SOIL BORING LOCATION
- PGP-25 — GEOPROBE SAMPLE LOCATION
- EXISTING CHAIN LINK FENCE
- RAILROAD
- PROPERTY LINES
- TOPOGRAPHIC CONTOUR
- SITE BOUNDARY
- WEST FLUME
- SLURRY BARRIER WALL

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	IN PROGRESS	5/24/12	JR	ERW	TCD

DRAWN BY	JR	DATE 5/24/12
CHECKED BY	ERW	DATE 5/24/12
APPROVED BY	TCD	DATE 5/24/12
PROJECT MGR.	TCD	DATE 5/24/12

SEAL:

PARSONS
COMMERCIAL TECHNOLOGY GROUP
OFFICE: 301 PLAINFIELD ROAD, SYRACUSE, NY 13212, (315) 451-9560

JOB: 446893
WBS: 04200

PROJECT TITLE
LCP OU-2 REMEDIAL DESIGN

NAKOH PROPERTY SOIL REMOVAL
SYRACUSE, NEW YORK

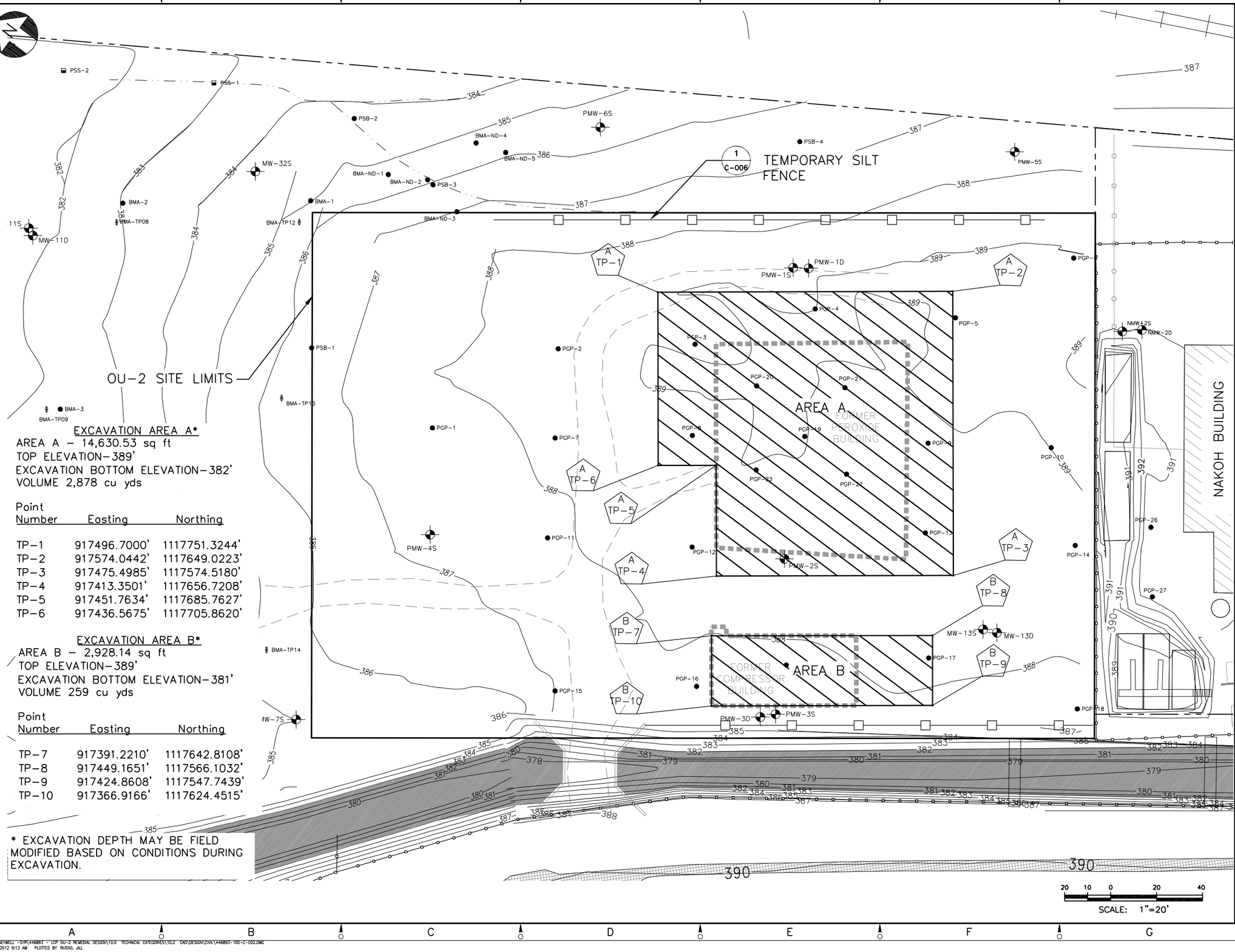
DRAWING TITLE
EXISTING CONDITIONS SITE PLAN

SCALE: SCALE 1"=40'
(IF PRINTED ON 22x34 SHEET)

DRAWING NO. 446893-C-001
REV. A

SCALE: 1"=40'

FILE NAME: P:\HONEYWELL - SYR\446893 - LCP OU-2 REMEDIAL DESIGN\10.0 TECHNICAL CATEGORIES\10.2 CAD\DESIGN\CIVIL\446893-100-C-001.DWG
PLOT DATE: 6/21/2012 9:28 AM PLOTTED BY: RUSSO, JILL



EXCAVATION AREA A*

AREA A – 14,630.53 sq ft
TOP ELEVATION–389'
EXCAVATION BOTTOM ELEVATION–382'
VOLUME 2,878 cu yds

Point Number	Easting	Northing
TP–1	917496.7000'	1117751.3244'
TP–2	917574.0442'	1117649.0223'
TP–3	917475.4985'	1117574.5180'
TP–4	917413.3501'	1117656.7208'
TP–5	917451.7634'	1117685.7627'
TP–6	917436.5675'	1117705.8620'

EXCAVATION AREA B*

AREA B – 2,928.14 sq ft
TOP ELEVATION–389'
EXCAVATION BOTTOM ELEVATION–381'
VOLUME 259 cu yds

Point Number	Easting	Northing
TP–7	917391.2210'	1117642.8108'
TP–8	917449.1651'	1117566.1032'
TP–9	917424.8608'	1117547.7439'
TP–10	917366.9166'	1117624.4515'

* EXCAVATION DEPTH MAY BE FIELD MODIFIED BASED ON CONDITIONS DURING EXCAVATION.

