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Title:	Subject: Chemistry and Metallurgy Research Building Historical Perchlorate Data and Discussion
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Los Alamos NATIONAL LABORATORY

Memorandum

Historical Perchlorate Data Analysis

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Phone: 505-665-0623
Date: April 19th, 2024

Subject: Chemistry and Metallurgy Research Building Historical Perchlorate Data and Discussion

The Chemistry and Metallurgy Research Building (CMR), located at TA-03-0029, was built in 1952 and was occupied by Los Alamos National Laboratory (LANL) employees in 1953. The facility was built to perform actinide analytical chemistry and material characterization in support of LANL and Department of Energy (DOE) mission of stockpile stewardship and research.

CMR has a long history of chemical processing and operations over the years. It is known that perchloric acid was widely used in several analytical and research operations and was fumed in some of the laboratory spaces while operations were active. Perchlorate operations have occurred in all wings of CMR, some of which are still active operational areas. Wings 5,7, and 9 are all currently operational areas within CMR. As part of ongoing risk reduction efforts at CMR Wings 2, 3 and 4 are set to be decommissioned and are no longer active. It was determined that the fume hoods and radiological liquid waste (RLW) sink drain p-traps required perchlorate sampling to determine appropriate controls for work in removing these items from the facility.

Several sampling characterizations have been conducted over the years in all wings to determine perchlorate levels throughout CMR with a total of 230 historical samples. The latest sampling data found in our Industrial Hygiene (IH) Comprehensive Tracking System (CTS) database was 2003; the most recent sampling was completed in 2023. There is a broad range of results depending on sample location in the building and the systems (ventilation vs. RLW sink drains) and currently controls used at CMR are dependent on location and are not universal to other LANL sites.

Below is a full list of the sample locations and sample results along with coordinating sample maps. Please note that not all samples were able to be located on the map as some of the historical sample locations were not identified in CTS. Maps and Table information is broken up by wing. Wings 4 and 9 do not have associated sample maps as the sample data was not specified.

Historical Data Results

To clearly identify sampled areas and results, the sampling efforts for all wings (2,3,4,5,7,9) are summarized below in Table1. Table 1 includes the following information.

- Specific Location
- Sample ID
- Sample Results

Sample Location	Sample ID	Result (MG/FT²)
WING 2 Sample Data		
Room-2000A P-Trap	2000A-A	0.00
Room 2000A Hood 680 P-trap	2000A-B	0.0
Room 2000A Hood #680	2000A-C	0.01
Room 2023	CB-2023-1	<0.01
Room 2023	CB-2023-2	<0.01
Room 2048 Lab bench sink P-trap	2048B-A	0.00
Room 2048 Hood #700	2048B-B	0.10
Room 2048	2048C-1	0.00864
Room 2048	2048C-2	0.0156
Room 2054 Lab bench P-trap	2054-A	0.00
Room 2054 Hood #710	2054-B	2.27
Room 2066 Hood #720	2066-A	0.01
Room 2066 Hood #720	2066-B	0.00
Room 2066 Hood #720	2066-C	0.00
Room 2066 Hood #720	2066-D	0.00
Room 2070 Lab Bench Sink P-trap	2070-A	0.0
Room 2070 HEPA Filter Hood #730	2070-B	0.24
Room 2070 Hood #730	2070-D	0.00
Room 2074 Ducting	2074-A	0.00
Room 2074 Ducting	2074-B	0.01
Room 2074 Hood #15170	2070-C	0.43
Room 2112 Hood #13020	2112-A	126
Room 2112 Hood #13020	2112-B	5.76
Room 2114 Hood #13010	2114-A	2.72

Sample Location	Sample ID	Result (MG/FT²)
Room 2114 Hood #13010	2114-B	3.36
Room 2114 Hood #8810	2114-C	2.4
Room 2114 Hood #810	2114-D	4
Room 2115	CB-2115-1	0.01
Room 2126 Hood #14840	2126-A	1.01
Room 2126 Hood #14840	2126-B	1.73
Room 2127 Hood #970	2127-A	<0.28
Room 2127 Hood #970	2127-B	<0.28
Room 2127 Hood #970	2127-C	<0.28
Room 2127 Sink P-Trap	2127-D	0.65
Room 2130 Hood #1040	2130-A	<0.17
Room 2130 Hood #1030	2130-B	0.23
Room 2130 Hood #1000	2130-C	<0.17
Room 2131 Hood 1060	2131-01A	1.2
Room 1231 Hood 1060	2131-02B	4.8
Room 2131 Sink P-Trap	2131-03C	1.6
Room 2131 Hood #1100	2131-04D	13.2
Room 2131 Hood #1100	2131-05E	3.6
Room 2131 Hood #18880	2131-06F	<1.08
Room 2131 Hood #18880	2131-07G	36
Room 2131 Hood #1090	2131-08H	25.2
Room 2131 Hood #1090	2131-09I	16.8
Room 2132	2132-01	<0.1
Room 2132	2132-02	<0.01
Room 2136	2136-01	0.1
Room 2136	2136-02	0.1

Sample Location	Sample ID	Result (MG/FT²)
WING 3 Sample Data		
Room 3097 floor	RS-3097-3	0.8
Room 3097 floor	CB-3097-3	1.8
Room 3097	CB-3097-4	0
Room 3097	CB-3097-3	16.8
Room 3097	CB-3097-2	9
Room 3097	CB-3097-1	9.9
Room 3034	CB-3034-4	<0.1
Room 3034	CB-3034-3	<0.1
Room 3034	CB-3034-2	<0.1
Room 3034	CB-3034-1	<0.1
Room 3034A Ducting	3034-A	410
Room 3068 Ducting	3068	430
Room 3070 Ducting	3070	79
Room 3110 Hood #1180	3110-A	0.65
Room 3110 Hood #1180	3110-B	0.26
Room 3110 Hood #1190	3110-C	0.43
Room 3110 Hood #1200	3110-D	2.16
Room 3110 Hood #1210	3110-E	95.04
Room 3110 Sink P-Trap Hood #1210	3110-F	1.77
Room 3110 Lab bench sink P-trap	3110-G	0.05
Room 3110 Lab bench sink P-Trap	3110-H	0.00
Room 3110 Lab bench sink P-Trap	3110-I	0.00
Room 3110 Lab bench sink P-Trap	3110-J	0.01
Room 3111 Hood #1220	3111-A	17.28
Room 3111 Sink P-Trap Hood #1220	3111-B	0.00
Room 3111 Lab bench sink P-Trap	3111-C	0.00
Room 3111 Hood #1230	3111-D	19.00
Room 1113 Lab bench sink P-Trap	3113-A	0.00
Room 1113 Hood #12780	3113-B	5.00
Room 3115 Hood # 1300	3115-A	0.01

Sample Location	Sample ID	Result (MG/FT²)
Room 3115 Lab bench sink P-Trap	3115-B	0.00
Room 3115 Hood #12810	3115-C	0.01
Room 3116 Lab bench sink P-Trap	3116-A	0.00
Room 3117 Lab bench sink P-Trap	3117-A	0.00
Room 3117 Hood #1360	3117-B	17.00
Room 3117 Hood #12800	3117-C	13.00
Room 3118 Hood #1390 Sink	3118-A	0.01
Room 3118 Hood #1390	3118-B	0.01
Room 3118 Hood #1390	3118-C	0.13
Room 3118 Lab bench sink P-Trap	3118-D	0.00
Room 3118 Lab bench sink P-Trap	3118-E	0.00
Room 3118 Lab bench sink P-trap	3118-F	0.00
Room 3118 Lab bench sink P-Trap	3118-G	0.00
Room 3121 Duct Hood#1440	3121-A	418
Room 3212 Hood #1440	3121-B	303.39
Room 3127 Hood #1510	3127-A	22.00
Room 3127 Lab bench sink P-Trap	3127-B	0.39
Room 3127 Lab Bench sink P-Trap	3127-C	0.00
Room 3129/3131 Lab bench sink P-Trap	3129/3131-A	0.03
Room 3129/3131 Lab bench sink P-Trap	3129/3131-B	0.00
Room 3129/3131 Lab bench sink P-Trap	3129/3131-C	0.00
Room 3129/3131 Hood #1390	3129/3131-D	11.40
Room 3129/3131 Ducting	281231314	0.05
Room 3129/3131 Ducting	281231313	0.46
Room 3129/3131 Ducting	281231312	1.35
Room 3129/3131 Ducting	281231311	3.6

