Proposed Morro Bay Battery Energy Storage System

Summary of Community Safety Report: Offsite Consequence Analysis

Presenter: Dr. Shari Libicki

March 20, 2024

6:00 p.m.

RAMBOLL

Bright ideas.
Sustainable change.

Overview

- Who is Ramboll?
- Objective of report and key finding
- What is an Offsite Consequence Analysis (OCA)?
- Risk assessment concepts: hazard versus risk
- Safety regulations: thresholds of significance
- Methodology of OCA
    - Fire events
    - Conservative assumptions designed to over predict potential impacts
    - EPA-recommended models
- Discussion of results

Ramboll

- Founded 1945 in Denmark
- Independent engineering, architectural, and consultancy company
- Advisor to public agencies and private businesses on various industries, including: energy, infrastructure, transportation, water, waste, and technology

Insight & Excellence

By virtue of our knowledge, experience and ingenuity we develop solutions that meet client demands and fit human needs.

We give our best to surpass the ordinary and deliver high quality.

Integrity & Empathy

Decency is the hallmark of our business. We behave responsibly by keeping to our high ethical standards.

We put ourselves in the place of other people – clients, colleagues and stakeholders alike – to work out the best solutions for everyone.

35

Countries covered by global office network

18,000

Experts

Dr. Shari Beth Libicki

- More than 30 years of experience evaluating potential health and safety impacts to the public.

- Trained engineer:
  - Stanford University: PhD and MS in Chemical Engineering
  - University of Michigan: BSE in Chemical Engineering

- Advisor to both public agencies and private entities, including:
  - California Air Resources Board (CARB)
  - Bay Area Air Quality Management District
  - South Coast Air Quality Management District
  - City of Richmond

Purpose and Big Picture

- The community safety concern evaluated in OCA is a potential fire event and resulting emissions

- Broader context:
  - Lithium-ion batteries are widespread (e.g., cell phones, laptops, cars) and well-understood
  - Emergency response plans are required for facilities like the BESS
  - Government agencies have decades of experience managing greater risks
  - BESS facilities have been sited in urban environments

Ultimate Finding: No Adverse Safety Impacts to the Community

- Offsite Consequence Analysis (OCA):
  - Detailed 65+ page technical report
  - Thorough literature review
  - Hundreds of computer simulations
  - 100+ scientific references
  - Available to the public

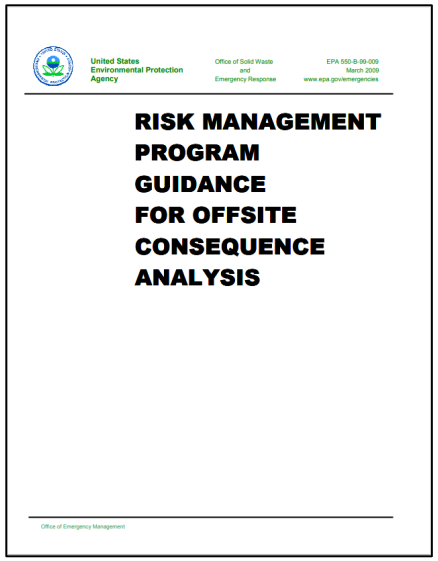
- **Conclusion**: No significant risk to the community
  - Conservative assumptions to over-predict potential impacts to community
  - Based on EPA-recommended models
  - Well-accepted approach used to inform siting decisions across many industries

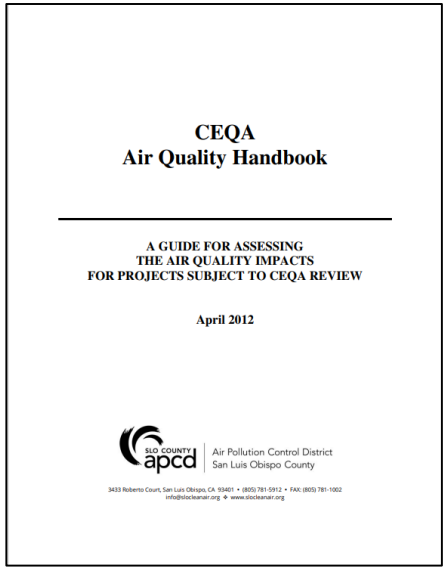
OCAs Predict Potential Impacts To Protect Public Health

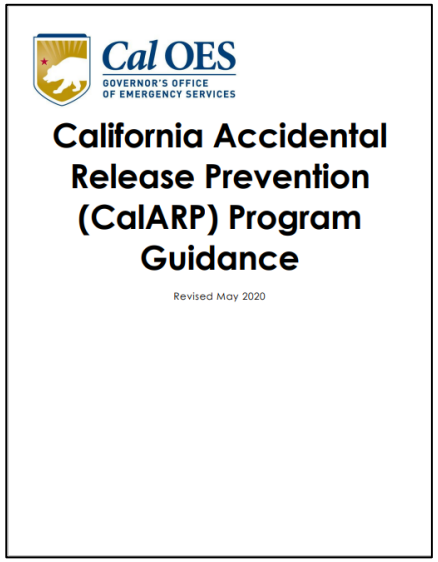
- OCAs inform decision-making regarding siting and safety measures for battery storage installations
- OCA results can inform emergency response plans and evacuation procedures
- OCAs can be used to improve overall safety and risk management practices for the industry

OCA: The Basics

- **Objective**: Identify hazards and risks from unplanned releases of hazardous chemicals
- *How* is an OCA prepared?
  - Guidance from expert agencies: US EPA, California EPA, San Luis Obispo County
  - Uses dispersion modeling software (AERSCREEN)
- *What* does an OCA analyze?
  - A maximum credible release event over a given time frame
  - Conservative assumptions to over-predict potential impacts, e.g., meteorological conditions