LEGEND:

- NMW-1S — MONITORING WELL LOCATION
- PSB-5 — SOIL BORING LOCATION
- PGP-25 — GEOPROBE SAMPLE LOCATION
- DIRT ROADS
- PAVED ROADS
- APPROXIMATE PROPERTY LINE
- FORMER STRUCTURES
- EXISTING CHAIN LINK FENCE
- RAILROAD
- SILT FENCE
- AREAS TO BE EXCAVATED TO GROUNDWATER
- A TP-2 — EXCAVATION LIMITS
- TOPOGRAPHIC CONTOUR
- SITE BOUNDARY
- WEST FLUME
- SLURRY BARRIER WALL

NOTES:

1. EXCAVATE TWO HORIZONTAL TO ONE VERTICAL (2:1) SLOPE UNTIL INTERSECTION WITH GROUNDWATER.
2. IF SIGNIFICANT ODOR OR VOCs ARE DETECTED APPLY FOAM OVER EXCAVATION.
3. REMOVED SOILS WILL BE STOCKPILED OR DIRECTLY PLACED IN TRUCKS FOR DISPOSAL. FOAM MAY BE APPLIED TO SOIL PLACED IN TRUCKS.
4. FOUNDATION AND PILES ENCOUNTERED DURING EXCAVATION TO BE BROKEN APART AND DISPOSED OFFSITE WITH SOIL.

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	IN PROGRESS	5/24/12	JR	ERW	TCD

DRAWN BY	JR	DATE 5/24/12
CHECKED BY	ERW	DATE 5/24/12
APPROVED BY	TCD	DATE 5/24/12
PROJECT MGR.	TCD	DATE 5/24/12

SEAL

PARSONS
COMMERCIAL TECHNOLOGY GROUP
OFFICE 301 PLAINFIELD ROAD SYRACUSE, NY 13212 (315) 451-9560

JOB 446893
WBS 04200

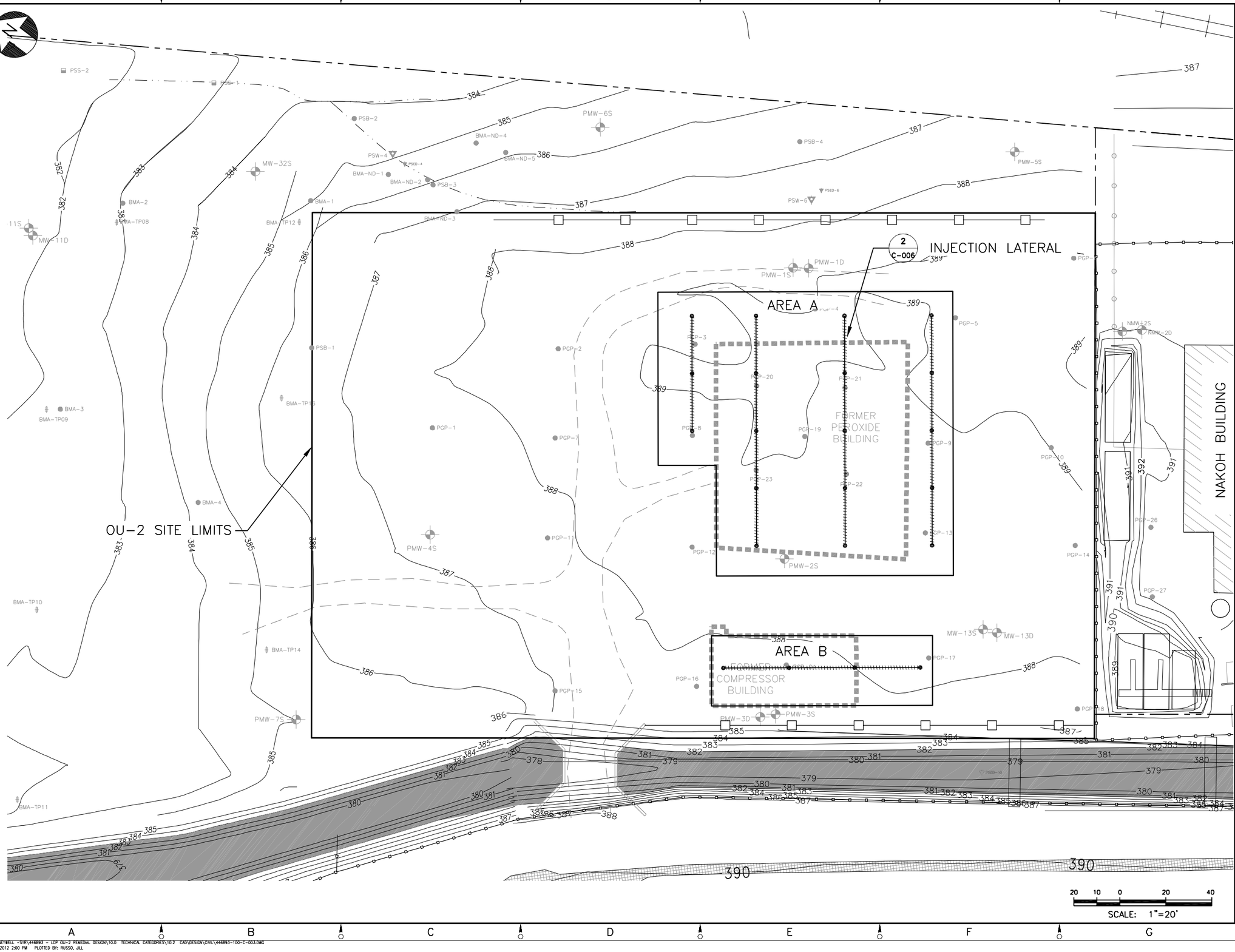
PROJECT TITLE
LCP OU-2 REMEDIAL DESIGN
NAKOH PROPERTY SOIL REMOVAL
SYRACUSE, NEW YORK

DRAWING TITLE
SHALLOW SOILS EXCAVATION PLAN

SCALE: SCALE 1"=20' (IF PRINTED ON 22x34 SHEET)

DRAWING NO. 446893-C-002 REV. A

FILE NAME: P:\HONEYWELL -SYR\446893 - LCP OU-2 REMEDIAL DESIGN\10.0 TECHNICAL CATEGORIES\10.2 CAD\DESIGN\CIVIL\446893-100-C-002.DWG
PLOT DATE: 7/11/2012 9:13 AM PLOTTED BY: RUSSO, JILL



NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
A	IN PROGRESS	5/24/12	JR	ERW	TCD

