Pasco Sanitary Landfill: Managing a Subsurface Fire at a MTCA Cleanup Site

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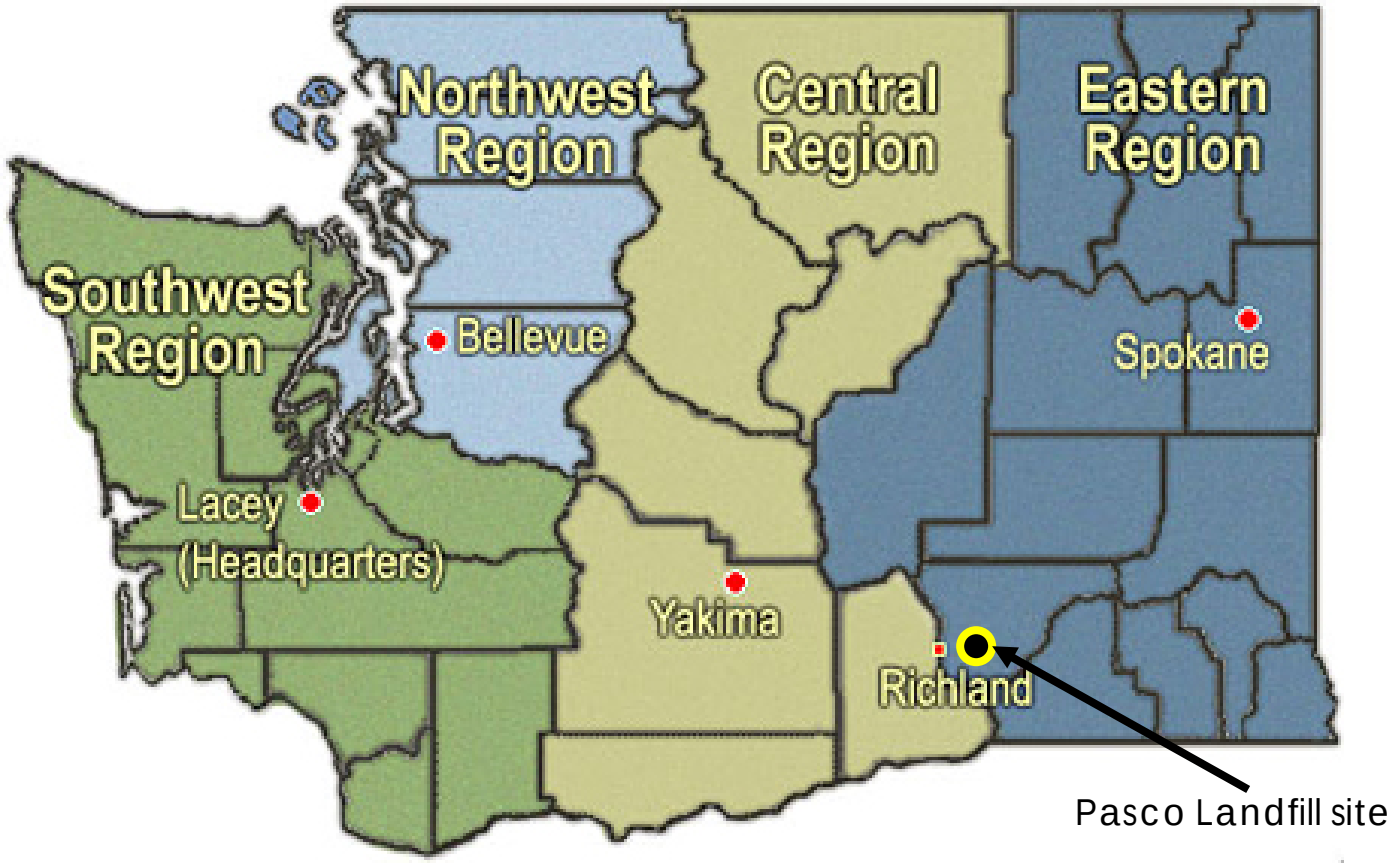
DEPARTMENT OF ECOLOGY
State of Washington

How the public sometimes perceives the pace of environmental cleanup at complex sites

Department of Ecology
Regional and Field Offices



Topics for today

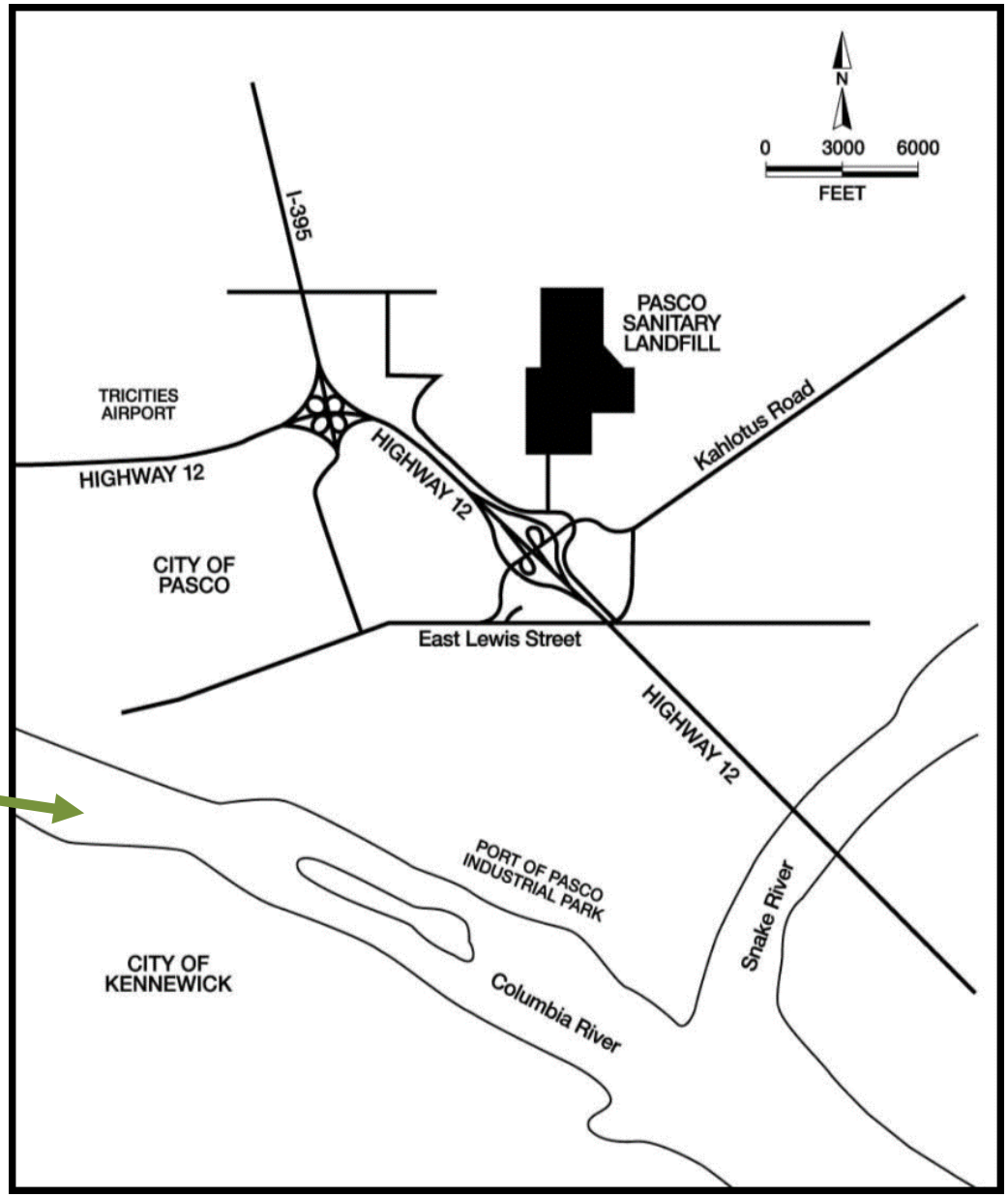
- Site history
- Cleanup activities: Past & present
- Landfill fire basics
- Balefill area fire: Initial actions
- Final fire extinguishment
- Lessons learned
- Ongoing activities

