

# HEALTH EFFECTS OF PFAS

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# PFAS

PER- AND POLY-FLUOROALKYL SUBSTANCES

- HUMAN-MADE CLASS OF CHEMICALS WITH A WIDE VARIETY OF APPLICATIONS



Oil



Heat



Water

- EXTREMELY STABLE IN THE ENVIRONMENT  WIDELY DISTRIBUTED

Contaminated water



Firefighting foams



Contaminated food



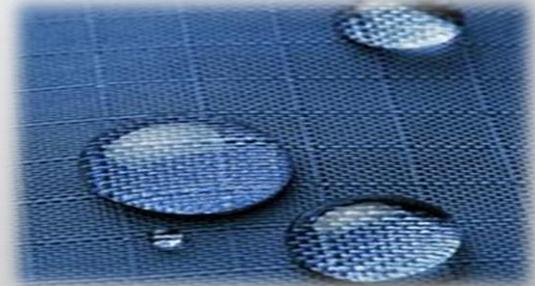
## HOW CAN I BE EXPOSED TO PFAS?



Hand to mouth transfer



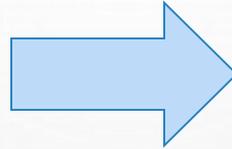
Maternal Transfer



PFAS treated fabrics

# WHAT IF I'M EXPOSED?

Globally Distributed



Human Exposure

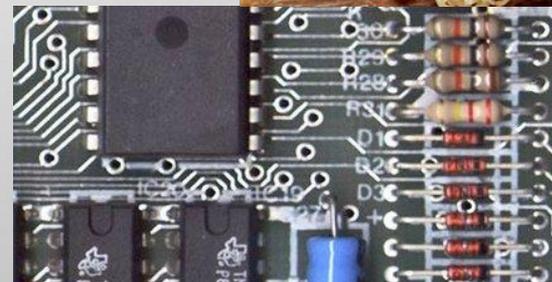
NHANES survey found  
PFAS present in the  
blood of nearly every  
person tested (> 2,000  
people)

EXPOSURE DOESN'T ALWAYS LEAD TO HEALTH EFFECTS!



# PFAS Use in products

- Fire Fighting Foams
- Cookware, pizza boxes, fast food wrappers, popcorn bags...
- Stain repellants for carpets, clothing, furniture...
- Personal care products – shampoo, conditioner, toothpaste, floss...
- Polishes, waxes, and paints
- Electronics manufacturing





# Contaminated Site Regulatory Process

## Site Discovery

- Spill occurs and is reported
- Contamination discovered
- Compounds found to be harmful

## Characterization

- What is it
- Where is it
- How did it get there
- Where is it going
- Who and what may be effected