Sample Location	Sample ID	Result (MG/FT²)
Room 3129/3131 Ducting	2711313110	1.25
Room 3129/3131 Ducting	271131319	125
Room 3129/3131 Ducting	271131318	1489
Room 3129/3131 Ducting	271131316	0.22
Room 3129/3131 Ducting	271131315	1.93
Room 3129/3131 Ducting	271131314	0.15
Room 3129/3131 Ducting	271131312	0.37
Room 3129/3131 Ducting	271131311	0.44
Room 3129/3131	1	<0.1
Room 3129/3131	2	0.7
Room 3129/3131	3	<0.1
Room 3129/3131	5	0.2
Room 3129/3131	6	<0.1
Room 3129/3131	7	1.3
Room 3135/3137 Lab bench P-Trap	3135/3137-A	0.00
Room 3135/3137 Lab bench P-Trap	3135/3137-B	0.00
Room 3135	CB-3135-05	<0.1
Room 3135	CB-3135-04	<0.1
Room 3135	CB-3135-03	<0.1
Room 3135	CB-3135-02	<0.1
Room 3135	CB-3135-01	<0.1
Room 3135 Hood Ducting	282131353	<0.1
Room 3135 Hood Ducting	282131352	<0.1
Room 3135 Hood Ducting	28213151	<0.1
Room 3135/3137	12	<0.1
Room 3135/3137	10	0.3
Room 3135/3137	9	0.2
Room 3135/3137	8	<0.1
Room 3137 Sink in Hood #17880	3137-A	0.01
Room 3137 Hood #17880	3137-B	0.01
Room 3137 Hood #17870	3137-C	0.01
Room 3137 Hood #17870	3137-D	0.00
Room 3137 Sink in Hood #17850	3137-E	0.00
Room 3137 Sink in Hood #17850	3137-F	0.00

Sample Location	Sample ID	Result (MG/FT²)
Room 3137 Hood #17850	3137-G	0.01
Room 3137 Hood 17850	3137-H	0.01
Room 3137 Sink in Hood #17860	3137-I	0.00
Room 3137 Sink in Hood #17860	3137-J	0.00
Room 3137 Hood #17860	3137-K	0.00
Room 3137 Hood #17860	3137-L	0.01
Room 3195	5010431952	98.7
Room 3195	5010431951	2.8
Room 3195	RS-3195-1	2.4
Room 3195 Fan Housing	RS-3195-2	1.3
Room 3195 Floor by FE-19	CB-3195-2	2.7
Room 3195 Floor by FE-19	CB-3195-1	27.1
Room 3195 Fan Gasket	CB-3195-1	15.6
Room 3195 Floor	CB-3195-2	1
Room 3295 ventilation	3295-A	1.1
Room 3295 ventilation	3295-B	2.4
Room 3295 ventilation	3295-C	1.6
Room 3295 ventilation	3295-D	1.1
Room 3295 ventilation	3295-E	4.1
Room 3295 ventilation	3295-F	42
Room 3295 ventilation	3295-G	16
Room 3295 ventilation	3295-H	14
Room 3295 ventilation	3295-I	0.5
Room 3295 ventilation	3295-J	0.6
Room 3295	RS-3295-4	0.7
Room 3295	RS-3295-5	0.6
Room 3295	RS-3295-6	10.5
Room 3295	CB-3295-1	4716
Room 3295	CB-3295-1	1294
Room 3295 Floor	8	13.8
Room 3295 Floor	7	0.6
Room 3295	5	2.9
Room 3295	4	0.3
Room 3295	CB-3295-2	28
Room 3295	CB-3295-4	18
Room 3295	CB-3295-5	0

Sample Location	Sample ID	Result (MG/FT²)
Room 3295	A	70
Room 3295	B	39
Room 3295	D	<0.1
WING 4 Sample Data		
Room 4295 Fan Housing FE-24 Door opening	503034295-3	0.14
Room 4295 Fan Housing FE-24	503034295-2	7.56
Room 4294 Fan Housing FE-24 On fan Wheel	503034295-1	0.29
Room 4295 Fan Housing FE-24	CB-4295-1	0.3
Room 4295 Fan Housing FE-24	CB-4295-2	4.6
Room 4295 Fan Housing FE-24	CB-4295-3	1.4
WING 5 Sample Data		
Room 5122 Sink Drain	071323-02	ND
Room 5034 RLW Lines	CB-5034-1	<0.01
Room 5023 RLW Lines	61523-01	<0.3
Room 5023 RLW Lines	61523-02	<0.3
Room 5023 RLW Lines	61623-03	<0.3
Room 5023 RLW Lines	61623-04	<0.3
Room 5295 Fan Wheel	CB-5295-01	0.1
Room 5295 Fan Wheel	CB-5295-02	0.1
Room 5295 Fan Wheel	CB-5295-1	2.7
Room 5295 Fan Wheel	CB-5295-2	0.1
Room 5295 Fan Wheel	CB-5295-3	<0.1
Wing 7 Sample Data		
Room 7023 On acid drain line under vent to lab space	502027023-1	<0.01
Room 7023 on floor under ventilation into lab space	502027023-2	0.01
Room 7023 Opening of existing pipe	CB-7023-3	0
Room 7023 opening of removed piping	CB-7023-2	0.3
Room 7023 Duct opening	CB-7023-1	0.5
Room 7023 Floor Drain	CB-7023-5	0.02

Sample Location	Sample ID	Result (MG/FT²)
Room 7023 Existing Pipe on tank	CB-7023-4	0.3
Room 7023 Ducting from 7129	CB-7023-1	0.01
Room 7121 Floor ducting	501317121-1	0.1
Room 7016 South Duct by Door	CB-7016-2	39
Room 7016 North Duct above table	CB-7016-1	<0.1
Room 7114 Floor ducting	CB-7114-1	<0.1
Room 7114 Floor ducting	CB-7114-2	<0.1
Room 7129 Floor Ducting	1	0.12
Room 7129 Floor Ducting	2	0.11
Room 7129 Ducting	3	0.24
Room 7129 Ducting	4	0.22
Room 7123 Floor ducting	5	0.1
Room 7123 Floor ducting	4	0.3
Room 7123 Floor Ducting	2	<0.1
Room 7123 Floor Ducting	1	0.1
Room 7123 Ducting	5	0.1
Room 7123 Ducting	4	0.3
Room 7123 Ducting	2	<0.1
Room 7123 Ducting	1	0.1
WING 9 Sample Data		
Room 9030 Inside duct FE-49 FE-50	CB-9030-1	<0.2
Room 9030 Exhaust Fan FE-49 FE-50	CB-9030-2	<0.2
Room 9041 Ducting	CB-9041-1	<0.1
Room 9041 Ducting	CB-9041-2	<0.1
Room 9041 Ducting	CB-9041-3	<0.1

Discussion

Current LANL procedure documents that are followed are OSH-LIHSM-51-007 and CMR TSR procedures. OSH-LIHSM-51 “Perchlorate Presence Determination” is a procedure that is intended to be followed when sample results indicate perchlorate levels below the action level (AL) of 500 mg/ft² or above 1.25 mg/ft². Based off sample results Wing 3 is the highest area of concern. It had several sample results above 1.25 mg/ft² and two of highest samples overall (above the AL), the highest being 4716 mg/ft² in room 3295 in the Ventilation/Duct work. The area of least concern is Wing 9, this area was an addition to the building and no known

perchlorate fuming was performed in the area (This sampling was completed as verification for Wing 9.) This historical sampling data and map locations has helped support our decision on where perchlorates are of concern throughout CMR and support the concern that perchlorates exist in the CMR ventilation and RLW sink drain systems. This historical data, especially the data in wing 3 allows us to assume worst case scenario and use the sample data to assume that downstream characterization for the whole wing is also contaminated. Knowing this information has helped us determine appropriate controls. When performing invasive work activities in CMR the current controls and PPE are required.