DRAWN BY	JR	DATE 5/24/12
CHECKED BY	ERW	DATE 5/24/12
APPROVED BY	TCD	DATE 5/24/12
PROJECT MGR.	TCD	DATE 5/24/12

SEAL

PARSONS
COMMERCIAL TECHNOLOGY GROUP
OFFICE
301 PLAINFIELD ROAD
SYRACUSE, NY 13212
(315) 451-9560

JOB 446893
WBS 04200

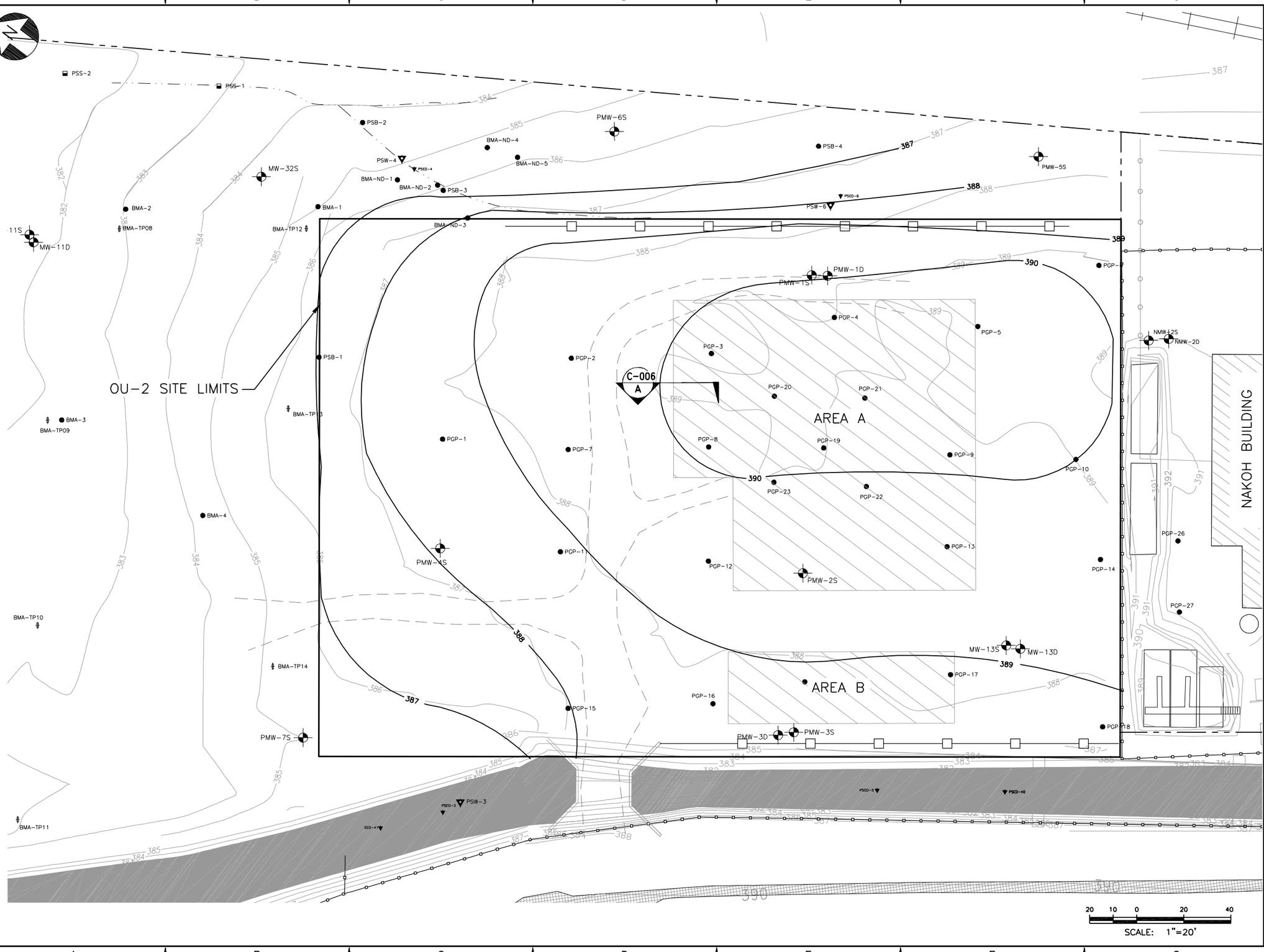
PROJECT TITLE
LCP OU-2 REMEDIAL DESIGN
NAKOH PROPERTY SOIL REMOVAL
SYRACUSE, NEW YORK

DRAWING TITLE
SHALLOW SOILS EXCAVATION AREA WITH INJECTION LATERALS

SCALE: SCALE 1"=20' (IF PRINTED ON 22x34 SHEET)

DRAWING NO. 446893-C-003 REV. A

FILE NAME: P:\HONEYWELL -SYR\446893 - LCP OU-2 REMEDIAL DESIGN\10.0 TECHNICAL CATEGORIES\10.2 CAD\DESIGN\CIVIL\446893-100-C-003.DWG
PLOT DATE: 6/26/2012 2:00 PM PLOTTED BY: RUSSO, JILL



LEGEND:

- NMW-1S — MONITORING WELL LOCATION
- PSB-5 — SOIL BORING LOCATION
- PGP-25 — GEOPROBE SAMPLE LOCATION
- DIRT ROADS
- PAVED ROADS
- APPROXIMATE PROPERTY LINE
- FORMER STRUCTURES
- EXISTING CHAIN LINK FENCE
- RAILROAD
- SILT FENCE TO BE REMOVED AFTER FINAL GRADING
- FORMER EXCAVATION AREAS
- EXISTING TOPOGRAPHIC CONTOUR
- PROPOSED TOPOGRAPHIC CONTOUR
- SITE BOUNDARY
- WEST FLUME
- SLURRY BARRIER WALL

NOTES:

1. 1" GRAVEL CAP PLACED ACROSS SITE TO FINISHED GRADE.

NO.	DESCRIPTION	DATE	DRAWN	CH'D	APPV'D
A	IN PROGRESS	5/24/12	JR	ERW	TCD

DRAWN BY	JR	DATE 5/24/12
CHECKED BY	ERW	DATE 5/24/12
APPROVED BY	TCD	DATE 5/24/12
PROJECT MGR.	TCD	DATE 5/24/12

SEAL

PARSONS
COMMERCIAL TECHNOLOGY GROUP
OFFICE
301 PLAINFIELD ROAD
SYRACUSE, NY 13212
(315) 451-9560

JOB 446893
WBS 04200

PROJECT TITLE

LCP OU-2 REMEDIAL DESIGN

NAKOH PROPERTY SOIL REMOVAL
SYRACUSE, NEW YORK

DRAWING TITLE

FINISH GRADE AND SITE RESTORATION PLAN

SCALE: SCALE 1"=20' (IF PRINTED ON 22x34 SHEET)

DRAWING NO. 446893-C-004

REV. A

FILE NAME: P:\HONEYWELL -SYR\446893 - LCP OU-2 REMEDIAL DESIGN\10.0 TECHNICAL CATEGORIES\10.2 CAD\DESIGN\CIVIL\446893-100-C-004.DWG
PLOT DATE: 6/26/2012 2:01 PM PLOTTED BY: RUSSO, JILL

