

Letter Health Consultation

Phosphine gas and human exposures from Pond 15S

FMC SITE, EASTERN MICHAUD FLATS

CHUBBUCK AND POCATELLO, IDAHO

**Prepared by the
Idaho Department of Health & Welfare**

JUNE 2, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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June 1, 2010

Greg Weigel
EPA Idaho Operations Office
1435 North Orchard Street
Boise, Idaho 83706

RE: Phosphine gas and human exposures from Pond 15S, FMC site, Eastern Michaud Flats

Dear Mr. Weigel:

The Bureau of Community and Environmental Health (BCEH), ATSDR Cooperative Agreement Program, has completed an evaluation of the air sampling data you submitted to us on May 12, 2010, for the Pond 15S area of the FMC Eastern Michaud Flats Superfund site near Chubbuck and Pocatello, Idaho (see attached maps). These data are for the period February 25, 2010, through May 6, 2010. We conclude that the phosphine gas being released from Pond 15S is an urgent public health hazard to the health of people breathing the air in the proximity of Pond 15S, including workers, visitors to the pond area and any potential trespassers in the pond area. The real-time meter used to measure phosphine in ambient air at breathing zone height near the Pond 15S lift station number 1 (LS1, just north of Pond 15S) was maxed out (concentration was above the upper detection limit, UDL, of 20 ppm) for many of the readings in the data we reviewed. At concentrations above the meter UDL at LS1, breathing the air for just a few seconds could cause measurable harm and could be lethal. At median concentrations measured at LS1, breathing the air for 8 hours a day could cause respiratory tract damage. People near the Pond 15S perimeter and immediately downwind of LS1 could also be breathing phosphine at levels that could cause respiratory tract irritation if exposed for 8 hours a day. This is an urgent public health hazard for anyone on site in the RCRA pond area (workers, visitors and trespassers). Data collected over the

past 10 years along the fence line (both with the ponds open and capped) did not show phosphine above a level of concern (i.e. mostly below the lower detection limit (LDL) of 0.01 ppm) for that period. To ensure that phosphine in ambient air is not at a level of concern and to fully characterize any potential hazard, a more robust fence line monitoring program is recommended immediately.

Pond 15S is one of several capped impoundments on the site that generate phosphine from the degradation of phosphates. Pond 15S is approximately 150 by 300 meters in size. Pond 16S which is to the northwest of 15S was previously also releasing phosphine gas to ambient air but the release at pond 16S has been controlled. It is possible that other RCRA ponds in the pond area at the site could release phosphine in the future (see attached aerial photo and RCRA pond area map). The FMC portion of Eastern Michaud Flats has no production facilities left on site. Workers at the site are engaged in controlling and remediating contamination from phosphate product production. The site has a full-time health and safety manager and a health and safety plan specific to the RCRA pond area. The health and safety plan stipulates that all workers on site must have the 40-hour HAZWOPER certification. The plan does not require all workers entering the RCRA pond area to wear personal real-time phosphine monitors, but it does require workers who are doing task-specific jobs which might result in an exposure to phosphine above the OSHA PEL of 0.3 ppm to wear a monitor. Examples of such work would be checks of temperature and pressure monitoring equipment and servicing of phosphine gas extraction systems. For those wearing personal monitors, phosphine monitor “trigger levels” are:

- If readings show less than 0.3 ppm, the task may proceed without restrictions.
- If readings indicate the phosphine level is between 0.3 ppm and less than 0.5 ppm, task work will be restricted to 5-hours maximum.
- If readings attain 0.5 ppm and are sustained at this level (or higher) for longer than 5 minutes, exposed workers must relocate to positions upwind of the original task area. This upwind area must have sustained readings below 0.5 ppm.
- If workers in the upwind area need to re-enter the original work area after relocation, the original task area must be checked prior to re-entry. When approaching the original task area, the area should not be re-entered if phosphine readings are at or above 0.5 ppm. The person taking any reading prior to re-entry should not proceed further into the area once his/her monitor shows a concentration of 0.5 ppm or higher level during the approach. Work in the original task area can resume when readings in the original task area have decreased to less than 0.3 ppm.

In addition, any person performing work that might result in an exposure to phosphine above 0.5 ppm can only perform that work in the RCRA Pond Area with a “buddy”. We do not have any information to judge health and safety plan enforcement.