When perchlorate levels are below 1.25 mg/ft² there is no required controls or PPE in respect to a perchlorate hazard.

When perchlorate levels are above 1.25 mg/ft² and below 500 mg/ft² the following controls are required for invasive work:

- Wet methods must be used.
- Non-spark producing tools shall be used.

When perchlorate levels are above the action level of 500 mg/ft^2, or an explosives safety SME determines the perchlorate levels to be of concern through visual inspection, then the following controls are implemented:

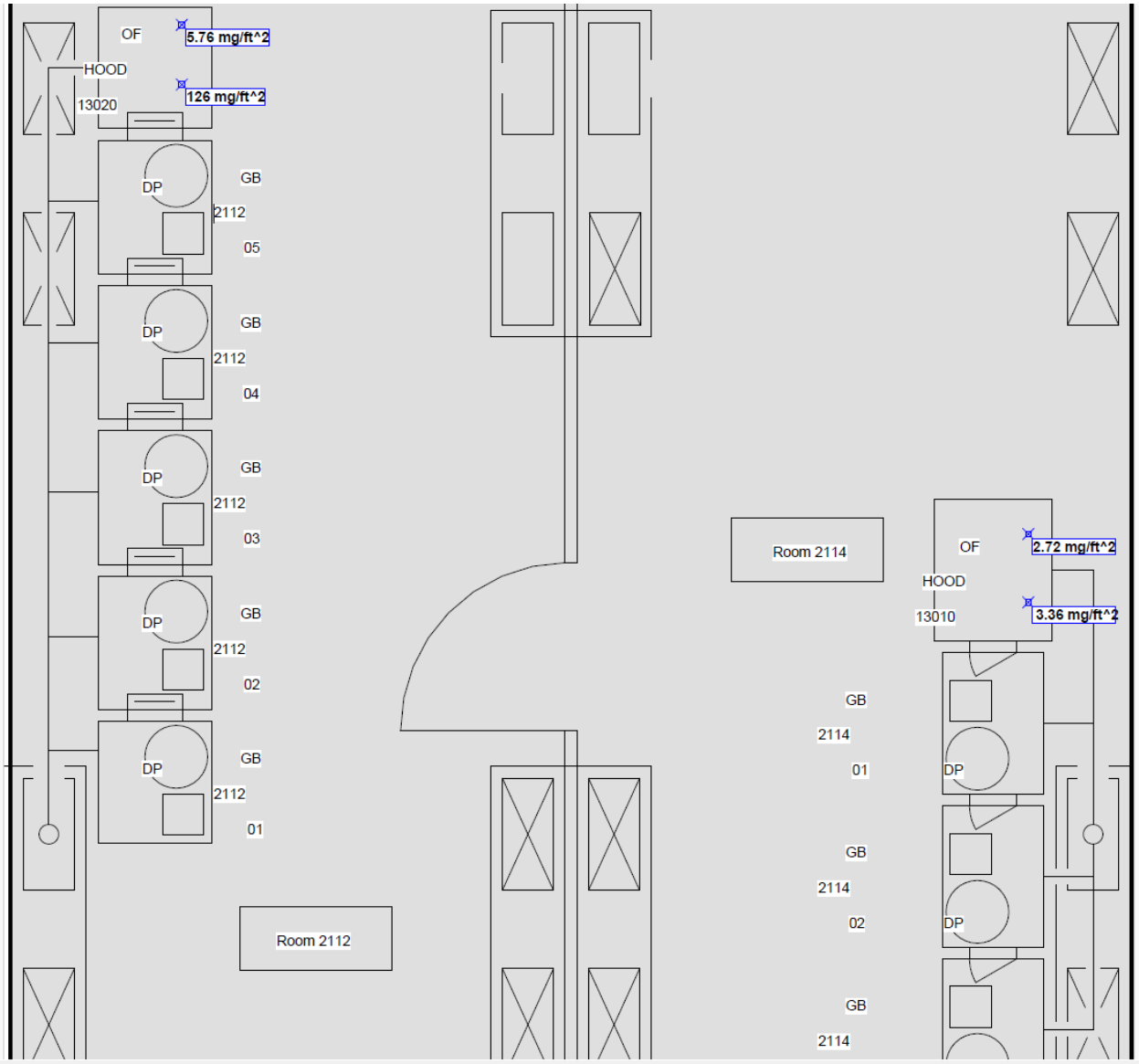
- Attempt to decontaminate the system to lower the perchlorate concentration to below the action level of 500 mg/ft^2 OR
- Proceed with the work using a continuously wetted environment, fire resistant PPE, and establishing a safe separation distance from the hazard as determined by an Explosives SME. In addition, the Waste Management Coordinator must be informed for both wastewater and scrap metal disposal requirements.

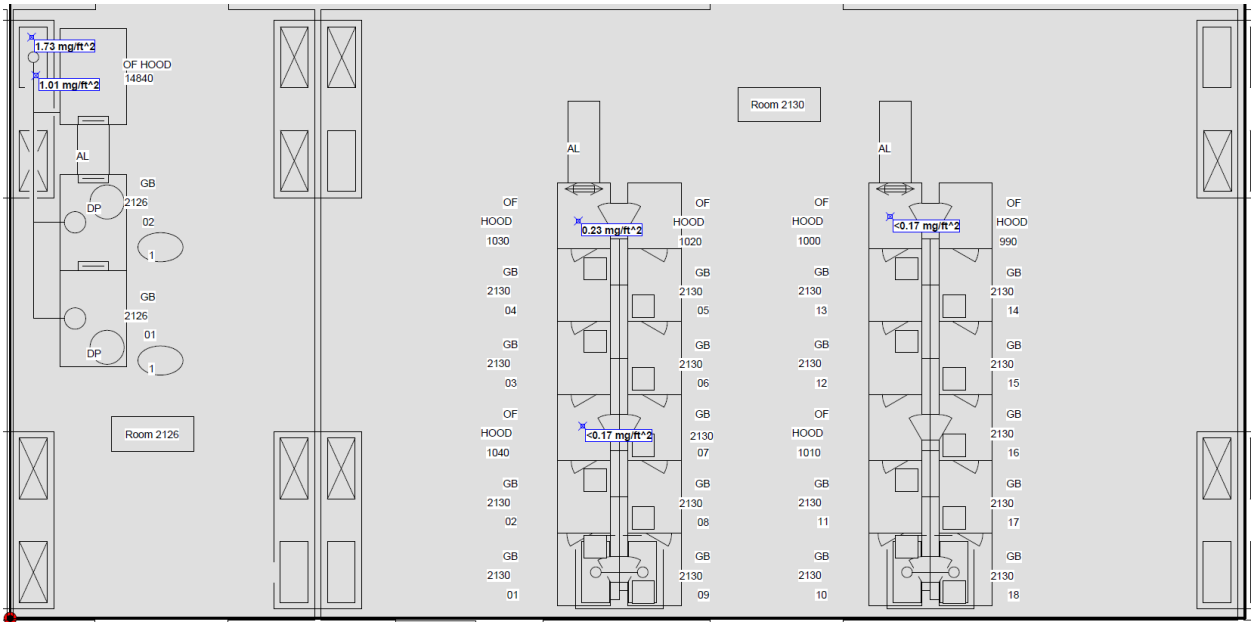
Due to the amount of invasive work that occurs in the CMR facility and current and historical chemical and beryllium contamination, the following PPE is required for breaching of the exhaust system and RLW lines::