Evaluate  
Cleanup  
Options

## Cleanup and Mitigation

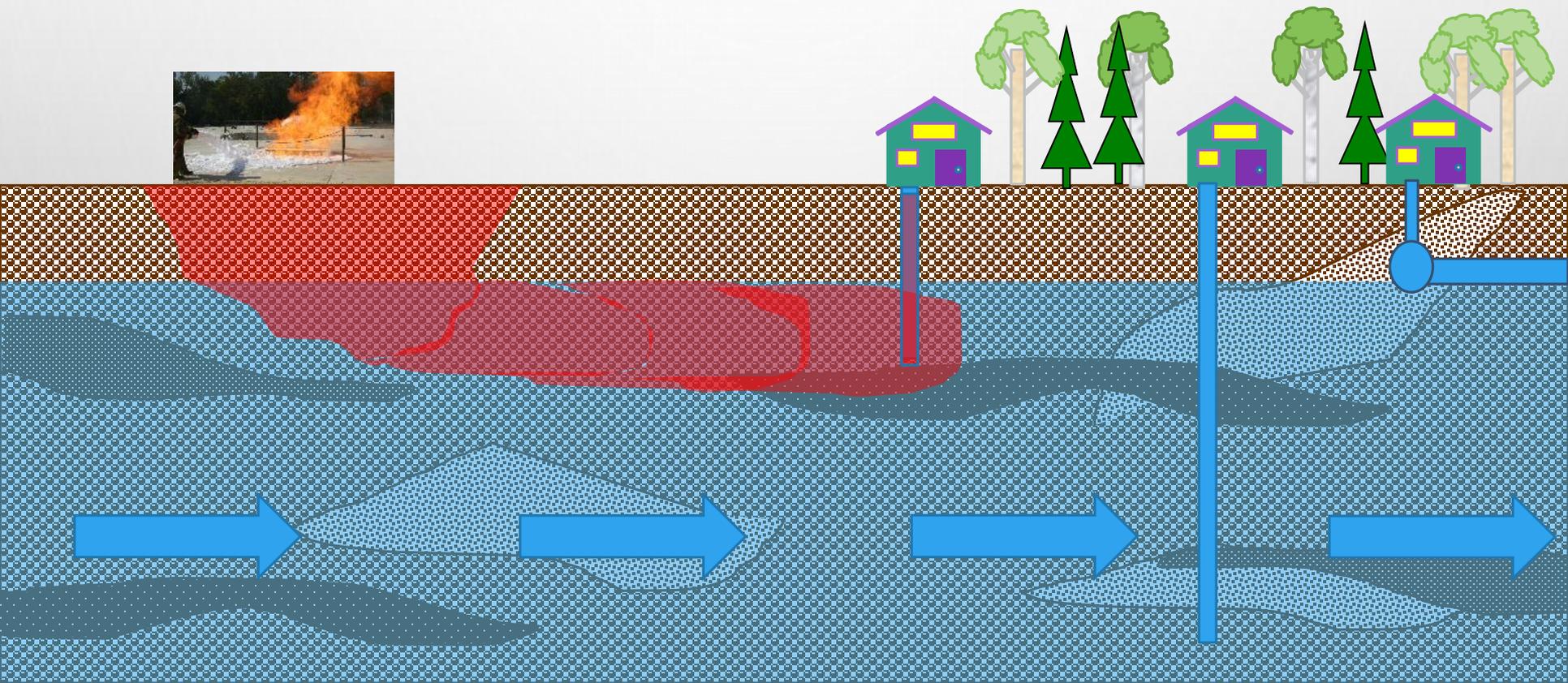
- Interim actions  
(e.g., provide water)
- Long-term Solution

Site Closure



# Contaminant Transport in Groundwater

- Soluble contaminants can be transported in groundwater
- As groundwater moves, it will carry dissolved substances with it
- If an ongoing source exists, plume will expand





# PFAS AWARENESS

## 2012-2015

- Third Unregulated Contaminant Monitoring Rule (UCRM3)

## 2016

- EPA Lifetime Health Advisory level 70 ppt PFOA+PFOS
- DEC groundwater cleanup 400 ppt PFOA and 400 ppt PFOS

## 2018

- DEC action level 70 ppt for five PFAS



# DEC PFAS ACTION LEVELS (Aug 2018)

Contaminant	
perfluorooctanesulfonic acid (PFOS)	Summed Action Level <b>70 ppt</b>
perfluorooctanoic acid (PFOA)	
perfluorononanoic acid (PFNA)	
perfluorohexanesulfonic acid (PFHxS)	
perfluoroheptanoic acid (PFHpA)	
perfluorobutanesulfonic acid (PFBS)	Action Level <b>2000 ppt</b>



# GUSTAVUS WATER WELL SAMPLES TO DATE

## SUMMARY OF INITIAL GUSTAVUS SAMPLE RESULTS - REVISED

Analyte			Perluoro-butane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluoro-nonanoic acid (PFNA)	Perfluoro-hexane sulfonic acid (PFHxS)	Perfluorooctanoic acid (PFOA)	Perfluorooctane sulfonate (PFOS)	Sum of 5 PFAS <sub>§</sub>
ADEC Action Level			2,000	70 <sub>§</sub>					70 <sub>§</sub>
Sample Name	Well Owner	Sample Date	ppt	ppt	ppt	ppt	ppt	ppt	ppt
<i>Alaska Airlines Well AE20399</i>	ADOT&PF	6/27/18	3.7 JH*	7.4 JH*	0.39 JL*	26 JL*	3.1 JL*	<b>250 JL*</b>	<b>287 J*</b>
<i>Gustavus Water Plant AE20398</i>	NPS	6/27/18	<1.9 B*	8.0 JH*	0.41 JL*	14 JL*	5.5 JL*	16 JL*	44 J*

ppt parts per trillion, equivalent to nanograms per liter

ADEC Alaska Department of Environmental Conservation

ADOT&PF Alaska Department of Transportation & Public Facilities

NPS National Park Service

§ Sum of 5 PFAS is equal to the sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA. Action level is 70 ppt; results are compared to 65 ppt. ADEC technical memorandum issued August 20, 2018.

