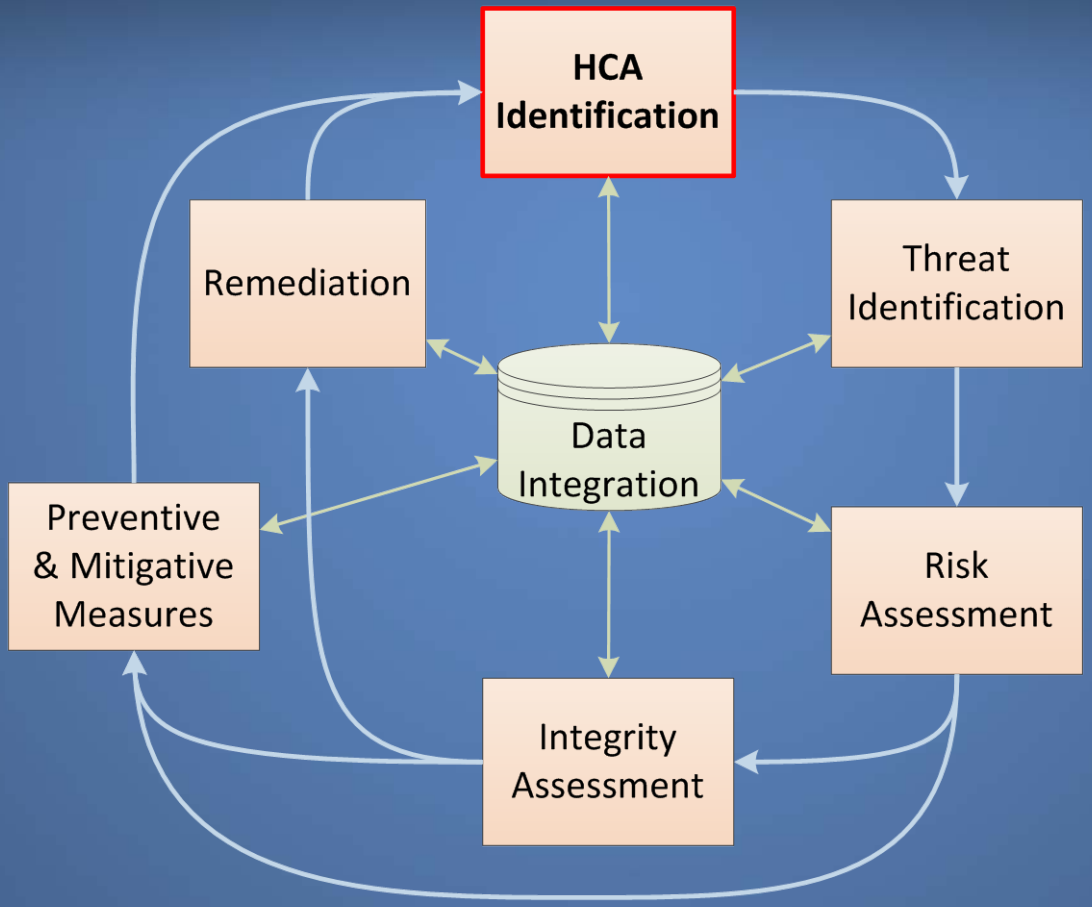
National Transportation Safety Board

Safety Issues: HCA Identification, Threat Identification, and Risk Assessment

Nathan Doble

Transportation Research Analyst