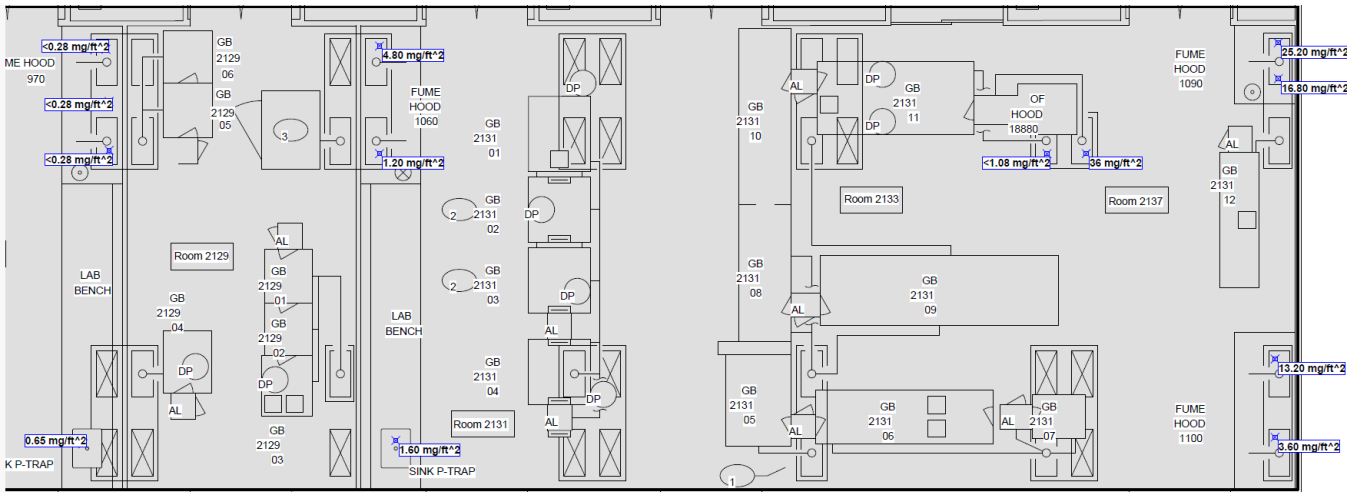
- MSA OptimAir TL positive pressure Powered Air Purifying Respirator (PAPR) with OptiFilter TL OV/CL/CD/HC/HS/SD/HE/HF cartridge and double-bibbed Tychem QC hood.
- DryGuard coverall, or equivalent.
- Trionic gloves, or equivalent.
- If cut-resistant over gloves are worn, they must be synthetic level 4 (non-leather).

Attachment(s): Wing 2 Sample Maps
Wing 3 Sample Map
Wing 5 Sample Map
Wing 7 Sample Map

