APPENDIX A

PPG RI SOIL SAMPLE RESULTS – HEXAVALENT CHROMIUM

TABLE A-1
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B01001	10/26/92	PPG1-B01	0.40 - 1	8.48	14.0 J	5.10 U	---	---	---	---
1560B01004	10/26/92	PPG1-B01	2.60 - 3	8.48	492 J	12.8	---	---	---	---
1560B01101	10/26/92	PPG1-B01	0.40 - 1	8.48	18.0 J	5.80 U	---	---	---	---
1560B02001	10/27/92	PPG1-B02	0.80 - 1.80	8.88	54.0 J	5.50	---	---	---	---
1560B02002	10/27/92	PPG1-B02	1.80 - 2	8.88	1050 J	72.2	---	---	---	---
1560B02005	10/27/92	PPG1-B02	4 - 4.80	8.88	1290 J	2100	---	---	---	---
1560B02008	10/27/92	PPG1-B02	10 - 11	8.88	20.0 J	5.60 U	---	---	---	---
1560B03001	10/27/92	PPG1-B03	1 - 2	5.97	13.0 J	4.90 U	---	---	---	---
1560B03003	10/27/92	PPG1-B03	4 - 4.20	5.97	32.0 J	5.80 U	---	---	---	---
1560B03004	10/27/92	PPG1-B03	6 - 6.40	5.97	43.0 J	6.30 U	---	---	---	---
1560B03005	10/27/92	PPG1-B03	6.40 - 6.70	5.97	66.0 J	6.50 U	---	---	---	---
1560B03006	10/27/92	PPG1-B03	12.50 - 13.30	5.97	20.0 J	5.90 U	---	---	---	---
1560B03007	10/27/92	PPG1-B03	14 - 15	5.97	48.0 J	17.6 U	---	---	---	---
1560B04001	10/28/92	PPG1-B04	0.50 - 1.40	7.53	8.80 J	5.80 U	---	---	---	---
1560B04003	10/28/92	PPG1-B04	4 - 4.50	7.53	7.40 J	5.50 U	---	---	---	---
1560B04004	10/28/93	PPG1-B04	4.50 - 4.80	0.00	59.0 J	5.80 U	---	---	---	---
1560B04006	10/28/92	PPG1-B04	8.10 - 8.50	7.53	9.80 J	6.00 U	---	---	---	---
1560B04007	10/28/92	PPG1-B04	8.50 - 9	7.53	10.0 J	6.50 U	---	---	---	---
1560B05001	10/27/92	PPG1-B05	0.60 - 1.20	8.84	21.0 J	5.20 U	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B05003	10/27/92	PPG1-B05	4 - 5	8.84	2090 J	113	---	---	---	---
1560B05004	10/27/92	PPG1-B05	5 - 5.20	8.84	1080 J	53.7	---	---	---	---
1560B05006	10/27/92	PPG1-B05	8 - 9	8.84	2130 J	119	---	---	---	---
1560B05008	10/27/92	PPG1-B05	13.10 - 14	8.84	24.0 J	5.60 U	---	---	---	---
1560B05009	10/27/92	PPG1-B05	14 - 15	8.84	17.0 J	6.00 U	---	---	---	---
1560B06001	10/28/92	PPG1-B06	0.50 - 1.10	8.25	64.0 J	4.80 U	---	---	---	---
1560B06003	10/28/92	PPG1-B06	4 - 4.40	8.25	9.70 J	5.70 U	---	---	---	---
1560B06006	10/28/92	PPG1-B06	8.50 - 9	8.25	17.0 J	7.30 U	---	---	---	---
1560B06007	10/28/92	PPG1-B06	12 - 12.30	8.25	23.0 J	7.50 U	---	---	---	---
1560B06008	10/28/92	PPG1-B06	12.30 - 12.80	8.25	13.0 J	7.40 U	---	---	---	---
1560B07001	10/28/92	PPG1-B07	0.50 - 1.20	7.32	19.0 J	5.60 U	---	---	---	---
1560B07003	10/28/92	PPG1-B07	4 - 4.70	7.32	17.0 J	5.40 U	---	---	---	---
1560B07005	10/28/92	PPG1-B07	8 - 8.90	7.32	25.0 J	7.30 U	---	---	---	---
1560B07006	10/28/92	PPG1-B07	8.90 - 9.20	7.32	16.0 J	6.50 U	---	---	---	---
1560B07105	10/28/92	PPG1-B07	8 - 8.90	7.32	19.0 J	6.80 U	---	---	---	---
1560B08001	10/29/92	PPG1-B08	0.50 - 1.20	8.26	16.0 J	9.80 U	---	---	---	---
1560B08003	10/29/92	PPG1-B08	4 - 4.80	8.26	23.0 J	5.10 U	---	---	---	---
1560B08006	10/29/92	PPG1-B08	10 - 11	8.26	37.0 J	5.70 U	---	---	---	---
1560B09001	10/29/92	PPG1-B09	0 - 0.40	7.89	4.80 J	5.10 U	---	---	---	---

KEY:
ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B09003	10/29/92	PPG1-B09	4 - 4.60	7.89	6.50 J	5.70 U	---	---	---	---
1560B09005	10/29/92	PPG1-B09	8 - 8.60	7.89	20.0 J	6.30 U	---	---	---	---
1560B09006	10/29/92	PPG1-B09	12 - 12.50	7.89	9.00 J	6.30 U	---	---	---	---
1560B09007	10/29/92	PPG1-B09	14 - 14.30	7.89	5.90 J	4.90 U	---	---	---	---
1560B09008	10/29/92	PPG1-B09	14.30 - 15.30	7.89	11.0 J	6.00 U	---	---	---	---
1560B10001	10/30/92	PPG1-B10	0 - 0.80	9.34	21.4 J	5.40 U	---	11000	8.10	3.65
1560B10002	10/30/92	PPG1-B10	2 - 2.90	9.34	---	---	---	---	6.89	---
1560B10003	10/30/92	PPG1-B10	4 - 4.80	9.34	363 J	17.3	---	---	---	---
1560B10004	10/30/92	PPG1-B10	4.80 - 5.20	9.34	6360 J	2460	---	3300	11.3	3.28
1560B10005	10/30/92	PPG1-B10	6 - 7	9.34	7840 J	3910	---	---	10.5	---
1560B10007	10/30/92	PPG1-B10	8 - 8.50	9.34	312 J	5.70 U	---	---	---	---
1560B10008	10/30/92	PPG1-B10	8.50 - 9.20	9.34	3300 J	238	---	---	---	---
1560B10009	10/30/92	PPG1-B10	10 - 10.60	9.34	400 J	5.80 U	---	---	---	---
1560B10010	10/30/92	PPG1-B10	10.60 - 11.30	9.34	18.0 J	6.00 U	---	---	---	---
1560B10011	10/30/92	PPG1-B10	12 - 12.80	9.34	230 J	5.70 U	---	---	---	---
1560B11001	10/30/92	PPG1-B11	0.20 - 1	7.22	130 J	5.50 U	---	17000	8.01	2.55
1560B11002	10/30/92	PPG1-B11	1 - 1.70	7.22	448 J	12.2	---	---	---	---
1560B11004	10/30/92	PPG1-B11	4 - 4.40	7.22	46.0 J	6.20 U	---	1800	8.57	2.88
1560B11006	10/30/92	PPG1-B11	8 - 8.80	7.22	240 J	6.80 U	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B11007	10/30/92	PPG1-B11	8.80 - 9	7.22	16.0 J	6.10 U	---	---	---	---
1560B12001	10/30/92	PPG1-B12	0.50 - 0.80	6.85	482 J	10.1	---	---	---	---
1560B12004	10/30/92	PPG1-B12	8 - 8.60	6.85	180 J	6.70	---	---	---	---
1560B12005	10/30/92	PPG1-B12	8.60 - 9.40	6.85	37.0 J	6.10 U	---	---	---	---
1560B13001	11/02/92	PPG1-B13	0.50 - 1.50	6.82	6.00 J	5.60 U	---	---	---	---
1560B13005	11/02/92	PPG1-B13	4 - 4.30	6.82	38.0 J	5.30 U	---	---	---	---
1560B13006	11/02/92	PPG1-B13	4.30 - 5.10	6.82	51.0 J	6.90 U	---	---	---	---
1560B13009	11/02/92	PPG1-B13	8 - 8.50	6.82	45.0 J	6.80 U	---	---	---	---
1560B13010	11/02/92	PPG1-B13	8.50 - 9.30	6.82	6.80 J	5.70 U	---	---	---	---
1560B14001	11/02/92	PPG1-B14	0 - 1	8.85	21.0 J	5.80 U	---	---	---	---
1560B14005	11/02/92	PPG1-B14	4 - 5	8.85	44.0 J	5.80 U	---	---	---	---
1560B14009	11/02/92	PPG1-B14	8 - 8.70	8.85	11.0 J	5.50 U	---	---	---	---
1560B14011	11/02/92	PPG1-B14	12 - 12.50	8.85	9.20 J	6.00 U	---	---	---	---
1560B14012	11/02/92	PPG1-B14	12.50 - 13.20	8.85	7.10 J	6.30 U	---	---	---	---
1560B15001	11/18/92	PPG1-B15	0.50 - 1	10.18	8.50 J	5.80 UJ	---	---	---	---
1560B15002	11/18/92	PPG1-B15	1 - 1.30	10.18	12.0 J	5.90 UJ	---	---	---	---
1560B15004	11/18/92	PPG1-B15	4 - 4.30	10.18	10.0 J	5.50 UJ	---	---	---	---
1560B15008	11/18/92	PPG1-B15	8 - 9	10.18	17.0 J	6.20 UJ	---	---	---	---
1560B15009	11/18/92	PPG1-B15	9 - 9.40	10.18	10.0 J	5.80 UJ	---	---	---	---

KEY:
ft. = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent
J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B09003	10/29/92	PPG1-B09	4 - 4.60	7.89	6.50 J	5.70 U	---	---	---	---
1560B09005	10/29/92	PPG1-B09	8 - 8.60	7.89	20.0 J	6.30 U	---	---	---	---
1560B09006	10/29/92	PPG1-B09	12 - 12.50	7.89	9.00 J	6.30 U	---	---	---	---
1560B09007	10/29/92	PPG1-B09	14 - 14.30	7.89	5.90 J	4.90 U	---	---	---	---
1560B09008	10/29/92	PPG1-B09	14.30 - 15.30	7.89	11.0 J	6.00 U	---	---	---	---
1560B10001	10/30/92	PPG1-B10	0 - 0.80	9.34	21.4 J	5.40 U	---	11000	8.10	3.65
1560B10002	10/30/92	PPG1-B10	2 - 2.90	9.34	---	---	---	---	6.89	---
1560B10003	10/30/92	PPG1-B10	4 - 4.80	9.34	363 J	17.3	---	---	---	---
1560B10004	10/30/92	PPG1-B10	4.80 - 5.20	9.34	6360 J	2460	---	3300	11.3	3.28
1560B10005	10/30/92	PPG1-B10	6 - 7	9.34	7840 J	3910	---	---	10.5	---
1560B10007	10/30/92	PPG1-B10	8 - 8.50	9.34	312 J	5.70 U	---	---	---	---
1560B10008	10/30/92	PPG1-B10	8.50 - 9.20	9.34	3300 J	238	---	---	---	---
1560B10009	10/30/92	PPG1-B10	10 - 10.60	9.34	400 J	5.80 U	---	---	---	---
1560B10010	10/30/92	PPG1-B10	10.60 - 11.30	9.34	18.0 J	6.00 U	---	---	---	---
1560B10011	10/30/92	PPG1-B10	12 - 12.80	9.34	230 J	5.70 U	---	---	---	---
1560B11001	10/30/92	PPG1-B11	0.20 - 1	7.22	130 J	5.50 U	---	17000	8.01	2.55
1560B11002	10/30/92	PPG1-B11	1 - 1.70	7.22	448 J	12.2	---	---	---	---
1560B11004	10/30/92	PPG1-B11	4 - 4.40	7.22	46.0 J	6.20 U	---	1800	8.57	2.88
1560B11006	10/30/92	PPG1-B11	8 - 8.80	7.22	240 J	6.80 U	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B15010	11/18/92	PPG1-B15	10 - 11	10.18	9.50 J	6.60 UJ	---	---	---	---
1560B16001	11/10/92	PPG1-B16	0 - 1	6.95	28.9 J	5.80 U	---	---	---	---
1560B16003	11/10/92	PPG1-B16	4 - 4.30	6.95	169	6.20 U	---	---	---	---
1560B16006	11/10/92	PPG1-B16	8 - 8.70	6.95	11.0 J	6.40 U	---	---	---	---
1560B16007	11/10/92	PPG1-B16	8.70 - 8.80	6.95	11.6 J	5.90 U	---	---	---	---
1560B17001	11/02/92	PPG1-B17	0 - 1	8.93	10.0 J	5.90 U	---	---	---	---
1560B17002	11/02/92	PPG1-B17	1 - 1.20	8.93	5.80 J	7.90 U	---	---	---	---
1560B17005	11/02/92	PPG1-B17	4 - 4.50	8.93	9.00 J	8.60 U	---	---	---	---
1560B17008	11/02/92	PPG1-B17	8 - 9	8.93	9.50 J	6.20 U	---	---	---	---
1560B17009	11/02/92	PPG1-B17	9.30 - 9.50	8.93	5.80 J	6.40 U	---	---	---	---
1560B17010	11/02/92	PPG1-B17	10 - 10.70	8.93	4.40 J	6.80 U	---	---	---	---
1560B17011	11/02/92	PPG1-B17	10.70 - 10.80	8.93	8.10 J	6.40 U	---	---	---	---
1560B17102	11/02/92	PPG1-B17	0 - 1	8.93	12.0 J	6.50 U	---	---	---	---
1560B18001	11/04/92	PPG1-B18	0.50 - 1	8.05	42.0 J	5.70 U	---	---	---	---
1560B18002	11/04/92	PPG1-B18	1 - 1.30	8.05	9.80 J	5.90 U	---	---	---	---
1560B18004	11/04/92	PPG1-B18	4 - 4.30	8.05	15.0 J	5.50 U	---	---	---	---
1560B19001	11/04/92	PPG1-B19	0.50 - 1	7.48	160 J	12.6	---	---	8.31	---
1560B19004	11/04/92	PPG1-B19	4 - 4.30	7.48	190 J	6.10	---	---	8.04	---
1560B19006	11/04/92	PPG1-B19	8 - 8.50	7.48	66.0 J	7.50 U	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B15010	11/18/92	PPG1-B15	10 - 11	10.18	9.50 J	6.60 UJ	---	---	---	---
1560B16001	11/10/92	PPG1-B16	0 - 1	6.95	28.9 J	5.80 U	---	---	---	---
1560B16003	11/10/92	PPG1-B16	4 - 4.30	6.95	169	6.20 U	---	---	---	---
1560B16006	11/10/92	PPG1-B16	8 - 8.70	6.95	11.0 J	6.40 U	---	---	---	---
1560B16007	11/10/92	PPG1-B16	8.70 - 8.80	6.95	11.6 J	5.90 U	---	---	---	---
1560B17001	11/02/92	PPG1-B17	0 - 1	8.93	10.0 J	5.90 U	---	---	---	---
1560B17002	11/02/92	PPG1-B17	1 - 1.20	8.93	5.80 J	7.90 U	---	---	---	---
1560B17005	11/02/92	PPG1-B17	4 - 4.50	8.93	9.00 J	8.60 U	---	---	---	---
1560B17008	11/02/92	PPG1-B17	8 - 9	8.93	9.50 J	6.20 U	---	---	---	---
1560B17009	11/02/92	PPG1-B17	9.30 - 9.50	8.93	5.80 J	6.40 U	---	---	---	---
1560B17010	11/02/92	PPG1-B17	10 - 10.70	8.93	4.40 J	6.80 U	---	---	---	---
1560B17011	11/02/92	PPG1-B17	10.70 - 10.80	8.93	8.10 J	6.40 U	---	---	---	---
1560B17102	11/02/92	PPG1-B17	0 - 1	8.93	12.0 J	6.50 U	---	---	---	---
1560B18001	11/04/92	PPG1-B18	0.50 - 1	8.05	42.0 J	5.70 U	---	---	---	---
1560B18002	11/04/92	PPG1-B18	1 - 1.30	8.05	9.80 J	5.90 U	---	---	---	---
1560B18004	11/04/92	PPG1-B18	4 - 4.30	8.05	15.0 J	5.50 U	---	---	---	---
1560B19001	11/04/92	PPG1-B19	0.50 - 1	7.48	160 J	12.6	---	---	8.31	---
1560B19004	11/04/92	PPG1-B19	4 - 4.30	7.48	190 J	6.10	---	---	8.04	---
1560B19006	11/04/92	PPG1-B19	8 - 8.50	7.48	66.0 J	7.50 U	---	---	---	---

KEY:
ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent
J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B24001	11/06/92	PPG1-B24	0 - 1	8.89	17.7	5.60 UJ	---	---	---	---
1560B24002	11/06/92	PPG1-B24	1 - 1.40	8.89	431	15.8 J	---	---	---	---
1560B24003	11/06/92	PPG1-B24	2 - 2.10	8.89	641	23.9 J	---	---	---	---
1560B24004	11/06/92	PPG1-B24	4 - 4.60	8.89	37.3	5.40 UJ	---	---	---	---
1560B24005	11/06/92	PPG1-B24	4.60 - 5	8.89	3440	1360 J	---	---	---	---
1560B24006	11/06/92	PPG1-B24	6 - 6.70	8.89	4930	2150 J	---	---	---	---
1560B24008	11/06/92	PPG1-B24	8 - 9	8.89	419	7.10 UJ	---	---	---	---
1560B24009	11/06/92	PPG1-B24	10 - 10.80	8.89	296	8.40 UJ	---	---	---	---
1560B24010	11/06/92	PPG1-B24	12 - 13	8.89	22.2	7.00 UJ	---	---	---	---
1560B24105	11/06/92	PPG1-B24	4.60 - 5	8.89	4490	3410 J	---	---	---	---
1560B25001	11/06/92	PPG1-B25	0.50 - 1.40	6.44	165	5.80 UJ	---	---	---	---
1560B25002	11/06/92	PPG1-B25	4 - 5	6.44	38.5	6.00 UJ	---	---	---	---
1560B25003	11/06/92	PPG1-B25	6 - 6.70	6.44	41.5	8.80 UJ	---	---	---	---
1560B25004	11/06/92	PPG1-B25	6.70 - 7	6.44	59.2	6.40 UJ	---	---	---	---
1560B25005	11/06/92	PPG1-B25	8 - 8.80	6.44	17.0	6.40 UJ	---	---	---	---
1560B26001	11/05/92	PPG1-B26	0.50 - 1	6.98	166	11.2 J	---	---	---	---
1560B26005	11/05/92	PPG1-B26	4 - 4.40	6.98	456	6.00 UJ	---	---	---	---
1560B26006	11/05/92	PPG1-B26	4.40 - 5	6.98	54.0	7.10 UJ	---	---	---	---
1560B26008	11/05/92	PPG1-B26	8 - 8.70	6.98	7.19	7.20 UJ	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B26009	11/05/92	PPG1-B26	8.70 - 9.50	6.98	8.66	5.90 UJ	---	---	---	---
1560B27001	11/10/92	PPG1-B27	0.50 - 1.10	7.28	11.3 J	5.70 U	---	---	---	---
1560B27003	11/10/92	PPG1-B27	4 - 4.40	7.28	29.9 J	6.60 U	---	---	---	---
1560B28001	11/05/92	PPG1-B28	0 - 1	7.75	132	6.20 J	---	7400	7.13	2.88
1560B28005	11/05/92	PPG1-B28	4 - 4.50	7.75	92.3	5.90 UJ	---	430	7.15	3.95
1560B28006	11/05/92	PPG1-B28	4.50 - 4.90	7.75	81.0	51.0 J	---	---	---	---
1560B28010	11/05/92	PPG1-B28	12 - 13	7.75	8.14	6.50 UJ	---	---	---	---
1560B29001	11/06/92	PPG1-B29	0.50 - 1.50	7.94	13.1	5.90 UJ	---	---	---	---
1560B29003	11/06/92	PPG1-B29	4 - 5	7.94	14.5	6.60 UJ	---	---	---	---
1560B29005	11/06/92	PPG1-B29	8 - 9	7.94	13.8	6.50 UJ	---	---	---	---
1560B29006	11/06/92	PPG1-B29	9 - 9.40	7.94	16.7	7.20 UJ	---	---	---	---
1560B29103	11/06/92	PPG1-B29	4 - 5	7.94	14.7	6.20 UJ	---	---	---	---
1560B30001	11/05/92	PPG1-B30	0.50 - 1.50	6.93	6.81	5.30 UJ	---	---	---	---
1560B30003	11/05/92	PPG1-B30	4 - 4.50	6.93	256	141 J	---	---	---	---
1560B30004	11/05/92	PPG1-B30	4.50 - 4.90	6.93	57.6	7.50 J	---	---	---	---
1560B30005	11/05/92	PPG1-B30	6 - 6.50	6.93	14.4	6.60 UJ	---	---	---	---
1560B30006	11/05/92	PPG1-B30	8 - 8.90	6.93	10.2	5.70 UJ	---	---	---	---
1560B30101	11/05/92	PPG1-B30	0.50 - 1.50	6.93	7.02	5.30 UJ	---	---	---	---
1560B31001	11/05/92	PPG1-B31	0 - 1	8.79	62.1	6.40 UJ	---	---	---	---

KEY:
ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B31005	11/05/92	PPG1-B31	4 - 5	8.79	16.0	6.00 UJ	---	---	---	---
1560B31008	11/05/92	PPG1-B31	8 - 8.20	8.79	15.7	6.30 UJ	---	---	---	---
1560B31011	11/05/92	PPG1-B31	16 - 16.30	8.79	16.2	11.7 UJ	---	---	---	---
1560B32001	11/16/92	PPG1-B32	0 - 0.80	11.25	17.0 J	5.30 UJ	---	---	---	---
1560B32002	11/16/92	PPG1-B32	0.80 - 1.20	11.25	7.80 J	5.40 UJ	---	---	---	---
1560B33001	11/16/92	PPG1-B33	0 - 1	11.52	25.0	5.30 UJ	---	---	---	---
1560B33005	11/16/92	PPG1-B33	4 - 5	11.52	34.0	5.50 UJ	---	---	---	---
1560B33007	11/16/92	PPG1-B33	8 - 8.50	11.52	43.0	7.00 UJ	---	---	---	---
1560B33008	11/16/92	PPG1-B33	10 - 11	11.52	38.0	7.30 UJ	---	---	---	---
1560B33009	11/16/92	PPG1-B33	16 - 17	11.52	21.0 J	6.00 UJ	---	---	---	---
1560B33101	11/16/92	PPG1-B33	0 - 1	11.52	16.0 J	5.30 UJ	---	---	---	---
1560B34001	12/01/92	PPG1-B34	0.50 - 1.10	7.01	28.5 J	6.10 U	---	---	---	---
1560B34004	12/01/92	PPG1-B34	8 - 8.70	7.01	12.8 J	7.50 U	---	---	---	---
1560B34005	12/01/92	PPG1-B34	8.70 - 9.20	7.01	9.34 J	6.70 U	---	---	---	---
1560B35001	11/17/92	PPG1-B35	0.50 - 0.90	6.96	1.13 J	4.90 UJ	---	---	---	---
1560B35002	11/17/92	PPG1-B35	0.90 - 1.30	6.96	25.6 J	8.90 UJ	---	---	---	---
1560B35005	11/17/92	PPG1-B35	4 - 4.50	6.96	12.4 J	5.70 UJ	---	---	---	---
1560B35006	11/~~27~~ 17/92	PPG1-B35	4.50 - 5	6.96	10.9 J	6.20 UJ	---	---	---	---
1560B35008	11/17/92	PPG1-B35	8 - 8.40	6.96	14.6 J	5.50 UJ	---	---	---	---

KEY:
ft = Feet
ft-msl = Feet above mean sea level
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--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B35009	11/17/92	PPG1-B35	8.40 - 8.90	6.96	21.3 J	5.30 UJ	---	---	---	---
1560B35011	11/17/92	PPG1-B35	14 - 15	6.96	16.2 J	5.80 UJ	---	---	---	---
1560B35012	11/17/92	PPG1-B35	15 - 16	6.96	10.6 J	4.90 UJ	---	---	---	---
1560B35102	11/17/92	PPG1-B35	0.90 - 1.30	6.96	16.6 J	4.90 UJ	---	---	---	---
1560B36001	11/17/92	PPG1-B36	0 - 0.60	7.89	23.2 J	5.60 UJ	---	---	---	---
1560B36003	11/17/92	PPG1-B36	4 - 4.80	7.89	11.0 J	5.30 UJ	---	---	---	---
1560B36004	11/17/92	PPG1-B36	4.80 - 5	7.89	52.4 J	5.60 UJ	---	---	---	---
1560B36006	11/17/92	PPG1-B36	8 - 8.10	7.89	18.9 J	5.50 UJ	---	---	---	---
1560B36007	11/17/92	PPG1-B36	12 - 12.40	7.89	10.6 J	6.00 UJ	---	---	---	---
1560B37001	11/18/92	PPG1-B37	0 - 0.50	7.13	3.80 J	5.20 UJ	---	---	---	---
1560B37004	11/18/92	PPG1-B37	4 - 4.30	7.13	5.50 J	5.00 UJ	---	---	---	---
1560B37006	11/18/92	PPG1-B37	8 - 9.40	7.13	13.0 J	6.10 UJ	---	---	---	---
1560B37007	11/18/92	PPG1-B37	10 - 11	7.13	12.3 J	6.40 UJ	---	---	---	---
1560B37008	11/18/92	PPG1-B37	10.70 - 11.60	7.13	9.50 J	6.10 UJ	---	---	---	---
1560B38001	11/19/92	PPG1-B38	1 - 1.80	7.41	13.1 J	5.80 U	---	---	---	---
1560B38003	11/19/92	PPG1-B38	4 - 4.20	7.41	9.88 J	5.60 U	---	---	---	---
1560B38006	11/19/92	PPG1-B38	8 - 8.20	7.41	14.6 J	5.90 U	---	---	---	---
1560B38007	11/19/92	PPG1-B38	10 - 10.60	7.41	8.59 J	7.00 U	---	---	---	---
1560B39001	11/16/92	PPG1-B39	0.50 - 1	7.91	13.0 J	5.50 UJ	---	---	---	---

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% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B39003	11/16/92	PPG1-B39	4 - 5	7.91	9.80 J	5.50 UJ	---	---	---	---
1560B39004	11/16/92	PPG1-B39	8 - 9	7.91	15.0 J	6.10 UJ	---	---	---	---
1560B39005	11/16/92	PPG1-B39	9 - 9.30	7.91	12.0 J	5.60 UJ	---	---	---	---
1560B40001	11/19/92	PPG1-B40	1 - 1.10	7.03	10.0 J	5.70 U	---	---	---	---
1560B40003	11/19/92	PPG1-B40	4 - 4.80	7.03	12.7 J	5.60 U	---	---	---	---
1560B40004	11/19/92	PPG1-B40	4.80 - 5	7.03	12.7 J	6.00 U	---	---	---	---
1560B40007	11/19/92	PPG1-B40	8 - 9	7.03	11.6 J	6.10 U	---	---	---	---
1560B40008	11/19/92	PPG1-B40	10 - 10.90	7.03	11.8 J	6.00 U	---	---	---	---
1560B40009	11/19/92	PPG1-B40	10.90 - 11.70	7.03	7.64 J	6.60 U	---	---	---	---
1560B41001	11/18/92	PPG1-B41	0 - 0.80	8.13	26.0 J	5.90 UJ	---	15000	8.31	2.12
1560B41004	11/18/92	PPG1-B41	4 - 4.60	8.13	19.0 J	6.40 UJ	---	---	9.64	---
1560B41006	11/18/92	PPG1-B41	8 - 8.50	8.13	11.0 J	5.00 UJ	---	---	---	---
1560B41007	11/18/92	PPG1-B41	8.50 - 9.10	8.13	9.41 J	6.60 UJ	---	---	---	---
1560B41107	11/18/92	PPG1-B41	8.50 - 9.10	8.13	9.77 J	5.60 UJ	---	---	---	---
1560B42001	10/29/92	PPG1-B42	0 - 0.50	8.30	38.0 J	5.80 U	---	---	---	---
1560B42002	10/29/92	PPG1-B42	0.50 - 0.90	8.30	15.0 J	5.70 U	---	---	---	---
1560B42004	10/29/92	PPG1-B42	4 - 5	8.30	100 J	5.60 U	---	---	---	---
1560B42007	10/29/92	PPG1-B42	9 - 10	8.30	9.60 J	7.40 U	---	---	---	---
1560B42008	10/29/92	PPG1-B42	11 - 11.50	8.30	40.0 J	6.20 U	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B42009	10/29/92	PPG1-B42	11.50 - 12.10	8.30	7.50 J	5.90 U	---	---	---	---
1560B42010	10/29/92	PPG1-B42	12.10 - 13	8.30	16.0 J	10.6 U	---	---	---	---
1560B42102	10/29/92	PPG1-B42	0.50 - 0.90	8.30	20.0 J	5.40 U	---	---	---	---
1560B43001	11/09/92	PPG1-B43	0.20 - 1.20	8.41	22.2	6.00 U	---	---	---	---
1560B43005	11/09/92	PPG1-B43	4 - 4.90	8.41	81.5	8.00	---	---	---	---
1560B43008	11/09/92	PPG1-B43	8 - 8.50	8.41	11.8	6.00 U	---	---	---	---
1560B43009	11/09/92	PPG1-B43	8.50 - 9.20	8.41	10.2	7.10 U	---	---	---	---
1560B43011	11/09/92	PPG1-B43	12 - 12.70	8.41	11.6	7.40 U	---	---	---	---
1560B43012	11/09/92	PPG1-B43	12.70 - 13	8.41	6.26 J	5.90 U	---	---	---	---
1560B43013	11/09/92	PPG1-B43	13 - 13.40	8.41	28.7	10.2 U	---	---	---	---
1560B44002	11/10/92	PPG1-B44	1 - 1.50	7.77	15.4	5.60 U	---	---	---	---
1560B44004	11/10/92	PPG1-B44	4 - 4.90	7.77	37.2 J	5.80 U	---	36000	7.13	4.88
1560B44006	11/10/92	PPG1-B44	8.60 - 9	7.77	--- R	6.10 U	---	---	7.41	---
1560B44007	11/10/92	PPG1-B44	10 - 11	7.77	9.84	5.30 U	---	---	---	---
1560B44008	11/10/92	PPG1-B44	11 - 11.20	7.77	10.7 J	6.20 U	---	---	---	---
1560B44009	11/10/92	PPG1-B44	12 - 12.30	7.77	18.8 J	6.00 U	---	---	---	---
1560B44102	11/10/92	PPG1-B44	1 - 1.50	7.77	13.6	5.30 U	---	---	---	---
1560B46001	11/23/92	PPG1-B46	0.50 - 1.50	6.61	27.0 J	5.70 U	---	---	8.49	---
1560B46003	11/23/92	PPG1-B46	4 - 4.20	6.61	59.0 J	11.9 J	---	---	7.62	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B46004	11/23/92	PPG1-B46	6 - 7.10	6.61	32.0 J	7.30 U	---	---	10.9	---
1560B46005	11/23/92	PPG1-B46	8 - 8.60	6.61	39.0 J	6.60 U	---	---	---	---
1560B47001	11/20/92	PPG1-B47	0.50 - 1.50	6.38	28.0	5.40 U	---	---	9.23	---
1560B47003	11/20/92	PPG1-B47	4 - 4.80	6.38	20.0 J	5.20	---	---	9.26	---
1560B47005	11/20/92	PPG1-B47	5 - 5.40	6.38	404	26.3 J	---	---	10.1	---
1560B47008	11/20/92	PPG1-B47	12 - 12.40	6.38	478	24.1 J	---	---	9.25	---
1560B47009	11/20/92	PPG1-B47	12.40 - 12.60	6.38	98.0	6.10 U	---	---	10.1	---
1560B48001	11/20/92	PPG1-B48	0 - 0.60	7.14	95.0	6.10 U	---	---	---	---
1560B48004	11/20/92	PPG1-B48	4 - 4.30	7.14	180	12.9 J	---	---	---	---
1560B48005	11/20/92	PPG1-B48	6 - 6.50	7.14	525	40.5 J	---	---	---	---
1560B48006	11/20/92	PPG1-B35	6.50 - 7.50	6.96	78.0	6.90 J	---	---	---	---
1560B48007	11/20/92	PPG1-B48	8 - 8.80	7.14	34.0	6.20	---	---	---	---
1560B48008	11/20/92	PPG1-B48	8.80 - 9.10	7.14	27.0 J	15.5 U	---	---	---	---
1560B48101	11/20/92	PPG1-B48	0 - 0.60	7.14	130	6.30 U	---	---	---	---
1560B49001	11/20/92	PPG1-B49	0 - 0.20	7.19	43.0	6.00 U	---	---	---	---
1560B49002	11/20/92	PPG1-B49	0.20 - 1.20	7.19	180	10.3 J	---	23000	8.28	2.55
1560B49006	11/20/92	PPG1-B49	4 - 5	7.19	39.0	5.90 UJ	---	9300	8.03	2.67
1560B49009	11/20/92	PPG1-B49	8 - 8.30	7.19	15.0 J	6.90 U	---	---	---	---
1560B49010	11/20/92	PPG1-B49	10 - 10.10	7.19	14.0 J	6.90 U	---	---	8.07	---

KEY:
ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B49011	11/20/92	PPG1-B49	12 - 13	7.19	15.0 J	6.50 U	---	---	9.34	---
1560B50001	11/24/92	PPG1-B50	0 - 0.40	9.21	24.6	6.00 U	---	---	---	---
1560B50002	11/24/92	PPG1-B50	0.40 - 1.40	9.21	26.2	5.90 U	---	---	---	---
1560B50005	11/24/92	PPG1-B50	4 - 4.40	9.21	36.7	6.20 U	---	---	---	---
1560B50006	11/24/92	PPG1-B50	4.40 - 4.80	9.21	392	26.6	---	---	---	---
1560B50008	11/24/92	PPG1-B50	8 - 8.60	9.21	52.2	6.10 U	---	---	---	---
1560B50009	11/24/92	PPG1-B50	8.60 - 9.20	9.21	12.5	6.40 U	---	---	---	---
1560B50010	11/24/92	PPG1-B50	12 - 12.90	9.21	38.1	6.30 U	---	---	---	---
1560B50011	11/24/92	PPG1-B50	12.90 - 13.80	9.21	10.8	5.90 U	---	---	---	---
1560B51001	11/24/92	PPG1-B51	0 - 0.70	8.79	17.7	5.90 U	---	---	---	---
1560B51002	11/24/92	PPG1-B51	0.70 - 1.20	8.79	15.6	5.10 UJ	---	---	---	---
1560B51005	11/24/92	PPG1-B51	4 - 4.30	8.79	17.4	5.70 UJ	---	---	---	---
1560B51008	11/24/92	PPG1-B51	8 - 8.10	8.79	24.9	5.90 U	---	---	---	---
1560B51009	11/24/92	PPG1-B51	10 - 10.90	8.79	11.2	6.10 U	---	---	---	---
1560B51010	11/24/92	PPG1-B51	10.90 - 11.90	8.79	19.7	6.60 U	---	---	---	---
1560B52001	12/03/92	PPG1-B52	0 - 0.30	9.24	17.0 J	5.80 UJ	---	---	---	---
1560B52002	12/03/92	PPG1-B52	0.30 - 0.90	9.24	36.4	6.20 U	---	---	---	---
1560B52005	12/03/92	PPG1-B52	4 - 5	9.24	78.2	20.6	---	---	---	---
1560B52008	12/03/92	PPG1-B52	8 - 8.80	9.24	66.1	5.90 U	---	---	---	---

KEY:
ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B52010	12/03/92	PPG1-B52	12 - 12.10	9.24	69.3	5.50 U	---	---	---	---
1560B52011	12/03/92	PPG1-B52	11 - 12	9.24	6.40	6.10	---	---	---	---
1560B53001	11/20/92	PPG1-B53	0.50 - 1.50	7.57	110 J	19.3 J	---	---	8.26	---
1560B54001	11/23/92	PPG1-B54	0.60 - 0.90	7.41	12.0 J	5.40 U	---	---	---	---
1560B54002	11/23/92	PPG1-B54	0.90 - 1.30	7.41	9.80 J	5.70 U	---	---	---	---
1560B54004	11/23/92	PPG1-B54	6 - 7	7.41	17.0 J	6.00 U	---	---	---	---
1560B54005	11/23/92	PPG1-B54	8 - 8.80	7.41	18.0 J	6.50 U	---	---	---	---
1560B55001	12/02/92	PPG1-B55	0.50 - 1.50	8.29	10.0 J	5.30 U	---	---	---	---
1560B55003	12/02/92	PPG1-B55	4 - 4.70	8.29	17.0 J	5.10 U	---	---	---	---
1560B55005	12/02/92	PPG1-B55	8 - 8.50	8.29	40.0 J	6.40 U	---	---	---	---
1560B55006	12/02/92	PPG1-B55	10 - 10.30	8.29	120 J	6.90	---	---	---	---
1560B55007	12/02/92	PPG1-B55	10.30 - 10.70	8.29	220 J	6.80 UJ	---	---	---	---
1560B55008	12/02/92	PPG1-B55	14 - 14.40	8.29	42.0 J	6.40 UJ	---	---	---	---
1560B56001	12/02/92	PPG1-B56	0.50 - 1.50	8.36	8.40 J	5.20 U	---	---	---	---
1560B56002	12/02/92	PPG1-B56	1.50 - 2	8.36	2.90 J	5.10 U	---	---	---	---
1560B56005	12/02/92	PPG1-B56	4 - 4.70	8.36	2410 J	8.10 U	---	---	---	---
1560B56008	12/02/92	PPG1-B56	8 - 8.60	8.36	160 J	6.70 U	---	---	---	---
1560B56009	12/02/92	PPG1-B56	12 - 13	8.36	11.0 J	6.30 U	---	---	---	---
1560B56102	12/02/92	PPG1-B56	1.50 - 2	8.36	3.80	5.30 U	---	---	---	---