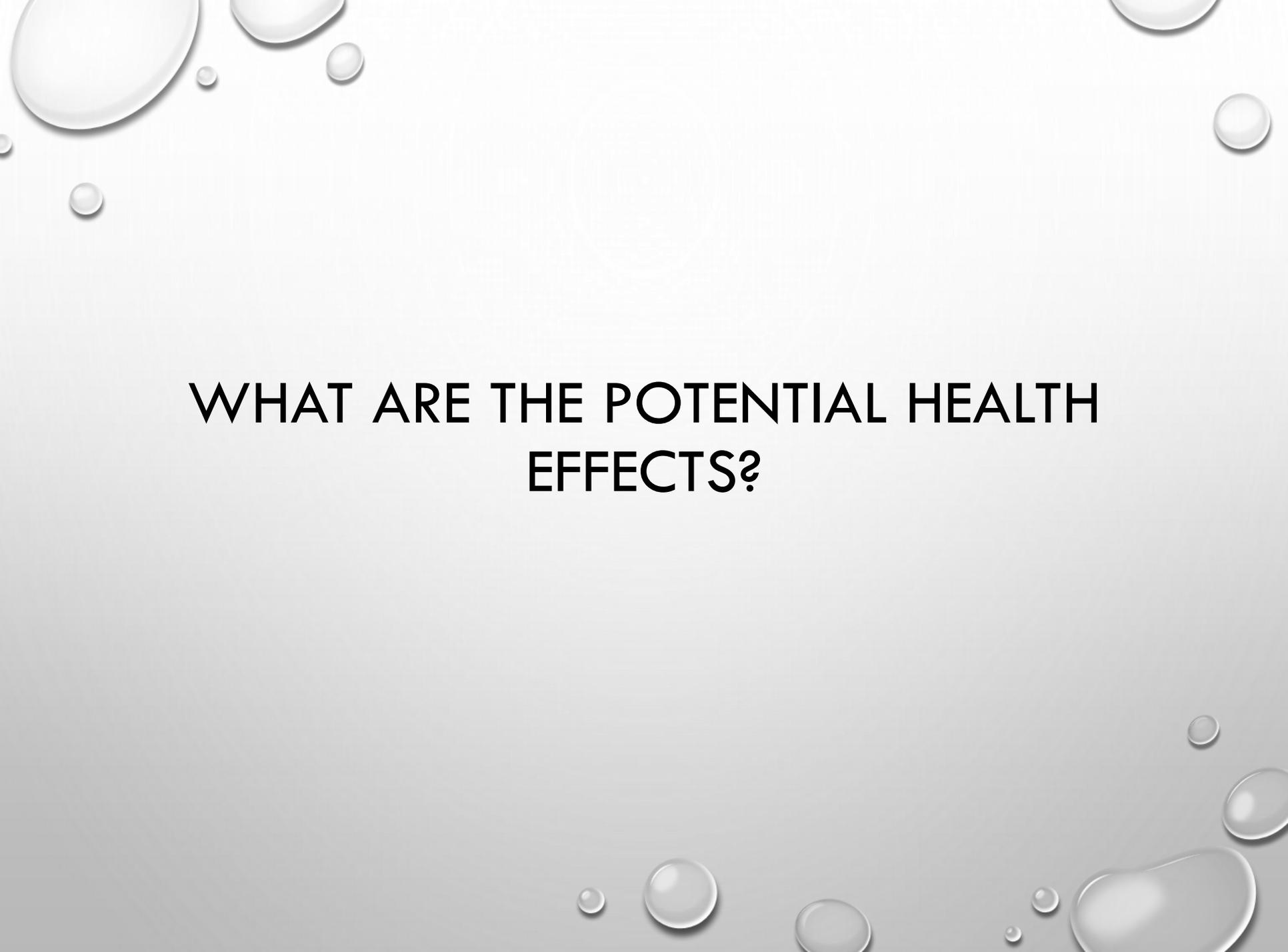
**Bold** Concentration exceeds action level.

< Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control (QC) failures.