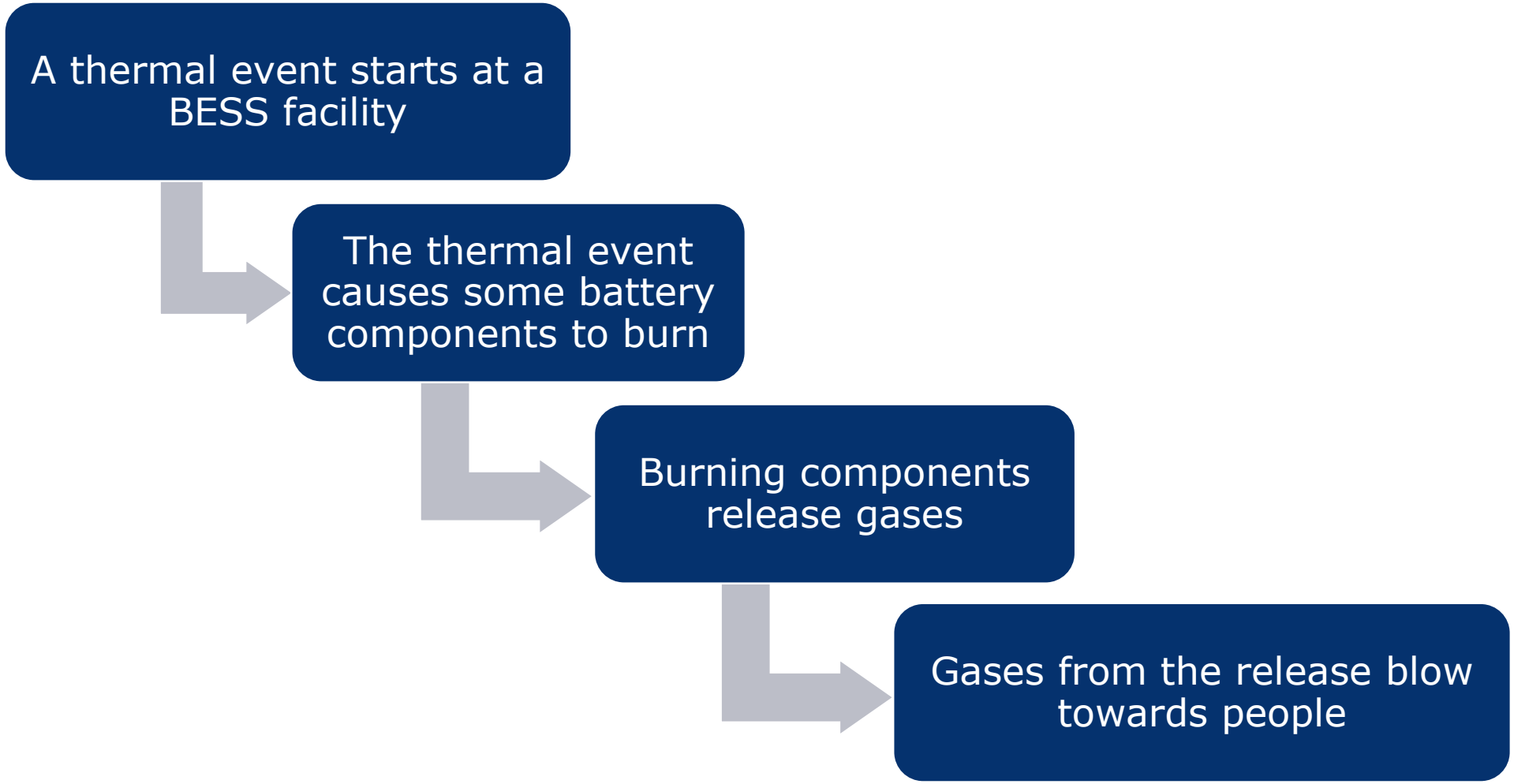




USEPA. Risk management program guidance for offsite consequence analysis accessed on January 20, 2023: https://www.epa.gov/sites/default/files/2013-11/documents/oca-chps.pdf
U.S. Government Publishing Office. 40 CFR Part 68.22 Offsite consequence analysis parameters. https://www.govinfo.gov/content/pkg/CFR-2000-title40-vol10/pdf/CFR-2000-title40-vol10-sec68-22.pdf