HCA Identification



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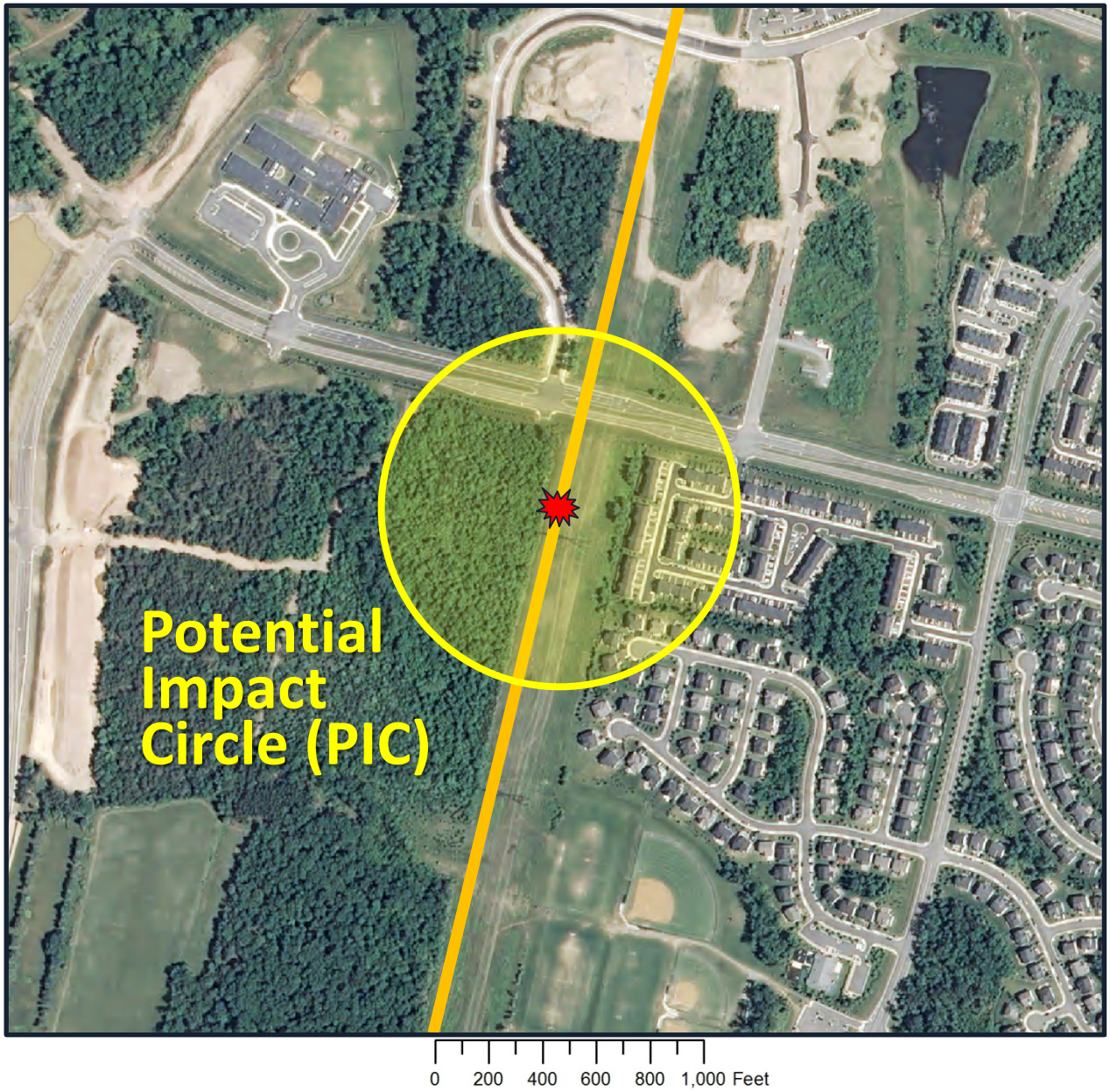

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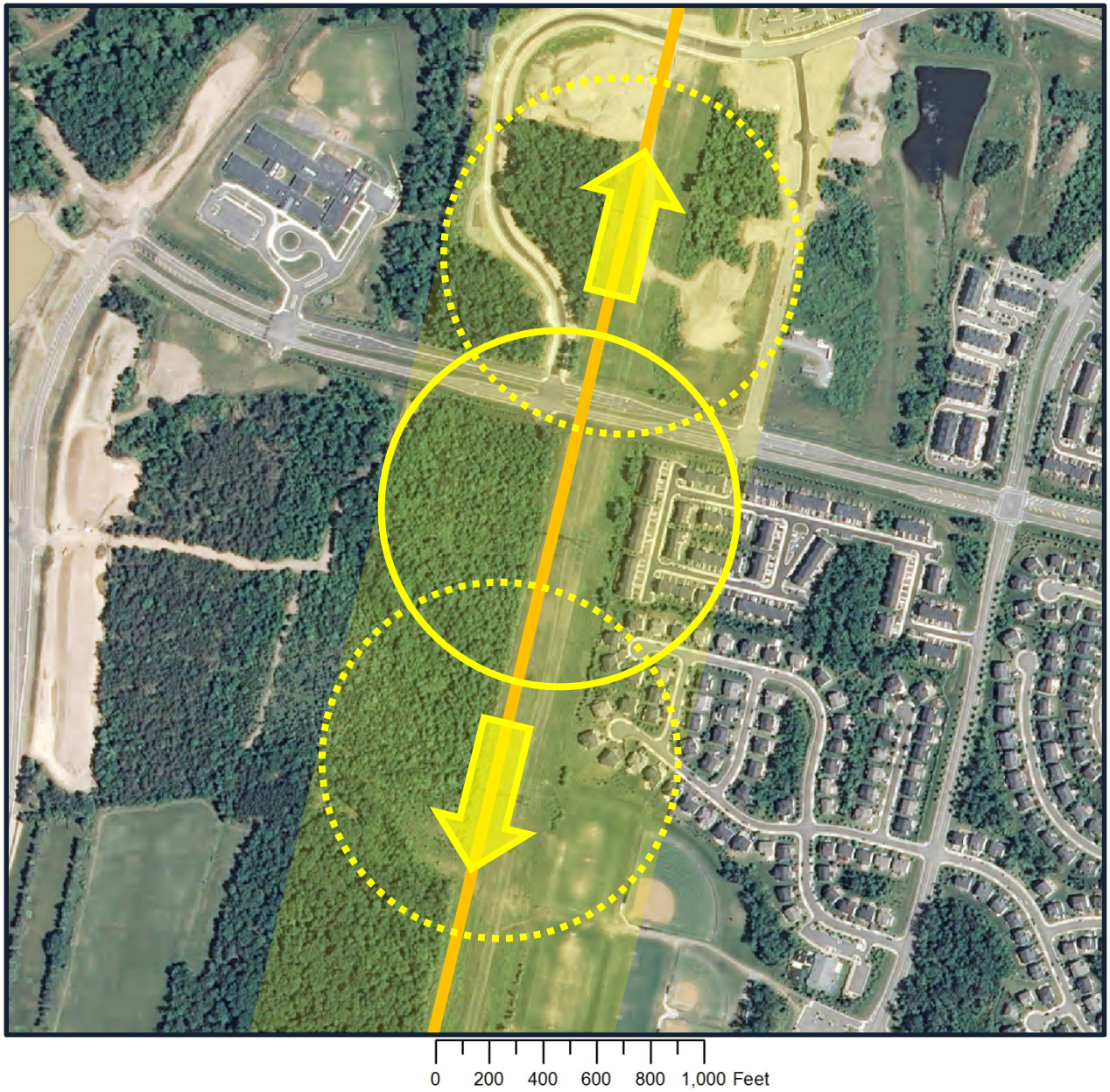