5 C-006 TYPICAL MONITORING WELL

3 C-006 ISCO TREATMENT GRID

PMW-6I
PMW-6S
PMW-5S
MW-12S
PMW-1D
PMW-1S
PMW-2I
PMW-4I
PMW-4S
PMW-2S
MW-13S
MW-13D
PMW-3I
PMW-3D
PMW-7S
MW-11S
MW-11D
MW-12S
MW-12D

AREA A
AREA B

BUFFER ZONE
SEE NOTE 2

OU-2 SITE LIMITS

NAKOH BUILDING

PSS-1 PSS-2 PSB-1 PSB-2 PSB-3 PSB-4 PSW-4 PSW-6 PSED-4 PSED-6
BMA-1 BMA-2 BMA-3 BMA-4 BMA-ND-1 BMA-ND-2 BMA-ND-3 BMA-ND-4 BMA-ND-5
BMA-TP08 BMA-TP09 BMA-TP10 BMA-TP11 BMA-TP12 BMA-TP13 BMA-TP14
PGP-1 PGP-2 PGP-3 PGP-4 PGP-5 PGP-6 PGP-7 PGP-8 PGP-9 PGP-10 PGP-11 PGP-12 PGP-13 PGP-14 PGP-15 PGP-16 PGP-17 PGP-18 PGP-19 PGP-20 PGP-21 PGP-22 PGP-23 PGP-24 PGP-25 PGP-26 PGP-27

1 2 3 4 5 6 7 8 9 10

SCALE: 1"=20'

20 10 0 20 40

LEGEND:

- NMW-1S — MONITORING WELL LOCATION
- PSB-5 — SOIL BORING LOCATION
- PGP-25 — GEOPROBE SAMPLE LOCATION
- NEW INTERMEDIATE MONITORING WELLS
- DIRT ROADS
- PAVED ROADS
- APPROXIMATE PROPERTY LINE
- FORMER STRUCTURES
- EXISTING CHAIN LINK FENCE
- RAILROAD
- SILT FENCE
- AREAS TO BE EXCAVATED TO GROUNDWATER
- TARGET ISCO TREATMENT AREA
- ISCO TREATMENT GRID
- EXISTING TOPOGRAPHIC CONTOUR
- SITE BOUNDARY
- WEST FLUME
- SLURRY BARRIER WALL

NOTES:
1. SOIL SAMPLE WILL BE COLLECTED IN SUBAREA.
2. 15' MINIMUM SPACING BETWEEN DIRECT PUSH INJECTION POINTS AND WEST FLUME.

NO	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	IN PROGRESS	5/24/12	JR	ERW	TCD

DRAWN BY	JR	DATE 5/24/12
CHECKED BY	ERW	DATE 5/24/12
APPROVED BY	TCD	DATE 5/24/12
PROJECT MGR.	TCD	DATE 5/24/12

SEAL

PARSONS
COMMERCIAL TECHNOLOGY GROUP
OFFICE 301 PLAINFIELD ROAD SYRACUSE, NY 13212 (315) 451-9560

JOB 446893
WBS 04200

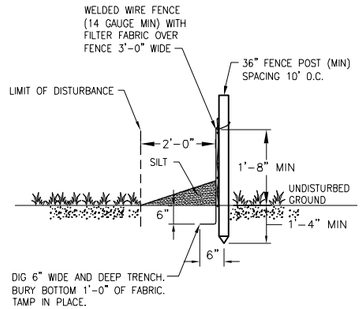
PROJECT TITLE
LCP OU-2 REMEDIAL DESIGN
NAKOH PROPERTY SOIL REMOVAL SYRACUSE, NEW YORK

DRAWING TITLE
SATURATED SOILS DIRECT PUSH AND PVC INJECTION SECTION PLAN

SCALE: SCALE 1"=20' (IF PRINTED ON 22x34 SHEET)

DRAWING NO. 446893-C-005 REV. A

FILE NAME: P:\HONEYWELL -SYR\446893 - LCP OU-2 REMEDIAL DESIGN\10.0 TECHNICAL CATEGORIES\10.2 CAD\DESIGN\CIVIL\446893-100-C-005.DWG
PLOT DATE: 7/11/2012 9:24 AM PLOTTED BY: RUSSO, JILL



TYPICAL SILT FENCE

DETAIL 1 / C-002

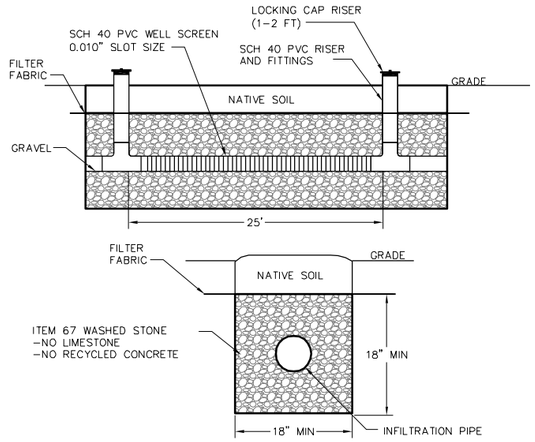
SCALE: NTS

SILT FENCE NOTES:

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID-SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABLINKA T14N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

GENERAL NOTES:

1. INSTALL ALL EROSION AND SEDIMENT CONTROL PRACTICES PRIOR TO SITE DISTURBANCE. INSTALL PERIMETER CONTROLS PRIOR TO OTHER PRACTICES.
2. EROSION AND SEDIMENT CONTROL PRACTICES AS SHOWN ARE IN ACCORDANCE WITH THE SPECIFICATIONS OF THE LATEST VERSION OF THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC), "NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL".
3. CLEARLY MARK AND MAINTAIN NON DISTURBED AREAS AS PERMANENT BUFFER AREAS OF THE SITE. MAXIMUM CLEARING SHALL BE TO THE LIMITS SHOWN.
4. INSTALL ADDITIONAL SILT FENCE AT THE TOE OF SOIL OR WASTE AT A DISTANCE OF 10 FEET LATERALLY FROM THE TOE OF SLOPE.
5. MAXIMUM SIDE SLOPES OF ALL EXPOSED AREAS SHALL NOT EXCEED 3:1 (H:V), UNLESS DIRECTED BY THE ENGINEER
6. AREAS OF EXPOSED SOIL SHALL BE COVERED WITHIN 14 DAYS WITH MULCH, FERTILIZER AND SEED, OR HYDROSEEDED TO ESTABLISH VEGETATION.
7. TEMPORARY MULCH (ITEM 209.1001) SHALL BE SPREAD UNIFORMLY IN A CONTINUOUS BLANKET AT AN APPROXIMATE RATE OF 2 T/ACRE. MULCH MAY BE SPREAD BY HAND, MECHANICAL SPREADERS, OR BLOWERS.
8. INSPECT TEMPORARY MEASURES ONCE EVERY SEVEN (7) CALENDAR DAYS. REPAIR DAMAGED MEASURES WITHIN 48 HOURS. PROVIDE ADDITIONAL MEASURES AS NEED TO PREVENT MIGRATION OF SEDIMENTS TO OFFSITE AREAS, OR AS DIRECTED BY THE ENGINEER OR OWNER.
9. MAINTAIN TEMPORARY EROSION CONTROL MEASURES UNTIL CONSTRUCTION ACTIVITIES ARE COMPLETE, FINAL PERMANENT EROSION CONTROL MEASURES ARE IN PLACE AND/OR VEGETATION IS ESTABLISHED.