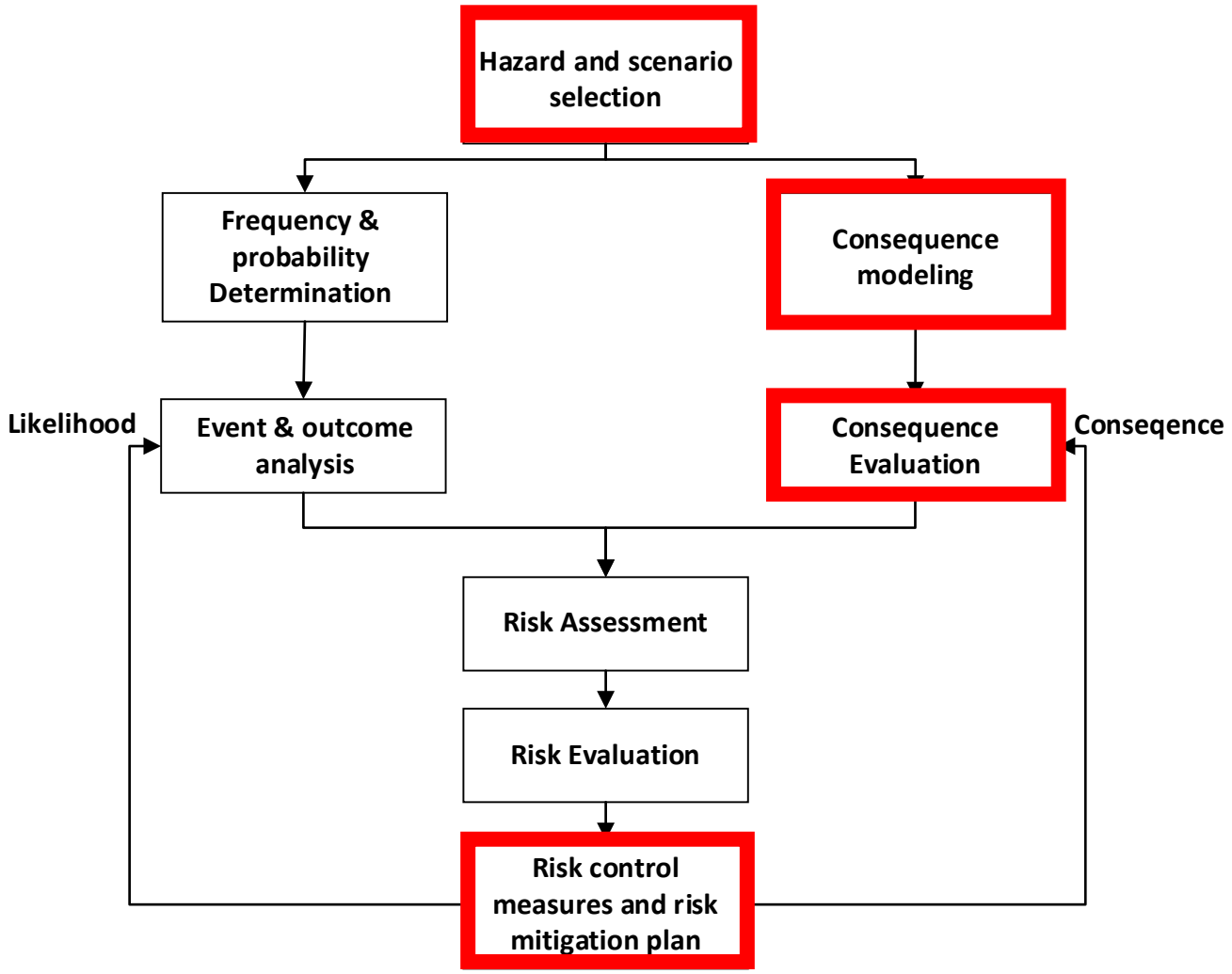
OCA Considers the Health of Entire Community

What Is the Potential Hazard?



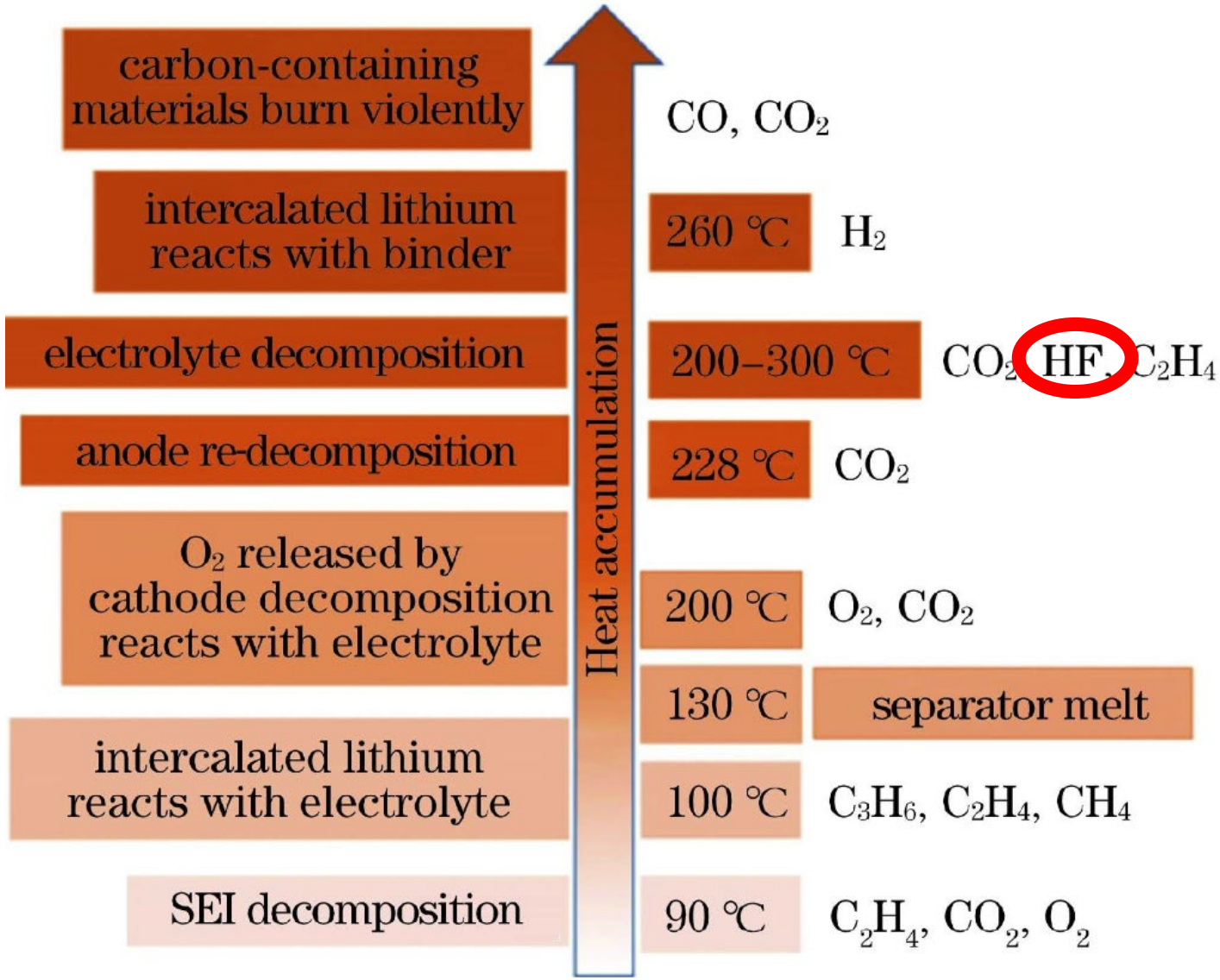
How Do We Assess Risk?

