Alaska Risk Assessment of Oil & Gas Infrastructure

Alaska's Risk Assessment

PROPOSED RISK ASSESSMENT METHODOLOGY OVERVIEW

Version: v.0.01

Meeting Objective

- Provide an Overview of the Proposed Risk Assessment Methodology
- Provide an Opportunity to Ask Questions
- Receive Public Comments

Presentation Topics

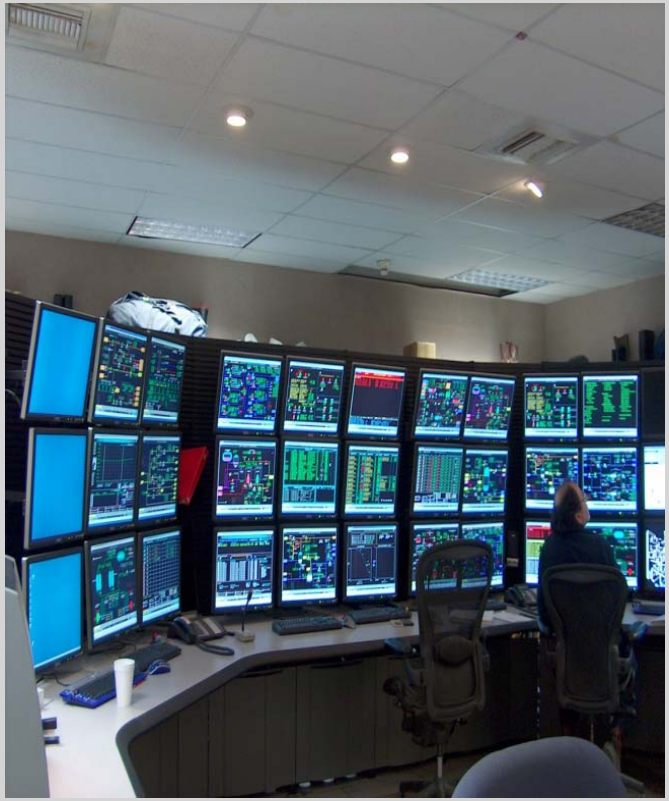
- ARA Project Background
- Stakeholder Consultation and Methodology Inputs
- Risk Assessment Methodology
- What's Next?
- Avenues for Public Input

Project Background

- **Alaska Reliance on Oil & Gas Production Revenue**
- **3-year Initiative Launched in May 2007 by Governor Palin**
- **Alaska Department of Environmental Conservation (DEC) Initial Planning Period**
- **Emerald/ABS Consulting Selected in June 2008**
- **ADEC Project Manager Assigned in August 2008**

Project Team

- **State of Alaska**
  - ADEC Project Manager - Ira Rosen
  - State Agency Oversight Team (SAOT)
- **Emerald / ABS Consulting**
  - Project Manager - Bettina Chastain, P.E.



Project Objectives

- Assess the Current State of Oil & Gas Infrastructure and Systems
- Identify and Rank Areas of Greatest Risk in Terms of Safety, Environment, and Reliability
- Present Results for State Decision Makers

Project Timeline

Phase 1:

Risk Assessment

Methodology Design

June 2008 – Aug 2009

Phase 2:

Risk Assessment

Implementation

Aug 2009 – Feb 2010

Phase 3:

Analysis & Final Report

Feb 2010 – May 2010

Phase 1 Tasks

- ☑ Develop a Project Plan
- ☑ **Consult with Stakeholders** (August – November, 2008)
- ☑ Review Best Practices to Consider in Methodology Design
- ☑ Develop Interim Report
- ☑ Propose a Risk Assessment Methodology (December – January 2009; Draft Issued February 2009)
- ☑ **Public and Peer Review of Proposed Methodology** (March – July 10, 2009)
- ☐ Proposed Final Risk Assessment Methodology (Due By August 7, 2009)

Overview of Phase 2 & 3

- Implement the Risk Assessment according to the Risk Assessment Methodology
- Analyze Risk Assessment Results
- Produce Draft and Final Reports

Basic Infrastructure Scope

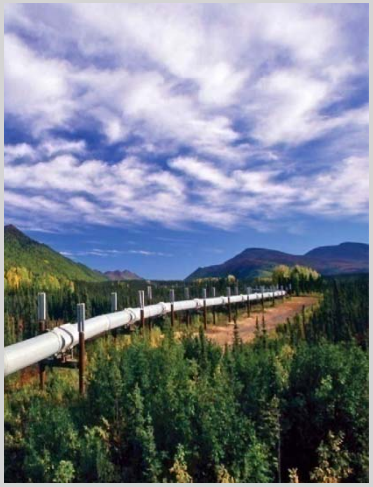
Included:

- **North Slope Infrastructure**, *including production facilities and pipelines up to Pump Station 1*
- **Trans Alaska Pipeline System (TAPS)**, *including the Valdez Marine Terminal (VMT) up to the marine terminal loading arms*
- **Cook Inlet Infrastructure**, *including production facilities, the Cook Inlet Gas Gathering System (CIGGS) up to the Nikiski LNG Plant and the Cook Inlet Pipeline (CIPL) up to the Drift River Marine Terminal loading arms (Cook Inlet will be considered in the initial phase of this project.)*

Excluded:

- **Areas of future oil and gas development** *(i.e., areas where production operations begin after the commencement of this project, July 1, 2008)*

Basic Project Scope



Infrastructure Components

Included:

- **Production wells**
- **Gathering lines** *(flowlines from wells upstream of processing center)*
- **Facility piping**
- **Crude oil pipelines**
- **Gas and water injection systems** *(including wells)*
- **Gas transport pipelines integral to operating infrastructure** *(Cook Inlet)*
- **Oil and gas processing and treatment**
- **Waste management and disposal** *(re-injection materials)*
- **Storage tanks**
- **Terminals**
- **Marine loading facilities**
- **Support systems** *(e.g. utility systems, electric power, fuel systems, water supplies, control/communications systems)*

Excluded:

- **Marine transportation** *(e.g., tankers and other marine infrastructure)*
- **Refineries and product distribution lines not integral to operating infrastructure**
- **Exploration and other future development infrastructure** *(e.g., drilling rigs)*
- **Reservoir maintenance**
- **Future facilities or projects** *(i.e., production operations with planned start-up after the commencement of this project, July 1, 2008)*

Basic Project Scope

Factors / Considerations for the Engineering Study

Included:

- **Original design/operating life**
- **Natural aging process** *(corrosion, abrasion, wear, and fatigue)*
- **Operating procedures and standards**
- **Maintenance and management**
- **Regulations and agency oversight**
- **Foreseeable changes in operations** *(such as changes in throughput and heavy oil production)*
- **Natural hazards** *(earthquake, tsunami, severe weather, ice, volcanic, etc.)*

Excluded:

- **Market conditions** *(e.g., commodity prices that drive the economics of shutting in operations)*
- **Security issues / Intentionally man-made hazards** *(e.g., terrorist attacks or sabotage)*

Significant Consequence Areas

Safety:

Consequences to the safety of life and health of both the general public and industry employees.

Environment:

Consequences to the natural resources of the State.

Reliability:

Events that result in disruptions of the production of oil & gas, from which the State receives the majority of its revenues.

Alaska Risk Assessment of Oil & Gas Infrastructure

STAKEHOLDER CONSULTATION / METHODOLOGY INPUTS

Purpose of Stakeholder Consultation

- Help to Develop Customized and Fit-For-Purpose Risk Assessment Methodology
- Refine the Project Scope (Infrastructure Components)
- Develop Project Specific Definition of Unacceptable Consequences
- Communicate Project Information to Stakeholders

Stakeholder Outreach

- Regional Stakeholder Public Meetings
  - Anchorage (Statewide)
  - Barrow (North Slope Region)
  - Fairbanks (Interior Region)
  - Kenai (Cook Inlet Region)
  - Valdez (Prince William Sound/Copper River Basin Region)

Key Stakeholder Consultation

- 200 Individuals and 39 Meetings
- Key Stakeholders
  - General Public
  - Local Governments
  - State and Federal Agencies
  - University of Alaska
  - Non-Governmental Organizations (NGOs)
  - Native Organizations

Stakeholder Questions

1. **What is the primary reason you are interested in the Alaska Risk Assessment of Oil & Gas Infrastructure Project?**

2. **What components of the existing oil & gas industry infrastructure warrant the most attention from the project team?**

Stakeholder Questions

3. **Within the categories of impact to human safety, impact to the environment, and production/revenue loss, what kinds of events would you consider to be the most significant?**

4. **Do you have any other specific concerns or priorities in the areas of safety, the environment, or production that should be considered in the risk assessment study?**

Project Reports to Date

- ✓ Interim Report – January 2009
  - Results and Documentation of Stakeholder Consultation Process
  - Best Practice Data
  - Infrastructure Description
  - Initiating Events
  - Unacceptable Consequences
- ✓ Proposed Risk Assessment Methodology Report – March 2009
  - Methodology Inputs
  - Infrastructure Scope
  - Technical Methodology
  - Risk Assessment Results

SCOPE OF INFRASTRUCTURE COMPONENTS, PROCESSES, AND SYSTEMS

Basic Infrastructure Scope

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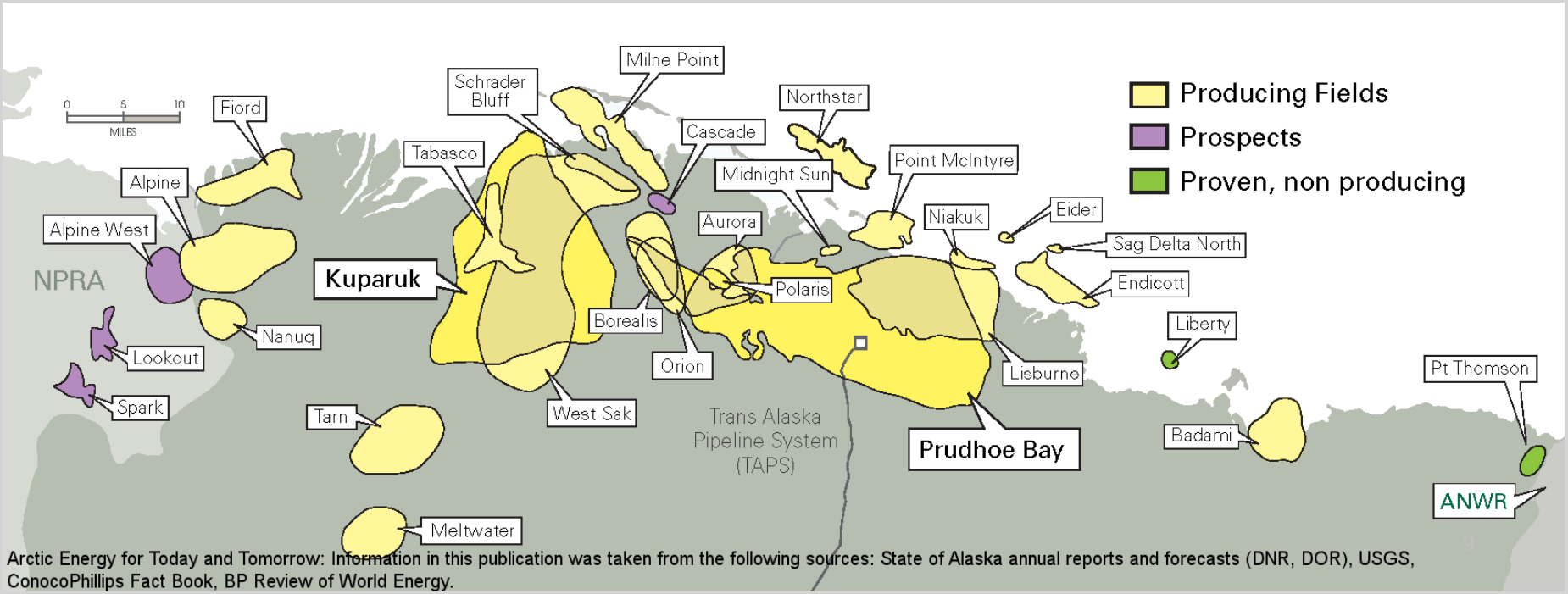
North Slope Infrastructure

