Portland Public Schools (PPS) Water System Assessment and Proposed Capital Improvement Program

February 2017

Our Tasks

- Identify improvements to PPS facilities needed to provide drinking water at lead levels below 15 ppb from designated fixtures
- Apply EPA's *3T's for Reducing Lead in Drinking Water in Schools: Revised Technical Guidance*
- Prepare a gap analysis report (complete), cost estimate (complete) and detailed implementation plan (spring 2017)

Executive Summary

- Portland Public Schools water system shows clear signs of deterioration consistent with its age and use.
- Improvements to the PPS water system are necessary in order for it to provide drinking water within acceptable lead levels.
- Improvements will include some water fixture and pipe replacement and also removal of existing water filters.
- The recommended cost of these improvements is estimated at $28.5m. Improvements will likely take at least three years to fully implement.

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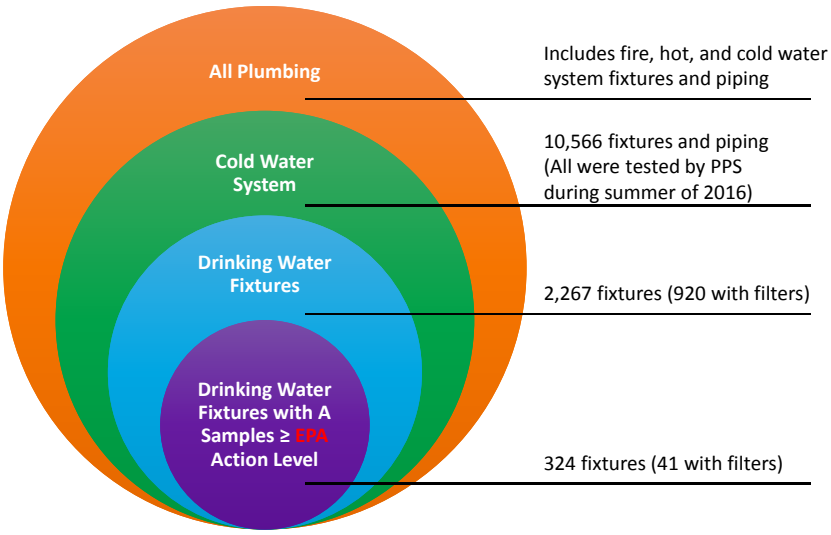
Water System Components



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Cold Water System Fixture Types

- **Drinking Fountains** (bubblers, coolers, and bottle fill stations)
- **Classroom Faucets** (not including science lab faucets)
- **Spigots**
- **Food Preparation Fixtures** (faucets, sprayers, handwashing sinks, ice makers, and CTE classrooms)
- **Other Faucets** (restroom faucets, janitorial closet faucets, science lab faucets, and handwashing stations)
- **Showers**

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Drinking Water Fixture Focus

- **Drinking Fountains** (bubblers, coolers, and bottle fill stations)
- **Classroom Faucets** (not including science lab faucets)
- **Spigots**
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- **Showers**

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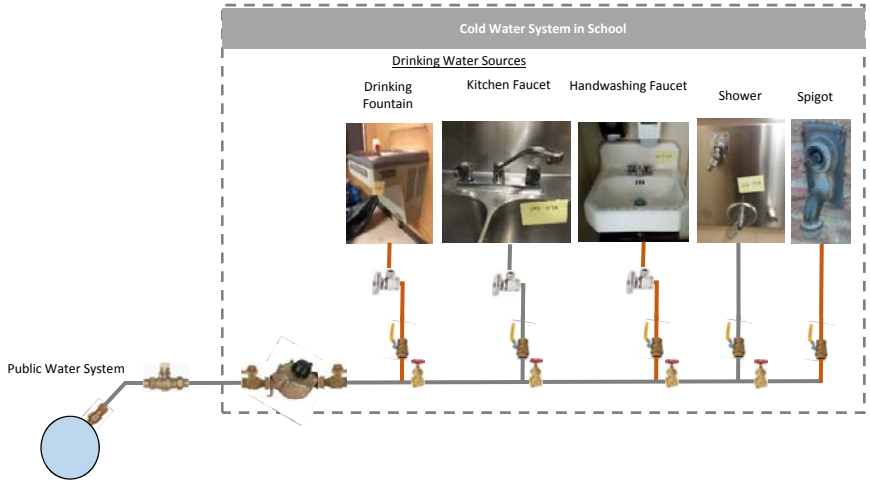
Typical Fixture Configuration



Brass Valves, Soldered Copper Pipe, Galvanized Pipe, and Even Filters are Sources of Lead in Drinking Water

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Water Quality Sampling Results

- "A" Sample = First Draw
- "B" Sample = After Flushing for 30-60 sec.

	Total Number of Fixtures	Number of Fixtures with A Sample ≥ 15 ppb	Percent of Total	Number of Fixtures with A and B Samples ≥ 15 ppb	Percent of Total
Drinking Fountains	1,796	226	13%	71	4.0%
Kitchen Fixtures	471	98	21%	12	2.5%
Classroom Faucets	2,525	813	32%	N/A	
Other Faucets	3,799	1,246	33%	N/A	
Spigots	1,366	830	61%	N/A	
Showers/Eye Washes	609	399	66%	N/A	
TOTALS	**10,566**	**3,612**	**34%**	**N/A**	

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Filters

- Challenges
  - Require frequent replacement at material and labor expense
  - Poorly maintained filters can affect performance and be a source of lead
  - Only certain types of filters are NSF-certified for drinking water
  - Tracking and servicing of individual filters is very difficult given varying water flows and lack of meter to monitor.

- **Policy Recommendation**
  - **Move toward elimination of filters as a long-term water quality protection solution**

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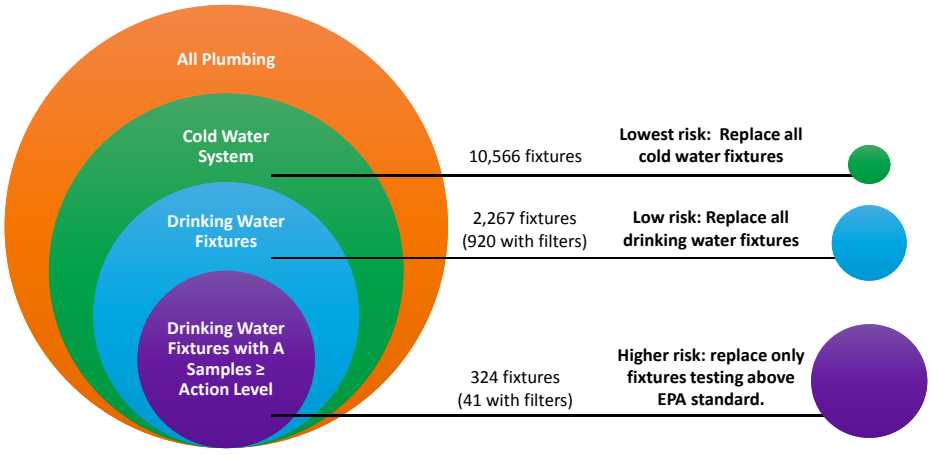
Water Fixture Replacement Strategies vs. Risk



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Fixture and Piping Replacement Alternatives

Levels of Replacement and Approximate Costs				
Replace only "drinking water" fixtures with A Samples ≥ 15 ppb Remove and permanently decommission all fixtures with B Samples ≥ 15 ppb	Replace "drinking water" fixtures with the A Sample ≥ 15 ppb Replace piping when B Samples ≥ 15 ppb	Replace all "drinking water" fixtures Replace piping when B Samples ≥ 15 ppb	Replace all fixtures Replace piping when B Samples ≥ 15 ppb	Replace all fixtures Replace all pipes
$3.5M	$11.6M	$28.5M	$107.5M	$107.5M

Increased Cost

Increased Risk of Future Exceedances

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Recommended Alternative

- Replace all drinking water fixtures (2,267 fixtures)
- Remove all filters upon fixture replacement
- Perform verification sampling (once fixture is replaced and before fixture is placed back into service)
- Partial piping replacement to address fixtures with verification "B" Samples ≥ 15 ppb
- Perform verification sampling (once partial piping replacement is completed)

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Recommended Alternative Cost Estimate

Cost Item	Cost	Notes
Fixture Replacement Capital Cost	$5,957,000	
Partial Pipe Replacement Capital Cost	$9,250,000	Assumed 40% of fixtures replaced will need piping replacement
Subtotal for Fixture and Partial Pipe Replacement	*$15,206,000*	
Program Management/ Implementation Cost (30%)	$4,562,000	Includes design, project management, program management, administrative time, and temporary provisions for service during construction
Subtotal	*$19,768,000*	
Program Level Contingencies (30%)	$5,931,000	Cover changes and issues encountered during implementation of the fixture and piping replacement program
Subtotal	*$25,698,000*	
Escalation	$2,794,000	
Total Estimated Cost for Fixture and Partial Pipe Replacement	**$28,500,000**	

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Implementation Schedule

- Option A: 5-6 years
  - Minimizes disruptions, performs intensive plumbing work in summer months only
- Option B: 3 years
  - Requires intensive plumbing work in summer and continuous weekend work for fixture replacement and testing; pipe replacement over 2 summer seasons with more significant disruption
- Option C: Alternative Delivery
  - May compress schedule further; limited by available licensed plumbing contractors, procurement requirements, tolerable disruption levels

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Thank You

Cost Estimates for Water Fixture and Building Piping Replacement

Prepared for

Portland Public Schools

January 23, 2017

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Executive Summary

Portland Public Schools (PPS) retained CH2M to estimate the cost of replacing water fixtures and cold water piping in PPS facilities. CH2M applied the guidance in *3Ts for Reducing Lead in Drinking Water in Schools: Revised Technical Guidance* (3Ts), published by the United States Environmental Protection Agency (EPA), to identify cold water system improvements needed at 96 Portland Public Schools (PPS) facilities (as shown in Figure 1-1 in Section 1) to address lead levels in drinking water. The goal for the improvements is to provide drinking water below the action level for lead of 15 ppb adopted by PPS from every fixture designated as a drinking water source at all PPS facilities. CH2M evaluated a range of alternatives with varying levels of fixture and piping replacement and management strategies for existing fixtures and piping. CH2M prepared cost estimates for the alternatives. Using those estimates, PPS identified preferred improvements for fixture and cold water piping replacement.

Sources of Lead in Drinking Water

According to the 3Ts document, the sources of lead in drinking water in schools include a site specific combination of:

1. Lead in source water
2. Corrosion of building piping materials containing lead
3. Corrosion of drinking water fixtures containing lead

Lead in drinking water may come from many sources, including water piping and fixtures in a building. Lead present in solder, brass fixtures, and lead or galvanized pipes can leach into water standing in a piping system. The amount of lead that leaches into drinking water depends on source water chemistry, water temperature, use patterns, system configuration, presence of biofilms, and materials used to construct the plumbing system. The longer water stands in the piping system, the more lead it can absorb.

The amount of lead in piping, valves, and fixtures was not regulated by the Federal government before 1986. In 1998, the Lead Contamination Control Act defined a “lead free” fixture as having less than 8 percent lead. This definition was in place until 2014. As of January 2014, the Reduction of Lead in Drinking Water Act limits the maximum concentration of lead in the wetted surface of newly installed potable water piping, valves, and fixtures to 0.25 percent. Most PPS facilities were constructed before the lead content of potable water piping, valves, and fixtures was regulated. The lead content of fixtures installed before 1986 may be as high as 18 to 25 percent. In Oregon, solder containing 50 percent lead was used to join copper pipe before 1985.

EPA Recommended Control Measures and Permanent Remedies

The 3Ts document provides guidance for collecting water samples, interpreting sample results, and using sample results to develop and make improvements that will provide safe drinking water from designated drinking water sources. EPA guidance addresses three areas: training, testing, and telling. Fixture and piping replacement are important parts of the testing phase, as defined by EPA. EPA recommends that fixture and piping replacement should be complemented by training, management of fixtures and piping that are not replaced, and communication with students, staff, and the community.

If sampling shows that fixtures and/or piping are a source of lead in drinking water, the 3Ts document identifies routine control measures, interim control measures, and permanent remedies that may be implemented:

- Routine control measures include aerator (screen) cleaning, using only cold water for food and beverage preparation, flushing the cold water system before first use each day, and placing signs at fixtures that are not designated as drinking water sources.
- Interim (short-term) control measures include flushing the piping system before first use each day, providing bottled water, and shutting off problem fixtures.
- Permanent remedies identified by EPA include replacement of problem fixtures with lead-free materials, installing point of use filters, removing grounding wires (where this can be done safely), replacing lead pipe and pipe with coatings containing lead with lead free materials, reconfiguring piping, manual flushing, automatic flushing, long-term supply of bottled water, and permanently disconnecting and removing problem fixtures.

PPS has selected fixture and piping replacement as permanent remedies, with the goal of reducing the risk of fixtures testing high for lead in the future, as well as removing all filters from drinking water fixtures.

Water Quality Sampling

EPA recommends that decisions regarding management of lead in drinking water be driven by sampling data.

Sampling by TRC for PPS

PPS hired a third party contractor, TRC Solutions Inc. (TRC), to perform two-step water quality sampling at cold water fixtures in all PPS-owned buildings. The fixtures included drinking fountains (bubblers and coolers), faucets (classroom faucets, science lab faucets, kitchen fixtures, restroom faucets, and janitorial closet faucets), sprayers, handwashing stations, icemakers, showerheads, eyewashes, and spigots. The sampling did not include fixtures supplied only with hot water (for example, dishwashers) or the hot water side of faucets with separate hot and cold water valves. For faucets that mix hot and cold water (for example a two-handle, single spout faucet or lever handle, single spout faucet), only cold water was sampled.

Prior to sampling, TRC reported that the cold water piping and fixtures were flushed until cold water was detected at each fixture. Approximately 8 to 18 hours later, two samples were collected at each cold water fixture. The first sample (A Sample) was a first-draw sample (without any additional flushing) and the second sample (B Sample) was a sample collected after 30 seconds to one minute of flow. TRC completed sampling at all schools on July 2, 2016. PPS provided preliminary laboratory results with floor plans showing the sample locations to CH2M.

Sampling Results and Fixtures in Replacement Program

TRC collected A and B water samples from 10,864 cold water outlets. The lead concentration in all A Samples was measured. B Samples were analyzed for 338 fixtures selected by PPS where the A Sample was at or exceeded the PPS action level. The B Sample results were primarily provided for drinking fountains and kitchen fixtures.

To develop capital cost estimates, sampling results for the outlets were grouped into 10,566 fixtures. Some fixtures such as combination cooler/bottle fill units have multiple outlets that were sampled, but will be replaced with one new fixture. It was also assumed that where there are two or three drinking fountains (bubblers or coolers) next to each other in common areas, they would be replaced with one

cooler/bottle fill unit. These assumptions create a difference between the outlet and fixture counts of 298 outlets.

Table ES-1 summarizes the number of fixtures used to the develop the replacement programs, the number of fixtures for which the lead concentration in the A sample was at or above the PPS action level of 15.0 ppb, the number of B samples for which PPS provided laboratory data where the A Sample was at or above the action level, and the number of fixtures for which the lead concentration in the A and B Samples exceeded the PPS action level of 15.0 ppb.

Table ES-1. Summary of PPS Cold Water Fixtures

	Totals for 96 PPS Facilities			
	Total Number of Fixtures in Replacement Program	**Number of Fixtures with A Sample ≥ PPS Action Level**	**Number of B Samples Analyzed Where A Sample ≥ PPS Action Level**	**Number of Fixtures with A and B Samples ≥ PPS Action Level**
Drinking Fountains (bubblers, coolers, and bottle filling stations)	1,796	226	226	71
Kitchen Fixtures (faucets, sprayers, handwashing sinks, and ice makers)	471	98	78	12
Classroom Faucets (not including science lab faucets)	2,525	813	2	1
Other Faucets (restroom faucets, janitorial closet faucets, science lab faucets, and handwashing stations)	3,799	1,246	17	2
Spigots	1,366	830	15	3
Showers/Eye Washes	609	399	0	0
TOTALS	**10,566**	**3,612**	**338**	**89**

NOTES:
1. Fixture data is based on sampling performed by TRC Solutions and a site visit by CH2M in 2016
2. Some fixtures have multiple outlets that were sampled; for example combination cooler/bottle fill units count as one fixture but two samples were collected.
3. Filters had been installed at approximately 920 of the fixtures sampled. 41 of the fixtures with filters have A Sample results at or above the PPS action level.
3. PPS has adopted an action level of 15.0 ppb
4. B Samples were analyzed primarily for drinking fountains and kitchen fixtures with A Samples at or above the action level, as well as a few additional fixtures.