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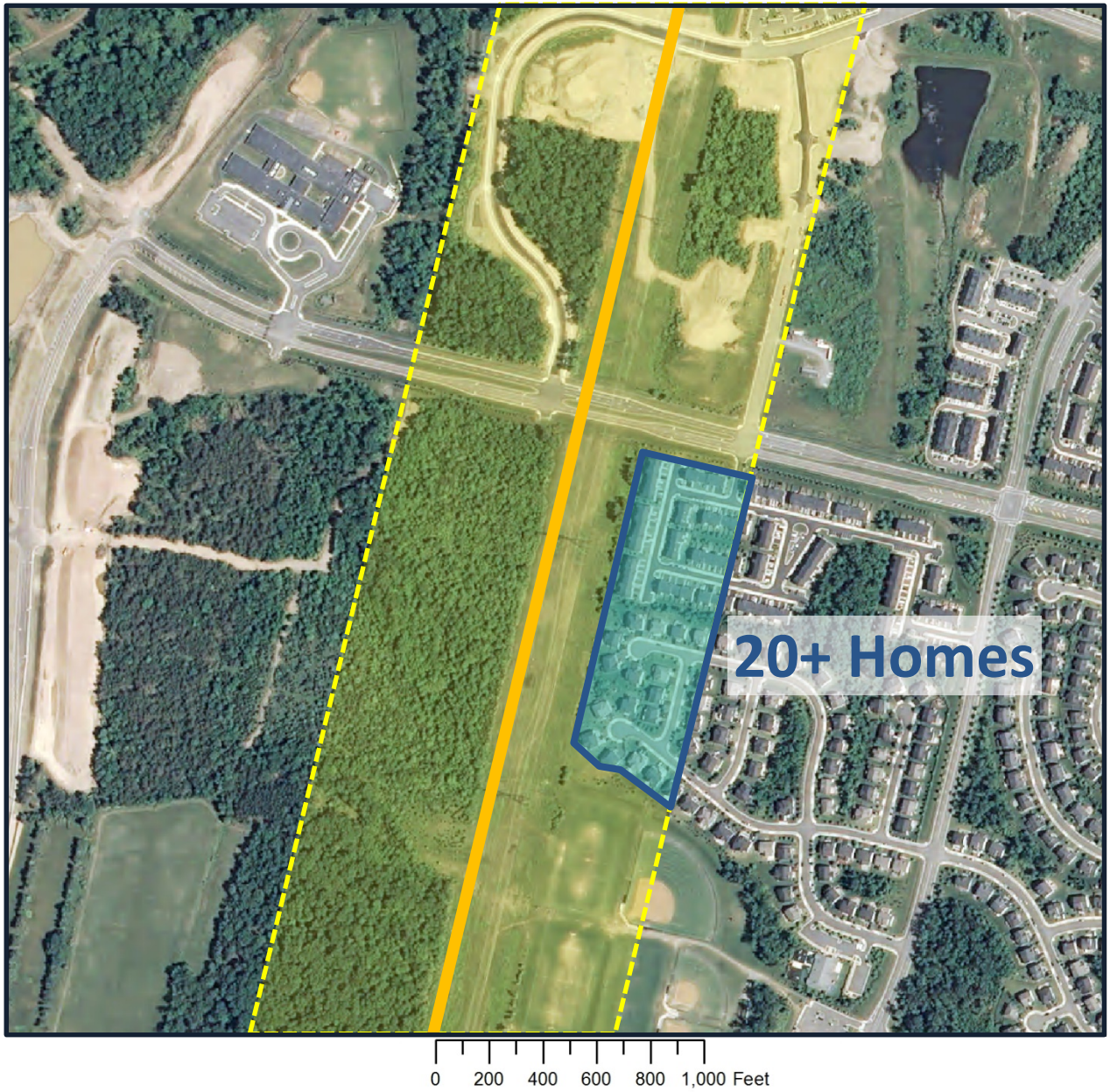