Pasco Landfill site history

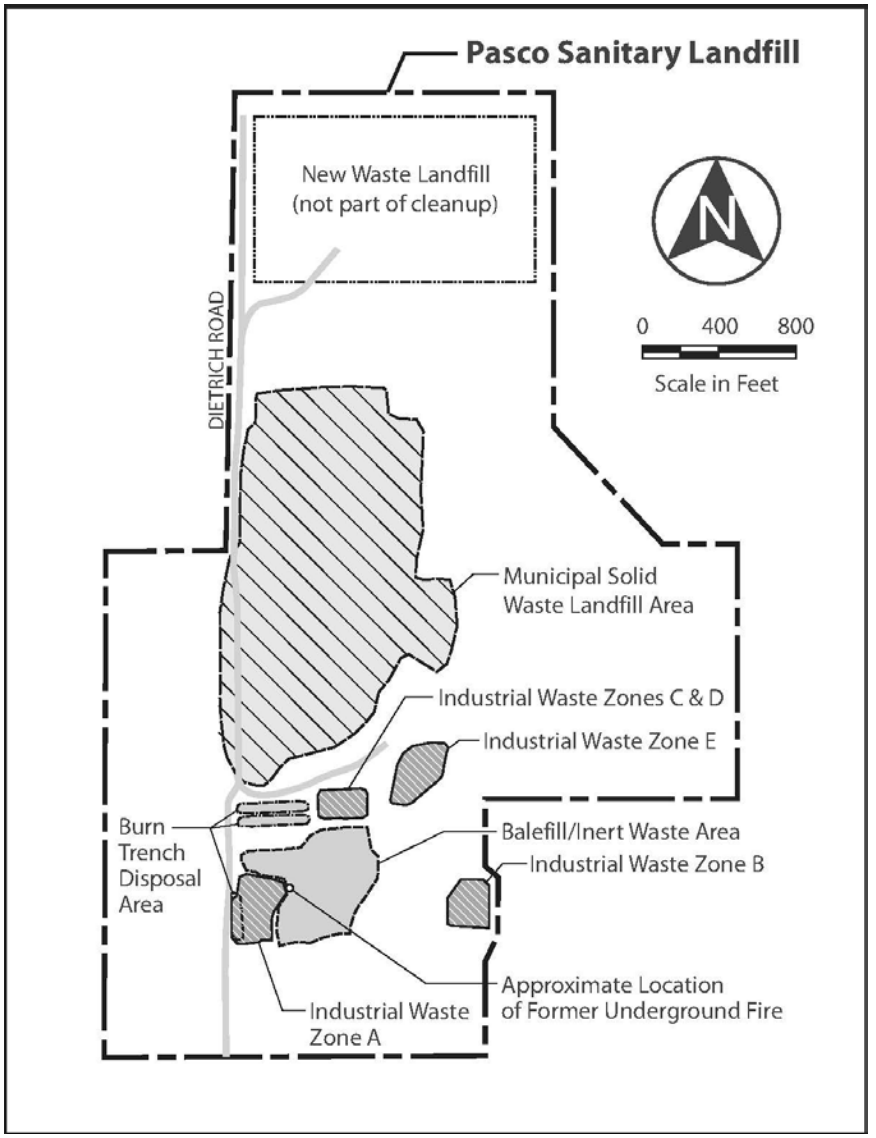
Site location

Dietrich Road by intersections of Kahlotus Road and U.S. Highway 12

Columbia River



Site map


Pasco Sanitary Landfill
New Waste Landfill
(not part of cleanup)
N
0
400
800
Scale in Feet
DIETRICH ROAD
Municipal Solid
Waste Landfill Area
Industrial Waste Zones C & D
Industrial Waste Zone E
Burn
Trench
Disposal
Area
Balefill/Inert Waste Area
Industrial Waste Zone B
Approximate Location
of Former Underground Fire
Industrial Waste
Zone A

Aerial view

SVE = Soil vapor extraction

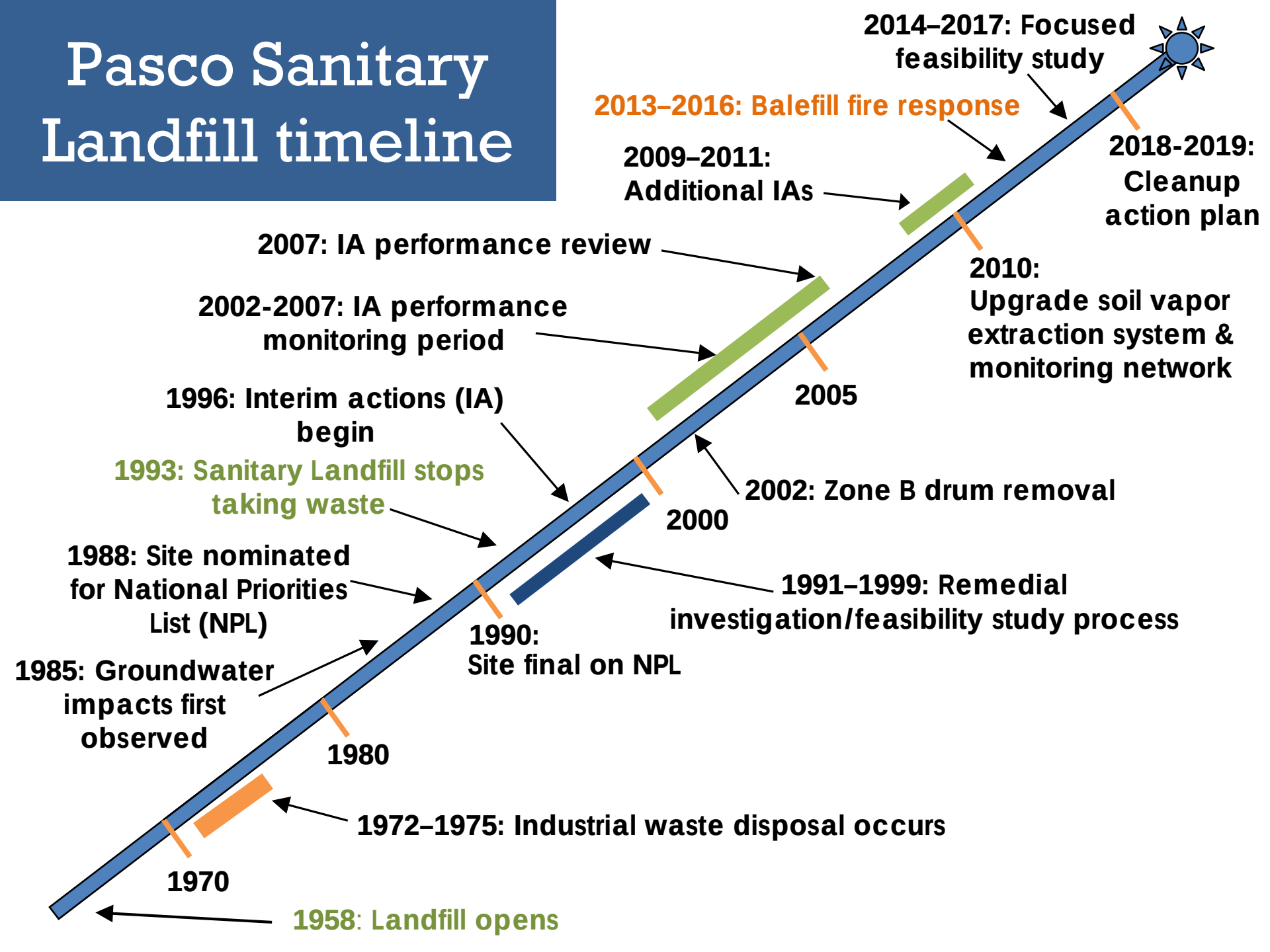
What's in the neighborhood?

Site history & features

- **Municipal waste landfill (1958 – 1993)**
  - Burn trenches (1958–1971)
  - Balefill and Inert Waste Area (1976–1993)
  - Septic tank wastes, sewage sludge (1976–1989)
- **Industrial wastes (1972 – 1975)**
  - Zone A: ~35,000 drums mixed industrial waste
  - Zone B: Herbicide wastes (~5,000 drums)
  - Zone C/D: Various sludges/resins (>3,000,000 gallons)
  - Zone E: Chlor-alkali wastes (~11,000 tons)
- **Groundwater plume (1985 – present)**