Based on PPS data, it is estimated that filters were present on 920 drinking fountains and faucets. Of the 920 fixtures with filters, 41 had A Sample results at or above the PPS action level. The filters are not NSF certified lead removal filters, but they may have removed an unknown portion of the lead in water ahead of the fixture. It is assumed that 40 percent of the fixtures with filters would have B sample results exceeding the PPS action level if the filters were removed.

Fixture and Water System Remedies

CH2M used the decision process and remedies recommended by EPA in the 3Ts document and sampling data provided by PPS to identify five fixture replacement alternatives, each including partial pipe or full pipe replacement to address lead contributions from the piping system. The alternatives were developed to assist PPS in selecting and implementing cost effective improvements to manage lead in drinking water at all PPS facilities. All five alternatives include:

- Flushing new fixtures and piping prior to use
- Verification sampling for new fixtures
- All non-drinking water fixtures would be returned to service regardless of A and B Sample results
- Installing signs at all fixtures that are not designated drinking water fixtures
- Attaching identification tags to all drinking water fixtures
- Maintaining a database to record sampling results and fixture maintenance and replacement of drinking water fixtures
- Seasonal flushing of building cold water systems
- Periodic resampling of designated drinking water fixtures at an interval of three to five years

It is estimated that 879 drinking fountains, kitchen fixtures, and CTE skills classroom fixtures with A Sample results below the action level have existing filters. In order to remove the filters from these fixtures, additional sampling with the filter removed will be required. It is assumed that the additional testing will show that 40 percent of these fixtures will have B Sample results at or above the PPS action level. For Fixture Replacement Alternative 1 (described below), those fixtures will be capped and removed from service. For Fixture Replacement Alternatives 2, 3, 4, and 5, piping replacement will be needed to address lead contributed by piping. It was assumed that the remaining 60 percent of fixtures with existing filters can be returned to service after filters are removed, piping and fixtures are flushed, and sampling results are available.

The five fixture alternatives are described below. For each alternative, Table ES-2 summarizes the number of fixtures replaced, the number of fixtures removed from service, the number of fixtures in service at the end of the replacement program, and the number of fixtures meeting the PPS action level for lead.

1. **Fixture Replacement Alternative 1** – Alternative 1 replaces drinking fountains (including drinking fountains in common areas and classrooms), kitchen fixtures, and Career and Technical Education (CTE) skills classroom fixtures with A Samples that tested at or above the PPS action level for lead and B Samples that tested below the PPS action level for lead. Drinking fountains, kitchen fixtures, and CTE skills classroom fixtures with B Samples at or above the action level, indicating that the piping system is also contributing lead, would be capped and removed. Verification sampling will be required after fixture replacement. It was assumed that 40 percent of the fixtures will have B Sample results at or above the PPS action level and will be capped and removed. No piping replacement is proposed for Fixture Replacement Alternative 1. Alternative 1 also includes the removal of filters from fixtures that are not replaced, and capping and removing any fixtures with B Samples at or above the action level with filters removed. Drinking fountains, kitchen fixtures, and CTE skills classroom fixtures would be the only fixtures designated as approved drinking water sources.

   At the completion of Fixture Alternative 1, 241 fixtures will have been replaced, 179 fixtures will have been removed from service (83 based on known B Sample results and 96 assumed from Verification Sample B results after fixture replacement), and 352 fixtures with existing filters will have been removed from service (40 percent of 879 fixtures with existing filters), leaving a total of 1,736 designated drinking water sources in service.

2. **Fixture Replacement Alternative 2** – Alternative 2 adds replacement of additional fixtures and partial or full pipe replacement to Alternative 1 to address fixtures where the B Sample is at or above the PPS action level, instead of capping and removing fixtures. Alternative 2 replaces drinking fountains, kitchen fixtures, and CTE skills classroom fixtures with A Samples that tested

at or above the PPS action level for lead and B samples that tested at any concentration for lead. Full pipe replacement or partial pipe replacement would be needed to make water from the fixtures with a B Sample result at or above the PPS action level safe to drink. Verification sampling will be required after fixture replacement, and the results will determine the extent of partial piping replacement required. For the partial pipe replacement cost estimate, it was assumed that 40 percent of fixtures replaced will have B Sample results at or above the PPS action level and will require piping replacement. Alternative 2 also includes the removal of filters from fixtures that are not replaced, and partial pipe replacement for any fixtures with B Samples at or above the action level with filters removed. Drinking fountains, kitchen fixtures, and CTE skills classroom fixtures would be the only fixtures designated as approved drinking water sources.

At the completion of Alternative 2, 324 fixtures will have been replaced and partial or full pipe replacement will allow the use of the remaining fixtures, leaving a total of 2,267 designated drinking water sources in service.

3. **Fixture Replacement Alternative 3** – Alternative 3 adds replacement of classroom faucets as designated drinking water sources to Alternative 2. Alternative 3 replaces drinking fountains, kitchen fixtures, CTE skills classroom fixtures, and classroom faucets (not including science laboratory or dark room faucets) with A Samples that tested at or above the PPS action level for lead and B Samples that tested at any concentration for lead. Full pipe replacement or partial pipe replacement would be needed to make water from the fixtures with a B Sample result at or above the action level safe to drink. Verification sampling will be required after fixture replacement, and the results will determine the extent of partial piping replacement required. For the partial pipe replacement cost estimate, it was assumed that 40 percent of fixtures replaced will have B Sample results at or above the PPS action level and will require piping replacement. Alternative 3 also includes the removal of filters from fixtures that are not replaced, and partial pipe replacement for any fixtures with B Samples at or above the action level with filters removed. Drinking fountains, kitchen fixtures, CTE skills classroom fixtures, and classroom faucets would be designated as approved drinking water sources.

   At the completion of Alternative 3, 1,137 fixtures will have been replaced and partial or full pipe replacement will allow the use of the remaining fixtures, leaving a total of 4,792 designated drinking water sources in service.

4. **Fixture Replacement Alternative 4** – Alternative 4 replaces all drinking fountains, kitchen fixtures, and CTE skills classroom fixtures, regardless of the A Sample lead concentration. Full pipe replacement or partial pipe replacement would be needed to make water from the fixtures with a B Sample result at or above the action level safe to drink. Verification sampling will be required after fixture replacement, and the results will determine the extent of partial piping replacement required. For the partial pipe replacement cost estimate, it was assumed that 40 percent of fixtures replaced will have B Sample results at or above the PPS action level and will require piping replacement. Drinking fountains, kitchen fixtures, and CTE skills classroom fixtures would be designated as approved drinking water sources.

   At the completion of Alternative 4, 2,267 fixtures will have been replaced and partial or full pipe replacement will allow the use of all of the fixtures, leaving a total of 2,267 designated drinking water sources in service.

5. **Fixture Replacement Alternative 5** – Alternative 5 replaces all fixtures. Full pipe replacement would be needed to make water from the fixtures with a B Sample result exceeding the action level safe to drink. All fixtures would then deliver water with lead concentrations acceptable for drinking water, but drinking fountains, kitchen fixtures, CTE skills classroom fixtures, and classroom faucets would be designated as preferred drinking water sources.

At the completion of Alternative 5, 10,566 fixtures will have been replaced and full pipe replacement would allow the use of all fixtures. All fixtures will deliver water below the PPS action level for lead, but only 4,792 fixtures would be designated drinking water sources.

Table ES-2 Fixture Count for Alternative Replacement Programs

Cold Water Fixture Replacement Alternative:	**Alternative 1:** Replace drinking fountains and kitchen fixtures[1] with A Sample ≥ the PPS action level and B Sample < the PPS action level[2]	**Alternative 2:** Replace drinking fountains and kitchen fixtures[1] with A Sample ≥ the PPS action level	**Alternative 3:** Replace drinking fountains, kitchen fixtures[1], and classroom faucets with A Sample ≥ the PPS action level	**Alternative 4:** Replace all drinking fountains and kitchen fixtures[1]	**Alternative 5:** Replace all cold water fixtures
Total Number of Fixtures Replaced[3]	241	324	1,137	2,267	10,566
Total Number of Drinking Water Fixtures Removed from Service	531	0	0	0	0
Total Number of Drinking Water Fixtures in Service at Completion of Program	1,736	2,267	4,792	2,267	4,792
Total Number of Fixtures in Service at Completion of Program Meeting PPS Action Level for Lead	1,736	2,267	4,792	2,267	10,566

[1]Kitchen fixtures includes Career and Technical Education (CTE) skills classroom fixtures.

[2]Drinking fountains and kitchen fixtures with A and B Samples at or above the action level will be capped and removed.

[3]Fixture count assumes that existing bubblers located in hallways and cafeterias would be replaced with cooler/bottle fill units. Double bubbler units (in hallways and cafeterias) will be replaced with one cooler/bottle fill unit, so there are fewer drinking fountains to be replaced than were sampled.

Estimated Costs

CH2M prepared capital cost estimates for five fixture replacement alternatives, each with options for partial pipe replacement or full pipe replacement. The range of estimates allows for comparison of alternatives and selection of the preferred alternative by PPS. Table ES-3 summarizes the capital cost estimates for the 96 facilities combined.

It is estimated that 920 drinking fountains, kitchen fixtures, and CTE skills classroom fixtures have existing filters. 41 of these fixtures had A Sample results that tested at or above the PPS action level and these fixtures would be replaced or removed in all of the fixture replacement alternatives. PPS has a goal of being able to operate drinking water fixtures without using filters. In order to remove the filters from the remaining 879 fixtures, additional testing with the filter removed will be required. It is assumed that the additional testing will show that 40 percent of these fixtures will have B Sample results at or above the PPS action level, and partial or full piping replacement will be needed. An alternative to pipe replacement, which is used with Fixture Replacement Alternative 1, would be to cap and remove those fixtures from service, resulting in removal of 352 drinking water fixtures from service. It was assumed that the remaining 60 percent of fixtures with existing filters can be returned to service after filters are removed, piping and fixtures are flushed, and sampling results are available.

For Fixture Replacement Alternative 1, no piping replacement is required. Fixtures where B Samples indicate that the piping is also a source of lead would be removed and the pipe connections capped.

For Fixture Replacement Alternatives 2 through 5, some type of piping remedy is required where B Sample results are at or above the action level. This can be accomplished through full pipe replacement

or partial pipe replacement. Full pipe replacement costs were estimated based on detailed cost estimates for two elementary schools, two middle schools, and two high schools. For localized areas with B Samples at or above the action level, the lead contribution from piping can be addressed with partial pipe replacement. The appropriate remedy would be selected depending on the extent and cost of the partial pipe replacement required. Since B sample data was not available for all fixtures that will be designated as drinking water fixtures, it was assumed that 40% of the fixtures designated as drinking water sources would require partial pipe replacement.

Table ES-3. Capital Cost Estimate for Fixture and Cold Water Piping Replacement Alternatives for all 96 PPS Facilities (2016 Dollars Escalated to 2020 Dollars)

Cold Water Fixture Replacement Alternative:	**Alternative 1:** Replace drinking fountains and kitchen fixtures[1] with A Sample ≥ the PPS action level and B Sample < the PPS action level[2]	**Alternative 2:** Replace drinking fountains and kitchen fixtures[1] with A Sample ≥ the PPS action level	**Alternative 3:** Replace drinking fountains, kitchen fixtures[1], and classroom faucets with A Sample ≥ the PPS action level	**Alternative 4:** Replace all drinking fountains and kitchen fixtures[1]	**Alternative 5:** Replace all cold water fixtures
Fixture Replacement Costs[3] (Add Fixture Replacement Costs to Pipe Replacement Costs to Obtain Total Estimated Costs for Options 1 and 2 below)					
Fixture Replacement Capital Cost[3]	$1,173,000	$1,120,000	$2,377,000	$5,957,000	$18,868,000
Cost to Remove Filters From Fixtures Not Replaced[4]	$697,000	$3,743,000	$3,743,000	$0	$0
Subtotal for Fixture Replacement	*$1,869,000*	*$4,862,000*	*$6,120,000*	*$5,957,000*	*$18,868,000*
Option 1 - Costs for Fixture Replacement with Partial Pipe Replacement					
Partial Pipe Replacement Capital Cost[5]	N/A	$1,322,000	$4,639,000	$9,250,000	N/A
Subtotal for Fixture and Partial Pipe Replacement	*$1,869,000*	*$6,184,000*	*$10,759,000*	*$15,206,000*	*N/A*
Program Management/ Implementation Cost (30%)[6]	$561,000	$1,856,000	$3,228,000	$4,562,000	N/A
Subtotal	*$2,429,000*	*$8,040,000*	*$13,987,000*	*$19,768,000*	*N/A*
Program Level Contingencies (30%)[7]	$729,000	$2,412,000	$4,196,000	$5,931,000	N/A
Subtotal	*$3,158,000*	*$10,451,000*	*$18,183,000*	*$25,698,000*	*N/A*
Escalation[8]	$344,000	$1,137,000	$1,977,000	$2,794,000	N/A
Total Estimated Cost for Fixture and Partial Pipe Replacement	**$3,510,000**	**$11,590,000**	**$20,160,000**	**$28,500,000**	**N/A**
Option 2 - Costs for Fixture Replacement with Full Pipe Replacement					
Full Pipe Replacement Capital Cost[5]	N/A	$38,500,000	$38,500,000	$38,500,000	$38,500,000
Subtotal for Fixture and Full Pipe Replacement	*$1,869,000*	*$43,362,000*	*$44,620,000*	*$44,457,000*	*$57,368,000*
Program Management/ Implementation Cost (30%)[6]	$561,000	$13,009,000	$13,386,000	$13,337,000	$17,211,000
Subtotal	*$2,429,000*	*$56,371,000*	*$58,006,000*	*$57,794,000*	*$74,579,000*
Program Level Contingencies (30%)[7]	$729,000	$16,912,000	$17,402,000	$17,339,000	$22,374,000
Subtotal	*$3,158,000*	*$73,282,000*	*$75,408,000*	*$75,132,000*	*$96,952,000*
Escalation[8]	$344,000	$7,968,000	$8,199,000	$8,169,000	$10,541,000
Total Estimated Cost for Fixture and Full Pipe Replacement	**$3,510,000**	**$81,250,000**	**$83,610,000**	**$83,300,000**	**$107,500,000**

Table ES-3. Capital Cost Estimate for Fixture and Cold Water Piping Replacement Alternatives for all 96 PPS Facilities (2016 Dollars Escalated to 2020 Dollars)

Cold Water Fixture Replacement Alternative:	**Alternative 1:** Replace drinking fountains and kitchen fixtures[1] with A Sample ≥ the PPS action level and B Sample < the PPS action level[2]	**Alternative 2:** Replace drinking fountains and kitchen fixtures[1] with A Sample ≥ the PPS action level	**Alternative 3:** Replace drinking fountains, kitchen fixtures[1], and classroom faucets with A Sample ≥ the PPS action level	**Alternative 4:** Replace all drinking fountains and kitchen fixtures[1]	**Alternative 5:** Replace all cold water fixtures

[1]Kitchen fixtures includes Career and Technical Education (CTE) skills classroom fixtures.

[2]Drinking fountains and kitchen fixtures with A and B Samples at or above the action level will be capped and removed.

[3]Fixture replacement cost includes demolition and disposal of existing materials; removal of existing filters (if present); the cost of a new fixture, stop valves, and piping from the stop valve to the fixture; and labor to install the fixture. Cost also includes wall replacement; proof of performance testing; placarding of fixtures that are not designated water sources; capping pipes and removing fixtures; an allowance for fixtures not tested or identified; asbestos, lead paint, and access issues; work hour restrictions; and contractor overhead, profit, and contingencies.

[4]Cost includes testing for all fixtures, filter removal for 60% of fixtures, and piping remedy for 40% of fixtures.