- OCA does not evaluate likelihood of an event
- OCA assumes a maximum credible event occurs, and combines it with conservative weather conditions
- The likelihood of both happening at once is very, very small



What Is Emitted?

- We reviewed past studies that evaluate primary emissions from battery fires
- Most chemicals emitted are flammable but not toxic
- *Batteries* **2023**, *9*(8), 411; https://doi.org/10.3390/batteries9080411



How Much Is Released?

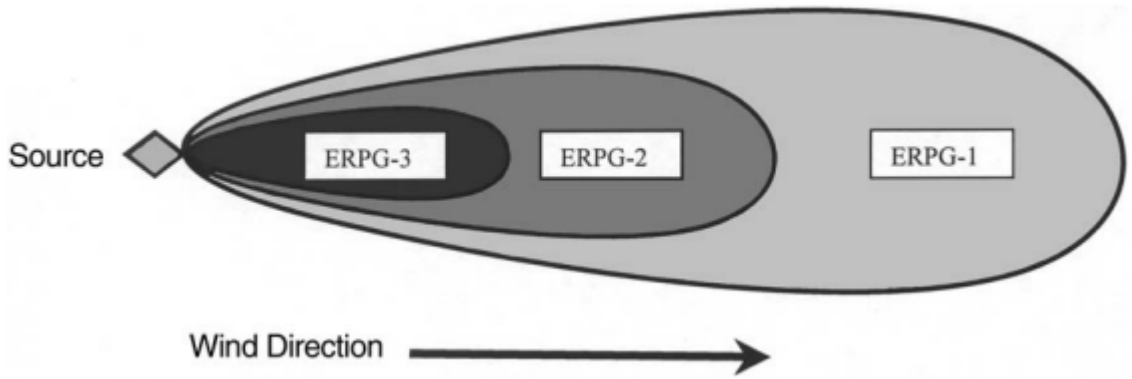
- Emissions factors in the OCA represent the amount of a pollutant released per kilogram of battery burned
- Emissions factors can vary from battery to battery depending on factors like electrolyte chemistry, housing components, and wiring materials

- An "**emissions factor**" tells us how much of a pollutant is released for a certain unit of activity (e.g., gallon of diesel consumed)
- Emissions factors are often used in air quality studies
- Extensive literature on emissions from battery fires
  - Dozens of studies calculate emission rates
  - Emissions factors often based on number of modules or racks burned
  - Emissions factors normalized for purposes of OCA

OCA uses the highest credible emissions factors to evaluate impacts

How To Assess Impacts on People?

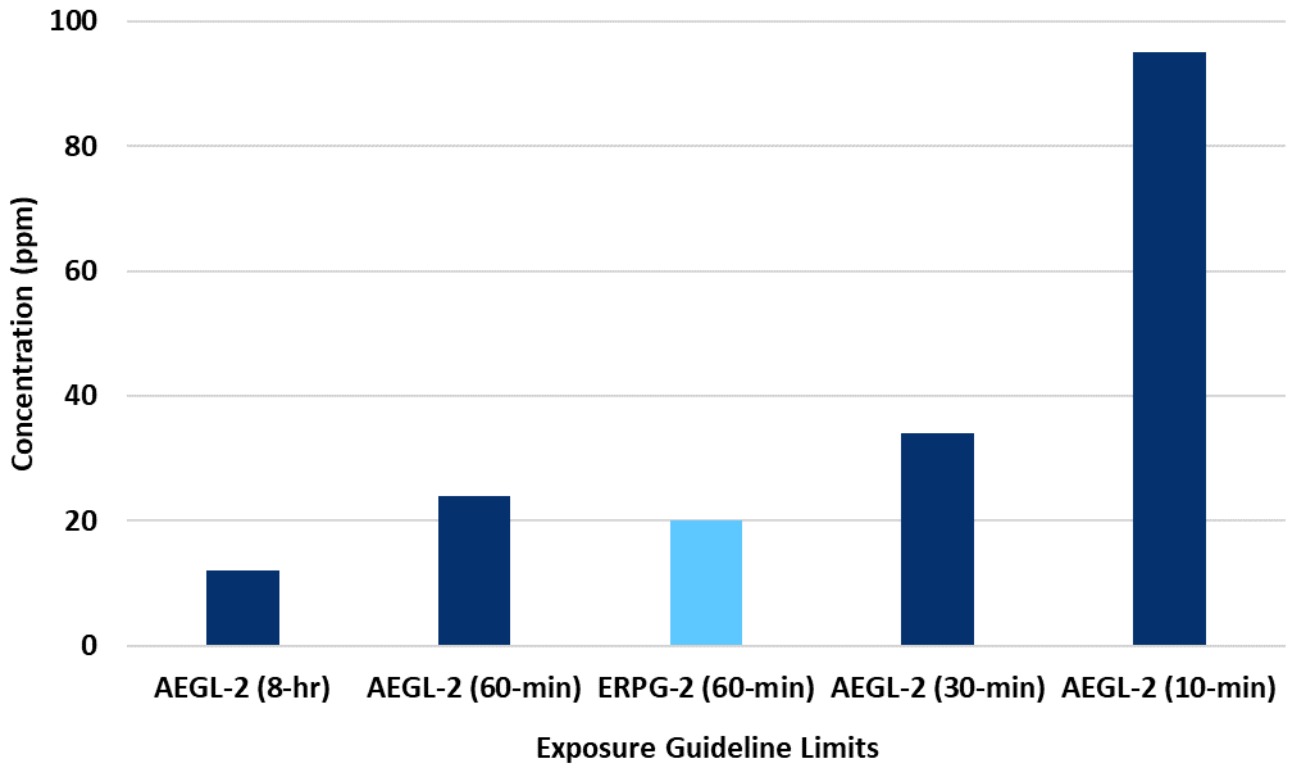
- Two sets of guidelines
  - Different exposure durations
  - Increasing levels of significance
- Both guidelines are used for releases where the onset is *sudden* and with a *relatively short duration*
- This OCA uses both sets of guidelines to evaluate impacts