KEY:
ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent
J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B57001	12/03/92	PPG1-B57	0 - 0.30	8.85	12.7 J	5.60 U	---	---	---	---
1560B57002	12/03/92	PPG1-B57	0.30 - 1.30	8.85	8.08 J	5.20 U	---	---	---	---
1560B57005	12/03/92	PPG1-B57	8 - 9	8.85	14.1 J	6.50 U	---	---	---	---
1560B57007	12/03/92	PPG1-B57	12 - 12.40	8.85	13.3 J	6.20 U	---	---	---	---
1560B57008	12/03/92	PPG1-B57	12.40 - 12.90	8.85	10.3 J	6.20 U	---	---	---	---
1560B57009	12/03/92	PPG1-B57	12.90 - 13.30	8.85	6.59 J	5.50 UJ	---	---	---	---
1560B58001	11/23/92	PPG1-B58	0 - 0.60	8.58	19.0 J	6.20 U	---	---	7.11	---
1560B58002	11/23/92	PPG1-B58	0.60 - 1.60	8.58	20.0 J	5.60 U	---	---	7.97	---
1560B58003	11/23/92	PPG1-B58	1.60 - 1.80	8.58	853 J	36.4 J	---	---	8.16	---
1560B58006	11/23/92	PPG1-B58	4 - 5	8.58	17.0 J	5.90 U	---	---	7.49	---
1560B58009	11/23/92	PPG1-B58	8 - 8.30	8.58	17.0 J	6.50 U	---	---	8.16	---
1560B58011	11/23/92	PPG1-B58	12 - 13	8.58	14.0 J	6.00 U	---	---	8.18	---
1560B58012	11/23/92	PPG1-B58	13 - 13.40	8.58	13.0 J	5.60 U	---	---	9.19	---
1560B58106	11/23/92	PPG1-B58	4 - 5	8.58	15.0 J	5.40 U	---	---	7.19	---
1560B59001	12/02/92	PPG1-B59	0.50 - 0.80	7.28	22.0	5.30 U	---	---	---	---
1560B59004	12/02/92	PPG1-B59	4 - 4.60	7.28	15.5 J	6.00 U	---	---	11.7	---
1560B59005	12/02/92	PPG1-B59	4.60 - 5.60	7.28	18.4 J	7.30 U	---	---	---	---
1560B59006	12/02/92	PPG1-B59	6 - 6.60	7.28	9.11 J	5.50 U	---	---	---	---
1560B60001	12/07/92	PPG1-B60	0 - 0.30	8.08	20.0	7.40 UJ	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B60002	12/07/92	PPG1-B60	0.30 - 0.50	8.08	19.7	5.40 UJ	---	---	---	---
1560B61001	12/07/92	PPG1-B61	0 - 0.50	7.83	24.6	6.30 UJ	---	---	---	---
1560B61002	12/07/92	PPG1-B61	0.50 - 1.50	7.83	13.8	5.30 UJ	---	---	---	---
1560B62001	01/26/93	PPG1-B62	0.85 - 1.85	10.52	25.0 J	5.30 U	---	---	---	---
1560B62003	01/26/93	PPG1-B62	2 - 3	10.52	10.0 J	5.50 U	---	---	---	---
1560B62004	01/26/93	PPG1-B62	3 - 3.20	10.52	36.0 J	5.70 U	---	---	---	---
1560B62005	01/26/93	PPG1-B62	4 - 4.20	10.52	34.0 J	5.50 U	---	---	---	---
1560B63001	01/26/93	PPG1-B63	0.80 - 1.80	10.52	33.0 J	5.50 U	---	---	---	---
1560B63003	01/26/93	PPG1-B63	2 - 2.30	10.52	20.0 J	5.70 U	---	---	---	---
1560B63004	01/26/93	PPG1-B63	2.30 - 2.60	10.52	4.20 J	5.00 U	---	---	---	---
1560B63005	01/26/93	PPG1-B63	2.60 - 3.30	10.52	14.0 J	5.70 U	---	---	---	---
1560B63006	01/26/93	PPG1-B63	4 - 4.60	10.52	515 J	5.60 U	---	---	---	---
1560B63007	01/26/93	PPG1-B63	4.60 - 4.70	10.52	2090 J	48.4	---	---	---	---
1560B63008	01/26/93	PPG1-B63	4.70 - 5.70	10.52	3860 J	1870	---	---	---	---
1560B63009	01/26/93	PPG1-B63	6 - 7	10.52	3900 J	1140	---	---	---	---
1560B63010	01/26/93	PPG1-B63	7 - 8	10.52	6850 J	2050	---	---	---	---
1560B63011	01/26/93	PPG1-B63	8 - 8.80	10.52	4430 J	1640	---	---	---	---
1560B63012	01/26/93	PPG1-B63	8.80 - 9	10.52	2410 J	220	---	---	---	---
1560B64001	01/27/93	PPG1-B64	1.20 - 1.70	6.86	51.0 J	5.60 UJ	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
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U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560B64002	01/27/93	PPG1-B64	2 - 2.30	6.86	70.0 J	6.10 UJ	---	---	---	---
1560B64003	01/27/93	PPG1-B64	4 - 4.60	6.86	43.0 UJ	6.50 UJ	---	---	---	---
1560B65001	01/27/93	PPG1-B65	2 - 2.40	6.88	30.0 J	6.40 UJ	---	---	---	---
1560B65003	01/27/93	PPG1-B65	4.40 - 5.10	6.88	14.0 J	6.00 UJ	---	---	---	---
1560B65103	01/27/93	PPG1-B65	4.40 - 5.10	6.88	17.0 J	6.20 UJ	---	---	---	---
1560B66001	01/27/93	PPG1-B66	1 - 2	10.56	8.50 J	5.50 UJ	---	---	---	---
1560B66002	01/27/93	PPG1-B66	2 - 3	10.56	13.0 J	5.40 UJ	---	---	---	---
1560B66005	01/27/93	PPG1-B66	4.70 - 4.80	10.56	2160 J	96.3 J	---	---	---	---
1560B66006	01/27/93	PPG1-B66	4.80 - 5.40	10.56	5320 J	2350 J	---	---	---	---
1560B66007	01/27/93	PPG1-B66	6 - 6.80	10.56	1100 J	277 J	---	---	---	---
1560B66008	01/27/93	PPG1-B66	8 - 8.70	10.56	360 J	5.70 UJ	---	---	---	---
1560B66102	01/27/93	PPG1-B66	2 - 3	10.56	13.0 J	5.40 UJ	---	---	---	---
1560B67001	01/27/93	PPG1-B67	0 - 1	0.00	388 J	6.00 UJ	---	---	---	---
1560B68001	02/25/93	PPG1-B68	1.30 - 1.70	9.94	12.6	5.30	---	---	---	---
1560B68002	02/25/93	PPG1-B68	2 - 3	9.94	6.00	5.60 U	---	---	---	---
1560B68004	02/25/93	PPG1-B68	4 - 5	9.94	8.49	6.00 UJ	---	---	---	---
1560B68006	02/25/93	PPG1-B68	6 - 7	9.94	17.8	18.0 UJ	---	---	---	---
1560M01001	12/09/92	PPG1-M01	0.50 - 1.50	7.56	13.3	5.30 UJ	---	---	---	---
1560M01003	12/09/92	PPG1-M01	4 - 5	7.56	15.7	5.40 UJ	---	---	---	---

KEY:
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J = Estimated value
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U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560M01007	12/09/92	PPG1-M01	8 - 10	7.56	133	7.00 UJ	---	---	---	---
1560M01008	12/09/92	PPG1-M01	12 - 13	7.56	10.0	6.00 UJ	---	---	---	---
1560M02001	12/08/92	PPG1-M02	0.10 - 0.40	9.47	16.2 J	5.50 UJ	---	---	---	---
1560M02004	12/08/92	PPG1-M02	4 - 4.20	9.47	2450 J	38.0 J	---	---	---	---
1560M02005	12/08/92	PPG1-M02	4.20 - 5.20	9.47	8310 J	1410 J	---	---	---	---
1560M02008	12/08/92	PPG1-M02	8 - 9	9.47	4570 J	2270 J	---	---	---	---
1560M02010	12/08/92	PPG1-M02	12 - 12.40	9.47	22.0 J	5.80 UJ	---	---	---	---
1560M02011	12/08/92	PPG1-M02	12.40 - 13.40	9.47	11.0 J	6.20 UJ	---	---	---	---
1560M02013	12/08/92	PPG1-M02	16 - 17	9.47	42.0 J	6.00 UJ	---	---	---	---
1560M02105	12/08/92	PPG1-M02	4.20 - 5.20	9.47	5780 J	1980 J	---	---	---	---
1560M03003	12/09/92	PPG1-M03	6 - 6.50	7.05	12.7	6.40 UJ	---	---	---	---
1560M04003	12/08/92	PPG1-M04	10 - 10.30	8.67	8.50 J	7.10 UJ	---	---	---	---
1560M04004	12/08/92	PPG1-M04	10.30 - 11.30	8.67	9.76 J	5.90 UJ	---	---	---	---
1560M04005	12/08/92	PPG1-M04	14 - 15	8.67	11.4 J	6.00 UJ	---	---	---	---
1560M04006	12/08/92	PPG1-M04	15.40 - 15.90	8.67	17.0 J	9.30 UJ	---	---	---	---
1560M05002	12/10/92	PPG1-M05	8 - 8.40	8.20	4720	26.0	---	---	---	---
1560M05003	12/10/92	PPG1-M05	8.40 - 9	8.20	128	5.90 U	---	---	---	---
1560M05005	12/10/92	PPG1-M05	12 - 12.50	8.20	12.6	6.00 U	---	---	---	---
1560T01001	12/15/92	PPG1-T01	1.20 - 1.20	0.00	8.70	5.60 UJ	---	---	---	---

KEY: ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
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J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE A-1 (CONT)
CHROMIUM, TOC, pH, AND CEC FOR SOIL SAMPLES
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER	SAMPLE DATE	LOCATION	SPLIT-SPOON INTERVAL (ft)	GS ELEVATION (ft/msl)	TOTAL CHROMIUM (mg/kg)	HEXAVALENT CHROMIUM (mg/kg)	CHEMICAL OXYGEN DEMAND (mg/kg)	TOTAL ORGANIC CARBON (mg/kg)	pH	CATION EXCHANGE CAPACITY (%)
1560T01002	12/15/92	PPG1-T02	2.50 - 2.50	0.00	28.0	6.60 UJ	---	---	---	---
1560T01003	12/15/92	PPG1-T01	3.10 - 3.10	0.00	6.30	6.60 UJ	---	---	---	---
1560T02001	03/30/93	PPG1-T02	2.90 - 2.90	0.00	924 J	38.1	---	---	---	---
1560T02002	03/30/93	PPG1-T02	1.40 - 1.40	0.00	38.5 J	17.4	---	---	---	---
1560T02101	03/30/93	PPG1-T02	2.90 - 2.90	0.00	1520 J	5.50 U	---	---	---	---
1560T03001	03/30/93	PPG1-T02	3 - 3	0.00	72.8 J	28.1 J	---	---	---	---
1560T03002	03/30/93	PPG1-T03	1.50 - 1.50	0.00	35.4 J	6.00 U	---	---	---	---
1560T04001	04/07/93	PPG1-T04	2 - 2	0.00	23.5	6.10 U	---	---	---	---
1560T04002	04/07/93	PPG1-T04	1.50 - 1.50	0.00	13.5	6.30 U	---	---	---	---
1560T04003	04/07/93	PPG1-T04	0.80 - 0.80	0.00	59.9	5.80 U	---	---	---	---

KEY:
ft = Feet
ft-msl = Feet above mean sea level
mg/kg = milligrams per kilogram
% = percent

J = Estimated value
--- R = Rejected
U = Analyzed but not detected
--- = Not analyzed

TABLE B-1
FIRST ROUND GROUND WATER QUALITY DATA
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER SAMPLE LOCATION SAMPLE DATE	1560G00901 FIELD BLNK 01/05/93		1560G01001 PPG1-MW1 01/05/93		1560G02001 PPG1-MW2 01/06/93		1560G02101 PPG1-MW2 01/06/93		1560G03001 PPG1-MW3 01/06/93	
(ug/l)										
Aluminum	31.4	J	8650	J	2780	J	3070	J	286	J
Antimony	3.00	UJ	24.0	UJ	24.0	UJ	24300	UJ	24.0	UJ
Arsenic	9.60	UJ	8.30	J	69.7	J	1.00	J	7.60	J
Barium	12.1	U	256		133	J	2.00	J	163	J
Beryllium	34.3	U	3.20	J	1.60	J	1.40	J	1.00	U
Cadmium	1.70	UJ	4.00	U	4.00	U	4.00	U	4.00	U
Calcium	1420	J	73900		12300		12200		284000	
Chloride (mg/l)	1.00	U	55.6		302		295		189	
Chromium, Hexavalent	25.0	UJ	25.0	UJ	433	J	476	J	25.0	UJ
Chromium, Total	3.00	J	89.8		1160		1630		4.40	J
Cobalt	9.60	J	24.0	J	4.90	J	4.00	U	4.00	U
Copper	12.1	J	14.1	J	20.5	J	16.8	J	11.4	J
Iron	34.3	J	26500	J	2790	J	3050	J	13800	
Lead	1.70	J	913	J	103	J	120	J	2.70	J
Magnesium	22.0	U	12500		3490	J	4770	J	70900	
Manganese	5.30	J	1730		110	J	123	J	2910	
Mercury	0.10	U	0.73		0.29		0.33		0.10	U
Nickel	5.00	UJ	26.0	J	19.3	J	16.2	J	5.00	UJ
Potassium	517	J	8290	J	24800	J	24300	J	19600	J
Selenium	1.00	UJ	1.00	UJ	2.10	J	1.00	UJ	2.00	U
Silver	---	R	---	R	---	R	---	R	---	R
Sodium	229	J	57700		1340000		1250000		115000	
Thallium	3.00	U	3.00	U	3.00	U	3.00	U	3.00	UJ
Vanadium	4.00	J	86.0		301		285		7.10	J
Zinc	167		689		71.6		64.5		352	
pH (std)	---		9.69		10.3		10.3		6.52	
Redox Potential (mV)	---		249		-1736		-1736		-932	
Specific Conductivity (umhos/cm)	---		547		3700		3700		2626	
Temperature (oC)	---		11.3		13.7		13.7		11.0	
Total dissolved solids (mg/l)	74.0		350		3100		3500		4600	
Total suspended solids (mg/l)	2.00		3500		120		160		46.0	

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--- = Not analyzed
B = Analyte detected in blank

ug/l = micrograms/liter
umhos/cm = micromhos per centimeter
oC = degrees Celcius
mV = millivolts
std = standard units

mg/l = micrograms/liter

TABLE B-1(CON'T)
FIRST ROUND GROUND WATER QUALITY DATA
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER SAMPLE LOCATION SAMPLE DATE	1560G04001 PPG1-MW4 01/05/93		1560G05001 PPG1-MW5 01/05/93	
(ug/l)				
Aluminum	168	J	312	J
Antimony	24.0	UJ	24.0	UJ
Arsenic	2.40	J	4.20	J
Barium	173	J	24.0	J
Beryllium	1.00	U	1.00	U
Cadmium	4.00	U	4.00	U
Calcium	208000		47200	
Chloride (mg/l)	346		29.6	
Chromium, Hexavalent	25.0	UJ	25.0	UJ
Chromium, Total	5.80	J	7.50	J
Cobalt	11.8	J	4.00	U
Copper	18.5	J	14.4	J
Iron	14300	J	875	J
Lead	10.4	J	10.3	J
Magnesium	51100		10000	
Manganese	1040		278	
Mercury	0.10	U	0.10	U
Nickel	5.00	UJ	5.00	UJ
Potassium	5980	J	3830	J
Selenium	5.00	UJ	1.00	U
Silver	---	R	---	R
Sodium	304000		26300	
Thallium	15.0	UJ	3.00	U
Vanadium	3.00	J	4.40	J
Zinc	6.10	J	254	
pH (std)	7.23		8.90	
Redox Potential (mV)	-112		250	
Specific Conductivity (umhos/cm)	2719		485	
Temperature (oC)	12.8		13.2	
Total dissolved solids (mg/l)	1500		230	
Total suspended solids (mg/l)	91.0		45.0	

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ug/l = micrograms/liter
umhos/cm = micromhos per centimeter
oC = degrees Celcius
mV = millivolts
std = standard units

mg/l = micrograms/liter

TABLE B-1(CON'T)
FIRST ROUND GROUND WATER QUALITY DATA
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER SAMPLE LOCATION SAMPLE DATE	1560G01001 PPG1-MW1 01/05/93		1560G02001 PPG1-MW2 01/06/93		1560G02101 PPG1-MW2 01/06/93		1560G03001 PPG1-MW3 01/06/93		1560G04001 PPG1-MW4 01/05/93	
(ug/l)										
Aluminum (filtered)	97.4	J	3270	J	3160	J	12.6	J	12.0	UJ
Antimony (filtered)	24.0	UJ	24.0	UJ	24.0	UJ	24.0	UJ	24.0	UJ
Arsenic (filtered)	9.30	J	63.9	J	53.4	J	6.20	J	2.20	J
Barium (filtered)	11.6	J	137	J	131	J	148	J	156	J
Beryllium (filtered)	1.00	UJ	1.70	J	1.50	J	1.00	U	1.00	U
Cadmium (filtered)	4.00	UJ	4.00	UJ	4.30	J	4.00	U	4.00	U
Calcium (filtered)	33100	J	14700		11400		278000		216000	
Chloride (filtered) (mg/l)	---		---		---		---		---	
Chromium, Hexavalent (filtered)	25.0	U	251	J	252	J	25.0	UJ	25.0	U
Chromium, Total (filtered)	4.40	J	1070		1220		2.00	J	2.00	U
Cobalt (filtered)	7.70	J	4.20	J	4.00	U	4.00	U	2.00	U
Copper (filtered)	10.4	J	16.8	J	17.1	J	12.1	J	5.00	J
Iron (filtered)	51.6	J	2960	J	2860	J	11600	J	12.4	J
Lead (filtered)	4.40		158	J	93.6	J	1.10	J	7520	J
Magnesium (filtered)	5550	J	4170	J	4010	J	68800		1.10	J
Manganese (filtered)	12.2	J	94.4	J	91.4	J	2790		46200	
Mercury (filtered)	0.10	U	0.27		0.24		0.10	U	1110	
Nickel (filtered)	5.00	J	10.5	J	7.50	J	5.00	UJ	0.10	U
Potassium (filtered)	5980	J	24600	J	22600	J	19200	J	---	
Selenium (filtered)	1.60	J	1.00	UJ	1.50	J	5.00	UJ	19200	J
Silver (filtered)	---	R	---	R	---	R	---	R	2.00	U
Sodium (filtered)	43600	J	1290000		1110000		115000		---	R
Thallium (filtered)	3.00	UJ	3.00	U	3.00	U	3.00	UJ	248000	
Vanadium (filtered)	11.4	J	287		254		3.40	J	3.00	UJ
Zinc (filtered)	238	J	328		64.4		13.6	J	2.00	U
									13.6	J

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ug/l = micrograms/liter
umhos/cm = micromhos per centimeter
oC = degrees Celcius
mV = millivolts
std = standard units

mg/l = micrograms/liter

TABLE B-1(CON'T)
FIRST ROUND GROUND WATER QUALITY DATA
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER SAMPLE LOCATION SAMPLE DATE	1560G05001 PPG1-MW5 01/05/93	
(ug/l)		
Aluminum (filtered)	63.4	J
Antimony (filtered)	24.0	UJ
Arsenic (filtered)	2.70	J
Barium (filtered)	18.3	J
Beryllium (filtered)	1.00	U
Cadmium (filtered)	4.00	U
Calcium (filtered)	47000	
Chloride (filtered) (mg/l)	---	
Chromium, Hexavalent (filtered)	25.0	U
Chromium, Total (filtered)	2.00	U
Cobalt (filtered)	4.00	U
Copper (filtered)	9.70	J
Iron (filtered)	126	J
Lead (filtered)	1.80	J
Magnesium (filtered)	9690	
Manganese (filtered)	252	
Mercury (filtered)	0.10	U
Nickel (filtered)	5.00	UJ
Potassium (filtered)	3720	J
Selenium (filtered)	1.00	UJ
Silver (filtered)	---	R
Sodium (filtered)	27000	
Thallium (filtered)	3.00	U
Vanadium (filtered)	2.00	U
Zinc (filtered)	271	

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umhos/cm = micromhos per centimeter
oC = degrees Celcius
mV = millivolts
std = standard units

mg/l = micrograms/liter

TABLE B-2
SECOND ROUND GROUND WATER QUALITY DATA
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER SAMPLE LOCATION SAMPLE DATE	1560G00902 FIELD BLNK 01/06/93		1560G01002 PPG1-MW1 07/19/93		1560G02002 PPG1-MW2 07/20/93		1560G02102 PPG1-MW2 07/20/93		1560G03002 PPG1-MW3 07/20/93	
(ug/l)										
Aluminum	42.0	J	3360		11900		12500		1910	
Antimony	24.0	UJ	30.6	U	30.6	U	30.6	U	30.6	U
Arsenic	1.00	UJ	7.60	J	69.8		66.7		7.70	J
Barium	1.00	U	151	J	121	J	129	J	178	J
Beryllium	1.00	UJ	0.33	J	2.10	J	2.20	J	0.53	J
Cadmium	4.00	UJ	2.80	U	2.80	U	2.80	U	2.80	U
Calcium	1680	J	74400		22000	J	22300	J	358000	
Chloride (mg/l)	1.00	U	---		---		---		---	
Chromium, Hexavalent	25.0	UJ	25.0	U	25.0	UJ	25.0	UJ	25.0	UJ
Chromium, Total	2.00	U	24.6		1360		1430		5.50	J
Cobalt	4.00	U	6.30	J	6.30	J	8.00	J	18.3	J
Copper	9.10	J	28.7		42.3		49.9		12.4	J
Iron	103	J	5470	J	14600	J	15500	J	55300	J
Lead	2.60	J	183		97.7		115		---	R
Magnesium	27.2	J	16300		5930		6910		80000	
Manganese	10.5	J	291	J	138	J	155	J	3180	J
Mercury	0.10	U	0.20		0.16	J	0.28		0.10	U
Nickel	5.00	UJ	13.3	J	38.8	J	41.1		8.80	J
Potassium	394	J	11400	J	34100	J	33200	J	22300	J
Selenium	1.00	UJ	2.80	UJ	2.80	UJ	3.20	J	2.80	UJ
Silver	---	R	2.60	U	2.60	U	2.70	J	2.60	U
Sodium	201	J	90300		1860000		1750000		181000	
Thallium	3.00	U	3.40	U	3.40	UJ	3.40	U	3.40	UJ
Vanadium	2.00	U	15.0	J	469		458		8.30	J
Zinc	179		---	R	---	R	---	R	---	R
pH (std)	---		7.62		9.22		9.25		6.50	
Redox Potential (mV)	---		---		---		---		---	
Specific Conductivity (umhos/cm)	---		---		---		---		---	
Temperature (oC)	---		19.0		17.0		17.0		17.0	
Total dissolved solids (mg/l)	16.0		857		4210		4590		1820	
Total suspended solids (mg/l)	2.00		154		32.0		40.0		100	

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ug/l = micrograms/liter
umhos/cm = micromhos per centimeter
oC = degrees Celcius
mV = millivolts
std = standard units

mg/l = micrograms/liter

TABLE B-2(CON'T)
SECOND ROUND GROUND WATER QUALITY DATA
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER SAMPLE LOCATION SAMPLE DATE	1560G04002 PPG1-MW4 07/20/93		1560G05002 PPG1-MW5 07/19/93	
(ug/l)				
Aluminum	2020		3960	
Antimony	30.6	U	30.6	U
Arsenic	7.90	J	3.50	UJ
Barium	282		59.3	J
Beryllium	0.42	J	0.30	U
Cadmium	2.80	U	2.80	U
Calcium	223000		71700	
Chloride (mg/l)	1.00	U	---	
Chromium, Hexavalent	25.0	UJ	25.0	U
Chromium, Total	5.50	J	49.9	
Cobalt	4.10	U	6.50	J
Copper	14.0	J	37.3	
Iron	43800	J	5920	J
Lead	---	R	39.8	J
Magnesium	95600		13400	
Manganese	1420	J	527	J
Mercury	0.10	U	0.10	U
Nickel	8.20	J	6.40	U
Potassium	46400	J	5290	J
Selenium	2.80	UJ	2.80	UJ
Silver	2.60	U	2.60	U
Sodium	880000		31600	
Thallium	3.40	UJ	3.40	UJ
Vanadium	6.20	J	11.6	J
Zinc	---	R	---	R
pH (std)	6.54		7.15	
Redox Potential (mV)	---		---	
Specific Conductivity (umhos/cm)	---		---	
Temperature (oC)	17.0		19.0	
Total dissolved solids (mg/l)	3030		312	
Total suspended solids (mg/l)	59.0		282	

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ug/l = micrograms/liter
umhos/cm = micromhos per centimeter
oC = degrees Celcius
mV = millivolts
[illegible] = standard units

mg/l = micrograms/liter

TABLE B-2(CON'T)
SECOND ROUND GROUND WATER QUALITY DATA
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER SAMPLE LOCATION SAMPLE DATE	1560G01002 PPG1-MW1 07/19/93		1560G02002 PPG1-MW2 07/20/93		1560G02102 PPG1-MW2 07/20/93		1560G03002 PPG1-MW3 07/20/93		1560G04002 PPG1-MW4 07/20/93	
(ug/l)										
Aluminum (filtered)	712	J	12800	J	7770	J	1580	J	1280	J
Antimony (filtered)	30.6	U	30.6	U	30.6	U	30.6	U	30.6	U
Arsenic (filtered)	8.50	J	76.8		69.6		5.70	J	6.80	J
Barium (filtered)	80.6	J	121	J	103	J	160	J	280	
Beryllium (filtered)	0.30	U	2.40	J	2.20	J	0.42	J	0.73	J
Cadmium (filtered)	2.80	U	2.80	U	2.80	U	2.80	U	2.80	U
Calcium (filtered)	72100		20500	J	21100	J	341000		222000	
Chloride (filtered) (mg/l)	---		---		---		---		---	
Chromium, Hexavalent (filtered)	25.0	U	25.0	UJ	25.0	UJ	25.0	UJ	25.0	UJ
Chromium, Total (filtered)	4.60	J	1460		1200		3.60	J	3.40	U
Cobalt (filtered)	4.50	J	10.6	J	8.10	J	4.10	U	4.10	U
Copper (filtered)	5.70	J	39.1		33.6		9.20	J	14.3	J
Iron (filtered)	508	J	14500	J	11000	J	20000	J	42800	J
Lead (filtered)	---	R	56.0	J	52.2	J	---	R	---	R
Magnesium (filtered)	13700		5690		5170		78200		113000	
Manganese (filtered)	168	J	126	J	103	J	3100	J	1390	J
Mercury (filtered)	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U
Nickel (filtered)	6.40	U	52.6		36.0	J	6.40	U	6.40	U
Potassium (filtered)	9190	J	37100	J	36000	J	22000	J	49500	J
Selenium (filtered)	4.00	J	3.40	J	2.80	UJ	2.80	UJ	2.80	UJ
Silver (filtered)	2.60	U	2.60	U	2.60	U	2.60	U	2.60	U
Sodium (filtered)	67300		2140000		2180000		170000		961000	
Thallium (filtered)	5.10	J	3.40	UJ	3.40	UJ	3.40	UJ	3.40	UJ
Vanadium (filtered)	2.90	J	536		537		4.20	J	4.90	J
Zinc (filtered)	---	R	---	R	---	R	---	R	---	R

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ug/l = micrograms/liter
umhos/cm = micromhos per centimeter
oC = degrees Celcius
mV = millivolts
std = standard units

mg/l = micrograms/liter

TABLE B-2(CON'T)
SECOND ROUND GROUND WATER QUALITY DATA
GROUP 1 - SITE 156
PPG NON-RESIDENTIAL CHROMIUM REMEDIATION

SAMPLE NUMBER SAMPLE LOCATION SAMPLE DATE	1560G05002 PPG1-MW5 07/19/93	
(ug/l)		
Aluminum (filtered)	---	R
Antimony (filtered)	30.6	U
Arsenic (filtered)	6.30	J
Barium (filtered)	34.4	J
Beryllium (filtered)	0.30	U
Cadmium (filtered)	2.80	U
Calcium (filtered)	66100	J
Chloride (filtered) (mg/l)	---	
Chromium, Hexavalent (filtered)	25.0	U
Chromium, Total (filtered)	3.90	J
Cobalt (filtered)	4.50	J
Copper (filtered)	---	R
Iron (filtered)	151	J
Lead (filtered)	---	R
Magnesium (filtered)	11900	
Manganese (filtered)	415	J
Mercury (filtered)	0.10	U
Nickel (filtered)	6.40	U
Potassium (filtered)	5010	J
Selenium (filtered)	3.90	J
Silver (filtered)	2.60	U
Sodium (filtered)	32000	
Thallium (filtered)	6.40	J
Vanadium (filtered)	2.20	U
Zinc (filtered)	---	R

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--- = Not analyzed
B = Analyte detected in blank

ug/l = micrograms/liter
umhos/cm = micromhos per centimeter
oC = degrees Celcius
mV = millivolts
std = standard units

mg/l = micrograms/liter

APPENDIX B

LANGAN SOIL SAMPLE RESULTS – CHROMIUM PARAMETERS

TABLE 2

LANGAN SOIL SAMPLE RESULTS - CHROMIUM PARAMETERS
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

			Sample Depth (ft-bgs)				NJDEP 1999 REVISED SOIL CLEANUP CRITERIA - Cr (III)			NJDEP 1999 REVISED SOIL CLEANUP CRITERIA - Cr (VI)		
							DIRECT CONTACT		Impact to GW (mg/kg)	DIRECT CONTACT [c]		Impact to GW (mg/kg)
Sample	Geologic Unit	Ground Elevation (ft-MSL)	Top (ft)	Bottom (ft)	Total Chromium (mg/kg)	Hexavalent Chromium (mg/kg)	Residential (mg/kg)	Non-Residential (mg/kg)		Residential (mg/kg)	Non-Residential (mg/kg) [d]	
MetroVest Equities Soil Sample Data												
LB1 #003		7.19	1.5	2	25.8	ND	120,000	(a)	(b)	240	20	(e)
LB2 #002		7.14	1.5	2	66.1	ND	120,000	(a)	(b)	240	20	(e)
LB3 #004		7.38	1.5	2	16.4	ND	120,000	(a)	(b)	240	20	(e)
LB3 #005		7.38	6	6.5	NA	▨ 32.5	120,000	(a)	(b)	240	20	(e)
LB3 #006		7.38	21.5	22	NA	ND	120,000	(a)	(b)	240	20	(e)
LB4 #009		7.56	3	3.5	36.2	ND	120,000	(a)	(b)	240	20	(e)
LB4 #008		7.56	6	6.5	NA	2.6	120,000	(a)	(b)	240	20	(e)
LB4 #010		7.56	16	16.5	NA	ND	120,000	(a)	(b)	240	20	(e)
LB5 #015	SAND	8.84	3.5	4	5240	▨ 105	120,000	(a)	(b)	240	20	(e)
LB5 #016		8.84	9.5	10	NA	ND	120,000	(a)	(b)	240	20	(e)
LB5 #017		8.84	21	21.5	NA	ND	120,000	(a)	(b)	240	20	(e)
LB6 #011	SAND	8.25	1.5	2	28.4	NA	120,000	(a)	(b)	240	20	(e)
LB6 #012		8.25	8	8.5	NA	12.2	120,000	(a)	(b)	240	20	(e)
LB6 #013		8.25	26	26.5	NA	ND	120,000	(a)	(b)	240	20	(e)
LB7 #022		8.88	11	11.5	10.6	ND	120,000	(a)	(b)	240	20	(e)
DUP1 #023		8.88	11	11.5	12.8	ND	120,000	(a)	(b)	240	20	(e)
LB8 #024		7.53	3	3.5	21.9	ND	120,000	(a)	(b)	240	20	(e)
DUP2 #025		7.53	3	3.5	16.6	ND	120,000	(a)	(b)	240	20	(e)
LB9 #020		7.32	9	9.5	41.9	ND	120,000	(a)	(b)	240	20	(e)
LB10 #018		7.32	4	4.5	14.8	ND	120,000	(a)	(b)	240	20	(e)
LB11 #026		7.28	3	3.5	14.5	ND	120,000	(a)	(b)	240	20	(e)
LB12 #021		7.83	3.5	4	22.6	ND	120,000	(a)	(b)	240	20	(e)
LB13 (1-1.5)		8.88	1	1.5	13.3	ND	120,000	(a)	(b)	240	20	(e)
LB13 (3.5-4)		8.88	3.5	4	22.1	ND	120,000	(a)	(b)	240	20	(e)
LB13 (5-5.5)		8.88	5	5.5	16.5	ND	120,000	(a)	(b)	240	20	(e)
LB13 (7.5-8)		8.88	7.5	8	16.4	5.7	120,000	(a)	(b)	240	20	(e)
LB14 (1-1.5)		8.88	1	1.5	11.4	ND	120,000	(a)	(b)	240	20	(e)
LB14 (3.5-4)		8.88	3.5	4	21.9	ND	120,000	(a)	(b)	240	20	(e)
LB14 (5-5.5)		8.88	5	5.5	13.8	ND	120,000	(a)	(b)	240	20	(e)
LB14 (7.5-8)		8.88	7.5	8	11.1	ND	120,000	(a)	(b)	240	20	(e)
LB15 (1-1.5)		7.53	1	1.5	16.8	ND	120,000	(a)	(b)	240	20	(e)
LB15 (3.5-4)		7.53	3.5	4	19.3	ND	120,000	(a)	(b)	240	20	(e)
LB15 (5-5.5)		7.53	5	5.5	24.5	2.3	120,000	(a)	(b)	240	20	(e)
LB15 (7.5-8)		7.53	7.5	8	24.6	ND	120,000	(a)	(b)	240	20	(e)
LB16 (1-1.5)		6.88	1	1.5	18.3	ND	120,000	(a)	(b)	240	20	(e)
LB16 (3.5-4)		6.88	3.5	4	16.1	ND	120,000	(a)	(b)	240	20	(e)
LB16 (5-5.5)		6.88	5	5.5	44.8	ND	120,000	(a)	(b)	240	20	(e)
LB16 (7.5-8)		6.88	7.5	8	31.1	ND	120,000	(a)	(b)	240	20	(e)
LB17 (4.5-5)		10.56	4.5	5	300	18.4	120,000	(a)	(b)	240	20	(e)
LB17 (5-5.5)		10.56	5	5.5	193	6.6	120,000	(a)	(b)	240	20	(e)
LB17 (6-6.5)		10.56	6	6.5	241	▨ 28.8	120,000	(a)	(b)	240	20	(e)
LB17 (7.5-8)		10.56	7.5	8	234	3.9	120,000	(a)	(b)	240	20	(e)
LB18 (4.5-5)		10.56	4.5	5	434	12.5	120,000	(a)	(b)	240	20	(e)
LB18 (5-5.5)		10.56	5	5.5	398	5.6	120,000	(a)	(b)	240	20	(e)
LB18 (6-6.5)		10.56	6	6.5	834	5.5	120,000	(a)	(b)	240	20	(e)
LB18 (7.5-8)		10.56	7.5	8	119	ND	120,000	(a)	(b)	240	20	(e)
LB19 (4.5-5)		8.26	4.5	5	2600	▨ 27.4	120,000	(a)	(b)	240	20	(e)
LB19 (5-5.5)		8.26	5	5.5	307	▨ 22.7	120,000	(a)	(b)	240	20	(e)
LB19 (6-6.5)		8.26	6	6.5	10500	16.6	120,000	(a)	(b)	240	20	(e)
LB19 (7.5-8)		8.26	7.5	8	7150	▨ 1930	120,000	(a)	(b)	240	20	(e)
LB20 (2-2.5)		7.89	2	2.5	12.5	ND	120,000	(a)	(b)	240	20	(e)
LB20 (2.5-3)		7.89	2.5	3	9.1	ND	120,000	(a)	(b)	240	20	(e)
LB20 (3.5-4)		7.89	3.5	4	16	ND	120,000	(a)	(b)	240	20	(e)
LB20 (5-5.5)		7.89	5	5.5	20.4	ND	120,000	(a)	(b)	240	20	(e)
DB-1 (1.5-2)		7.53	1.5	2	14.2	0.37	120,000	(a)	(b)	240	20	(e)
DB-1 (4-4.5)		7.53	4	4.5	14.3	1.3	120,000	(a)	(b)	240	20	(e)
DB-1 (8-8.5)		7.53	8	8.5	25.9	ND	120,000	(a)	(b)	240	20	(e)
DB-1 (10.5-11)		7.53	10.5	11	23.6	0.44	120,000	(a)	(b)	240	20	(e)
DB-2 (1.5-2)		10.56	1.5	2	58.7	1.6	120,000	(a)	(b)	240	20	(e)
DB-2 (3.5-4)		10.56	3.5	4	26.5	2.2	120,000	(a)	(b)	240	20	(e)
DB-2 (6-6.5)		10.56	6	6.5	46.7	ND	120,000	(a)	(b)	240	20	(e)
DB-3 (1.5-2)		8.26	1.5	2	161	6.2	120,000	(a)	(b)	240	20	(e)
DB-3 (4.5-5)		8.26	4.5	5	169	ND	120,000	(a)	(b)	240	20	(e)
DB-3 (5-5.5)		8.26	5	5.5	121	ND	120,000	(a)	(b)	240	20	(e)
DB-3 (7.5-8)		8.26	7.5	8	855	▨ 29.8	120,000	(a)	(b)	240	20	(e)
DB-3 (10.5-11)		8.26	10.5	11	1270	3.3	120,000	(a)	(b)	240	20	(e)

▨ = Exceedance of Non-Residential Soil Cleanup Criteria.