[5]Piping replacement applies to the cold water system only. Partial piping replacement includes only piping to designated drinking water fixtures where B samples are at or above the action level. Full pipe replacement includes new headers and main runs and new cold water piping to all replaced fixtures in the facility. New headers and main runs will be routed in existing crawl spaces and other access ways. Where headers and main runs cannot be routed in existing crawl spaces and access ways, pipe will be routed at ceiling level with aesthetic cover. Drops to fixtures will be routed inside wall cavities, if possible. If not possible to route inside wall cavities, pipe will be installed under plaster or surface mounted with aesthetic cover. Most existing cold water pipe that is replaced will be abandoned in place. New cold water piping will be copper header and main runs with PEX drops from headers to fixtures. Where possible, runs to multiple fixtures will be combined into larger diameter pipe. Cost includes the cost of the pipe, appropriate couplings and hangers, insulation, and labor to install the piping; isolation valves and fitting; asbestos, lead paint, and access issues; work hour and seasonal work restrictions; and contractor overhead, profit, and contingencies.

[6]Program Management/Implementation Costs include design, project management, program management, administrative time, and temporary provisions for service during construction.

[7]Program Level Contingencies was estimated at 30% to cover changes and issues encountered during implementation of the fixture and water system piping replacement program.

[8] Costs were estimated in 2016 dollars and escalated to 2020 dollars at a compounded rate of 3.5% per year.

Preferred Alternative

After comparing costs, advantages, disadvantages and risks of the alternatives, CH2M recommended and PPS selected Alternative 4 with partial pipe replacement as the preferred alternative, at an estimated capital cost of $28,500,000 in 2020 dollars. Fixture Replacement Alternative 4 replaces all drinking fountains, kitchen fixtures, and CTE skills classroom fixtures, with partial pipe replacement. It would provide safe drinking water from every designated drinking water fixture. Since Alternative 4 replaces all fixtures designated as drinking water fixtures and addresses lead contributed by the piping system, it reduces the risk that future samples will exceed the action level. It also increases the probability that future tests would remain below the action level if the action level changes.

In Alternative 4, the following fixtures would be designated as drinking water sources:

1. Drinking fountains (including drinking fountains in common areas and classrooms)
2. Kitchen fixtures
3. CTE skills classroom fixtures

The preferred alternative requires signage, training of staff and students, and monitoring of fixtures that are not designated as drinking water sources.

This alternative identifies lead coming from the cold water piping system with verification sampling. Where verification sample results for new fixtures are at or above the action level, partial pipe replacement will be needed to address lead coming from the piping system. Because Alternative 4 will replace all drinking water fixtures, all existing external filters on drinking fountains or kitchen fixtures will be removed when the fixture is replaced.

In addition to the capital cost, PPS will have operations and maintenance costs for the drinking water improvements, including database management, periodic testing, and seasonal flushing.

PPS District Wide Lead Paint Assessment Update

February 6, 2017

Scope of our Work

- All School Paint Condition Assessment
  - Visually inspect all interior and exterior painted and varnished surfaces
  - Identify surfaces in poor condition
  - Peeling, flaking, chipped, cracking
  - Special attention to readily accessible paint in poor condition
  - Document location of poor condition paint
  - Quantify poor condition paint
- Districtwide Paint Stabilization Cost Estimate
- Program Review / Recommendations

2

Assessment Protocol and Guidelines

Important to note this is not a Lead Risk Assessment, rather a paint condition assessment

U.S Department of Housing and Urban Development (HUD)

Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (2012 Edition)

de minimis amounts of paint are amounts that do not exceed:
(a) 20 square feet on exterior surfaces,

(b) 2 square feet in any one interior room or space, or

(c) 10 percent of the total surface area on an interior or exterior component type with a small surface area (such as window sills, baseboards, or trim)

PBS

PPS

3

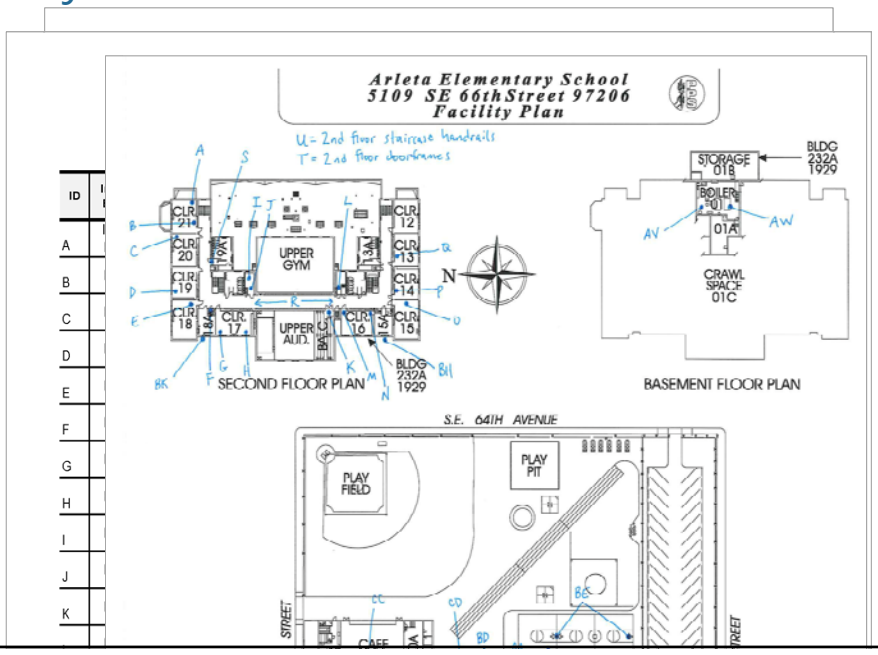
Assessment Examples-Fair condition

4

Assessment Examples-Poor Condition

5

Project Deliverables



6

Immediate Response

What triggers an immediate response

- Widespread or exceptional deterioration
- Child occupied facility or portions of facility
  - Ages 6 and under
- Accessibility to the hazard

Response measures employed

- Restricting access
- Cleaning of paint chips, dust, or debris
- Stabilization of painted surfaces via removal/priming/painting
- Work performed by Licensed Lead Abatement Contractors

7

District-wide Cost Estimating Methodology

Estimated Quantity of Deteriorated Paint District-Wide

$$\frac{\underset{\text{(Assessed SF)}}{\mathbf{2{,}030{,}071}}}{\underset{\text{(Deteriorated GSF Assessed)}}{\mathbf{176{,}457}}} \times \frac{\underset{\text{(District-Wide GSF)}}{\mathbf{9{,}786{,}733}}}{\chi}$$

$$\chi = 850{,}678$$

8

District-wide Cost Estimating Methodology

Estimated Cost to Stabilize Deteriorated Paint

850,678 SF (Deteriorated Paint)	×	**$9.50** (Unit Cost for Prep and Paint of Deteriorated Surfaces)	=	**$8,081,441**

Estimated Cost to Paint Adjacent Surfaces

850,678 SF (Surfaces Adjacent to Deteriorated Paint to be Painted)	×	**$2.50** (Unit Cost for Prep and Paint of Good-Condition Surfaces)	=	**$2,126,695**

ESTIMATED TOTAL BUDGET COST FOR STABILIZATION

$8,081,441	+	**$2,126,695**	=	$**10,208,136**

PBS

9

PPS

District-wide Cost Estimating Methodology

Applying a 5% escalation rate from 2016 to 2017

$10,208,136 + 5% =$10,718,543

17.5% Design and Program cost, plus a 15% Contingency

$10,718,543 + 32.5% = $14,202,069

Project Timeline escalated Cost 3% per year for 5 years

$14,202,069 + escalated cost = $16,623,936

PBS

10

PPS

Lead Paint Management - Status

- Paint abatement and encapsulation work completed at around forty highest risk schools over summer 2016
- PBS' assessment work is ongoing. Twenty four school sites surveyed to date including:

•Applegate ES
•Beach PK-8
•Beverly Cleary K-8
•Boise-Eliot
•Bridger K-8
•Bridlemile ES
•Buckman ES
•Capitol Hill ES
•Chief Joseph K-8
•Cesar Chavez K-8
•Chapman ES
•Rose City Park
•Creative Science
•Duniway ES
•Forest Park ES
•Glencoe ES
•Grout ES
•Hayhurst ES
•Harrison Park K-8
•IrvingtonK-8
•Markham ES
•Vestal K-8
•George MS
•Cleveland HS

PBS

11

Lead Paint Management - Status

- End result will be a comprehensive, accurate, and independently verified detail of outstanding paint needs
- Third party will also evaluate our current program and make recommendations for improvement.
- Summer Work on the Horizon:
  - Major Exterior Repainting at:
    - Astor
    - Atkinson
    - Hayhurst
    - Woodstock
- Reinstitution of Internal Five Person Paint Crew (will work off hours during school year / focus on various internal work)

PBS

12

Thank You! Questions?

Portland Public Schools
Risk Management
Environmental Health and Safety Section

Gap Analysis and Recommendations

Presented To:
Yousef Awwad, CPA, MBA, CGMA, PMP
Chief Executive Officer

From:
John W. Burnham, Ph.D.
Interim Senior Director
Environmental Health and Safety Section

December 31, 2016

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Executive Summary

After discussions with Portland Public Schools (PPS) leadership, I joined PPS in July 2016 as the Interim Senior Director for Environmental Health and Safety (EHS). I had just retired from Oregon Health and Science University (OHSU) after 23 years as the Director of EHS. Upon my arrival at PPS, Yousef Awwad, CFO at that time, created a team of professionals focused on resolution of school drinking water contaminated with lead. My early role at PPS has primarily been as the technical advisor to this health and safety team and to conduct a gap analysis review of the PPS EHS group. More recently, I joined a PPS team focused on including selected EHS needs in the May 2017 capital improvement bond measure.

This gap analysis is a product of my review of the EHS group. This is the third formal EHS gap analysis I have conducted in large academic organizations. Prior EHS gap analyses were completed at Portland State University and OHSU. A comprehensive gap analysis at PPS required identification of all programs which are overseen or assisted by EHS. This is a time-intensive process that requires knowledge of a wide range of EHS programs, individual program operating strategies and a fundamental understanding of risk analysis[1-6]. EHS occupies a unique niche within large establishments and, generally speaking, those outside EHS are often not aware of the complexity and scope of typical EHS groups.

Review of the PPS EHS group resulted in the identification of 57 programs for which EHS is either directly responsible to administer or to provide assistance. This number of programs surprises most observers, but is not uncommon in an organization as complex as PPS. Using a technique I call abridged risk analysis/assessment, I investigated the status and needs of each of these programs with the intent to identify which of the programs currently presents the greatest potential enterprise risk. This process involves conducting an abridged multi-category risk assessment for each program based on the risk profile of each program. Risk categories considered for each program included financial, operations, reputational, human safety, environmental and regulatory/compliance risks[1-6]. In the EHS world, most risk assessments are informal and based on regulatory compliance concerns with occasional consideration given to human health and safety risk. Plainly speaking, EHS groups are often almost exclusively focused on compliance and PPS EHS is a classic example. This has the unintended consequence of not recognizing, assessing and acting on all the potential enterprise/institutional risk, e.g. reputational risk, operational risk, etc., and its impact on the organization's objectives and strategy.

Of the 57 programs, 25 are currently inadequately supported and present a range of enterprise/institutional risks. The current staffing level cannot support these programs. I am recommending that two new positions, one safety professional and one industrial hygienist, be created and consideration be given to reorganizing the EHS group to reduce the risks associated with these 25 programs. During this assessment, two of the three existing EHS positions were filled and this was taken into account when identifying gaps. Recruitment to fill the Senior Manager position began in November. The largest gap involves several safety programs related to maintenance and custodial activities. This involves nine different safety programs and will likely require one of the two proposed new positions. Other major gaps include, but are not limited to, fall protection, database management, chemical fume hood certification, school safety committees and stage/auditorium safety. The crucial first step is the recruitment of a seasoned Senior Manager and structuring this position to allow for the development of EHS objectives, an overall risk-based operating strategy, the development of efficient individual program operating strategies and creation of balanced workloads for all employees.

Introduction

I recently retired as the Director of Environmental Health and Safety (EHS) at Oregon Health and Science University (OHSU) after 23 years. During this period, I also worked part-time at Portland State University (PSU) at the request of OHSU and PSU leadership to assist with the restructuring of the PSU EHS program. While at PSU, I worked with David Hobbs, now PPS Senior Director of Facilities and Assets Management (FAM). In June 2016, Mr. Hobbs invited me to meet with him to discuss ongoing issues related to lead in drinking water. I met with PPS leadership twice in June to discuss these issues. After the second meeting, PPS asked me to join the district to help address the concerns related to lead in drinking water. In addition to the lead in water concerns, District leadership was interested in conducting a gap analysis for EHS. During these meetings, the decision to move EHS from FAM to the Risk Management department was discussed along with the fact the current Senior Manager of EHS was on administrative leave. Effective July 18 I was brought in as the Senior Director of EHS.

This gap analysis was developed after a comprehensive review of the existing EHS Section. This assessment included a review of EHS records, Risk Management injury/illness records and several interviews inside and outside of EHS. These record reviews and interviews along with targeted investigations of specific programs informed the contents of this report. The aim of this gap analysis is to identify those EHS programs in substantial need of augmentation to reduce potential financial, operations, reputational, human health & safety, environmental and regulatory risks. These specific risk categories were selected based on my experience, knowledge and professional opinion regarding the role of EHS in the practice of Enterprise Risk Management (ERM)[1-6]. Qualitative risk assessment methodology[1] is discussed in the section on Risk Assessment. Throughout this document, the terms institutional risk and enterprise risk are used interchangeably, however, I favor the use of institutional over enterprise for PPS.

Interim Senior Director Role

The responsibilities of the Interim Senior Director of EHS include daily meetings with a newly formed Health & Safety Leadership group to discuss current operations, new issues of concern, short-term/ long-term planning related to lead in PPS schools and EHS issues to be included in the May 2017 capital improvement bond measure. The Senior Director's role in this group was to provide internal technical guidance, seek out external experts when appropriate, provide specific recommendations, interview with representatives from the media as requested and participate in joint presentations to the PPS Board of Directors as needed. This specialized leadership group was the main conduit to implement a number of targeted operations to address narrow and broad lead-related health and safety concerns prior to and after the start of the 2016/2017 school year. In the process of implementing these programs, the Interim Senior Director often worked directly with the Risk Management Director, Executive Director of Operations, Senior Director of FAM and the Interim Chief of Community Involvement and Public Affairs, all of whom played mission-critical roles in successful implementation and outcome monitoring. Each of these individuals also reviewed the contents of this gap analysis with a special thanks to Joe Crelier, Director of Risk Management, for his contributions.

Shortly after arrival at PPS I assisted with the resolution of a number of specific risk issues, e.g., produce from gardens, use of eye wash stations, correct fixture sampling protocol, etc., related to lead contamination in District water fixtures/plumbing. I also initiated the process of investigating the scope of the entire EHS section of Risk Management. This investigation of EHS scope entailed the identification of existing programs, each program's structure and scope, estimates of labor resources dedicated to each program, qualitative estimates of potential institutional risk presented by each program and the presence of meaningful operating gaps due to programs that present substantial risk, yet do not currently exist. This included meetings with the two EHS personnel, several FAM personnel, the Senior Director of FAM, the Director of Risk Management and PPS leadership. The existence and status of an ongoing gap analysis was also discussed on several occasions with PPS Board members and Senior Management.

PPS EHS Background

EHS Org Chart and Scope

The EHS Organization Chart within the Risk Management department is presented in Figure 1. EHS is represented by the three positions located on the left side of the chart. This gap analysis represents a review of the EHS group only and does not include a review of the Insurance and Claims Section. In the past, EHS staffing has ranged from two to four full-time employees. The two EHS employees present during the creation of this gap analysis were Herb Wagner, a long-time employee of PPS, and Joel McCarthy. Mr. McCarthy left in November to join a consulting firm after approximately 1.5 years at PPS.