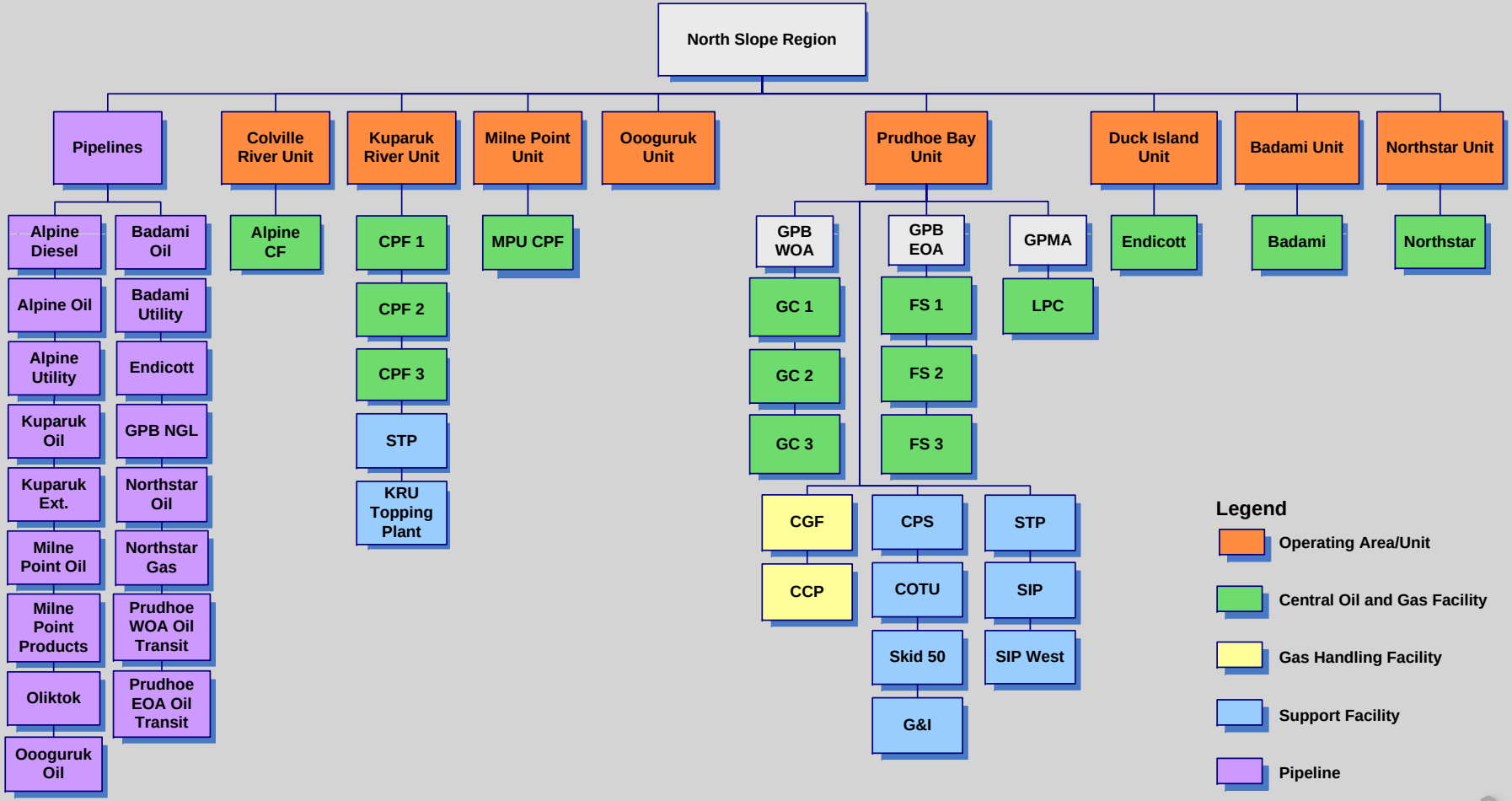


Arctic Energy for Today and Tomorrow: Information in this publication was taken from the following sources: State of Alaska annual reports and forecasts (DNR, DOR), USGS, ConocoPhillips Fact Book, BP Review of World Energy.