☐ = Exceedance of Residential Soil Cleanup Criteria.

(a) No Soil Cleanup Criteria exist for the non-residential scenario.
(b) No Impact to Groundwater Soil Cleanup Criteria since trivalent chromium is insoluble in water.
(c) Alergic Contact Dermatitis Soil Cleanup Criteria are being developed for the residential and non-residential scenarios.
(d) Soil Cleanup Criterion for the non-residential scenario are preliminary.
(e) Soil Cleanup Criteria for the Impact to Groundwater Scenario are site specific.
bgs = below ground surface
GW = Ground Water
mg/kg = milligrams per kilogram
MSL = Mean Sea Level
R = Indicates rejected value

APPENDIX C

LANGAN SOIL SAMPLE RESULTS – NON-CHROMIUM PARAMETERS

TABLE 3

PPG SOIL SAMPLE RESULTS - NON-CHROMIUM PARAMETERS
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

Sample Location					B-8	B-8	B-16	B-24
Sample Depth (ft.)					8.0-8.5	10.0-11.0	6.0-7.0	7.3-7.6
Sample Elevation (MSL, ft)	NJDEP 1999 REVISED				0.24*-0.26	2.74*-1.74*	0.05*-0.95	1.29-1.59
Sample Number	SOIL CLEANUP CRITERIA				005	006	004	007
Matrix	DIRECT CONTACT.		IMPACT		Soil	Soil	Soil	Soil
Sampling Date	RESIDENT.	NON-RES.	TO G.W.	Units	10/29/1992	10/29/1992	11/10/1992	11/06/92
Parameters					Q	Q	Q	Q
VOLATILE ORGANIC COMPOUNDS (VOCs)								
Acetone	1000	1000	100	mg/kg	R	NA	R	0.363 JB
2-Butanone	1000	1000	50	mg/kg	ND	NA	ND	0.0234 J
Ethylbenzene	1000	1000	100	mg/kg	0.0229 J	NA	ND	ND
Methylene Chloride	49	210	1	mg/kg	R	NA	R	0.504 JB
Toluene	1000	1000	500	mg/kg	ND	NA	0.006 J	ND
Trichloroethylene	23	54	1	mg/kg	0.0219 J	NA	ND	0.0109 J
Xylene (total)	410	1000	67	mg/kg	0.116 J	NA	ND	ND
Total VOCs	*1000*	*1000*	–	*mg/kg*	*0.1608*	*NA*	*0.006*	*0.5149*
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)								
1,2,4-Trichlorobenzene	68	1200	100	mg/kg	NA	0.096 J	ND	ND
1,2-Dichlorobenzene	5100	10000	50	mg/kg	NA	0.32 J	ND	ND
1,3-Dichlorobenzene	5100	10000	100	mg/kg	NA	0.19 J	ND	ND
1,4-Dichlorobenzene	570	10000	100	mg/kg	NA	0.31 J	ND	ND
Acenaphthene	3400	10000	100	mg/kg	NA	0.18 J	11 J	1.2 J
Acenaphthylene	—	—	—	mg/kg	NA	ND	ND	ND
Anthracene	10000	10000	100	mg/kg	NA	0.11 J	34 J	2.2 J
Benzo(a)anthracene	0.9	4	500	mg/kg	NA	ND	**110 J**	**4.1 J**
Benzo(a)pyrene	0.66	0.66	100	mg/kg	NA	ND	**110 J**	ND
Benzo(b)fluoranthene	0.9	4	50	mg/kg	NA	ND	**170 J**	ND
Benzo(g,h,i)perylene	—	—	—	mg/kg	NA	ND	78 J	ND
Benzo(k)fluoranthene	0.9	4	500	mg/kg	NA	ND	ND	ND
Carbazole	—	—	—	mg/kg	NA	ND	ND	ND
Chrysene	9	40	500	mg/kg	NA	ND	**120 J**	3.7 J
di-n-butylphthalate	5700	10000	100	mg/kg	NA	0.27 J	ND	ND
Dibenzo(a,h)anthracene	0.66	0.66	100	mg/kg	NA	ND	ND	ND
Dibenzofuran	—	—	—	mg/kg	NA	0.16 J	ND	ND
bis(2-Ethylhexyl)phthalate	49	210	100	mg/kg	NA	ND	ND	ND
Fluoranthene	2300	10000	100	mg/kg	NA	0.16 J	**190 J**	7.5 J
Fluorene	2300	10000	100	mg/kg	NA	0.15 J	19 J	1.1 J
Indeno(1,2,3-cd)pyrene	0.9	4	500	mg/kg	NA	ND	ND	ND
2-Methylnaphthalene	—	—	—	mg/kg	NA	0.12 J	ND	ND
Naphthalene	230	4200	100	mg/kg	NA	ND	7.6 J	0.69 J
Phenanthrene	—	—	—	mg/kg	NA	ND	170 J	7.7 J
Pyrene	1700	10000	100	mg/kg	NA	0.17 J	**210 J**	5.8 J
Total SVOCs				*mg/kg*	NA	*2.236*	*1229.6*	*33.99*
PESTICIDES								
None Detected	—	—	—	mg/kg	NA	ND	ND	ND
POLYCHLORINATED BIPHENYLS (PCBs)								
None Detected	0.49	2	50	mg/kg	ND	ND	ND	ND
METALS								
Only Analyzed for Chromium	120000	—	—	mg/kg	NA	37 J	NA	NA
TOTAL PETROLEUM HYDROCARBONS								
TPHC	10000	10000	10000	mg/kg	NA	89.8	106	542

Note: Data provided to Langan by PPG Industries
* = Indicates sample depth below Mean Sea Level
— = Criteria not established
J = Indicates an estimated value
R = Indicates a rejected value
ND = Not detected
NA = Not analyzed
21,900 = Values which are BOLD and boxed denote exceedences of NJDEP cleanup criteria

TABLE 3

PPG SOIL SAMPLE RESULTS - NON-CHROMIUM PARAMETERS
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

Sample Location	NJDEP 1999 REVISED SOIL CLEANUP CRITERIA				B-36	B-37	B-37	B-38
Sample Depth (ft.)					6.0-6.3	6.0-6.8	6.0-6.8	7.3-7.6
Sample Elevation (MSL, ft)					1.59-1.89	0.33-1.13	0.33-1.13	0.19*-0.11
Sample Number					005	005	105	005
Matrix	DIRECT CONTACT.		IMPACT		Soil	Soil	Soil	Soil
Sampling Date	RESIDENT.	NON-RES.	TO G.W.	Units	11/17/1992	11/18/1992	11/18/1992	11/19/1992
Parameters					Q	Q	Q	Q
VOLATILE ORGANIC COMPOUNDS (VOCs)								
Acetone	1000	1000	100	mg/kg	0.26 J	0.101 J	NA	ND
2-Butanone	1000	1000	50	mg/kg	ND	ND	NA	ND
Ethylbenzene	1000	1000	100	mg/kg	ND	ND	NA	ND
Methylene Chloride	49	210	1	mg/kg	ND	ND	NA	0.00466 J
Toluene	1000	1000	500	mg/kg	ND	ND	NA	ND
Trichloroethylene	23	54	1	mg/kg	ND	ND	NA	ND
Xylene (total)	410	1000	67	mg/kg	ND	ND	NA	ND
Total VOCs	*1000*	*1000*	*–*	*mg/kg*	*0.26*	*0.101*	*NA*	*0.00466*
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)								
1,2,4-Trichlorobenzene	68	1200	100	mg/kg	NA	ND	ND	ND
1,2-Dichlorobenzene	5100	10000	50	mg/kg	NA	ND	ND	ND
1,3-Dichlorobenzene	5100	10000	100	mg/kg	NA	ND	ND	ND
1,4-Dichlorobenzene	570	10000	100	mg/kg	NA	ND	0.054 J	ND
Acenaphthene	3400	10000	100	mg/kg	NA	ND	ND	0.47 J
Acenaphthylene	—	—	—	mg/kg	NA	ND	ND	ND
Anthracene	10000	10000	100	mg/kg	NA	ND	ND	1.5 J
Benzo(a)anthracene	0.9	4	500	mg/kg	NA	ND	ND	**3.3**
Benzo(a)pyrene	0.66	0.66	100	mg/kg	NA	ND	ND	**3.4**
Benzo(b)fluoranthene	0.9	4	50	mg/kg	NA	ND	ND	ND
Benzo(g,h,i)perylene	—	—	—	mg/kg	NA	ND	ND	2.3
Benzo(k)fluoranthene	0.9	4	500	mg/kg	NA	ND	ND	ND
Carbazole	—	—	—	mg/kg	NA	ND	0.4 J	ND
Chrysene	9	40	500	mg/kg	NA	3.7 J	ND	ND
di-n-butylphthalate	5700	10000	100	mg/kg	NA	0.078 J	ND	ND
Dibenzo(a,h)anthracene	0.66	0.66	100	mg/kg	NA	ND	ND	ND
Dibenzofuran	—	—	—	mg/kg	NA	ND	ND	0.4 J
bis(2-Ethylhexyl)phthalate	49	210	100	mg/kg	NA	ND	ND	ND
Fluoranthene	2300	10000	100	mg/kg	NA	ND	ND	6.3 J
Fluorene	2300	10000	100	mg/kg	NA	ND	ND	0.73 J
Indeno(1,2,3-cd)pyrene	0.9	4	500	mg/kg	NA	ND	ND	**2.2**
2-Methylnaphthalene	—	—	—	mg/kg	NA	ND	ND	0.12 J
Naphthalene	230	4200	100	mg/kg	NA	ND	ND	0.13 J
Phenanthrene	—	—	—	mg/kg	NA	ND	ND	ND
Pyrene	1700	10000	100	mg/kg	NA	ND	ND	ND
Total SVOCs				*mg/kg*	*NA*	*0.078*	*0.454*	*20.85*
PESTICIDES								
None Detected	—	—	—	mg/kg	NA	ND	ND	ND
POLYCHLORINATED BIPHENYLS (PCBs)								
None Detected	0.49	2	50	mg/kg	NA	ND	ND	ND
METALS								
Only Analyzed for Chromium	120000	—	—	mg/kg	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS								
TPHC	10000	10000	10000	mg/kg	NA	84.8	126	ND

Note: Data provided to Langan by PPG Industries
* = Indicates sample depth below Mean Sea Level
— = Criteria not established
J = Indicates an estimated value
R = Indicates a rejected value
ND = Not detected
NA = Not analyzed
21,900 = Values which are BOLD and boxed denote exceedences of NJDEP cleanup criteria

TABLE 4

LANGAN SOIL SAMPLE RESULTS - NON-CHROMIUM PARAMETERS
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

Sample Location					LB1		LB2		LB3		LB4	
Sample Depth (ft)					1.5-2		1.5-2		1.5-2		3-3.5	
Sample Elevation (MSL, ft)					5.19-5.69		5.14-5.64		5.38-5.88		4.06-4.56	
Langan Sample Number	NJDEP 1999 REVISED				003		002		004		009	
Laboratory Sample Number	SOIL CLEANUP CRITERIA				E97917-3		E97917-2		E97917-4		E98449-2	
Matrix	DIRECT CONTACT.		IMPACT		Soil		Soil		Soil		Soil	
Sampling Date	RESIDENT.	NON-RES.	TO GW	Units	8/29/2001		8/27/2001		8/29/2001		9/4/2001	
Parameters						Q		Q		Q		Q
VOLATILE ORGANIC COMPOUNDS (VOCs)												
Acetone	1000	1000	100	mg/kg	ND		ND		ND		ND	
2-Butanone	1000	1000	50	mg/kg	ND		ND		ND		ND	
Ethylbenzene	1000	1000	100	mg/kg	ND		ND		ND		ND	
Methylene Chloride	49	210	1	mg/kg	ND		ND		ND		ND	
Toluene	1000	1000	500	mg/kg	ND		ND		ND		ND	
Trichloroethylene	23	54	1	mg/kg	ND		ND		ND		ND	
Xylene (total)	410	1000	67 (10)	mg/kg	ND		ND		ND		ND	
Total VOC TICs	*1000*	*1000*	—	*mg/kg*	*ND*		*ND*		*ND*		*ND*	
Total VOCs	*1000*	*1000*	—	*mg/kg*	*0*		*0*		*0*		*0*	
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)												
1,2,4-Trichlorobenzene	68	1200	100	mg/kg	ND		ND		ND		ND	
1,2-Dichlorobenzene	5100	10000	50	mg/kg	ND		ND		ND		ND	
1,3-Dichlorobenzene	5100	10000	100	mg/kg	ND		ND		ND		ND	
1,4-Dichlorobenzene	570	10000	100	mg/kg	ND		ND		ND		ND	
Acenaphthene	3400	10000	100	mg/kg	ND		0.178		ND		ND	
Acenaphthylene	—	—	—	mg/kg	ND		0.0175	J	ND		ND	
Anthracene	10000	10000	100	mg/kg	ND		0.455		0.0171	J	ND	
Benzo(a)anthracene	0.9	4	500	mg/kg	0.027	J	**0.912**		0.05	J	ND	
Benzo(a)pyrene	0.66	0.66	100	mg/kg	0.0245	J	**0.735**		0.0489	J	ND	
Benzo(b)fluoranthene	0.9	4	50	mg/kg	0.03	J	0.832		0.0537	J	ND	
Benzo(g,h,i)perylene	—	—	—	mg/kg	0.0148	J	0.342		ND		ND	
Benzo(k)fluoranthene	0.9	4	500	mg/kg	0.0116	J	0.341		0.0246	J	ND	
Carbazole	—	—	—	mg/kg	ND		0.134		ND		ND	
Chrysene	9	40	500	mg/kg	0.0255	J	0.826		0.0499	J	ND	
Di-n-butylphthalate	5700	10000	100	mg/kg	ND		ND		ND		ND	
Dibenzo(a,h)anthracene	0.66	0.66	100	mg/kg	ND		0.103		ND		ND	
Dibenzofuran	—	—	—	mg/kg	ND		0.095		ND		ND	
bis(2-Ethylhexyl)phthalate	49	210	100	mg/kg	0.153		0.0506	J	0.0767		0.0773	BJ
Fluoranthene	2300	10000	100	mg/kg	0.0504	J	1.89		0.0998		ND	
Fluorene	2300	10000	100	mg/kg	ND		0.163		ND		ND	
Indeno(1,2,3-cd)pyrene	0.9	4	500	mg/kg	ND		0.401		ND		ND	
2-Methylnaphthalene	—	—	—	mg/kg	ND		ND		ND		ND	
Naphthalene	230	4200	100	mg/kg	ND		0.0351	J	ND		ND	
Phenanthrene	—	—	—	mg/kg	0.0281	J	1.56		0.0864		ND	
Pyrene	1700	10000	100	mg/kg	0.0455	J	1.64		0.108		ND	
Total SVOCs	—	—	—	mg/kg	*0.4104*	*J*	*10.71*	*J*	*0.6151*	*J*	*ND*	
Total TICs, SVOCs	—	—	—	*mg/kg*	*0*		*2.38*		*0*		*0*	
PESTICIDES												
None Detected	—	—	—	mg/kg								
POLYCHLORINATED BIPHENYLS (PCBs)												
None Detected	0.49	2	50	mg/kg	ND		ND		ND		ND	
METALS												
Aluminum	—	—	—	mg/kg	13700		21000		7690		17400	
Antimony	14	340	(a)	mg/kg	ND		ND		ND		ND	
Arsenic	20	20	(a)	mg/kg	ND		ND		6.6		ND	
Barium	700	47000	(a)	mg/kg	66.3		39.6		137		27.1	
Beryllium	2	2	(a)	mg/kg	ND		ND		ND		ND	
Cadmium	39	100	(a)	mg/kg	ND		ND		ND		ND	
Calcium	—	—	—	mg/kg	1220		16600		6640		11800	
Cobalt	—	—	—	mg/kg	5.4		21.2		6.7		14.5	
Copper	600	600	(a)	mg/kg	11.6		93		49.2		59.2	
Iron	—	—	—	mg/kg	11500		29500		24800		23000	
Lead	400	600	(a)	mg/kg	16.9		18.1		388		2.6	
Magnesium	—	—	—	mg/kg	1130		10900		2860		7010	
Manganese	—	—	—	mg/kg	235		360		356		297	
Mercury	14	270	(a)	mg/kg	0.041		1.4		ND		ND	
Nickel	250	2400	(a)	mg/kg	8.8		41.7		15.4		24.7	
Potassium	—	—	—	mg/kg	ND		ND		958		ND	
Selenium	63	3100	(a)	mg/kg	ND		ND		ND		ND	
Sodium	—	—	—	mg/kg	ND		2600		ND		2040	
Vanadium	370	7100	(a)	mg/kg	20.2		66.8		16.5		42.8	
Zinc	1500	1500	(a)	mg/kg	26.4		55.9		262		30.5	
TOTAL PETROLEUM HYDROCARBONS												
TPHC	10000	10000	10000	mg/kg	ND		ND		690		64.4	

* = Indicates sample depth below Mean Sea Level

** = VOCs analysis for this sample took place outside the required laboratory holding time for the sample

— = Criteria not established

B = Indicates analyte found in associated method blank

J = Indicates an estimated value

GW = Ground Water

mg/kg = milligrams per kilogram

MSL = Mean Sea Level

ND = Not detected

NA = Not analyzed

TIC = Tenatively Identified Compounds

21,900 = Values which are BOLD and boxed denote exceedences of NJDEP cleanup criteria

(a) = The impact to groundwater criteria for inorganic constituents are developed on a site-specific basis

TABLE 4

LANGAN SOIL SAMPLE RESULTS - NON-CHROMIUM PARAMETERS
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

Sample Location					LB5		LB6		LB7**		DUP1** (LB7)	
Sample Depth (ft)					3.5-4		1.5-2		11-11.5		11-11.5	
Sample Elevation (MSL, ft)					4.84-5.34		6.25-6.75		2.62*-2.12*		2.62*-2.12*	
Langan Sample Number	NJDEP 1999 REVISED				015		011		022		023	
Laboratory Sample Number	SOIL CLEANUP CRITERIA				E99250-2		E98449-4		N707-1		N707-2	
Matrix	DIRECT CONTACT.		IMPACT		Soil		Soil		Soil		Soil	
Sampling Date	RESIDENT.	NON-RES.	TO GW	Units	9/17/2001		9/6/2001		10/1/2001		10/1/2001	
Parameters						Q		Q		Q		Q
VOLATILE ORGANIC COMPOUNDS (VOCs)												
Acetone	1000	1000	100	mg/kg	ND		ND		ND		ND	
2-Butanone	1000	1000	50	mg/kg	ND		ND		ND		ND	
Ethylbenzene	1000	1000	100	mg/kg	ND		ND		ND		ND	
Methylene Chloride	49	210	1	mg/kg	ND		ND		ND		ND	
Toluene	1000	1000	500	mg/kg	ND		ND		ND		ND	
Trichloroethylene	23	54	1	mg/kg	ND		ND		ND		ND	
Xylene (total)	410	1000	67 (10)	mg/kg	ND		ND		ND		ND	
Total VOC TICs	*1000*	*1000*	—	*mg/kg*	*ND*		*ND*		*ND*		*ND*	
Total VOCs	*1000*	*1000*	—	*mg/kg*	*0*		*0*		*0*		*0*	
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)												
1,2,4-Trichlorobenzene	68	1200	100	mg/kg	ND		ND		ND		ND	
1,2-Dichlorobenzene	5100	10000	50	mg/kg	ND		ND		ND		ND	
1,3-Dichlorobenzene	5100	10000	100	mg/kg	ND		ND		ND		ND	
1,4-Dichlorobenzene	570	10000	100	mg/kg	ND		ND		ND		ND	
Acenaphthene	3400	10000	100	mg/kg	0.103		ND		ND		ND	
Acenaphthylene	—	—	—	mg/kg	0.121		ND		ND		ND	
Anthracene	10000	10000	100	mg/kg	0.354		ND		ND		ND	
Benzo(a)anthracene	0.9	4	500	mg/kg	**1.3**		ND		ND		ND	
Benzo(a)pyrene	0.66	0.66	100	mg/kg	**1.27**		ND		ND		ND	
Benzo(b)fluoranthene	0.9	4	50	mg/kg	**1.61**		ND		ND		ND	
Benzo(g,h,i)perylene	—	—	—	mg/kg	0.423		ND		ND		ND	
Benzo(k)fluoranthene	0.9	4	500	mg/kg	0.708		ND		ND		ND	
Carbazole	—	—	—	mg/kg	0.158		ND		ND		ND	
Chrysene	9	40	500	mg/kg	1.31		ND		ND		ND	
Di-n-butylphthalate	5700	10000	100	mg/kg	ND		ND		ND		ND	
Dibenzo(a,h)anthracene	0.66	0.66	100	mg/kg	0.13		ND		ND		ND	
Dibenzofuran	—	—	—	mg/kg	0.067	J	ND		ND		ND	
bis(2-Ethylhexyl)phthalate	49	210	100	mg/kg	ND		0.0755	J	ND		ND	
Fluoranthene	2300	10000	100	mg/kg	2.53		ND		ND		ND	
Fluorene	2300	10000	100	mg/kg	0.12		ND		ND		ND	
Indeno(1,2,3-cd)pyrene	0.9	4	500	mg/kg	0.566		ND		ND		ND	
2-Methylnaphthalene	—	—	—	mg/kg	0.0402	J	ND		ND		ND	
Naphthalene	230	4200	100	mg/kg	0.0423	J	ND		ND		ND	
Phenanthrene	—	—	—	mg/kg	1.46		ND		ND		ND	
Pyrene	1700	10000	100	mg/kg	2.29		ND		ND		ND	
Total SVOCs	—	—	—	*mg/kg*	*14.603*	*J*	*0.0755*	*J*	*ND*		*ND*	
Total TICs, SVOCs	—	—	—	*mg/kg*	*4.14*		*0.16*		*0*		*0*	
PESTICIDES												
None Detected	—	—	—	mg/kg								
POLYCHLORINATED BIPHENYLS (PCBs)												
None Detected	0.49	2	50	*mg/kg*	*ND*		*ND*		*ND*		*ND*	
METALS												
Aluminum	—	—	—	mg/kg	11600		12700		8040		8140	
Antimony	14	340	(a)	mg/kg	11.5		ND		ND		ND	
Arsenic	20	20	(a)	mg/kg	ND		1.6		2.4		2.5	
Barium	700	47000	(a)	mg/kg	308		24.3		ND		23.6	
Beryllium	2	2	(a)	mg/kg	ND		ND		ND		ND	
Cadmium	39	100	(a)	mg/kg	ND		ND		ND		ND	
Calcium	—	—	—	mg/kg	30300		10900		925		1240	
Cobalt	—	—	—	mg/kg	32.5		16.2		6.2		6.3	
Copper	600	600	(a)	mg/kg	52.8		49.1		15.5		12.6	
Iron	—	—	—	mg/kg	37900		24700		16200		17300	
Lead	400	600	(a)	mg/kg	**21500**		3.4		5.8		7.5	
Magnesium	—	—	—	mg/kg	15800		7040		3160		3340	
Manganese	—	—	—	mg/kg	410		323		245		404	
Mercury	14	270	(a)	mg/kg	2.2		NA		ND		ND	
Nickel	250	2400	(a)	mg/kg	99.4		24.7		13.5		14.4	
Potassium	—	—	—	mg/kg	811		ND		862		920	
Selenium	63	3100	(a)	mg/kg	ND		ND		ND		ND	
Sodium	—	—	—	mg/kg	ND		1390		ND		ND	
Vanadium	370	7100	(a)	mg/kg	229		39.9		13.6		14.3	
Zinc	1500	1500	(a)	mg/kg	293		30.2		41.6		44.3	
TOTAL PETROLEUM HYDROCARBONS												
TPHC	10000	10000	10000	mg/kg	357		NA		ND		ND	

* = Indicates sample depth below Mean Sea Level
** = VOCs analysis for this sample took place outside the required laboratory holding time for the sample
— = Criteria not established
B = Indicates analyte found in associated method blank
J = Indicates an estimated value
GW = Ground Water
mg/kg = milligrams per kilogram
MSL = Mean Sea Level
ND = Not detected
NA = Not analyzed
TIC = Tentatively Identified Compounds
21,500 = Values which are BOLD and boxed denote exceedences of NJDEP cleanup criteria
(a) = The impact to groundwater criteria for inorganic constituents are developed on a site-specific basis

TABLE 4

LANGAN SOIL SAMPLE RESULTS - NON-CHROMIUM PARAMETERS
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

Sample Location					LB8	DUP2 (LB8)	LB9	LB10
Sample Depth (ft)					3-3.5	3-3.5	9-9.5	4-4.5
Sample Elevation (MSL, ft)					4.03-4.53	4.03-4.53	2.18*-1.68*	2.82-3.32
Langan Sample Number	NJDEP 1999 REVISED SOIL CLEANUP CRITERIA				024	025	020	018
Laboratory Sample Number					N707-3	N707-4	E99662-1	E98449-6
Matrix	DIRECT CONTACT.		IMPACT TO GW		Soil	Soil	Soil	Soil
Sampling Date	RESIDENT.	NON-RES.		Units	10/3/2001	10/3/2001	9/25/2001	9/21/2001
Parameters					Q	Q	Q	Q
VOLATILE ORGANIC COMPOUNDS (VOCs)								
Acetone	1000	1000	100	mg/kg	ND	ND	ND	ND
2-Butanone	1000	1000	50	mg/kg	ND	ND	ND	ND
Ethylbenzene	1000	1000	100	mg/kg	ND	ND	ND	ND
Methylene Chloride	49	210	1	mg/kg	ND	ND	ND	ND
Toluene	1000	1000	500	mg/kg	ND	ND	ND	ND
Trichloroethylene	23	54	1	mg/kg	ND	ND	ND	ND
Xylene (total)	410	1000	67 (10)	mg/kg	ND	ND	ND	ND
Total VOC TICs	*1000*	*1000*	—	*mg/kg*	*ND*	*ND*	*ND*	*ND*
Total VOCs	*1000*	*1000*	—	*mg/kg*	*0*	*0*	*0*	*0*
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)								
1,2,4-Trichlorobenzene	68	1200	100	mg/kg	ND	ND	ND	ND
1,2-Dichlorobenzene	5100	10000	50	mg/kg	ND	ND	ND	ND
1,3-Dichlorobenzene	5100	10000	100	mg/kg	ND	ND	ND	ND
1,4-Dichlorobenzene	570	10000	100	mg/kg	ND	ND	ND	ND
Acenaphthene	3400	10000	100	mg/kg	ND	ND	0.159	0.288
Acenaphthylene	—	—	—	mg/kg	ND	ND	0.0347 J	0.0275 J
Anthracene	10000	10000	100	mg/kg	ND	ND	0.495	0.601
Benzo(a)anthracene	0.9	4	500	mg/kg	0.0301 J	ND	0.586	**1.12**
Benzo(a)pyrene	0.66	0.66	100	mg/kg	0.0239 J	ND	0.444	**0.896**
Benzo(b)fluoranthene	0.9	4	50	mg/kg	0.0248 J	ND	0.455	**0.912**
Benzo(g,h,i)perylene	—	—	—	mg/kg	ND	ND	0.236	0.374
Benzo(k)fluoranthene	0.9	4	500	mg/kg	0.0141 J	ND	0.198	0.383
Carbazole	—	—	—	mg/kg	ND	ND	0.11	0.164
Chrysene	9	40	500	mg/kg	0.0253 J	ND	0.509	1.08
Di-n-butylphthalate	5700	10000	100	mg/kg	ND	ND	ND	ND
Dibenzo(a,h)anthracene	0.66	0.66	100	mg/kg	ND	ND	0.0483 J	0.0969
Dibenzofuran	—	—	—	mg/kg	ND	ND	0.132	0.086 J
bis(2-Ethylhexyl)phthalate	49	210	100	mg/kg	ND	0.052 J	ND	ND
Fluoranthene	2300	10000	100	mg/kg	0.0508 J	ND	1.41	2.06
Fluorene	2300	10000	100	mg/kg	ND	ND	0.264	0.222
Indeno(1,2,3-cd)pyrene	0.9	4	500	mg/kg	ND	ND	0.234	0.433
2-Methylnaphthalene	—	—	—	mg/kg	ND	ND	0.0454 J	0.0949
Naphthalene	230	4200	100	mg/kg	ND	ND	0.0288 J	0.0589 J
Phenanthrene	—	—	—	mg/kg	0.0244 J	0.0164 J	1.91	2.15
Pyrene	1700	10000	100	mg/kg	0.0393 J	0.0222 J	1.29	2.3
Total SVOCs	—	—	—	mg/kg	*0.2327 J*	*0.0906 J*	*8.5892 J*	*13.347 J*
Total TICs, SVOCs	—	—	—	*mg/kg*	*0*	*0*	*9.74*	*4.71*
PESTICIDES								
None Detected	—	—	—	mg/kg				
POLYCHLORINATED BIPHENYLS (PCBs)								
None Detected	0.49	2	50	mg/kg	ND	ND	ND	ND
METALS								
Aluminum	—	—	—	mg/kg	14200	12500	10300	9870
Antimony	14	340	(a)	mg/kg	ND	ND	ND	ND
Arsenic	20	20	(a)	mg/kg	1.8	2	3.5	6.3
Barium	700	47000	(a)	mg/kg	32.2	32.9	107	85
Beryllium	2	2	(a)	mg/kg	ND	ND	ND	ND
Cadmium	39	100	(a)	mg/kg	ND	ND	ND	0.87
Calcium	—	—	—	mg/kg	11800	11400	8060	1470
Cobalt	—	—	—	mg/kg	16.7	16.1	6.2	ND
Copper	600	600	(a)	mg/kg	98.3	62.8	20.6	80.6
Iron	—	—	—	mg/kg	26300	24700	14700	14700
Lead	400	600	(a)	mg/kg	11.2	6.1	124	224
Magnesium	—	—	—	mg/kg	7580	8180	2840	2390
Manganese	—	—	—	mg/kg	350	358	416	142
Mercury	14	270	(a)	mg/kg	ND	ND	**17.1**	1.3
Nickel	250	2400	(a)	mg/kg	24.4	24.3	12.3	16
Potassium	—	—	—	mg/kg	679	679	969	977
Selenium	63	3100	(a)	mg/kg	ND	ND	ND	1.3
Sodium	—	—	—	mg/kg	1200	919	ND	ND
Vanadium	370	7100	(a)	mg/kg	56.5	57.9	19.3	18.8
Zinc	1500	1500	(a)	mg/kg	44.2	36.6	52.5	436
TOTAL PETROLEUM HYDROCARBONS								
TPHC	10000	10000	10000	mg/kg	368	**10800**	ND	ND

* = Indicates sample depth below Mean Sea Level

** = VOCs analysis for this sample took place outside the required laboratory holding time for the sample

— = Criteria not established

B = Indicates analyte found in associated method blank

J = Indicates an estimated value

GW = Ground Water

mg/kg = milligrams per kilogram

MSL = Mean Sea Level

ND = Not detected

NA = Not analyzed

TIC = Tenatively Identified Compounds

21,900 = Values which are BOLD and boxed denote exceedences of NJDEP cleanup criteria

(a) = The impact to groundwater criteria for inorganic constituents are developed on a site-specific basis

TABLE 4

LANGAN SOIL SAMPLE RESULTS - NON-CHROMIUM PARAMETERS
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

Sample Location					LB11	LB12
Sample Depth (ft)					3-3.5	3.5-4
Sample Elevation (MSL, ft)					3.78-4.28	3.83-4.33
Langan Sample Number	NJDEP 1999 REVISED				026	021
Laboratory Sample Number	SOIL CLEANUP CRITERIA				N707-5	E99662-2
Matrix	DIRECT CONTACT.		IMPACT		Soil	Soil
Sampling Date	RESIDENT.	NON-RES.	TO GW	Units	10/5/2001	9/26/2001
Parameters					Q	Q
VOLATILE ORGANIC COMPOUNDS (VOCs)						
Acetone	1000	1000	100	mg/kg	ND	ND
2-Butanone	1000	1000	50	mg/kg	ND	ND
Ethylbenzene	1000	1000	100	mg/kg	ND	ND
Methylene Chloride	49	210	1	mg/kg	ND	ND
Toluene	1000	1000	500	mg/kg	ND	ND
Trichloroethylene	23	54	1	mg/kg	ND	ND
Xylene (total)	410	1000	67 (10)	mg/kg	ND	ND
Total VOC TICs	*1000*	*1000*	—	*mg/kg*	*ND*	*ND*
Total VOCs	*1000*	*1000*	—	*mg/kg*	*0*	*0*
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)						
1,2,4-Trichlorobenzene	68	1200	100	mg/kg	ND	ND
1,2-Dichlorobenzene	5100	10000	50	mg/kg	ND	ND
1,3-Dichlorobenzene	5100	10000	100	mg/kg	ND	ND
1,4-Dichlorobenzene	570	10000	100	mg/kg	ND	ND
Acenaphthene	3400	10000	100	mg/kg	ND	ND
Acenaphthylene	—	—	—	mg/kg	ND	ND
Anthracene	10000	10000	100	mg/kg	0.0475 J	ND
Benzo(a)anthracene	0.9	4	500	mg/kg	0.138	ND
Benzo(a)pyrene	0.66	0.66	100	mg/kg	0.117	ND
Benzo(b)fluoranthene	0.9	4	50	mg/kg	0.134	ND
Benzo(g,h,i)perylene	—	—	—	mg/kg	0.0596 J	ND
Benzo(k)fluoranthene	0.9	4	500	mg/kg	0.057 J	ND
Carbazole	—	—	—	mg/kg	ND	ND
Chrysene	9	40	500	mg/kg	0.137	ND
Di-n-butylphthalate	5700	10000	100	mg/kg	ND	ND
Dibenzo(a,h)anthracene	0.66	0.66	100	mg/kg	ND	ND
Dibenzofuran	—	—	—	mg/kg	ND	ND
bis(2-Ethylhexyl)phthalate	49	210	100	mg/kg	ND	ND
Fluoranthene	2300	10000	100	mg/kg	0.327	ND
Fluorene	2300	10000	100	mg/kg	ND	ND
Indeno(1,2,3-cd)pyrene	0.9	4	500	mg/kg	0.0696 J	ND
2-Methylnaphthalene	—	—	—	mg/kg	ND	ND
Naphthalene	230	4200	100	mg/kg	ND J	ND
Phenanthrene	—	—	—	mg/kg	0.216	ND
Pyrene	1700	10000	100	mg/kg	0.243	ND
Total SVOCs	—	—	—	*mg/kg*	*1.5457 J*	*ND*
Total TICs, SVOCs	—	—	—	*mg/kg*	*0*	*0*
PESTICIDES						
None Detected	—	—	—	mg/kg		
POLYCHLORINATED BIPHENYLS (PCBs)						
None Detected	0.49	2	50	mg/kg	ND	ND
METALS						
Aluminum	—	—	—	mg/kg	7610	13600
Antimony	14	340	(a)	mg/kg	ND	ND
Arsenic	20	20	(a)	mg/kg	5.7	5.5
Barium	700	47000	(a)	mg/kg	101	152
Beryllium	2	2	(a)	mg/kg	ND	0.74
Cadmium	39	100	(a)	mg/kg	1.7	ND
Calcium	—	—	—	mg/kg	34700	1100
Cobalt	—	—	—	mg/kg	9.4	16
Copper	600	600	(a)	mg/kg	106	25.8
Iron	—	—	—	mg/kg	16600	30100
Lead	400	600	(a)	mg/kg	205	9.5
Magnesium	—	—	—	mg/kg	5170	3860
Manganese	—	—	—	mg/kg	262	1870
Mercury	14	270	(a)	mg/kg	0.74	0.061
Nickel	250	2400	(a)	mg/kg	31.4	22.2
Potassium	—	—	—	mg/kg	890	2290
Selenium	63	3100	(a)	mg/kg	ND	1.3
Sodium	—	—	—	mg/kg	ND	ND
Vanadium	370	7100	(a)	mg/kg	19.1	27.5
Zinc	1500	1500	(a)	mg/kg	810	102
TOTAL PETROLEUM HYDROCARBONS						
TPHC	10000	10000	10000	mg/kg	56.8	ND

* = Indicates sample depth below Mean Sea Level

** = VOCs analysis for this sample took place outside the required laboratory holding time for the sample

— = Criteria not established

B = Indicates analyte found in associated method blank

J = Indicates an estimated value

GW = Ground Water

mg/kg = milligrams per kilogram

MSL = Mean Sea Level

ND = Not detected

NA = Not analyzed

TIC = Tentatively Identified Compounds

21,900 = Values which are BOLD and boxed denote exceedences of NJDEP cleanup criteria

(a) = The impact to groundwater criteria for inorganic constituents are developed on a site-specific basis

APPENDIX E

PROJECT AIR MONITORING PLAN
AND
AIR MONITORING QUALITY ASSURANCE PLAN

PROJECT AIR MONITORING PLAN
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

Prepared for:

PPG INDUSTRIES, INC.
4325 ROSANNA DRIVE
ALLISON PARK, PENNSYLVANIA

Prepared by:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
333 Baldwin Road
Pittsburgh, Pennsylvania 15205-9702

CEC Project 100-710.0011

SEPTEMBER 2012

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1.0 INTRODUCTION

This Project Air Monitoring Plan (PAMP) was prepared for the Metropolis Towers (Site) remedial action. The PAMP was developed by Civil & Environmental Consultants, Inc. (CEC) for PPG Industries, Inc. (PPG) who will perform remedial action at the site. Based on historical records, unknown persons transported Chromate Chemical Production Waste (CPPW) to the site for use as fill material during construction operations. The remedial activities are being performed to remove the CCPW and CCPW-affected fill from the site. The remedial action proposed for the site (excavation and offsite disposal) will result in disturbance of the CCPW-affected fill material which may create a potential for airborne exposure to human receptors.