EHS is responsible for managing or assisting with the management of the institutional/enterprise risk presented by 57 regulatory and non-regulatory environmental, health and safety programs. These programs are illustrated in Table 1, classified under the six primary functions traditionally performed by EHS. The primary functions are presented in the dark boxes with the names of programs, regulatory agency and estimated annual person-hours committed to each program in the column below. A lay description of each program is provided in the section following Table 1. The large number of programs within EHS is not uncommon, for example, OHSU has 65 programs due to the accreditation requirements for four hospitals and PSU has over 50 active EHS programs.

The number of hours assigned to each program are best estimates of the time spent per year by Mr. Wagner and Mr. McCarthy on each specific program. These are <u>not</u> measured numbers, hence they are only valuable for comparison purposes between different programs and to determine which programs are receiving large allocations of labor and those that receive little or no labor hours.

The EHS section manages and maintains specialized monitoring and testing equipment. The equipment and the use of each item is as follows:

- Three High Volume Pumps – Area Air Monitoring
- Four Personal Air Pumps – Personal Air Monitoring
- Gillian Air Sample Pump Calibrator – Calibrate Air Pumps

- Sensidyne Gas Detector Pump – Color-metric Air Monitoring
- TSI IAQ 7545 Air Quality Diagnostic Meter – IAQ Measurements
- TelAire Air Quality Meter – IAQ Measurements
- CO2,Temperature, Humidity Meter – IAQ Measurements
- Jerome 431X Mercury Vapor Analyzer – Measure Mercury Vapor (Mercury Spill)
- Photovac HL-20 Microtip Organic Vapor Analyzer – Potentially Obsolete
- Moisture Probe – Detect Moisture in Wall
- Thermal Imaging Camera – Detect Temperature in Wall
- Auto-Ranging Light Meter – Measure Light Level
- Innov-X-Systems I-300 Lead Paint Analyzer – Real-Time Detection of Lead in Paint
- Anemometer – Measure Air Velocity
- Hot-Wire Air Velocity Meter – Measure Air Velocity
- Air-Pressure Velometer – Measure Air Velocity
- Sound-Level Meter – Measure Real–Time Noise Level
- Metrosonics DB307 Noise Dosimeter – Measure TWA Noise Dosage
- Industrial Scientific ATX 612 Confined Space Monitor – Confined Space Measurements
- Two Industrial Scientific M-40 Confined Space Monitor – Confined Space Measurements
- 18 Radon Monitors (About half need maintenance)

EHS currently has three full-time positions, this means that these employees are spread very thin, each overseeing and/or assisting with a large number of programs. It also likely means that many of the programs receive limited or no support.

Based on the active programs and the estimated annual hours dedicated to each program, EHS staff devote a high percentage (60 – 65%) of their person-hours working on programs, e.g., asbestos, indoor air quality, lead paint, radon, mold, Gmax testing, water quality, etc., that support school utilities, systems, equipment and buildings.

Figure 1

Risk Management Organization Chart

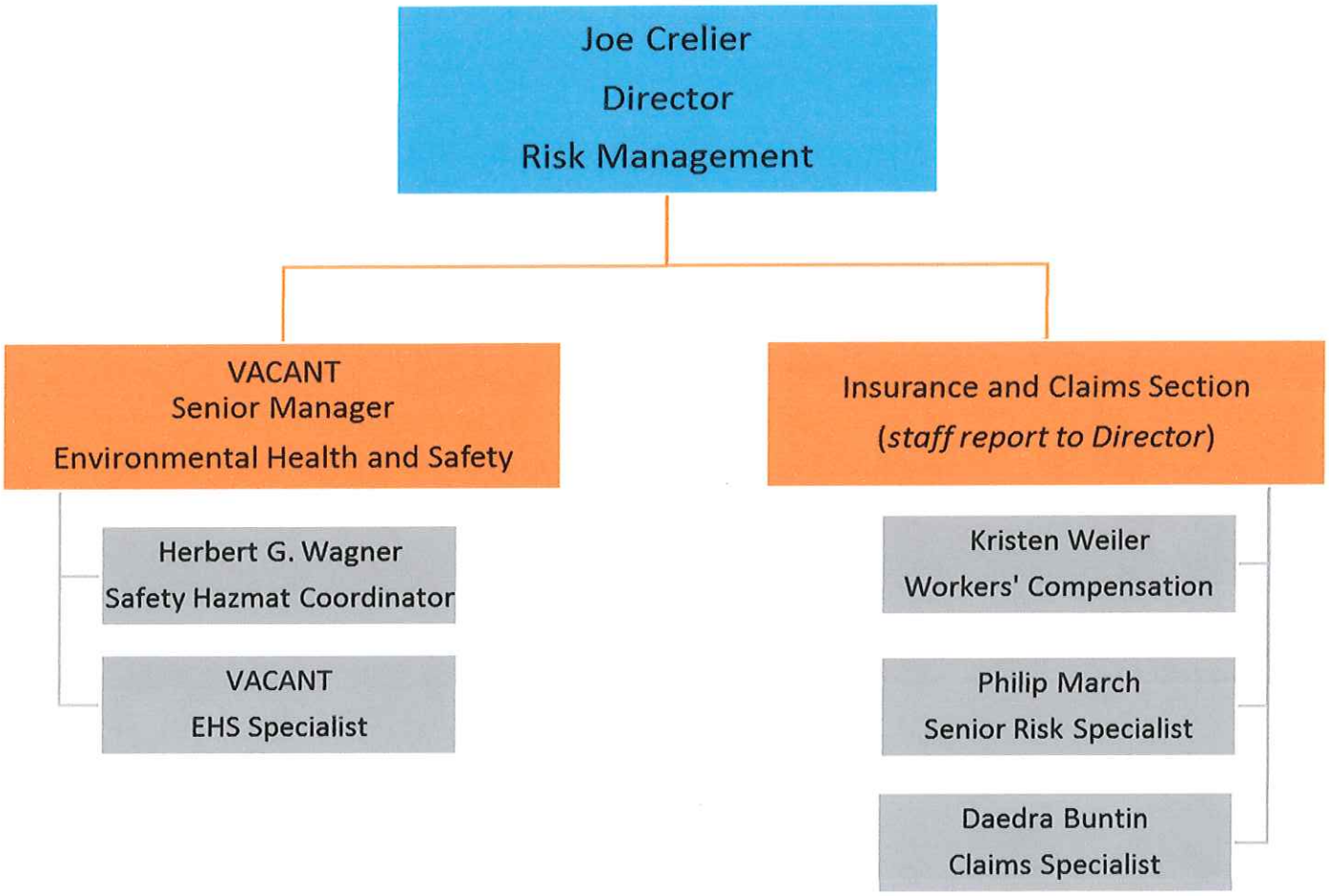


Table 1

PPS EHS Primary Functions with Programs* - Regulatory Agency/Annual Labor Hours

General Occupational/Student Safety	Environmental
• AED Inspections – ODE/50 Hours**	• Asbestos Surveys/Abate– OSHA/DEQ/ODE/880 Hours**
• BESC Safety Committee Membership – OSHA/<20 Hours	• Lead-Based Paint Disposal – OHA/DEQ/EPA/<20 Hours
• Building/Room Remodel Plan Review – OSHA/<40 Hours	• Medical/Biological Waste Disposal – OHA/40 Hours
• Confined Space Entry – OSHA/60 Hours	• Metro Hazardous Waste Disposal – Metro/200 Hours
• Electrical Safety – OSHA/<20 Hours	• RCRA Hazardous Chemical Waste Mgmt – DEQ/40 Hours
• Emergency Management Assistance – ODE/<40 Hours	• Toxic Subst Cntl Act-PCB Collect/Dispose-EPA/DEQ/<20 Hours
• Ergonomics – OSHA/<40 Hours	• Underground Injection Control – DEQ/<20 Hours
• Fall Protection – OSHA/180 Hours	• Underground Storage Tanks – DEQ/0 Hours
• FAM Maintenance Safety Meetings – OSHA/60 Hours	• Universal Waste Management – DEQ/80 Hours
• Fire/Life Safety Program Assistance – PF&R/ODE/<40 Hours	• Water Quality (Lead/Copper) – OHA/DEQ/EPA/100 Hours
• Fork Lift Training – OSHA/<20 Hours	
• Gmax Testing – CPSC/<20 Hours	
• High Lift Training – OSHA/<20 Hours	
• Incident/Accident Investigation – OSHA/<40 Hours	
• Indoor Air Quality – OSHA/440 Hours	
• Ladder Safety – OSHA/<40 Hours	
• Lockout/Tagout Program – OSHA/<20 Hours	
• Machine Guarding – OSHA/<20 Hours	
• Motor Vehicle Safety – OSHA/ODOT/0 Hours	
• Noise Assessment/Abatement – OSHA/<40 Hours	
• OR-OSHA Complaint Letters/Inspections – OSHA/80 Hours	
• Personal Protective Equipment – OSHA/60 Hours	
• Playground Inspections – CPSC/ODE/160 Hours**	
• Respirator Selection/Fit Testing – OSHA/80 Hours	
• School Safety Committee Assist – OSHA/40 Hours	
• Site Safety Surveys – CPSC/EPA/OSHA/120 Hours	
• Stage/Auditorium Safety – OSHA/<20 Hours**	
• Student Transportation Safety – ODE/0 Hours	
• Welding/Cutting Safety – OSHA/0 Hours	

*Each of these programs supports employee environmental health and safety and/or student health and safety. **Included in Site Safety Surveys.

Table 1 (Cont'd)

PPS EHS Primary Functions with Programs* - Regulatory Agency/Annual Labor Hours

Chemical Safety	Radiation Safety
• Air Contaminant Monitoring – OSHA/<20 Hours • Art Program Safety – OSHA/100 Hours** • Chemical Fume Hood Certification – OSHA/0 Hours • Hazard Comm/Safety Data Sheets – OSHA/<40 Hours • Hazardous Materials Inventory Report – OSFM/40 Hours • Integrated Pest Management – DEQ/OSHA/<20 Hours • Lab Safety (Chemical Hygiene) Plan – OSHA/<20 Hours • Lead-Based Paint Surveys – OHA/OSHA/200 Hours** • On-Call Response – DEQ/OSHA/200 Hours • Spill Response/Cleanup – DEQ/OSHA/<20 Hours	• Radon Testing/Mitigation – OHA/EPA/200 Hours
Administrative	**Biological Safety**
• Budget/0 Hours • Database Management – See Program Description Section • Healthy and Safe Schools Plan - ODE/0 Hours • Personnel Issues/0 Hours	• Bacterial Contamination Monitoring – OHA/40 Hours • Bio-aerosol Mold Monitoring/Abate – OSHA/160 Hours • Bloodborne Pathogens – OSHA/<20 Hours

AGENCY ACRONYMS

CPSC – Consumer Products Safety Commission
DEQ – Department of Environmental Quality
EPA – Environmental Protection Agency
Metro – Portland Metro
ODE – Oregon Department of Education
ODOT – Oregon Depart. of Transportation
OHA – Oregon Health Authority
OSFM – Oregon State Fire Marshal
OSHA – OR Occupational Safety and Health Admin.
PF&R – Portland Fire & Rescue

*Each of these programs supports employee environmental health and safety and/or student health and safety. **Included in Site Safety Surveys.

Program Descriptions

Below are the descriptions for each EHS program identified in Table 1. These descriptions are presented in alphabetical order independent of the EHS primary function group (chemical safety, environmental, etc.) to which they belong. Each program description is a brief, high-level narrative that provides the reader with the basics of the program at PPS. At the end of each description are brief statements of any existing gap and the initials of the individual(s) currently responsible for that program along with an estimate of the person-hours per year spent working on that program. The initials are for Herb Wagner (HW) and Joel McCarthy (JM). The acronym NOA stands for No One Assigned. Several of the programs either require limited resources per year or current staffing levels are inadequate to properly resource the program. These programs are designated as receiving <20 person-hours per year or 0 person-hours. If additional information is needed concerning a specific program, please contact PPS EHS or Risk Management.

AED Inspections – Maintenance of District automated external defibrillators (AED). EHS conducts annual inspections during site safety surveys. Replace batteries and pads as needed. (HW/50 hours)

Air Contaminant Monitoring – EHS conducts specialized air monitoring for air contaminates, e.g., carbon monoxide, solvents, formaldehyde, etc. (HW/<20 hours)

Art Program Safety – Provide school staff with assistance as requested. EHS picks up and disposes chemical waste. Conduct annual inspections during site safety surveys. Biggest gap is the lack of resources to more fully understand the chemical processes being used and how kilns are being used. (HW/80 hours) (JM/<20 hours)

Asbestos Surveys/Sampling/Abatement – EHS maintains an asbestos inventory/database and conducts 6 month surveillance and comprehensive triannual inspections. Design in-house and contracted abatement projects as needed. Guide maintenance activity that impacts existing inventory. Manage employee training, personal monitoring and review abatement project design. Oversee abatement process through coordination of contractor selection, scheduling with school and facilities staff, project management and maintenance staff. Biggest gap is the need to update recordkeeping/database. (HW/80 hours) (JM/800 hours)

Bacterial Contamination Monitoring – EHS personnel serve as the licensed well water operator for the water well that serves Skyline. Testing is conducted monthly. Records are maintained onsite and in the EHS office. (HW/40 hours)

BESC Safety Committee Membership – EHS personnel participate as members of the BESC building personnel safety committee, providing input on a variety of safety topics, incidents and investigations as requested. This committee meets only quarterly and does not include employees from the FAM trades. (HW/<20 hours)

Bio-Aerosol Mold Monitoring/Abatement – EHS conducts mold assessment and air sampling as needed and coordinates abatement through project management/design, contractor selection,

scheduling/coordination of contractor, school and facilities maintenance staff and recordkeeping. (HW/40 hours) (JM/120 hours)

Bloodborne Pathogens – EHS provides training for staff (custodian/maintenance) who have the potential for exposure to blood and body fluids that may contain human blood. Focus of the training is to emphasize the requirement to follow Universal Precautions in the prevention of all exposures, e.g., percutaneous, skin, eyes, etc. Bloodborne pathogens include HIV and HBV. (HW/<20 hours)

Budget – Budget tracking is one of the responsibilities of the EHS Senior Manager. The Director of Risk Management currently tracks the budget. EHS has one budget that covers staff while others are used for contractors. (NOA/0 hours)

Building/Room Remodel Plan Review – Review plans for scheduled remodeling to identify safety/health hazards, i.e., asbestos, lead-based paint, mold, fall protection, PCB ballast, etc. Conduct site walks during active project to identify hazards. This process is FAM employee driven, hence not all remodeling is vetted by EHS. EHS should explore possible options to efficiently screen remodeling plans. (HW/<20 hours) (JM/<20 hours)

Chemical Fume Hood Certification – Chemistry/Biology fume hoods must be inspected and air flow measurements conducted annually to evaluate adequate air flow to capture vapors from hazardous chemicals used in chemistry and biology labs. Many hoods are old and poorly designed. The biggest gap is there is no plan to certify hoods on an annual basis. This program is currently inactive due to inadequate staffing. (NOA/0 hours)

Confined Space Entry – Testing and implementation of safe work practices for confined space entry, i.e., tanks, vaults, etc. not used for human occupation, to identify potential life and safety hazards. The written program is 22 years old, it should be reviewed and updated as needed. (HW/40 hours) (JM/<20 hours)

Database Management – EHS personnel design, maintain and update databases for AEDs, asbestos, well testing, confined space inventory, fall protection locations, Gmax testing, safety data sheets, hazardous materials inventory, fume hood testing, lead-based paint surveys/encapsulation/removal, RCRA and Metro waste disposal, playground inspections, radon testing, respirator selection/fit tests, site safety surveys, TSCA disposal, universal waste disposal, indoor air quality and water quality testing. Although the hours for database management are presented in specific programs, database management is set apart as a separate program to demonstrate the large number of programs that require dedicated databases. The EHS Senior Manager needs to conduct a comprehensive review of database management to standardize software and format where possible and they should periodically monitor the status of each database to assure all databases are properly used and updated. (HW) (JM)

Electrical Safety – This program is designed to address the unique needs of the FAM Electrical Shop and is heavily influenced by the tasks conducted, e.g., specific hot work, low voltage, etc. Simple electrical issues are included in the site safety surveys. Biggest gap is the lack of resources to provide comprehensive electrical safety services including the development of an arc flash protocol. (HW/<20 hours)

