



Pawhuska High School ER

August 14, 2017 - EPA Activation

621 East 15th Street, Pawhuska, OK 74056

VAPOR SEEP / SCHOOL IMPACT ASSESSMENT

August 14 to 21, 2017

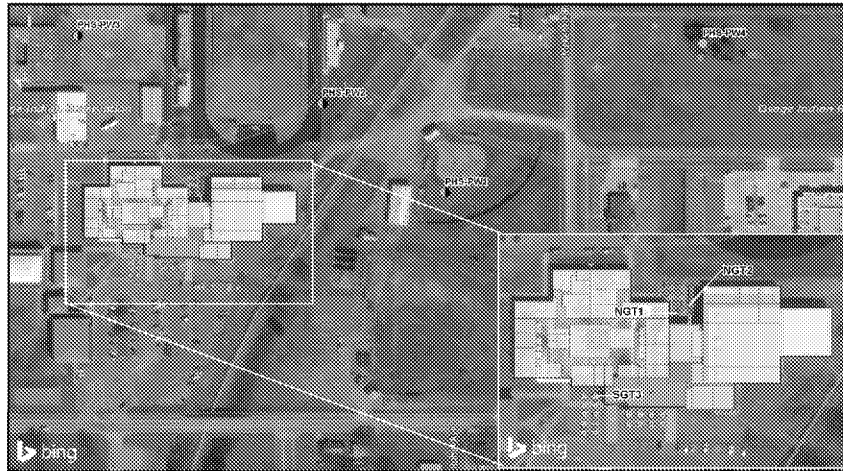
OSC Adam Adams

EPA Objectives: EPA responded at the request of Oklahoma to assess indoor and outdoor air quality relative to unknown vapor seeps at the north and south entrances/exits.

Pawhuska High School ER Toxicity Summary

- All air sampling results were **BELOW** screening levels used by the U.S. Environmental Protection Agency for chemicals of concern.
- The air sampling results were compared to the EPA Regional Screening Levels for residential air.
- Screening levels are used when a situation is initially investigated to determine if potentially harmful levels of chemicals are present that warrant further investigation.
- The screening levels are developed using default exposure factors and toxicity factors associated with the chemicals of potential concern.
- Exposure factors are things such as how much air a person breaths in a day.
- Toxicity factors describe the harm a certain amount of a chemical could potentially cause.

Pawhuska High School ER Site Map



Legend

- Production Well Status**
- Well has been Plugged
 - Well has NOT been Plugged
- Geothermal Features**
- North Geothermal (NGT) Wells
 - South Geothermal (SGT) Wells
 - Geothermal Lines
- Site Boundary**
- Site Boundary
 - Site Feature



US EPA REGION 6

PAAHUSKA HE ER
251 E. 10TH ST.
PAAHUSKA, OSAGE COUNTY, OKLAHOMA

DATE AUGUST 2013	PROJECT NO. N/A	SCALE AS SHOWN
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Pawhuska High School ER

■ EPA Task 1:

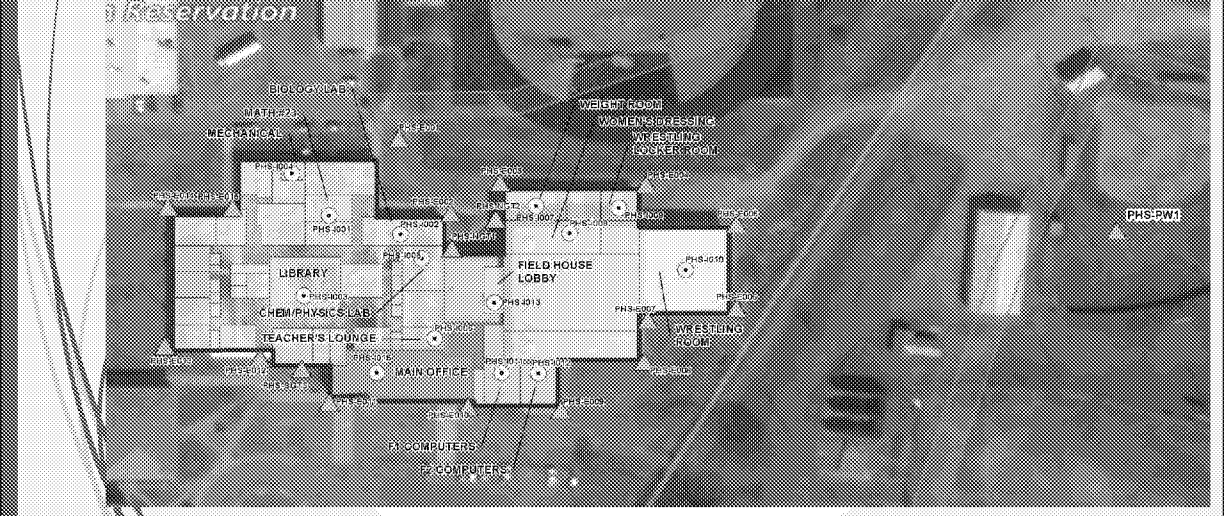
■ Air monitoring (daily)