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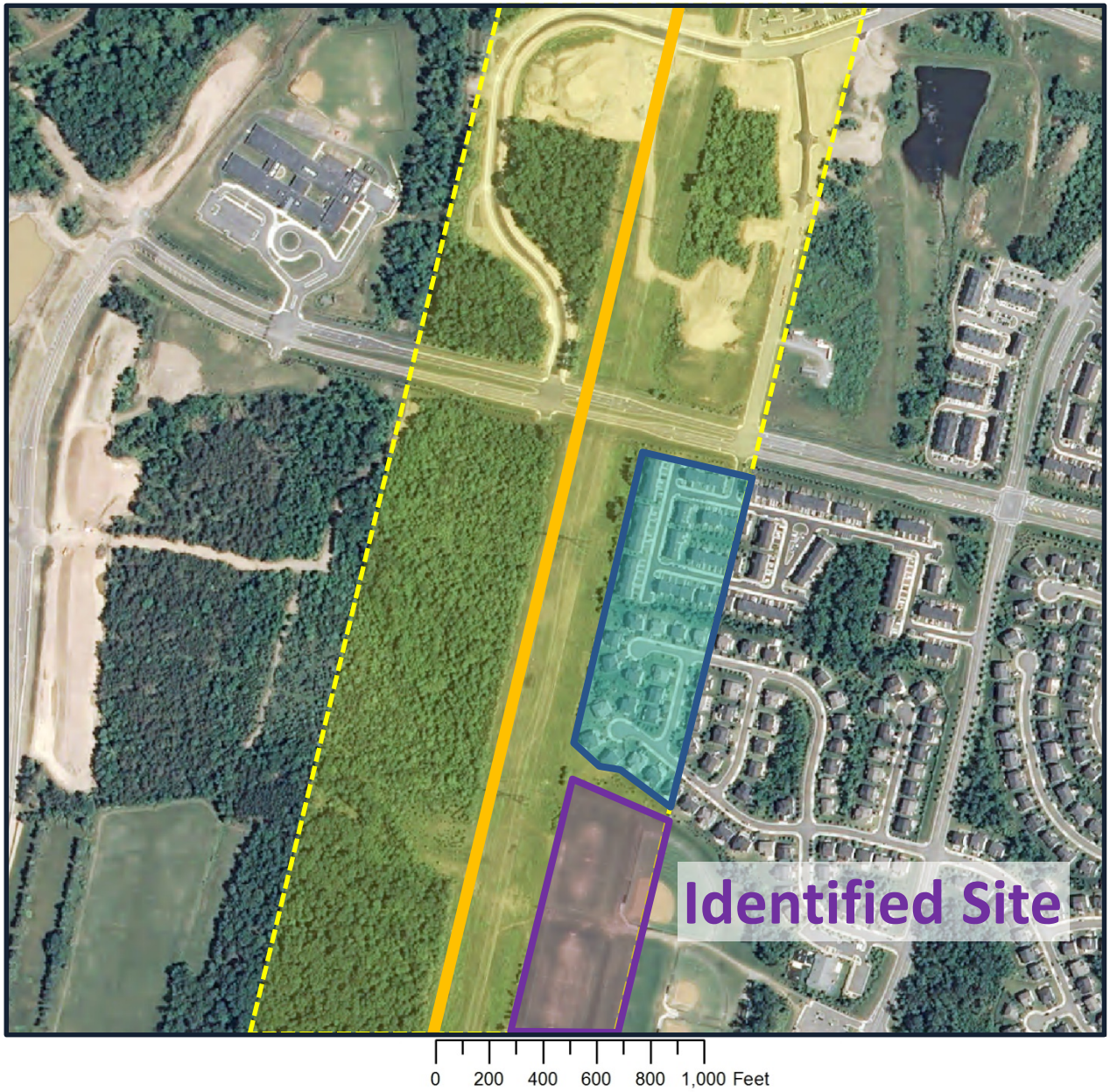