Emergency Management Assistance – EHS personnel participate in and contribute to a wide range of emergency management drills/incidents on a case by case basis as requested. (HW/<20 hours) (JM/<20 hours)

Ergonomics – The purpose of this program is to protect employees from injury due to lifting strain, material handling, awkward postures, or repetitive motion. Ergonomics is the science and best practice of developing work tasks that compliment natural human motion and limitations. The EHS section of Risk Management is called upon to provide safe-lifting training and consultation. The Workers' Compensation claims section provides ergonomic solutions and initiatives to reduce injuries. A contracted provider is also utilized for ergonomic services. (HW/<20 hours) (JM/<20 hours)

Fall Protection – EHS has developed a written fall protection program that includes employee training and site-specific roof access plans. The focus of the program is to safely access roofs and other elevated surfaces for cleaning and maintenance. Many PPS roofs and elevated surfaces lack fall protection infrastructure, consequently access to some rooftop drains, gutters and mechanical equipment is not allowed, leading to potential water accumulation and inability to maintain equipment. These issues represent major gaps in the program, hence there is an immediate need to develop an overall roof access plan. (HW/40 hours) (JM/140 hours)

FAM Maintenance Safety Meetings – EHS staff provide monthly training to maintenance personnel covering a wide range of safety topics. These sessions also include a Q/A session. However, this monthly meeting does not take the place a functioning safety committee. A facilities safety committee should be chartered and meetings conducted monthly. (HW/40 hours) (JM/<20 hours)

Fire/Life Safety Program Assistance – EHS occasionally assists FAM in response to fire marshal findings/citations to assist in the resolution of fire code issues. The FAM electrical and mechanical shops oversee monitoring, notification and suppression systems. FAM also oversees code compliance and a contractor is used for fire extinguisher inspection and testing. (HW/< 20 hours) (JM/<20 hours)

Fork Lift Training – EHS participates in annual training of maintenance, custodial and warehouse personnel using contracted trainers. Annual training covers the Powered Industrial Trucks standard from OR-OSHA. Biggest gaps are identification and training of new employees prior to fork lift use and maintaining certifications for existing employees. (HW/<20 hours)

Gmax Testing – EHS uses a contractor to visually assess and measure "impact attenuation" on play equipment and athletic fields (synthetic surfaces/turf) to detect surface degradation needing repair and/or replacement. EHS personnel also include the inspection of these surfaces in site safety surveys. (HW/<20 hours)

Hazard Communication/Safety Data Sheets – EHS oversees the hazard communication program that requires training and access to safety data sheets to minimize chemical exposures to PPS employees who utilize hazardous chemicals. Hazard communication applies to all employees who handle chemicals that are not "laboratory scale". In addition to a written program, EHS assists with the maintenance of an

electronic database of Safety Data Sheets for each chemical used by all PPS employees. The database is currently accessible on the PPS website. (HW/<20hours) (JM/<20 hours)

Hazardous Materials Inventory Report – EHS provides an annual report to the Oregon State Fire Marshal concerning the identification, location and quantity of specific classes of hazardous chemicals. Generally, the report focuses on the location of significant quantities of flammable solvents, acids/bases, pesticides/herbicides, chemistry lab stock rooms and fertilizers. The report provides fire responders with the location of these materials in the event of a fire to advise them concerning the presence of special hazards. (HW/40 hours)

Healthy and Safe Schools Plan (HSSP) – EHS oversees the administration and quality assurance checks on ODE named environmental concerns in OAR 581-022-2223. Timely distribution and posting of environmental sampling results and annual plan revision. The Director of Risk Management is the contact on record for the HSSP and is presently using a temp agency for clerical assistance. This is a new program for EHS and it will be assigned to an EHS Specialist. (NOA/0 hours)

High-Lift Training – EHS provides and participates in annual training of maintenance, custodial and warehouse personnel using contract trainers regarding the safe use of man-lifts, scissor lifts and bucket trucks. EHS assists with the setup of the training area and provides personnel protective equipment. Biggest gaps are training new employees before using high lift equipment, maintaining certifications for existing employees and the high-lift equipment. (HW/<20 hours)

Incident/Accident Investigation – EHS provides assistance to PPS Risk Management on request to investigate, document and recommend prevention measures for specific injury and/or property losses on district property. (HW/<20 hours) (JM/<20 hours)

Indoor Air Quality – EHS responds to FAM and employee concerns regarding a range of air quality issues (odors, low/high humidity, low/high temperature, carbon dioxide/monoxide, etc.). Inspections are typically in conjunction with FAM. (HW/40 hours) (JM/400 hours)

Integrated Pest Management – EHS oversees the PPS policy concerning the safe use and disposal of waste pesticides and herbicides. Biggest gap is the lack of resources to adequately oversee and monitor the Integrated Pest Management (IPM) program. (HW/<20 hours)

Lab Safety (Chemical Hygiene) Plan – Requires a written chemical hygiene plan that includes written standard operating procedures (SOP) for those laboratory-scale procedures using hazardous chemicals. Also requires training, assess to safety data sheets, maintenance of container labeling and the appointment of a Chemical Hygiene Officer (CHO). Appointment of a CHO is required by OR-OSHA. The CHO provides guidance regarding the use of hazardous chemicals in chemistry and biology laboratories within the requirements of the Laboratory Safety (Chemical Hygiene) Plan, which is currently inadequate to address PPS laboratories. Presently, EHS staff serve as CHO as needed. A single individual needs to be officially designated CHO, the chemical hygiene plan should be reviewed, training needs should be reviewed and the level of person hours needed identified. Standard operating procedures should be created for classes (flammable, strong acids, etc.) of hazardous chemicals. (HW<20 hours)

Ladder Safety – A written program, training and evaluation of all ladders is needed for safe use. Biggest gap is the wide range of ladder usage and lack of inventory/location and identification of specific employees needing training. (HW/<20 hours) (JM/<20 hours)

Lead-Based Paint Disposal – Lead-based paint waste from in-house removal is collected, containerized, stored and disposed as RCRA waste 1-2 times per year. (HW/<20 hours)

Lead-Based Paint Surveys – Lead paint surveys are conducted annually during site safety surveys. Paint condition is assessed and documented. This includes the occasional use of XRF equipment to measure lead content. Special attention is given to K-5 classrooms, child-occupied areas and play structures. This program could present a major resource gap going forward after consultant development of a comprehensive database on the condition of paint throughout the District. There is a critical need to maintain the accuracy of this database which should be completed by year end. Biggest current gap is lack of an accurate database. (HW/200 hours)

Lockout/Tagout Program – Requires written program and awareness training that specifies requirements to lockout or tagout electrical, hydraulic or mechanical equipment with stored energy during repairs and maintenance. EHS maintains a stock of lockout/tagout kits in shop areas. The written program is 14 years old, it should be reviewed and updated as needed. Biggest gap is the lack of a rigorous training program. (HW/<20 hours)

Machine Guarding – EHS provides generic training for FAM maintenance personnel concerning working with equipment that has moving parts, e.g. drive belts, grinding wheels, etc. There is a need to evaluate work practices and inspect equipment to confirm adequate guards are used at all times to prevent serious injury. (HW/<20 hours)

Medical/Biological Waste Disposal – Medical/biological waste is collected during summer months and upon request during the school year for disposal. Waste consists of sharps, latex gloves, specimens, etc. (HW/40 hours)

Metro Hazardous Waste Disposal – Chemical waste that is allowed to be handled by Portland Metro is collected upon request and taken to the Metro station for disposal. (HW/200 hours)

Motor Vehicle Safety – Need a written plan and training related to safe operation of vehicles. (NOA/0 hours)

Noise Assessment/Abatement – EHS conducts personal dosimetry and area noise monitoring as needed to maintain a hearing conservation program. Areas that exceed the action level are posted as requiring hearing protection. EHS manages annual hearing tests for maintenance employees. (HW/<20 hours) (JM/<20 hours)

On-Call Response – EHS personnel serve their turn during off-hours as on-call to consult and/or come on-site to help resolve a wide range of concerns. The far majority of the issues that come up are not related to

EHS. This program should be reviewed for potential reduction in EHS person hours. (HW/100 hours) (JM/100 hours)

OR-OSHA Complaint Letters/Inspections – EHS personnel provide documentation and/or corrective action in response to receipt of complaint letters. They also escort and facilitate OR-OSHA inspections. (HW/40 hours) (JM/40 hours)

Personnel Issues – The EHS Senior Manager is responsible for managing the EHS section in the PPS Risk Management department. At a minimum, this includes finding the right balance of assigned EHS programs for each EHS employee, establishing short and long-term priorities for each EHS program, assessing EHS employee training needs, evaluating employee performance and employee counseling, discipline and retention. The EHS Senior Manager is a "working manager" position with operations responsibilities for selected EHS programs in addition to managing EHS personnel. The EHS Senior Manager must have exceptional communication and people skills, excellent regulation interpretation skills and understand the role of risk assessment in EHS. This position is currently vacant. (NOA/0 hours)

Personal Protection Equipment – EHS assesses hazards and recommends/provides hand, eye, skin, head, respiratory, hearing, etc. personal protective equipment, e.g., gloves, eye protection, etc. Biggest gap is the absence of a written PPE plan for trades, mechanical and custodian personnel. (HW/40 hours) (JM<20 hours)

Playground Inspections – Playground inspections are conducted annually during site safety surveys and again during the summer months. Each area is inspected by a Certified Playground Safety Inspector (HW) for damaged equipment, condition of synthetic surfaces and paint condition. Greatest need is to develop a comprehensive database that includes age and condition. (HW/160 hours)

Radon Testing/Mitigation – EHS conducts in-house radon testing as needed. Solicit RFP, schedule/coordinate contractor (testing) and school staff. Assess need for evacuation, follow up testing and mitigation. Oversee/coordinate mitigation and recordkeeping. This program is in the process of expanding and will need additional operating resources to manage contractors, conduct site inspections, track work orders and maintain database. (JM/200 hours)

RCRA Hazardous Chemical Waste Management – BESC and all PPS schools are classified as Conditionally Exempt Generators of hazardous chemical waste by DEQ. This allows EHS to collect, handle, centrally store and dispose chemical waste that is not taken by Portland Metro. These wastes typically consist of lead-based paint waste, aerosol cans and solvents. Off-site shipment occurs 1-2 times per year. (HW/40 hours)

Respirator Selection/Fit Testing – EHS personnel determine employee need for respirators based on regulation, process, personal air monitoring and risk assessment. Qualitative fit testing is currently conducted using irritant smoke. Typical need for respirator is in-house lead-based paint removal and asbestos-related activities. Provide for initial/follow up medical examination, perform respirator selection/fit testing and training. EHS should give consideration to purchasing a TSI Portacount to conduct quantitative fit testing. (HW/<20 hours) (JM/60 hours)

School Safety Committee Assist – Schools are required to have safety committees. Risk Management currently has a temporary employee auditing the centralized committee meeting records and doing other tasks in an analysis of the status of PPS school safety committees. EHS does not have the resources to track and confirm that each school is conducting these required committee meetings. This is an opportunity to develop better relationships with key personnel at many of the schools and potentially prevent future misunderstandings/confusion, injuries and regulatory issues. (HW/40 hours)

Site Safety Surveys – Site safety surveys are conducted at least annually. They include inspection of AEDs, playgrounds, auditorium stages, asbestos, art programs and lead paint condition. In addition, boiler rooms, mechanical spaces, kitchen areas, shops, etc. are inspected for general hazards. The total hours estimated for site safety surveys is 710 hours, however this includes the six above programs which are estimated to receive a total of 590 hours as shown in Table 1. This leaves 120 hours for the general hazard inspection part of the surveys. (HW/120 hours)

Spill Response/Cleanup – EHS has a written spill response plan and pre-placed spill kits at BESC, Benson High School and Green Thumb. Small spills are handled in-house. Contractor would be used for the rare uncontrolled spill. (HW/<20 hours)

Stage/Auditorium Safety – This is a specialized area of safety. EHS should oversee hiring a contractor with this specialty. The contractor would conduct inspections of curtains, rigging systems and ropes, electrical systems, flooring and fall arrest systems annually. They will also conduct training for teachers involved with stage productions. This program lacks the resources to maintain adequate safety on District stages. (HW/<20 hours)

Student Transportation Safety – EHS conducts fork-lift training and picks up hazardous and universal waste for Student transportation. Student Transportation is accountable to comply with Oregon OAR 581-053-(002-0640). This includes, but is not limited to, driver physical exams, driving/criminal record and drug/alcohol testing, as well as pre-trip vehicle inspections and student behavior management. Drivers also receive training on student injury prevention, classroom driving safety and behind the wheel safety using certified teachers. Contractors operate all large buses and 1/2 of the small buses. PPS employees maintain and operate 1/3 of all buses, which are all small. (NOA/0 hours)

Toxic Substance Control Act (TSCA)/PCB Collection/Disposal – Polychlorinated Biphenyls (PCB) were used in light ballasts prior to the 1980s. Many older fluorescent light fixtures still exist in PPS buildings. As the older fixtures are replaced to improve energy efficiency, the PCB ballasts are collected and EHS disposes as TSCA waste. (HW/<20 hours)

Underground Injection Control – EHS oversees the permit to inject storm water from parking lots and roof surfaces underground. The permit requires annual testing of water from representative locations to test for contaminants. (JM/<20 hours)

Underground Storage Tanks (UST) – PPS appears to have a few USTs that are no longer in use that need to be decommissioned and one that is still in use. Biggest gap appears to be lack of a comprehensive

inventory and status of each UST. A single individual in or outside EHS should be designated to oversee this program. (NOA/0 hours)

Universal Waste Management – Universal waste is collected throughout the school year in designated, labelled containers for pickup and disposal by EHS. This waste consists primarily of light tubes, batteries and latex paints. (HW/80 hours)

Water Quality (Lead/Copper) – This program is currently overseen by the multi-disciplinary Health and Safety Leadership group mentioned in the section on Interim Senior Director Role. For additional details, refer to this topic in the section on Areas of Improvement/Progress. New legislation is expected this Spring requiring lead testing in schools. This program will present a major resource gap going forward and EHS will need to implement a water quality program testing 10% of water fixtures annually. (HW/<20 hours) (JM/80 hours)

Welding/Cutting Safety – This typically is a written welding, cutting, brazing and soldering health and safety program that covers fume exposure, compressed gases, fire prevention/watch, personal protective equipment, ventilation, confined space and plasma arc. Biggest gap is lack of a written program and targeted training specific to PPS. (NOA/0 hours)

EHS Metrics

Although EHS must administer or assist with 57 programs, some programs have a large number of inspections/assessments or require unique attention due to the frequency of customer needs. These programs include AED inspections/maintenance, asbestos abatement, chemical hazardous waste, mold abatements, indoor air quality, site safety surveys and universal waste management. Below are recent metrics for these programs:

- AED Inspections/Maintenance – 155 inspections/year
- Asbestos Abatement Projects – 300/year (In-house) and 36/year (Contractor)
- Chemical (RCRA) Hazardous Waste – 3,683 lbs./year
- Mold Abatements – 15/year
- Indoor Air Quality Assessments – 90/year
- Site Safety Surveys – 85/year*
- Universal Waste Recycled – 3,195 lbs. batteries, 7,180 lbs. light tubes, 5,244 lbs. compact fluorescent bulbs, 7,344 lbs. latex paint and 850 lbs. tires recycled per year

*Each survey can include inspection of several of the active programs, such as lead-based paint condition, playground condition, etc.

District Benchmarking for EHS

A number of public sources were reviewed to identify school districts similar to PPS. The two comparative values used were number of schools and students, which resulted in selecting four districts for benchmarking purposes. The districts were Wichita, Omaha, Seattle and Salem-Keizer. Salem-Keizer was selected because it is the second largest district in Oregon, making it likely to be the best local comparison. Initial phone calls were made to confirm that each school district's comparative values were similar to PPS. Several questions were asked to identify the scope of EHS programs and if the EHS groups were comprehensive or fragmented over two or three different departments. This is critical for comparison purposes because it is not uncommon for EHS programs to be spread across more than one department. For example, a district could have lead-based paint surveys, water quality, asbestos inventory/abatement or AED inspections located in facilities and ergonomics located in Risk Management or HR with the remainder of EHS programs in an EHS department. This approach was used to identify, with reasonable accuracy, the number of FTEs dedicated to EHS programs and the overall scope of EHS programs in the district. The findings from interviewing EHS leaders in each district are shown in Table 2.