Phosphine has a vapor density of 1.2 (slightly heavier than air) and can settle and concentrate in low-lying areas. Phosphine is very flammable (NFPA rating = 4), highly reactive, and highly toxic to humans. Phosphine’s lower explosive limit (LEL) in air is approximately 18,700 ppm. Inhalation of phosphine gas can adversely affect the respiratory, nervous and gastrointestinal systems, and the heart, liver, and kidneys. Acute effects resulting from short-term exposures to concentrations above 2 ppm include lung irritation, cough and chest

tightness, nausea, vomiting, abdominal pain, dizziness, lethargy and convulsions. Edema (fluid on the lungs) and liver and kidney toxicity can follow but is usually delayed. Chronic effects resulting from long-term exposure to concentrations in the range of 0.5 to 1 ppm include bronchitis, gastrointestinal distress, neurological effects, and anemia. In some cases jaw swelling and bone deterioration can develop causing increased risk for bone fracture. Liver and kidney toxicity can develop over time, as well as chemical-induced asthma.

The Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) is 0.3 ppm as an 8-hour time-weighted average. The PEL is the level intended to be protective of workers' health for an entire 8- or 10-hour work shift. The National Institute for Occupational Safety and Health (NIOSH) short-term exposure limit (STEL) for phosphine is 1 ppm. This is a 15-minute time-weighted average concentration that should not be exceeded during any part of a workday. NIOSH has established 50 ppm as the immediately dangerous to life and health (IDLH) concentration for phosphine gas. The IDLH is the concentration that could result in death or irreversible health effects, or could prevent the exposed individual from escaping the contaminated environment within 30 minutes. Median concentrations in ambient air at LS1 are above both the OSHA PEL and the NIOSH STEL. We need more monitoring data using a method with a higher UDL to determine if the IDLH concentration is being exceeded.

On-site exposure in the RCRA pond area.

At least two and usually several more workers are on site and have access to the RCRA pond area on a given day. The total number of people on site varies greatly and the numbers are higher on days when visitors (agencies, tribes, consultants, others) are present. Visitors to the site are held to the workplace health and safety standards set forth in the site specific health and safety plan. Sampling using real-time area air monitors at LS1 between February 25 and May 6, 2010, indicated that concentrations of phosphine gas in ambient air were highly variable and frequently above levels known to cause harm to humans. Samples were generally taken 3-4 times per 24-hour period at approximately 4 to 6 hour intervals. The phosphine monitoring instrument's UDL of 20 ppm was routinely exceeded. During the month of April 2010, the median phosphine concentration at the LS1 area monitor was 3.4 ppm, and the mean was 5.6 ppm. However, since the monitoring instrument only goes to 20 ppm and five of the readings used to calculate the median and mean were reported to be 20 ppm or greater it is very possible that the mean is much higher. Estimated phosphine concentrations under the pond cap range from approximately 20,000 to 70,000 ppm. It is therefore possible that the NIOSH IDLH level is being exceeded in areas where workers are present, especially given the highly variable phosphine concentrations and potential for shifting wind directions.

Off-site potential exposure.

To the north of the site are two roads, East County Road and Interstate 86. Pond 15S is approximately 400 meters from East County Road and 600 meters from Interstate 86. The Pocatello Airport business park is approximately 1.5 kilometers northwest of Pond 15S and the airport passenger terminal is approximately 2.2 kilometers in the same direction. The nearest residences are 2 kilometers due north of Pond 15S. Current fence line monitoring consists of a worker taking a reading at breathing level at a few points on the fence line once a day. Reports from EPA for the past 10 years indicate that fence line phosphine readings have

been non-detect on the instrument used, which has a LDL of 0.01 ppm plus or minus 5%. This instrument is adequate, though once-a-day monitoring at a few points along the fence is not adequate to determine if there is a risk to the public from phosphine. Without more frequent monitoring data collection, it is not possible to know what current risk, if any, there is to the public at the fence line.

To prevent adverse health effects, BCEH recommends:

- Local emergency response personnel remain apprised of the potential risks on-site. The phosphine issue under the pond covers has been in the news for several years; however, the local fire and police departments should be made aware of the current leak from the lift station at Pond 15S.
- Engineering controls and work practices to minimize contact with phosphine should be an immediate priority at the pond area of the site. Contractors working to lower the phosphine concentration under the Pond 15S cap must take the LEL, flammability and toxicity risks into consideration.
- Efforts are made to assure that there is no trespassing into the pond area, including inspection of current fences and additional signage if lacking. Signage should be in both Spanish and English, and should clearly state the potential health risk to trespassers.
- Efforts are made to more comprehensively monitor phosphine levels at the fence line, specifically on the north side of the pond area, to determine if the public right-of-way is being impacted by phosphine. Monitors should be placed at ground level as well as at breathing height since phosphine is heavier than air. The LDL should be an order of magnitude below the PEL. Frequency of sampling at minimum should be several times per day at different times of the day.
- EPA and FMC pursue controls and formulate an ongoing sampling plan.
- All persons entering the RCRA pond area be required to wear/carry a real-time portable phosphine monitor.
- OSHA be consulted to ensure that OSHA standards are met and NIOSH worker respiratory protection recommendations are followed onsite.