North Slope Infrastructure

- Major Operating Areas/Units – 8
- Major Processing Facilities – 17
- Major Support Facilities – 11
- Pipelines – 17
- Well Pads – 133
- Wells – 3,671

North Slope Infrastructure

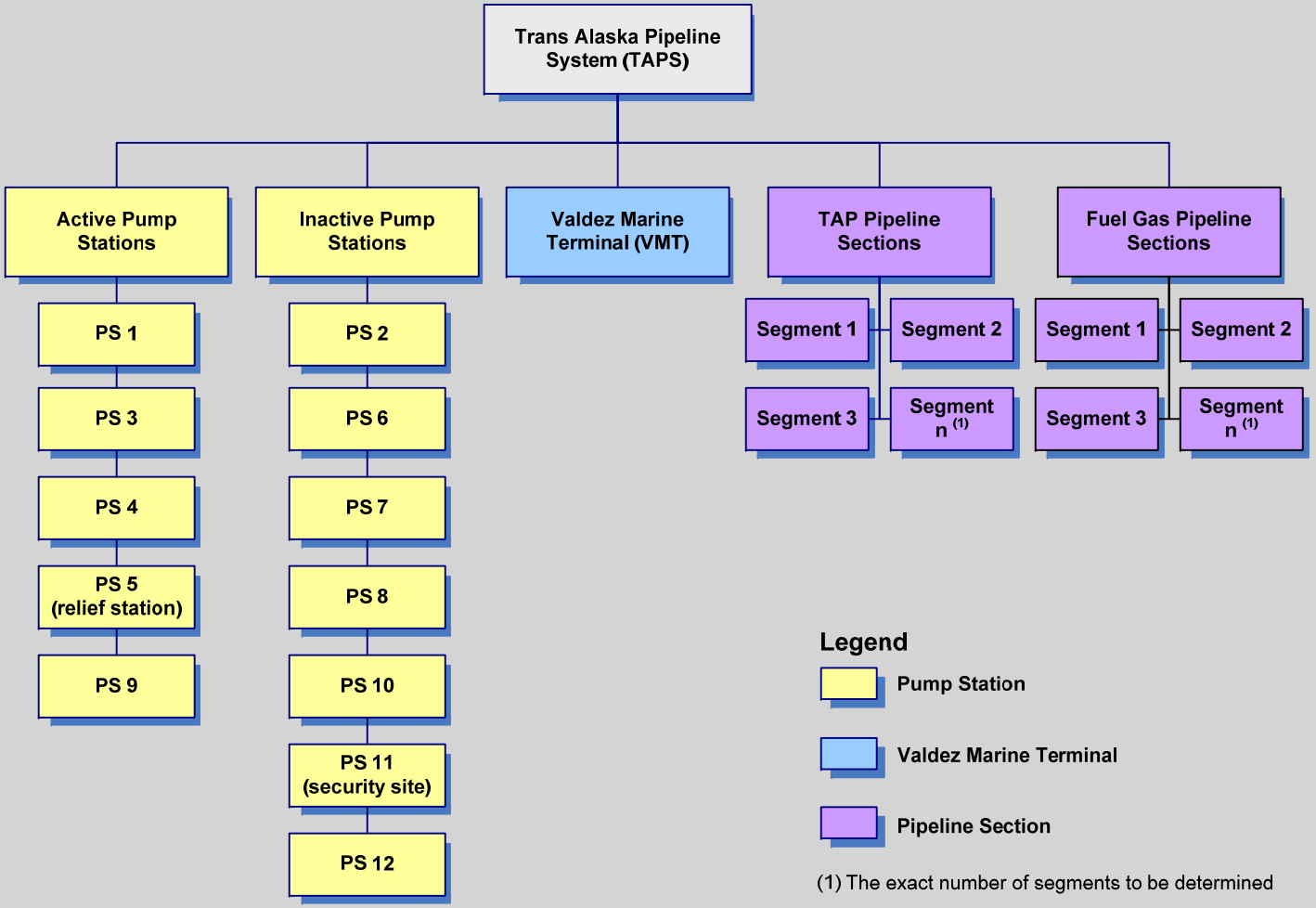


TAPS Infrastructure