Table 2
School District Benchmarking

School District	No. Schools[1]	Enrollment[2]	EHS FTE	Comments
Portland	83	49,000	3.0	
Seattle	102	54,000	2.5	Recent report to Leadership – EHS Understaffed by 2-3 FTE
Salem-Keizer	65	42,000	2+	Some EHS programs located in Facilities[3]
Wichita	89	50,500	6.0	Programs very similar to PPS EHS
Omaha	89	52,000	7.0	Programs very similar to PPS EHS

[1]Varying definitions of school [2]Rounded [3]Likely less than 1 FTE

Benchmarking on this limited number of comparable school districts indicates that PPS EHS staffing is comparable to Seattle and Salem-Keizer. Discussions with Seattle EHS leaders indicated that they believe they are understaffed by 2-3 FTE and have made a presentation to their leadership requesting more staff. Wichita and Omaha EHS programs have much higher EHS staffing levels, although they have very similar numbers of schools and enrollment.

Areas of Improvement/Progress

EHS Moved to Risk Management Department

Historically, PPS EHS has reported up through FAM. This has been and still remains a common reporting structure for EHS groups in academic organizations. The reasoning used for this reporting structure is that many of the programs that EHS oversees have a facilities component. Although this is a practical reporting structure, it means that the EHS Senior Manager at PPS reported to the Facilities Director. This fact presents inherent potential for unintended conflict of interest. This is due to the fact that the EHS Senior Manager must oversee the regulatory compliance of their direct FAM supervisor and FAM employees.

In addition, one common misunderstanding is that the primary role of EHS is limited to developing programs that are in compliance with federal, state and local regulations. Although EHS does indeed develop compliance programs, this is a short-sighted perception and viewpoint. The reality is that regulatory compliance is effective at reducing regulatory risk, however some EHS programs are not regulated and those that are regulated do not always address all potential risk. Hence, many other risk categories should be considered by EHS leadership/employees when addressing EHS-related concerns.

Those risk categories[1-6] include financial, operations, reputational, human health & safety, and environmental risks, as well as regulatory risk. Failure of EHS leadership to consider all of these risk categories in decision making and program development can have unintended consequences and result in substantial institutional risk and inefficient use of limited resources.

In the summer of 2016, PPS leadership elected to move the EHS Section away from FAM and into the Risk Management department. This reporting structure is part of a growing trend to reduce the potential for conflicts of interest and at the same time acknowledges that EHS oversees programs that have the potential to negatively impact organizational objectives and strategy. Placing EHS inside Risk Management also places EHS in an environment and culture where the primary role is to identify and reduce institutional risk.

Another justification for EHS to be in the Risk Management department is the fact that PPS is authorized by the state to be self-insured for Workers' Compensation. This requires that a self-insured employer must have an occupational safety and health loss control program as required by ORS 654.097 in the insurance company statutes.

Moving EHS to the department of Risk Management represents a major improvement for the functionality and productivity of the EHS Section.

Water Quality

Beginning in the spring and continuing into the 2016/2017 school year, PPS has made substantial progress in minimizing public concern regarding dissolved lead in drinking water and water used in food preparation.

This included testing almost 11,000 water fixtures throughout the District. Two samples were taken from each fixture. The first sample (A sample) was an immediate sample taken after the fixture remained unused for 8-18 hours. A second sample (B sample) was taken after a 30 second flush. One of the first steps was to cover all drinking fountains to prevent access, use pre-washed food in kitchens and provide bottled water. Arrangements were also made to provide blood-lead screening for students and employees. Water test results became available during the summer indicating that water from 12% of fountains and 39% of other fixtures contained elevated lead levels.

A total of 498 kitchen fixtures were included in this testing and 107 produced water with elevated lead levels. After using a flushing protocol, only 8 (2%) of the 498 fixtures had elevated lead levels. A 30 minute flushing protocol was published, sinks requiring flushing prior to use were labeled and training was conducted. Kitchens resumed normal operation on October 3.

Work continues to measure lead levels in B samples from fountains and selected other fixtures in an effort to open fountains and selected fixtures. Based on B sample results, decisions will be made to replace fixtures and/or water lines upstream of fixtures as appropriate.

Several specific issues related to lead contaminated water became matters of concern during 2016. These issues included sampling procedure, handwashing, showers, dishwashing, emergency eyewashes and eating produce from school gardens. Each of these issues and others were researched and inquiries were made with Oregon Health Authority and the Oregon Toxicology Information Center. Each issue was individually resolved as presenting insignificant lead exposure.

Lead-Based Paint

Lead-based paint was used on PPS schools prior to its ban in 1978. Consequently, many painted surfaces have lead-based paint covered with non-lead-based paint. This fact presents an ongoing maintenance need to track the condition of all painted surfaces. The most common causes of lead poisoning in children are typically from eating chips of lead paint and exposure to lead-paint dust.

PPS is working with a consultant to create a comprehensive database of lead-based paint throughout the District that should be available near the end of 2016/2017 school year. Removal of peeling paint, encapsulation and application of new paint has been completed in several schools, heavily focused on K-5 buildings since that student population is at the highest risk. This will be an ongoing project throughout the school year. After the District-wide database is complete, a strategy will be developed to conduct ongoing surveys and maintenance.

Radon

Initial radon testing in early 2016 was intended to target all sites in which previous tests indicated elevated concentrations of radon, regardless of whether or not follow-up sampling prompted mitigation actions. However, we ran out of cold weather, so not all sites with previously elevated results were able to be sampled before the end of the 2015/2016 school year. In all, 26 sites and about 800 locations were

sampled. Of those 800 locations, 88 had results over the action level of 4 pCi/l. Of those 88, 15 locations had results at or above the upper limit of 8 pCi/l, requiring more immediate action. The HVAC at those locations was set to run continuously and they were retested just before the end of the 2015-2016 school year. All but 2 of those 15 locations tested below 4 pCi/l under those conditions. These two locations were temporarily closed and mitigation actions have been ongoing since that time. Both locations are now opened with continuous monitoring and permanent mitigation systems are being designed and implemented.

In the fall of 2016, EHS continued the process of performing comprehensive radon testing following the guidelines set forth by Oregon Health Authority. This included any needed follow-up sampling of the initially tested 800 locations and initial testing at all locations not covered during the spring of 2016. During the 2016/2017 school year, long-term testing will also take place at all locations with initial results between 4 and 8 pCi/l. Short-term follow-up testing will take place at any location with initial results at or above 8 pCi/l, including those areas which were re-tested at the end of the 2015-2016 school year. Any location with confirmed results above 4 pCi/l will be mitigated. By the end of the 2016/2017 school year, we should know where we stand on the need for mitigation throughout the District, although there may be need for additional testing in 2017/2018. In addition, mitigation for locations at all sites should be largely completed by the end of the 2017/2018 school year.

Radon is normally mitigated by balancing/tuning the existing HVAC or by depressurization of the crawlspace/tunnels/sub-slab. Generally, HVAC is used for short-term mitigation and depressurization systems are used for long-term/permanent solutions. It is also likely that many locations can be mitigated simply by finding and conducting needed repairs to the HVAC system.

Institutional Risk

Introduction

As mentioned earlier, I use the terms institutional risk and enterprise risk interchangeably. Over the years, I have noticed that many academic organizations refer to themselves as institutions rather than enterprises, presumably because the word enterprise is used almost exclusively to refer to a private organization or company. For this reason, I tend to favor the use of the term institutional risk when referring to PPS risks.

Risk Analysis

The terms risk analysis and risk assessment are often used interchangeably. In fact, they are related but different terms[1]. Risk analysis describes the broad concept of performing a comprehensive analysis of a potential risk and has three components. The three components are risk management, risk assessment and risk communication. The risk analysis process[1] is typically initiated and overseen by a risk manager. The risk manager selects the issue of concern for risk analysis and then works to reach consensus on the development of a risk profile. A risk profile is simply the identification of what is already known about a

perceived risk along with any associated uncertainty. The risk profile is then used to justify or negate the need to conduct a full risk assessment. Often, the risk profile provides sufficient facts to qualitatively estimate institutional risk. If the risk profile supports the need for a more comprehensive risk assessment, the risk manager then commissions a risk assessor to assemble an inclusive team of knowledgeable individuals to conduct the risk assessment. At the completion of a risk assessment, the risk manager would identify the risk management options (RMO) to address the specific risk issue and reach consensus on the selection of the best RMO. Finally, the risk manager completes the risk analysis process through risk communication to the appropriate level within the organization to seek approval to implement the RMO. This might also include communication outside the organization.

The risk analysis process should be scalable[1] depending on the time frame available to conduct the risk analysis. There are three critical factors in the conduct of a risk analysis. First is to agree on the question that is posed to the risk assessment team after completion of the risk profile. This question should clearly define the specific risk issue that the assessment team must investigate to complete the risk assessment. It should be as specific as possible. One other critical factor is to clearly define the areas of uncertainty that exist in the process of performing the risk assessment. It is likely there will always be uncertainty that is identified in the risk analysis process. One of the goals of the risk analysis process is to reduce uncertainty. If uncertainty cannot be eliminated, which is often the case, it should be clearly identified/documented to aid in the selection of the best RMO. Finally, the risk assessment step must be conducted using a team that includes individuals who either possess knowledge specific to the risk question or can acquire the needed knowledge. This knowledge should be based on the best established and scientific facts available. In gathering facts, consideration should be given to financial, operations, regulatory, and reputational consequences and probability, as well as that for environmental health and safety.

It is the intent of this gap analysis to conduct a qualitative, abridged risk analysis of each of the 57 EHS programs and to identify those programs that present substantial institutional risk along with the operational staffing resources needed to address these programs. The term "abridged risk analysis" is used because the limited time available to construct this report did not allow time to conduct a more comprehensive risk analysis for each of the 57 programs.

Risk Assessment

One common reality in many public school environments is limited resources to address the growing number of federal, state and local requirements along with adherence to many guidelines and best practices. Hence, the development and implementation of efficient programs that minimize institutional risk is a critical component in the management of an EHS program. Consequently, strategies that allocate resources to areas of higher risk have the greatest overall impact on the wide range of possible institutional risks.

Each of the programs presented in Table 1 were identified and assessed to delineate if they are required and/or justified by unacceptable institutional risk. Qualitative risk assessments[1] were not limited to regulatory compliance risk due to the fact that some programs are not required by regulation, yet present substantive institutional risk. Consequently, risk categories considered for each program in Table 1

included financial, operations, reputational, human health/safety and environmental, as well as regulatory risk. An example of a program that is required by regulation is fire/life safety hardware/code compliance. This is clearly a regulatory compliance issue and but also presents substantial potential for human health & safety, reputational, financial, and operations risk, as well as regulatory risk. However, an example of a program that is not required by regulation is ergonomics. Although an ergonomics program is not required by regulation, the potential exists for extensive human health, financial and operations risk.

Due to the limited time available and the large number of programs, qualitative estimates of risk were determined using my knowledge and experience of the risk profile for each program in a school district like PPS along with assignments of severity/consequence. Typical severity assignments for each of the six EHS risk categories are shown in Table 3.

Table 3 – Severity/Consequence Assignments

Financial	**Human**
Very High - >$1,000,000 High - $100,001 – 1,000,000 Moderate - $10,001 – 100,000 Low - $1,001 – 10,000 Very Low – 0 - $1,000	Very High – Fatality/Catastrophe/Perm. Disability High – Serious Injury/Illness >3 Mo Disability Moderate – Serious Injury/Illness <3 Mo Disability Low – Minor Injury/Illness <1 Wk Sick Leave Very Low – No Injury/Illness Only 1st Aid
Operations	**Environmental**
Very High – Cease Operation(s) High – Extensive Impact SOU/MOU* >1 Wk Moderate – Extensive Impact SOU/MOU <1 Wk Low – Minor Impact SOU* Very Low – Little or No Impact	Very High – Uncontrolled Release High – Controlled Release (High Impact) Moderate – Controlled Release (Mod. Impact) Low – Controlled Release (Min. Impact) Very Low – De Minimis Impact
Reputational	**Regulatory**
Very High – Multi-Media Release >1 Month High - Multi-Media Release <1 Month Moderate –Single Media Release (Inj./Illness) Low – Single Media Release (Reg. Issue Only) Very Low – No Media Coverage	Very High – Cease Operations High – Repeat Violations/Increased Fines Moderate – Citation & Fine/Permit Violation Low – Citation w/No Fine Very Low – No Citation

*SOU – Single Operating Unit/MOU - Multiple Operating Units

These qualitative severity assignments were then combined with assignment of likelihood/frequency as follows, providing estimated risk for each risk category.

Very Likely - >Once/Year
Likely – Every Year
Infrequent – Every 1-10 Years
Unlikely – Every 10 – 50 Years
Very Unlikely - <Once/50 Years

My definitions for each of the six risk categories are as follows:

Financial Risk – Risk of an economic loss/cost resulting from failure to adequately manage an EHS program.

Operations Risk – Risk of a loss of personnel, equipment, utilities or classroom/building space critical to PPS objectives, strategy and operations.

Reputational Risk – Risk of a reduction or loss of internal and/or public image, reputation or trust.

Human Health/Safety Risk – Risk of human injury, illness, disability or fatality.

Environmental Risk – Risk of a controlled or uncontrolled release of a hazardous material to air, water or soil.

Regulatory Risk – Risk of a regulatory finding resulting in a citation, fine and/or an impact on operations.

Great City Schools and Enterprise Risk Management

The Council of the Great City Schools (CGCS) is a national organization that exclusively represents the needs of urban public schools with 70 member schools, including PPS. CGCS recently published a white paper (see link below) entitled Enterprise Risk Management in Great City Schools[2].

Enterprise risk management (ERM) is a relatively new concept. Depending on your source, ERM evolved from classical risk management within the private sector in the mid-1990s to minimize financial losses. It has now slowly found its way into some academic organizations. This slow evolution will likely continue. ERM is a comprehensive integrated approach to the management of all potential organizational risks that a school district faces. The practice of ERM requires a broad approach to risk management that goes beyond insuring against pure risk. At its heart, ERM formally wraps risk-based decision making into the overarching objectives and strategies of the institution. This requires that all leaders within an organization identify, understand and implement best practices in managing the areas of risk for which they are accountable.

The reason that ERM is a topic in this gap analysis is due to the growing, increasingly complex list of risks that public schools need to manage, hence there is a mounting need to consider the insertion of risk into large public school district strategic decision making.

http://www.cgcs.org/cms/lib/DC00001581/Centricity/Domain/87/EntRiskMan_Report_R5.pdf

Areas of Concern

The following EHS programs/topics are areas of concern. Because of the challenges in weighing the many factors that must be considered, it is difficult to assign level of priority to each of these areas/programs.

An attempt is made in the discussion of each area to indicate its level of importance based on the potential impact that a given issue can have on District objectives and strategy. Potential impact is based on anecdotal and contextual evidence, as well as the professional experience and knowledge of the author along with Risk Management statistics where applicable. Programs that are areas of concern are presented in alphabetical order after a brief discussion of broader areas of concern and each program includes specific recommendations.

Prioritization of Resources

EHS decisions can have significant impact on the objectives, strategy, operations and budgets of other departments and even the entire institution/enterprise. EHS decision making and problem solving skills should expand beyond the current almost exclusive focus on regulation-based solutions to include Systems Thinking. EHS should approach all decision making holistically by considering Risk, Relationships and Resources, as well as Regulations in all decision making where Risk is defined as institutional or enterprise-wide risk. I refer to this as the 4R's Strategy. This management strategy can be used to identify and prioritize those programs that justify a greater allocation of existing resources on the basis of six categories of risk. Those categories include financial, operations, reputational, human, environmental and regulatory.

Senior Manager Selection/Duties

The recruitment of a Senior Manager for the EHS Section began in November 2016. Ideally, the new manager will have extensive experience in a public schools environment and a strong science background in chemistry and biology with a preference toward chemistry. This person will need to have experience that covers the entire spectrum of EHS programs or have the background and skills to understand the science and operations for each program and have a working knowledge of evaluating institutional risk. Ultimately, they will be the eyes, ears, face and heartbeat of the EHS group at PPS. The careful selection of a new Senior Manager should be the highest priority for the EHS section.