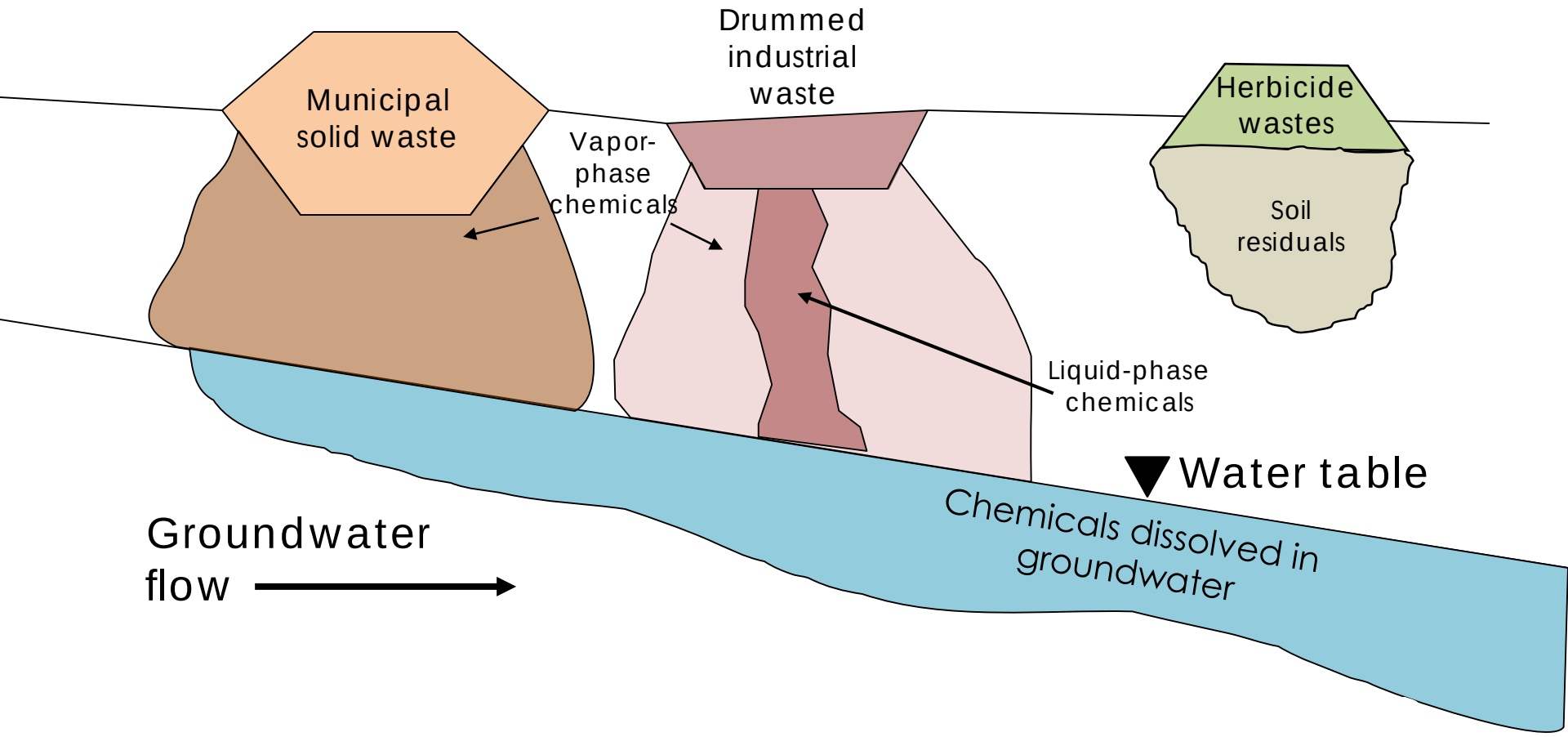
Cleanup actions & landfill operations

Pasco Sanitary Landfill timeline



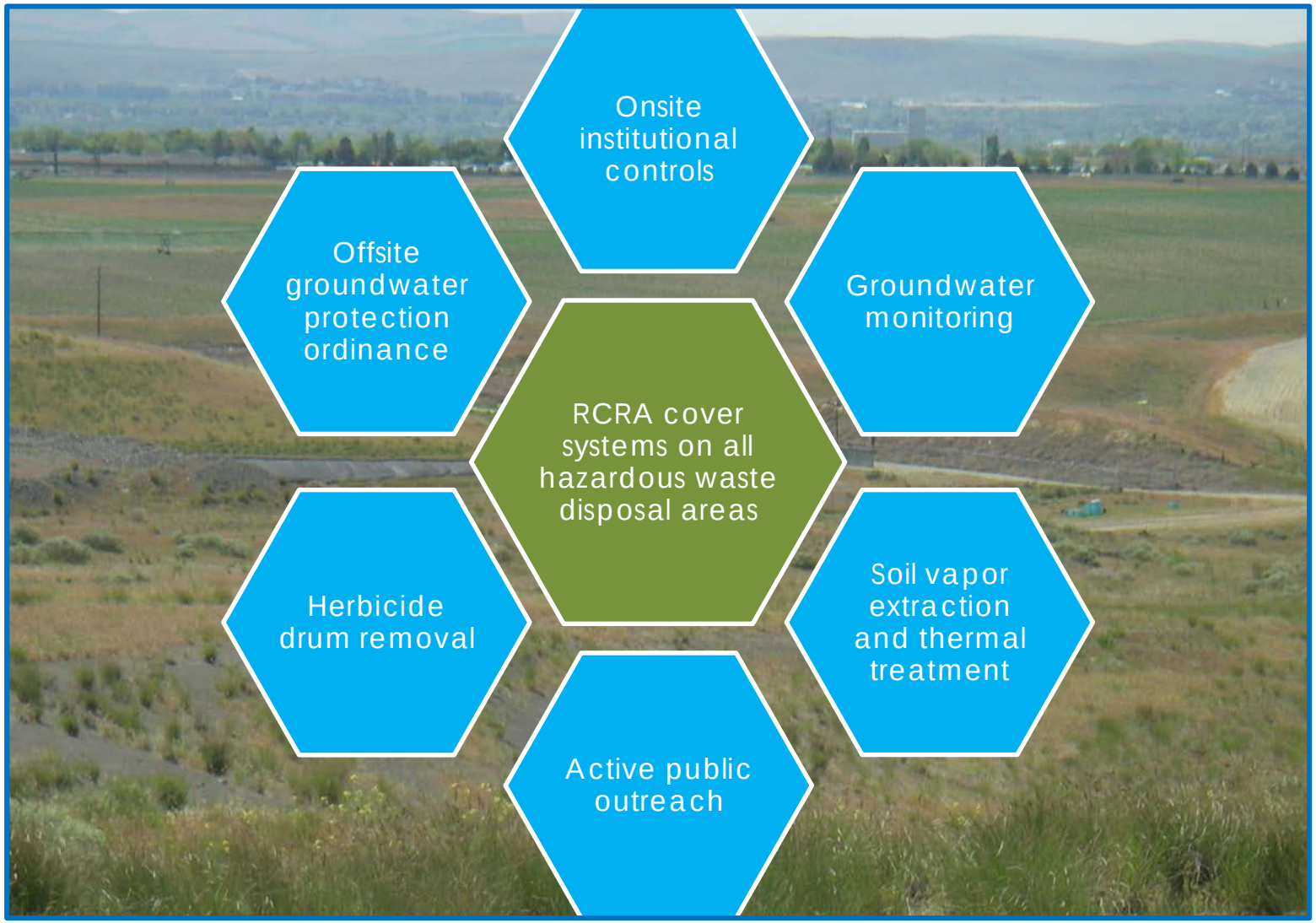
What's happened here?