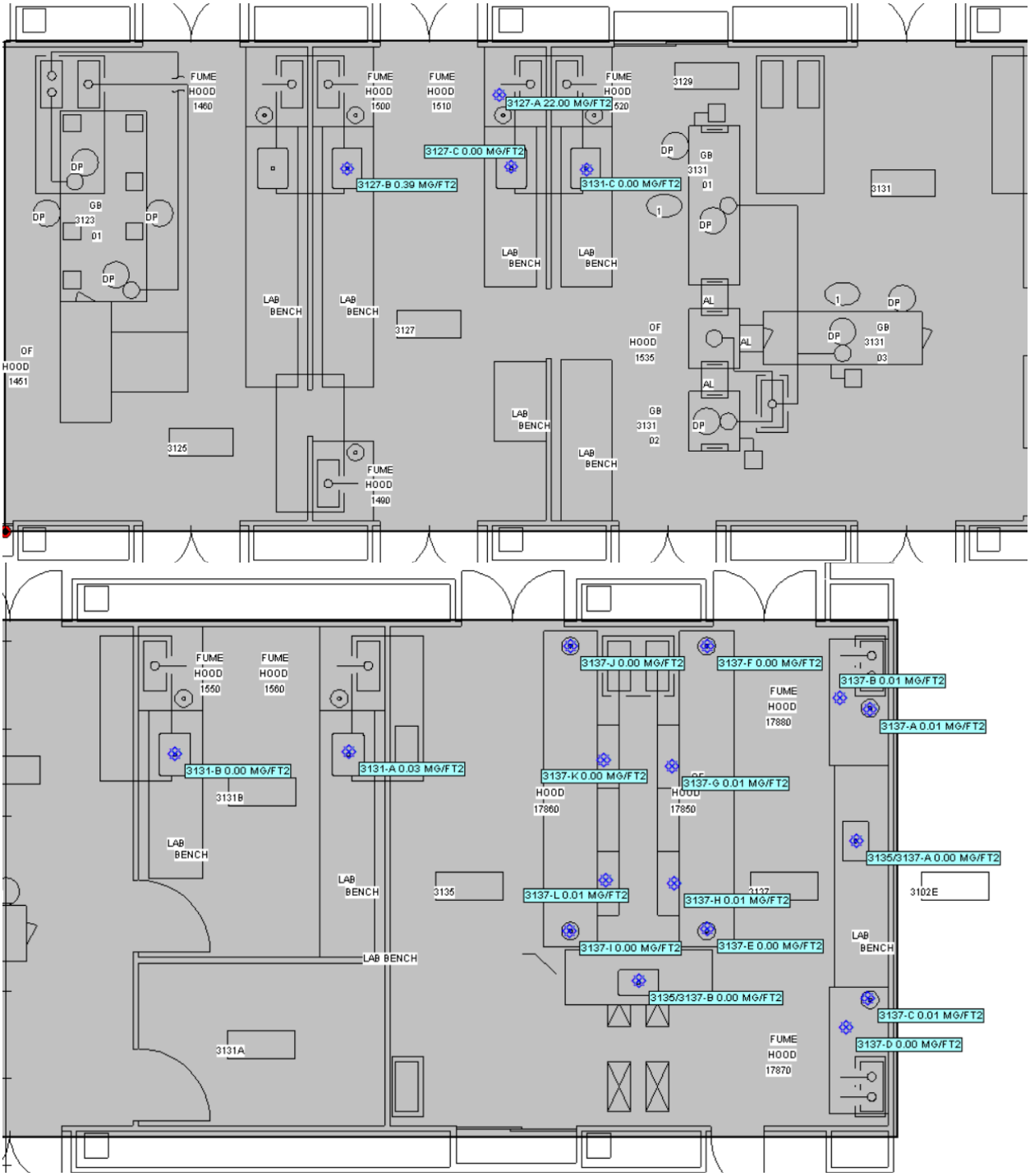
Attachment 1: WING 2 SAMPLE MAPS

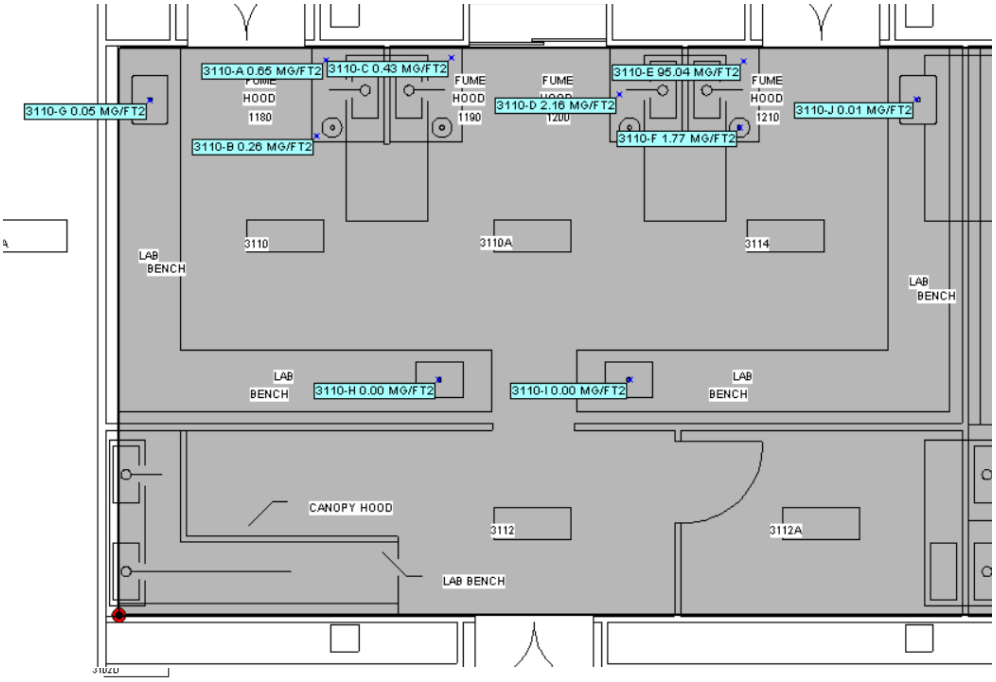


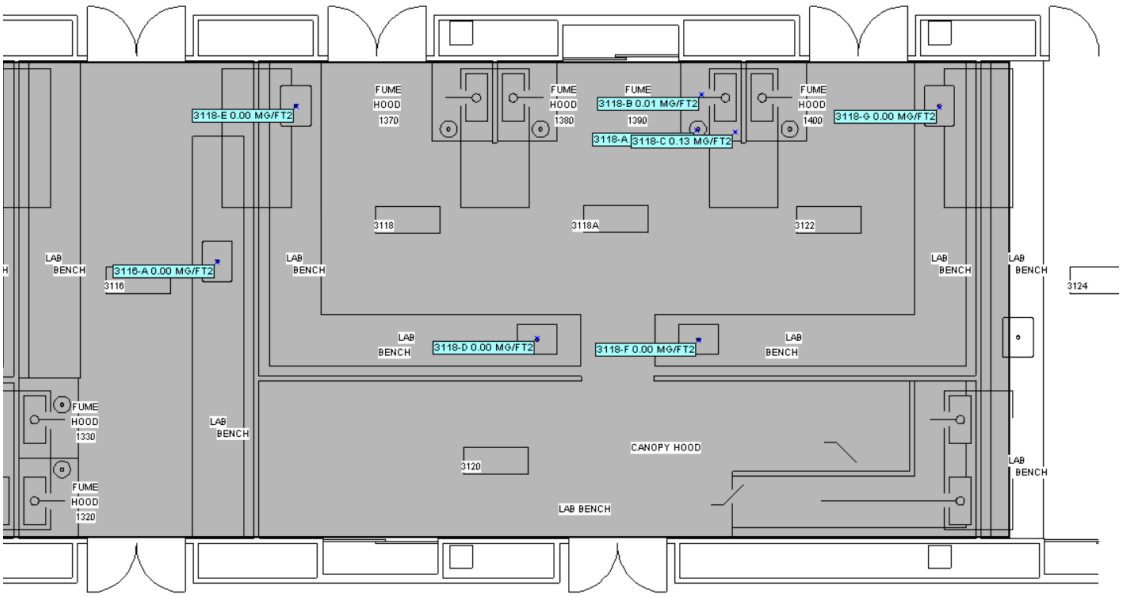

1.73 mg/ft^2
1.01 mg/ft^2
OF HOOD 14840
AL
GB 2126 02
DP
1
GB 2126 01
DP
1
Room 2126
Room 2130
AL
OF HOOD 1030
GB 2130 04
GB 2130 03
OF HOOD 1040
GB 2130 02
GB 2130 01
0.23 mg/ft^2
OF HOOD 1020
GB 2130 05
GB 2130 06
<0.17 mg/ft^2
GB 2130 07
GB 2130 08
GB 2130 09
AL
OF HOOD 1000
GB 2130 13
GB 2130 12
OF HOOD 1010
GB 2130 11
GB 2130 10
<0.17 mg/ft^2
OF HOOD 990
GB 2130 14
GB 2130 15
GB 2130 16
GB 2130 17
GB 2130 18


<0.28 mg/ft^2
ME HOOD 970
<0.28 mg/ft^2
<0.28 mg/ft^2
GB 2129 06
GB 2129 05
4.80 mg/ft^2
FUME HOOD 1060
1.20 mg/ft^2
Room 2129
LAB BENCH
GB 2129 04
GB 2129 01
GB 2129 02
GB 2129 03
0.65 mg/ft^2
K P-TRAP
GB 2131 01
GB 2131 02
GB 2131 03
GB 2131 04
Room 2131
1.60 mg/ft^2
SINK P-TRAP
LAB BENCH
GB 2131 10
GB 2131 11
OF HOOD 18880
<1.08 mg/ft^2
36 mg/ft^2
Room 2133
Room 2137
GB 2131 08
GB 2131 09
GB 2131 05
GB 2131 06
GB 2131 07
GB 2131 12
FUME HOOD 1090
25.20 mg/ft^2
16.80 mg/ft^2
FUME HOOD 1100
13.20 mg/ft^2
3.60 mg/ft^2