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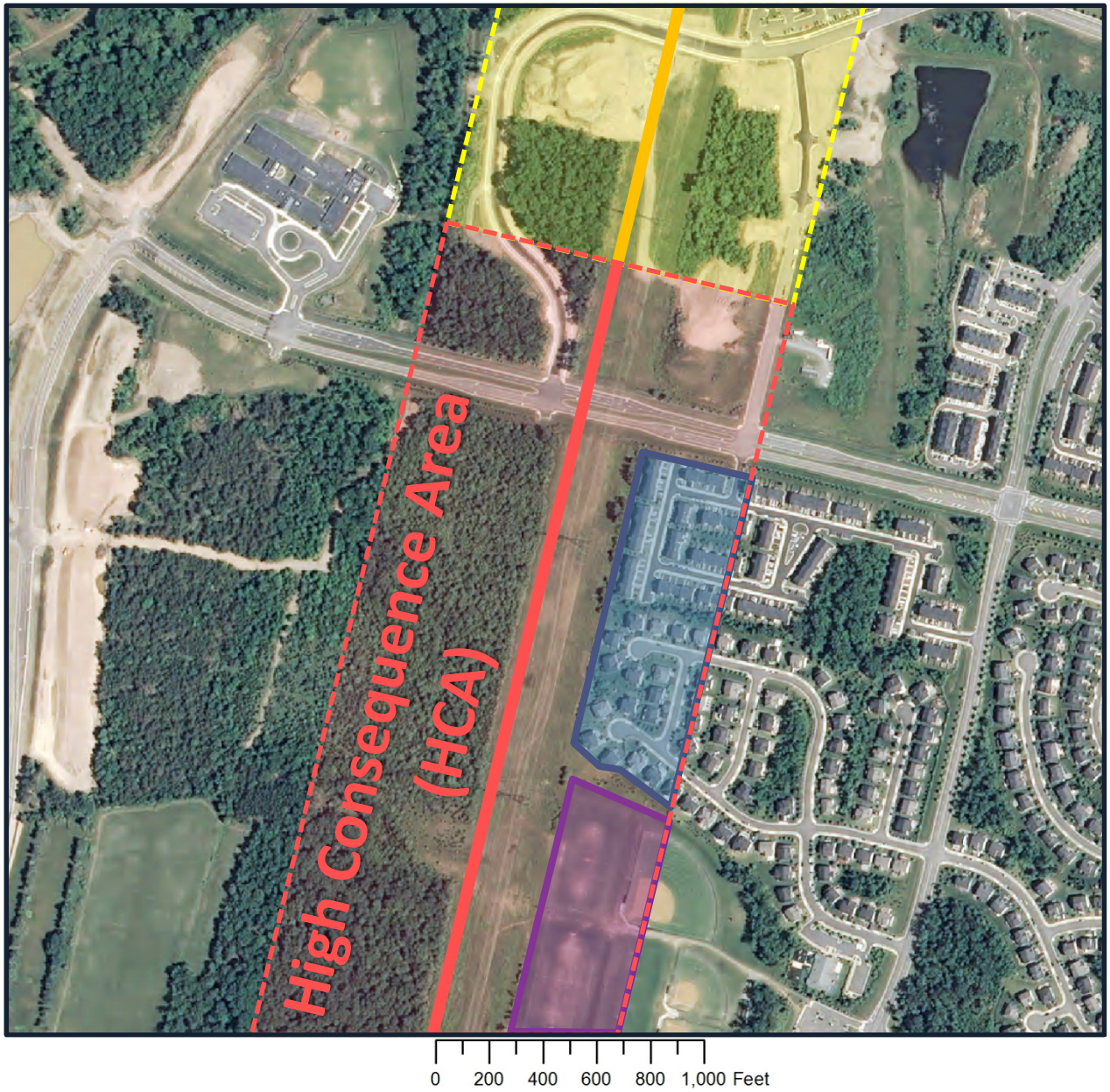

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HCA Identification Safety Issues

- Reporting requirements
- Positional accuracy and buffering
- Authoritative sources for geospatial data

Reporting Requirements

- HCA identification frequently cited in inspections
  - Highest percent of collected civil penalties
- Operator incident reports do not verify HCA identification
- Operators not required to submit HCA data to NPMS