- Indoors (high school)
- Outside
 - North Geothermal well area (NGT)
 - South Geothermal well area (SGT)
 - Softball field, right field

■ Air Monitoring

- TVA-1000 PID/FID
- 4 Gas MultiRae Plus (Oxygen, Volatile Organic Compounds (VOC's), Hydrogen Sulfide, Lower Explosive Limit (LEL))
- Indoors – Breathing zone 3 to 5 feet above ground
- Outside – Breathing zone 3 to 5 feet above ground
 - NGT – Breathing zone and 2 feet above upper extent of NGT1 and NGT2 in excavations and 0 to 3 inches above ground surface at all other NGT locations.
 - SGT – Ground level to 3 inches above ground (no pits)
 - Softball Field – Ground level to 3 inches above ground (no pit)

Pawhuska High School ER Air Monitoring Locations



Pawhuska High School ER – Air Monitoring

- EPA Daily Air Monitoring (08/15 – 21/17) for Volatile Organic Compounds (VOC's):
- **High School Indoors** (maximum VOC measurement during this period): 1.77 ppm
- **High School Outside** (maximum measurements during this period):
 - North Geothermal well (NGT) area (0 to 3 inches, not including NGT 1 and 2) – 3.83 ppm
 - NGT 1 and NGT 2 excavated pits (2 feet above seep) – 9,600 ppm
 - NGT 1 and NGT 2 excavated pits (breathing zone) – 78 ppm
 - South Geothermal well (SGT) area (0 to 3 inches, not including SGT 3) – 79 ppm
 - SGT 3 (0 to 3 inches) – 4,800 ppm
 - High School Perimeter (0 to 3 inches) – 2.08 ppm
 - Softball field, right field, previously plugged well – 9,400 ppm
 - Just north of practice field, not a plugged well (0 to 3 inches) – 60,000 ppm
- **Note:** LEL for methane is 50,000 ppm / TLV for methane is 1,000 ppm



Pawhuska High School ER Air Monitoring Guidance for Methane

- **National Institute of Occupational Safety and Health (NIOSH).** The Threshold Limit Value (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) is the level to which a worker can be exposed day after day for a working lifetime without adverse effects. The NIOSH TLV for methane is 1,000 ppm.

Methane – Characteristics and Hazards

- **Methane gas.**
 - Colorless, odorless gas that is lighter than air, and flammable.
 - The explosive limits of methane gas are 5 to 15 %volume, which would be 50,000 to 150,000 ppm.

Pawhuska High School ER

■ EPA Task 2:

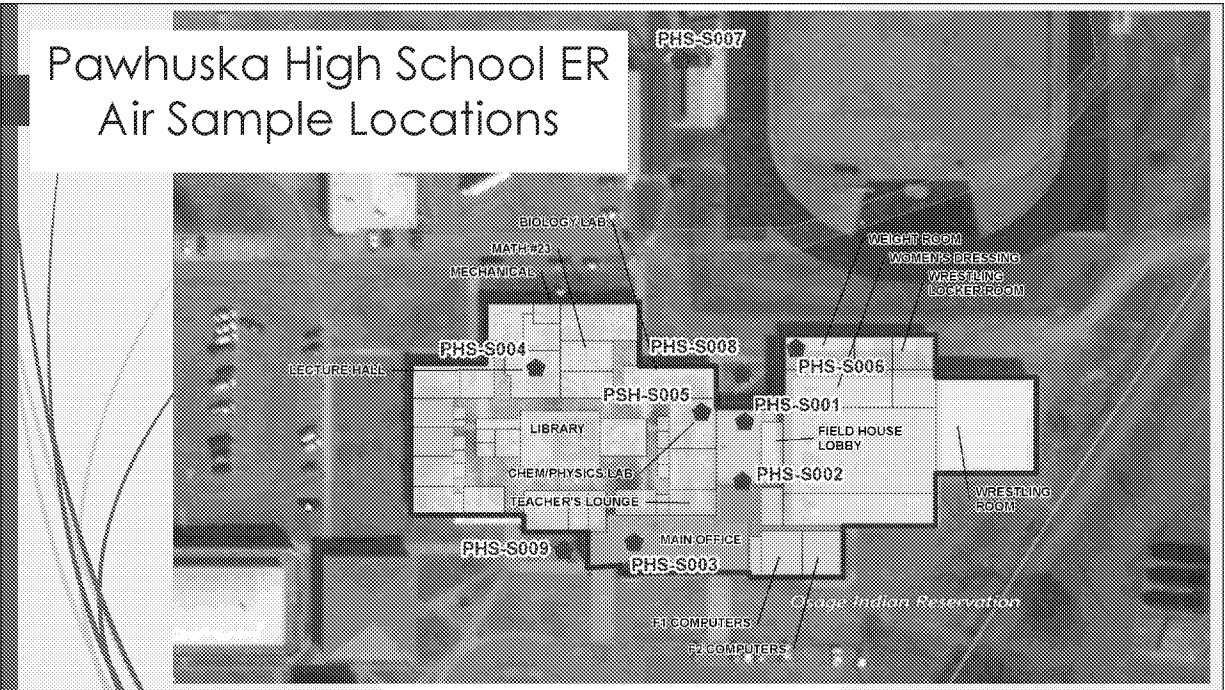
■ Air Sampling (8/17/17)