Simplified conceptual site model



Cleanup actions: Past & present

Major cleanup components

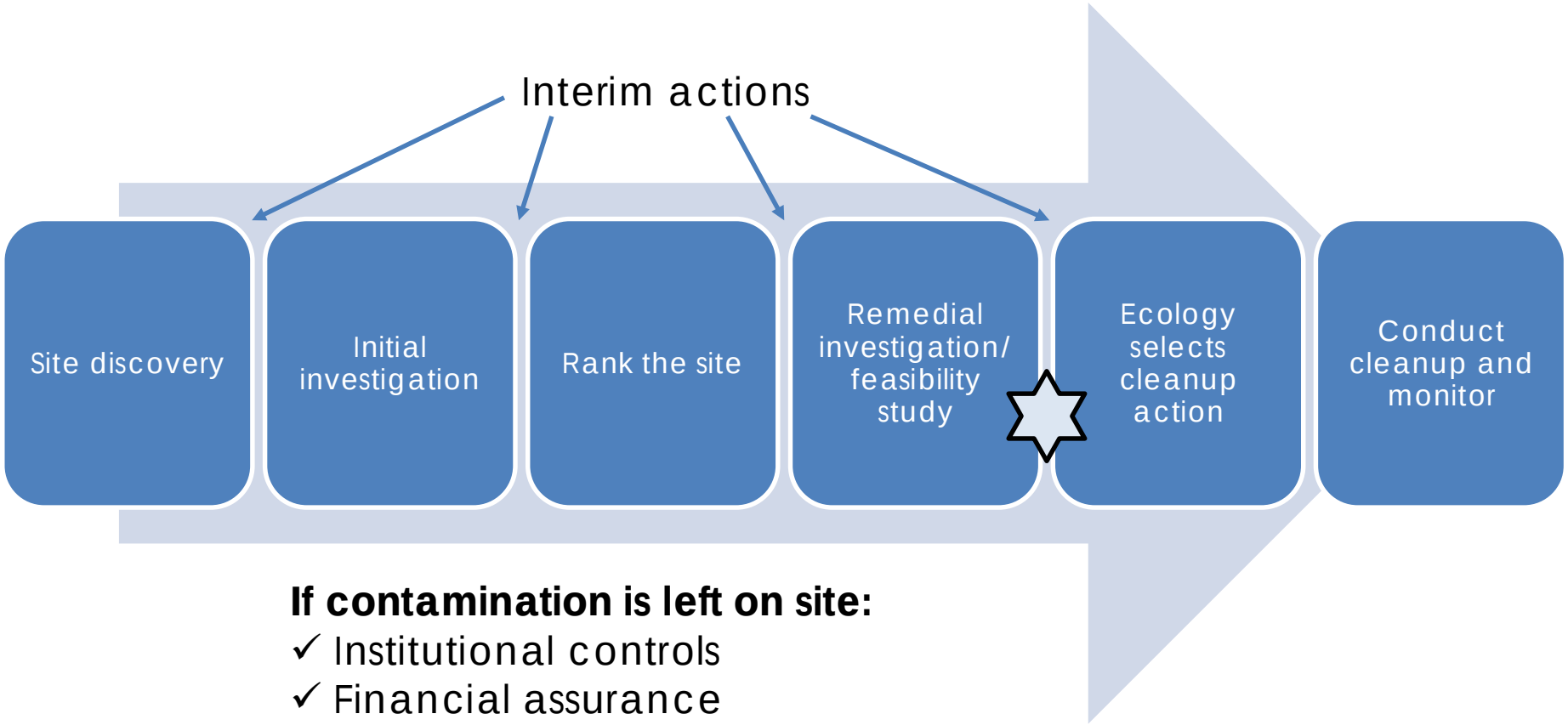


RCRA = Resource Conservation & Recovery Act

Model Toxics Control Act (MTCA)
Key elements

- Passed as citizen's initiative in 1988
- Directs contaminated site cleanup in WA
- Defines process from discovery through final cleanup and closure
- Identifies potentially liable persons (PLPs)
  - PLPs pay for investigation & cleanup costs
- Seeks selection of permanent remedies
- Involves community in site cleanup decisions

Steps in the cleanup process



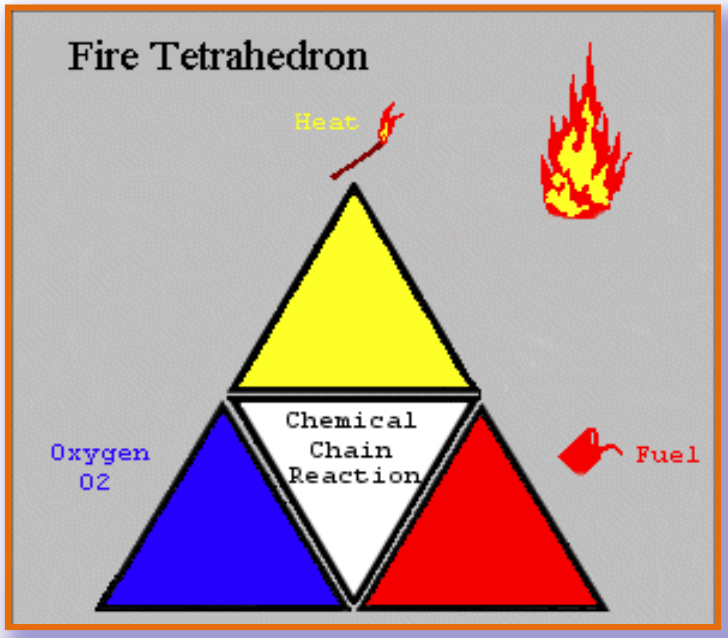
If contamination is left on site:

- ✓ Institutional controls
- ✓ Financial assurance
- ✓ Monitoring
- ✓ Periodic reviews

In a nutshell…

- Several waste disposal areas/types
- Variety of contaminants – VOCs dominate
- Leaking drums – Key remedial challenge
- Multiple PLPs – Ongoing litigation
- Ongoing interim action cleanup
- Moving toward a final remedy

Cleanup is progressing … Then *landfill fire!* Now what?



Landfill fire basics

How common are landfill fires?

Statistics

- 1,754 landfills in U.S. as of 2006
- ~8,400 dump or sanitary landfill fires reported in U.S. each year according to National Fire Incident Records
- 1 in 200 fires escalates to a major incident
  - 42 major incidents per year?
- Probability of small fire better than 50%
- Probability of major fire estimated at 0.5%

Courtesy: Todd Thalhamer

Environment | Local News | Northwest

Fire in Superfund landfill near Pasco continues to smolder

Originally published July 4, 2015 at 7:04 pm | *Updated July 4, 2015 at 7:50 pm*

A fire has been smoldering underground at an old Pasco garbage dump since November 2013. The place is now a federal Superfund site, and the state's going to try a more aggressive firefighting plan.

By Annette Cary
Tri-City Herald

E-paper

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> Recycling > Cutting the Risk of Landfill Fires

14.08.2013 00:47

Cutting the Risk of Landfill Fires

With the average landfill site having a 60% statistical risk of fire each year, it's critical that operators have an emergency plan in place. So if disaster strikes, just how do you cut your losses?

Commonly used terms

- Underground fire
- Subsurface heating event
- Subsurface oxidation
- Low oxygen pyrolysis
- Subterranean fire
- Smoldering event

*They all pretty much describe the same thing!

Environmental health and safety considerations

- Subsurface landfill fires can create many life-threatening conditions
- All site personnel and anyone involved with the site must be informed about possible site hazards:
  - **Open holes/cracks**
  - **Toxic gas exposures (smoke/particulates, CO, PM2.5, VOCs)**
  - **Ground cave-ins due to the void spaces**
  - **Burn issues from the elevated temperatures**
  - **Toxic combustion by-products can be produced**

Anticipating worst-case local impacts

Contents lists available at ScienceDirect

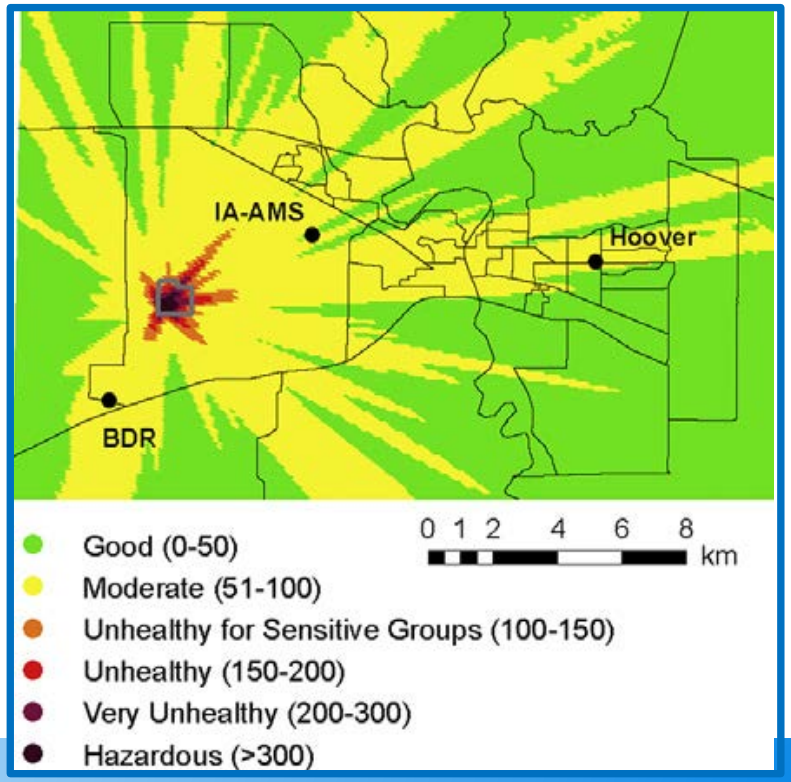
Atmospheric Environment

journal homepage: www.elsevier.com/locate/atmosenv

Uncontrolled combustion of shredded tires in a landfill – Part 2: Population exposure, public health response, and an air quality index for urban fires

Ashish Singh [a], Scott N. Spak [b], Elizabeth A. Stone [c], Jared Downard [c], Robert L. Bullard [a], Mark Pooley [b], Pamela A. Kostle [d, 1], Matthew W. Mainprize [d], Michael D. Wichman [d], Thomas M. Peters [e], Douglas Beardsley [f], Charles O. Stanier [a, g, *]