Attachment 1: WING 3 SAMPLE MAPS

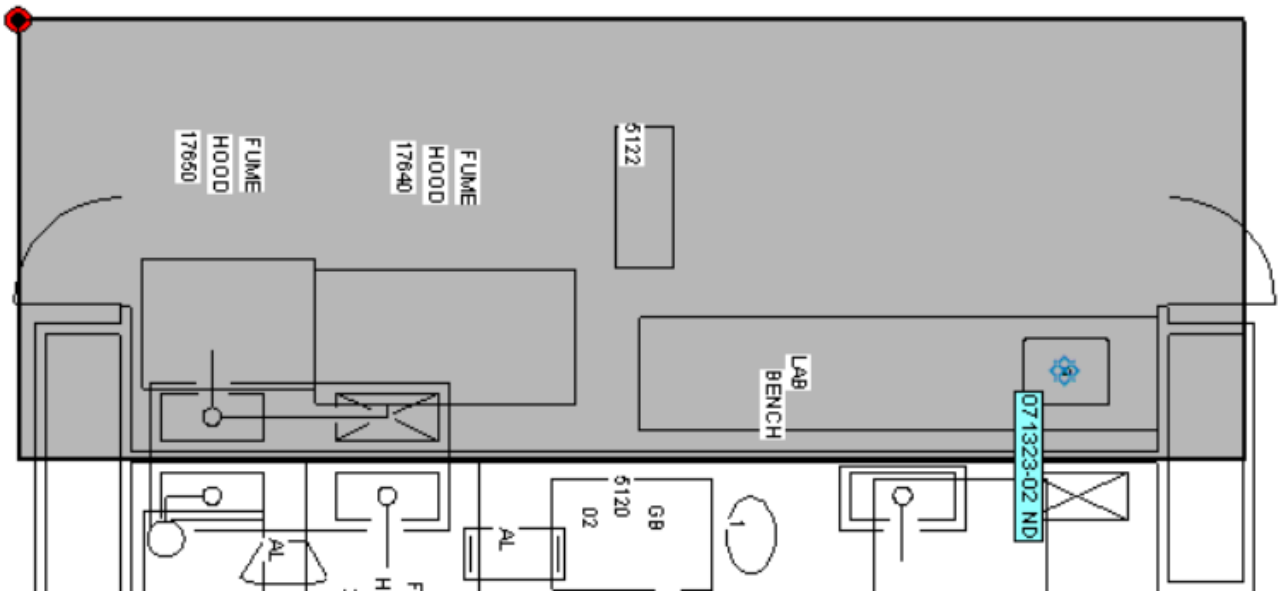


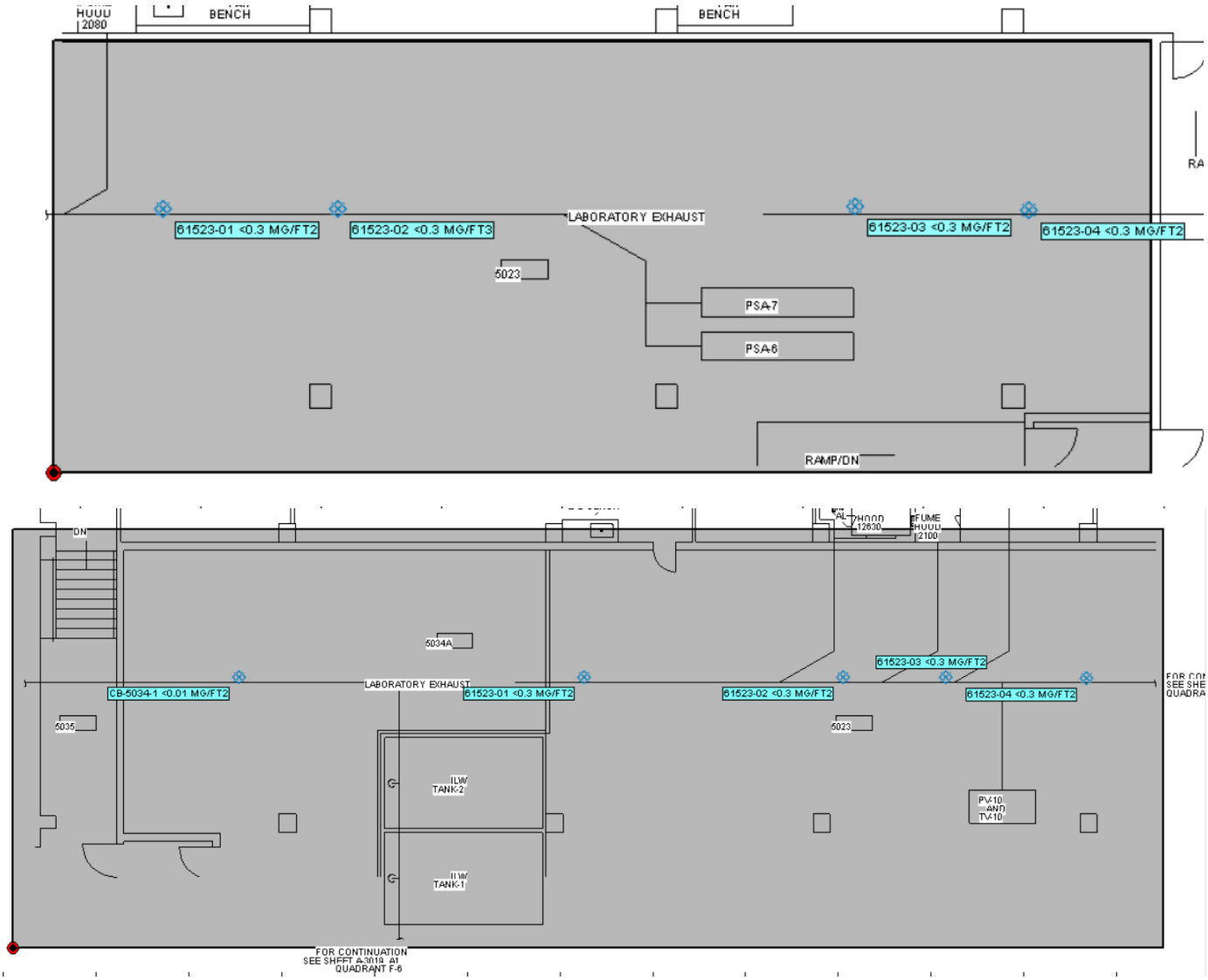

3110-A 0.65 MG/FT2
3110-C 0.43 MG/FT2
3110-E 95.04 MG/FT2
3110-G 0.05 MG/FT2
3110-D 2.16 MG/FT2
3110-J 0.01 MG/FT2
3110-B 0.26 MG/FT2
3110-F 1.77 MG/FT2
FUME HOOD 1180
FUME HOOD 1190
FUME HOOD 1200
FUME HOOD 1210
3110
3110A
3114
LAB BENCH
3110-H 0.00 MG/FT2
3110-I 0.00 MG/FT2
CANOPY HOOD
3112
3112A
LAB BENCH


3118-E 0.00 MG/FT2
FUME HOOD 1370
FUME HOOD 1380
3118-B 0.01 MG/FT2
FUME HOOD 1390
FUME HOOD 1400
3118-G 0.00 MG/FT2
3118-A
3118-C 0.13 MG/FT2
3118
3118A
3122
3116-A 0.00 MG/FT2
3116
3124
3118-D 0.00 MG/FT2
3118-F 0.00 MG/FT2
FUME HOOD 1330
FUME HOOD 1320
3120
CANOPY HOOD
LAB BENCH