This PAMP is established to control exposure of residents and the general public to dust emissions containing hexavalent chromium (Cr^{+6}), assess the effectiveness of measures to prevent unacceptable dust emissions, and to evaluate the need for implementation of enhanced dust control measures. This PAMP sets forth guidelines and requirements for monitoring and controlling dust emissions within the remedial construction zone and monitoring air quality outside the remedial construction zone. The air monitoring described in this PAMP will be performed for the duration of remediation activities to control emissions from the remedial activities so onsite and offsite air quality is not adversely affected.

1.1 SITE LOCATION

The Metropolis Towers site (formerly the Gregory Park Apartments) is a residential complex of approximately 8.42 acres. The site is bounded by Warren Street to the east, Montgomery Street/Esplanade Drive to the south, Luis Munoz Marin Boulevard to the west, and Christopher Columbus Drive (formerly Railroad Avenue) to the north. The site is presently occupied by two 21-story residential buildings, a foundation slab from the former 1-story corridor connecting the buildings, paved parking lots, and landscaped areas.

The former Gregory Park Apartments were developed in the early 1960's after the demolition of previously existing industrial/commercial structures. Unknown persons imported CCPW to the site and placed it as fill during area redevelopment. Based on the ICF Kaiser Engineers, Inc. 29

September 1993 Draft Remedial Investigation Report, soils at the site contain CCPW-related chemicals at various concentrations.

1.2 SITE DEVELOPMENT

From the late 1800's through 1955, the present site area was comprised of numerous industrial lots and was zoned as mixed commercial/residential district. A 1906 Sanborn map indicates that the following industries occupied the site prior to 1950: National Iron Works; a filling station; a painting contractor; a chemical warehouse; an auto trucking park; a motor freight station; a machine shop, and a furniture manufacturer.

Aerial photography from April 1951 shows that the site area was occupied by approximately 70 buildings. Most of the buildings appeared to be multiple storied of a size suggesting either commercial or light-industrial usage. Approximately 20 buildings were of a size and shape suggesting that row houses existed in this area. A small surface water impoundment existed near the former Metropolis Towers swimming pool building and commons area. Several streets including Christopher Columbus Drive (formerly Railroad Avenue/Newark Avenue), Gregory Street, and Van Vorst Drive passed through the site area.

Between 1955 and 1961, nearly 100 individual properties were acquired by the Jersey City Redevelopment Authority (JCRA) as part of a development project. By 1961, all but one of the previously-existing buildings had been razed and the project area had been graded and leveled. Several streets had also been abandoned.

Deeds from the Hudson County tax office indicate that JCRA sold the site to Gregory Park Incorporated on March 23, 1961. Gregory Park Incorporated proceeded with construction of the existing onsite structures. After construction of the existing buildings was completed in 1965, Gregory Apartments I and II were sold to Gregory Park subsidiaries. Gregory Park Buildings I and II were purchased by a community cooperative in 1986. Metrovest Equities, Inc., subsequently purchased the property in 1992, and the current owner of the property is Alma Reality Corporation.

1.3 SITE CONTAMINATION

Since 1961, the site has been used for residential purposes. As noted, prior to 1961, numerous businesses were present in the area. Some of these operations were potential sources for hazardous waste discharges. However, details of site specific operations and discharges are not available. There are no records to indicate whether any environmental permits were applied for, or received by, any of the previous owners.

As also noted, the existing onsite structures were built in the early 1960s following demolition of former industrial/commercial structures in the area. CCPW was reportedly used as fill material to raise the site grades prior to construction of the existing structures. Based on data obtained by PPG, soil and fill contain hexavalent chromium at concentrations exceeding the NJDEP Residential Soil Cleanup Criteria.

In addition to the chromium concentrations, at certain locations the soil at the site contains elevated concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, pyrene, lead and mercury. These contaminants appear to be attributable to historic fill materials at the site.

1.4 PREVIOUS SITE INVESTIGATIONS

Investigations performed at the site between 1990 and present have identified contamination in the soil and ground water. Contaminants of concern in soil include metals (specifically hexavalent chromium) and, at discrete locations, polynuclear aromatic hydrocarbons (PAHs), lead, and total petroleum hydrocarbons (TPH).

1.5 PROJECT OBJECTIVES

The primary purpose of the PAMP is to define procedures to proactively control dust emissions, monitor dust emissions, and document air quality for the surrounding community while the remedial action is performed. The PAMP is separate from onsite personnel health and safety monitoring plans.

The total duration of remedial activities (project duration) is estimated to take 15 months. The project duration includes mobilization, excavation of CCPW-affected soil fill and off-site disposal, backfilling with clean fill, restoration of the surface to pre-remedial conditions and use, and demobilization. The duration of intrusive remedial action, defined as the start of CCPW-affected soil/fill excavation to the end of CCPW-affected soil/fill excavation, is planned to be less than one year. During this one year period, excavation of CCPW-affected soil/fill will occur intermittently resulting in a consolidated duration of about 225 work days.

The PAMP is presented in four sections and one appendix:

- Section 2 presents the basis of the ambient air monitoring
- Section 3 presents the details of the air sampling including a description of the air monitoring sample methodology; monitoring station information; sample identification and handling; record keeping practices; and action levels and corrective actions.
- Section 4 presents the air monitoring organization and responsibilities, including a contact list of organizations involved with the remediation
- Section 5 describes the air monitoring equipment that will be used
- Appendix A presents the Quality Assurance Project Plan (QAPP)

2.0 OBJECTIVES OF AMBIENT AIR MONITORING

2.1 IDENTIFICATION OF TARGET CHEMICALS

Chemicals identified in site soil fill materials during the investigation phases were screened using USEPA guidance (USEPA, 1989) to identify the chemical or chemicals most likely to cause adverse health effects from inhalation if their air concentrations are not controlled during remedial activities. The chemical or chemicals identified using this process will serve as indicators for the derivation of acceptable air concentrations (AAC). The identified indicator chemical(s) will serve as surrogates for other chemicals found in site soil fill materials.

The concentration-toxicity screen considers the frequency of chemical detection in fill materials, the concentrations detected, and the chemical-specific toxicity values. Chemicals detected infrequently (<30%) are not likely to comprise a significant portion of particulate material generated during intrusive activities, would be less likely to pose a hazard during remedial action and were given less weight in the screening. Chemicals with relative low toxicities or chemicals considered as essential human nutrients were also given less weight in the screening. A comparative inhalation Non-cancer Risk Factor was calculated for each chemical detected frequently (>30%) by dividing the average detected soil/fill concentration by the chemical-specific chronic inhalation Reference Concentration (RfCi).

$$Noncancer\ Risk\ Factor = \frac{Chronic\ Inhalation\ Reference\ Concentration\ RfCi}{Average\ Soil\ Fill\ Concentration}$$

The toxicity factors used in the screening were obtained from Oak Ridge National Laboratory's online Risk Assessment Information System (RAIS, 2010) that includes toxicity information from the USEPA (Integrated Risk Information System, Provisional Peer Reviewed Toxicity Values, and Health Effects Assessment Summary Tables) as well as state agencies (CAL EPA, Mass DEP). If a chronic RfCi was not available from these sources, one was calculated from the chronic oral Reference Dose (RfD) assuming an inhalation rate of 20 m^3/day by a 70 kg individual.

Table 1 presents the results of the screening performed.

Hexavalent chromium (CrVI) was identified as the chemical that presents the largest Noncancer Risk Factor and thus presents the greatest relative inhalation risk. The hexavalent chromium Noncancer Risk Factor exceeds the next lower ranked chemical by a factor of 3 making it an appropriate surrogate for limiting the inhalation risks from other site chemicals. On this basis, hexavalent chromium was selected as the indicator chemical for the derivation of an acceptable air concentration.

2.2 ACCEPTABLE AIR CONCENTRATION (AAC) – HEXAVALENT CHROMIUM

Table 2 presents the calculation of the project duration-specific acceptable air concentration (AAC) for hexavalent chromium developed in consultation with the Department. The project duration-specific AAC for hexavalent chromium in air will be 487 ng/m^3 based on a non-carcinogenic exposure endpoint within a duration of 225 working days per calendar year for intrusive remedial activities. Intrusive remediation activities (8-hours of work per 24-hour day) will be performed during 5 days out of a 7-day week. Intrusive remedial activity duration is planned to have a calendar duration of less than one year with excavation of CCPW-affected soil fill occurring intermittently during that period.

The AAC for hexavalent chromium is based on non-carcinogenic health effects because of a short (e.g. less than 1 year) duration of intrusive remedial activities. The ACC is based on the non-cancer inhalation reference concentrations (RfCi) for hexavalent chromium of 0.1 mg/m^3 provided in IRIS. The RfCi is an estimate of a continuous inhalation exposure to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects over a lifetime (IRIS).

PPG has established an operational goal of achieving a project average hexavalent chromium air concentration of 49 ng/m^3 to the extent practicable using best management practices during the duration of intrusive remedial activities at the site.

Compliance with the AAC and measurement of achievement of the hexavalent chromium goal during the duration of intrusive remedial activities will be based on the results of daily 8-hour Time Weighted Average (TWA) analysis for hexavalent chromium in air. Daily results will be evaluated and periodically communicated to the Department to assess compliance on a

30/60/90-day and project-to-date rolling average. Should the project duration exceed one calendar year due to schedule delays or other unforeseen conditions, the AAC will be recalculated in coordination with the Department using a carcinogenic exposure endpoint.

When approximately 9-10 months of project time have elapsed, the Department will evaluate whether the proposed project schedule is on track, or if additional project time will be required due to schedule delays or other unforeseen conditions. A new project schedule will be developed at this time, based upon production rates of activities to date. If this new project schedule extends beyond 225 intrusive activity days, PPG must calculate and measure against a carcinogenic endpoint AAC based upon the revised duration of intrusive activity. PPG will then be required to comply with one of the following:

1. If project-to-date average AAC concentrations are below the calculated carcinogenic exposure AAC, and it appears that work can continue to operate within the average limit of the carcinogenic exposure AAC, work can continue to perform remediation activities without a change in operations.

2. If project-to-date average AAC concentrations exceed the calculated carcinogenic exposure AAC, or it appears that continued operations might cause the carcinogenic exposure AAC to be exceeded prior to the completion of the remediation, PPG will implement additional engineering controls to eliminate potential dust exposure to the residential population at the site.

2.3 PARTICULATE ACTION LEVEL (PAL)

The Acceptable Air Concentration (AAC) for hexavalent chromium calculated in Table 2 and presented in Section 2.2 reflects the concentration of hexavalent chromium in the dust particles collected by the time-integrated samplers and analyzed in the laboratory. These results cannot be assessed real-time to guide proactive dust suppression activities. The NJDEP has recommended use of a real-time Particulate Action Level (PAL) for respirable PM_{10} particulates (independent of chemical concentration in dust) calculated as: (PM_{10} 24-hour average National Ambient Air Quality Standard of 150 $\mu g/m^3$) – (37 $\mu g/m^3$ background correction based on 2004 Fort Lee data) x (24 hours / 8 hours) = 339 $\mu g/m^3$.

PPG has also established an operational goal of achieving no visible dust emissions to the extent practicable using best management practices during the duration of intrusive remedial activities at the site.

The real-time PAL will be evaluated at fixed monitoring locations and near the excavations by an Air Monitoring Technician (AMT) during intrusive activities using hand-held instruments at locations near the excavations. The combination of monitoring locations will allow proactive dust control to be implemented and to verify that dust control measures are being successful in controlling dust levels.

Due to there being little to no spatial buffer between the general public and excavation work areas, compliance with the PAL will be assessed using a conservative averaging time of 5 minutes, with a 1-minute averaging time as an “early warning” mechanism. PPG’s dust control goal is to achieve “no visible dust” during the performance of remedial work in all areas.

As total dust and hexavalent chromium air results become available, PPG will evaluate the data to determine whether there is a correlation between the dust and hexavalent chromium concentrations. The real-time dust action level may need to be revised based on the data assessment.

2.4 AIR MONITORING ACTIVITIES

This section provides an introduction to the air monitoring activities and provides a summary description of each component. Additional details regarding many of the components are provided in subsequent sections as well as in Section 3.

2.4.1 Monitoring Duration and Frequency

Air monitoring will be performed on a daily basis throughout the duration of intrusive remedial activities. Intrusive remedial activities are anticipated to take place 5 days per week during the scheduled project duration and will continue to be performed should the schedule be extended. Daily samples for PM_{10} and hexavalent chromium analysis will be obtained during the 8-hour work day. One 24-hour duration sample for PM_{10} and hexavalent chromium analysis will be obtained each day, with one 72-hour duration sample for PM_{10} and hexavalent chromium collected over the weekend (Friday through Sunday). Real-time monitoring will be performed 24 hours a day/ 7 days per week.

2.4.2 Monitoring Locations

Due to the proximity of the remedial excavation areas to residents and the general public, barriers and fencing will be used to control physical access to the remedial areas. The monitoring locations will be adjusted during the remedial activity based on the location of the remedial area. The air monitoring program includes use of hand-held monitors within the remedial area and at fixed locations defined to monitor at ground level and above the remedial area at elevated locations. Additional information is provided in Section 2.8.

2.4.3 Dust Suppression

Dust suppression will be proactively implemented during site activities during the standard 8-hour work day. At the end of each work day and during non-working periods (e.g., weekends), excavation areas and any stockpiled material will be stabilized using engineering controls to mitigate the production of fugitive dusts during non-work periods. The stabilization will be performed through the use of wind screens, chemical binders or tarps depending on the materials and conditions present onsite. Results from the real-time monitoring will be used to verify the effectiveness of dust suppression activities.

2.4.4 Real-Time Monitoring

Real-time PM_{10} air monitoring will be conducted continuously during all remedial activities at the site. Monitors will be in use continuously within the remedial area, at ground level and above the perimeter of each remedial area when work is being performed in that area. Stationary real-time monitoring stations will be connected by telemetry to a central site location to facilitate data collection, data storage, and response to monitor alarms. Hand-held air monitors will also be employed at the site on a continuous basis to proactively monitor dust levels at the site and to verify that dust control measures are being successful in controlling dust to below the allowable site limits and no visible dust emission goal.

2.4.5 Integrated Sampling – PM_{10} and Hexavalent Chromium

Confirmatory, time-integrated air sampling will be performed daily when remedial activities are being performed (5 days per week) using a network of monitoring equipment positioned at ground level and at elevated locations above the active work area. Time-integrated sampling will primarily be performed using an 8-hour averaging time but will include one location with a sampler programmed to obtain a 24-hour sample. Integrated samples for hexavalent chromium and PM_{10} analysis will use a 7-day laboratory turn-around time (TAT). Sampling utilizing time-integrated sampling methods and equipment will be used to provide data to confirm compliance with the PAL, the AAC and project goals.

2.4.6 Meteorological Monitoring

Meteorological data to be collected during the remedial activities and will include wind speed and direction, ambient air temperature, relative humidity, precipitation and barometric pressure. The meteorological data will be collected using a meteorological station equipped with a datalogger to store the data. The station will be connected by telemetry to a central site location to facilitate data collection and data storage.

2.4.7 Reporting

Air monitoring data will be included, after validation, in a weekly and bi-weekly (every two weeks) progress report to the Department. The reports shall be made available to interested parties through a project internet website.

2.5 DUST CONTROL

PPG has established an operational goal of achieving no visible dust emissions to the extent practicable using best management practices during the duration of intrusive remedial activities at the site. The AMT will proactively discuss the potential for producing visible dust emissions with the contractor before task initiation to identify best management practices to apply for the

suppression of dust prior to generation. The AMT will also monitor site activities for occurrence of visible dust and take action by notifying the appropriate contractor to suppress emissions.
The real-time ground level and elevated air monitoring stations will be connected by telemetry to a centrally located air monitoring system for monitoring compliance with the PAL. The monitoring system will remain in operation 24 hours per day and 7 days per week. The Air Monitoring Technician (AMT) will be responsible for monitoring site dust levels within the active remedial area and responding to investigate system alarms. Once the system alarm is activated, it will remain active until it is reset following investigation and action by the AMT.

In the event that dust levels exceed the PAL, the AMT will identify the source and notify the appropriate contract to suppress emissions. The AMT will notify the site manager or designated representative of the PAL exceedance. While dust control activities will be proactively applied, Section 2.6 presents progressively applied dust control actions that will be taken based on the persistence of the dust source.

2.6 PROGRESSIVE DUST ABATEMENT PROTOCOL

Dust suppression will be proactively implemented during intrusive site work during the standard 8-hour work day to maintain compliance with the PAL and achievement of the no visible dust goal. At the end of each work day and during non-working periods (e.g. weekends), excavation areas and any stockpiled excavated material will be stabilized using engineering controls to mitigate the production of fugitive dusts during non-work periods. The stabilization will be performed through the use of wind screens, chemical binders or tarps depending on the materials and conditions present on site. However, to verify that the dust controls are being successful in controlling dust levels to below the site specific limits, abatement actions have been developed should the concentrations exceed allowable limits.

Each level of abatement action contains mandatory and supplemental abatement actions. Additional abatement activities, not necessarily limited to those listed above may also be implemented at the discretion of site management based on an assessment of site activities and conditions. The mandatory abatement activities listed under each Abatement Level defines the minimum abatement actions that must be taken in response to monitoring system alarms.

Abatement options are increasingly more aggressive with regard to emissions abatement as the persistence of the excursions increase. Ultimately, the abatement levels require the stoppage of remedial activities until steps can be taken to reduce emissions concentrations to levels below the action levels. Due to there being little to no spatial buffer between the general public and excavation work areas, abatement actions will be based on the 5 minute averaging time and 1 minute "early warning" averaging time values that trigger alarms on the PM_{10} monitors near the excavations. Progressive abatement levels are outlined on Table 3.

The abatement actions are outlined as follows:

<u>Abatement Level 1:</u> Level 1 Abatement must be commenced at the first 1 minute averaging alarm. The mandatory abatement action associated with this level includes fog application to the area or areas identified as potential sources of dust emissions. Additional abatement actions associated with this level include temporary relocation of work to an excavation area with potentially lower emission levels.

<u>Abatement Level 2:</u> Level 2 Abatement must be commenced if the 5 minute averaging alarm occurs following application of Level 1 Abatement. Mandatory abatement actions associated with this level include all mandatory actions associated with Level 1 in addition to applying PM emission suppressant such as foam over the surface of inactive open areas, surfaces, and pits and slowing the pace of remedial activity. Additional abatement actions associated with this level include changing the remedial process or equipment to alternates that reduce air emissions and installing screened fencing around work areas.

<u>Abatement Level 3:</u> Level 3 Abatement Action must be commenced if a second 5 minute averaging alarm occurs following application of Level 2 Abatement. Mandatory abatement actions associated with this level include all mandatory actions associated with Level 2 in addition to ceasing excavation and loading activities. Additional abatement actions associated with this level include re-assessing remedial operations that contribute to dust emission, re-evaluating the air monitoring work plan, and implementing methods necessary to mitigate emissions that could occur after site work ceases.

Resuming Remedial Activities Following Abatement Level 3: Remedial activities can be resumed if there is no alarm within a 5 minute averaging time following the last alarm.

2.7 MONITORING EQUIPMENT

Air monitoring and sampling will be performed using the following equipment or equivalents:

Real-Time Monitoring Equipment

- DataRam or equivalent, for monitoring PM_{10} at ground level and elevated perimeter locations
- MiniRAM or equivalent for hand-held monitoring of PM_{10} within the remedial area
- MetOne AutoMet^{TM} or equivalent self-contained digital met station

Time-Integrated Sampling Equipment

- Andersen GUV-16H – PM_{10} High Volume Air Sampler, for PM_{10} or equivalent
- Personnel type sampling pumps for time-integrated Chromium VI monitoring

2.8 SAMPLING APPROACH

Air monitoring according to the PAMP will be performed on a daily basis whenever remedial activities are taking place on the site (5 days per week). The overall remedial excavation and restoration activities have been divided into three sections designated as Layout Areas. Remedial excavation and restoration in a Layout Area will be completed before moving to the next Layout Area. Layout Areas will separate residents, parking and the general public through barriers and fencing from the remedial construction activities and truck traffic. The air monitoring approach has been designed specific to the construction in each Layout Area. Air monitoring will be performed within the Layout Area at ground and select elevated locations for evaluating compliance with the PAL and ACC. Figures 2 through 9 present the air monitoring locations that will be established and used for monitoring during remedial work for each Layout Area.

During the remedial action at each Layout Area, real-time PM_{10} concentrations will be monitored using hand-held instruments, at the specific “fixed” ground level perimeter locations and at the elevated “first balcony” locations. With the exception of the elevated “first balcony” locations, real-time measurements will be made approximately 1.5 meters above ground level.

Time-integrated (8-hour duration) ambient air sampling for PM_{10} and hexavalent chromium concentration in PM_{10} will be performed at the same locations as the specific “fixed” ground level perimeter locations and at the elevated “first balcony” locations. Time-integrated 24-hour duration sampling for PM_{10} and hexavalent chromium will be performed at one location co-located with an 8-hour duration time-integrated air sampler. With the exception of the elevated “first balcony” locations, real-time measurements will be made approximately 1.5 meters above ground level. The time-integrated data will also be used for comparison to the PAL and AAC.

2.8.1 Monitoring Locations

Air Monitoring Station (AMS) locations have been established to provide for the collection of representative samples during soil excavation. AMSs will be placed near ground level and at elevated locations representing air quality at the first floor balcony level. One ground level AMS will include a collocated set of time-integrated samplers for quality assurance/quality control (QA/QC) purposes. The change in station locations is based on the sequencing of the remediation and the buildings located on the site. Each layout area will be completed before starting the next layout location. The approximate locations of the AMSs are shown in Figures 8 and 9 for Layout Area 1, Figures 2, 3 and 4 for Layout Area 2, and Figures 5, 6 and 7 for Layout Area 3.

The air monitoring station locations were determined based on several factors including:

- Location and duration of potential onsite emissions sources (e.g., excavation layout areas, haul roads etc.)
- Evaluation of potential exposure pathways (i.e., impacted soils)
- Location of sensitive receptors near the site
- Duration of remedial activities.

Based on these factors, the proposed air monitoring network includes stationary time-integrated air monitoring stations positioned to provide representative ambient air quality data. Placement of the air monitoring stations near the remedial areas will allow for measurement of hexavalent chromium and PM_{10} that may be emitted during the remedial action. Final positioning of the AMSs will be selected during mobilization to avoid airflow disruption from nearby structures and site work activities.

Real-time ground level and “first balcony” elevated air monitoring stations will be connected by telemetry to a centrally located air monitoring system. The monitoring system will remain in operation 24 hours per day and 7 days per week during remedial activities. Air monitoring results will be uploaded daily to an internet server for backup. The Air Monitoring Technician (AMT) will be responsible for monitoring site dust levels and responding to investigate system alarms.

2.8.2 Real-Time Monitoring

Real-time monitoring will be performed during all remedial activities. During remedial activities, real-time air concentrations will be directly measured continuously at the sampling locations. The dust meters will measure the concentration of $PM_{10.}$ Real-time PM_{10} concentration data from fixed-location samplers will be recorded via telemetry to a centrally located air monitoring system. Real-time monitoring for PM_{10} will also be conducted within the remedial area near potential emission sources using hand-held instruments to allow proactive dust control to be implemented and to verify that dust control measures are being successful in controlling dust levels to be below the allowable limits at and above the construction area. The results from all PM_{10} monitoring will be reported weekly to the Department. A stationary weather monitoring system will be established to provide continuous onsite air temperature, wind speed, wind direction, barometric pressure, precipitation, and relative humidity data.

2.8.3 Time-Integrated Monitoring

Confirmatory time-integrated air sampling of hexavalent chromium and PM_{10} concentrations will be conducted at the AMSs at a frequency of once per day during the 5 day work week. Sampling duration for each confirmatory time-integrated sample set will be approximately 8 hours. Integrated samples for hexavalent chromium and PM_{10} analysis will be obtained daily from each sampling location during the planned eight-hour workday. A 7-day turnaround time (TAT) will be utilized for all hexavalent chromium and PM_{10} air data.

The results for time-integrated monitoring will be reported weekly for PM_{10} and biweekly (every two weeks) for hexavalent chromium via air monitoring program progress reports. These reports, after they have been validated, shall be made available to any interested parties through the establishment of an internet website.

2.8.4 Meteorological Data Collection

Meteorological data to be collected during the remedial activities will include wind speed and direction, ambient air temperature, relative humidity, precipitation and barometric pressure. The meteorological data will be collected using a meteorological station equipped with a datalogger to store the data.

2.9 QUALITY ASSURANCE PROJECT PLAN

The Quality Assurance Project Plan (QAPP) for the air monitoring is included as Appendix A.
The QAPP is a comprehensive plan which addresses quality assurance objectives for data measurement; sampling procedures; sample custody; calibration procedures and frequency; analytical procedures; data reduction, validation and reporting; internal quality control checks; performance and system audits; preventive maintenance; procedures used to assess data precision, accuracy and completeness; and corrective actions.

3.0 AMBIENT AIR SAMPLING

The following subsections describe meteorological monitoring, real-time monitoring, the time-integrated sampling program, sampling locations, background monitoring, air monitoring record keeping, and data evaluation procedures.

3.1 REAL-TIME MONITORING

Real-time air monitoring will be accomplished for PM_{10} at the sampling locations along the perimeter of the Layout Area being excavated. The PM_{10} monitoring will be conducted from fixed sampling stations at locations along the perimeter of the site. Field technicians using hand-held monitoring instruments will perform additional monitoring within the Layout Area based onsite conditions and remedial activities. Additional detail concerning the real-time monitoring is presented in the following subsections.

The field sampling equipment will be calibrated daily and maintained in proper working condition according to the manufacturer's specifications and the attached SOPs. The manufacturer's operating instructions/manuals for each sampling instrument used will be kept in the site field office.

To monitor potential emissions from the site during the remedial action, real-time monitoring will be conducted at each AMS and additional locations as necessary. The approximate locations of the monitoring stations are shown in Figures 2 through 9. Station locations may be adjusted based on site-specific conditions including real-time air monitoring results, meteorological conditions, location of remedial activities, etc. The instruments proposed for the real-time monitoring network will monitor PM_{10} directly.

The real-time PM_{10} monitoring will be conducted using the Data Ram, or equivalent. The Data Ram has a particle size range of 0.35 to 20 microns (µ) and a concentration range from 1 to 10,000 micrograms per cubic meter ($\mu g/m^3$). The DataRams will be configured to respond only to dust particles < 10 µm in diameter.

In order to quantify air quality levels generated by the Site activities, the monitoring network will be coupled with the meteorological station to identify background (upwind) and downwind (potential Site contribution) AMSs. The wind direction will be averaged by the system over 5-minute intervals. If the results of the downwind monitoring indicate an exceedance of the ambient air action levels, the field technician conducting the real-time monitoring will alert Site management of the exceedance. Progressive dust abatement will be implemented based on the persistence of the dust event.

3.2 CONFIRMATORY TIME-INTEGRATED SAMPLING

Confirmatory time-integrated sampling will be performed using air sampling equipment appropriate for the quantitative measurement of hexavalent chromium and PM_{10}. Confirmatory time-integrated sampling will be performed at a frequency of one per day during the remedial activities. Sampling will be conducted at each of the remedial area locations during the planned 8-hour work day. Sampling will also be conducted at one location every day for a 24-hour period and once per weekend over a 72-hour period.

PM_{10} will be collected using an Andersen Instruments Model GUV-16H, PM_{10} High-Volume Air Sampler, or equivalent. PM_{10} measures the respirable fraction of airborne dust and therefore provides a measure for the inhalation exposure pathway. Sampling and analysis will be in accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP 2000-105, March 2007, Rev 6, “Filter Processing Method for the Determination of Suspended Particulates in Ambient Air” or an equivalent method approved by the Department .

Hexavalent chromium samples will be collected and analyzed using the OSHA Method ID-215 protocols on accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP II-CR6PREP “Preparation of PVC Filters for the Determination of Hexavalent Chromium by IC” and SOP II-CR6IC “Analysis of Hexavalent Chromium by Ion Chromatography” or an equivalent method approved by the Department.

Time-integrated confirmation sampling will be collected at a flow rate of approximately 15 liters per minute (lpm). Sampling will be initiated at the start of the work day and will conclude after 8 hours (one sample), 24 hours (second sample), or 72 hours (weekend sample).

Samples will be packaged, preserved, and shipped via overnight delivery to the analytical laboratory. Samples recovered from the sampling equipment on weekends will be preserved on site until the following Monday when they will be shipped via overnight delivery to the laboratory.

The analytical laboratory for the air monitoring program time-integrated sampling will be a laboratory approved by the NJDEP for the performance of the analyses. The confirmatory sampling results for PM_{10} and hexavalent chromium will be reported to PPG by the laboratory within 7 days of collection.

The field sampling equipment will be calibrated daily and maintained in proper working condition according to the manufacturer’s specifications. The manufacturer’s operating instructions/manuals for each sampling instrument will be kept in the Site field office.

3.3 METEOROLOGICAL CONDITIONS MONITORING

A real-time meteorological station will be used to measure and record ambient temperature, relative humidity, barometric pressure, precipitation, wind direction, and wind speed. The meteorological station will be connected to a data acquisition system (DAQS), which will record these meteorological parameters every 10 seconds and store the average values for the various parameters at 15-minute intervals.

The integration of the meteorological data with the air monitoring data, specifically wind direction, will facilitate the comparison of background and downwind real-time air monitoring results in order to identify potential Site sources of air emissions.

The location of the meteorological station will be selected based on site characteristics to control the effects of natural obstructions that may affect meteorological measurements. Final determination of the meteorological station positioning within this area of the Site will be made during project mobilization. The meteorological instruments will be mounted on a grounded mast or tripod such that measurements are made at approximately ten meters above the Site surface.

3.4 MONITORING/SAMPLING LOCATIONS

Ground level time-integrated and real-time sampling equipment will be placed on secure platforms to position the sampler inlet locations approximately 1.5 meters above the Site surface. "First balcony" time integrated and real-time sampling equipment will be placed on a secure tower to position the sampler inlet locations near the center of the balcony. The locations of the AMSs for this project are presented in Figures 2 through 9. Final positioning of the AMSs will be selected during mobilization to avoid airflow disruption from nearby structures and site work activities. The AMSs for the time-integrated monitoring will also be used for the real-time monitoring.

To satisfy project-specific QA/QC for the sampling program and provide a duplicate sample for analysis, a collocated, time-integrated sampling station will be used. The collocated station will be paired with an AMS obtaining an 8-hour duration sample.

3.5 BASELINE SAMPLING

Although the daily sampling and monitoring of the Site will produce upwind samples representing a daily background of air quality, the time-integrated ambient air monitoring program will rely on an initial baseline sampling period. Establishing baseline air quality is important to the time-integrated sampling program because it establishes a "baseline" of recent air quality near the site prior to commencing remedial activities. The real-time monitoring program, however, will rely on the daily meteorological measurements to determine background (upwind) air quality.

To establish the initial baseline air quality for the Site, time-integrated (8-hour duration) sampling will be conducted prior to intrusive remedial activities. The baseline levels will not be used to modify the AAC values presented in Table 2. Initial background sampling will be performed at select AMSs locations proposed in Figures 2 through 9.

Baseline sampling will be performed over a five-day period. Sampling will be conducted for PM_{10} and hexavalent chromium. Sampling will be conducted with equipment identical to the equipment to be used during the remedial action air monitoring. Sampling procedures and analytical methods will be the same as those used during the remedial action air monitoring (8- -hour).

3.6 SAMPLE DESIGNATION

Real-time air monitoring sample identifications will be based on AMS designations (Figures 2 through 9). For each real-time measurement, the date, sample start time, AMS identification, and wind direction will be recorded in the real-time air monitoring notebooks.

Time-integrated samples will be designated according to the following sample identification protocol:

AMS id, sampling method, sample date

For example, a PM_{10} time-integrated sample collection started on January 30, 2010 from station AMS1 would have the following sample identification:

AMS1PM10013010

Additional identification for QA/QC samples would follow the above sample identification protocol, followed by:

D for a duplicate sample
T for a trip blank sample
F for a field blank sample

For example, a PM_{10} duplicate time-integrated sample collection started on January 30, 2010 from the collocated sampling station at AMS1 would have the following sample identification:

AMS1PM10013010D

3.7 RECORD KEEPING

3.7.1 Real-Time Monitoring Data

The real-time monitoring data will be maintained in a database developed specifically for input of the real-time air monitoring data. Field data, including maintenance, sampling irregularities, and repairs, will be recorded in a field logbook for the real-time monitoring. The real-time monitoring data and maintenance records will also be presented in the Remedial Action Ambient Air Monitoring Report.

The assessment of the real-time monitoring data to evaluate exceedance of the action levels will be an ongoing daily process.

3.7.2 Time-Integrated Sampling Data

Field data, including calibration, sample identifications, equipment maintenance, sampling irregularities, and shipments, will be recorded in field logbooks. A set of field logbooks will be maintained for the time-integrated sampling network to log daily information of the nature described above.

A database will be established to manage analytical sample tracking and reported laboratory results. The reported analytical results will be organized by AMS, sampling method, and sampling date.

The accumulated time-integrated results, field data, and comparison to the AAC will be presented in the Remedial Action Ambient Air Monitoring Report prepared in conjunction with the Remedial Action Completion Report.

4.0 AMBIENT AIR MONITORING ORGANIZATION AND CONTROL

Figure 10 provides an organization chart for the air monitoring program. PPG Industries, Inc. (PPG) will designate a Site Manager who will be the contact for air monitoring and air quality related issues. PPG in addition to procuring a remediation contractor, will procure a contractor to supervise and conduct the air monitoring program, who will in turn designate an Air Monitoring Contract Program Manager (AMCPM) and an Air Monitoring Technician (AMT). The Remediation Contractor's Site Manager, the Air Monitoring Contract Project Manager and the Air Monitoring Technician will be identified following procurement by PPG. Analytical services for the time-integrated samples will be provided as a subcontract to the company conducting the air monitoring program. Mr. Tom Cozzi is the New Jersey Department of Environmental Protection (NJDEP) Manager for the remedial action of the Site.

4.1 AMBIENT AIR MONITORING MANAGEMENT PERSONNEL, RESPONSIBILITIES, AND COMMUNICATION

The Air Monitoring Contract Project Manager (AMCPM) for the Site will manage the implementation of the air monitoring program. The company selected by PPG will assign a qualified Air Monitoring Technician (AMT) to conduct the air monitoring program. The AMCPM will coordinate the time-integrated sample analyses and data reporting with a laboratory accepted by the NJDEP to perform the sample analyses.