The following items will be completed as part of the Public Health Action Plan for this site. BCEH will coordinate through ATSDR to support EPA in:

- Ensuring local emergency personnel remain apprised of the potential risks on-site.
- Distributing a copy of this Letter Health Consultation to all interested parties.
- Working to ensure fencing and signage (in both Spanish and English) are adequate to keep people out and warn them of the dangers of phosphine gas.
- Working to review proposed sampling plans for the RCRA pond area.
- Assessing new monitoring data as they become available and reporting findings.
- Consulting OSHA to ensure that the RCRA Pond Area health and safety plan complies with appropriate OSHA standards and that the respiratory protection program conforms to NIOSH recommendations.

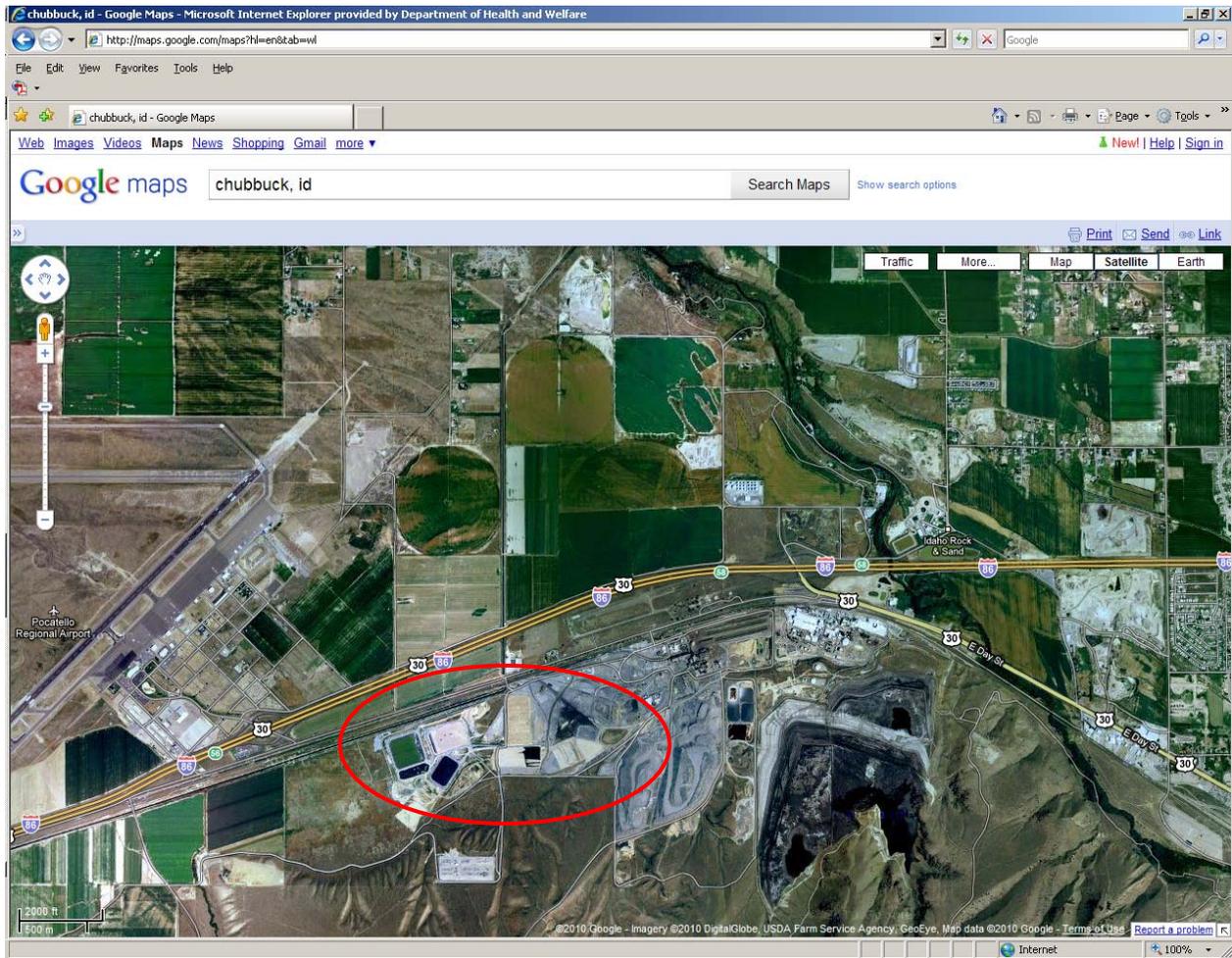
Feel free to provide my contact information (listed in the first page header) to other interested parties involved in this matter. If you have questions, please feel free to contact BCEH any time.