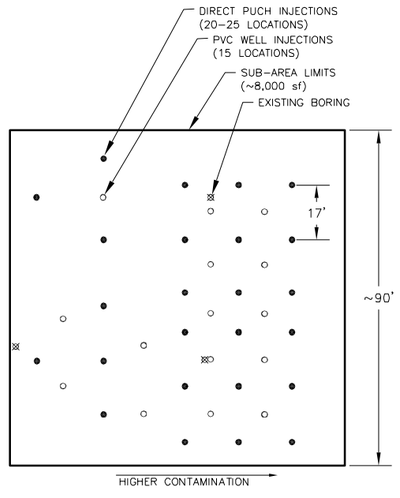
NOTE:
LATERAL PIPING WILL BE GROUTED AND ABANDONED IN PLACE.

INJECTION TRENCH

DETAIL 2 / C-003

SCALE: NTS

DETAIL PROVIDED BY ERFS.



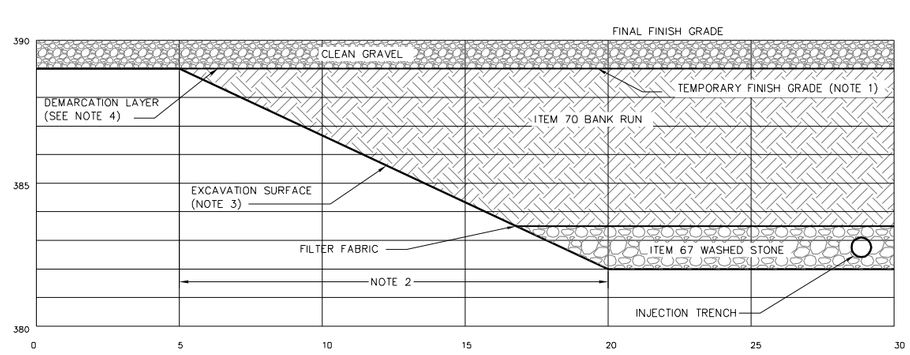
NOTES:
1. EACH SUB-AREA WILL HAVE DIFFERENT DISTRIBUTION BASED ON CONTAMINATION PROFILE. INJECTION DISTRIBUTION WILL BE MORE CONCENTRATED IN AREAS WITH HIGHER LEVELS OF CONTAMINANTS BASED ON BASELINE SAMPLING.

TYPICAL SUB-AREA INJECTION PLAN

DETAIL 3 / C-004

SCALE: NTS

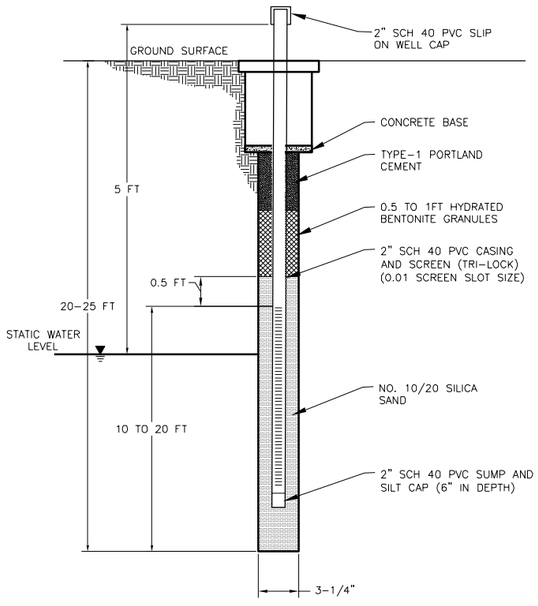
DETAIL PROVIDED BY ERFS.



NOTES:
1. ROD SPECIFIES DEMARCATION LAYER AND CLEAN 1' GRAVEL CAP ACROSS SITE. GRAVEL WILL BE PLACES POST ISCO ACTIVITIES.
2. REMOVE 2 FEET VERTICALLY AT TOP OF SLOPE THEN EXCAVATE TWO HORIZONTAL TO 1 VERTICAL (2:1) SLOPE UNTIL INTERSECTION WITH GROUNDWATER.
3. EXCAVATION SURFACE SHOWS EXPECTED ELEVATION OF GROUNDWATER EXCAVATION SURFACE MAY VARY IN FIELD.
4. DEMARCATION LAYER TO BE TENCATE MIFARI ORANGE DELINEATION NONWOVEN GEOTEXTILE OR EQUAL.

SECTION A

SCALE: NTS / C-004

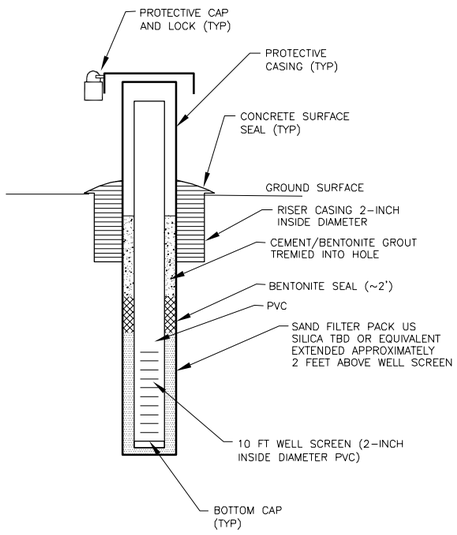


TYPICAL ISCO INJECTION WELL

DETAIL 4 / -

SCALE: NTS

DETAIL PROVIDED BY ERFS.