In the event of an AAC exceedance, the AMT will evaluate the possible cause and, if associated with site activities, will evaluate the required abatement measures and direct the Remediation Contractor's Site Manager to implement abatement. The Remediation Contractor's Site Manager will be responsible for the implementation of emission abatement options in response to the AAC exceedance. The AMT is responsible for evaluating the effectiveness of the abatement performed and notifying the Remediation Contractor's Site Manager to undertake additional abatement if needed.

All exceedances of action levels (all levels) and the AAC will be recorded in the daily work log by the AMT and the Remediation Contractor's Site Manager. The AMT will communicate all exceedances to the PPG Site Manager. The emission abatement actions implemented in response to the air quality exceedance(s) will also be recorded in the daily work log.

5.0 EQUIPMENT

5.1 REAL-TIME MONITORING EQUIPMENT

Real-time air monitoring will be conducted using a DataRam, or equivalent. The real-time air monitoring will be conducted at each of the time-integrated air monitoring stations established to monitor the remedial activities being performed. The DataRam will continuously measure the concentration of PM_{10} and the readings will be stored for downloading to a central computer. Additional PM_{10} concentration data collected as a result of remedial activities will be recorded in the real-time air monitoring field notebook.

At a minimum, the following daily results will be prepared.

- Daily average PM_{10} concentration compared to action level
- Hourly average wind speed, wind direction, and air temperature

The following sections describe the real-time air monitoring equipment and how it will be used during the remedial action. Appendix A includes specific details for sampling and calibration procedures.

5.1.1 MIE DataRam Dust Monitor

PM_{10} will be monitored with a MIE DataRam, or equivalent. Direct-reading real-time MIE DataRam meters will be used to monitor for particulates (or dust). The measurement of dust levels is accomplished using infrared electromagnetic radiation to sense airborne particles. The dust meter will be configured to respond only to dust particles < 10 micron in diameter. The minimum detection limit for this monitor is 0.1 micrograms per cubic meter ($\mu g/m^3$). The DataRam displays particulate concentration every six seconds as µg/m3.

5.2 TIME-INTEGRATED SAMPLING EQUIPMENT

Time-integrated concentrations of hexavalent chromium and PM_{10} in ambient air will be measured using air sampling equipment. The following sections describe the equipment and how it will be used during the remedial action. Refer to Appendix C for sampling and calibration procedures.

5.2.1 Respirable Particulates (PM_{10}) – 40 CFR 50, Appendix J

40 CFR, Part 50, Appendix J provides sampling procedures for the measurement of PM_{10} respirable particulates. The method uses an air sampler to draw a measured quantity of ambient air through a size-selective inlet and filter during the sampling period. The filters are weighed before and after use to calculate net mass gained. The concentration of total respirable particulates is computed as the mass gained divided by the volume of air sampled corrected to standard conditions, and is expressed as µg/m3.

Sampling and analysis will be in accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP 2000-105, March 2007, Rev 6, “Filter Processing Method for the Determination of Suspended Particulates in Ambient Air” or other method approved by the Department.

Sampling equipment includes an air sampler with shelter and blower motor, flow rate measurement device, pre-weighed particulate filter, high-volume sampler calibration kit, thermometer, barometer, and a timing/control device. The Model GUV-16H High Volume PM_{10} Sampler or equivalent will be used.

5.2.2 Hexavalent Chromium

Hexavalent chromium samples will be collected and analyzed using the OSHA Method ID-215 protocols on accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP II-CR6PREP “Preparation of PVC Filters for the Determination of Hexavalent Chromium by IC” and SOP II-CR6IC “Analysis of Hexavalent Chromium by Ion Chromatography” or other method approved by the Department.

Sampling equipment includes a vacuum pump, cellulose filter and filter holder. Samples will be shipped to the laboratory within 24-hours, except weekend samples which will be preserved on site until they can be shipped to the laboratory the following Monday.

5.3 METEOROLOGICAL CONDITIONS MONITORING EQUIPMENT

A MetOne AutoMet™, or equivalent, self-contained digital meteorological system will be used to measure and record wind speed and wind direction, ambient temperature and relative humidity, and barometric pressure. The system will record these measurements at 10-second intervals. The recorded measurements will be averaged by 5-minute increments by the system internal software. The 15-minute average measurements for each meteorological parameter will be automatically stored in the internal DAQS.

The meteorological station will be composed of components that will include the following items or equivalents:

- Met One Model 020 C Wind Direction Sensor
- Met One Model 010 C Wind Speed Sensor
- Met One Model 083 D Relative Humidity/Temperature Sensor
- Met One Model 090 D Barometric Pressure Sensor
- Met One Model 370 8" Precipitation Gauge

These components will be assembled and connected to an AutoMet Model 466A data logger and MicroMet® Plus software, or equivalent, for internal data integration and logging.

Wind direction will be monitored with a Model 020C Wind Direction Sensor as part of the MetOne AutoMet meteorological system. The 020C has a lower detection threshold of 0.5 mph, and a directional accuracy of ±3º. Wind speed will be measured with a model 010C Wind Speed Sensor. The 010C has an operating range of 0-125 mph, a lower threshold of 0.5 mph, and accuracy of ±1%.

Temperature and relative humidity will be measured with a Model 083D-1-35 Relative Humidity/Temperature Sensor. The relative humidity sensor has a 0-100% relative humidity range, and accuracy of ±2%. The temperature sensor has a temperature range of -120ºF to +120ºF, and accuracy of ±0.5ºF.

Barometric pressure will be measured with a Model 090D Barometric Pressure Sensor. The 090D standard operating range is 26 to 32 inches of mercury (Hg), with accuracy of ±0.04 inches Hg.

Precipitation will be measured with a Model 370 Precipitation Gauge. The 370 standard operating range is 0.001 to 10 inches of precipitation, with accuracy of ±0.001 inches.

The meteorological system will be mounted on a 10-meter aluminum mast, a 10-meter tripod, or equivalent structure depending upon the final monitoring location selected. As stated in Section 3.1, the monitoring location will be selected to mitigate measurement interferences from surrounding natural obstructions such as trees or buildings. The mast or tripod mounted system will be equipped with a lightning rod and grounding system.

The meteorological station will be coupled with a data logger and software for the internal management of the meteorological data measured.

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TABLES

TABLE 1
TOXICITY SCREEN FOR PARAMETERS DETECTED FREQUENTLY IN SOIL SAMPLES
Metropolis Towers - Jersey City, Hudson County, New Jersey

Chemical	Average Concentration	Maximum Concentration	Minimum Concentration	Number of Samples	Number of Samples Above Detection Limit	Frequency of Samples Above Detection	Rfc (mg/m^3)	Rfc Reference	Noncancer Risk Factor
Chromium, Hexavalent	209	8460	1	718	250	35%	1.00E-04	IRIS	2,089,475
Nickel	61	785	4.2	660	658	100%	9.00E-05	ATSDR	679,300
Lead	406	24200	2.2	660	659	100%	1.00E-03	MassDEP	405,706
Arsenic	5	47.8	0.67	660	544	82%	1.50E-05	CALEPA	363,827
Barium	169	4220	10.1	660	636	96%	5.00E-04	HEAST	337,055
Cadmium	1	74.6	0.084	660	232	35%	1.00E-05	ATSDR	75,039
Vanadium	104	1460	7.3	660	660	100%	1.80E-02	CALC	5,752
Mercury	1	49.3	0.015	660	479	73%	3.00E-04	IRIS	2,680
Copper	108	15000	2.9	660	660	100%	1.40E-01	CALC	773
Zinc	276	9270	13.4	660	660	100%	1.10E+00	CALC	251
Dibenzofuran	0.24	8.50	0.02	81	45	56%	3.50E-03	CALC	68
Naphthalene	0.16	2.29	0.02	81	35	43%	3.00E-03	CALC	55
Phenanthrene	1.52	29.70	0.02	81	76	94%	5.00E-02	MassDEP	30
Chrysene	0.90	15.60	0.01	81	74	91%	5.00E-02	MassDEP	18
Benzo(a)anthracene	0.87	16.20	0.02	81	71	88%	5.00E-02	MassDEP	17
Pyrene	1.73	25.20	0.01	81	76	94%	1.10E-01	CALC	16
Benzo(a)pyrene	0.78	14.10	0.01	81	71	88%	5.00E-02	MassDEP	16
Benzo(b)fluoranthene	0.74	12.90	0.02	81	67	83%	5.00E-02	MassDEP	15
Benzo(k)fluoranthene	0.61	11.10	0.03	81	64	79%	5.00E-02	MassDEP	12
Fluoranthene	1.69	32.30	0.01	81	77	95%	1.40E-01	CALC	12
2-Methylnaphthalene	0.16	2.55	0.22	81	32	40%	1.40E-02	CALC	12
Benzo(g,h,i)perylene	0.43	8.34	0.02	81	62	77%	5.00E-02	MassDEP	9
Indeno(1,2,3-cd)pyrene	0.42	8.22	0.02	81	62	77%	5.00E-02	MassDEP	8
Dibenzo(a,h)anthracene	0.14	3.14	0.02	81	44	54%	5.00E-02	MassDEP	3
4,4'-DDT	0.004	0.036	0.000	81	40	49%	1.80E-03	CALC	2
Fluorene	0.27	8.90	0.01	81	44	54%	1.40E-01	CALC	2
4,4'-DDE	0.003	0.045	0.000	81	31	38%	1.80E-03	CALC	2
Acenaphthylene	0.09	13.30	0.02	81	44	54%	5.00E-02	MassDEP	2
Acenaphthene	0.34	13.30	0.02	81	51	63%	2.10E-01	CALC	2

NOTES:

CALC - Calculated form Oral RfD assuming inhalation rate of 20 m3/day by a 70 kg individual.

IRIS - Integrated Risk Information System, U.S. EPA

ATSDR - Agency for Toxic Substances and Disease Registry

Mass DEP - Massachusetts Department of Environmental Protection, Risk Assessment ShortForms

CALEPA - California Environmental Protection Agency.

HEAST - Health Effects Assessment Summary Tables.

RfC - Chronic Inhalation Reference Concentration.

Noncancer Risk Factor - Average Concentration divided by RfC.

All Concentrations in mg/kg.

TABLE 2
ACCEPTABLE AIR CONCENTRATION (AAC) - HEXAVALENT CHROMIUM
SITE-SPECIFIC EXPOSURE - NONCARCINOGENIC
Metropolis Towers - Jersey City, Hudson County, New Jersey

DERIVATION OF ACCEPTABLE AIR CONCENTRATION BASED ON 8-HOUR PER DAY HEXAVALENT CHROMIUM EXCAVATION ACTIVITY

$$AAC = \frac{R_fC_i \text{ x } AT}{ET \text{ x } EF \text{ x } ED}$$

Reference: U.S. EPA RAGS Part F, 2009 (pg. 18)

Parameter	Description	Units	Value
AAC	= Acceptable Air Concentration	$(\mu g/m^3)$	(see below)
R_fC_i	= Chronic Inhalation Reference Concentration	$(\mu g/m^3)$	(see below)
AT	= Averaging Time (Project Duration)	(days)	365
ET	= Exposure Time (8 hours/24 hours)	(days)	0.33
EF	= Exposure Frequency	(days)	225
ED	= Exposure Duration (365 days)	(years)	1.0

Chemical	R_fC_i $(\mu g/m^3)$	R_fC_i Reference	Project AAC	
			(ug/m^3)	(ng/m^3)
Chromium VI	1.00E-01	IRIS	0.487	487

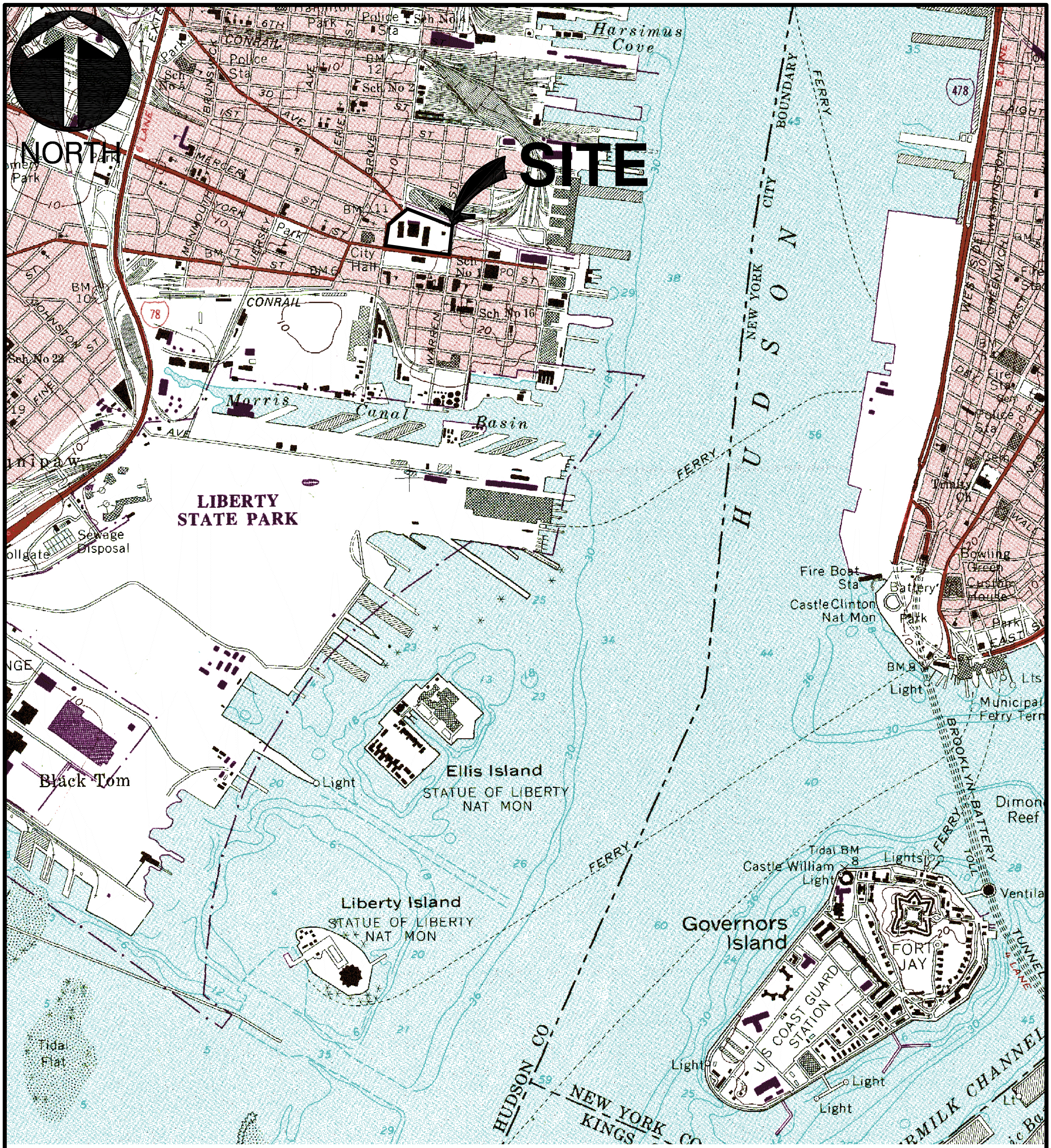
TABLE 3
PROGRESSIVE DUST ABATEMENT PROTOCOL
Metropolis Towers – Jersey City, Hudson County, New Jersey

Trigger	Abatement Action Level	Site Activity
First 1 minute Alarm	Level 1	• Temporarily relocate work to an excavation area with potentially lower emission levels. • ***Apply water fog to area(s) identified as potential source of dust emissions.***
First 5 minute Alarm	Level 2	• *Level 1 actions plus:* • ***Apply PM emission suppressant such as foam over the surface of inactive open areas/ surfaces/ pits.*** • **Slow the pace of remedial activity.** • Change the remedial process or equipment to alternates that reduce air emissions. • Put up a fence with a screen around work areas.
Second 5 minute Alarm	Level 3	• *Level 2 actions plus:* • ***Cease excavation and loading activities.*** • Re-assess remedial operations that contribute to dust emissions. • Re-evaluate air monitoring work plan. • Implement methods necessary to mitigate emissions that could occur after site work ceases.

Notes:

The mandatory abatement activities (identified by ***bold italics***) listed under each Action Level defines the minimum abatement actions that must be taken in response to monitoring system alarms. Additional abatement activities, not necessarily limited to those listed above may also be implemented at the discretion of site management based on an assessment of site activities and conditions.

FIGURES



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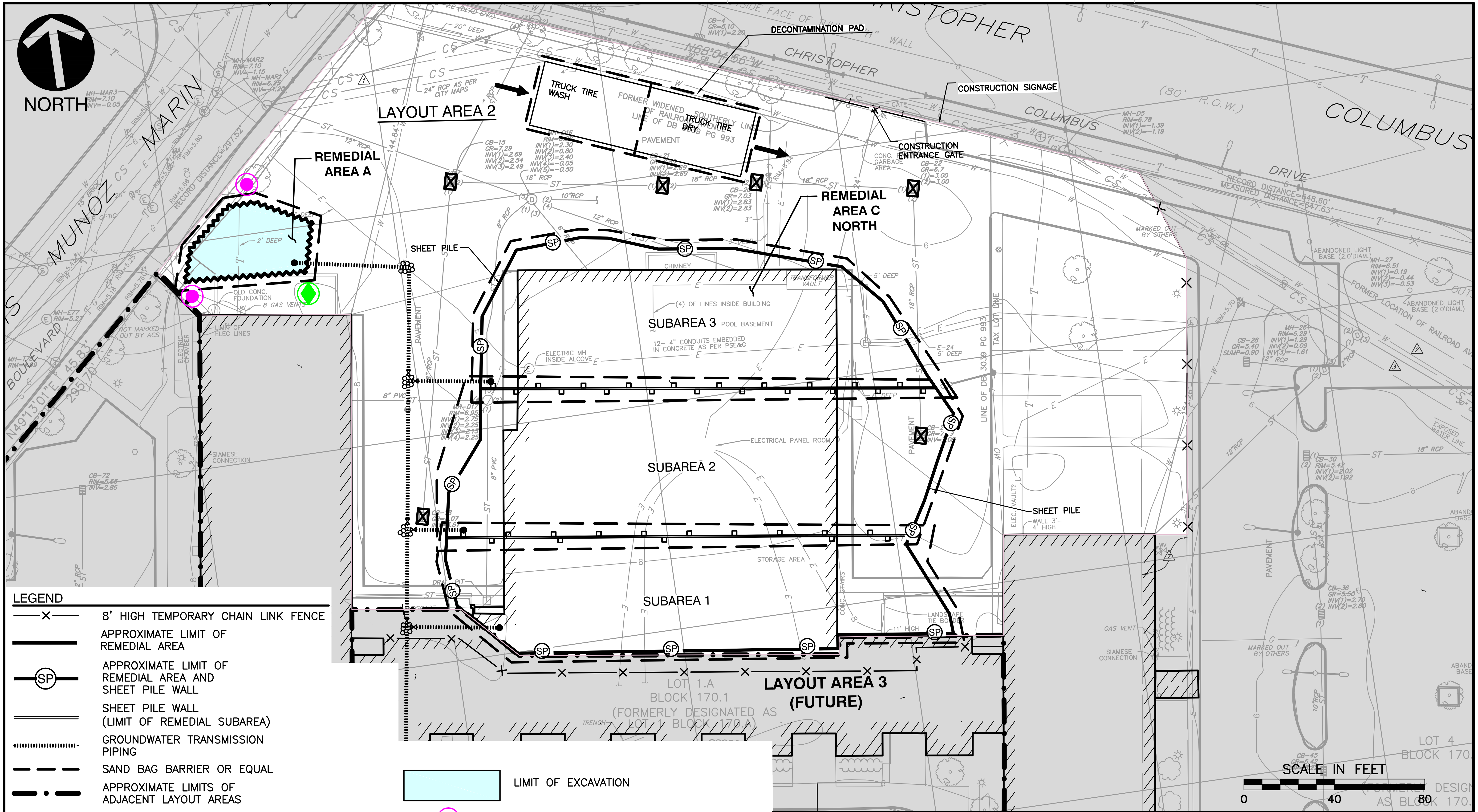
SITE LOCATION MAP
PPG INDUSTRIES, INC.
METROPOLIS TOWERS
JERSEY CITY, N.J. – N.Y.

DWN. BY: KAP
CHKD. BY: ETM
SCALE: 1"=2000'
DATE: 7/26/06
PROJECT NO.: 211603.0007
FIGURE 1

\\SVR-PITTSBURGH\PROJECTS\2010\100-710\-CADD\DWG\100710-FIG1.DWG{SITE LOCATION MAP} (LCOLAIZZI) – AUG 11, 2010 – 14:2:0



LEGEND

—×—	8' HIGH TEMPORARY CHAIN LINK FENCE
▬	APPROXIMATE LIMIT OF REMEDIAL AREA
—(SP)—	APPROXIMATE LIMIT OF REMEDIAL AREA AND SHEET PILE WALL
═	SHEET PILE WALL (LIMIT OF REMEDIAL SUBAREA)
┈	GROUNDWATER TRANSMISSION PIPING
— — —	SAND BAG BARRIER OR EQUAL
—·—	APPROXIMATE LIMITS OF ADJACENT LAYOUT AREAS
●	SUMP PIT AND PUMP
⊠	INLET PROTECTION
➡	DIRECTION OF TRUCK TRAFFIC
〰	LIMIT OF EXCAVATION WITHOUT SHEET PILE
🟦	LIMIT OF EXCAVATION
◉	GROUND AIR MONITOR
◆	ELEVATED & GROUND AIR MONITOR
⁂	SANDBAGS
⋈	GATE VALVE

REFERENCE: "TOPOGRAPHIC SURVEY" (DWG. NO. 7.01, REV.4, DATED 2–16–06) BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES.

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LAYOUT AREA 2 REMEDIAL AREA A AIR MONITORING LOCATIONS

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DATE:	7/31/2012	DWG SCALE:	1"=40'	PROJECT NO:	100-710		

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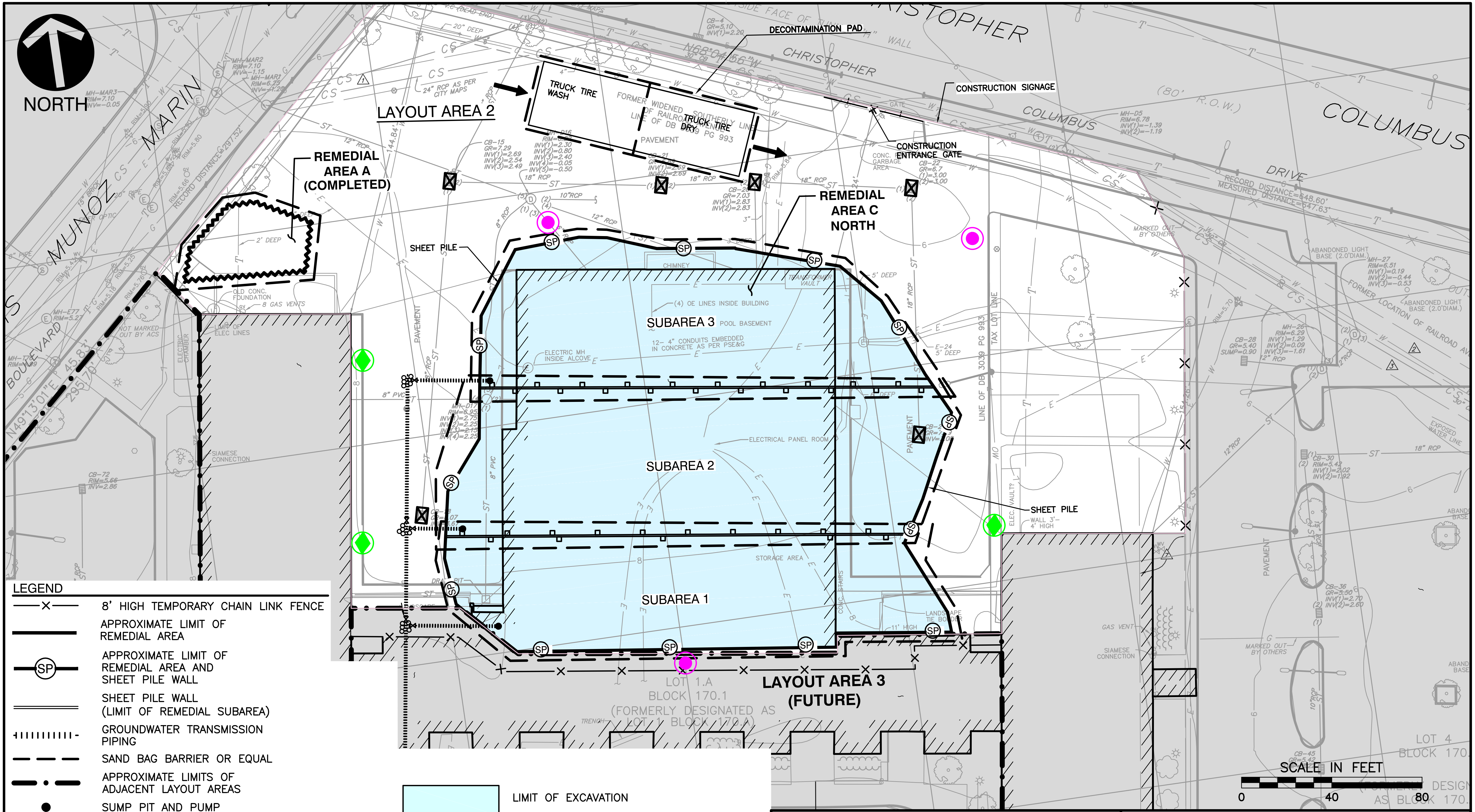

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—	APPROXIMATE LIMIT OF REMEDIAL AREA
—(SP)—	APPROXIMATE LIMIT OF REMEDIAL AREA AND SHEET PILE WALL
═	SHEET PILE WALL (LIMIT OF REMEDIAL SUBAREA)
ıııııııııı	GROUNDWATER TRANSMISSION PIPING
— — —	SAND BAG BARRIER OR EQUAL
—·—	APPROXIMATE LIMITS OF ADJACENT LAYOUT AREAS
●	SUMP PIT AND PUMP
☒	INLET PROTECTION
➡	DIRECTION OF TRUCK TRAFFIC
〰	LIMIT OF EXCAVATION WITHOUT SHEET PILE
▭	LIMIT OF EXCAVATION
◉	GROUND AIR MONITOR
◆	ELEVATED & GROUND AIR MONITOR
ꝏ	SANDBAGS
⋈	GATE VALVE

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LAYOUT AREA 2 REMEDIAL AREA C NORTH
AIR MONITORING LOCATIONS

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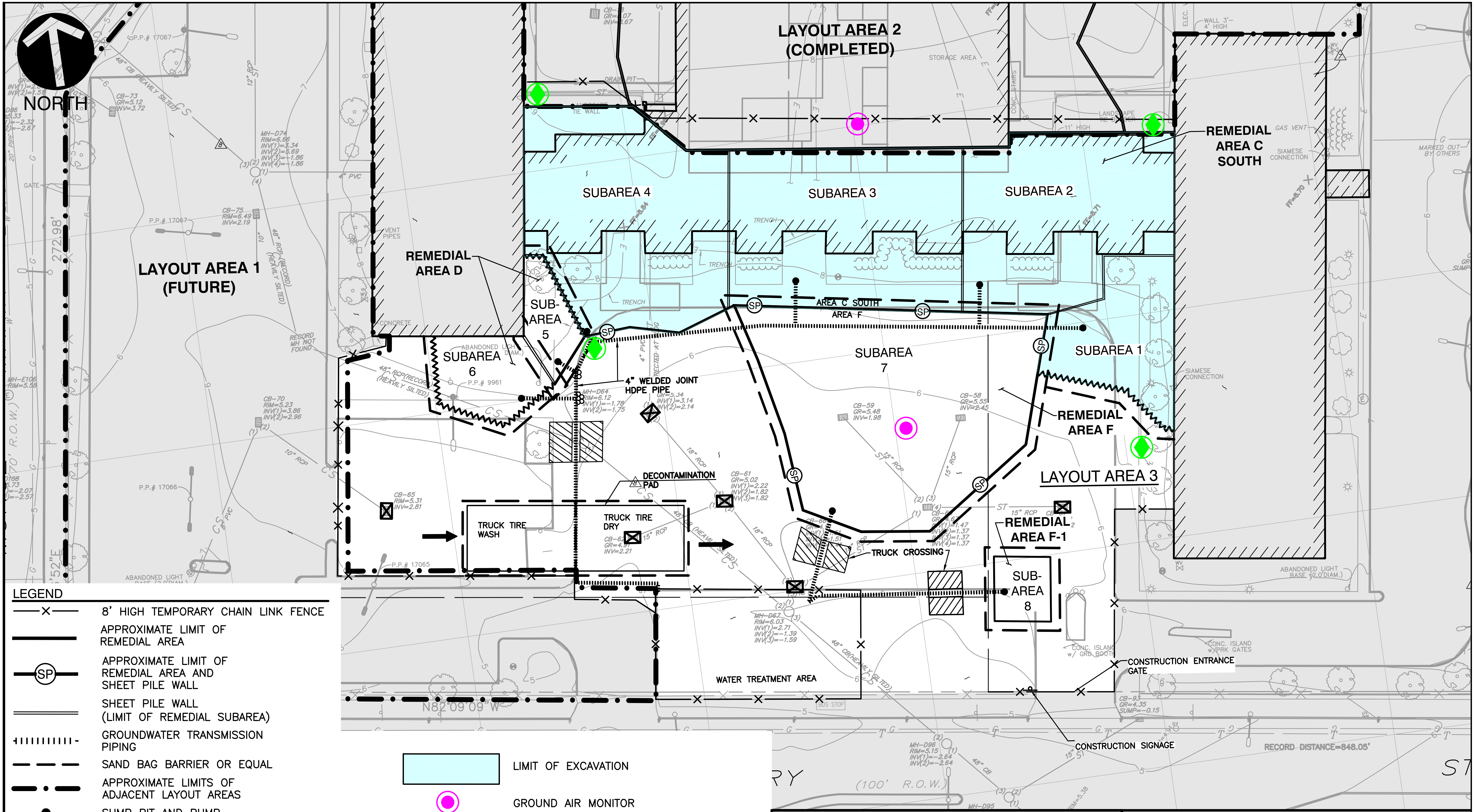

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➡	DIRECTION OF TRUCK TRAFFIC
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◎	GROUND AIR MONITOR
🟩	ELEVATED & GROUND AIR MONITOR
∞	SANDBAGS
⋈	GATE VALVE

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LAYOUT AREA 3 REMEDIAL AREA C SOUTH
AIR MONITORING LOCATIONS

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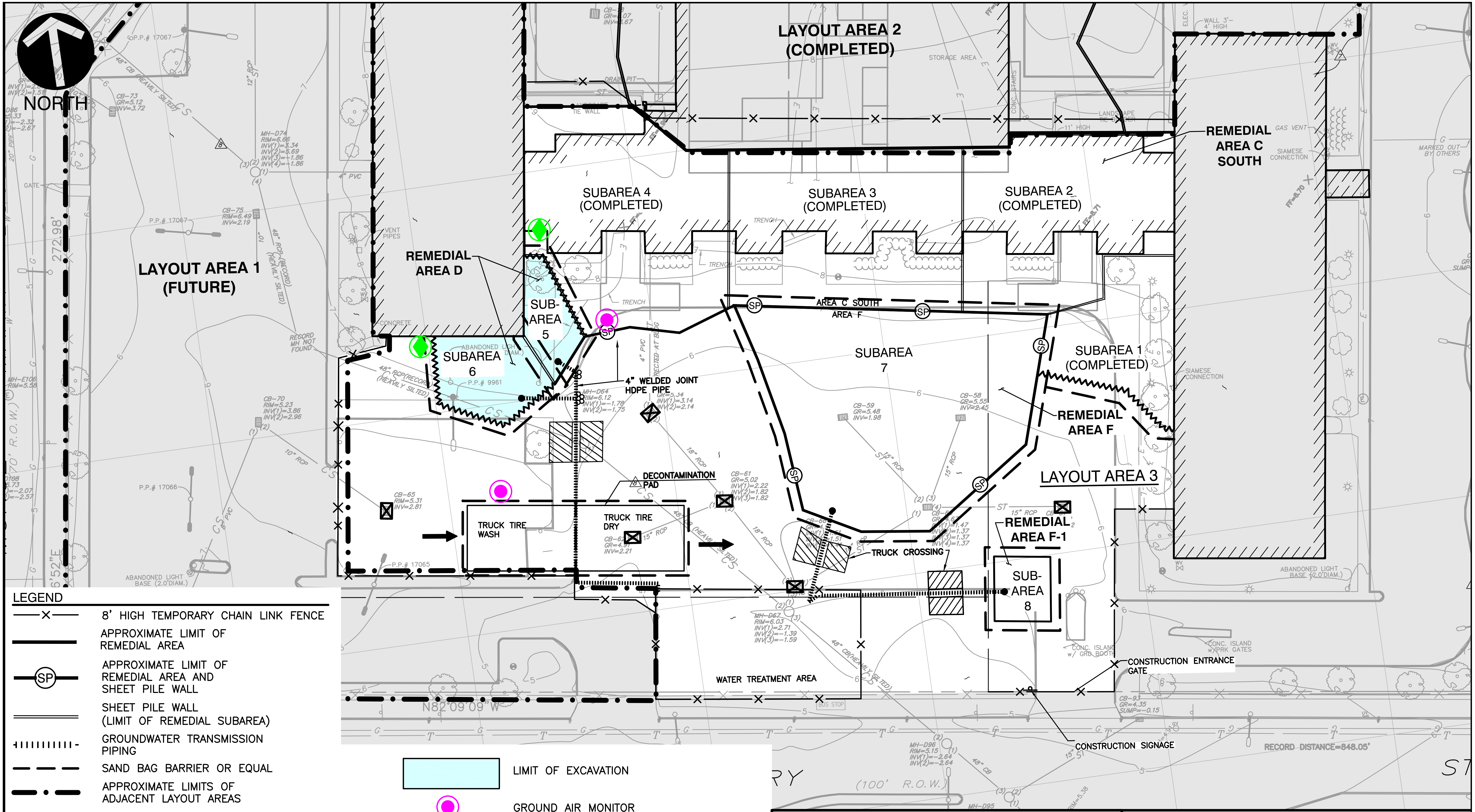

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🟦	LIMIT OF EXCAVATION
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◆	ELEVATED & GROUND AIR MONITOR
ꝏ	SANDBAGS
⋈	GATE VALVE

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LAYOUT AREA 3 REMEDIAL AREA D
AIR MONITORING LOCATIONS

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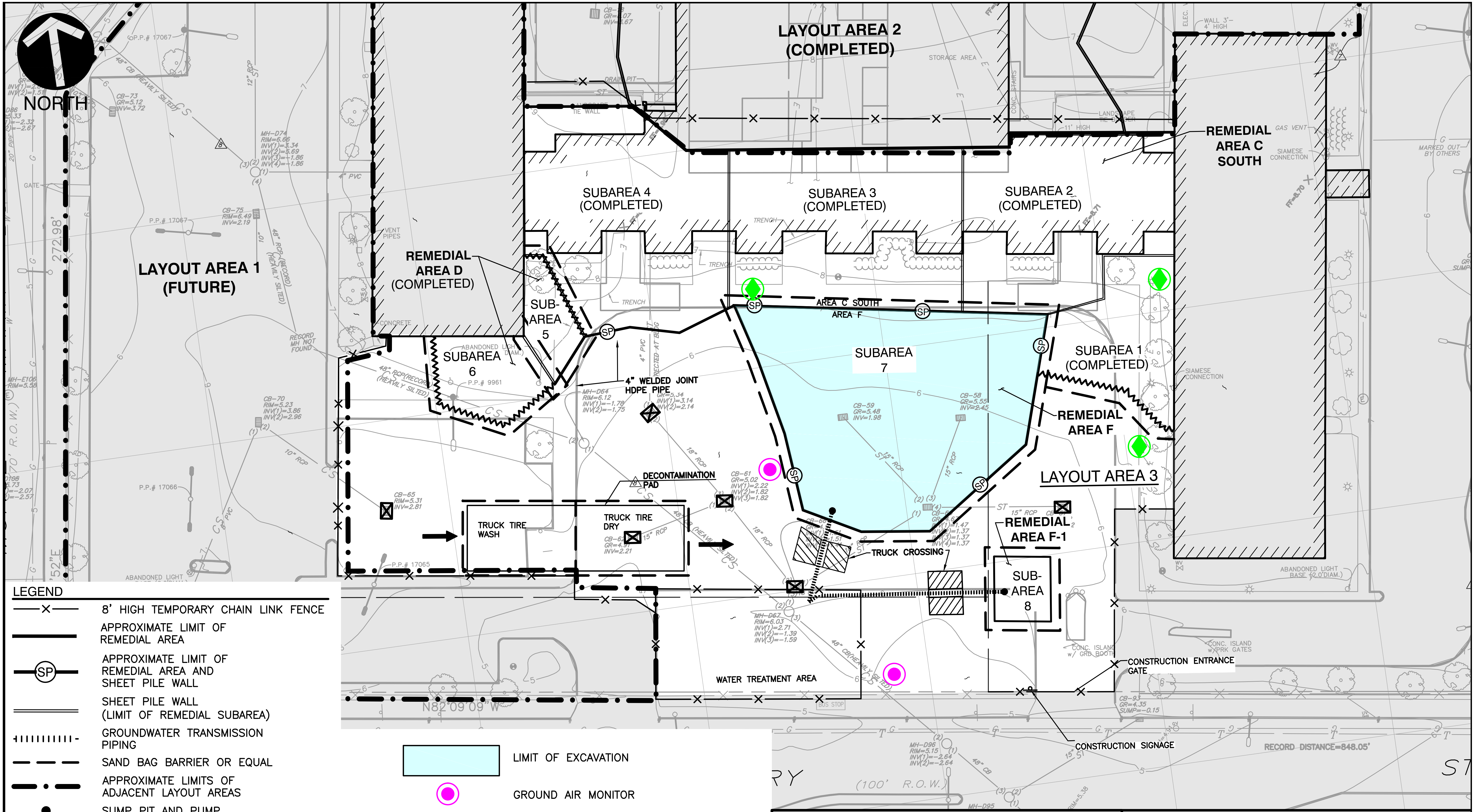