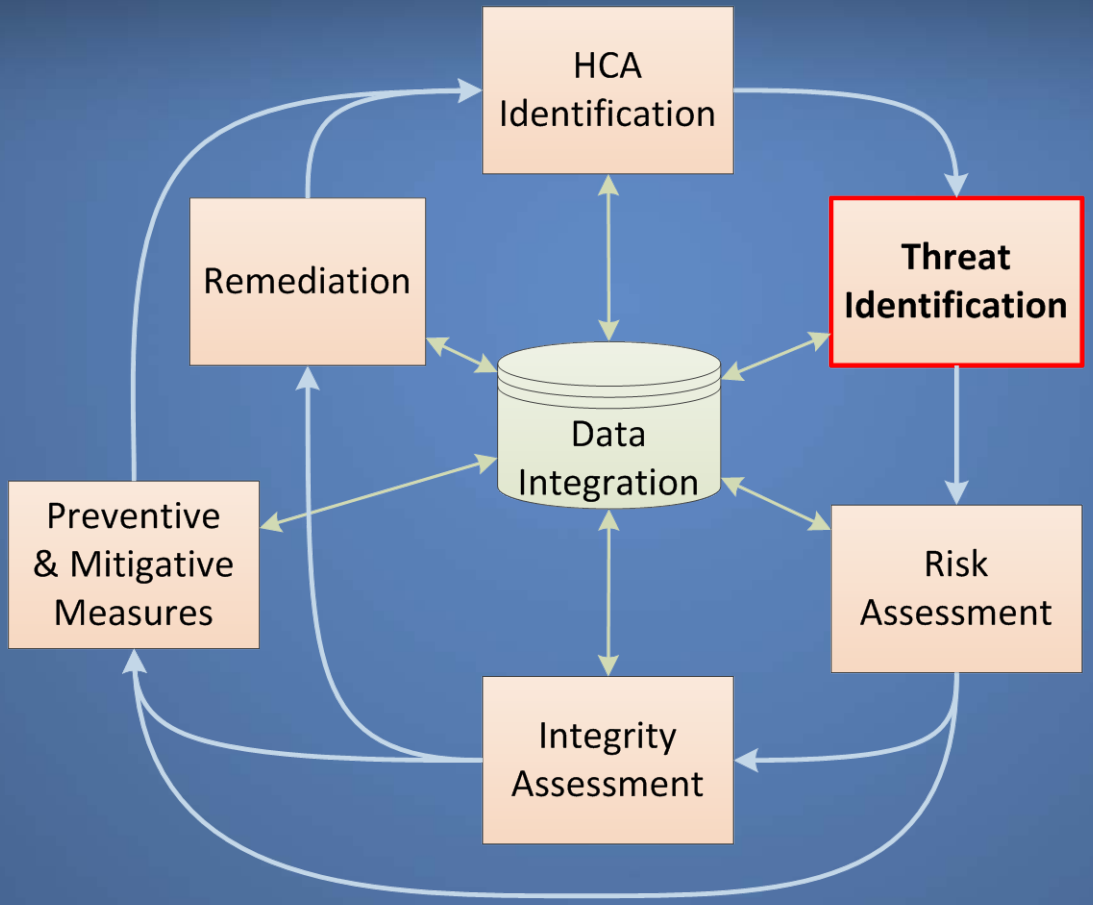
Positional Accuracy and Buffering

- Operators must account for mapping/measuring inaccuracies
  - Most interviewed operators add a distance buffer to PICs, but approaches vary
- No standards for geospatial data commonly used by pipeline industry
- Lack of standards limits operators' ability to determine technically sound buffers

Authoritative Sources for Geospatial Data

- Errors in determining Identified Sites are a frequent compliance issue
  - Palm City, FL
- No national repository for geospatial data used in HCA identification
- Lack of authoritative data source may contribute to inaccurate HCA identification

Threat Identification



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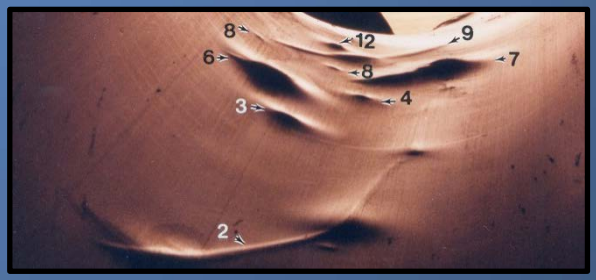
Threat Categories

- Time-Dependent
  - External Corrosion
  - Internal Corrosion
  - Stress Corrosion Cracking
- Stable
  - Manufacturing
  - Construction
  - Equipment
- Time-Independent
  - Third-Party / Mechanical
  - Incorrect Operations
  - Weather-Related / Outside Forces

External Corrosion

Manufacturing (bad weld)

Third-Party (dents)