In small EHS groups like PPS EHS, this position is typically a "working manager" position. In addition to management duties, the EHS manager often becomes the lead person for specific EHS programs based on their past experience and knowledge and the workloads and experience of other EHS employees. Although they will have direct operations involvement, it is critical that they also have time to focus on the objectives of the EHS Section. This includes developing program operating strategies, identifying and monitoring performance metrics, conducting risk assessments and working closely with the Director of Risk Management for daily and long-term decision making, maintenance of the Healthy and Safe Schools Plan and creation of an annual report. The selection of specific operations duties for the Senior Manager should be limited to those programs that allow time to adequately conduct the administration of the EHS Section. One of the most critical operating strategies that the manager should develop is the management of data for future access and use. Many of the EHS programs are data driven and several are data intensive, accumulating massive amounts of data measurements. The accessibility and accuracy of these databases can directly influence future decision making and costs, as well as reducing the need for consultants and repeat data gathering. This should be one of the highest priorities for the Senior Manager.

As important as the education and experience of the new manager are to their success, it is equally important that they possess innate people skills. Communication, customer service, collaboration and empathy skills are crucial and go a long way in the development of creative, inclusive and cost effective solutions for complex EHS issues!

Finally, the Senior Manager and Risk Management Director should work with FAM senior management to agree on and implement a methodology to prioritize safety and health-related work orders.

Annual Report

As mentioned earlier, the EHS Senior Manager must be responsible to collaborate with Risk Management leadership to create an annual report for the EHS Section. This is one of the most important roles of the Senior Manager, if done properly it provides an annual "fresh" look at where improvements can be made along with celebrating accomplishments. Just as important, it is instructive for PPS upper administration regarding their understanding of the scope and complexity of the EHS section. The annual report can be a standalone report or wrapped into a Risk Management annual report at the discretion of the Risk Management Director. Contents of the report should include, but not be limited to, established performance metrics, discussion of major accomplishments, existing needs and challenges going forward and those topics selected by the Risk Management Director.

Art Program Safety

EHS picks up and disposes a variety of hazardous chemicals from District art programs. Annual visits during site safety surveys also occur. Art programs also operate high-temperature kilns. Limited resources in EHS has prevented a comprehensive review of the potential hazards associated with art program operation. EHS needs the resources to evaluate art programs at PPS and conduct risk assessments on materials in use and kiln usage.

Chemical Fume Hood Certification

Chemical fume hoods at all school laboratory locations must be certified annually to minimize the potential for student exposure to chemical vapors. A practical Standard Operating Procedure (SOP) using the ANSI standard should be developed that describes the step by step process for certification. Certification of each hood must be documented and a database or spreadsheet created and maintained annually. This work is not complex, although each hood will require 15-30 minutes to certify. To minimize costs, certification can be performed by a trained EHS employee.

Database Management

Database management has the potential to reduce the costs and time demands of several EHS programs. The accessibility and accuracy of EHS databases can directly impact day to day and long-term decision making in FAM, Risk Management and EHS. Development of accurate and useable databases should be

one of the highest priorities for the EHS Senior Manager. See Senior Manager Duties in the Areas of Concern section for further discussion regarding the high priority of this program.

Facilities Safety/Safety Committee

PPS FAM Operations have 423 multi-craft, mechanical trades and custodial personnel. Many of these employees work in hazardous environments and use hazardous equipment. The risk associated with many of these processes and procedures can result in serious injury or illness, some have the potential to result in a fatality. The large number of hazardous activities conducted by FAM maintenance and custodial personnel increases the probability of a serious and costly outcome. Programs and potential consequences are presented below. Descriptions of each of these 14 programs are available in the Program Descriptions section. Nine of these programs are exclusive or almost exclusive to FAM Operations.

- Confined Space – Serious Illness/Injury/Fatality
- Lockout/Tagout – Serious Injury/Fatality
- Fall Protection – Serious Injury/Fatality
- Forklift – Serious Injury/Fatality
- High Lift – Serious Injury/Fatality
- Electrical Safety – Serious Injury/Fatality
- Motor Vehicle Safety – Serious Injury/Fatality
- Ladder Safety – Serious Injury/Fatality
- Welding/Cutting – Serious Illness/Injury
- Machine Guarding – Serious Injury
- Hazard Communication (Chemical Exposure) – Serious Injury/Illness
- Respirator Fit Testing – Serious Illness
- Personal Protective Equipment – Serious Injury
- Ergonomics – Serious Illness

PPS safety programs associated with these activities are fragmented and limited in scope. Training is conducted for some activities, but validation of safe employee practices is limited. Although there are monthly training sessions, there is no safety committee that includes members of FAM maintenance and custodial staff. The frequency of incidents and claims involving these FAM employees is higher than that of other PPS departments. Over the past five years, FAM maintenance and custodial employees have reported almost 20% of the OSHA recordable incidents that became worker's compensation claims. A broad range of FAM maintenance employees filed these claims although the majority were custodians. Most common injuries were sprains and strains. Lack of a comprehensive facilities safety program presents substantial human health and safety, regulatory, reputational, operations and financial risk to PPS and should be given a high priority. EHS should review the Facilities Safety related programs in the list above and create a comprehensive program for FAM maintenance and custodial employees along with the creation of a dedicated safety committee. Finally, a TSI Portacount should be purchased to conduct quantitative fit testing for lead-paint and asbestos remediation employees.

Fall Protection

Although fall protection is included in the discussion above regarding facilities safety, it is important that it be addressed individually due to the impact on roof access. Many PPS buildings do not have fall protection infrastructure used to prevent or arrest employee falls while working on roofs. Although roof maps have been created that provide guidance on those sections of a given roof that can be accessed by FAM personnel, some portions of roofs cannot be accessed to perform maintenance on building support equipment and removal of debris (leaves, etc.) that plug roof drains. Current plans are to select a contractor to respond as needed to unplug drains that cannot be safely reached by FAM personnel. There is also a need to identify a consultant to assist with long-term planning for all buildings, and the identification of FAM or EHS personnel to serve as the in-house expert to manage a comprehensive fall protection program. Because of the complexity and extensive costs associated with installation of fall protection hardware, a multifaceted program should be developed by EHS. Final strategy will likely include installation of fall protection infrastructure at selected sites, limited access to sections of selected roofs and the use of an on-call contractor for drain cleanouts as needed, along with an in-house expert to oversee the program. Development of a comprehensive fall protection operating strategy should be a high priority for EHS to effectively deal with roof drains and reduce the risk of serious injury. Although the likelihood of a serious safety incident is likely low to moderate, the human health and safety, financial, reputational and regulatory risk is substantial because of the potential serious consequences.

Fire/Life Safety

FAM oversees the fire/life safety program at PPS. It appears that adequate operating resources are allocated to PPS fire/life safety systems and code compliance. However, experience at past workplaces has indicated that this program has a tendency to drift over the years. This is of significant concern because of the potential for catastrophic human health and safety, operations, financial and reputational risk. EHS, in conjunction with FAM, should conduct a comprehensive review of fire/life safety systems function and testing along with overall code compliance.

Integrated Pest Management

PPS has a written plan for Integrated Pest Management (IPM). EHS leadership should review and update as needed based on the new Healthy and Safe Schools rule. There is also a need for EHS to play a more active role in IPM, including the review of current pest management procedures, training for FAM maintenance personnel and approval of new pest management devices and chemicals.

Lab Safety Plan

PPS does have a written Laboratory Safety plan which is also called a Chemical Hygiene plan in OR-OSHA's hazardous chemicals in laboratories rule. A broad range of toxic and flammable chemicals is used in small quantities in PPS laboratories. Very few resources are currently being devoted to this program. There is also a lack of clarity on the designation of the required Chemical Hygiene Officer (CHO). EHS should designate a CHO to review the entire program. Emphasis should be placed on updating the existing

chemical hygiene plan, training for laboratory faculty, an updated review of the chemicals currently in use in student laboratories, the need for safety standard operating procedures for specific chemicals and experiments and waste disposal practices. This appears to be primarily a regulatory risk.

Lead-Based Paint Surveys

Eating chips of lead-based paint and exposure to lead-paint dust are the most common causes of blood-lead poisoning in children. We are currently working with a consultant to create a District-wide database on paint condition from field observations. After this database is complete, there will be a need for ongoing comprehensive and accurate field surveys to prevent the need to update the database using consultants. EHS already conducts site safety surveys, see section on EHS Metrics. These surveys are field evaluations of a number of EHS issues and have included paint condition in the past. Lead-based paint condition should continue to be included in these surveys and the format of the new database maintained up-to-date at all times. This should add little additional time to site surveys and could substantially reduce future consulting costs along with helping to prioritize painting needs while minimizing the presence of lead-based paint in poor condition. Inadequate maintenance of this database could result in significant financial, reputational and human health and safety risk in the future. This must be a long-term and high priority for EHS to minimize potential student exposure and future reputational risk.

Motor Vehicle Safety

EHS should create and maintain a safe driving program that includes screening of drivers, driver training and accident prevention.

On-Call

EHS employees respond and participate in on-call activities for a total of approximately 200 hours per year. In this role, each EHS employee must be available to respond to requests by carrying an on-call cell phone for 5-6 weeks per year. Interviews with the two EHS employees indicates that the far majority of on-call activity involves FAM issues that are not related to EHS issues such as spills, safety concerns, etc. It appears that this is not a wise use of EHS time in a limited resource environment. Consideration should be given to EHS personnel serving in an ad hoc role to respond only as needed for EHS related concerns. This would require EHS to provide on-call participants with documentation on when EHS should be called and EHS leadership to develop a dependable communication strategy for those rare instances that EHS resources are needed.

Playground Inspections

Inspections of playgrounds occur annually during site safety surveys and when requested. Work orders are initiated as needed for repairs. EHS should establish a standard protocol for playground inspections and create a database that documents the need for partial and/or full replacement to aid in the budgeting and prioritization of replacement funding.

Radon

As discussed early in the section on Areas of Improvement/Progress, extensive long-term and short-term testing will take place throughout the 2016/2017 school year and also likely will continue during 2017/2018. This testing will result in the need to conduct site specific mitigation in the 2016/2017 and 2017/2018 school years. Consequently, person-hour demand on EHS will continue to be high for this program and may increase during this period depending the number of sites requiring mitigation and the specific mitigation process required. This may result in a time demand spike for EHS staff and also cause increased capital costs for FAM if several HVAC systems must be upgraded. EHS leadership should carefully watch this program to monitor staffing needs. After this two year period, staffing needs should be reduced and remain relatively low. This program is included in the Healthy and Safe Schools rule, hence regulatory and reputational risks are substantial. Human health risk is considered high due to the fact that radon is believed to be the second leading cause of lung cancer in the U.S.

School Safety Committees

State OSHA regulations and PPS policies require that each school have a safety committee. Risk Management is currently reviewing the central records that confirm compliance with this requirement, but not all are complete. The establishment of functioning safety committees that meet quarterly has many benefits. Local school leaders would receive regular reports on safety concerns and school employees can report concerns locally, increasing the likelihood that local solutions can be found. In addition, school committees give Risk Management and EHS points of contact for needed two way communications to discuss current and future health and safety projects, evaluate incidents and to provide resources as needed. EHS should review this program and reestablish it as needed to create active safety committees at each school. They should also attend meetings on an ad hoc basis to consult and assist with the resolution of issues, this provides visibility and credibility for EHS and lends to a culture of safety.

Site Safety Surveys

Site safety surveys is one of the core EHS programs and currently requires over 700 person hours. This is a valuable and high impact program that should be carefully reviewed and updated. These surveys should be used to maintain the lead-based paint database created by PBS consultants to reduce the potential for lead exposures and to minimize future consulting and maintenance costs related to lead-based paint removal and encapsulation. Risk Management and EHS leadership should review the current survey program and modify as necessary to maximize the generation of data valuable to the prioritization of resources. The many programs and general hazard inspections currently included in surveys should be reviewed for continued inclusion based on the efficient use of the time spent conducting surveys and the potential to reduce hazards/risk and future costs. This program should be structured to maximize its potential to efficiently reduce costs and institutional risk.

Stage/Auditorium Safety

Stage safety is being reviewed for a health and safety capital proposal to the Board for a May 2017 bond measure. Regardless of its selection for a bond measure, there is a genuine need to improve stage safety on the operations level. EHS should develop a comprehensive program operations strategy. At a minimum this will include training for school faculty and EHS using a professional trainer with expertise in stage operations safety. EHS should conduct periodic field inspections of stage curtains, rigging systems, ropes, fall arrest systems, flooring and electrical systems. Although it is unlikely a serious safety incident will occur, the potential consequences of an injury includes long-term disability and even fatality, as well as reputational and financial risks.

Underground Storage Tanks

The author has not been able to find a comprehensive database on the existence and status of all regulated and unregulated underground storage tanks (USTs) in the District. This list likely does exist although the recordkeeping may be fragmented. The existence of "orphan" USTs that have not been decommissioned, if they exist, could represent significant financial, environmental and reputational risk for the District. The status of all USTs should be determined and a central database created.

Water Quality

FAM has completed taking A (initial) and B (after 30 second flush) samples from almost 11,000 water fixtures. Testing of all A samples is complete and selected B sample testing will likely be completed in the near future, leading to decisions to replace fixtures and/or upstream water lines based on test results and fixture usage. Included in this decision-making process will be the past and future use of filters in fountains. There will be a need to retest after repairs have been completed on several fixtures to confirm lead levels have been reduced below or remain below action limits. Risk Management and FAM operations must agree on EHS's role in the maintenance of this program. It is imperative that a long-term operating strategy be created, maintained, monitored and rigidly enforced. It is recommended that at least one individual in EHS be assigned the responsibility to strictly oversee water quality operations at PPS to prevent maintenance program drift. New legislation requiring testing every 10 years is expected in the near term. This will require that EHS test 10% of required water fixtures annually. There is substantial, long-term institutional risk associated with this program, primarily due to potential future financial and reputational risk if not properly maintained.

Recommendations

The PPS EHS group needs a reset for its mission, objectives, overall operating strategy and staffing. The staffing level of three full-time FTE is inadequate to properly develop clear objectives and an overall operating strategy to reduce the potential institutional risk associated with EHS programs. Current staffing

has resulted in day-to-day "firefighting" in an effort to respond to the latest customer or regulatory need. Yet, the scope of the EHS section has grown to include 57 different programs. This is not an uncommon circumstance for EHS groups in large organizations. EHS groups have been faced with a steadily increasing number of required new programs, not to mention guidelines and best practices, over the past 25 years emanating from 10-15 different local, state and federal regulatory agencies. The challenge presented to EHS leadership over these years has been that when a new regulation is mandated, it often does not justify a new full-time employee. Consequently the new program is assigned to an existing employee's workload. When this happens repeatedly over a number of years, existing employee's workloads steadily increase and existing programs receive less and less resources resulting in ineffective environmental health and safety programs and increased institutional risk. This is complicated further by an almost exclusive focus on compliance with regulations from fear of non-compliance, yet regulatory compliance is only one of the six institutional risk categories that EHS should consider when setting priorities and allocating resources.

EHS Senior Manager

The first crucial step in adequately staffing and administrating EHS is the recruitment of a highly qualified EHS Senior Manager. This individual must have a good balance of education, experience and organizational skills, as well as superior people skills. Operationally, EHS is driven by applied science, regulation interpretation skills and program development skills, but at its core, EHS is really in the business of providing EHS customer service to parents, students and PPS employees along with the reduction of PPS institutional risk. Put simply, EHS is in the business of customer service and risk reduction. The Senior Manager must recognize these two basic foundational precepts to set effective objectives and an overall operating strategy. For a more detailed discussion on the EHS Senior Manager position, see that section under Areas of Concern.