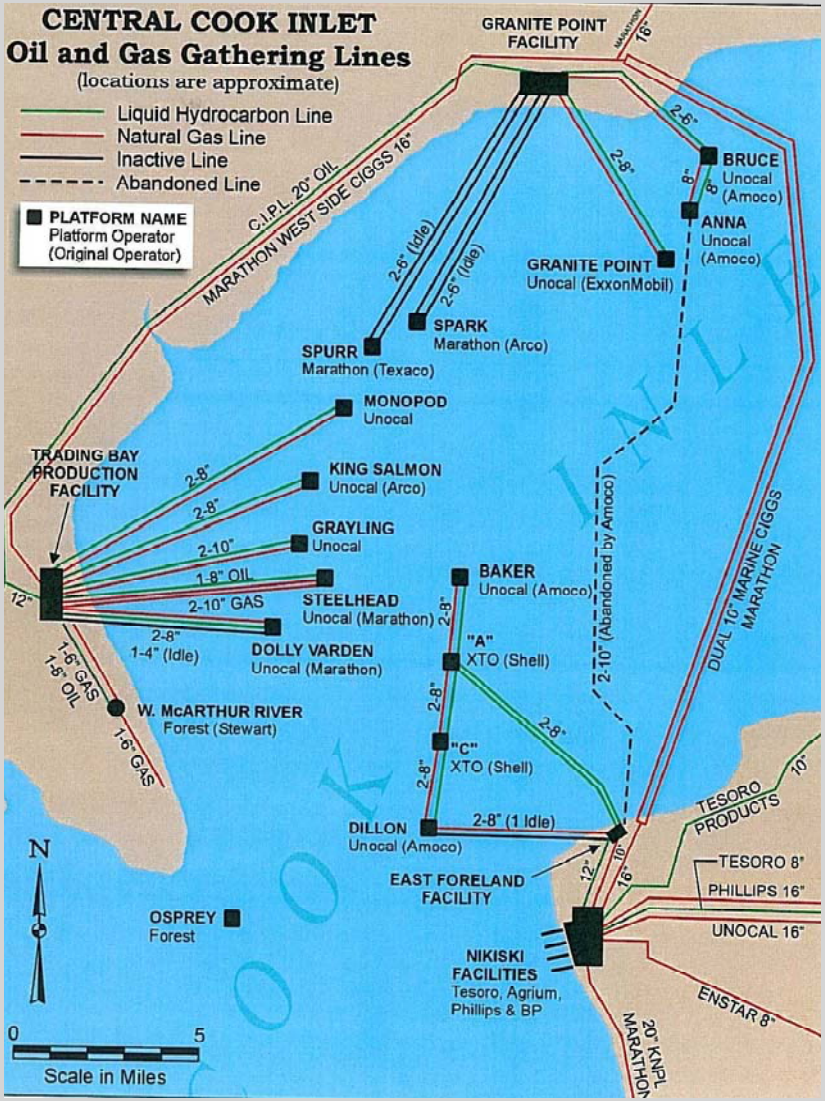
TAPS Infrastructure

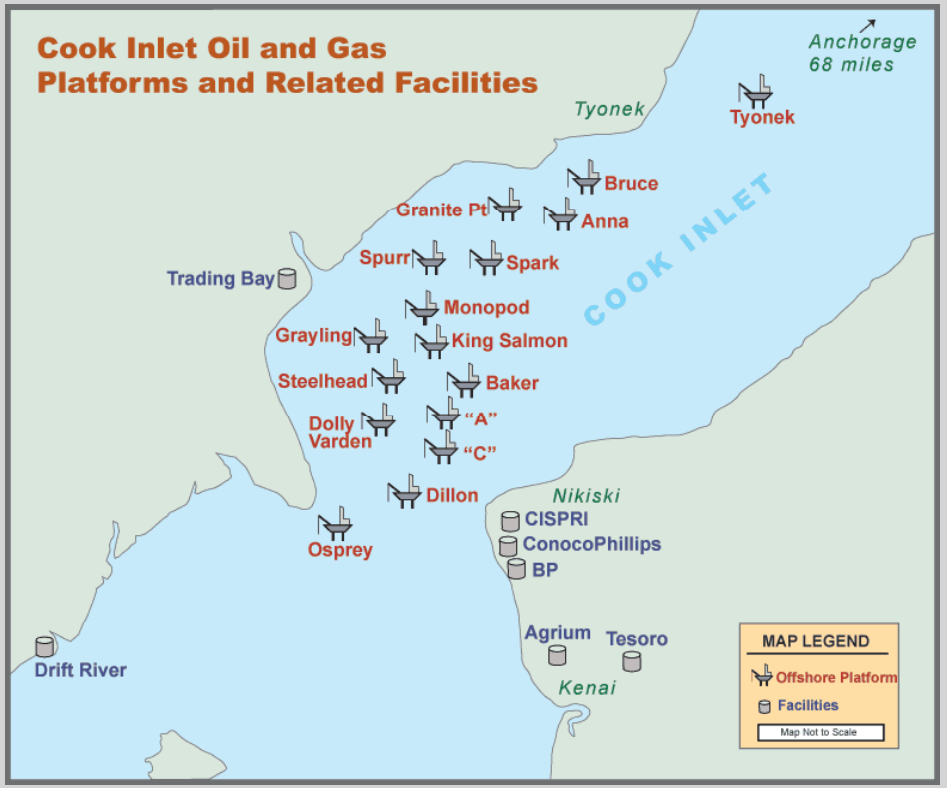
- TAPS 48-Inch Pipeline – 800 Miles
- Fuel Gas Pipeline – 144 Miles
- Active Pump Stations – 5
- Inactive Pump Stations – 6
- Major Valdez Marine Terminal Components – 6