TYPICAL MONITORING WELL

DETAIL 5 / C-005

SCALE: NTS

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	IN PROGRESS	5/24/12	JR	ERW	TCD

		SEAL
DRAWN BY: JR	DATE: 5/24/12	
CHECKED BY: ERW	DATE: 5/24/12	
APPROVED BY: TCD	DATE: 5/24/12	
PROJECT MGR: TCD	DATE: 5/24/12	

PARSONS
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JOB: 446893
WBS: 04200

PROJECT TITLE
LCP OU-2
REMEDIAL DESIGN

NAKOH PROPERTY SOIL REMOVAL
SYRACUSE, NEW YORK

DRAWING TITLE
DETAILS

SCALE: SCALE AS SHOWN
(IF PRINTED ON 22x34 SHEET)

DRAWING NO.: 446893-C-006
REV.: A

FILE NAME: P:\HONEYWELL - SYR\446893 - LCP OU-2 REMEDIAL DESIGN\10.0 TECHNICAL CATEGORIES\10.2 CAD\DESIGN\CIVIL\446893-100-C-006.DWG
PLOT DATE: 7/2/2012 10:33 AM PLOTTED BY: RUSSO, JILL

APPENDIX C

CQAP

LCP OU-2
REMEDIAL DESIGN REPORT
CONSTRUCTION QUALITY ASSURANCE PLAN

Prepared For:

Honeywell

301 Plainfield Road, Suite 330
Syracuse, New York 13212

Prepared By:

PARSONS

301 Plainfield Road, Suite 350
Syracuse, New York 13212
Phone: (315) 451-9560
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September 2012

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LIST OF TABLES

LIST OF ATTACHMENTS

REPORTING DOCUMENTATION

ACRONYMS

ASTM	American Society for Testing and Materials
CM	Construction Manager
CQAP	Construction Quality Assurance Plan
CQC	Construction Quality Control
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
MQA	Manufacturing Quality Assurance
MQC	Manufacturing Quality Control
NYSDEC	New York State Department of Environmental Conservation
PM	Program Manager
QA/QC	Quality Assurance/Quality Control
SHSO	Site Health and Safety Officer

SECTION 1

INTRODUCTION

1.1 PURPOSE

This Construction Quality Assurance Plan (CQAP) presents procedures and protocols to determine that the construction of the LCP OU-2 Remedial Design is executed in accordance with the approved design documents.

1.2 BACKGROUND

The Draft LCP OU-2 Remedial Design Report, completed pursuant to Order on Consent (Index # 07-0001-01-03), presents a description of:

- The site and its location
- Remedial objectives and selected response action
- Remedial design elements

1.3 REPORT ORGANIZATION

This CQAP is organized into six sections and one attachment. The remedial action objectives, and site location and description are presented in Section 1. The definitions relative to the Quality Management System are presented in Section 2. Project management, including roles and responsibilities of the project team, chain of command, communication, and meetings is presented in Section 3. Construction oversight tasks such as inspections, Quality Assurance/Quality Control (QA/QC) testing and documentation are presented in Section 4. References are included in Section 5.

Section 5 contains CQA testing and monitoring procedures. Sample copies of construction documentation forms are provided in the attachment.

SECTION 2

DEFINITIONS AND USE OF TERMS

2.1 DEFINITIONS RELATING TO CONSTRUCTION QUALITY ASSURANCE

Generally, construction quality assurance and construction quality control are defined as follows:

- Construction Quality Assurance (CQA) - The planned and systematic means and actions that provide the permitting agency and Honeywell International, Inc. (Honeywell) confidence that materials and/or services meet contractual and regulatory requirements and will perform satisfactorily in service.
- Construction Quality Control (CQC) – The planned system of inspections and testing taken by the Contractor to monitor and control the characteristics of an item or service in relation to contractual and regulatory requirements.

In the context of this document:

- CQA refers to means and actions employed by the Certifying Engineer to assess conformity of the remedy with the requirements of the drawings, specifications, and work plans.
- CQC refers to those actions taken by the Contractor to determine compliance of the materials and workmanship of the remedy with the requirements of the drawings, specifications, and work plans.

2.2 REFERENCES TO STANDARDS

The CQAP references to test procedures pertain to the latest editions of the American Society for Testing and Materials (ASTM) or EPA SW-846.

2.3 UNITS

The CQAP expresses all parameters, properties and dimensions in English Units, unless specified otherwise.

SECTION 3

PROJECT MANAGEMENT

3.1 ROLES AND RESPONSIBILITIES OF THE CONSTRUCTION TEAM

Several organizations will be directly involved in the performance and review of the remedial design. Each entity plays a key role and has responsibilities necessary to execute the project. An established chain of command is essential for communication and decision making. Preliminary roles and responsibilities of the team members and agencies are described below. Key contact information is presented in Table 3.1.

3.1.1 NYSDEC

The New York State Department of Environmental Conservation (NYSDEC) is the lead agency for the site. This state agency will review and approve plans, drawings, reports, and schedules submitted for the pre-design, remedial design, and remedial action as documented in the Order on Consent. The NYSDEC will designate a Project Manager (PM) for the LCP OU-2 site. The NYSDEC's PM shall participate in progress meetings, conduct site inspections and provide regulatory approval for components of the remedy. The NYSDEC's PM shall both conduct and participate in public meetings as necessary, and shall be the point of contact for public questions and concerns. Other agencies or government entities shall provide comments to the project team through NYSDEC.

3.1.2 Honeywell

Honeywell is ultimately responsible for the design and implementation of the LCP OU-2 remedy in accordance with the Order on Consent. Honeywell's PM shall attend public meetings and specific construction meetings and review documents prior to submission to the NYSDEC.

3.1.3 Parsons Project Manager

The Parsons PM serves as Honeywell's representative. The PM is responsible for constructing the remedy in accordance with the Contract Documents and the approved Final Design. The PM will perform the functions listed below:

- Provide overall direction and management for remedial design activities
- Perform administrative and decision-making activities, as well as provide necessary authorizations within Parsons related to the project
- Facilitate remedial design coordination between Parsons and external organizations
- Communicate directly with the Construction Manager (CM), CQA Engineer and Certifying Engineer for project needs
- Review all reports in the draft version prior to their final edition
- Communicate with NYSDEC and other agencies on an ongoing basis regarding technical issues and project status

3.1.4 Construction Manager

The CM is responsible for completion of the construction work. The CM's project team will consist of, at a minimum, construction personnel and/or subcontractors, a Site Health and Safety Officer (SHSO) and a CQC Inspector.

The CM has the following specific duties:

- Communicate directly with the PM for project needs
- Implement onsite construction activities and direct the construction personnel on daily operations
- Prepare for and attend meetings as required
- Procure, contract, and monitor subcontractors and suppliers as needed
- Establish work budgets and schedules with milestones
- Submit documentation to the Certifying Engineer as required in the Contract Documents
- Monitor the financial status of the project, negotiate change orders, and submit pay applications
- Maintain construction quality and safety standards

The full-time onsite SHSO is responsible for implementation of the Health and Safety Plan (HASP). The SHSO has the following specific duties:

- Verify that site personnel possess the necessary training and medical surveillance
- Conduct daily safety meetings with the workers
- Establish work zones and relocating zones as necessary
- Determine personnel protective equipment requirements for specific work tasks and order any changes based on work area monitoring data
- Monitor the work for compliance with the HASP and applicable regulations, and take corrective measures as appropriate
- Implement air monitoring program and report data
- Perform routine safety inspections
- Report and investigate accidents, incidents, and near misses

The full-time onsite CQC Inspector is responsible for:

- Preparing technical submittals
- Conducting CQC testing (or working with independent testing subcontractor)
- Documenting the work (i.e., daily reports, etc.)