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⋈	GATE VALVE

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LAYOUT AREA 3 REMEDIAL AREA F
AIR MONITORING LOCATIONS

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DATE:	7/31/2012	DWG SCALE:	1"=40'	PROJECT NO:	100-710	6

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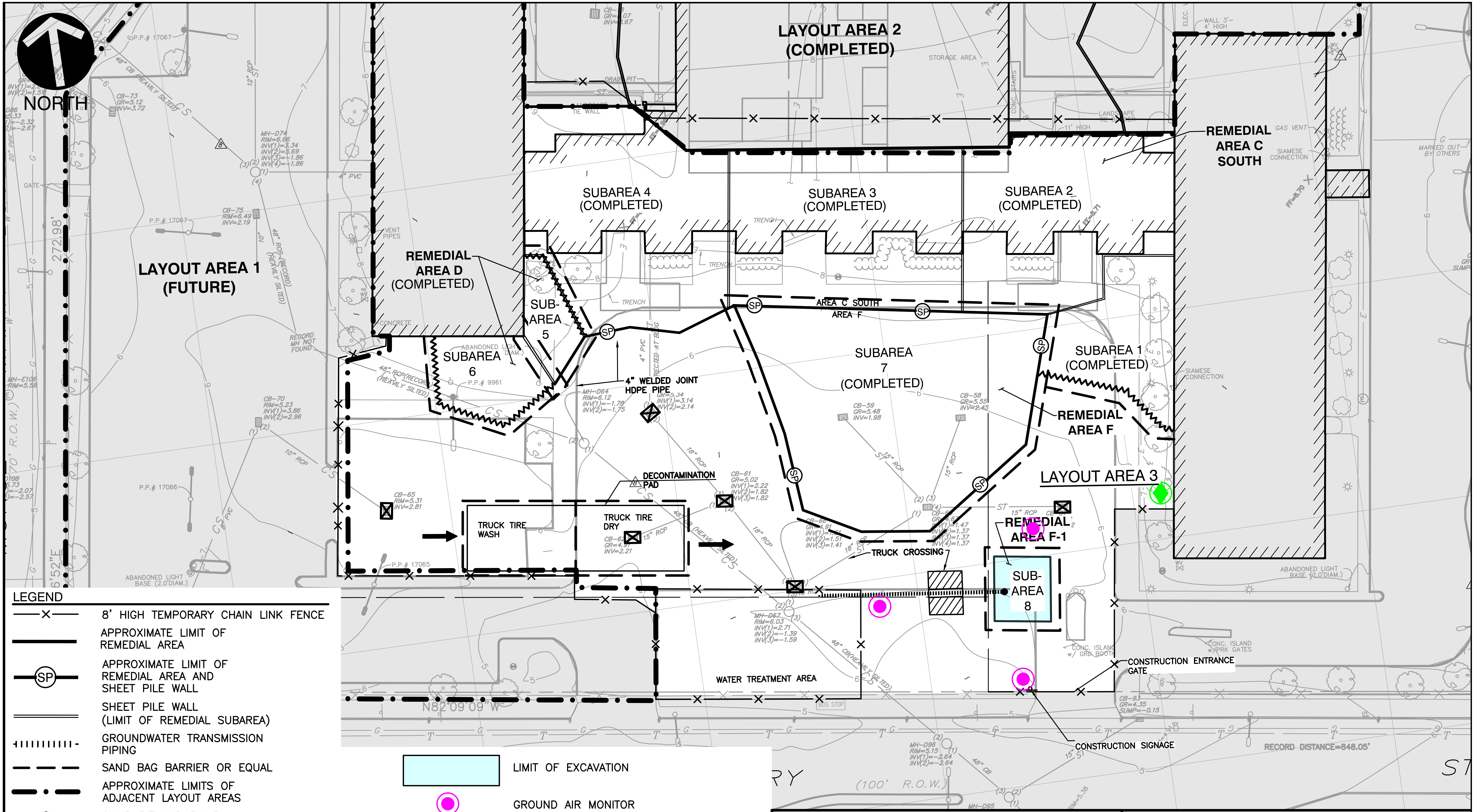

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LAYOUT AREA 3 REMEDIAL AREA F-1
AIR MONITORING LOCATIONS

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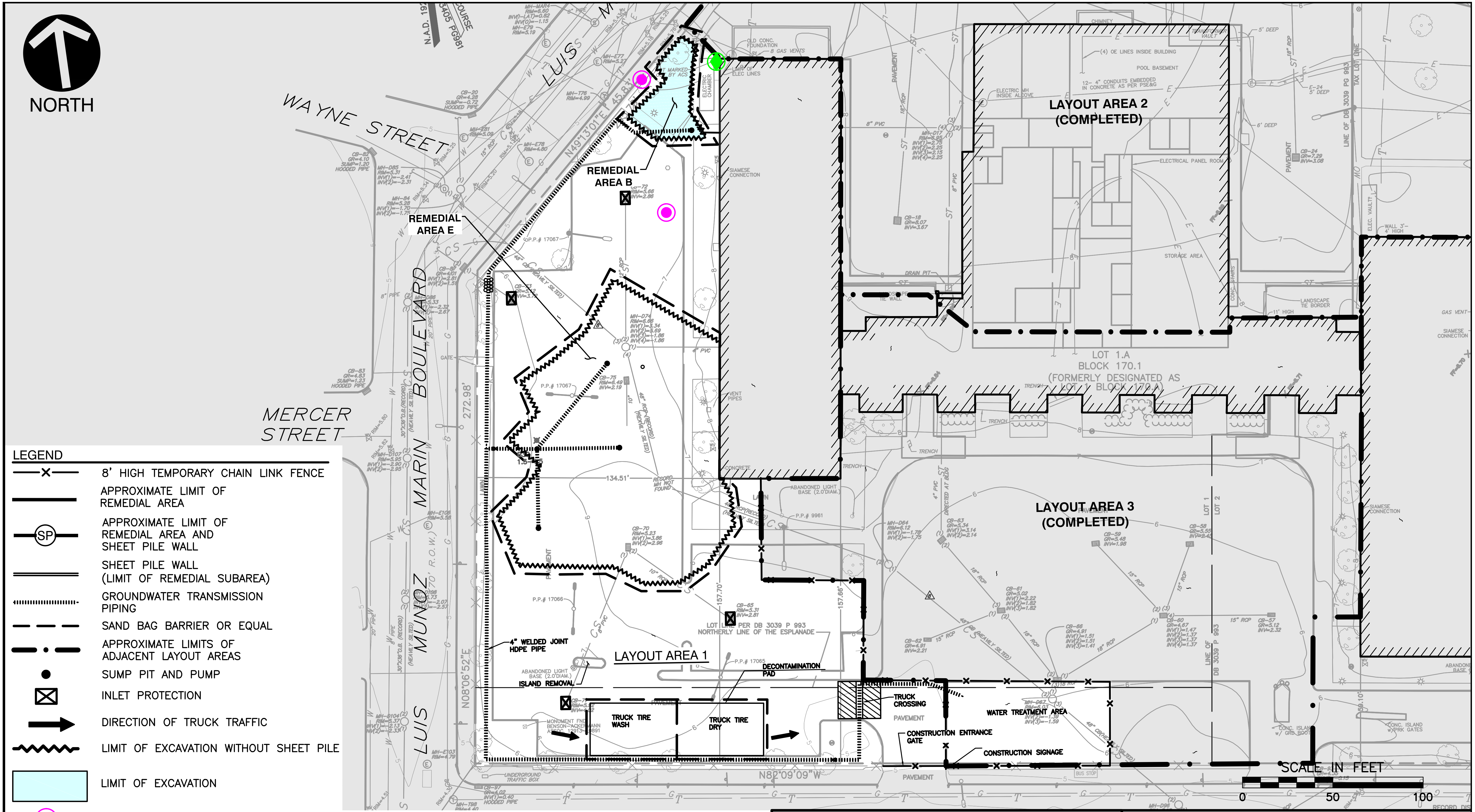

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—×—	8' HIGH TEMPORARY CHAIN LINK FENCE
▬▬	APPROXIMATE LIMIT OF REMEDIAL AREA
—(SP)—	APPROXIMATE LIMIT OF REMEDIAL AREA AND SHEET PILE WALL
═══	SHEET PILE WALL (LIMIT OF REMEDIAL SUBAREA)
┈┈┈	GROUNDWATER TRANSMISSION PIPING
— — —	SAND BAG BARRIER OR EQUAL
▬ · ▬	APPROXIMATE LIMITS OF ADJACENT LAYOUT AREAS
•	SUMP PIT AND PUMP
☒	INLET PROTECTION
➡	DIRECTION OF TRUCK TRAFFIC
〰	LIMIT OF EXCAVATION WITHOUT SHEET PILE
▭	LIMIT OF EXCAVATION
◉	GROUND AIR MONITOR
◆	ELEVATED & GROUND AIR MONITOR
∞	SANDBAGS
⋈	GATE VALVE

REFERENCE: "TOPOGRAPHIC SURVEY" (DWG. NO. 7.01, REV.4, DATED 2-16-06) BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES.

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Civil & Environmental Consultants, Inc.
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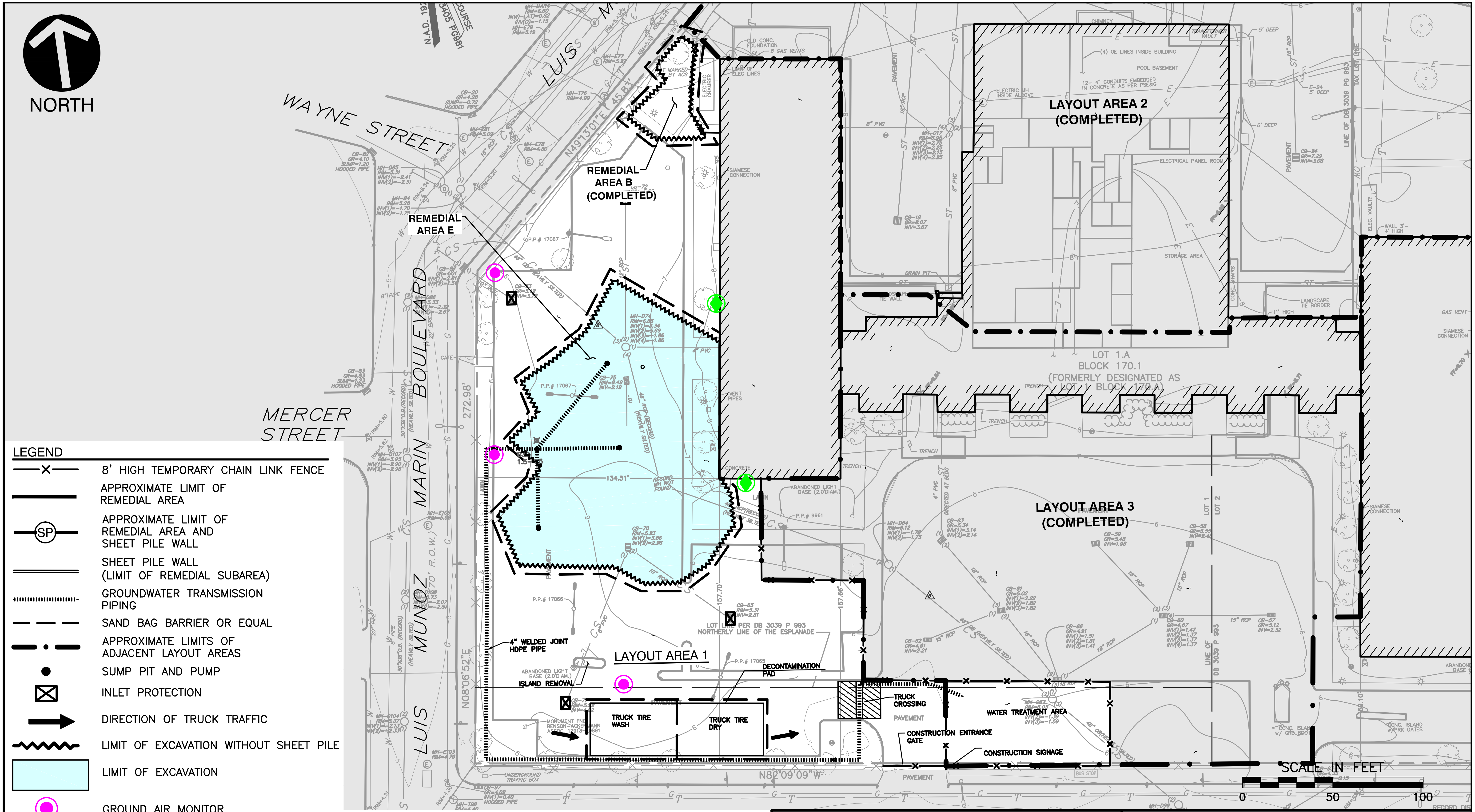
PPG INDUSTRIES, INC.
METROPOLIS TOWERS
JERSEY CITY
HUDSON COUNTY, NEW JERSEY

LAYOUT AREA 1 REMEDIAL AREA B
AIR MONITORING LOCATIONS

DRAWN BY: SCC	CHECKED BY: BSJ	APPROVED BY: ETM	DRAWING NO.:			
DATE: 7/31/2012	DWG SCALE: 1"=50'	PROJECT NO: 100-710	8			



LEGEND

—×—	8' HIGH TEMPORARY CHAIN LINK FENCE
━━	APPROXIMATE LIMIT OF REMEDIAL AREA
—(SP)—	APPROXIMATE LIMIT OF REMEDIAL AREA AND SHEET PILE WALL
═══	SHEET PILE WALL (LIMIT OF REMEDIAL SUBAREA)
┄┄┄	GROUNDWATER TRANSMISSION PIPING
— — —	SAND BAG BARRIER OR EQUAL
—·—	APPROXIMATE LIMITS OF ADJACENT LAYOUT AREAS
●	SUMP PIT AND PUMP
⊠	INLET PROTECTION
➡	DIRECTION OF TRUCK TRAFFIC
〰	LIMIT OF EXCAVATION WITHOUT SHEET PILE
🟦	LIMIT OF EXCAVATION
◉	GROUND AIR MONITOR
◆	ELEVATED & GROUND AIR MONITOR
∞	SANDBAGS
⋈	GATE VALVE

REFERENCE: "TOPOGRAPHIC SURVEY" (DWG. NO. 7.01, REV.4, DATED 2-16-06) BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES.

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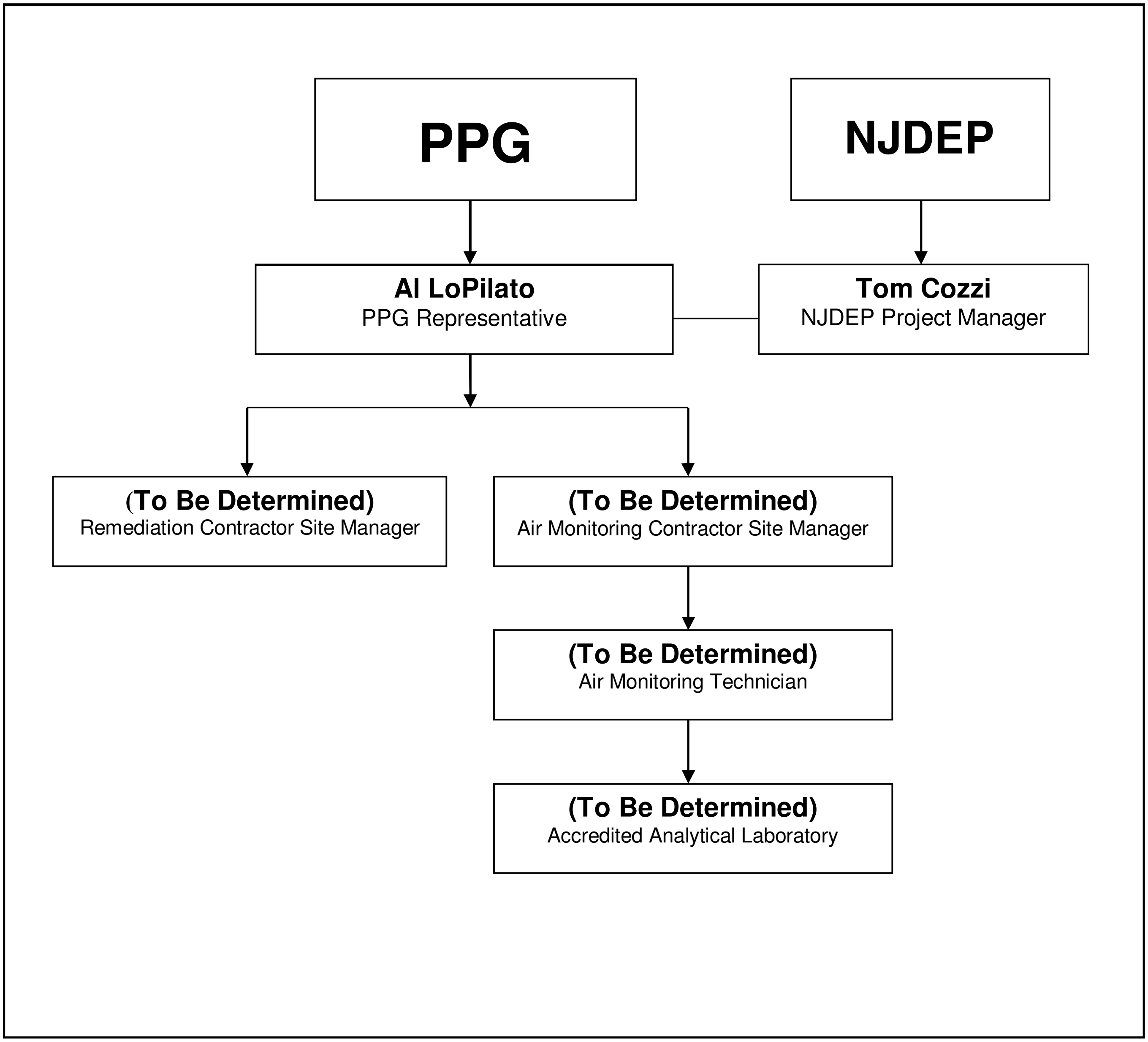
HUDSON COUNTY, NEW JERSEY

LAYOUT AREA 1 REMEDIAL AREA E
AIR MONITORING LOCATIONS

DRAWN BY: SCC	CHECKED BY: BSJ	APPROVED BY: ETM	DRAWING NO.:
DATE: 7/31/2012	DWG SCALE: 1"=50'	PROJECT NO: 100-710	9

FIGURE 10
AIR MONITORING ORGANIZATIONAL CHART
Project Air Monitoring Plan
Metropolis Towers – Jersey City, Hudson County, New Jersey



APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

PROJECT AIR MONITORING PLAN
QUALITY ASSURANCE PROJECT PLAN
METROPOLIS TOWERS SITE
JERSEY CITY, NEW JERSEY

Submitted to:

PPG Industries, Inc.
4325 Rosanna Drive
Allison Park, PA 15101

CEC Project 100-710

August 2012

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TABLES

1.0 PROJECT DESCRIPTION

PPG Industries, Inc. (PPG Industries) is conducting remedial activities at the Metropolis Towers Site in Jersey City, New Jersey. In support of these remedial activities, PPG Industries will conduct ambient air monitoring to evaluate short-term (daily) exposures and potential risks associated with long-term exposure to ambient concentrations that may occur during the remedial action. The Project Air Monitoring Plan (PAMP) has been prepared to address the objectives and procedures of the air monitoring for the remedial activities. The location of the Site is depicted in Figure 1 of the PAMP.

Ambient air monitoring efforts include collecting ambient air samples from air monitoring stations (AMS) at the site. The air monitoring will include real-time measurements of particulate matter less than 10-micron in aerodynamic size (PM_{10}) concentrations. The real-time air monitoring will supplemented with confirmatory time-integrated measurements of ambient concentrations of hexavalent chromium and PM_{10}. Continuous meteorological data will be collected on site in support of the monitoring program.

This Quality Assurance Project Plan (QAPP) and standard operating procedure (SOP) manual are being produced to provide acceptable guidelines for the air monitoring.

2.0 AIR MONITORING ORGANIZATION AND CONTROL

PPG Industries, Inc. (PPG) will designate a Site Manager who will be the contact for air monitoring and air quality related issues. The Remediation Contractor's Site Manager, the Air Monitoring Contract Project Manager (AMCPM) and the Air Monitoring Technician (AMT) will be identified following procurement by PPG. PPG will also procure a contractor to supervise and conduct the air monitoring program, who will in turn designate an Air Monitoring Contract Program Manager (AMCPM). Analytical services for the time-integrated samples will be provided as a subcontract to the company conducting the air monitoring program. Mr. Tom Cozzi is the New Jersey Department of Environmental Protection (NJDEP) Manager for the remedial action of the Site.

2.1 AMBIENT AIR MONITORING MANAGEMENT PERSONNEL, RESPONSIBILITIES, AND COMMUNICATION

The Air Monitoring Contract Project Manager (AMCPM) for the Site will manage the implementation of the air monitoring program. The company selected by PPG will assign a qualified Air Monitoring Technician (AMT) to conduct the air monitoring program. The AMCPM will coordinate the time-integrated sample analyses and data reporting with a laboratory accepted by the NJDEP to perform the sample analyses.

In the event of a Particulate Action Level (PAL) or Acceptable Air Concentration (AAC) exceedance, the AMT will evaluate the possible cause and, if associated with site activities, will evaluate the required abatement measures and direct the Remediation Contractor's Site Manager to implement abatement. The Remediation Contractor's Site Manager will be responsible for the implementation of emission abatement options in response to the exceedance. The AMT is responsible for evaluating the effectiveness of the abatement performed and notifying the Remediation Contractor's Site Manager to undertake additional abatement if needed.

All exceedances of action levels will be recorded in the daily work log by the AMT and the Remediation Contractor's Site Manager. The AMT will communicate all exceedances to the PPG Site Manager. The emission abatement actions implemented in response to the air quality exceedance(s) will also be recorded in the daily work log.

3.0 QA OBJECTIVES

Objectives for precision, accuracy, completeness, representativeness, and comparability of the data collected are specified in the following subsections. Specifications for precision and accuracy are based on current knowledge about the measurement methods. Objectives for completeness, representativeness, and comparability are based on the intended use of the data.

3.1 PRECISION AND ACCURACY

Data quality objectives (dqo) for the air quality measurements are specified in Table QA-2. To comply with the Quality Assurance (QA) requirements of 40 Code of Federal Regulations (CFR), Part 58, Appendix B, the precision of manual air quality measurements is usually reported quarterly. Manual precision determinations will be met by equipping the Site with one set of collocated samplers. The two samplers will be within four meters (m) of each other but at least two meters apart to preclude airflow interference. Calibration, sampling, and analysis will be the same for both collocated samplers and the other samplers in the network. The duplicate samplers will be operated during every other sampling event.

The real-time ambient monitors are portable units that are, for the most part, self-contained where precision and accuracy checks based on 40 CFR, Part 58, Appendix B guidelines do not apply.

The differences in measured concentration [micrograms per cubic meter (µg/m3)] between the designated sampler (Xi) and the collocated sampler (Yi) are used to calculate precision as follows:

$$di = \frac{Yi - Xi}{(Xi + Yi)/2} \, x \, 100 \qquad \textbf{(3-1)}$$

$$dj = \frac{1}{n} \sum_{i=1}^{n} di \qquad \textbf{(3-2)}$$

$$Sj = \sqrt{\frac{1}{n-1}\left[\sum_{i-1}^{n} di^{2} - \frac{1}{n}\left(\sum_{i=1}^{n} di\right)^{2}\right]} \qquad \textbf{(3-3)}$$

Upper 95 percent probability limit = dj + 1.96.S **(3-4)**

Lower 95 percent probability limit = dj - 1.96.S **(3-5)**

The mean and standard deviation of all of the percent values for a given pollutant are used to define the precision of that measurement during the sampling program. In this analysis, it is assumed that the variability of the percent values fits a normal distribution. On the basis of this assumption, it is expected that 95 percent of the data in that distribution will fall within 1.96 standard deviations on either side of the mean.

The precision therefore will be reported as a 95-percent confidence interval bounded by two-percent values. The interpretation is that for any randomly-selected value within the database represented, there is only a five-percent probability that its accuracy is outside of the boundaries defined as the upper and lower 95-percent confidence limits.

Accuracy statistics for manual samplers will be quantified through performance audits of the samplers. In these audits, each sampler will be challenged with a one-point flow rate determination at the designed flow rate for that particular pollutant sampler at actual conditions, in accordance with procedures in Section 10.0.

For each sampler, the percent difference between the sampler flow rate and the audit orifice flow rate is calculated as:

$$\Delta \textbf{\textit{Percent}} \quad = \quad \frac{[Sampler\ Flow - Audit\ Flow]}{[Audit\ Flow]}\ x\,100 \qquad \textbf{(3-6)}$$

This procedure yields a percent difference value for each analyzer. Each percent difference value represents the accuracy of the current period's data from that sampler within the represented portion of the measurement range.

3.2 COMPLETENESS

The objective for completeness is to obtain valid data for at least 90 percent of all scheduled sample run dates. Criteria for valid data are specified in Table QA-2 and presented in more detail in Section 8.

Completeness requirements for averaging periods are as follows:

Period	Minimum
1 hour	45 minutes
3 hour	2.5 hours
24 hour	23 hours

3.3 REPRESENTATIVENESS OF SAMPLES

The sampling site locations will be selected according to the criteria established by the project management group and listed in Section 4. The intent of these criteria is to locate the sampling sites so that PM_{10} and hexavalent chromium concentrations represent the conditions at and around the remediation activity at the Site.

3.4 COMPARABILITY

The objective for comparability is to obtain a database that is consistent with other organizations and agencies. Table 3 lists the target compounds and the reporting limits. Units for standard temperature and pressure will be 25 degrees Celsius (°C) and 760 millimeters (mm), respectively.

3.5 REFERENCES FOR SAMPLING METHODS

The measurement of ambient PM_{10} by high-volume method is from the Reference Method for the Determination of Particulate Matter as PM_{10} in the Atmosphere, 40 CFR Part 50, Appendix J. The PM_{10} analysis will be determined in accordance with the procedures in 40 CFR 50, Appendix J, EPA-600-9-76-005 and EPA-600/4-77-027a. Sampling and analysis will be in accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP 2000-105, March 2007, Rev 6, “Filter Processing Method for the Determination of Suspended Particulates in Ambient Air”. Alternate methods may be used if approved by the Department.

Hexavalent chromium samples will be collected and analyzed using the OSHA Method ID-215 protocols on accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP II-CR6PREP “Preparation of PVC Filters for the Determination of Hexavalent Chromium by IC” and SOP II-CR6IC “Analysis of Hexavalent Chromium by Ion Chromatography” or an alternate method approved by the Department.

4.0 SAMPLING PROCEDURES

4.1 PROCEDURES FOR STATION SITING

The Metropolis Towers remedial action air monitoring network will consist of ground level and elevated AMSs at locations depending on the work area. The meteorological station will be in the vicinity of the northwest corner of the Site. Figures 2 through 9 of the PAMP depict the locations of the AMSs and meteorological station. The following summarizes the siting protocol.

4.1.1 General Siting Criteria for AMS Locations

Locations must conform to the following criteria:

1. The AMS must be accessible in all weather conditions.
2. The AMS must be located in an area secure from damage by animals or vandals.
3. The AMS must be serviceable by line power and have room for a suitable platform for the collocated samplers.
4. All possible efforts should be made to locate the AMS on level, naturally vegetated land or in grassy areas. The AMS location shall not have a slope greater than 20 degrees from the horizontal.
5. The AMS must be located outside the wakes of buildings, trees, or abrupt changes in terrain.
6. At the meteorological measuring station site, the guideline protocol as described in Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements (as revised March 1995) will be followed. In general, the location should not have a slope of more than ±2 percent; maximum obstruction or vegetation height should be <0.3 m.

Sensor and sampler siting criteria described in the EPA guidance, Air/Superfund National Technical Guidance Study Series, Volume IV, EPA-451/R-93-007, May 1993 and Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements (as revised March 1995) will be followed as closely as possible.

In general, sample inlets should:

1. Be greater than 10 m from trees.
2. Be at least twice the height of any obstacle away from that obstacle.
3. Have unrestricted airflow for a 270° arc around the probe.
4. Be at least 2 m in all directions from any horizontal supporting structure.
5. Be at least 50 feet (ft) from rural roadways (farther from more heavily traveled roads)

Wind speed and direction sensors should ideally be located 3 m above ground and in open terrain where the horizontal distance between the sensor and any obstruction is at least 10 times the height of that obstruction. Temperature sensors should be at least 2 m above non-irrigated grass or natural earth.

4.2 SAMPLING EQUIPMENT AND CONTAINERS

4.2.1 Air Sampling and Monitoring Equipment

The air sampling and monitoring equipment to be used to conduct the real-time and time-integrated sampling and monitoring for hexavalent chromium and PM_{10} are listed in Table QA-4.

4.2.2 Air Sampling and Monitoring Equipment Decontamination

Decontamination of the air sampling and monitoring equipment is not anticipated.

4.2.3 Air Sampling and Monitoring Equipment Calibration

Air sampling and monitoring equipment will be calibrated in accordance with manufacturer's instructions and discussed in Section 6.

4.2.4 Time-Integrated Air Sampling Containers and Preservation Techniques

The sampling containers, preservation techniques, and maximum holding times to be used during the time-integrated perimeter air monitoring are summarized in Table QA-5.

4.3 SAMPLE COLLECTION PROCEDURES

4.3.1 Real-Time Air Monitoring Techniques

The following instrumentation and sampling techniques will be used to collect the real-time monitoring data. During the remedial activities, real-time PM_{10} concentrations will be monitored using instrumentation positioned at "fixed" locations. PM_{10} concentrations will be measured using a DataRam Monitor, or equivalent.

4.3.1.1 PM_{10} Monitoring

PM_{10} concentrations will be measured using a DataRam Dust Monitor, or equivalent. The PM_{10} monitor will include an inlet heater and omnidirectional inlet. The PM_{10} monitor will be housed in a climate controlled, weather tight enclosure. The PM_{10} monitor shall have an internal or external datalogging capability designed to record and store PM_{10} data. The ambient air to be analyzed is drawn into the unit via an internal volume-controlled pump at a rate of 1.2 liters per minute (lpm). The sample passes through the sample cell, past the laser diode detector and is collected onto a 47-millimeter (mm) filter. The pump also generates the necessary clean sheath air, which is filtered and passes through the sheath air regulator back into the optical chamber. This ensures that no dust contamination comes in contact with the laser-optic assembly. This particle-free airflow is also used for the reference zero test during the auto-calibration.

The DataRam displays particulate concentration every six seconds as micrograms per cubic meter (µg/m3). The DataRam will measure PM_{10} concentrations in the range of 1 to 10,000 µg/m3. The monitor's accuracy is ±4% over the full detection range. Internal rechargeable batteries power the DataRam.

PM_{10} data will be collected using the following procedures:

1. To power up or power down the instrument, hold the ON/OFF key down until a "beep" is heard. A restart should not be attempted for at least five seconds after the instrument has been in the "OFF" mode.

2. At the beginning of each sampling event, the instrument initiates a self-test and calibration check, which lasts approximately 30 seconds. The system self-test and calibration consist of a series of electrical diagnostics and measurements performed with internal "clean" sheath air. When the system self-test and calibration are complete, the display will read "Calibration OK".
3. The actual PM_{10} measurement begins when the LCD displays the first concentration. Subsequent concentrations will be displayed every six seconds. The real-time PM_{10} measurement data are transferred to a central computer and stored to the air monitoring database.

4.3.1.2 Meteorological Parameters

The self-contained, digital meteorological system will be used to collect horizontal wind speed, horizontal wind direction, ambient temperature, relative humidity, and barometric pressure data at the designated continuous meteorological monitoring station. The meteorological sensors will be directly interfaced with the datalogger. The datalogger will record at ten second intervals each sensor's analog signal and convert that signal into engineering units in 15-minute average increments.

The wind speed sensor shall consist of a lightweight three-cup anemometer attached to a shaft, which is directly coupled to a slotted disc chopper wheel. The rotation of the cups in turn rotates the chopper that interrupts the light path of an optical link. The signal is amplified and produces pulsed frequency output proportional to wind speed. The wind speed sensor's output is directly interfaced with the data logger. The meteorological sensor must be able to interface to the printed circuit board, which converts the sensor's output to engineering units (miles per hour).

The wind direction sensor shall consist of a lightweight airfoil vane, which is directly coupled to a single precision potentiometer. The sensor must incorporate a built-in electronics module that provides a voltage source for the potentiometer that amplifies the output voltage signal for transmission to the data logger. The meteorological sensor interface printed circuit board converts the output voltage to engineering units (degrees).

The relative humidity sensor shall be equipped with an ambient temperature sensor mounted in the relative humidity sensor. The relative humidity sensor's operation is based upon the capacitance change of a polymer thin film capacitor. A 1-micron-thick dielectric polymer layer absorbs water molecules through a thin metal electrode and causes capacitance change proportional to relative humidity. The thin polymer layer reacts very fast, and therefore, the response time is very short, less than 5 seconds to 90% of the final value of relative humidity. The sensor responds to the full range from 0 – 100% relative humidity with ±2% accuracy. Its response is essentially linear, with small hysteresis, and negligible temperature dependence. The temperature sensor's range is from -120º F to +120º F with ±0.5º F accuracy. The independent analog signal from the relative humidity sensor and the temperature sensor will be interfaced with the datalogger.

The barometric pressure sensor shall convert absolute atmospheric pressure into a linear, proportional voltage that is interfaced with the datalogger. The sensor should be housed in a fiberglass enclosure. The standard range of the barometric sensor should be 26 to 32 inches of mercury (in Hg) suitable for elevations from sea level to 1500 ft.

4.3.2 Confirmatory Time-Integrated Air Monitoring Techniques

The following instrumentation and time-integrated air monitoring techniques will be used to collect air samples for analysis of hexavalent chromium and PM_{10} .

4.3.2.1 PM_{10}

The 24-hour time-integrated PM_{10} samples will be collected using the Andersen Model GUV-16H sampler or equal. This sampler is also an USEPA reference method for measuring PM_{10}. The PM_{10} sampler is equipped with an Andersen Model GFH360 VFC (VFC). The VFC is a dimensional venturi device used to control gas flow. Flow control is accomplished by accelerating the airflow through the venturi. At some point in the flow stream, the air velocity will equal the acoustic velocity, achieving critical flow. This "choking" condition is a distinctive characteristic of the VFC. The VFC uses this choked flow to maintain a constant actual flow rate of 40 cubic feet per minute (cfm) over a sampling period.

Sampling procedures used for the collection of PM_{10} data are consistent with quality assurance and operational specifications defined in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.11. “Reference Method for the Determination of Particulate Matter as PM_{10} in the Atmosphere (High-Volume PM_{10} Sampler Method)”.

Before installing a new filter, clean the rubber gasket on the filter holder to remove any filter fibers or dust. Use a clean, dry cloth or paint brush to clean the area surrounding the filter holder.

1. Record the project number, motor number, filter number, station number, date of sample collection, and time started [use military time (e.g., 2400 hours or 0001 hours)] on the PM_{10} Field Envelope.
2. Carefully remove clean filter from box and place in filter holder. If the filter is torn or broken, discard it, record deposition, and use the next filter in the box.
3. Center the holder on the screen so that when the faceplate is in position, the gasket will form an airtight seal on the outer edge of the holder. When aligned correctly, the edges of the filter should be parallel both to the edges of the screen below it and to the faceplate gasket above it.
4. Once the filter holder is in place, tighten the four wing nuts so that the gasket is airtight against the filter holder. Tighten the wing nuts evenly at diagonals, avoiding excessive tightening to minimize the filter’s tendency to stick to the gasket and to guard against damage to the gasket.
5. Turn the motor on and allow it to warm up for approximately five minutes. Attach a 24-inch oil manometer to the stagnation pressure tap.
6. After warm-up, record the total manometer reading (Pf1) on the PM_{10} Field Envelope.
7. Turn the motor off and set the timer so that the sampler will begin sampling at the appropriate time.
8. Enter the initial elapsed time reading on the PM_{10} Field Envelope.
9. Close the sampler inlet and complete the seasonal operating conditions data on the PM_{10} Field Envelope.
10. Note on the envelope any anomalies in ambient conditions (e.g., high winds, construction activity, dust storms).