- **Emergency Response Planning Guidelines (ERPGs)**
  - Developed by the **Emergency Response Planning Committee** of the **American Industrial Hygiene Association (AIHA)**
- **Acute Exposure Guideline Levels (AEGLs)**
  - A collaborative effort between the **U.S. Army** and the **U.S. Environmental Protection Agency (EPA)**

Safety Thresholds: Exposure Guideline Limits (HF)

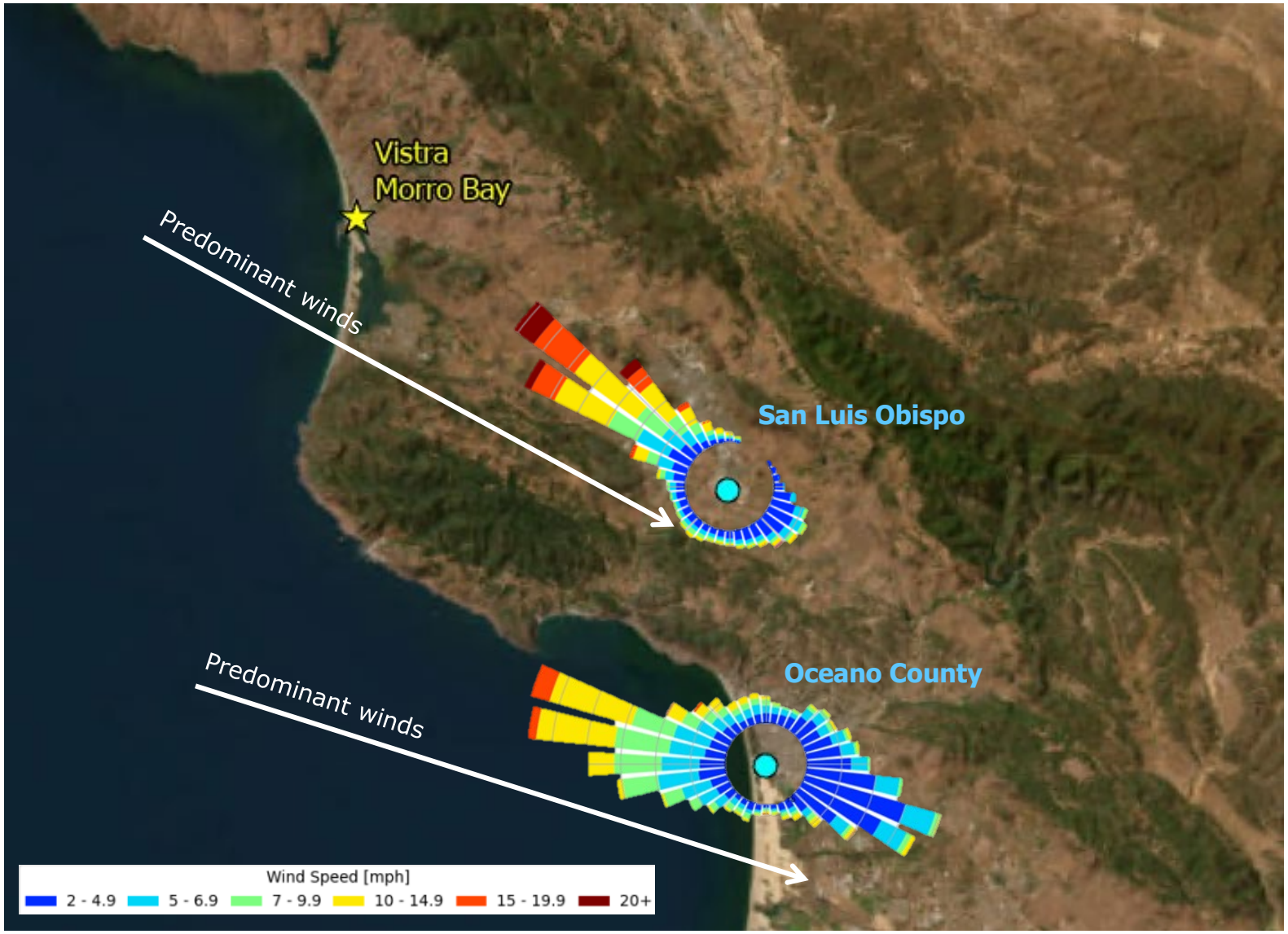
	HF
	60 min
AEGL-1 (ppm)	1
AEGL-2 (ppm)	24
AEGL-3 (ppm)	44
ERPG-1 (ppm)	2
ERPG-2 (ppm)	20
ERPG-3 (ppm)	50
	30 min
AEGL-1 (ppm)	1
AEGL-2 (ppm)	34
AEGL-3 (ppm)	62
	10 min
AEGL-1 (ppm)	1
AEGL-2 (ppm)	95
AEGL-3 (ppm)	170
	8 hour
AEGL-1 (ppm)	1.0
AEGL-2 (ppm)	12
AEGL-3 (ppm)	22
NR – Not recommended due to insufficient data **NA – Not appropriate**	



How To Estimate Downwind Concentrations?