AERMOD air dispersion modeling



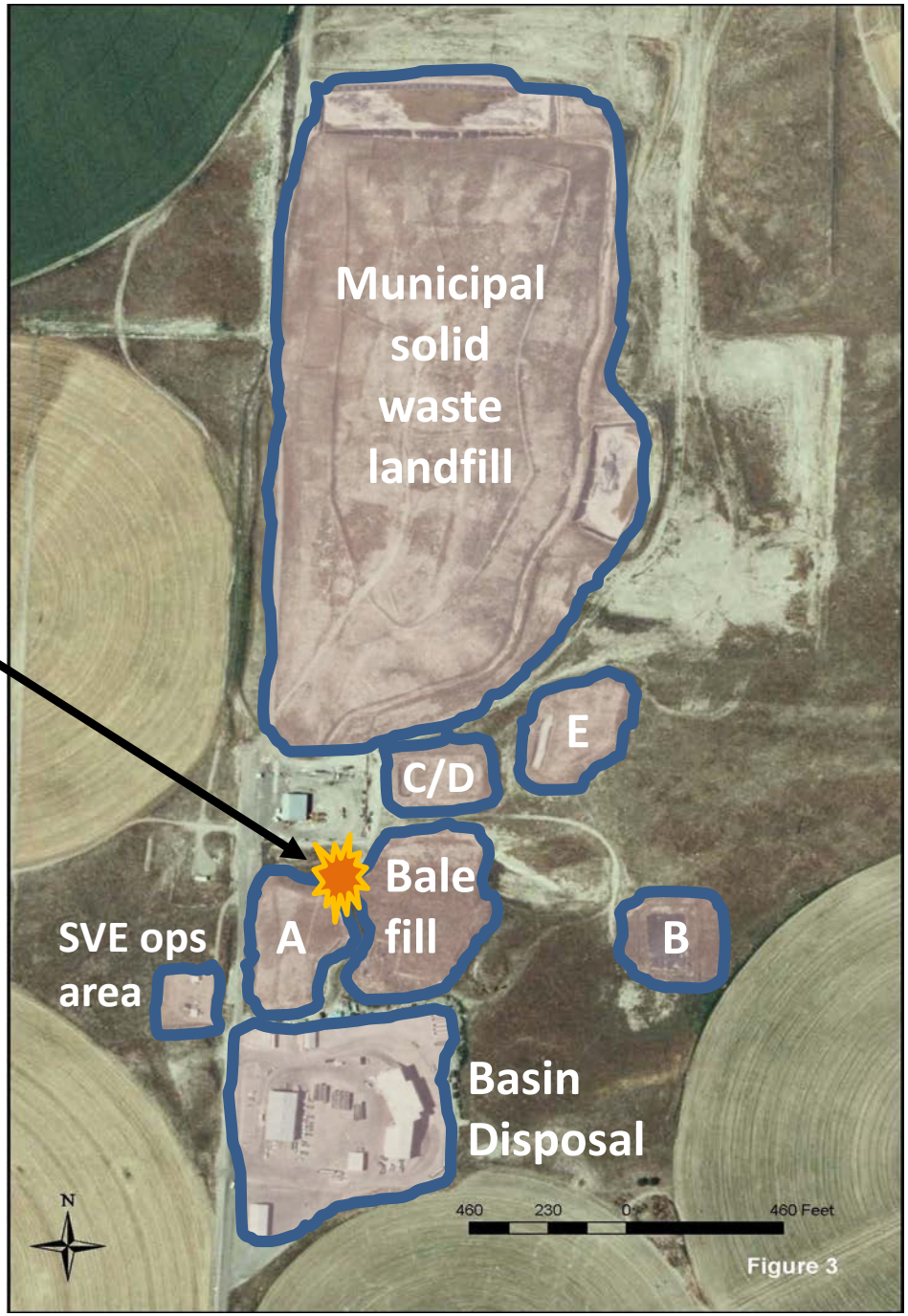
Commonly accepted underground fire evaluation criteria

- Waste temperatures >165–170 °F
- Subsurface vapor temperatures >140 °F
- Carbon monoxide >1,000 ppm
- Evidence of ground settlement and cracking
- Low subsurface oxygen levels
- *Possibly* elevated VOC concentrations
- Smoke and/or odors *may or may not* be evident
- Soot *may or may not* be evident