Use the following procedures to remove a collected sample:

1. Turn the sampler motor on and allow the motor to stabilize for approximately five minutes. Attach the 24-inch oil manometer to the sampler stagnation pressure tap and record the PF2 differential pressure.
2. Turn the sampler motor off.
3. Record the final elapsed time on the PM_{10} Field Envelope.
4. Without touching the exposed area, gently remove the exposed filter and filter holder.
5. Remove the filter from the filter holder and fold the exposed area together lengthwise.
6. Calculate the average sample flow rate using the equations and examples provided on the PM_{10} Field Envelope as follows:
    a. PF1 = manometer right side reading + left side reading at filter installation
    = 14.5 + 15.0
    = 29.5 inches water.
    b. PF2 = manometer right side reading + left side reading at filter removal
    = 14.5 + 14.50
    = 29.0 inches water.
    c. PFa = average flow for the respective sampling period millimeters of mercury (mm Hg)
    = [(PF1+ PF2)/2] x 1.8663
    = [(29.5 + 29.0)/2] x 1.8663
    = [58.5/2] x 1.8663
    = [29.25] x 1.8663
    = 54.59 mm Hg,
    where: 1.8663 = conversion factor for inches of water to mm Hg.
    d. Po/Pa = pressure ratio across the filter based on actual barometric pressure
    e. QA = actual flow rate derived from the look-up table for the specific VFC based
    = 1 – (PFa/Pa)
    = 1 – (54.59 / 751.65)
    = 1 – 0.073
    = 0.927.
    f. QA = actual flow rate derived from the look-up table for the specific VFC based on the Po/Pa ratio and actual temperature.

= Po/Pa = 0.927

= Ts = 41.6ºF or 6.33ºC

= 41.6 cfm or 1.178 m3/m

g. Convert Qa to Qstd using the following equation.

Qstd= Qa ((Pa/Pstd) * (Tstd/Ta))

Pa= Actual pressure in mm

Pstd= 760 mm

Tstd= 298.15°K

Ta= Actual temperature in degrees C + 273.15

7. Place the respective filter in the envelope for shipment to the laboratory.

Processing of the samples will be in accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP 2000-105, March 2007, Rev 6, "Filter Processing Method for the Determination of Suspended Particulates in Ambient Air".

4.3.2.2 Hexavalent Chromium

Hexavalent chromium samples will be collected and analyzed using the OSHA Method ID-215 protocols on accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP II-CR6PREP "Preparation of PVC Filters for the Determination of Hexavalent Chromium by IC" and SOP II-CR6IC "Analysis of Hexavalent Chromium by Ion Chromatography" or an alternate method approved by the Department.

The integrated hexavalent chromium samples will be collected using personal sampling pumps or equal . Air is drawn into the pump at 15 liters per minute (L/min) to collect approximately 21 m^3 for a 24-hour sample. Actual flow rate used is adjustable and must be documented in the field notebook. Sample flow is directed through a 37-mm PVC filter cartridge. The 37-mm PVC filter cartridge is connected to the sampling pump using tygon tubing. Before and after each use, sample cartridges are capped with polypropylene caps. Each sample period assembly and disassembly of the sampling system is performed using the following procedure:

1. Starting a Sample:
   a. Check sampling pump for leaks by plugging the inlet of the system so no flow is indicated at the outlet of the pump with a mass flow meter.
   b. Before installing the sample cartridge, flush the inlet for 15 minutes. Let the sample cartridge warm to ambient temperature before connecting to the sample pump.
   c. Check the sample flow rate of the entire system with the mass flow meter. A flow rate of 15 L/min should be used. Record the flow rate on the Time Integrated Field Form.
2. Completing a sample
   a. Measure the flow rate with the mass flow meter and record the flow rate on the Time Integrated Sampling Field Form.
   b. Remove the sample cartridge from the sampling pump and cap the ends with the polypropylene caps and place back in the shipping container or tube. Cap, seal with TFE-fluorocarbon tape.
   c. Check the sampling pump for leaks by plugging the inlet of the system so no flow is indicated at the outlet of the pump with a mass flow meter.
3. All samples will be packaged in an ice chest with blue ice for return shipment to the laboratory. Complete the chain-of-custody form, include a copy with the samples, and ship to the laboratory via express carrier for next business day.
4. Calculate the sample volume as follows:

   $V_m = (T_2 – T_1) \times [(Q_1 – Q_2) / 2]$

   where

   V_m = total volume sampled at measured temperature and pressure, L.

   $T_2 – T_1$ = total sampling time, minutes

   $(Q_1 – Q_2) / 2$ = average flow rate, L/min
5. Calculate the total volume at standard conditions, 25^oC and 760 mmHg, using the following equation:

   $V_s = V_m \times P_A/760 \times 298 / (273 + T_A)$

   where

   V_s = total sample volume at 25^oC and 760 mmHg pressure, L

   V_m – total sample volume at measured temperature and pressure, L.

P_A = average ambient pressure, mm Hg
T_A = average ambient temperature, ^{o}C

4.3.3 Sampling Program Operations

4.3.3.1 Baseline Sampling

Baseline sampling of ambient air quality will be conducted prior to mobilization. Baseline samples will be collected at select AMS stations for 5 days prior to mobilization.

4.3.3.2 Confirmatory Time-Integrated Sampling

The mobilization of the time-integrated samplers will begin during the mobilization phase of the remediation general contractor. Preliminary sampling will begin as soon as the sampling equipment is operational, approximately 2 days after the mobilization.

The time-integrated sampling will be conducted during the work week, or when remedial activities are planned. Once per week starting at approximately 0700 hours, confirmatory time-integrated sample collection will be initiated. The samples will be collected the following day.

4.3.3.3 Real-Time Monitoring

The real-time PM_{10} monitors will be tested for proper operation during the mobilization phase.

The real-time monitoring will be conducted continuously at “fixed” locations along the Site perimeter during the remedial activities.

The meteorological station will be established near the project office facilities during project mobilization. The meteorological instrumentation will also undergo testing during mobilization and continuously collect data at the start of the remedial activity.

4.3.4 QA/QC Sample Collection Procedures

A summary of QC sample requirements is provided in Table QA-6.

4.3.4.1 Trip Blanks

Clean, unused PUF cartridges will also serve as trip blanks for PAH analysis. Clean, unused filters will serve as trip blanks for metals and PM_{10} analysis. Trip blanks for PAH, metals and PM_{10} analysis will be submitted for analysis at a rate of 10% of samples taken or once a week, whichever is greater.

4.3.4.2 Field Blanks

Clean unused PUF cartridges will also serve as field blanks for PAH analysis. Clean unused filters will serve as field blanks for metals and PM_{10} analysis. Field blanks for PAH, metals and PM_{10} analysis will be submitted for analysis at a rate of 10% of samples taken or once a week whichever is greater.

4.3.4.3 Field Duplicates

Field duplicate samples will be collected to measure the precision of the sampling process. The field duplicate samples will be identified on the labels and chain-of-custody forms. Field duplicates will be collected at a rate of once per week from a designated collocated site for PAHs, metals and PM_{10}.

4.4 FIELD SAMPLING LOGBOOK

4.4.1 Time-Integrated Sampling

Field data, including calibration, sample identification, equipment maintenance, sampling irregularities, and shipments will be recorded in the field logbooks. A set of field logbooks will be maintained for the time-integrated sampling network to document daily information as described above, pertinent to documenting the time-integrated sampling program.

A database will be established to manage analytical sample tracking and reported laboratory results. The reported analytical results will be organized by AMS and by sampling date.

The accumulated time-integrated results, field data, and comparison to the project air quality standards will be presented in the Project Air Monitoring Report.

4.4.2 Real-Time Sampling

Field data, including maintenance, sampling irregularities, and repairs will be recorded in a field logbook for the real-time monitoring network. The real-time monitoring data and maintenance records will also be presented in the Project Air Monitoring Report.

The assessment of the real-time monitoring data to evaluate exceedance of the action levels will be an ongoing daily process.

5.0 SAMPLE CUSTODY

5.1 SECURITY

Security involves procedures used to insure sample integrity from sample collection until sample disposal after laboratory analyses are complete. Security procedures are described in the following paragraphs.

5.1.1 Field Sample Security

Once collected, samples will be in the possession of field team members or in coolers locked in the field facility. Quality assurance/quality control (QA/QC) samples will also be collected and analyzed to document sample integrity.

5.1.2 Laboratory Sample Security

Samples will be stored in the laboratory in a secure area with access limited to authorized laboratory personnel. Upon receipt of coolers containing samples, laboratory personnel will check to ensure that the chain-of-custody seals are intact, measure the temperature of each cooler, and document the condition of the samples.

5.1.3 Sample Custody

The primary objective of sample custody is to create an accurate, written, verified record that can be used to trace the possession and handling of the samples from the moment of collection until receipt by the laboratory. Adequate sample custody will be achieved by means of approved field and analytical documentation.

A sample for this project is defined to be in a person’s custody if it is:

1. In one’s actual physical possession.
2. In one’s view, after being in one’s physical possession.

3. In one’s physical possession and then locked or otherwise sealed so that tampering will be evident.
4. Kept in a secure area, restricted to authorized personnel only.

5.2 SAMPLE DESIGNATION

Real-time air monitoring sample identifications will be based on AMS designations. For each real-time measurement, the date, sample start time, AMS identification, and wind direction will be recorded on the real-time monitoring field data sheet.

Time-integrated sample will be designated according to the following sample identification protocol:

AMS ID, Time-Integrated sampling method, sample date.

For example, a PM_{10} time-integrated sample collection started on January 30, 2010 from station AMS1 would have the following sample identification:

AMS1PM10013010

Additional identification for QA/QC samples would follow the above sample identification protocol, followed by:

D for a duplicate sample
T for a trip blank sample
F for a field blank sample

For example, a PM_{10} duplicate time-integrated sample collection started on January 30, 2010 from the collocated sampling station at AMS1 would have the following sample identification:

AMS1PM10013010D

5.3 SAMPLE PRESENTATION AND FIELD DOCUMENTATION

Field procedures will be designed to minimize sample handling and transfers. During sampling, field team members will record the following information in field notebooks and on the field chain-of-custody log sheet using indelible ink:

1. Unique sample number as obtained from the sample label.
2. Source of sample (including site name, location, and sample type).
3. Date and time of sample collection.
4. Name(s) of collector(s).
5. Field data (flow rates, temperature).

6.0 CALIBRATION PROCEDURES AND FREQUENCY

All field analytical equipment will be calibrated immediately prior to use in the field. The calibration procedures will follow standard manufacturer's instructions to ensure that the equipment is functioning within tolerances established by the manufacturer. A copy of all the instrument user manuals will be placed in a three-ring notebook and sent to the field by the field team leader, who will maintain a record of the instrument calibration in the field notebook. A summary of calibration requirements are presented in Table QA-6.

6.1 REAL-TIME AIR QUALITY MONITORS

The real-time portable air quality monitoring equipment will be calibrated in a controlled environment, preferably indoors away from exhaust fumes and other sources which bias the zero setting.

6.1.1 PM_{10}

The DataRam is calibrated annually by the manufacturer. The manufacturer does not provide standards for field QA/QC checks. Each day during the monitor start-up, the DataRam conducts a self-test. The system self-test and calibration consist of a series of electrical diagnostics and measurements performed with internal "clean" sheath air. When the system self-test and calibration are complete, the display will read "Calibration OK".

6.1.2 Meteorological Instrumentation

Meteorological instrumentation is selected and installed according to recommendations in the EPA's *Ambient Monitoring Guidelines for PSD (EPA-450/4-80-012),* revised February 1981. All meteorological sensors will be aligned, tested, and calibrated prior to start-up, at 6-month intervals, and at the conclusion of the monitoring program. The test equipment used will be traceable to authoritative standards and follow SOPs and manufacturer's manuals.

The meteorological monitoring system will be calibrated in accordance with appropriate SOPs and technical instructions, and in conformance with the provisions of the EPA's *Quality*

Assurance Handbook for Air Pollution Measurement Systems: Volume IV: Meteorological Measurements (as revised March 1995). SOPs and technical instructions will be used in conjunction with the instrumentation manufacturer's operation and service manuals in performing the required maintenance and adjustments.

6.1.3 Wind Speed

The wind speed sensor will be challenged by using a synchronous motor to rotate the sensor shafts at various revolutions per minute (rpm) for horizontal wind speeds. The true wind speed corresponding to each rotational frequency will be determined from the manufacturer's calibration specifications and will be compared to the system readings at the data logger. Sensor adjustments will subsequently be made as required.

6.1.4 Wind Direction

To calibrate the wind direction sensor, readings will be taken from the sensor by use of a wind direction calibration tool. System readings at the data logger will be compared to the designated readings. Readings are recorded at 30, 90, 180, 270, and 360 degrees. Sensor adjustments will subsequently be made as required.

6.1.5 Temperature

Construction of the temperature/relative humidity probe does not allow for the use of a water bath to calibrate the temperature sensor. The accuracy of the ambient temperature probe will be verified using a NIST-traceable RTD probe. System readings at the data logger will be compared to the designated readings. Sensor adjustments will subsequently be made as required.

6.1.6 Relative Humidity

The relative humidity sensor's accuracy will be verified using a NIST-traceable transfer standard. System readings at the data logger will be compared to the designated readings. Sensor adjustments will subsequently be made as required.

6.1.7 Barometric Pressure

The barometric pressure sensor's accuracy will be verified using a transfer standard. System readings at the data logger will be compared to the designated readings. Sensor adjustments will subsequently be made as required.

6.2 TIME-INTEGRATED AIR QUALITY SAMPLERS

6.2.1 PM_{10}

The time-integrated PM_{10} samplers have been selected from the USEPA list of approved reference or equivalent methods. Probe sitings conform to the provisions of 40 CFR 58 Appendix E, Probe Siting Criteria for Ambient Air Quality Monitoring.

Calibrations and operational checks will be performed using a clean quartz filter for the PM_{10} sampler, installed in the normal sampling configuration with the resistance orifice placed on top of the filter. The resistance orifice will be a flow transfer standard traceable to NIST. The multi-point calibrations consist of three flow rates in the acceptable flow rate range (i.e., 1.02 to 1.24 m^3/min). The single point operational checks consist of flow rate verification at the operating range of 1.13 m^3/min (40 cubic feet per minute (cfm)).

Validation limits are 10 percent for the operational checks; however, tolerance limits are ±7 percent.

Multi-point calibrations shall be performed as follows:

1. Start up of the program and at a minimum quarterly thereafter.
2. Upon installation or decommissioning of a sampler in a field station.
3. After repair of a malfunctioning sampler.
4. After replacement of major components of a sampler.
5. When an operational check tolerance limit is exceeded.
6. After an audit shows >±7% at the audit point.

The calculations used during the multi-point calibrations of the PM_{10} are as follows:

Qa (orifice)= [[[square root[H2O (orifice) * [Ta/Pa]]]-b]*35.31
% Difference= [[Qa (sampler)- Qa (orifice)]/Qa (orifice)] * 100
% Difference limit= +/- 7.00

6.2.2 Hexavalent Chromium

Ambient air sampling pumps will be used to collect samples for subsequent analysis of hexavalent chromium. The sampling pumps will include a vacuum pump with a calibrated rotometer. No metal components shall be present from the sample probe to the inlet of the sampler. The pumps shall be capable of flow rates of at least 15 lpm.

Flow rates of the sampling system will be checked using a mass flow meter. Validation and tolerance limits are 10 percent for the operation and quality assurance (QA) checks.

6.3 LABORATORY ANALYTICAL INSTRUMENTS

Laboratory instrumentation will be calibrated in accordance with the procedures consistent with the laboratory's Quality Manual.

7.0 ANALYTICAL PROCEDURES

PM_{10} analysis will be performed in accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP 2000-105, March 2007, Rev 6, “Filter Processing Method for the Determination of Suspended Particulates in Ambient Air” or an alternate method approved by the Department..

Hexavalent chromium samples will be collected and analyzed using the OSHA Method ID-215 protocols on accordance with the PPG Field Sampling Plan/Quality Assurance Project Plan (FSP-QAPP) Appendix D-2, SOP II-CR6PREP “Preparation of PVC Filters for the Determination of Hexavalent Chromium by IC” and SOP II-CR6IC “Analysis of Hexavalent Chromium by Ion Chromatography” or an alternate method approved by the Department.

8.0 DATA REDUCTION, VALIDATION AND REPORTING

8.1 DATA REDUCTION

Data analysis activities will be performed in a planned and controlled manner. The project manager or the air monitoring supervisor will discuss the scope of work, contractual and regulatory requirements, and applicable QA/QC procedures with assigned personnel prior to initiating the activities. All data analyses and their results will be documented to provide evidence of satisfactory work performance and the basis for information transmitted externally to the project manager. Documentation may include calculations, logs and tables.

8.2 DATA VALIDATION

8.2.1 Field Data Analysis

Calculations, logs and tables will be formally checked using the standard review process as outlined in the following sections.

8.2.2 Calculations

For calculations, assignments for checking will be made or approved by the project manager or the air monitoring supervisor. An individual other than the person who performed the original work, or specified the method or input parameters to be used, will verify the calculations.

It is emphasized that a numerical check is not sufficient. The individual who reviews the calculations is responsible for every item on every sheet, including the completion of the title block and page numbers. The following steps are required to properly check calculations:

- The originator supplies the designated checker/reviewer with a machine copy of the calculations. Originals should not leave the originator’s possession until they are ready for the final checker’s/reviewer’s signature.
- If the checker/reviewer disagrees for any reason, the checker/reviewer crosses through the item with a red marker and writes the recommended correction or comment above it

- The checker/reviewer initials and dates all pages of the check prints

- The checker/reviewer returns the check prints to the originator who, in turn, reviews all recommended changes. If a disagreement exists, the originator adds comments to the check prints using a third color and then confers with the checker/reviewer until all differences are resolved.

- The originator corrects the calculations on the originals so they agree with the check prints. A one-to-one correspondence between the originals and check prints must exist.

- The originator gives the originals and check prints to the checker/reviewer who verifies that agreed upon corrections have been made.

- If satisfied with the changes, the checker/reviewer signs and dates the original logs and Tables.

The responsible member of the project group shall verify field logs. The verification shall provide that changes from the original field representative's logs to the final log sheets are consistent with results of the investigations. The final log sheets shall be checked in the same manner as all calculations, with the checker signing and dating all check prints.

In addition, all final tables representing information, data or the results of analyses shall be checked using the previously-described review procedure.

8.2.3 Laboratory Data

The laboratory data will be reviewed and evaluated for the following:

- The data packages were complete and compliant
- Holding times were met
- Blanks were reviewed and qualifications were performed, if necessary
- Field duplicates (if any) were reviewed and results were qualified, if necessary

- Matrix spike recoveries, laboratory control sample recoveries, and surrogate recoveries were reviewed and results were qualified, if necessary
- Internal standard areas were reviewed and results were qualified, if necessary

8.3 DATA REPORTING

The field and laboratory sample data, following validation, will be used to prepare a Data Report containing the following information:

- Project description
- Sampling and analytical procedures
- Date and location
- Equipment calibration
- Air sample results
- QA/QC
- Data reduction and validation procedures
- Internal quality control (QC) checks
- Performance and system audits
- Corrective actions
- QA reports to management (if applicable)

9.0 INTERNAL QUALITY CONTROL CHECKS

9.1 FIELD QUALITY CONTROL CHECKS

Field sampling quality control (QC) will be maintained by verifying that sample collection frequencies and procedures outlined in this air monitoring quality assurance plan are used.

Field measurement QC procedures will be checked by obtaining multiple readings and by calibrating field instruments daily according to manufacturer's specifications. Field personnel will read and understand applicable sections in manufacturer's literature and operations manuals before using the field instruments. Additionally, field personnel will be trained in proper instrument calibration and handling procedures before using field instruments.

The following paragraphs summarize the routine procedures required for each measurement parameter to meet the data quality objectives stated in Section 3 of this manual. Because each set of QC procedures includes calibration procedures, much of the information provided in Section 6 is repeated in this section. Additional information and detailed procedures for each time-integrated measurement can be found in the manufacturer's instruction manuals.

9.1.1 Real-Time Portable Air Monitors

9.1.1.1 DataRam Portable Fine Dust Monitor (PM$_{10}$)

Daily Field Technician Checks: Each sampling day the field technician, during the start-up of the DataRam conducts a self-test. The system self-test and calibration consist of a series of electrical diagnostics and measurements performed with internal "clean" sheath air. When the system self-test and calibration are complete, the display will read "Calibration OK".

9.1.1.2 Meteorological Instrumentation

On a daily basis, the field technician will perform checks on the meteorological instruments described in the following paragraphs.

Wind Speed and Wind Direction:

1. Check reasonableness of recordings versus the observed wind speed and wind direction.
2. Check for smooth operation and the integrity of the cups/vane.

Temperature and Relative Humidity:

1. Check reasonableness of recordings versus the observed temperature and relative humidity.
2. Check the physical integrity of the probe shield.

Barometric Pressure:

1. Check reasonableness of readings versus the observed barometric pressure.
2. Check the physical integrity of the sensor housing.

9.1.2 Time-Integrated Ambient Samplers

9.1.2.1 Andersen GPS-1 PUF Sampler (PAH)

Field Technician Checks:

1. Single point operational checks will be performed each time the initial and final flow rates are determined for each sampling period. The daily operational check will verify that the PUF samplers are maintaining flow rates within ±10% of the designed flow of 220 Lpm. If the ±10 % verification is exceeded, the sampler and magnehelic will be thoroughly checked for leaks. If these basic checks do not resolve the flow discrepancy, a multi-point calibration will be performed.
2. Physical integrity of the PUF samplers.
3. Annotate all site activities and observations in the project logbook.

9.1.2.2 Andersen GUV-16H PM_{10} High-Volume Sampler

Field Technician Checks:

1. Single point operational checks will be performed each time the initial and final flow rates are determined for each sampling period. The daily operational check will verify that the VFC are maintaining flow rates within ±7 percent of the designed flow of 40 cfm. If the ±7 percent verification is exceeded, the sampler and manometer will be thoroughly checked for leaks. If these basic checks do not resolve the flow discrepancy, a multi-point calibration will be performed. If any one point of the three-point calibration exceeds ±4 percent deviation from the orifice flow, the motor will be replaced and the multi-point calibration will be performed on the replacement motor. These procedures will be repeated until the ±7 percent criteria are met.
2. Physical integrity of the PM_{10} samplers.
3. Annotate all site activities and observations in the project logbook.

9.1.2.3 Personal Sampling Pumps (Hexavalent Chromium)

Field Technician Checks:

1. A series of 3 flow rate checks will be performed each time the initial and final flow rate are determined for each sampling period. The operational check will verify that the pumps are maintaining flow rates with ±10% of the designed flow of 1000-2000 ccm. If the ±10% verification is exceeded, the pump will be thoroughly checked for leaks. If the basic check does not resolve flow discrepancy, the technician will change-out sample pumps. Physical integrity of the hexavalent chromium samplers
2. Annotate all site activities and observations in the project logbook.

9.2 LABORATORY QUALITY CONTROL CHECKS

Laboratory QC checks are discussed in the laboratory’s Quality Manual.

10.0 PREVENTATIVE MAINTENANCE

A program of preventive maintenance and a ready supply of spare parts are essential to maximizing the collection of valid data. For the Metropolis Towers Site air monitoring, spare parts inventories will be maintained for real-time monitors and time-integrated samplers on-site. An adequate supply of consumables will be kept on site.

10.1 REAL-TIME AMBIENT MONITORS

10.1.1 PM_{10}

The DataRam will be maintained based on the following routine tasks:

- Replace the 47-mm PTFE filter – daily, or as needed
- Clean the filter holder assembly – each filter replacement
- Clean the sample collection pathway – weekly or as needed
- Replace the data storage card battery – quarterly or as needed

10.1.2 Meteorological Instrumentation

The MetOne meteorological instrumentation will be maintained based on the following routine tasks:

- Replace wind vane or cups – annually or as needed
- Replace wind speed bearings – semi-annually or as needed
- Replace wind direction bearings – annually or as needed
- Replace relative humidity probe filter – semi-annually or as needed
- Clean temperature/relative humidity shield – quarterly or as needed

10.2 TIME-INTEGRATED AMBIENT SAMPLERS

10.2.1 PM_{10}

Routine maintenance of the Andersen GUV-16H samplers will include general housekeeping practices such as the following:

- Cleaning the faceplate of each sampler – weekly, or as needed
- Cleaning the gaskets on the filter holders – each sample event
- Cleaning the inlet accelerator tubes, screen, and bounce plate – weekly, or as needed;
- Replacing manometer fluid - as needed
- Replacing motor brushes after fifteen (15) 24-hour sample runs or whenever a single flow-check is >±7 % different from the design flow rate of the PM_{10} samplers with VFCs. Audit or calibration points must not have greater than ±4.0% difference between the lookup and actual flow rate. All single flow-checks, audits and at least two of three calibration points must be between 39 and 60 cfm.

10.3 ANALYTICAL LABORATORY INSTRUMENTATION

Routine maintenance of the analytical instrumentation will be in accordance with the procedures documented in the laboratory's Quality Manual.

11.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA, PRECISION, ACCURACY, AND COMPLETENESS

The precision, accuracy, and completeness of each measurement will be addressed in this section. This section presents definitions of the qualities that will be calculated, the objectives of these assessments, and the specific procedures that will be used to quantify each.

11.1 REAL-TIME AMBIENT MONITORS – PM_{10}

The precision and accuracy of the DataRam is not obtainable based on the designed operation. The monitor is a self-contained unit that allows for a series self-tests consisting of electrical diagnostics and measurements performed with internal “clean sheath air”. After completion of this self-test, the “Calibration OK” message is displayed and normal sampling begins.

11.2 METEOROLOGICAL MEASUREMENTS

The precision of meteorological measurements (wind speed, wind direction, temperature, relative humidity, and barometric pressure) is generally unobtainable due to practical limitations. Collocated sensors and/or frequent calibration checks are generally not practical for field use. The accuracy of meteorological measurements will be based upon the complete systems' performance calibrations performed during the sampling program. The initial calibration differences between the designated parameter values and observed values measured by the meteorological systems will represent the accuracy of the period's data from each sensor.

Completeness will be determined as the percentage of the possible reported values that are actually validated and will be assessed for each parameter individually. A 90-percent data collection percentage will be considered acceptable.

11.3 TIME-INTEGRATED AIR QUALITY MEASUREMENTS

Precision statistics will be generated from the differences in measured concentrations from the collocated samplers. The accuracy between the collocated PAH, metal and PM_{10} measurements is quantified in percentages as follows:

$$\Delta \textbf{ Percent} = \frac{\left[Collocated - Designated\right]}{\left[\left(Collocated + Designated\right)/2\right]}\, x\, 1 \qquad \textbf{(12-7)}$$

The quarterly mean and standard deviation of all of the Δ percent values for a given pollutant are used to define the precision of that measurement during the period. In this analysis, it is assumed that the variability of the Δ percent values fits a normal distribution. On the basis of this assumption, it is expected that 95 percent of the data in that distribution will fall within 1.96 standard deviations on either side of the mean.

Therefore, the precision is reported as a 95-percent confidence interval, bounded by two percent values. The interpretation is that for any randomly selected value within the database represented, there is only a five percent probability that its accuracy is outside of the boundaries defined as the upper and lower 95-percent confidence limits.

Single Instrument Precision:

The percentage difference **(d_i)** is calculated for each precision check as follows:

$$d_i = \frac{Y_i - X_i}{\left(Y_i + X_i\right)/2}\, x\, 100 \qquad \textbf{(12-8)}$$

Where: **Y_i** = collocated measurement of the i-th sample, and
X_i = designated measurement of the i-th sample.

The quarterly average **(d_j)** and the standard deviation **(S_j)** are calculated as follows:

$$\overline{d_j} = \frac{1}{n}\sum_{i=1}^{n} d_i \qquad \textbf{(12-9)}$$

$$S_j = \sqrt{\frac{1}{n-1}\left[\sum_{i-1}^{n} d_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} d_i^2\right)\right]} \qquad \textbf{(12-10)}$$

Where: $\boldsymbol{n}$ = number of precision checks performed on the analyzer during the quarter.

For each instrument, the upper and lower 95-percent confidence limits are calculated as follows:

Upper limit **=** $d_j + 1.96\, S_j / \sqrt{2},$ and **(12-11)**

Lower limit **=** $d_j - 1.96\, S_j \sqrt{2}.$ **(12-12)**

Accuracy statistics will be quantified through performance audits of the samplers. In these quarterly audits, each sampler's flow rate will be compared to the flow rate determined by a variable resistance orifice. The audit flow rate will be 40 cfm.

For each sampler, the percent difference between the known flow rate and the corresponding sampler's flow rate is calculated as:

$$\Delta\ \textbf{\textit{percent}} = \frac{[Sampler\ \ Flow\ Rate - Audit\ \ Flow\ Rate\ \ ]}{[Audit\ \ Flow\ Rate]} \quad \textbf{(12-13)}$$

This procedure yields a percent difference value for each sampler. Each percent difference value represents the accuracy of the current period's data from that sampler within the represented portion of the measurement range.

Single Instrument Accuracy (manual PM_{10} measurements):

The percentage difference ***(d_i)*** for the audit flow rate is calculated using the following equation:

$$d_i = \frac{Y_i - X_i}{X_i} \quad x\,100 \qquad \textbf{(12-14)}$$

Where: $\boldsymbol{Y_i}$ = sampler's indicated flow rate, and

$\boldsymbol{X_i}$ = audit flow rate.

Completeness will be determined as the percentage of the possible reported values that are actually validated. Completeness will be assessed for each station and each sampler individually. A 90-percent data collection percentage will be considered acceptable.

12.0 CORRECTIVE ACTION

The following subsections describe corrective actions for sample collection/field measurements and laboratory analyses. Non-conformance with established QC procedures outlined in this manual will be identified and corrected.

The resident engineer will be notified immediately of any non-conformance issue. He will promptly report non-conformance to the Project Manager, who will discuss issues with the Owner's representatives.

12.1 INITIATION OF CORRECTIVE ACTION

Technical staff and project personnel will be responsible for reporting all non-conformance issues to the project manager. The project manager will be responsible for assessing suspected problem(s), and deciding whether the problem(s) will affect data quality. Corrective actions for field measurements may include the following measures:

- Repeat measurements
- Check for proper adjustments for ambient conditions, such as temperatures or humidity
- Check batteries
- Check instrument calibrations
- Recalibrate instrumentation
- Replace or repair instrumentation or measurement device
- Stop work (if necessary)
- Contact and consult with project manager

The project manager engineer is responsible for controlling, tracking, and implementing corrective actions. The corrective action request and routing form will be used to track the action.

12.2 DOCUMENTATION OF CORRECTIVE ACTION

The project manager will be responsible for ensuring that corrective action for non-conformance is documented in the following manner:

- Evaluating all reported non-conformance
- Controlling additional work on non-conforming issues
- Determining disposition or action to be taken
- Maintaining a log on non-conformance
- Reviewing non-conformance reports and corrective action taken
- Ensuring that non-conformance reports are included in the final Site documentation in project files

13.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Activities and actions to be reported will include:

- The project status in relation to the progress of proposed schedule
- Results of ongoing system audits
- Proposed corrective action and significant QA issues

The project manager reports the results of these activities to the affected line managers.

REFERENCES

Code of Federal Regulations, 40 CFR 50, Appendix M, EPA-600/9-76-005 and EPA-600/4-77-027a.

Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements (as revised March 1995).

Quality Handbook for Air Pollution Measurement Systems, Volume II, Section 2.11 Reference Method for the Determination of Particulate Matter as PM_{10} Sampler Method.

Thermo-Environmental Instruments, Inc. OVM 580IIS *Maintenance Procedure Thermo Environmental Instruments.* July 6, 2002.

EPA. *EPA Ambient Monitoring Guidelines for PSD*. (EPA-450/4-80-012), revised February 1981.

EPA. *Inductively Coupled Plasma-Atomic Emission Spectroscopy, Spectrometric Method for Trace Element Analysis,* SW-846 Method 6010B and USEPA Method 200.7.

EPA. Office of Air Quality Planning and Standards, 1993. *Air/Superfund National Technical Guidance Study Series – Volume IV, Guidance for Ambient Air Monitoring at Superfund Sites (Revised).* EPA 451/R-93-007.

TABLES

TABLE QA-1

EMERGENCY CONTACT LIST
Metropolis Towers – Jersey City, Hudson County, New Jersey

Local emergency medical team	
Emergency	911
Nearest emergency room	
Jersey City Medical Center 355 Grand Street Jersey City, NJ 07304-3254	201-915-2011
DIRECTIONS 1. Go SOUTH on MARIN BLVD toward GRAND ST 2. Turn RIGHT onto GRAND ST 3. End at Jersey City Medical Ctr 355 Grand St Jersey City, NJ 07304 Total Estimated Time: 1 minutes Total Distance: 0.5 miles	
Jersey City Police Department	
Emergency	911
All other communications	201-547-5450
Jersey City Fire Department	
Emergency	911
PPG Site Manager:	
Remedial Construction Project Manager: xxxxx	
Site Safety Officer: xxxx	
Air Monitoring Contractor Manager: xxxx	
Ait Monitoring Technician: xxxxx	
National Information Centers	
Chemtrec	(800) 424-9300
National Response Center	(800) 424-8802
Poison Control Center	(800) 942-5969

TABLE QA-2
AMBIENT/METEOROLOGICAL MONITORING DATA QUALITY OBJECTIVES
Metropolis Towers – Jersey City, Hudson County, New Jersey

Sensor	Parameter	Units	Calibration	Warning Criteria	Acceptance Criteria (Accuracy)	Precision
DataRam Real-Time Monitor	PM$_{10}$	µg/L	Annual. Manufacturer authorized only.	NA	Self-test calibration “OK”	NA
PM$_{10}$ Integrated Sampler	PM$_{10}$	lpm	Initial full calibration. Continuing checks before and after sampling episode.	±7% from target flow ±7% between pre and post sample flow check	±10% from target flow ±10% between pre and post sample flow check	±15%
Integrated Sampler	Cr+6	lpm	Initial full calibration. Continuing checks before and after sampling episode.	±7% from target flow ±7% between pre and post sample flow check	±10% from target flow ±10% between pre and post sample flow check	±15%
Wind Speed	Speed Accuracy	m/s	Quarterly	<5mps ≥0.2 mps >5mps ≥ 3% ≤ 5%	±0.5 mps < 5mps ± 5% of input for speeds >5 mps	NA
Wind Direction	Orientation Accuracy Linearity	Deg Deg	Quarterly	>3° <5° >3° <5°	± 5° from True North ± 5° mean absolute error; ±10° per input	NA
Temperature	Ambient Temperature	°C	Quarterly	>0.2 °C ≤ 5 °C	± 5°C	NA
Barometric Pressure	Ambient Pressure	in Hg	Quarterly	± 0.02 in Hg	± 0.04 in Hg	NA

TABLE QA-3
TARGET COMPOUND LIST AND REPORTING LIMITS
Metropolis Towers – Jersey City, Hudson County, New Jersey

Analyte	Method	Reporting Limit	MDL
Chromium VI	OSHA ID-215	0.03 µg	0.029 µg
PM_{10}	40 CFR 50 App J	NA	NA

TABLE QA-4
AIR MONITORING EQUIPMENT LIST
Metropolis Towers – Jersey City, Hudson County, New Jersey

Real-Time Monitors:	Parameter Measured
DataRam Dust Monitor	PM_{10}
Time-Integrated Samplers:	
Andersen GPS-1 or equal	Hexavalent Chromium
Andersen PM-10 Hi-Volume or equal	PM_{10}
Support Equipment:	
Met One AutoMet 466A DataLogger	

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TABLE QA-5
AIR SAMPLING CONTAINERS AND SPECIFICATIONS FOR PRESERVATION AND HOLDING TIMES
Metropolis Towers – Jersey City, Hudson County, New Jersey

Method	Media	Preservation and Handling Requirements	Holding Time
PM_{10}	Quartz Filter	Filter is placed into plastic folder and slipped into protective envelope	30 days
OSHA ID-215	37 mm cellulose filter	Cap filter cassette and freeze upon collection. Ship at 4°C.	Not specified

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TABLE QA-6
SUMMARY OF CALIBRATIONS AND QC SAMPLES FOR METHODS
Metropolis Towers – Jersey City, Hudson County, New Jersey

Method	Calibration	Duplicate[1]	Field Blank	Trip Blank
PM_{10} Real-time Instrumentation	Full calibration weekly and continuing calibration checks at beginning of sampling day. Calibration checks within ±20% of expected result or redo full calibration.	NA.	NA	NA
PM_{10}	Initial full calibration and continuing checks before and after sampling episode.	20% of samples taken or once per week, ±20% difference between duplicate results.	10% of samples taken or once per week, whichever is greater.	One with each sample batch shipped to the laboratory.
OSHA ID-215	Initial full calibration and continuing checks before and after sampling episode.	20% of samples taken or once per week, ±20% difference between duplicate results.	10% of samples taken or once per week, whichever is greater.	One with each sample batch shipped to the laboratory.
Notes: NA – not applicable				

APPENDIX F

WORKER HEALTH AND SAFETY PLAN FRAMEWORK

WORKER HEALTH AND SAFETY PLAN FRAMEWORK

METROPOLIS TOWERS SITE
(FORMERLY GREGORY PARK APARTMENTS
HUDSON COUNTRY CHROME SITE 156)
270-280 LUIS MUNOZ MARIN BOULEVARD
JERSEY CITY, NEW JERSEY

Prepared For:

PPG INDUSTRIES, INC.
4325 ROSANNA DRIVE
ALLISON PARK, PENNSYLVANIA

Prepared By:

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CEC Project 100-710.0011

APRIL 2012

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METROPOLIS TOWERS SITE - SITE 156

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APPENDICES

1.0 INTRODUCTION

1.1 WORKER HEALTH AND SAFETY PLAN FRAMEWORK APPLICABILITY

This site-specific worker Health and Safety Plan Framework (HASPF) establishes the planning requirements to mitigate potential risk to contract workers involved with the remedial action at the Metropolis Towers located at 280 Luis Munoz Marin Boulevard in Jersey City, New Jersey.