EHS Staffing Levels

In addition to existing full-time positions, EHS should recruit one safety professional and one industrial hygienist. The proposed organization chart for Risk Management/EHS is presented in Figure 2 where these two new positions are represented by those *EHS Specialists* in italics. These new positions are justified by existing workloads and the fact that 25 of the 57 EHS programs receive inadequate resources. For example, the Facilities Safety/Safety Committee combined with the Fall Protection program will likely require between 0.75 – 1.0 FTE. The two new positions combined with the existing three FTE should be able to adequately oversee each of the 57 programs if each program is carefully designed and assigned.

Because of the competition for quality EHS professionals, PPS will need to provide opportunity for professional development. This will attract applicants who have a desire to continue to improve their skills and career potential. The specific professional development choice will be candidate dependent. At a minimum, I recommend that successful candidates be provided PPS support to complete designation as a Certified Safety Professional (CSP) or a Certified Industrial Hygienist (CIH).

The fact that EHS presently has only one full-time employee and two open positions presents an excellent opportunity for reorganization of the EHS group. The new Senior Manager should collaborate with the

Director of Risk Management to review and propose the most operative assignment for all 57 programs to each of the five positions. The goal should be to assign programs to each position to match employee experience and technical skills along with creation of balanced workloads.

As a starting point to aid in this process, I have listed each of the 57 programs in two tiers. Tier One lists those programs that present higher institutional risk. The programs with significant operative gaps are in italics and highlighted in red. Recommendations/needs for each of these 25 programs are presented in the Areas of Concern section. This is not to imply that the 32 remaining programs cannot be refined/improved. The 12 programs in Tier One that currently do not have significant operating gaps have adequate operational funding and controls to manage the potential for high institutional risk. Tier Two lists those programs that inherently present limited institutional risk and currently appear to be adequately resourced.

Tier One Programs:

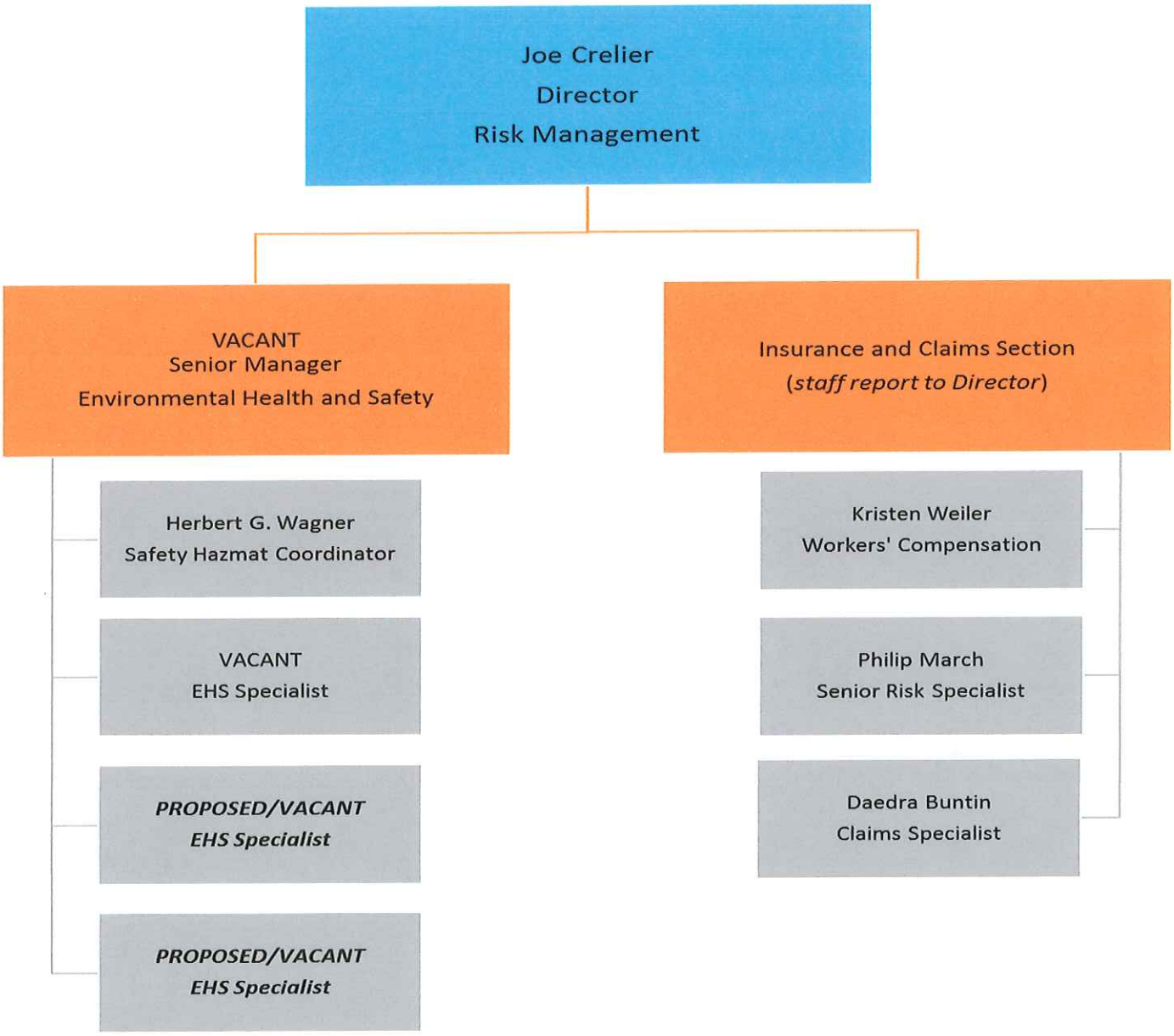
- AED Inspections
- *Art Program Safety*
- Asbestos Surveys/Sampling/Abatement
- Bio-Aerosol Mold Monitoring/Abatement
- *Chemical Fume Hood Certification*
- *Database Management*
- Ergonomics
- *Facilities Safety/Safety Committee (9 safety programs)*
- *Fall Protection*
- FAM Maintenance Safety Meetings
- *Fire/Life Safety Assistance*
- Gmax Testing
- Healthy and Safety Schools Plan
- Incident/Accident Investigation
- Indoor Air Quality
- *Integrated Pest Management*
- *Laboratory Safety*
- *Lead-Based Paint Surveys*
- *Motor Vehicle Safety*
- OR-OSHA Complaint Letters/Inspections
- Personal Protection Equipment
- *Playground Inspections*
- *Radon Testing/Mitigation*
- *School Safety Committee Assist*
- *Site Safety Surveys*
- *Stage/Auditorium Safety*
- Student Transportation Safety
- *Underground Storage Tanks*
- *Water Quality*

Tier Two Programs:

- Air Contaminant Monitoring
- Bacterial Contamination Monitoring
- BESC Safety Committee Membership
- Bloodborne Pathogens
- Budget
- Building/Room Remodel Plan Review
- Emergency Management Assistance
- Hazard Communication/Safety Data Sheets
- Hazardous Materials Inventory Report
- Lead-Based Paint Disposal
- Medical/Biological Waste Disposal
- Metro Hazardous Waste Disposal
- Noise Assessment/Abatement
- On-Call Response
- Personnel Issues
- RCRA Hazardous Chemical Waste Management
- Spill Response/Cleanup
- Toxic Substance Control Act (TSCA)/PCB Collection/Disposal
- Underground Injection Control
- Universal Waste Management

The resources required to develop, update and maintain each of the 57 programs varies widely. The listing above is an attempt to prioritize each of the programs into two tiers based on the potential institutional risk associated with each program. The assignment of abridged qualitative risk to each program is based on my technical/operational knowledge and experience with each program, as well as the uncertainty associated with each program. For a discussion on conducting a more comprehensive risk analysis[1] see that section.

Figure 2
Proposed Risk Management Org Chart



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Environmental Health & Safety Section Gap Analysis

February 6, 2017

John W. Burnham, Ph.D.
Interim Senior Director

PORTLAND PUBLIC SCHOOLS

Professional Background

- MS Environmental Health/PhD Organic Chemistry
- Scientist – Private Sector
- Regulator – OR-OSHA
- Graduate Faculty – OSU Public Health
- EHS Director – OHSU/PSU
- Retired – OHSU 7/15
- My Third EHS Gap Analysis

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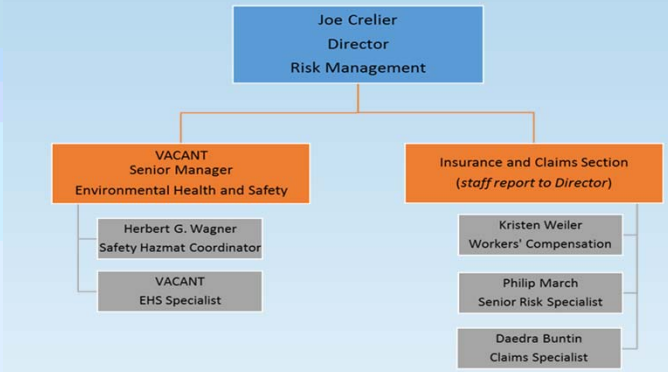
Risk Management/EHS Org Chart



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EHS Programs

- 57 Total Programs
- 29 General Occupational Safety
- 10 Environmental
- 10 Chemical Safety
- 1 Radiation Safety
- 3 Biological Safety
- 4 Administrative
- Ten Regulatory Agencies/Commissions
- Over 60% labor hours is building related

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Benchmarking

School District	No. Schools[1]	Enrollment[2]	EHS FTE	Comments
Portland	83	49,000	3.0	
Seattle	102	54,000	2.5	Recent report to Leadership – EHS Understaffed by 2-3 FTE
Salem-Keizer	65	42,000	2+	Some EHS programs located in Facilities[3]
Wichita	89	50,500	6.0	Programs very similar to PPS EHS
Omaha	89	52,000	7.0	Programs very similar to PPS EHS

[1]Varying definitions of school [2]Rounded [3]Likely less than 1 FTE

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Gap Analysis Methodology

- Identify all EHS Programs
- Required by Regulation?
- Investigate Program Operating Strategy
- Estimate Current Labor/Resource Commitment
- Identify Gaps
- Determine Risk Profile
- Conduct “Abridged” Institutional/Enterprise Risk Assessment

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Institutional/Enterprise Risk Assessment

I use the terms institutional risk and enterprise risk interchangeably, however I favor the use of institutional over enterprise for PPS because I tend to relate the word enterprise with a private enterprise.

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Risk Assessment Resources

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EHS Institutional/Enterprise Risk Assessment Severity/Consequence

Financial	Human
Very High - >$1,000,000 High - $100,001 – 1,000,000 Moderate - $10,001 – 100,000 Low - $1,001 – 10,000 Very Low – 0 - $1,000	Very High – Fatality/Catastrophe/Perm. Disability High – Serious Injury/Illness >3 Mo Disability Moderate – Serious Injury/Illness <3 Mo Disability Low – Minor Injury/Illness <1 Week Sick Leave Very Low – No Injury/Illness Only 1st Aid
Operations	**Environmental**
Very High – Cease Operation(s) High – Extensive Impact MOU* >1 Week Moderate – Extensive Impact SOU*/MOU <1 Week Low – Minor Impact Single Operating Unit (SOU) Very Low – Little or No Impact	Very High – Uncontrolled Release High – Controlled Release (High Impact) Moderate – Controlled Release (Mod. Impact) Low – Controlled Release (Min. Impact) Very Low – De Minimis Impact
Reputational	**Regulatory**
Very High – Multi-Media Release >1 Month High - Multi-Media Release <1 Month Moderate –Single Media Release (Inj./Illness) Low – Single Media Release (Reg. Issue Only) Very Low – No Media Coverage	Very High – Cease Operations High – Repeat Violations/Increased Fines Moderate – Citation & Fine/Permit Violation Low – Citation w/No Fine Very Low – No Citation

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Why these six risk categories?

These specific risk categories were selected based on my experience, knowledge and professional opinion regarding the role of EHS in the practice of Enterprise Risk Management (ERM)[1-6].

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Risk Categories

- Financial Risk – Risk of an economic loss/cost resulting from failure to adequately manage an EHS program.
- Operations Risk – Risk of a loss of personnel, equipment, utilities or classroom/building space critical to PPS objectives, strategy and operations.
- Reputational Risk – Risk of a loss of internal and/or public image, reputation or trust.

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Risk Categories Cont'd.

- Human Health/Safety Risk – Risk of human injury, illness, disability or fatality.
- Environmental Risk – Risk of a controlled or uncontrolled release of a hazardous material to air, water or soil.
- Regulatory Risk – Risk of regulatory finding resulting in a citation, fine and/or an impact on operations.

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Areas of Concern/Findings

Review of each program's operating strategy and abridged institutional risk assessment for each of the 57 EHS programs revealed that 25 programs are inadequately supported and present a range of institutional risks.

Specific recommendations for general areas of concern and each of the 25 programs are provided in the gap analysis report.

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Areas of Concern Cont'd.

Of the 25 programs of concern, those programs of greatest concern include, FAM operations safety, chemical fume hood certification, database management, fall protection, school safety committees and stage/auditorium safety.

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Recommendations

- Transition EHS from almost exclusive regulation compliance-based focus to focusing on institutional risk and relationships.
- Structure duties of new EHS Senior Manager to reduce time spent dealing with daily issues to allow adequate time for development of efficient program operating and compliance strategies, customer service and risk reduction.

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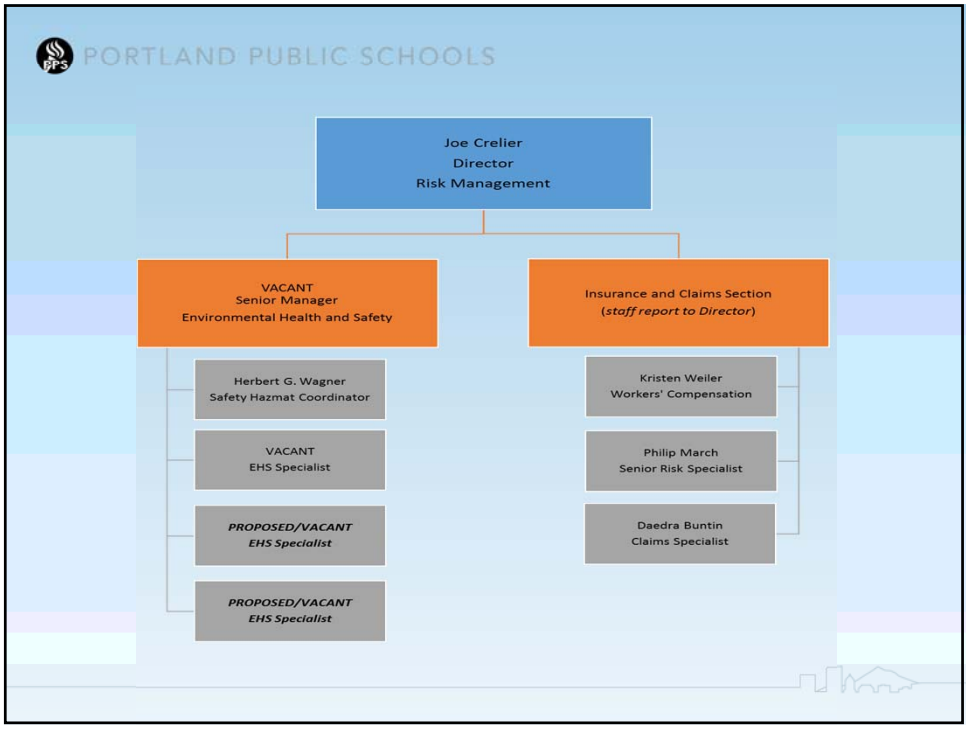
Recommendations Cont'd.

- Create two new EHS positions to adequately support all 57 programs. The two positions should include one safety professional and one industrial hygienist.
- EHS Senior Manager and Risk Management Director collaborate to organize duties of all EHS employees as needed based on each employee's skills and experience to create balanced workloads, reduced institutional risk and great customer service.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Joe Crelier
Director
Risk Management
VACANT
Senior Manager
Environmental Health and Safety
Insurance and Claims Section
(staff report to Director)
Herbert G. Wagner
Safety Hazmat Coordinator
VACANT
EHS Specialist
PROPOSED/VACANT
EHS Specialist
PROPOSED/VACANT
EHS Specialist
Kristen Weiler
Workers' Compensation
Philip March
Senior Risk Specialist
Daedra Buntin
Claims Specialist