

Safety Risk Assessment

Primary ARFF Station

2021-Jan-26 12:30

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1 Introduction

The POS continues to implement a Safety Management System (SMS), specific to SEA, which requires a pro-active look at changes to the airport system or existing conditions within the airport system that might introduce or contain hazardous conditions and therefore increase exposure to risk. According to POS's established guidance any requests to deviate from established ICAO, FAA or IATA recommended standards requires the completion of a SRA; so that, hazards which are identified through this process can be mitigated pro-actively and which provides the best opportunity for efficiency and operational continuity.

The SRA facilitation and subsequent documentation is based on the industry standard 5-Step Risk Assessment process including the following:

1. Define the System
2. Identify the Hazards
3. Analyze the Risks/Consequences
4. Assess the Risks
5. Mitigate the Risks

The established POS SMS definitions for Severity and Likelihood, and the Risk Matrix (Appendix B) were used for the risk assessment portion of the SRA and all participants agreed with and validated these metrics, definitions and thresholds as applicable and valid.

2 Logistics

SEA Aviation Operations coordinated all logistics for the SRA. The SRA meeting took place at MS Teams on 26 January 2021 from 12:30 to 14:30.

2.1 Stakeholders and Participants

Stakeholders and participants present for the SRA are listed below along with their respective organizations:

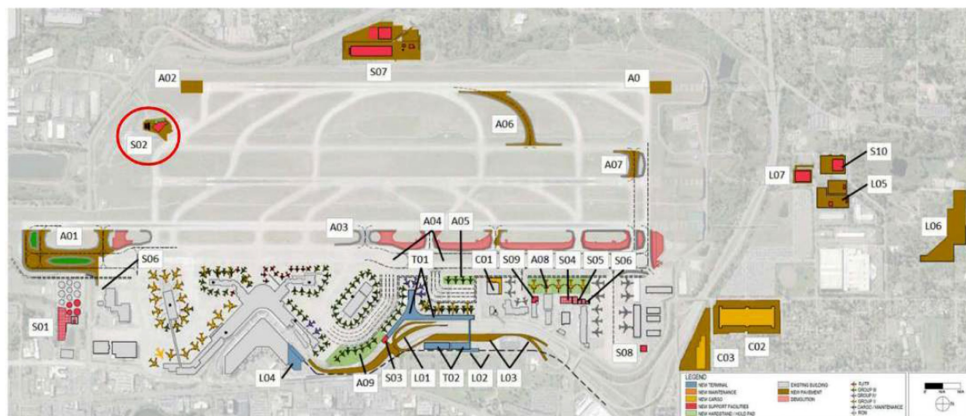
Adam Varo - Port of Seattle, **Alicia Waterton** - Port of Seattle, **Dave Crowner** - Port of Seattle, **Chris Coulter** - Port of Seattle, **Hilaire Bakam** - Port of Seattle, **Paul Pelton** - Port of Seattle, **Randy Krause** - Port of Seattle, **Robert Kikillus** - Port of Seattle, **Michael Smith** - Port of Seattle, **Tucker Field** - Port of Seattle, **Mark Coates** - Port of Seattle, **Barry Hennelly** - Port of Seattle, **Keith Taylor** - Port of Seattle, **Heather Munden** - Port of Seattle, **Patty Bergstedt** - Port of Seattle, **Colin Rice** - Port of Seattle, **Michelle Moshner** - Port of Seattle,

2.2 Background

The Sustainable Airport Master Plan (SAMP) proposed construction of a new north terminal processor and associated concourses that displace the existing Primary ARFF and other facilities. The proposed site for the new Primary ARFF is on the Southwest side of the Airport. This location meets the FAA mandated ARFF response times. Construction of a new Primary ARFF provides the opportunity to support modern fire-fighting operations, administration and training needs, opportunities for future expansion, and provides responders with a comfortable living space while on duty. The facility will be developed in accordance with the Port sustainability goals.

3 Define the System

This provides an overview of the project planning efforts undertaken to support future design and construction of a new Primary Aircraft Rescue and Firefighting Facility (ARFF). This SRA describes the operational facility requirements for the new Primary ARFF. It will be used to support discussions of resource requirements, potential project delivery methods, and to inform design efforts.



Location in Overall SAMP



Construction Area



Views of the ARRF Design

4 Identify the Hazards

Following the Definition of the System discussion, the SRA panel was asked to think about and identify the hazards associated with the new operation. The panel agreed to the following hazards:

The hazardous condition identified by the participants is: **Exhaust Fumes into ARFF station.**

The worst credible outcome agreed upon for this hazard is: **Carbon Monoxide and PM-10 infiltration leading to health issues.**

The credible risk was assessed in the category of **People**.