Best regards,

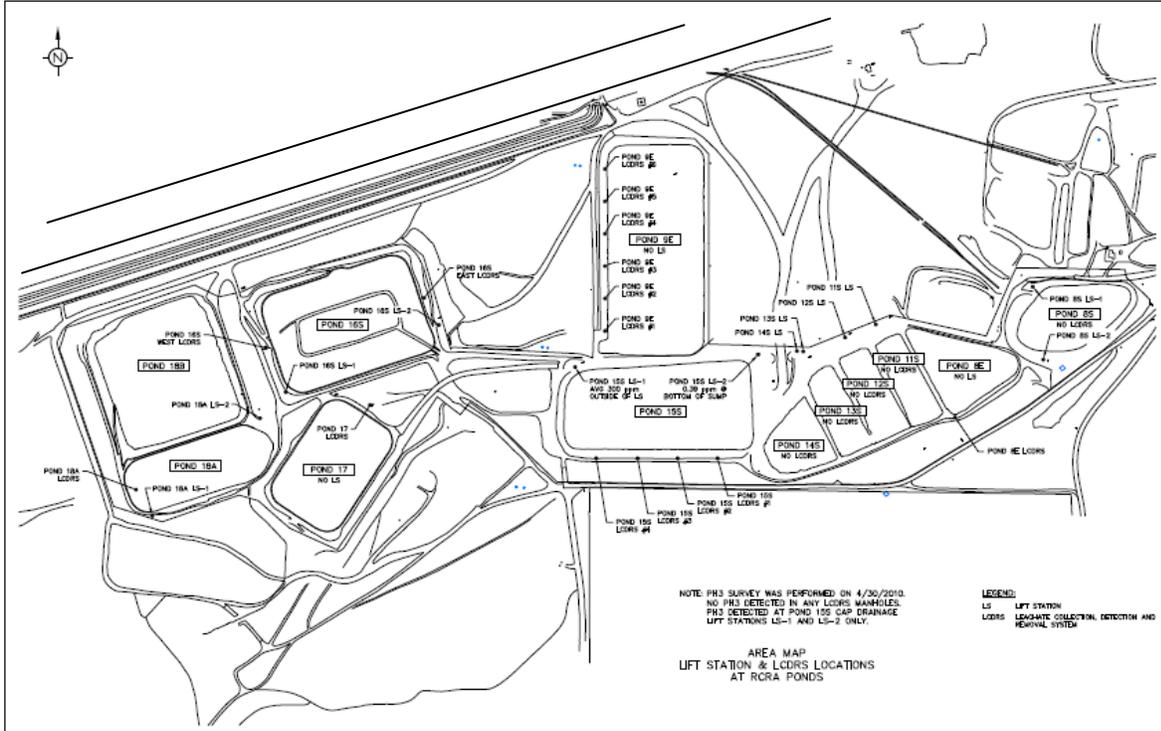
A handwritten signature in black ink, appearing to read 'K. Elgethun', with a long horizontal flourish extending to the right.

Kai Elgethun Ph.D., MPH
Public Health Toxicologist
Idaho Dept. of Health and Welfare

Attachments (3): Aerial photo of vicinity; Map of RCRA Ponds; References.



Screen shot of an aerial image with the RCRA pond area circled in red. East County Rd. runs adjacent to the site and parallel to Interstate 86. The Pocatello Airport and business park is visible on the left side of the photo. Outlying residential areas in Chubbuck/Pocatello are visible on the right side of the photo.



RCRA pond area map. Pond 15S is in the center of the map. The site fence line is adjacent to Pond 9E. East County Road is represented by the lines paralleling the fence line on the north side.

REFERENCES

ATSDR (April 2002; accessed May 2010). ToxFAQs for Phosphine. Available online: <http://www.atsdr.cdc.gov/tfacts177.html>.

FMC. FMC Report on Phosphine at FMC Pond 15S. Response to EPA Questions dated April 19, 2010 (Submitted April 26, 2010 (43 pages, plus 5 addendum pages for Table 3).

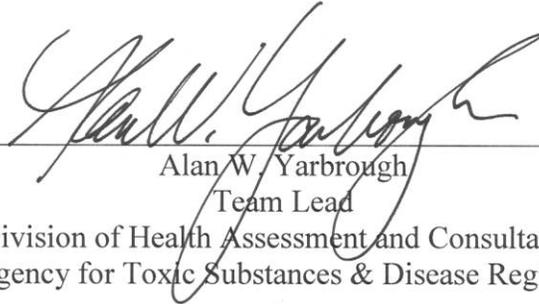
OEHHA-Cal/EPA (9/24/03; accessed May 2010). Technical support document: Toxicology. Clandestine drug labs: Methamphetamine. Vol. 1, Number 5. PHOSPHINE. Available online: http://www.oehha.org/public_info/pdf/TSD%20Phosphine%20Meth%20Labs%2010'8'03.pdf.

CERTIFICATION

This health consultation was prepared by the Idaho Division of Public Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. The editorial review was completed by the Cooperative Agreement partner.



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