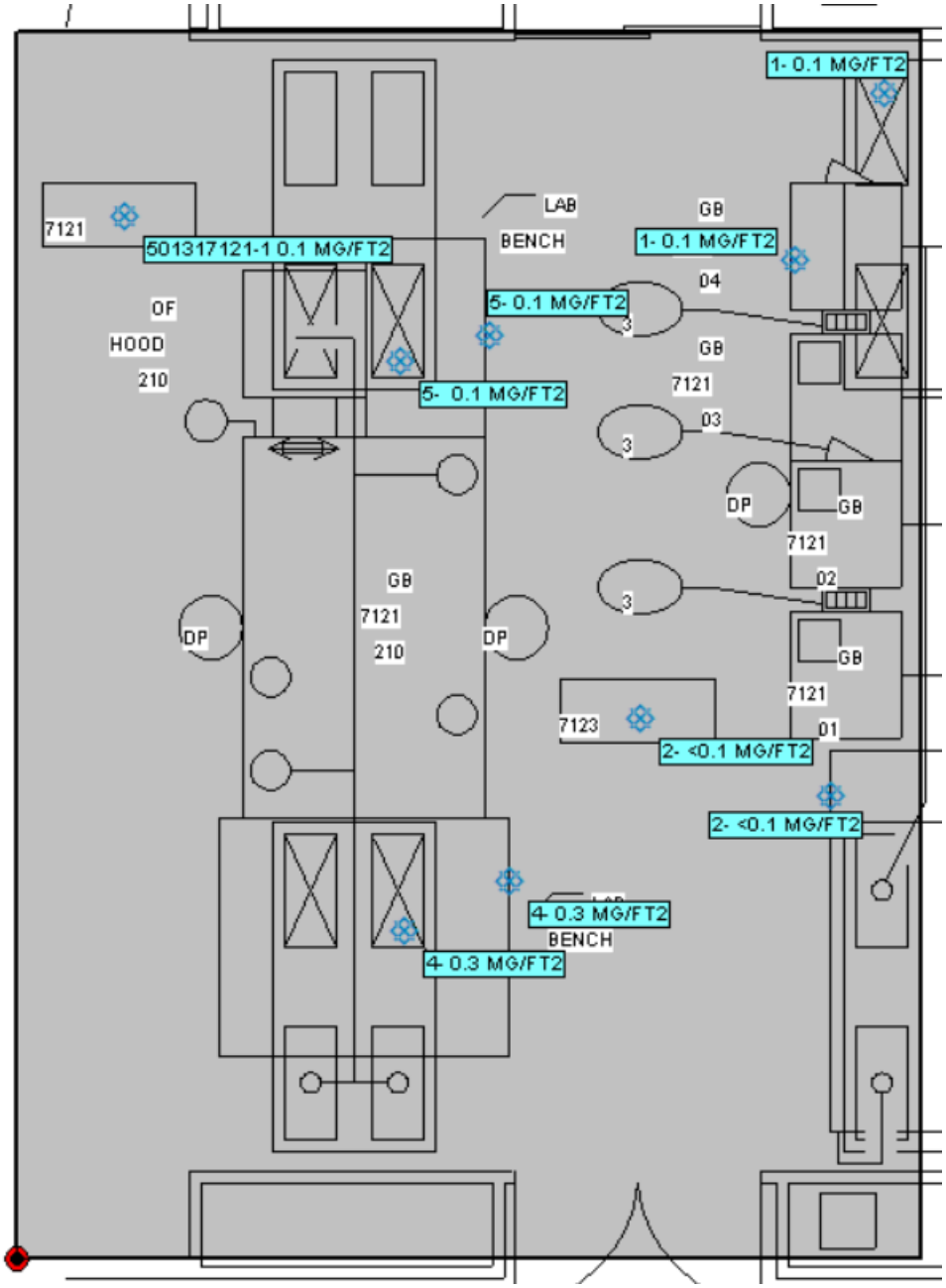

3111-A 0.65 MG/FT2
3111-B 0.26 MG/FT2
3111-C 0.00 MG/FT2
3111-D 19.00 MG/FT2
3113-A 0.00 MG/FT2
3113-B 5.00 MG/FT2
3115-B 0.00 MG/FT2
3115-A 0.01 MG/FT2
3115-C 0.01 MG/FT2
3117-C 13.00 MG/FT2
3117-B 17.00 MG/FT2
3117-A 0.00 MG/FT2
3121-A 418 MG/FT2
3121-B 303.39 MG/FT2
FUME HOOD 1410
FUME HOOD 14120
FUME HOOD 1450
LAB BENCH
OF HOOD 17720
DP
3119
3121
3123