This resulted in an agreed severity of **Minor 4** and an agreed likelihood of **Probable B**, which results in an overall risk rating of **M12**.

The hazardous condition identified by the participants is: **ARFF equipment coordination with Taxiway (Q) to exit the ARFF station.**

The worst credible outcome agreed upon for this hazard is: **Concern that an ARFF truck may be blocked by passing or holding, delaying an emergency response.**

The credible risk was assessed in the category of **People**.

This resulted in an agreed severity of **Hazardous 2** and an agreed likelihood of **Probable B**, which results in an overall risk rating of **H21**.

The hazardous condition identified by the participants is: **Jetblast into ARFF station area**

The worst credible outcome agreed upon for this hazard is: **Concerned for injuries for ARFF personnel.**

The credible risk was assessed in the category of **People**.

This resulted in an agreed severity of **Minor 4** and an agreed likelihood of **Remote C**, which results in an overall risk rating of **L8**.

The hazardous condition identified by the participants is: **Facility underneath part 77 surface**

The worst credible outcome agreed upon for this hazard is: **A portion of the design may encroach into the navigable airspace (antenna/ladder/lighting) which would require modification to the design or a change in airspace.**

The credible risk was assessed in the category of **Assets**.

This resulted in an agreed severity of **Major 3** and an agreed likelihood of **Extremely Remote D**, which results in an overall risk rating of **L10**.

The hazardous condition identified by the participants is: **Possible negative affects to navigational aids**

The worst credible outcome agreed upon for this hazard is: **Radar reflectivity (ASDE-X) / ADS-B issue on TWY Q may result in additional capitol expenses.**

The credible risk was assessed in the category of **Assets**.

This resulted in an agreed severity of **Major 3** and an agreed likelihood of **Frequent A**, which results in an overall risk rating of **H20**.

The hazardous condition identified by the participants is: **NOTES: General FAA regulatory concerns - what is the set back for full 747-8 compared to the planned OFA**

The worst credible outcome agreed upon for this hazard is:

The credible risk was assessed in the category of .

This resulted in an agreed severity of and an agreed likelihood of , which results in an overall risk rating of .

The hazardous condition identified by the participants is: **Access to facility via starling drive (bridge clearance)**

The worst credible outcome agreed upon for this hazard is: **Possible that ARFF vehicle may not pass under the bridge.**

The credible risk was assessed in the category of **Continuity of Operations**.

This resulted in an agreed severity of **Minor 4** and an agreed likelihood of **Probable B**, which results in an overall risk rating of **M12**.

The hazardous condition identified by the participants is: **Proximity of ARFF station to aircraft operations due to noise**

The worst credible outcome agreed upon for this hazard is: **Hearing loss**

The credible risk was assessed in the category of **People**.

This resulted in an agreed severity of **Major 3** and an agreed likelihood of **Extremely Remote D**, which results in an overall risk rating of **L10**.

The hazardous condition identified by the participants is: **ILS critical areas related to facility usage**

The worst credible outcome agreed upon for this hazard is: **Vehicle or personnel would interfere with ILS system resulting perception/reputation issue with FAA partners.**

The credible risk was assessed in the category of **Perception/Reputation**.

This resulted in an agreed severity of **Major 3** and an agreed likelihood of **Remote C**, which results in an overall risk rating of **M14**.

The hazardous condition identified by the participants is: **Reflectivity of ARFF station windows (glare)**

The worst credible outcome agreed upon for this hazard is: **Glare from the building may effect visibility for pilots.**

The credible risk was assessed in the category of **Continuity of Operations**.

This resulted in an agreed severity of **Minimal 5** and an agreed likelihood of **Extremely Improbable E**, which results in an overall risk rating of **L1**.

The hazardous condition identified by the participants is: **Need for alternative routes in case of significant aircraft traffic.**

The worst credible outcome agreed upon for this hazard is: **Delay in response time for ARFF vehicles (stuck in mud)**

The credible risk was assessed in the category of **People**.

This resulted in an agreed severity of **Catastrophic 1** and an agreed likelihood of **Remote C**, which results in an overall risk rating of **H23**.