Source: PHMSA, NTSB

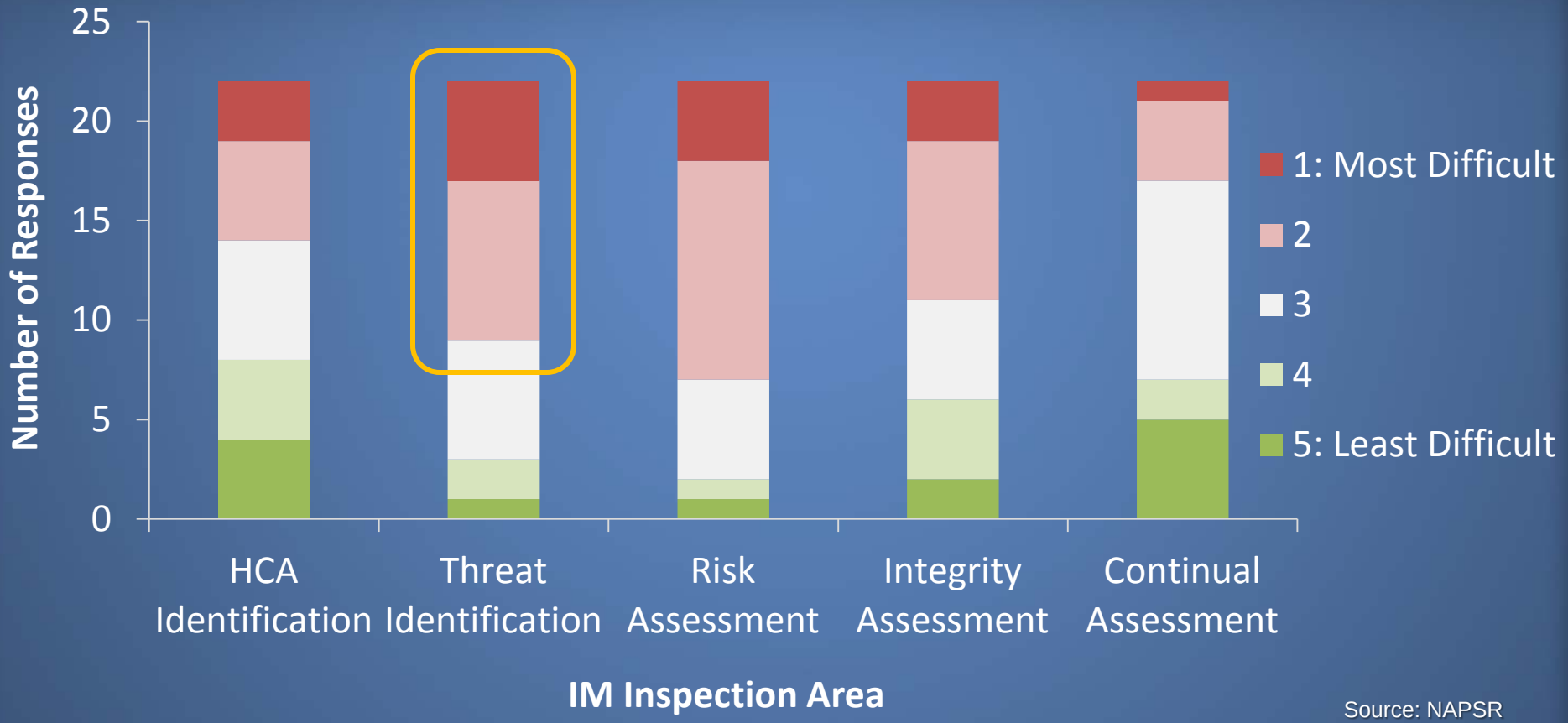
Threat Identification Safety Issues

- Elimination of Threats
- Interactive Threats

Elimination of Threats

- “Elimination” does not remove threat
  - Operator assumes threat not present
- Approaches vary among operators
  - Flowcharts
  - Decision trees
  - Statistical tests on risk model outputs

State Inspection Difficulties: Threat Identification



Source: NAPSR

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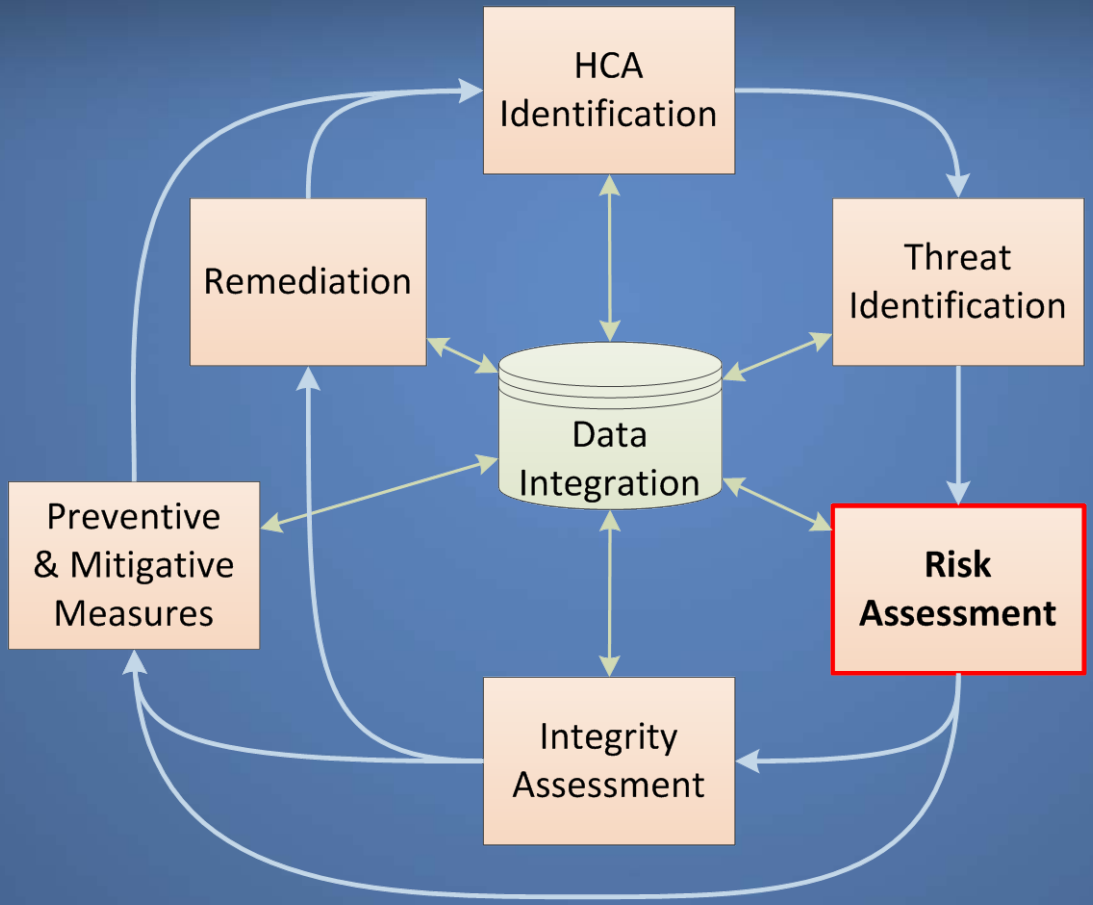
Elimination of Threats

- Factor in Palm City, FL accident
- Lack of data precludes thorough analysis
- Threat elimination compliance issues cited in 30% of PHMSA IM inspections
- Little guidance available to operators or inspectors