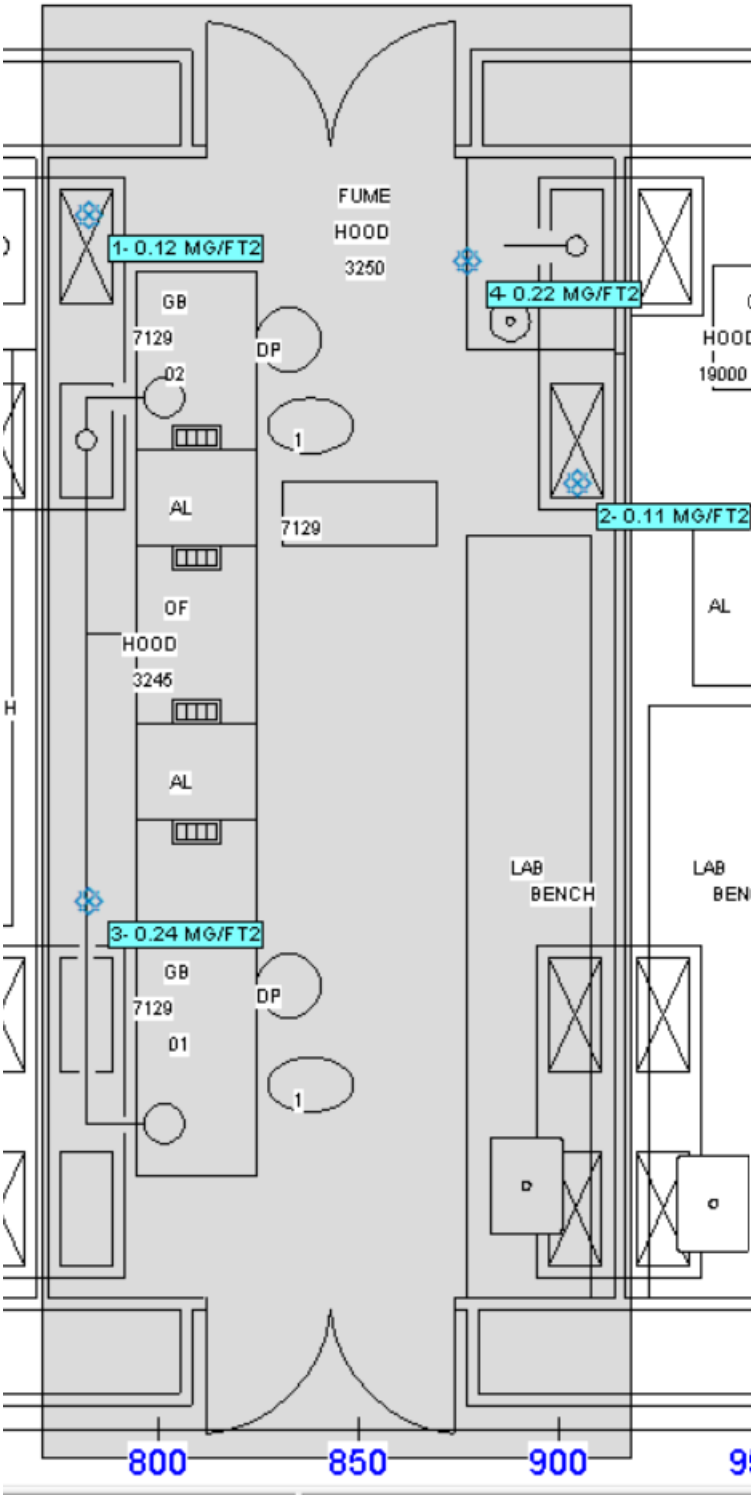
Attachment 1: WING 5 SAMPLE MAPS

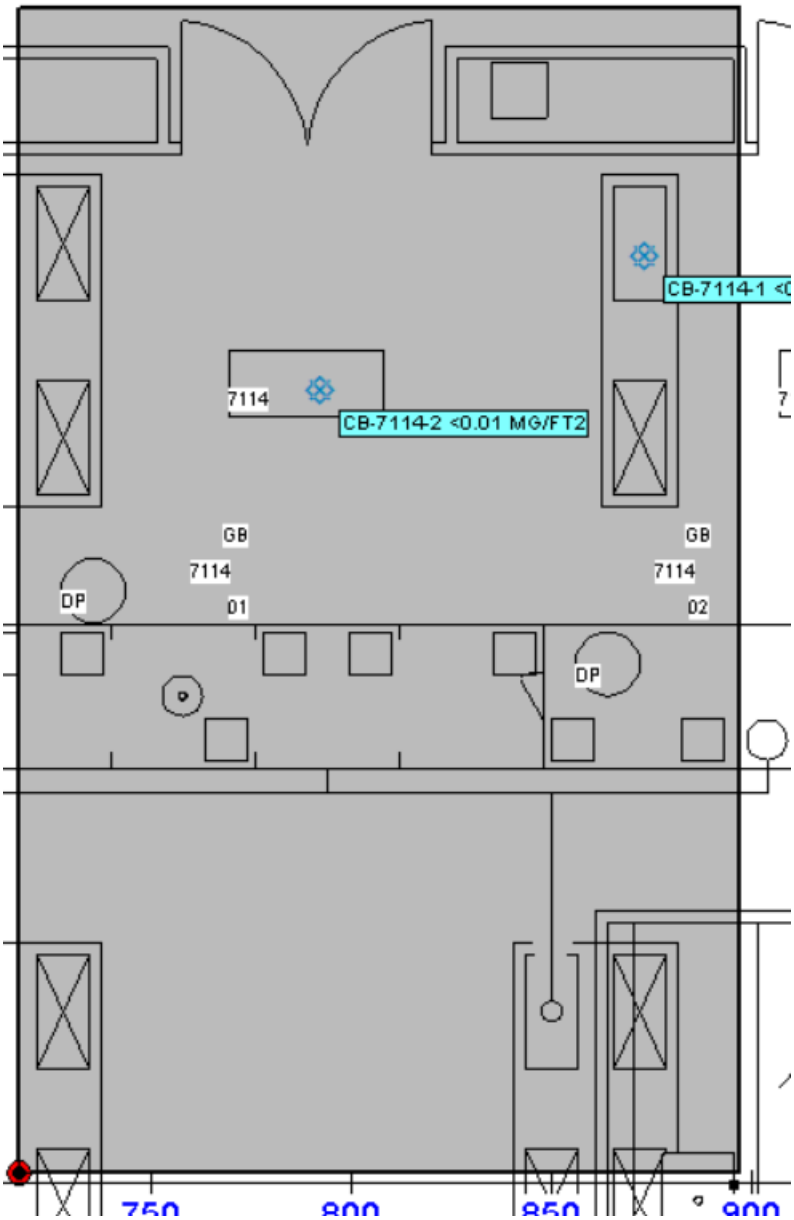


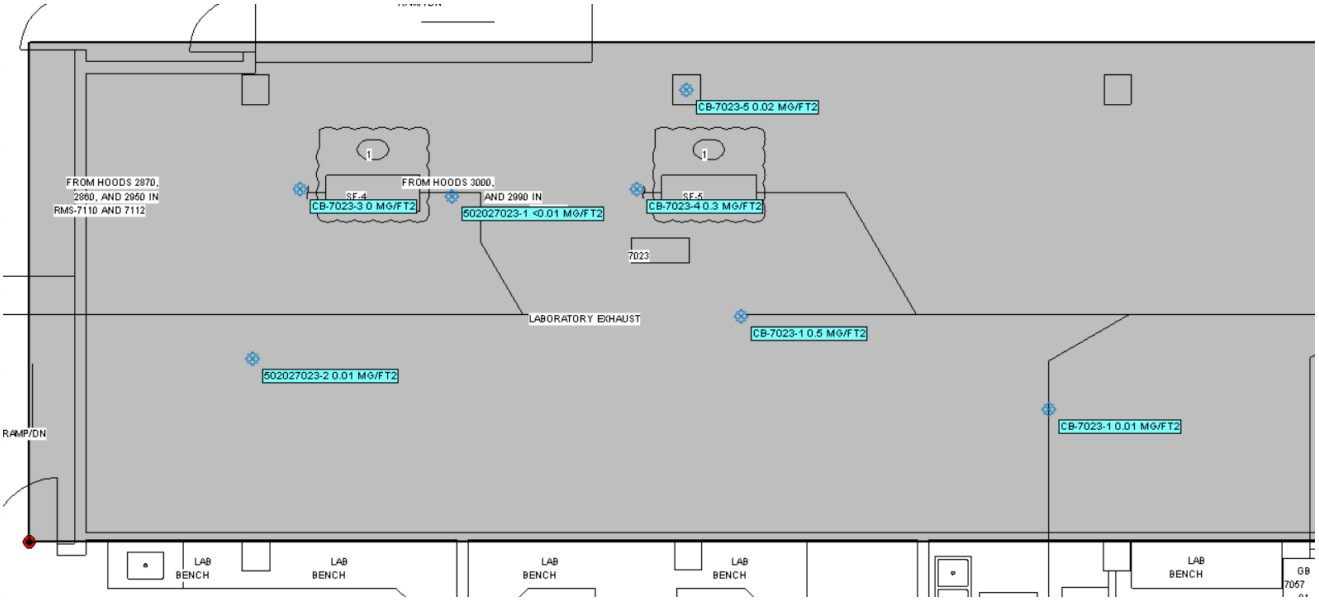

BENCH
BENCH
61523-01 <0.3 MG/FT2
61523-02 <0.3 MG/FT3
LABORATORY EXHAUST
61523-03 <0.3 MG/FT2
61523-04 <0.3 MG/FT2
5023
PSA-7
PSA-6
RAMP/DN
5034A
61523-03 <0.3 MG/FT2
CB-5034-1 <0.01 MG/FT2
LABORATORY EXHAUST
61523-01 <0.3 MG/FT2
61523-02 <0.3 MG/FT2
61523-04 <0.3 MG/FT2
5035
5023
ILW TANK-2
ILW TANK-1
PV-10 AND TV-10
FOR CONTINUATION SEE SHEET A-3019 AT QUADRANT F-6

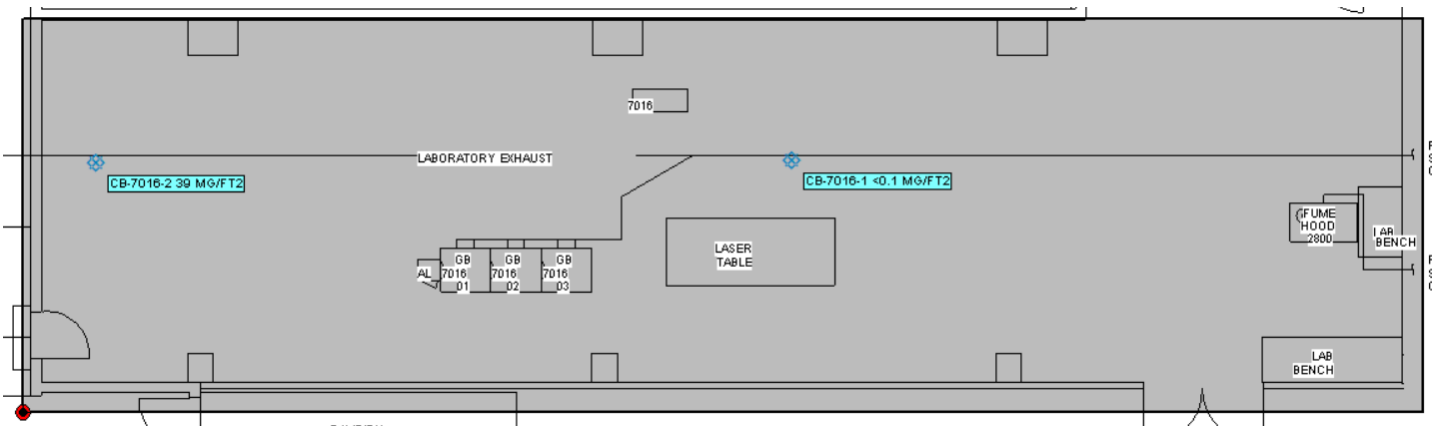
Attachment 1: WING 7 SAMPLE MAPS




FUME
HOOD
3250
1- 0.12 MG/FT2
GB
7129
02
DP
1
AL
7129
OF
HOOD
3245
AL
3- 0.24 MG/FT2
GB
7129
01
DP
1
4- 0.22 MG/FT2
HOOD
19000
2- 0.11 MG/FT2
AL
LAB
BENCH
LAB
BEN
800
850
900


CB-7114-1 <0
7114
CB-7114-2 <0.01 MG/FT2
GB
7114
01
GB
7114
02
DP
DP
750
800
850
900


CB-7023-5 0.02 MG/FT2
FROM HOODS 2870,
2860, AND 2950 IN
RMS-7110 AND 7112
SE-4
CB-7023-3 0 MG/FT2
FROM HOODS 3000,
AND 2990 IN
502027023-1 <0.01 MG/FT2
SE-5
CB-7023-4 0.3 MG/FT2
7023
LABORATORY EXHAUST
CB-7023-1 0.5 MG/FT2
502027023-2 0.01 MG/FT2
CB-7023-1 0.01 MG/FT2
RAMP/DN
LAB
BENCH
LAB
BENCH
LAB
BENCH
LAB
BENCH
LAB
BENCH
GB
7057


7016
LABORATORY EXHAUST
CB-7016-2 39 MG/FT2
CB-7016-1 <0.1 MG/FT2
LASER
TABLE
GB
7016
01
GB
7016
02
GB
7016
03
FUME
HOOD
2800
LAB
BENCH
LAB
BENCH