3.1.5 Certifying Engineer

The Certifying Engineer is responsible for providing engineering support to the PM and final certification of the remedy completion. The Certifying Engineer will be a New York State

licensed Professional Engineer. The Certifying Engineer or his/her representatives will perform the functions listed below:

- Managing remedial design
- Sealing the Final Design Report, drawings, and specifications
- Reviewing, approving, and sealing design modifications

The Certifying Engineer shall be responsible for completing QA activities including the following:

- Reviewing Contractor submittals
- Conducting routine inspections and documenting the work
- Confirming that workmanship is in accordance with the requirements of the design
- Preparing and sealing the final Construction Certification Report for submission to NYSDEC.

The Certifying Engineer will review the CQC procedures and documentation as provided by the CM. Daily reporting by the Certifying Engineer will include a daily summary report, field logs, photographic documentation and if necessary, reports of problem identification and corrective measures taken.

3.2 CHAIN OF COMMAND AND COMMUNICATION

Construction activities will commence until upon approval of the LCP OU-2 Remedial Design Report by the NYSDEC. Once approved and the work starts, Honeywell ultimately controls the work in terms of the Contractor, the project schedule, sequencing and means and methods on the condition that the work is conducted in accordance with the approved design.

The chain of command onsite starts with the PM. Issues or concerns from the NYSDEC will be channeled through the PM. During construction, the PM will be in direct communication with the NYSDEC and Honeywell's PM. In order to minimize confusion and miscommunication, NYSDEC, other agencies and the media will not communicate directly with the CM or subcontractors.

NYSDEC, Honeywell, the PM, or any other project personnel may immediately stop work if a condition is observed that threatens the safety of the public and/or personnel. However, if the work is being conducted safely and in accordance with the approved final design and contract documents, only the PM and Honeywell have the authority to stop work. NYSDEC or other agencies can communicate directly with the PM regarding a specific issue. If it is agreed by the agencies and the PM that work must be stopped to rectify the issue, the PM is to communicate directly with the CM.

Modifications to the Final Design, if required, must not be made without written approval of the Certifying Engineer. The Certifying Engineer will document the design modification correspondence.

3.3 MEETINGS

3.3.1 Construction Kick-off Meeting

Following approval of the Final Design, the PM is to conduct a construction kickoff meeting scheduled for the Project Team. Meeting attendees shall include representatives from NYSDEC, Honeywell, the Certifying Engineer, and the CM. At a minimum, the meeting agenda shall include the planned construction activities, construction means and methods, site safety, roles and responsibilities, and a site walk.

3.3.2 Progress Meeting

The PM is to conduct progress meetings on a bi-weekly basis to discuss the prior period's completed work and the next period's anticipated work. The NYSDEC representative, the PM, the CM, and the Certifying Engineer will participate, at a minimum. The agency's issues will be raised and addressed during the meeting. One meeting will be substituted by a monthly meeting for which a larger audience of Honeywell and agency personnel will be invited to participate. A brief project summary will be provided at the monthly meeting.

3.3.3 Construction Wrap-up Meeting

Following substantial completion of the remedy, the project team shall conduct a wrap-up meeting to discuss the final punch list, site operation, maintenance, monitoring and project completion issues. The Construction Certification Report punch list also will be addressed at this meeting.

TABLE 3.1

KEY CONTACT INFORMATION

NEW YORK STATE DEC
State Project Manager
Mr. Rick Mustico
NYS Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233-7015
Phone: (518) 402-9676
Fax: (518) 402-9773

HONEYWELL, INC.
Honeywell Project Manager
Mr. Michael Savage
Honeywell Inc.
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Phone: (315) 552-9746
Fax: (315) 552-9780
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PARSONS
Project Manager
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Parsons
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Fax: (315) 451-9570
Email: Thomas.Drachenberg@parsons.com

SECTION 4

CONSTRUCTION OVERSIGHT

4.1 INSPECTIONS

Members of the project team will regularly inspect the site for compliance with the Remedial Design. The Project Engineer or representative will conduct inspections of work areas on a daily basis. NYSDEC and the other agencies may conduct inspections during any work hour period. Inspections by the Certifying Engineer and regulatory agencies are intended to augment and not replace the Contractor's inspections required by the Contract Documents and good practice.

4.1.1 Routine Work Inspections

The Certifying Engineer will conduct routine inspections of specific work elements, including:

- Construction water drainage system
- Temporary water treatment system
- Stormwater drainage system
- Excavations
- Backfill construction
- ISCO injection activities
- Finished grading and final construction
- Survey markings

In addition to these specific work elements, the Certifying Engineer will periodically inspect the overall site condition. Overall site condition items include support areas, exclusion zones, and security fence/gates.

4.1.2 Pre-Final and Final Inspections

Following notification by the CM of substantial completion, the PM, the Certifying Engineer, and the NYSDEC will conduct a pre-final inspection of the site. A final written work punchlist will be prepared by the PM and the NYSDEC for submittal to the CM. The final punch list will enable the CM to understand the project completion expectations and schedule work activities, including demobilization. Once punch list items have been addressed by the CM and approved by the PM in writing, the NYSDEC will conduct a final inspection. Upon written NYSDEC approval, the remedy will be considered completed and the Contractor will demobilize from the site.

4.2 CONSTRUCTION QUALITY CONTROL AND ASSURANCE TESTING

CQA/QC testing is part of assessing whether construction is completed in accordance with the Final Design, and consists primarily of sampling and analysis of soil and groundwater

samples. CQC testing will be performed by the Contractor's Inspector. Requirements of CQC sampling and testing are detailed in the Remedial Design. Detailed procedures for sampling and analysis of samples are included in Appendix A. The Certifying Engineer will review CQC testing results, but will not perform independent CQA sampling and testing.

4.3 DOCUMENTATION

4.3.1 Field Log Book

The Certifying Engineer, CQC Inspector, and CM will maintain daily field log books for the project. Construction activities will be documented with the following details at a minimum: dates, times, weather conditions, personnel onsite, equipment used, materials used, visitors, health and safety issues, work activities completed, delays, and other construction related issues.

4.3.2 Daily and Weekly Reports

The CM will prepare a Daily Activity Report that summarizes construction activities from the field book. Required information for the Daily Activity Report is detailed in the specifications. The report will also include site photos and sketches of work completed as necessary. The Daily Activity Reports will be prepared and submitted to the Certifying Engineer on a regular basis. Refer to the attachment for an example of the Daily Activity Report.