- Indoors (high school)
- Outside
 - NGT, SGT, and Background

■ Air Sampling – Summa Canisters

- 8 Hour samples collected at 3 to 4 feet above ground
- 6 Samples inside the high school
- 3 Samples and 1 duplicate (co-located) sample outside
- Methods of Sample Analysis
 - TO 18m – Methane, Ethane, Propane, Butane, and Pentane
 - TO 15 – 62 Volatile Organic Compounds (VOC's)

Pawhuska High School ER Air Sample Locations





Pawhuska High School ER Air Sampling Methods and Results

- EPA Air Sampling (08/17/17) for gases (EPA Method 18 Mod/EPA EPA 25 Mod) and Volatile Organic Compounds (VOC's), (Method TO-15 VOA EXT. List):
- **EPA Method 18 Mod/EPA EPA 25 Mod includes methane, ethane, propane, butane, and pentane:** All results were non-detect except for methane in the sample and co-located duplicate sample between NGT1 and NGT2. Results were 12.31 ppm and 10.1 ppm respectively. Out of 5 volatile organic compounds analyzed, only methane was detected.
- **Method TO-15 (for 62 volatile organic compounds (VOC's)):**
 - Out of the 62 volatile organic compounds analyzed, 48 compounds were not detected during analysis. Fourteen compounds were above the Method Detection Limits (MDLs) for the analysis and below EPA Regional Screening Levels (RSL's).
 - EPA Regional Screening Levels (RSL's) are risk-based concentrations derived from standardized equations combining exposure information assumptions with the latest EPA toxicity data. RSLs are considered by the Agency to be protective for humans (including sensitive groups) over a lifetime.

Pawhuska High School ER Air Sampling Results

Air Sampling Results Summary

Analyte	Number of Detections	Maximum Detection	RSL	TLV	PEL	Units
Methane	2	12.31	---	1000	---	ppm
Dichlorodifluoromethane	10	0.000610	0.00238	---	---	ppm
Trichlorofluoromethane	10	0.002980	---	1000	---	ppm
Pentane	10	0.021640	0.03389	---	---	ppm
Acetone	10	0.011300	1.34711	---	---	ppm
Methylene Chloride	1	0.000660	0.01813	---	---	ppm
Trans-1,2-Dichloroethene	6	0.000650	---	---	200	ppm
Hexane	10	0.004530	0.02071	---	---	ppm
2-Butanone	10	0.002500	0.17634	---	---	ppm
Benzene	2	0.000270	0.00097	---	---	ppm
Heptane	10	0.001040	0.01025	---	---	ppm
Toluene	10	0.000650	0.13800	---	---	ppm
Octane	3	0.000360	---	---	300	ppm
m/p-Xylene	2	0.000230	0.00230	---	---	ppm
1,2,4-Trimethylbenzene	2	0.000210	0.00128	---	---	ppm

The additional 52 analytes were not detected at the reporting limit.

RSL = Regional Screening Level
 TLV = Threshold Limit Value
 PEL = Permissible Exposure Limit
 ppm = Parts Per Million



Pawhuska High School ER Exposure Guidance Levels

- **EPA Regional Screening Levels (RSL's):** Risk-based concentrations derived from standardized equations combining exposure information assumptions with the latest EPA toxicity data. RSLs are considered by the Agency to be protective for humans (including sensitive groups) over a lifetime.
- **OSHA Permissible Exposure Limit (PEL):** Maximum allowable amount in a workroom during an 8-hour work day in a 40-hour work week.
- **National Institute of Occupational Safety and Health (NIOSH):** The Threshold Limit Value (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) is the level to which a worker can be exposed day after day for a working lifetime without adverse effects.

Pawhuska High School ER

- ▣ **Summary of EPA Response.**
- ▣ **EPA Objectives:** EPA responded at the request of Oklahoma to assess indoor and outdoor air quality relative to unknown vapor seeps at the north and south entrances/exits.
- ▣ **Indoors:** Based on daily air monitoring (August 15 to 21, 2017) and air sampling results (collected August 17, 2017), no hazardous air quality conditions have been found inside the high school.
- ▣ **Outdoors:** Based on daily air monitoring (August 15 to 21, 2017) and air sampling results (collected August 17, 2017), the only hazardous conditions that were observed were at ground level at well (PW4) located on the north side of the practice football field. The hazardous conditions measured at PW4 were for VOC's detected with a FID/PID measured on August 20 and 21, 2017 at ground level. VOC concentrations were detected up to 60,000 ppm on the FID and <2 ppm on the PID indicating that Methane was likely present. The lower explosive limit for methane is 50,000 ppm.