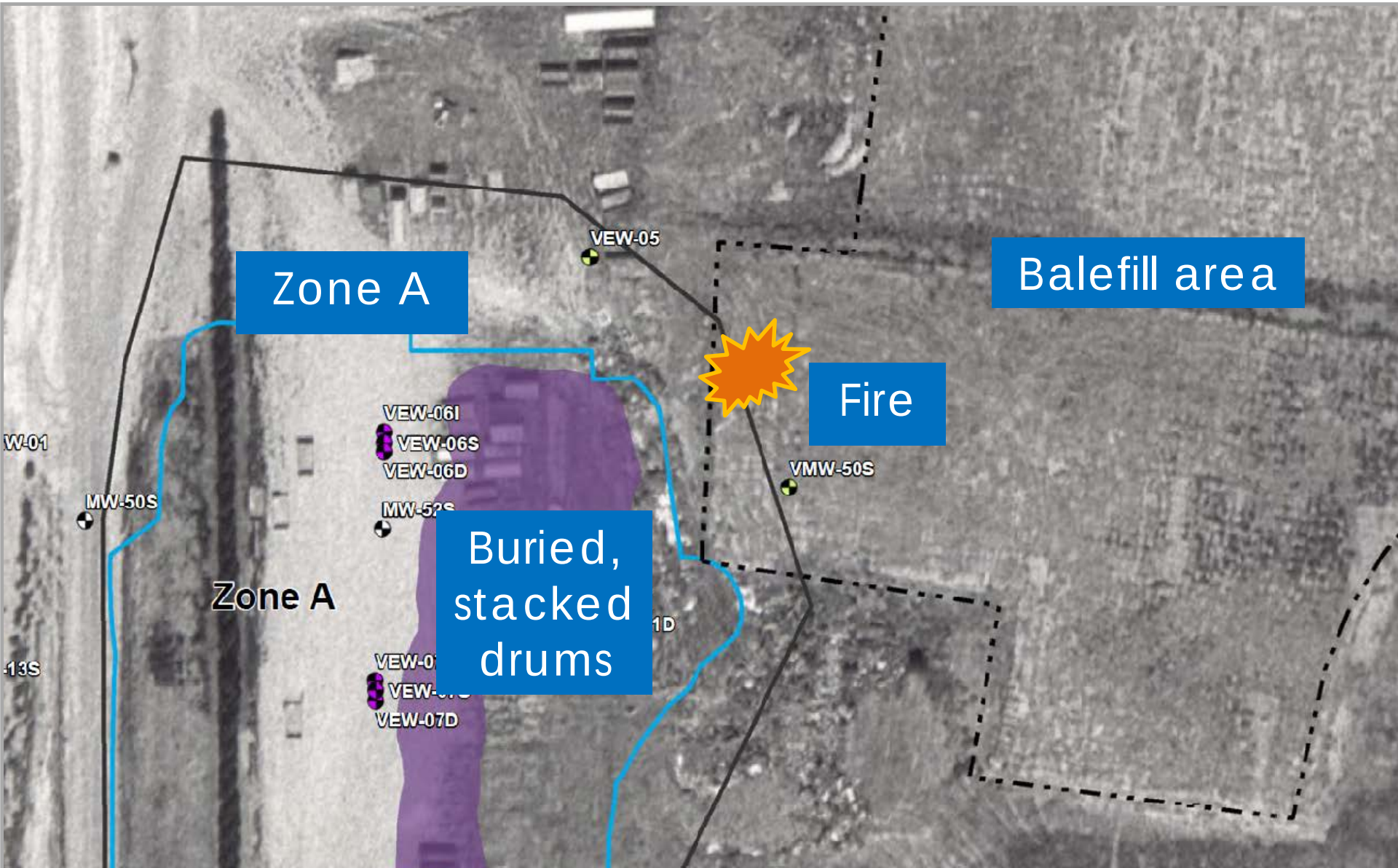
Balefill area fire: Initial actions

November 2013

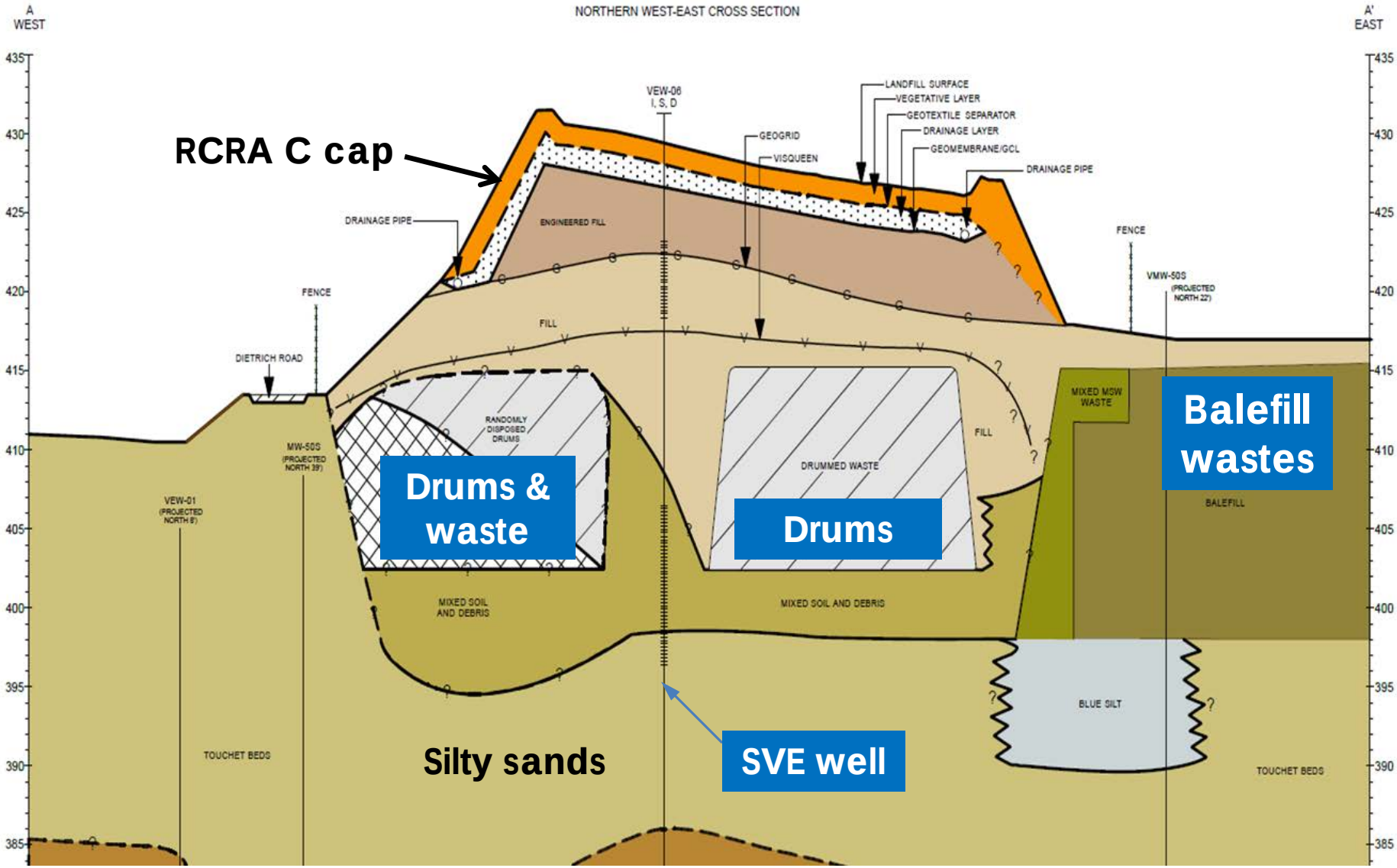
A landfill fire is suspected and reported in Balefill area following a routine visual inspection



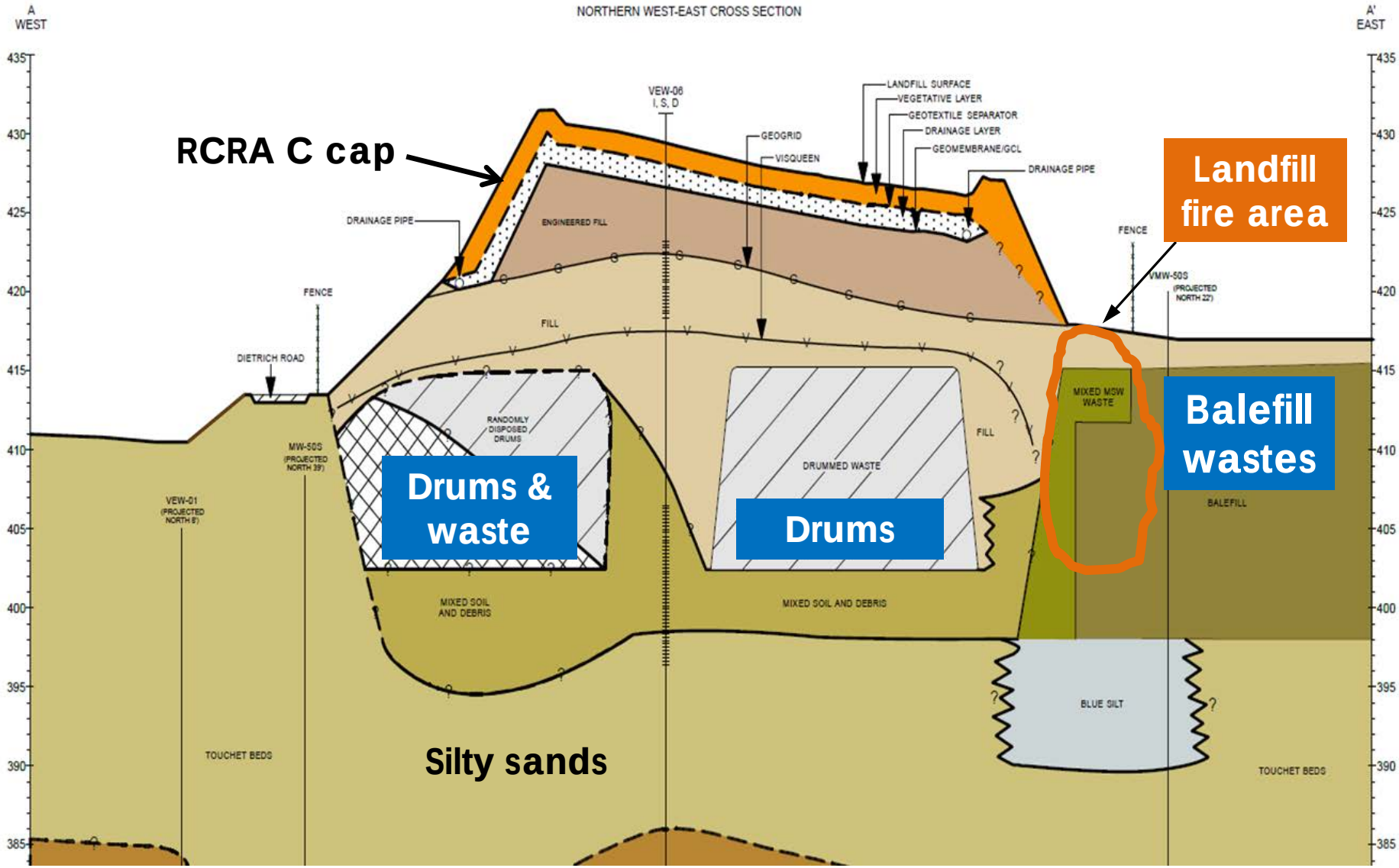
Balefill Area Underground Fire
November 2013



Zone A


NORTHERN WEST-EAST CROSS SECTION
A
WEST
A'
EAST
RCRA C cap
LANDFILL SURFACE
VEGETATIVE LAYER
GEOTEXTILE SEPARATOR
DRAINAGE LAYER
GEOMEMBRANE/GCL
DRAINAGE PIPE
GEOGRID
VISQUEEN
VEW-06
I, S, D
ENGINEERED FILL
FILL
FENCE
DIETRICH ROAD
VMW-50S
(PROJECTED NORTH 22')
MW-50S
(PROJECTED NORTH 39')
VEW-01
(PROJECTED NORTH 8')
RANDOMLY DISPOSED DRUMS
Drums & waste
DRUMMED WASTE
Drums
MIXED MSW WASTE
Balefill wastes
BALEFILL
MIXED SOIL AND DEBRIS
BLUE SILT
TOUCHET BEDS
Silty sands
SVE well
435
430
425
420
415
410
405
400
395
390
385

Zone A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Balefill area underground fire
Looking east from Zone A