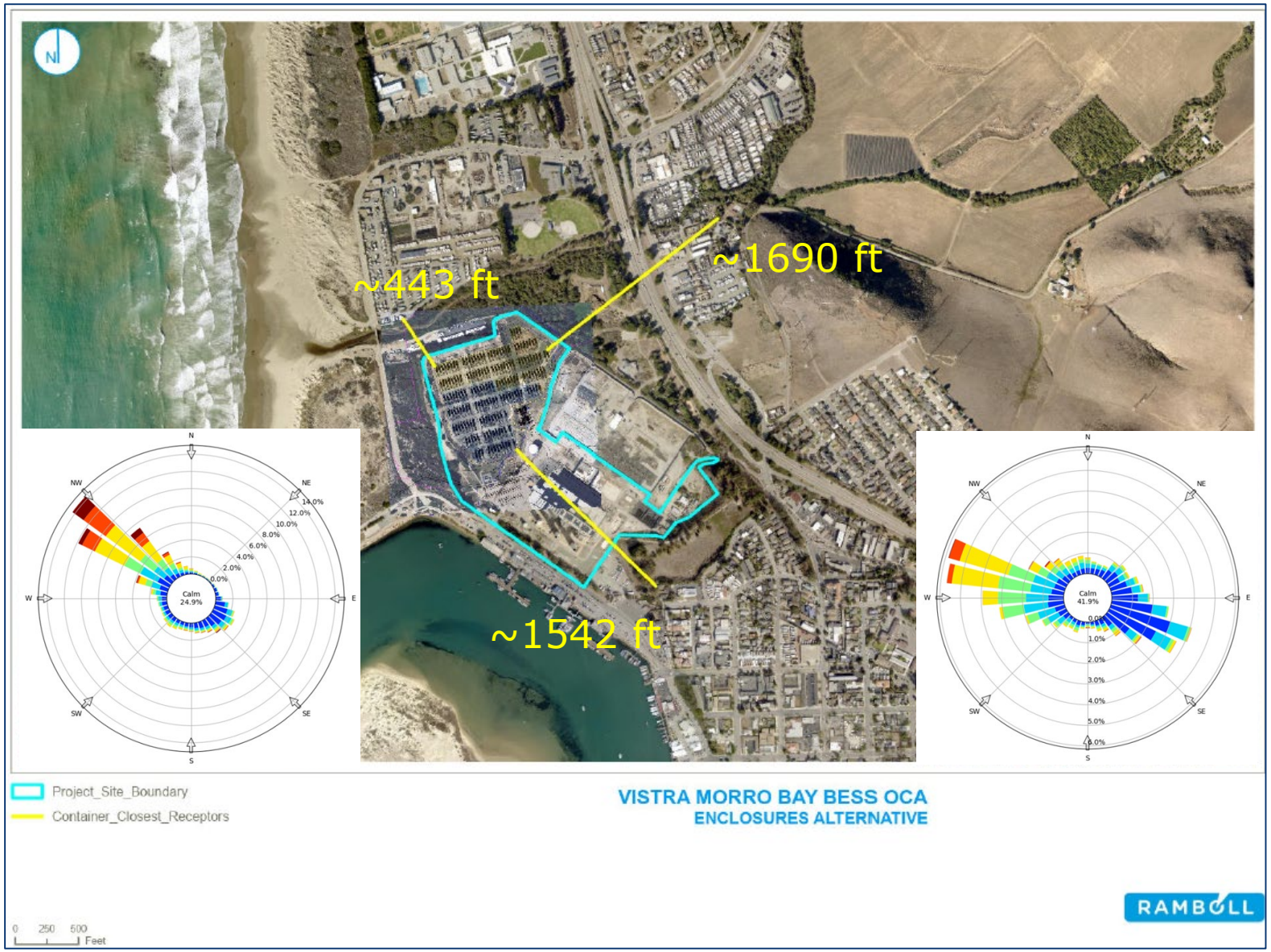
- Dispersion models simulate chemical and physical processes in the air
- Use information on emissions, duration of release, winds, and source configuration
- This study used AERSCREEN, a model designed to maximize concentrations