TAPS Infrastructure



Cook Inlet Infrastructure

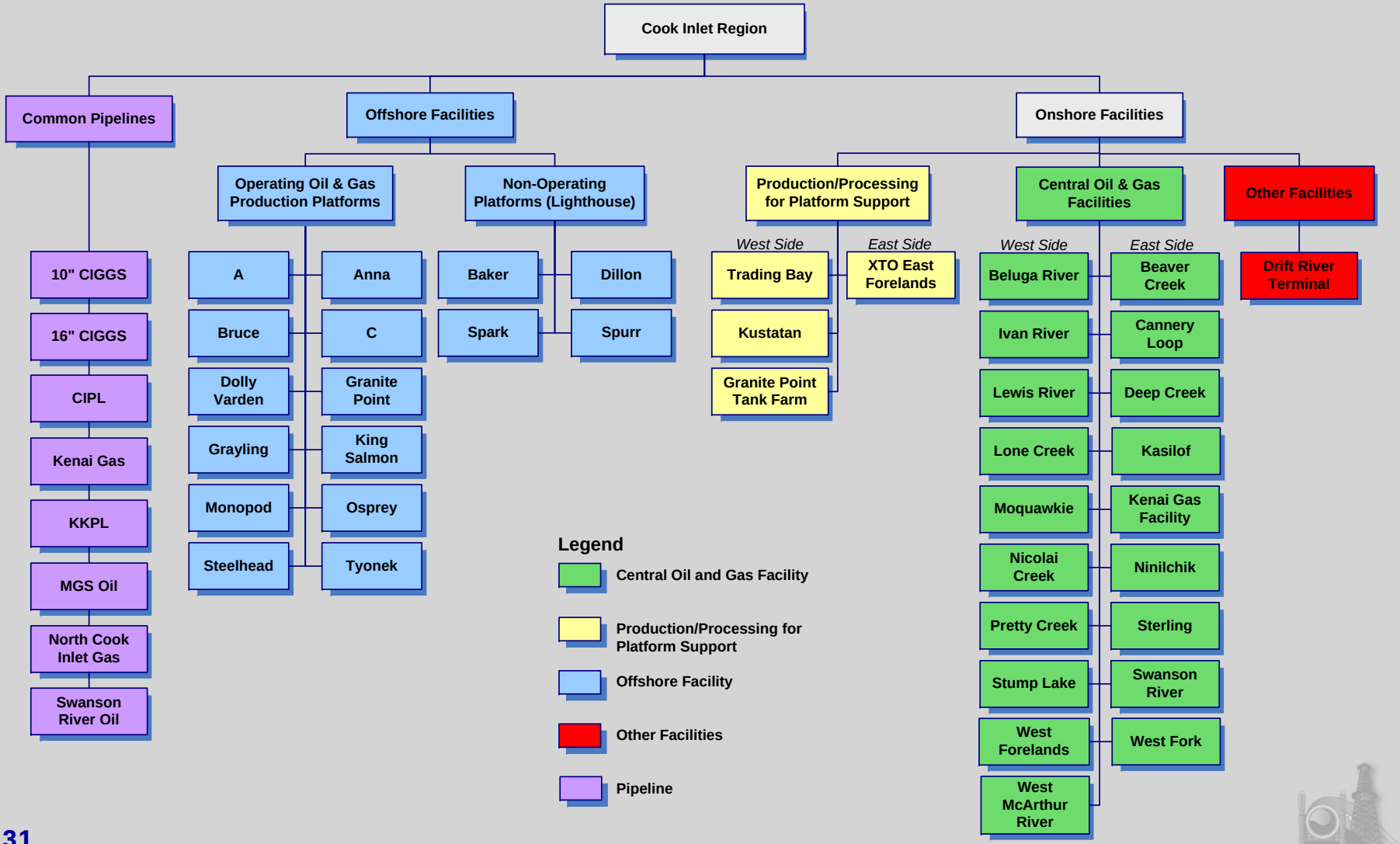




Cook Inlet Infrastructure

- Offshore Oil & Gas Production Platforms – 16
- Onshore Production/Processing Facilities (Platform Support) – 5
- Onshore Central Oil & Gas Production Facilities – 22
- Terminals – 1
- Pipelines – 8
- Offshore and Onshore Wells – 573

Cook Inlet Infrastructure



What is a Risk Assessment?

- Organized and systematic effort to identify and analyze hazardous scenarios;
- Starts with answering the question "What can go wrong?"
- Evaluate "how likely" it is that a significant event will occur;
- Evaluate "how damaging" the event would be to people, the environment, or production and state revenue if the event were to occur; and
- Combine the factors to determine a relative risk level.

Stakeholder Consultation

- Stakeholder Common Themes and Focus Areas
  - Initiating Events
  - Operational Hazard Events
  - Natural Hazard Events
  - Input for Definition of "Unacceptable" or Significant Consequences
    - Safety Considerations
    - Environmental Consequences
    - Reliability Consequences
  - Information Sources and Data Recommendations

Statewide Infrastructure Themes

- Aging Infrastructure
- Corrosion
- Changes in Process Conditions
- Industry Workforce
- Spills to Water
- Lack of Regulatory Oversight

North Slope Infrastructure Themes

- Subsea Pipelines (N*) and Multiphase Pipelines
- Pipeline Inspection and Pigging
- Loss of Critical Utilities/Support Systems
- North Slope Fire Safety
- Well Concerns
- Industry Culture
- Coastal Erosion
- Spills to Rivers and Beaufort Sea

TAPS Infrastructure Themes

- Strategic Reconfiguration Project
- Station Manning and Response Capabilities
- Pump Station 1 and VMT Tanks
- Loss of Power to Pump Stations/Black Start Conditions
- Loss of Communications
- Spills to Copper River Basin and Port Valdez

Cook Inlet Infrastructure Themes

- Subsea Pipelines in Cook Inlet
- Natural Hazards - Volcanoes
- Spills to Rivers and Cook Inlet
- Aging/Abandoned Infrastructure
- Loss of Southcentral Alaska Gas Production

Initiating Events

- Initiating Events Considered:
  - Operational Hazard Events – Related to the Operating Processes that Make Up the Infrastructure System, Such as:
    - Fires, Explosions and Spills
  - Natural Hazard Events – Caused by Naturally Occurring Phenomenon in the Environment:
    - Volcanoes, Earthquakes, Tsunamis, etc.