Interactive Threats

- Interactive threat compliance issues cited in 51% of PHMSA IM inspections
  - Most frequent issue cited
- Approaches vary among operators
- Insufficient guidance available
  - How to evaluate interactive threats
  - What threat interactions to consider
- Lack of data precludes thorough analysis

Risk Assessment



Risk Assessment Safety Issues

- Safety performance of risk models
- Risk modeling guidance
- Professional qualification standards

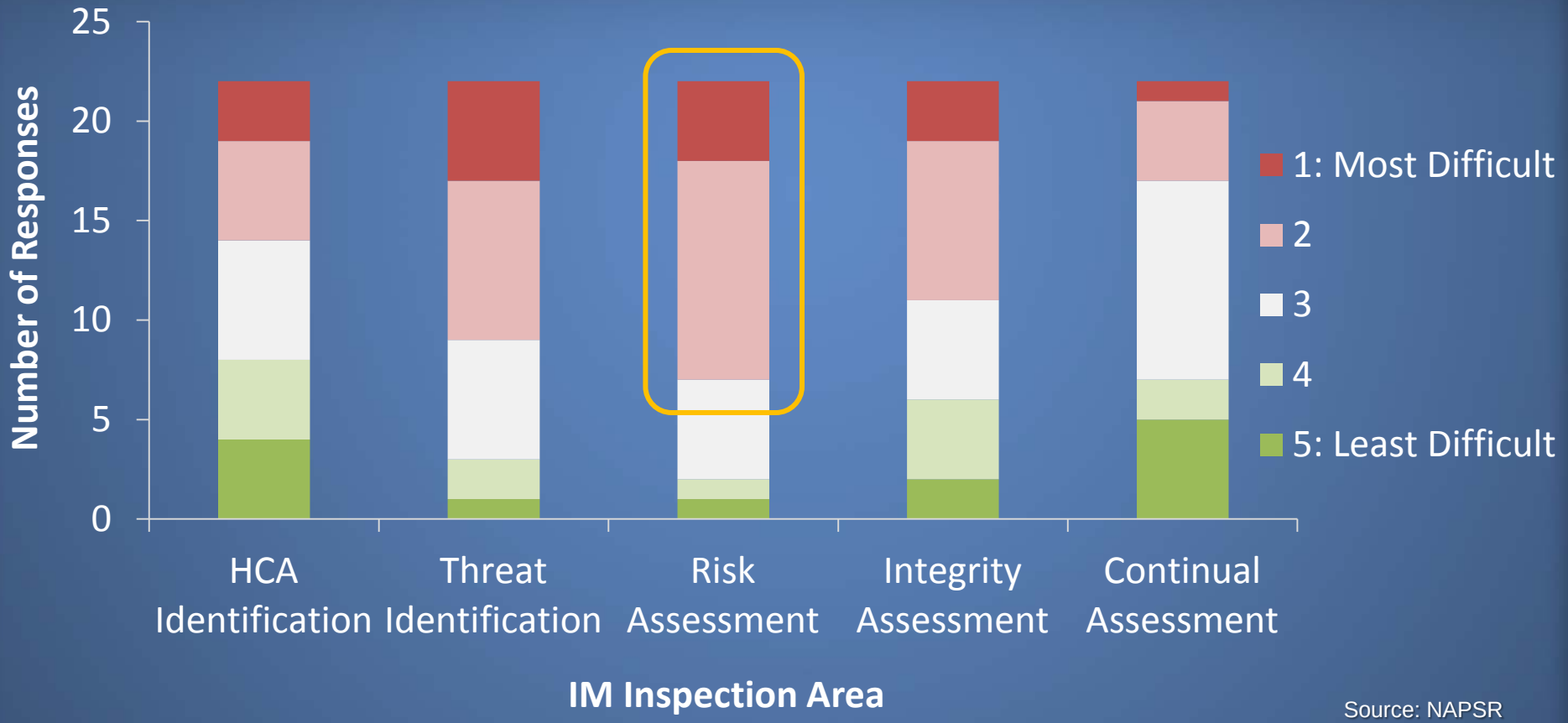
Risk Models

- Risk = Likelihood × Consequence
- Four types of models allowed
  - Subject matter expert (SME)
  - Relative risk
  - Scenario-based
  - Probabilistic (absolute risk)
- Most operators' models most closely resemble relative risk model

Risk Model Performance

- Operators considering probabilistic models
  - Data-intensive
  - Have advantages over relative risk models
- Insufficient guidance regarding relative safety performance of each model type
- Lack of data precludes analysis of risk model effects on accident occurrences

State Inspection Difficulties: Risk Assessment



Source: NAPSR

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Risk Modeling Guidance

- Weighting factors
  - Indicate relative importance of risk factors
  - System-wide weighting factors can obscure uncommon, but high-risk threats
- Risk metrics and risk aggregation
  - Operators often aggregate risk from segment to HCA level
  - Metrics may mask localized threats

Professional Qualification Standards

- Engineers and SMEs play large role in risk model design, implementation, and validation
- Professional qualification standards are often inadequate
- Example: risk validation role
  - No required training beyond IM familiarity
  - No required math or statistics knowledge

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