The CM will also prepare a weekly report which will document the various aspects of the work. This will include, but not be limited to: construction activities, safety issues, CQC requirements, deviations, schedule, budget, and other topics related to the weekly construction activities.

The CQC Inspector will prepare a daily CQC report summarizing the CQC activities. The report will be submitted to the Certifying Engineer on a daily basis.

CQA/QC issues will be addressed at the daily CQA/QC meeting between the CM, the Certifying Engineer, and the PM.

4.3.3 Photographic Documentation

The Certifying Engineer will be responsible for obtaining photographic documentation of the construction activities, materials installation methods, and testing procedures. Photographs will serve as a pictorial record of work progress, problems, and corrective measures. Photographic reporting data sheets should be used to organize and document photographs taken during construction. Such data sheets shall be cross-referenced or appended to summary reports, CQA monitoring logs, test data sheets, and/or problem identification and corrective measures reports.

4.3.4 Monthly Progress Report

The CM will prepare a monthly status report and submit it to the Certifying Engineer. Information to be included in the monthly status report is detailed in the specifications of the design.

Per the Order on Consent, Honeywell will prepare and submit a monthly progress report to the NYSDEC. The Monthly Progress Report will summarize work activities and other issues

pertinent to the construction completion. The PM will assist Honeywell to fulfill this requirement.

4.3.5 Field Change Form

Changes to the approved Final Design require approval by the Certifying Engineer, and if deemed significant, by Honeywell and the NYSDEC. Material substitutions (i.e., "or equals") are not considered a field change and will be approved, if appropriate, by the Certifying Engineer as part of the technical submittal review process.

4.3.6 Construction Certification Report and Record Drawings

Per the Order on Consent, a Construction Certification Report will be prepared and submitted to the NYSDEC 90 days following the remedy completion. The Certifying Engineer will certify that the construction was performed in accordance with the approved Final Design and approved field changes. The Construction Certification Report will include, but not be limited to the following:

- A description of the completed construction work activities
- Approved design changes to the Final Design
- Record Drawings
- A project photo log
- Sampling/analysis summary table
- Waste manifests, material trip tickets and/or summary table

Record Drawings will be prepared based on the Design Drawings, Contractor markups on the drawings conducted throughout the construction, and construction survey information conducted during and after the construction. The Record Drawings will be signed/sealed by the Certifying Engineer. The Record Drawings shall include record surveys prepared by a New York State licensed land surveyor.

SECTION 5

CONSTRUCTION QUALITY CONTROL (CQC) SAMPLING AND ANALYSIS PROCEDURES

5.1 INTRODUCTION

Construction Quality Control (CQC) testing and monitoring will be performed during construction of the LCP OU-2 remedy. Criteria to be used for determination of acceptability of the various components are identified in the specifications and this CQAP. CQC testing will consist of baseline sampling for groundwater, post-excavation sidewall sampling of soils, interim groundwater sampling to assess remedy effectiveness, and post-remediation sampling of soils and groundwater.

5.2 GROUNDWATER SAMPLING

Groundwater samples will be collected during baseline, interim, and post-remediation sampling events utilizing low flow collection methods and analyzed for Target Compound List (TCL) VOCs utilizing Method SW-846 8260B. Samples will be stored and shipped on ice to the analytical laboratory following chain of custody procedures. For QA/QC purposes, one field duplicate sample and one matrix spike/matrix spike duplicate (MS/MSD) will be collected and analyzed per every 20 samples. Trip blanks will also be included in VOC sample coolers and analyzed for TCL VOCs. Equipment blanks will be collected only if non-dedicated sampling equipment is used.

Samples will be extracted and analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory. Analyses will be performed in accordance with NY State ASP Category B. A matrix spike, matrix spike duplicate, field duplicate, and field blank sample will be collected and analyzed for each sample delivery group of up to 20 total samples.

The analytical program will use the data quality objectives and quality assurance objectives that are described in the LCP OU-2 Construction QAPP (Parsons, 2012). USEPA Level IV data validation will be conducted on 10 percent of the samples (i.e., full data validation) and a USEPA Level III data validation will be conducted on the remaining 90 percent of the samples. Data validation will be conducted by a third party not associated with the laboratory that performed the analyses.

5.3 POST-REMEDIATION SOIL SAMPLING

Two sampling tasks will be completed to document post-construction analytical results as follows:

- One composite sample will be collected from the excavation sidewall at every 30 ft. along the banks. Each sample will be a composite consisting of five grab samples within the 30-ft. stretch.

- Soils samples will be collected on 4 ft intervals using direct push methods from two sample locations within each sub-Area, as shown on Figure C-005.

Post remediation samples will be analyzed for TCL VOCs utilizing Method SW-846 8260B. Soil from each sample will be evaluated for lithology and field headspace screened using a PID. Samples will be placed in dedicated containers and shipped on ice to the analytical laboratory following chain of custody procedures.

Direct push samples will be examined visually in the field and physically described using the Unified Soil Classification System (USCS). Field screening results and observations will be documented on boring logs.

Samples will be extracted and analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory. Analyses will be performed in accordance with NY State ASP Category B. A matrix spike, matrix spike duplicate, field duplicate, and field blank sample will be collected and analyzed for each sample delivery group of up to 20 total samples.

The analytical program will use the data quality objectives and quality assurance objectives that are described in the LCP OU-2 Construction QAPP (Parsons, 2012). USEPA Level IV data validation will be conducted on 10 percent of the samples (i.e., full data validation) and a USEPA Level III data validation will be conducted on the remaining 90 percent of the samples. Data validation will be conducted by a third party not associated with the laboratory that performed the analyses.

5.4 IMPORTED EARTHEN MATERIALS TESTING

Honeywell is in the process of obtaining analytical approval for earthen materials from Syracuse Sand and Gravel's Granby quarry on any existing or future Honeywell remedial projects. In addition, a similar sampling program is being implemented at several other earthen material sources to pre-approve these materials prior to import. It is anticipated that the LCP OU-2 project will import earthen materials from these pre-approved sources.

If the LCP OU-2 project is unable to use pre-approved sources for earthen materials, a sampling program for imported materials will be implemented similar to the Geddes Brook remedial constructions project specifications. For the first 25,000 cubic yards of each fill type from a specific fill source, a representative composite sample will be collected from each 2,500 cubic yard batch. Samples will be analyzed for NYSDEC part 375 soil cleanup objectives compounds including VOCs, SVOCs, PCBs, pesticides/herbicides, metals, and total cyanide. The analytical program will follow data management and QA/QC procedures described in Section 2.0. It is anticipated that less than 5,000 cubic yards will be imported to the LCP OU-2 site.

SECTION 6

REFERENCES

LCP OU-2 Remedial Design Report, (Parsons, 2012

REPORTING DOCUMENTATION

APPENDIX D

CAMP

APPENDIX 1A

New York State Department of Health
Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.