UNACCEPTABLE CONSEQUENCES

Defining Unacceptable Consequences

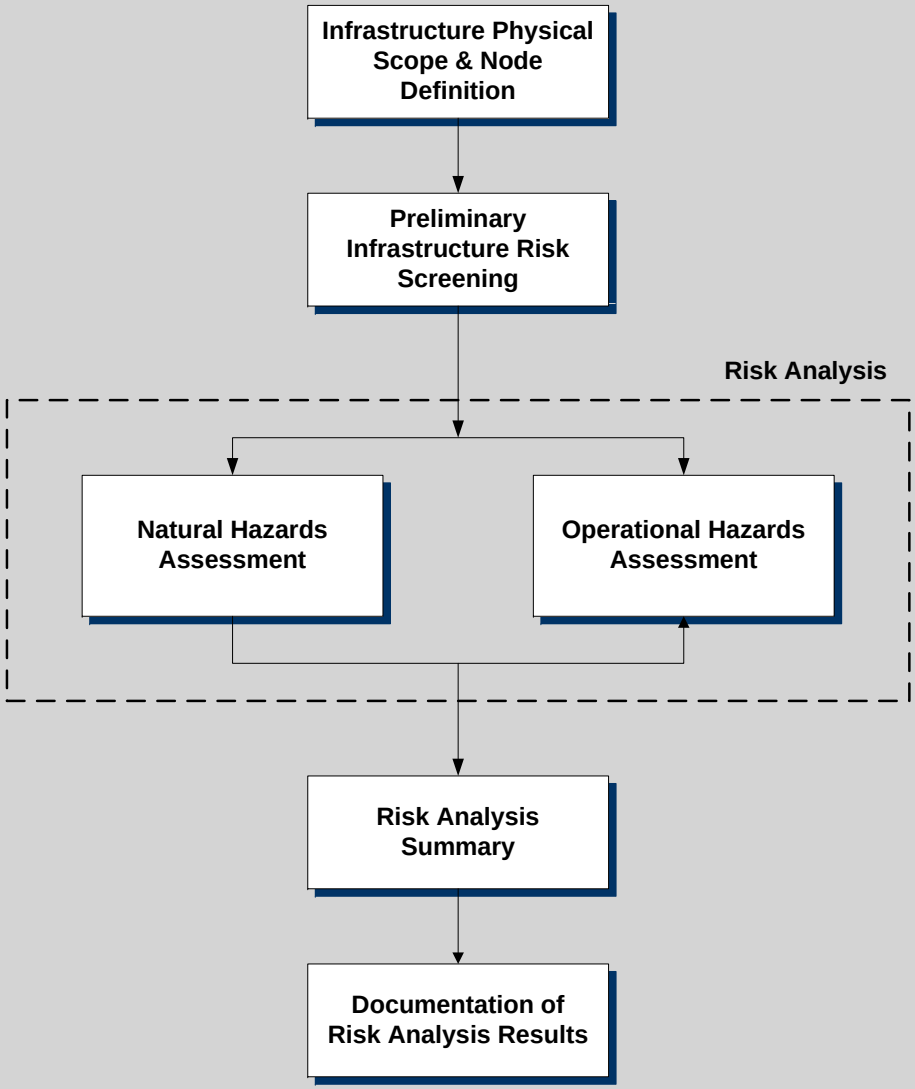
- "…the analysis will utilize an "unacceptable consequence" approach; beginning with the identification of the nature and extent of oil and gas infrastructure failures that would create unacceptable consequences or impacts to the environment, overall safety, and system reliability… consider wide-ranging stakeholder input before identifying an unacceptable consequence."
- Three Consequence Categories -
  1. Reliability of State Revenue Due to Loss of Production
  2. Safety (Occupational and Public)
  3. The Environment

Defining Unacceptable Consequences

- Determining What's "Significant"
- Structured to Support State Risk Management Decisions
  - Are we as a State willing to spend any more money directly or indirectly to reduce these identified risks?
  - If we are willing to spend additional money, where should those additional resources be focused to add the most value?
  - If there are different types of risks, how do we feel about each of them (i.e., how do we prioritize the risks so that we can make decisions on which ones should be addressed first?)

PROPOSED METHODOLOGY

Risk Assessment Methodology



Methodology Activities

- Nodal Breakdown
- Preliminary Infrastructure Screening
- Risk Analysis
  - Operational Hazards Assessment
  - Natural Hazards Assessment
- Risk Analysis Summary/Documentation