B\* Result considered non-detect due to method blank contamination. Listed as less than the reporting limit. Flag applied by Shannon & Wilson, Inc.

JH\* Estimated concentration, biased high, due to method blank contamination. Flag applied by Shannon & Wilson, Inc.

JL\* Estimated concentration, biased low, due to extraction outside the specified holding time. Flag applied by Shannon & Wilson, Inc.

The background of the slide is a light gray gradient. It is decorated with several realistic water droplets of various sizes, scattered primarily in the top-left and bottom-right corners. The droplets have highlights and shadows, giving them a three-dimensional appearance.

**WHAT ARE THE POTENTIAL HEALTH  
EFFECTS?**

# WHAT DOES THE SCIENCE SAY?

- PFAS ARE AN “EMERGING” CONTAMINANT
  - SCIENCE IS STILL EVOLVING
  - CURRENT GUIDANCE BASED OFF OF:
    - EPIDEMIOLOGICAL STUDIES
    - EVIDENCE FROM ANIMAL TOXICITY TESTS
- STUDIES OF HIGHLY EXPOSED COMMUNITIES SHOW A PROBABLE LINK BETWEEN EXPOSURE TO CERTAIN TYPES OF PFAS AND EFFECTS ON:
  - GASTROINTESTINAL SYSTEM- ULCERATIVE COLITIS
  - LIVER- LIVER DAMAGE, ABNORMAL FAT METABOLISM, HIGH CHOLESTEROL
  - KIDNEY- KIDNEY CANCER AND CHRONIC KIDNEY DISEASE
  - CARDIOVASCULAR SYSTEM- PREGNANCY-INDUCED HYPERTENSION
  - IMMUNE SYSTEM- DECREASED RESPONSE TO VACCINES
  - REPRODUCTIVE SYSTEM- TESTICULAR CANCER AND DECREASED FERTILITY
  - ENDOCRINE SYSTEM- THYROID DISEASE
  - DEVELOPMENT- REDUCED BIRTH WEIGHT



# LIMITATIONS OF EXISTING DATA

## EPIDEMIOLOGICAL STUDIES

- CONFOUNDING VARIABLES
- IS THERE ANOTHER POSSIBLE EXPLANATION FOR EFFECTS?
  - PRESENCE OF OTHER CONTAMINANTS
  - GENETICS, AGE, GENDER
  - SOCIOECONOMIC AND NUTRITION STATUS

## ANIMALS EXPOSURES

- HIGHER EXPOSURE LEVELS
- DIFFERENCES IN PHYSIOLOGY BETWEEN SPECIES AFFECT:
  - ABSORPTION, DISTRIBUTION, METABOLISM, EXCRETION
  - SENSITIVITY TO CONTAMINANT EXPOSURE

Scientists are still uncertain how long-term, chronic PFAS exposure to may impact human health.

# ANYTHING ELSE?

Developing embryos and children through age 18 are considered to be “susceptible populations” according to the U.S. Agency for Toxic Substances and Disease Registry toxicological profile for PFAS

- THIS IS BECAUSE OF:
  - TRANSFER FROM MOTHER TO CHILD DURING PREGNANCY AND BREASTFEEDING
  - HAND-TO-MOUTH TRANSFER AFTER HANDLING OBJECTS/CRAWLING
  - HIGHER CONCENTRATION PER KG OF BODY WEIGHT
  - CONTAMINANTS THAT CAUSE DEVELOPMENTAL AND ENDOCRINE EFFECTS CAN HAVE PERMANENT EFFECTS AT LOWER CONCENTRATIONS IN CHILDREN
- THE BENEFITS OF BREASTFEEDING OUTWEIGH THE POTENTIAL RISKS
  - WE RECOMMEND YOU CONTINUE BREASTFEEDING,
  - IT IS ESSENTIAL THAT PREGNANT AND NURSING WOMEN DO NOT CONTINUE TO DRINK PFAS-CONTAMINATED WATER

# Questions About:

**HUMAN HEALTH EFFECTS**

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# DHSS RECOMMENDATIONS

IF PFAS EXCEEDS DEC'S 70 PPT ACTION LEVEL, YOU SHOULD:

## FIND AN ALTERNATIVE WATER SOURCE FOR



Drinking



Giving to pets



Brushing your teeth

## YOU CAN CONTINUE USING THE WATER FOR



Showering/Bathing



General cleaning



Laundry