Fire indicators

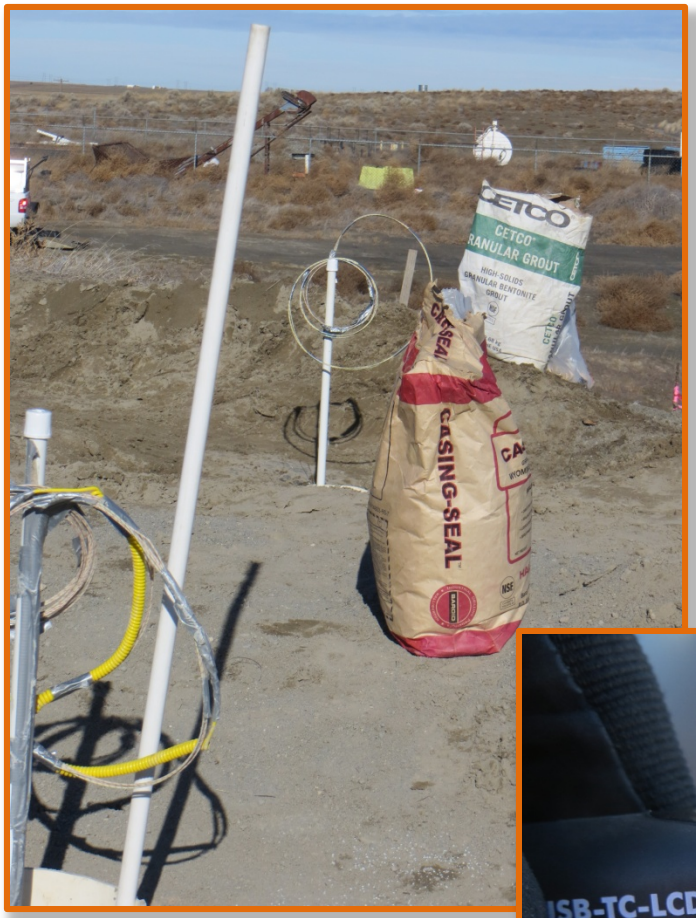
- Smoke
- Soil cracking
- Ground settlement
- Stressed vegetation
- Heat
- Carbon monoxide

Geoprobe temperature evaluation

How **BIG**?

How **HOT**?

Installing dedicated thermocouples



Multi-step process to final extinguishment

- Phase I: Smother & cover
  - Did not extinguish fire
  - Enforcement Order required to get further action
  - Fire extinguishment plans developed
- Phase II: Liquid CO_2 injection
- Phase III: Contain/excavate/quench approach

Phase I: Cover & smother

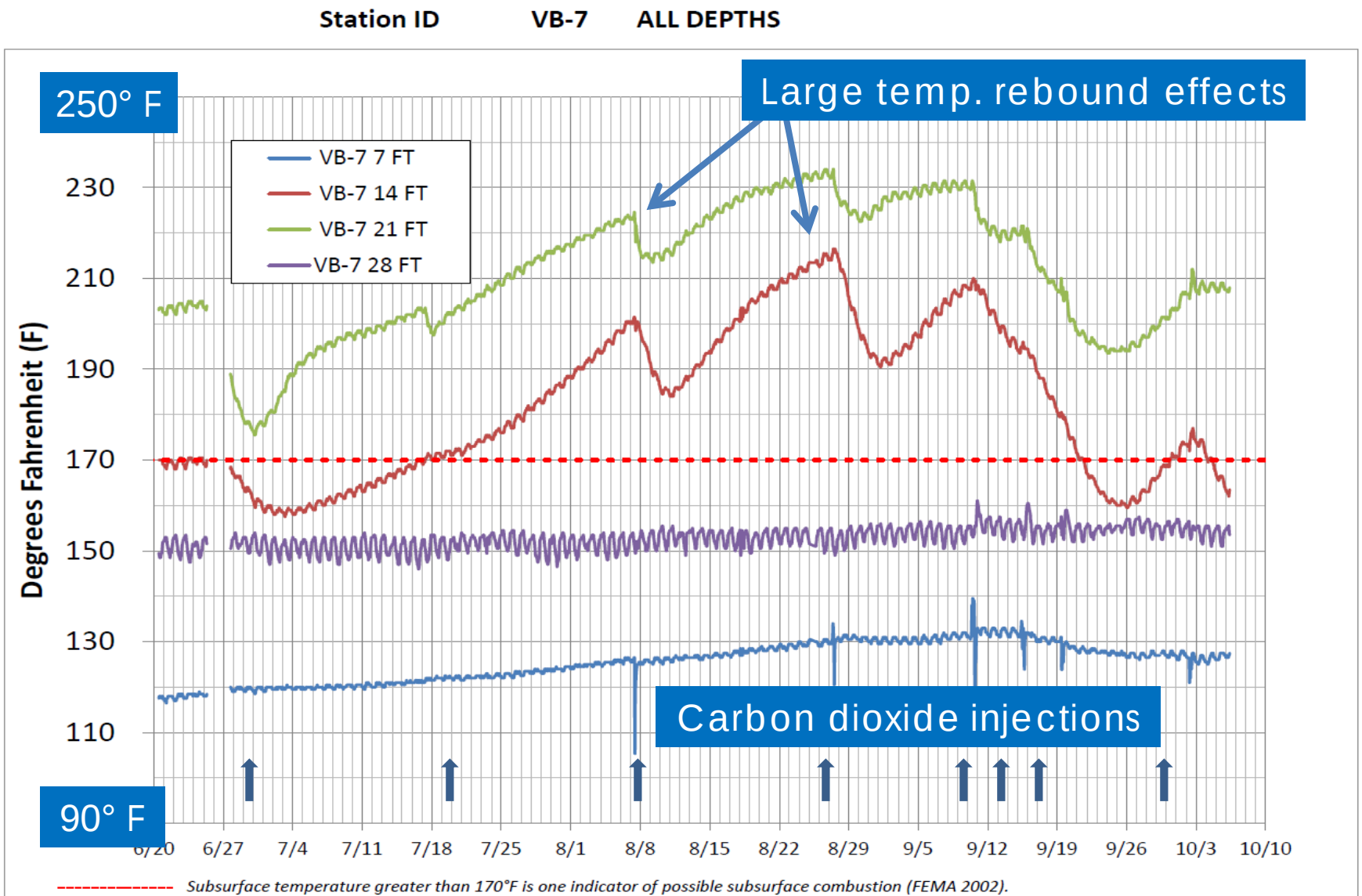
Phase II: Liquid carbon dioxide injection

June 26 & 27, 2014

Carbon dioxide refusal & short-circuiting

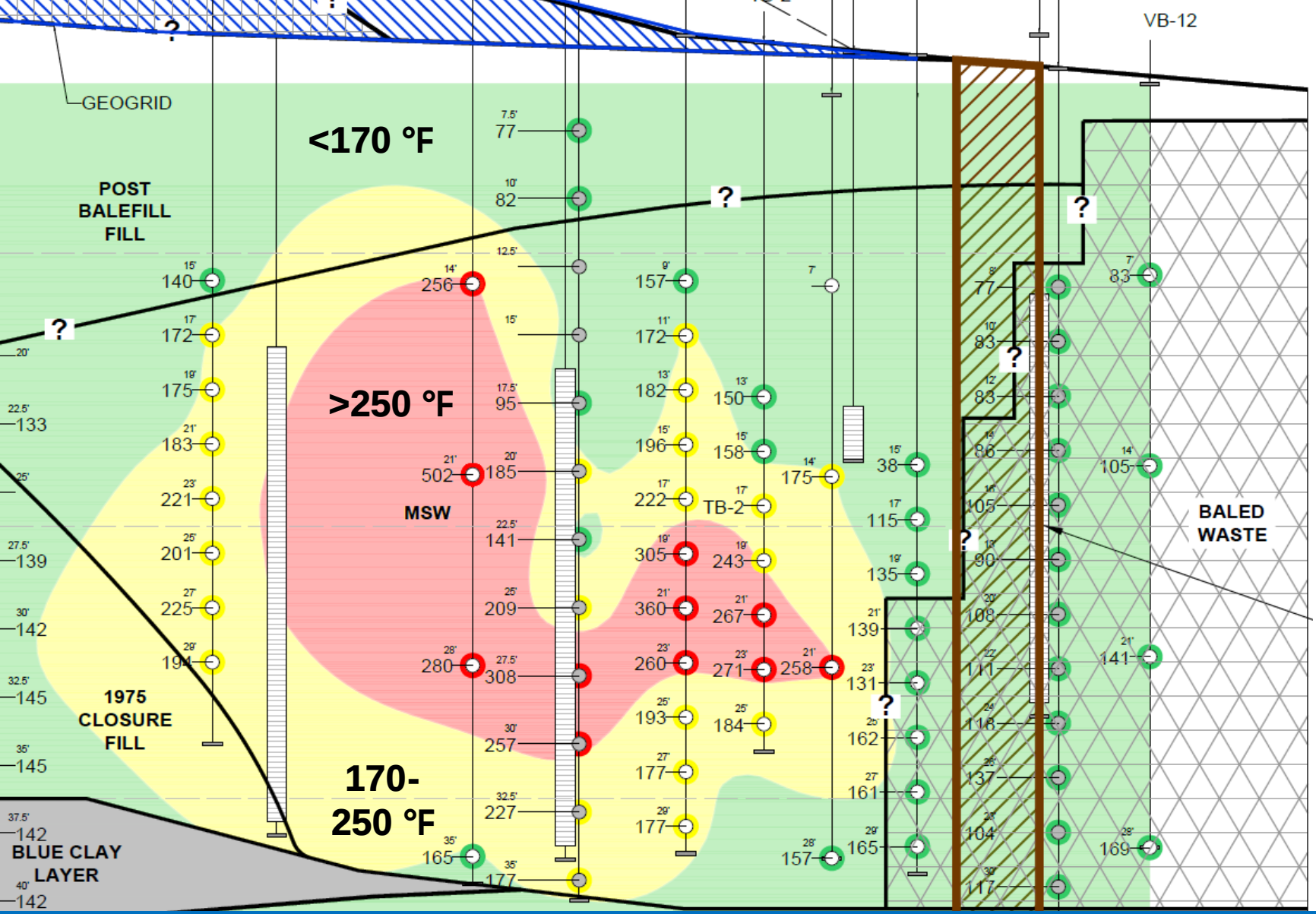
Injecting liquid carbon dioxide until probe won't transmit it or short-circuiting occurs