Meteorology Shows Consistent Offshore Winds

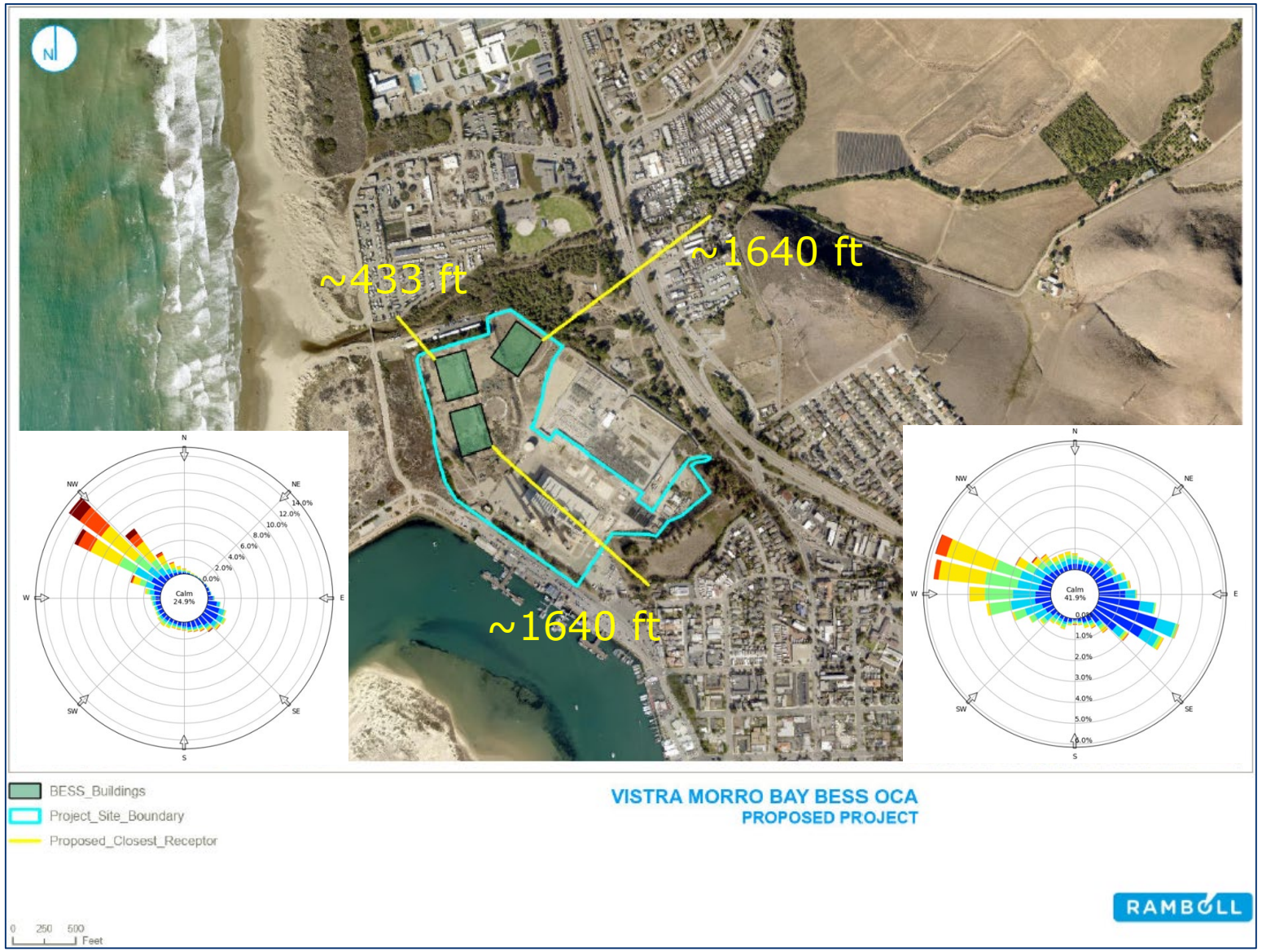


- Wind rose charts show wind speed and direction
- Two local meteorological stations:
  - San Luis Obispo
  - Oceano County
- Predominant winds blow from sea to land