The provisions of this plan apply to all contractor personnel who may potentially be exposed to safety and/or health hazards related to activities described in Section 3.0 of this document. This HASPF only pertains to the tasks that are listed in Section 3.0.

This HASPF has been written to comply with the requirements of OSHA's Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). All activities covered by this HASPF must be conducted in compliance with all applicable federal, state, and local health and safety regulations. Personnel covered by this HASPF who cannot or will not comply will be excluded from site activities.

This HASPF will be distributed to each contractor involved with the proposed investigative activities at the site. The General Contractor will prepare their own Health and Safety Plan based on this framework and provide their plan to each contractor employee and any subcontractor employee performing remedial work at the site. Each on-site contractor and subcontractor employee must sign a copy of the attached health and safety plan framework sign-off sheet (see Appendix A) and provide a copy to the PPG Industries, Inc. Site Representative (PPG Representative).

1.2 ORGANIZATION/RESPONSIBILITY

The implementation of health and safety at this project location will be the shared responsibility of the PPG Representative, the General Contractor Health and Safety Manager (GCHSM), the General Contractor Site Safety Officer (GCSSO) and other PPG contractors monitoring perimeter air quality at the site boundaries.

1.2.1 PPG Representative

The PPG Representative is the individual with primary responsibility for ensuring the overall health and safety of this project. As such, the PPG Representative is responsible for ensuring that the requirements of this HASPF are implemented. Some of the PPG Representative's specific responsibilities include:

- Assuring that all personnel to whom this HASPF applies have received a copy of it;
- Reviewing the General Contractor’s Site-Specific HASP for compliance with the HASPF, OSHA’s Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) and all applicable federal, state, and local health and safety regulations.
- Providing the GCHSM with updated information regarding conditions at the site and the scope of site work;
- Providing adequate authority and resources to the on-site GCSSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the GCSSO and GCHSM;
- Maintaining regular communications with the GCSSO and, if necessary, the GCHSM; and,
- Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project.

1.2.2 General Contractor Health and Safety Manager (GCHSM)

The GCHSM is the individual responsible for the preparation, interpretation and modification of the General Contractor’s HASP (GCHASP) prepared under this HASP Framework. Modifications to the GCHASP which may result in less stringent precautions cannot be undertaken by the PPG Representative or the GCSSO without the approval of the GCHSM. Specific duties of the GCHSM include:

- Writing, approving and amending the GCHASP for this project;
- Advising the PPG Representative and GCSSO on matters relating to health and safety on this site;

- Recommending appropriate personal protective equipment (PPE) and respiratory equipment to protect personnel from potential site hazards;
- Conducting accident investigations; and,
- Maintaining regular contact with the PPG Representative and GCSSO to evaluate site conditions and new information which might require modifications to the GCHASP.

1.2.3 General Contractor Site Safety Officer (GCSSO)

All general contractor employees and any subcontractors to the general contractor are responsible for implementing the safety requirements specified in the GCHASP. One general contractor employee will serve as the GCSSO. The GCSSO will be on-site during all activities covered by the GCHASP. The GCSSO is responsible for enforcing the requirements of the GCHASP once work begins. The GCSSO must have the authority to immediately correct all situations where noncompliance with the GCHASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the GCSSO's specific responsibilities include:

- Assuring that all personnel to whom the GCHASP applies, including all subcontractors, have submitted a completed copy of the GCHASP receipt and acceptance form;
- Assuring that all personnel to whom the GCHASP applies have attended a pre-entry briefing and any subsequent safety meetings that are conducted during the implementation of the program;
- Maintaining a high level of health and safety consciousness among employees implementing the proposed remedial activities;
- Procuring the air monitoring instrumentation required and performing air monitoring for worker protection activities;
- Procuring and distributing the PPE and safety equipment needed for this project under the GCHASP;
- Verifying that all PPE and health and safety equipment used by the general contractor and subcontractors are in good working order;
- Verifying that the general contractor’s employees are properly trained in the use of PPE, respiratory protection, and safety equipment required for this program;

- Notifying the PPG Representative of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of all personnel within the established restricted areas to ensure that required safety and health procedures are being followed;
- Conducting accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the pre-entry briefing prior to beginning work and subsequent safety meetings as necessary; and,
- Initiating emergency response procedures in accordance with Section 11.0 of this HASPF.

1.2.4 Remedial Personnel

All remedial personnel covered by this HASPF are responsible for following the health and safety procedures specified in the GCHASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the remedial personnel are as follows:

- Reading the GCHASP in its entirety prior to the start of on-site work;
- Submitting a completed GCHASP Acceptance Form to the PPG Representative prior to the start of work;
- Attending the required pre-entry briefing prior to beginning on-site work and any subsequent safety meetings that are conducted during the implementation of the program;
- Bringing forth any questions or concerns regarding the content of the GCHASP to the PPG Representative or the GCSSO prior to the start of work;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the GCSSO; and,
- Complying with the requirements of the GCHASP and the requests of the GCSSO.

1.2.5 Subcontractors

All subcontractors hired by the General Contractor are responsible for:

- Reading the GCHASP in its entirety prior to the start of on-site work;

- Attending the required pre-entry briefing prior to beginning on-site work and any subsequent safety meetings that are conducted during the implementation of the program;
- Ensuring, via daily inspections, that their equipment is in good working order;
- Operating their equipment in a safe manner;
- Appointing an on-site safety coordinator to interface with the GCSSO;
- Providing the GCSSO with copies of material safety data sheets (MSDS) for all hazardous materials brought on-site; and,
- Providing all the required PPE, respiratory equipment and safety supplies to their employees.

1.3 MANAGEMENT OF CHANGE/MODIFICATION OF THE GCHASP

1.3.1 Management

The procedures in the GCHASP will be developed based on the Remedial Action Work Plan and the proposed scope of work. Unanticipated site-specific conditions or situations may occur during the implementation of the work or the general contractor may elect to perform certain tasks in a manner that is different from what was originally intended due to a change in field conditions. As such, the GCHASP must be considered a working document that is subject to change to meet the needs of the project.

The General Contractor will complete a Job Hazard Analysis (JHA) when new tasks or different investigative techniques not addressed in the GCHASP are proposed. The use of new techniques will be reviewed and if new hazards are associated with the proposed changes, they will be documented on the JHA form. An effective control measure must also be identified for each new hazard. JHA forms will be reviewed by the GCSSO prior to being implemented. Once approved, the completed forms will be reviewed with all field staff during the daily safety meeting. A blank JHA form is presented as Appendix B.

1.3.2 GCHASP Modification

Should significant information become available regarding potential on-site hazards, it may be necessary to modify the GCHASP. All proposed modifications to the GCHASP must be reviewed and approved by the GCHSM before such modifications are implemented. Any significant modifications must be incorporated into the written document as addenda and the GCHASP must be reissued. The GCSSO must ensure that all personnel covered by the GCHASP receive copies of all issued addenda. Sign-off forms will accompany each addendum and must be signed by all personnel covered by the addendum. Sign-off forms will be submitted to the PPG Representative. The GCHASP addenda should be distributed during the daily safety meeting so that they can be reviewed and discussed. Attendance forms will be collected during the meeting.

2.0 SITE DESCRIPTION

The Metropolis Towers site (formerly Gregory Park Apartments) is a residential complex of approximately 8.42 acres located in Jersey City, New Jersey. The site is also known as Hudson County Chromium Site 156. The area is bounded by Newark Avenue to the North, Warren Street to the East, Montgomery Street/Esplanade Drive to the South, and Luis Munoz Marin Boulevard to the West. The site contains two 21-story residential buildings housing over 2,000 residents. Surrounding the two buildings are paved parking areas and landscaped areas. The former building between the two residential buildings was a combination retail space, swimming pool, and walkway between the two residential buildings; however, the building has been demolished to the floor slab.

During redevelopment of the area that resulted in the present residential use, chromate chemical production waste (CCPW) and other historic fill materials were reportedly used as fill material to raise the site grades prior to construction of the existing structures.

3.0 SCOPE OF WORK

PPG Industries, Inc. (PPG) will hire contractors to implement a remedial action at Metropolis Towers, 280 Luis Munoz Marin Blvd., Jersey City, NJ. The site contains chromate chemical production waste (CCPW) and historic fill that was placed to raise the grade prior to redevelopment of the two residential towers and central building between the towers. The subsurface soil lithology consists of typical urban fill extending to natural materials, including peat. Soil samples obtained from the site contain hexavalent chromium concentrations as high as 6,070 mg/kg. Various metals, volatile organic and semi-volatile organic compounds exist in fill materials above NJDEP Residential Soil Cleanup Criteria (RSCC). Chromium and various other metals exist in groundwater above the NJDEP Ground Water Quality Standards (GWQS).

The scope of work is detailed in the Remedial Action Work Plan and will include all activities required to accomplish the following:

- Implementation of a resident safety plan to physically exclude residents from entering the construction and construction support areas.
- Implementation of a project air monitoring plan (PAMP) to verify that contaminated dust is not leaving the site perimeter at levels beyond site-specific criteria.
- Excavation and off-site transport / disposal of fill materials contaminated with hexavalent chromium and CCPW-related metals having concentrations above the RSCC.
- Performance of post-excavation soil sampling within the excavations to document removal of target contaminants to levels below the RSCC.
- Installation of sheet piling and pumping of contaminated ground water to dewater portions of the excavations extending below the ground water table.
- On-site treatment of the contaminated ground water and on-site discharge to the Passaic Valley Sewerage Commissioners (PVSC) combined sanitary-storm sewer system.
- Protection of existing sub-surface utilities (electric, gas, water, sewer, storm water) that will remain active following remedial action.
- Backfilling of excavations with fill suitable for residential use and restoration of the land surface to prior status including such items as paving, sidewalk replacement, lighting replacement, and landscaping.

4.0 CHEMICAL HAZARD ASSESSMENT AND CONTROL

4.1 CHEMICAL CONTAMINANTS OF CONCERN

The primary contaminant of concern associated with the remedial action at the Metropolis Towers site is hexavalent chromium (Cr VI).

4.1.1 Chromium (VI)

Chromium is a naturally occurring element found in rocks, animals, plants, soil, and in volcanic dust and gases. Chromium is present in the environment in several different forms. The most common forms are chromium (0), trivalent (or chromium (III)), and hexavalent (or chromium (VI)). Chromium (III) occurs naturally in the environment and is an essential nutrient required by the human body to promote the action of insulin in body tissues so that sugar, protein, and fat can be used by the body. Chromium (VI) and chromium (0) are generally produced by industrial processes. No known taste or odor is associated with chromium compounds. The metal chromium, which is the chromium (0) form, is a steel-gray solid with a high melting point. It is used mainly for making steel and other alloys. The naturally occurring mineral chromite in the chromium(III) form is used as brick lining for high-temperature industrial furnaces, for making metals and alloys (mixtures of metals), and chemical compounds. Chromium compounds, mostly in chromium (III) or chromium (VI) forms, produced by the chemical industry are used for chrome plating, the manufacture of dyes and pigments, leather tanning, and wood preserving. Smaller amounts are used in drilling mud, rust and corrosion inhibitors, textiles, and toner for copying machines.

4.1.2 Chromium in the Site Environment

Chromium became part of and affected site environmental media (soil and ground water) through the use of chromate chemical production waste (CCPW) as fill materials during site redevelopment. CCPW contains both chromium (III) and chromium (VI) forms. In CCPW, concentrations of chromium (III) are equal to or greater than the concentrations of chromium (VI).

Among the remedial action areas, soil chromium (VI) concentrations vary by 2 orders-of-magnitude with the highest individual sample containing 6,070 mg/kg chromium (VI).

In the process of filling, CCPW was deposited with other fill materials that increased in chromium content through co-mingling and contact with CCPW leachate. Soluble forms of chromium (III) and chromium (VI) can be released through contact with precipitation, surface water, or ground water. Site ground water in direct contact with CCPW has been analyzed to contain levels of chromium above the GWQS.

Mechanical disturbance or wind erosion of exposed soil containing chromium (III) and chromium (VI) can result in the production of fugitive soil-derived dust containing chromium. Under pre-remedial site conditions, chromium-containing soil materials are covered by concrete, paving or landscaped areas preventing mechanical disturbance or wind erosion.

4.1.3 Chromium Exposure – Health Effects

The health effects resulting from exposure to chromium (III) and chromium (VI) are based on industrial worker exposure and animal feeding studies using the chemicals in a purified form. In general, chromium (VI) is more toxic than chromium (III). Chromium exposure may occur through chemical inhalation, chemical ingestion or direct contact with the chemical.

Factory workers who make or use chromic acid or chromium (VI) trioxide containing chromium (VI) and who breathed air containing greater than 2 $\mu g/m^3$ Cr(VI) for several months to many years may develop nasal conditions, such as runny nose, sneezing, itching, nosebleeds, ulcers, and holes in the nasal septum. Long-term exposure to chromium VI has been associated with lung cancer in workers exposed to levels in air that were 100 to 1,000 times higher than those found in the natural environment. Lung cancer may occur long after exposure to chromium has ended. Airborne chromium (VI) is believed to be responsible for the increased lung cancer rates observed in industrial workers who were exposed to high levels of chromium in workroom air. Inhalation of small amounts of chromium (VI) for short or long periods does not cause a problem in most people. However, high levels of chromium in the workplace have caused asthma attacks in people who are allergic to chromium. Inhalation of chromium (III) does not cause irritation to the nose or mouth in most people.

The federal Occupational Safety and Health Administration (OSHA) regulates worker exposure to chromium. On 2/28/2006, OSHA revised the permissible worker air exposure limit (PEL) for hexavalent chromium to 5.0 µg/m^3 as an 8-hour time-weighted average (TWA). The OSHA worker air action level above which monitoring and medical surveillance is required is 2.5 µg/m^3 Cr(VI) as an 8-hour time-weighted average. OSHA has not established a limit on workplace exposure to chromium (III).

Ingesting large amounts of chromium (VI) either accidentally or intentionally has caused stomach upsets and ulcers, convulsions, kidney and liver damage, and even death. The levels of chromium (VI) that caused these effects were far greater than those that you might be exposed to in food or water. Although chromium (III) in small amounts is a nutrient needed by the body, swallowing large amounts of chromium (III) may cause health problems. The metal, chromium (0) does not occur naturally and is not currently believed to cause a serious health risk.

Workers handling liquids or solids that have chromium (VI) in them have developed skin ulcers. Some people have been found to develop a sensitivity to chromium (VI) resulting in allergic reactions consisting of severe redness and swelling of the skin. Exposure to chromium (III) is less likely than exposure to chromium (VI) to cause skin rashes in chromium-sensitive people.

4.1.4 Hazard Substances Brought On Site

A material safety data sheet (MSDS) must be provided to the GCSCC by the contractor or subcontractor for each hazardous substance brought on-site. This applies to all fuels, solutions, and chemicals that will be brought on-site and will include all materials used to decontaminate sampling equipment, preserve samples, and gases needed to calibrate air monitoring equipment. The GCSSO is responsible for obtaining the MSDS for each material from the contractor or subcontractor bringing the material on-site. The GCSSO is responsible for maintaining the MSDS in an organized on-site notebook that is available at all times when work is being performed at the site.

All containers of hazardous materials must be labeled in accordance with OSHA's Hazard Communication Standard. Either the original manufacturer's label or an NFPA 704M label specific for the material is considered to be acceptable.

4.2 CHEMICAL EXPOSURE AND CONTROL

4.2.1 Chemical Exposure Potential

Workers may be exposed to soil, water, and dust containing chromium during the remedial action. Exposure may occur through inhalation, incidental ingestion, and dermal contact.

4.2.2 Chemical Hazard Control

The contractor shall review the chemical hazard control procedures and incorporate them or an acceptable alternate into their GCHASP. The chemical hazards associated with the remedial construction shall be mitigated by the following methods:

- The contractor will perform air monitoring (Section 6.1) in the worker's breathing zone to determine exposure to chromium dusts during excavation and loading of chromium contaminated soil. If exposures exceed the action levels, and cannot be suppressed to acceptable levels, respiratory protection as discussed in Section 7.2, will be donned.
- The contractor will avoid direct dermal contact with contaminated media by using protective clothing, as described in Section 7.1.
- Although unlikely, exposure to all of the contaminants of concern may occur via ingestion (hand-to-mouth transfer). The decontamination procedures described in Section 9.0 address personal hygiene issues that will limit the potential for contaminant ingestion.

5.0 PHYSICAL HAZARDS AND CONTROLS

The General Contractor and each subcontractor shall perform a Job Hazard Analysis (JHA) for the operations planned to complete the scope of work to identify physical hazards and appropriate controls. Results of the JHA shall be incorporated into the GCHASP. The JHA shall specifically include, but not be limited to, the following operations:

Utility Hazards
Traffic Hazards
Mobile Equipment Hazards
Excavation, Trenching, and Shoring
Electrical Hazards
Hand and Power Tool Hazards
Sheet Pile Driving Hazards
Noise Hazards
Thermal Stress Hazards
Slip, Trip and Fall Hazards
Rigging and Crane Hazards
Lifting Hazards

6.0 WORKER AIR MONITORING

The GCHASP shall include the following requirements for worker air monitoring.

6.1 DUST AND PM10 ACTION LEVEL

A dust Action Level has been established for the protection of workers from potential health hazards associated with dust in and around the exclusion zone. The Dust Action Level based on the airborne concentration of hexavalent chromium will also apply to concrete dust/silica dust. The justification for this Action Level is provided below. Worst case concentrations of hexavalent chromium will be removed during activities in Areas C-North and C-South; as a result, a more conservative dust action level was calculated for use during remedial excavation in these areas, as discussed further below.

Soil sampling at Metropolis Towers has revealed elevated levels of Cr6 in soils. Air monitoring will be required during any intrusive work in Site. The AL for particulates while intrusive activities are occurring in the Cr6-impacted area(s) was derived as follows:

Cr6 Action Level in Air in Exclusion/Work Zone:

Cr6 PEL = 0.005 mg/m3
Divide PEL for Cr6 by 2 as a safety factor

Modified PEL = 0.0025 mg/m3 (also OSHA limit above which monitoring and medical surveillance is required)

The arithmetic average for soil samples in areas C-North and C-South the area was calculated to be 1,100 mg Cr6/kg soil. Multiplying this average by a factor of safety of 4X, results in 0.44% Cr6 in soil. The Action Level is calculated by dividing the modified PEL by the expected maximum average concentration of Cr6 as follows:

AL = 0.0025 divided by 0.0044
AL = 0.568 mg/m3 or 568 µg/m3

Therefore, for workers in the exclusion zone, the site-wide Action Level for total dust (PM10) (based on Cr6) during intrusive work of 339 µg/m^3 will be appropriate for worker protection during excavation activities.

6.2 TASK INSTRUMENT ACTION LIMIT AND VERIFICATION

All tasks with the potential to generate dust.

Particulate meter **0.339 mg/m^3.** Implement dust control measures as indicated in Table 3 of the PAMP.

The protectiveness of worker's health by using this action level will be demonstrated by reviewing hexavalent chromium concentrations in dust collected at the exclusion zone Air Monitoring Stations (the details of the AMSs are described in the PAMP). Specifically, the laboratory analytical results will be reviewed as they are received to confirm that the concentration of hexavalent chromium in dust is less than 4,400 mg/kg which was conservatively utilized to develop the action level. By confirming that the concentration of hexavalent chromium in dust is consistently below this value the protectiveness of the AL will have been verified. This data comparison will occur almost daily as the results are received from the laboratory, and the results and evaluations will be maintained in a site log with the HASP.

6.3 CALIBRATION AND RECORDKEEPING

Air monitoring instrumentation will be bump tested or fully calibrated before each day's use in accordance with the manufacturer's instructions. A log of the calibrations and readings will be kept in the field notebook. Daily calibration information will also be recorded in the field notebook.

The particulate meter will be functional tested in zero/clean air following the manufacturer's instructions. The digital dust meter will be maintained in accordance with the manufacturer's instructions. Functional tests shall be recorded in a field notebook.

Detail description of equipment calibration and QA/QC procedures can be found in the Project Air Monitoring QA Plan.

Particulate Monitors

The TSI DustTrak and DataRam Model DR 1000 Aerosol Monitors or equivalent devices will be used to continuously monitor particulate emissions at the various fence line locations. At a minimum, the monitors will be field checked daily using zero calibration air. At the beginning of each workday (prior to site intrusive activities each day) a calibration zero check will be performed on each unit at the measurement locations. A zero (or particulate-free) test sample, using the appropriate particulate filter supplied by the manufacturer for this purpose, will be placed over the sample inlet. The data output for the monitor will be observed and the response recorded in the air monitoring contractor's field logbook. Once per month, all PM10 samplers will be challenged with an unknown upscale amount of particulates in order to verify each sampler's response to upscale particulate levels. The data output for the monitor will be observed and the response recorded in a field logbook.

6.4 PERSONAL AIR SAMPLING

Personal exposure assessment will be conducted only when the action levels are exceeded for hexavalent chromium/total dust. Personal air samples will be collected in accordance with OSHA and/or NIOSH methodology and analyzed by an AIHA accredited laboratory.

The results of the sampling will be communicated to project personnel. The number of workers selected to wear the personal sampling pumps will be determined in advance of the field activity.

Analytical Methods

☐ Hexavalent Chromium- 29 CFR 1910.1026(d)-Analytical Method OSHA ID-215 (or equivalent method approved by the NJDEP)

☐ Dust-NIOSH Analytical Method- 0500 (or equivalent method approved by the NJDEP)

7.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) will be worn to prevent site workers from being injured or exposed to the hazards posed by the site and/or the activities being performed. Chemical protective clothing will be worn to prevent direct dermal contact with the site's chemical contaminants. The following table describes the PPE and chemical protective clothing to be worn for general site activities and for certain specific tasks. The contractors JHA shall specify all PPE requirements for the specific task or operation.

PPE Item	All Remedial Areas
Hard Hat	✓
Steel Toed Safety Shoes	✓
Safety Glasses with Sideshields	✓
Light blue Tyvek Coveralls	In exclusion zone and when contact with contaminated media is anticipated.
ANSI-approved Class II traffic vests	If working in high traffic areas
Outer Nitrile Gloves with inner Latex liners	When contact with site soil, water or contaminated media is anticipated.
Hearing Protection	✓

7.1 RESPIRATORY PROTECTION

7.1.1 Action Levels for Donning Respiratory Protection

Respiratory protection, as described below, will be required if worker breathing zone concentrations are sustained (>1 minute) above the Action Level described in the following table.

Tasks Requiring Monitoring	Instrument	Action Level	Action Triggered
All tasks involving potential exposure to dusts generated from Site activities.	TSI DustTrak and DataRam Model DR 1000	0.339 mg/m3	Implement dust control actions per PAMP Table 3. Don air purifying respirators as described below.

Respiratory protection should be voluntarily donned if odors become objectionable at any time or if respiratory tract irritation is noticed.

7.1.2 Respirator Specification

Level C – Half Mask Air Purifying Respirator with Combination P-100/Organic Vapor Cartridges

7.1.3 Qualifications of Respirator Users

All employees who are expected to don respiratory protection must have successfully passed a qualitative or quantitative fit-test within the past year for the brand, model and size respirator they plan to don during the proposed activities.

7.2 OTHER SAFETY EQUIPMENT

The following additional safety items should be available at the site:

- Portable, hand-held eyewash bottles

- First aid kit
- Type A-B-C fire extinguisher
- Cellular phones

8.0 SITE CONTROL

To prevent both exposure of unprotected personnel and migration of contamination due to tracking by personnel or equipment, hazardous work areas will be clearly identified and decontamination procedures will be required for personnel and equipment leaving those areas. The site has been divided into three layouts (1,2 and 3) covering all remedial areas. Each layout is designed to allow control of remedial areas and prevent inadvertent residential access during remedial construction activities. Remedial construction within each layout will be performed sequentially. Each layout includes provisions for fencing and access to the site for construction vehicles that is separate from resident access. These aspects are part of the Resident Safety Plan for the site contained on the RAWP.

8.1 DESIGNATION OF ZONES

Within the layout Areas, work zones shall be identified as suggested in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/USCG/EPA, November 1985. According to this manual, each remedial area shall be divided into three zones:

- Exclusion or "Hot" Zone
- Contamination Reduction Zone (CRZ)
- Support Zone

8.1.1 Exclusion Zone

An exclusion zone will be established around each excavation area. The perimeter of the exclusion zone will be marked with caution tape or indicated by traffic cones to clearly identify that an exclusion zone is being entered. Unless workers have work they are performing within the exclusion zone, they should remain outside its marked boundary.

All workers entering the exclusion zone must wear the prescribed level of protective equipment.

8.1.2 Contamination Reduction Zone

A contamination reduction zone will be established adjacent to each exclusion zone. Workers will remove contaminated gloves and other disposable items in this area and place them in a plastic bag until they can be properly disposed.

8.1.3 Support Zone

At this site the support zone will include the area outside of the exclusion zone.

8.2 GENERAL SITE SAFETY PRACTICES

The GCHASP should identify any general site safety practices or safe operating procedures or guidelines that are used by the contractor to augment the site-specific health and safety plan. These may include policies such as those addressing equipment operator requirements and training, equipment use and maintenance, drug and alcohol policies, or smoking policies.

9.0 DECONTAMINATION

9.1 PERSONAL DECONTAMINATION

Proper decontamination is required of all workers before leaving the site. Decontamination will occur within the contamination reduction zone. Personnel decontamination will be accomplished by following a systematic procedure of cleaning (when necessary) and removing personal protective equipment (PPE) and clothing.

Contaminated PPE that can be re-used after decontamination such as boots will be rinsed, scrubbed clean in a detergent solution and then rinsed clean. To facilitate this, it may be necessary to establish a three basin wash system on site. Disposable PPE will be removed in the decontamination zone and placed in lined garbage bags.

If worn, respirators will be cleaned after each use with respirator wipe pads and will be stored in plastic bags after cleaning.

Regardless of the type of decontamination system required, a container of potable water and liquid soap should be made available so workers can wash their hands before leaving the site.

9.2 EQUIPMENT DECONTAMINATION

9.2.1 Small Equipment

Decontamination of small equipment will take place in the CRZ and may include use of solutions such as Alconox® depending on equipment. Equipment will be taken from the drop area and any protective coverings removed and disposed of in appropriate containers, along with used cleaning materials such as disposable cloths and brushes.

Small equipment will be protected from exposure as much as possible by wrapping, draping, masking, or otherwise covering the instruments with plastic (to the extent feasible) without hindering operation of the unit. For example, the PID meter can be placed in a clear plastic bag to allow reading the scale and operating the knobs. The PID sensor can be partially wrapped, keeping the sensor tip and discharge port clear. This equipment will be brushed or wiped with a disposable paper wipe. If necessary, the units can be taken inside in a clean plastic tub, wiped off with damp disposable wipes, and dried. The units will be checked, standardized, and recharged as necessary for the next day's operation, and then prepared with new protective coverings.

9.2.2 Heavy Equipment

Heavy equipment decontamination will take place at a designated on-site location.

It is anticipated that mobile equipment will be decontaminated with high-pressure water or steam in designated truck wash pads. Loose material will be removed with a brush. The worker performing this activity will be provided the level of protection utilized by the personnel who operated the subject equipment.

Wash waters and solids collected at the truck wash pads will be collected and stored in DOT-approved 55-gallon drums.

9.3 DISPOSAL OF CONTAMINATED MATERIAL

Protective gear, decontamination fluids (for both personnel and small equipment), and other disposable materials will be collected in the CRZ. Decontamination fluids will be collected in approved 55-gallon drums and stored at a designated on-site location for testing and off-site disposal. The contractor shall provide copies of any manifests generated to the PPG Representative.

9.4 SANITARY FACILITIES

The contractor shall supply temporary sanitary facilities as required by law for the use of remedial employees at the site for the duration of the work. The temporary sanitary facilities shall be serviced on a periodic basis.

10.0 MEDICAL MONITORING AND TRAINING REQUIREMENTS

10.1 MEDICAL MONITORING

All workers performing activities covered by this HASPF must be active participants in a medical monitoring program that complies with 29 CFR 1910.120(f) and 29 CFR 1926.1126. Each individual must have completed an annual surveillance examination and/or an initial baseline examination within the last year prior to performing any work on the site covered by this HASPF.

10.2 HEALTH AND SAFETY TRAINING

10.2.1 HAZWOPER

All personnel performing activities covered by this HASPF must have completed the appropriate training requirements specified in 29 CFR 1910.120 (e). Each individual must have completed an annual 8-hour refresher training course and/or initial 40-hour training course within the last year prior to performing work on this site.

10.2.2. 29 CFR 1926.1126 Training

Each employee must be trained in the OSHA Safety and Health Requirements for Construction involving Chromium (VI) 29 CFR1926.1126.

10.2.3 OSHA 10-hour Construction

All personnel performing activities covered by this HASPF must have completed the OSHA 10-hour Construction Awareness training (29 CFR 1926).

10.2.4 Pre-Entry Briefing

Prior to the commencement of on-site activities, a pre-entry briefing will be conducted by the GCSSO to review the specific requirements of this HASPF and the GCHASP. Attendance of the pre-entry meeting is mandatory for all personnel covered by this HASPF and must be documented on the attendance form provided in Appendix C. HASPF and GCHASP sign-off sheets should also be collected at the time of the pre-entry briefing. All documentation should be maintained in the project file.

11.0 EMERGENCY RESPONSE

The pre-entry briefing must be completed for each new employee before they begin work at the site. Short safety refresher meetings should be conducted, as needed, throughout the duration of the project.

OSHA defines emergency response as any "response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance." According to this definition, workers shall not participate in any emergency response where there are potential safety or health hazards (i.e., fire, explosion, or chemical exposure). Contractor response actions will be limited to evacuation and medical/first aid as described within this section below. As such, this section is written to comply with the requirements of 29 CFR 1910.38 (a).

The basic elements of an emergency evacuation plan include:

- Worker training,
- Alarm systems,
- Escape routes,
- Escape procedures,
- Critical operations or equipment,
- Rescue and medical duty assignments,
- Designation of responsible parties,
- Emergency reporting procedures, and
- Methods to account for all employees after evacuation.

11.1 WORKER TRAINING

Workers must be instructed in the site-specific aspects of emergency evacuation. On-site refresher or update training is required anytime escape routes or procedures are modified or personnel assignments are changed.

11.2 ALARM SYSTEM/EMERGENCY SIGNALS

An emergency communication system must be in effect. The most simple emergency communication system in many situations will be direct verbal communications. Each layout must be assessed at the time of initial set-up and periodically as the work progresses. Verbal communications must be supplemented anytime voices cannot be clearly perceived above ambient noise levels (i.e., noise from heavy equipment; drilling rigs, backhoes, etc.) and anytime a clear line-of-sight cannot be easily maintained due to distance, terrain or other obstructions. A hand-held air horn (three short blasts, repeated) can also be used in high-noise areas.

Verbal communications will be adequate to warn employees of hazards associated with the immediate work area. The GCSSO must bring a portable phone to the site to ensure that communications with local emergency responders is maintained, when necessary.

11.3 ESCAPE ROUTES AND PROCEDURES

During an on-site emergency, workers will leave the site by way of the construction entrances designated for each construction layout. All personnel on the site are responsible for knowing the escape route from the site and where to assemble after evacuation.

11.4 RESCUE AND MEDICAL DUTY ASSIGNMENTS

The phone numbers of the police and fire departments, ambulance service, local hospital, and project representatives are provided in the emergency reference sheet. This sheet must be posted at a defined location on-site.

In the event an injury or illness requires more than first aid treatment, the GCSSO will accompany the injured person to the medical facility and will remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the on-site project manager and the GCHSM.

If the injured employee can be moved from the accident area, he or she will be brought to the CRZ where their PPE will be removed. If the person is suffering from a back or neck injury, the person will not be moved and the requirements for decontamination do not apply. The GCSSO must familiarize the responding emergency personnel about the nature of the site and the injury. If the responder feels that the PPE can be cut away from the injured person's body, this will be done on-site. If this not feasible, decontamination will be performed after the injured person has been stabilized.

11.5 DESIGNATION OF RESPONSIBLE PARTIES

The GCSSO is responsible for initiating emergency response. In the event the GCSSO cannot fulfill this duty, the alternate GCSSO will take charge.

11.6 WORKER ACCOUNTING METHOD

The GCSSO is responsible for identifying all contractor and subcontractor workers on-site at all times. A daily worker sign-in/sign-out sheet can be used to account for all workers on-site.

11.7 ACCIDENT REPORTING AND INVESTIGATION

Any incident (other than minor first aid treatment) resulting in injury, illness or property damage requires an accident investigation and report. The investigation should be conducted as soon as emergency conditions are under control. The purpose of the investigation is not to attribute blame, but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An example accident investigation form is presented in Appendix D of this HASPF. The injured worker's supervisor, the GCHSM, and the PPG Representative should be notified immediately of the injury.

If a subcontractor employee is injured, they are required to notify the GCSSO. Once the incident is under control, the subcontractor will submit a copy of their company's accident investigation report to the GCSSO who will provide a copy the PPG Representative.

METROPOLIS TOWERS SITE
EMERGENCY CONTACTS LIST

Local emergency medical team	
Emergency	911
Nearest emergency room	
Jersey City Medical Center Wilzig Hospital 355 Grand Street Jersey City, NJ 07304-3254	201-915-2000

DIRECTIONS
1. Turn SOUTH on MARIN BLVD toward YORK ST.
2. Turn RIGHT onto GRAND ST.
3. End at Jersey City Medical Ctr 355 Grand Street.

Total Estimated Time: 1 minute

Jersey City Police Department	
Emergency	911
All other communications	201-547-5450
Jersey City Fire Department	
Emergency	911
Client Site Contact: W. B. Kennedy, Jr.	330-283-8587
GC Project Manager: xxxxx	(office) (cell)
GC Site Safety Officer: xxxx	(office) (cell)
Air Monitoring Contractor Manager: xxxx	(office) (cell)
PPG Representative: xxxxx	(office) (cell)
National Information Centers	
Chemtrec	(800) 424-9300
National Response Center	(800) 424-8802
Poison Control Center	(800) 942-5969

Map from Property to Jersey City Medical Center (Wilzig Hospital)
355 Grand Street – Jersey City, NJ

APPENDIX A

Health and Safety Plan Receipt and Acceptance Form

REMEDIAL ACTION
Metropolis Towers
280 Luis Munoz Marin Boulevard
Jersey City, New Jersey

I have received a copy of the Health and Safety Plan prepared for the above-referenced site and activities. I have read and understood its contents and I agree that I will abide by its requirements.

Name: ____

Signature:____

Date:____

Representing: ____

APPENDIX B
Job Hazard Analysis Form

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
SAFETY EQUIPMENT	**INSPECTION REQUIREMENT**	**TRAINING REQUIREMENTS**

APPENDIX C

Health and Safety Plan Pre-Entry Briefing Attendance Form
REMEDIAL ACTION
Metropolis Towers
280 Luis Munoz Marin Boulevard
Jersey City, New Jersey

Conducted by:		**Date Performed:**	
Topics Discussed:	1. Review of the content of the GCHASP (Required)		
	2.		
	3.		
	4.		

Printed Name	Signature	Representing

APPENDIX D

Example Accident Investigation Report Form

ACCIDENT INVESTIGATION REPORT

Injured Employee ______________________________ Job Title _______________________

Home Office ______________________________ Division/Department__________________

Date/Time of Accident____

Location of Accident __Metropolis Towers, Jersey City, New Jersey

Witnesses to the Accident:____

____

Injury Incurred? _______ Nature of Injury ____

Engaged in What Task When Injured? ____

Will Lost Time Occur? _______ How Long? _________ Date Lost Time Began_____________

Were Other Persons Involved/Injured?____

How Did the Accident Occur?

What Could Be Done to Prevent Recurrence of the Accident?

What Actions Have You Taken Thus Far to Prevent Recurrence?

Supervisor's Signature __________________________ Title ___________________ Date______
Reviewer's Signature ___________________________ Title ___________________ Date ______

Note: If the space provided on this form is insufficient, provide additional information on a separate page and attach. The completed accident investigation report must be submitted to the PPG Representative within two days of the occurrence of the accident.