Example temperature response to carbon dioxide injection



Carbon dioxide injections

- 21 injection events (June 2014–March 2015)
- 5,000 to 23,000 pounds of liquid carbon dioxide injected per event (6–15 probes per event)
- Total quantity injected: 255,000 pounds
- Carbon dioxide residence time ~1 week or less
- Oxygen intrusion and uneven gas dispersion appears to limit overall effectiveness



Temperature conditions prior to excavation and quenching

Final fire extinguishment

Phase III: Contain/excavate/quench approach


Excavate cement-bentonite wall around fire perimeter


Interior cement-bentonite wall
quench & mix operations

Interior cement-bentonite wall slot cut & trench excavation plan

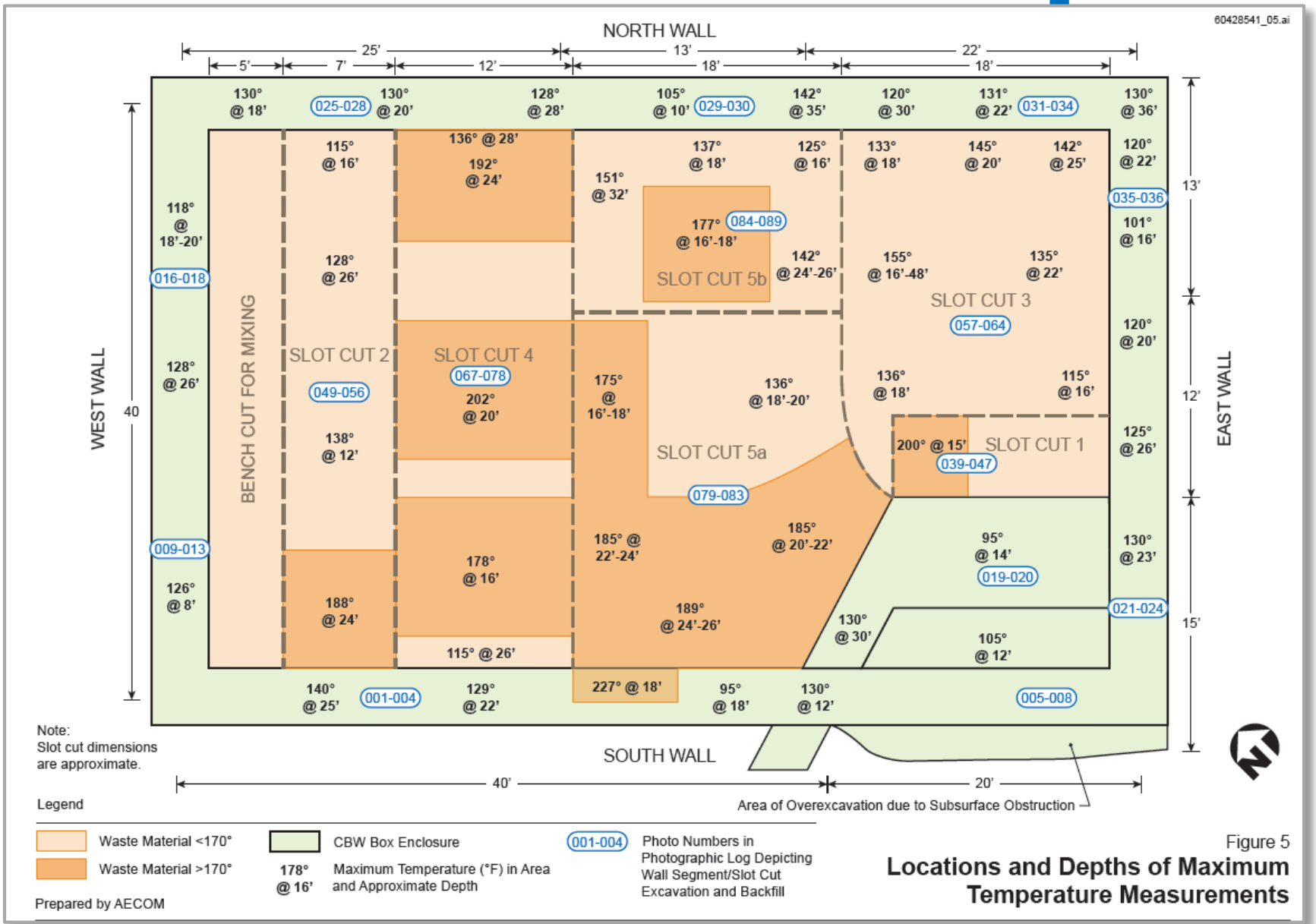


Figure 5

Locations and Depths of Maximum Temperature Measurements

Phase III: Contain/excavate/quench approach

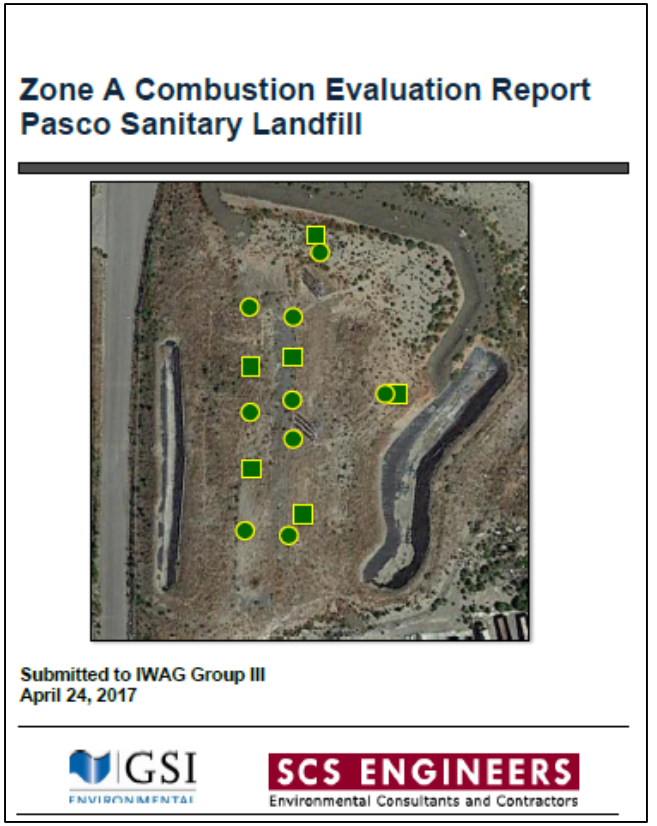
Soil-cement-bentonite barrier wall in Zone A

Lessons learned

- ✓ Proper planning and coordination is essential
- ✓ Each fire is unique. No “one size fits all” approach.
- ✓ Ensure local emergency responders are aware of site conditions and associated hazards
- ✓ Maintain routine communications with local fire department personnel on actions and status
- ✓ Ensure proper monitoring network and inspection plan is in place to provide early warning
- ✓ Regular updates to the public and media

Ongoing evaluation

- Ecology concern about Zone A subsurface conditions prompts a separate PLP-led combustion evaluation
- Zone A Combustion Evaluation Work Plan – approved December 2016
- Field work performed January – April 2017
- PLP report undergoing Ecology review



More to come …

Questions? Project contacts

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