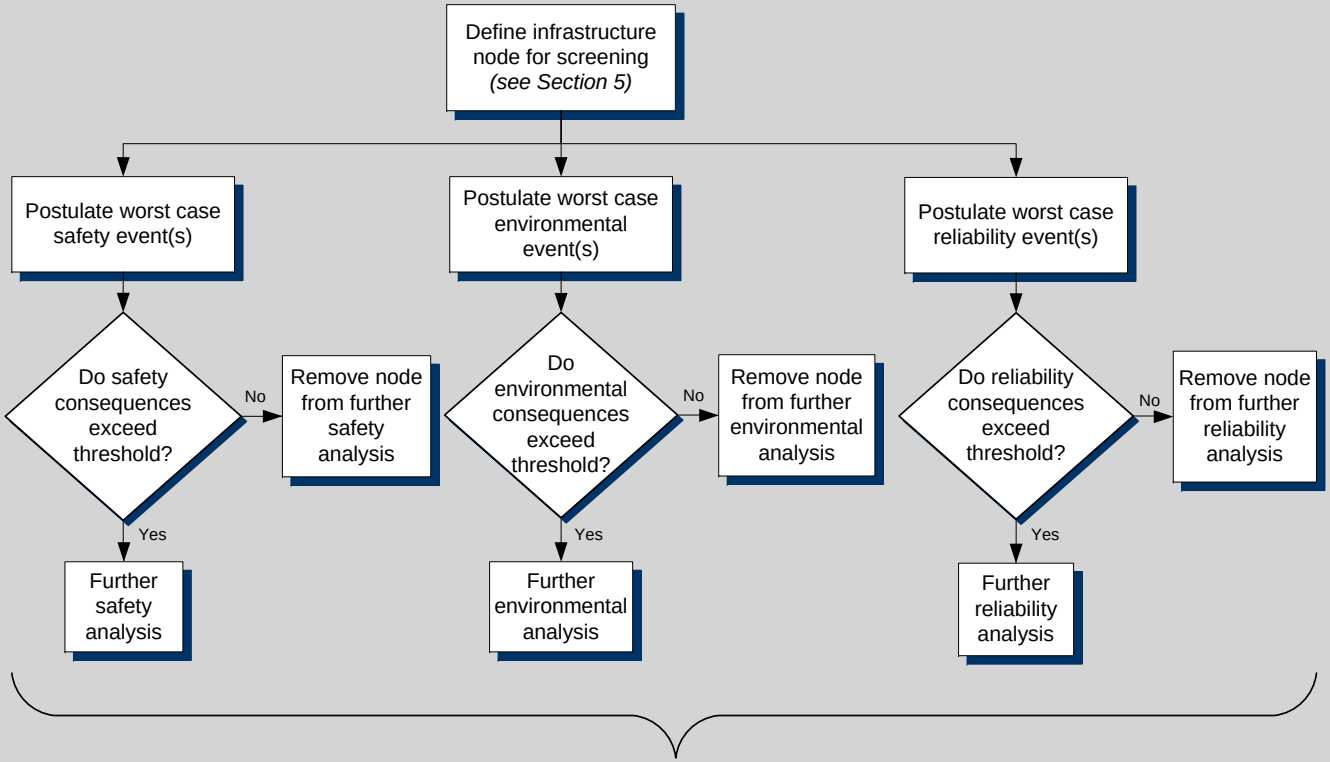
Nodal Breakdown

- Different Node Types by Region
  - Specific Types of Facilities
    - Common Systems
    - Typical Equipment
    - Common Failure Modes
  - Different Pipeline Types
    - Segmented by Topography, Geography, and Isolation Ability

Preliminary Screening

- Manage and Focus Scope of Review within Project Constraints
- Tied to Significant Consequences Identified by Stakeholders
- Consequence-Based Screening Approach
  - Safety
  - Environmental
  - Reliability

Preliminary Screening



Document Screening Results

1. Nodes that are potential contributors to significant events in all three consequence categories (SER)
2. Nodes that are potential contributors to significant events in one or two consequence categories (SE, SR, ER, S, E, or R)
3. Nodes that are NOT potential contributors to significant events in any consequence categories

Safety Consequence Category

Table 6-1 Safety Consequence Levels for Preliminary Screening

Category	Occupational Safety Impact (Number of Potential Fatalities)	Public Safety Impact (Number of Potential Fatalities)
5	> 100	>10
4	51 to 100	6 to 10
3	11 to 50	2 to 5
2	5 to 10	1
1	< 5	No public safety impact

Environmental Consequence Category

Table 6-2 Spill Levels for Preliminary Screening

Category	Volume (bbls of fluid)
4	> 10,000
3	1,001 to 10,000
2	10 to 1,000
1	< 10

Reliability Consequence Category

Table 6-3 Reliability Consequence Levels for Preliminary Risk Screening

Category	Category Production Loss Boundaries	Explanation (see Note)
3	> 42,000,000 bbls	Corresponds to about a two month full outage for TAPS
2	4,200,000 to 42,000,000 bbls	Corresponds to an outage range which includes an approximate 30 day outage for TAPS or a two week outage for a production source that is half of the TAPS throughput
1	< 4,200,000 bbls	Corresponds to less than a week outage for TAPS or a 60 day outage for a production source that is 10% of the TAPS throughput.

Risk Assessment Methodology

- Operational Hazards Assessment
- General Approach – 3 models
  - Safety Risk Assessment
  - Environmental Risk Assessment
  - Reliability Risk Assessment
- Scenario Development Basis
  - Failure Modes and Effects Analysis
  - Event Tree Modeling
  - Consequence Modeling

Risk Assessment Methodology

- Natural Hazards Assessment
- General Approach
  - Natural Hazard Applicability Screening
  - Component Vulnerability Screening
  - Natural Hazard Initiating Events Input to Operational Hazards Model

Risk Assessment Results

- ✓ Node-by-Node Data Set
- ✓ Summary Report
- ✓ Risk Profile

What's Next?

- Input on Proposed Risk Assessment Methodology
  - Public Review
  - National Academy of Sciences (NAS) Peer Review
- Finalize Risk Assessment Methodology
- Implementation Phase

Avenues for Public Comment

- Regional Public Meetings
- Anchorage Workshop
- Comment Cards
- E-Mail/Fax/Mail
- Web Site:

http://www.dec.state.ak.us/SPAR/ipp/ara/public.htm

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QUESTIONS?