Distances to Nearest Receptors – Enclosures Alternative



Distances to Nearest Receptors – Proposed Project



OCA Uses Multiple Conservative Assumptions

Slow wind speeds

Winds blowing towards residents

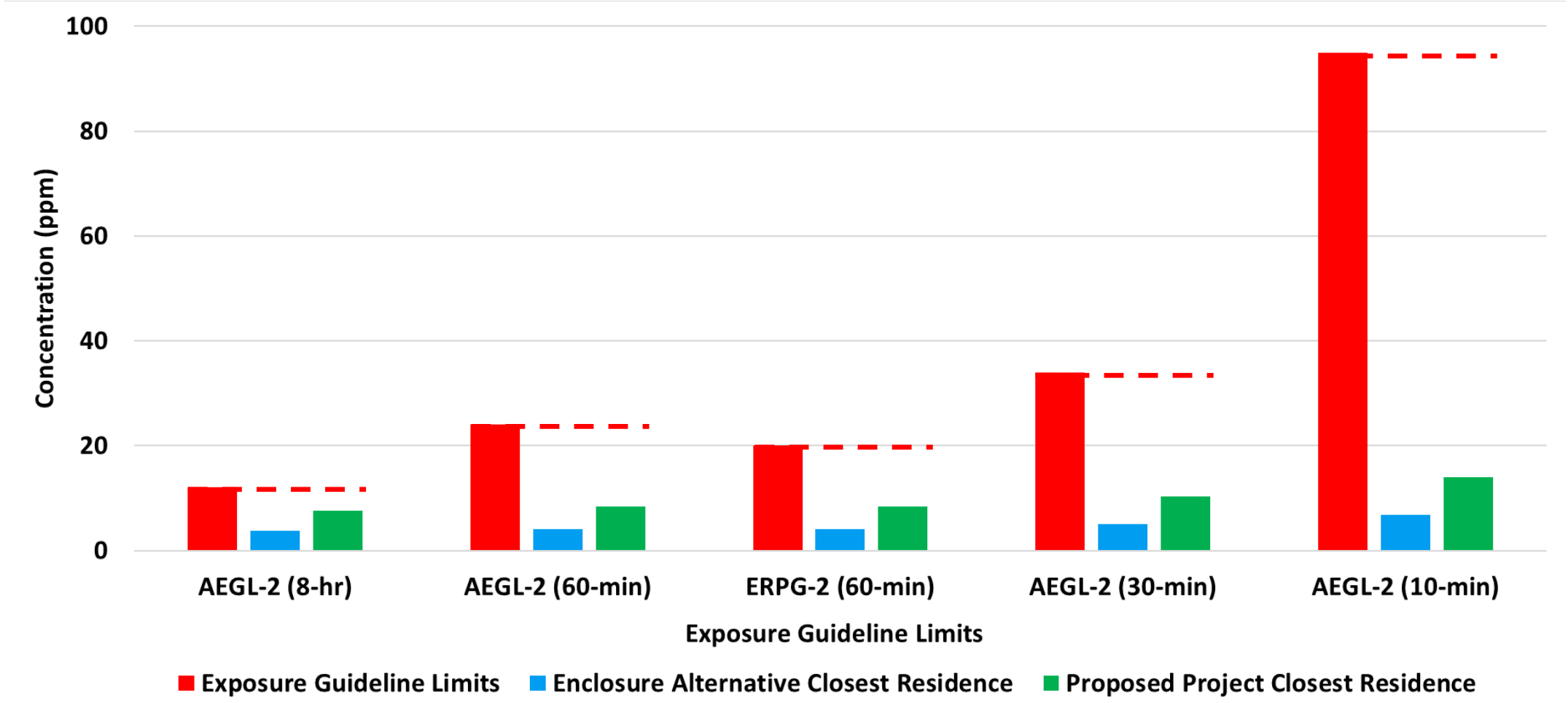
Evaluate impacts at nearest residence

Maximum emissions factors

Maximum credible fire event

Health protective standards

The Results: All Scenarios Comfortably Within Safety Thresholds for HF

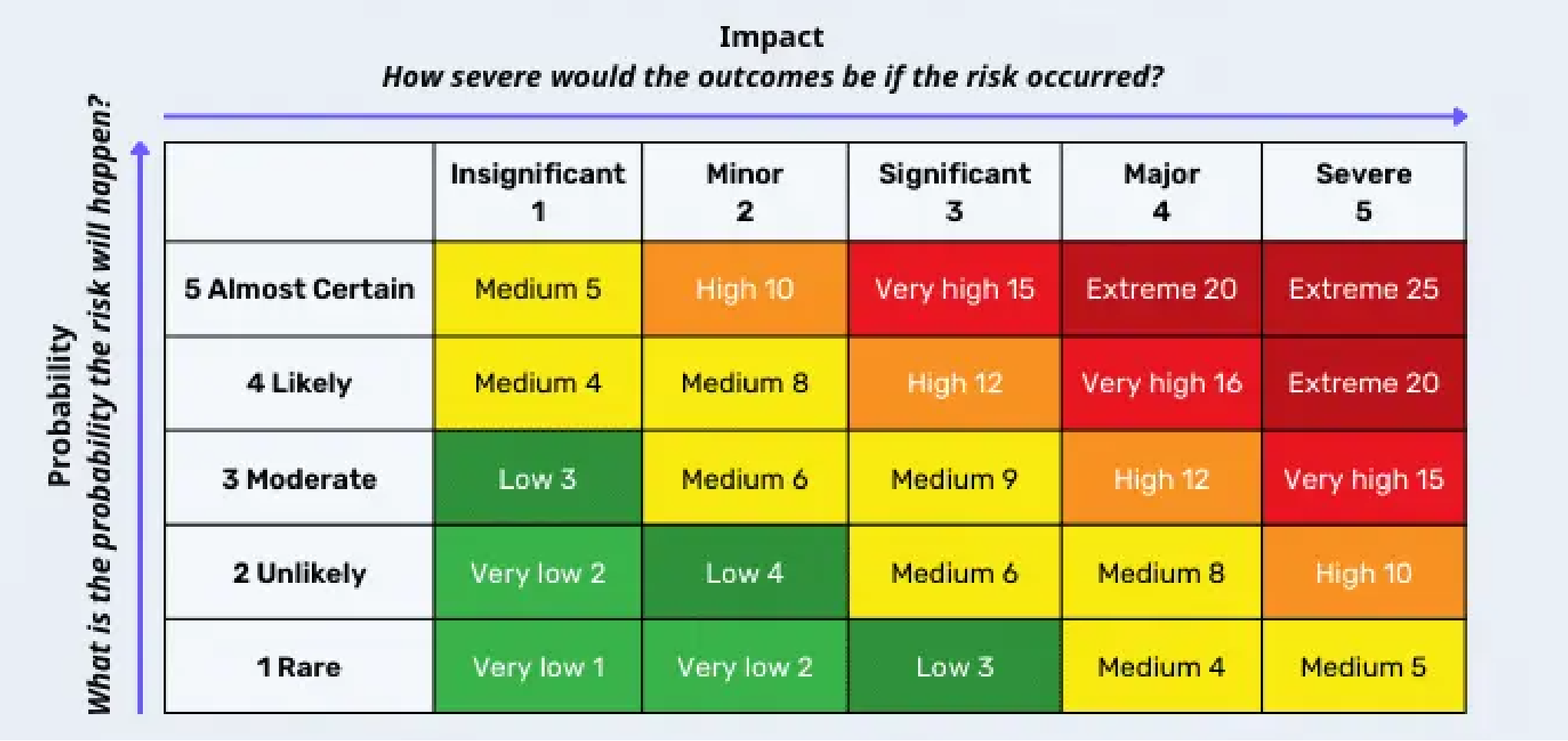


Enclosures Alternative – HF

- HF exposure limits would not be exceeded in areas outside the circles

- Circles represent the areas associated with different exposure limits:
  - 8-hours (blue)
  - 60-minutes (purple & yellow)
  - 30-minutes (green)
  - 10-minutes (orange)

Overall Risk vs. Potential Impacts?



	Insignificant 1	Minor 2	Significant 3	Major 4	Severe 5
5 Almost Certain	Medium 5	High 10	Very high 15	Extreme 20	Extreme 25
4 Likely	Medium 4	Medium 8	High 12	Very high 16	Extreme 20
3 Moderate	Low 3	Medium 6	Medium 9	High 12	Very high 15
2 Unlikely	Very low 2	Low 4	Medium 6	Medium 8	High 10
1 Rare	Very low 1	Very low 2	Low 3	Medium 4	Medium 5

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