The hazardous condition identified by the participants is: **Need to assess gate exit for ARFF to starting drive to 188th re: mutual aid**
 The worst credible outcome agreed upon for this hazard is: **For arriving/departing mutual aid response this would be possible delay.**
 The credible risk was assessed in the category of **Continuity of Operations**.
 This resulted in an agreed severity of **Hazardous 2** and an agreed likelihood of **Remote C**, which results in an overall risk rating of **M17**.

The hazardous condition identified by the participants is: **Permanent location for ARFF trainer**
 The worst credible outcome agreed upon for this hazard is: **Not having permanent parking causes issues for the FD availability and accessibility issues.**
 The credible risk was assessed in the category of **Continuity of Operations**.
 This resulted in an agreed severity of **Minor 4** and an agreed likelihood of **Probable B**, which results in an overall risk rating of **M12**.

The hazardous condition identified by the participants is: **Consideration for fueling availability/routes for ARFF vehicles.**
 The worst credible outcome agreed upon for this hazard is: **ARFF vehicles out of service during transition.**
 The credible risk was assessed in the category of **Continuity of Operations**.
 This resulted in an agreed severity of **Minor 4** and an agreed likelihood of **Probable B**, which results in an overall risk rating of **M12**.

The hazardous condition identified by the participants is: **During maneuvering of ARFF trucks in the vicinity of the ARFF station, they may cross into the infield areas during turns, picking up and throwing mud/grass/rocks onto nearby surfaces.**
 The worst credible outcome agreed upon for this hazard is: **This increases the risk that FOD may be thrown onto AMA surfaces from the trucks, resulting in an ingestion hazard.**
 The credible risk was assessed in the category of **Assets**.
 This resulted in an agreed severity of **Major 3** and an agreed likelihood of **Extremely Remote D**, which results in an overall risk rating of **L10**.

See Appendix B for Severity and Likelihood Chart with required actions.

5 Mitigation Plan

Following the listing of hazards and rating of associated risks the panel agreed on the following mitigation for identified risks:

Mitigations were primarily focused on operational issues that may arise for ARFF users and nearby aircraft operations rather than specifically construction issues. The operational issues noted include items which may affect the individual safety of the ARFF personnel, ARFF response on the airfield, as well as impacts to nearby surfaces and infrastructure.

Title	Description	Responsible Party	Completed By	Status
Part 77 Airspace Compliance	Do not design or build anything that will impact Part 77 Aerospace Compliance.	AVPMG	2021-Mar-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Model Jetblast	Needs to model this first to determine what is needed.	AVPMG	2021-Mar-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
FAA Equipment and Airfield Coordination	Early coordination with FAA on possible reflectivity/ navaid impacts. Incorporate feedback into design.	Airport Operations,AVPMG,AV/Planning	2021-Mar-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Entering ILS areas	Train Fire Fighters not to enter ILS critical areas.	Airport Operations,Fire Dept	2021-Mar-31 11:49	Not Started

Title	Description	Responsible Party	Completed By	Status
Building Safety Measures	Install enhanced gaskets on ARFF doors and ensure HVAC system addresses this issue. Install carbon monoxide detection system with visual alert system.	ARFF Design Team	2022-Dec-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Coordination Plan	TBD	Airport Operations	2021-Apr-09 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Verify Heights	Verify clearance for vehicles with physical measurements and check with ARFF.	ARFF Design Team	2021-Mar-05 11:00	Complete

Title	Description	Responsible Party	Completed By	Status
Noise Control	Include design elements to control noise in the facility, including door gaskets, windows, and insulation.	ARFF Design Team	2022-Dec-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Hearing Protection	ARFF Personnel are required to utilize hearing protection when required.	ARFF Team	2021-Mar-05 11:04	Complete

Title	Description	Responsible Party	Completed By	Status
Future Implementation	To be assessed during design as an alternate mutual aid access point.	ARFF Design Team,ARFF Team	2022-Dec-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Permanent Location Coordination	Ops and ARFF to coordinate on permanent location based on available space. Potential to work with design team for west side maintenance campus.	Airport Operations,ARFF Team,AV/Planning,ARFF Design Team	2021-Mar-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Interim Fuel Solution	In the interim before westside maintenance campus site is available, a temporary double walled fuel tank will be installed at the site for temporary fueling.	ARFF Design Team	2022-Dec-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Permanent Fueling Solution	Permanent fueling will be available at the west side maintenance campus once this site is complete.	ARFF Design Team	2022-Dec-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Training for Awareness of Drivers	Drivers to receive awareness training on this hazard to reduce the likelihood of occurrence.	ARFF Team	2022-Dec-31 00:00	Not Started

Title	Description	Responsible Party	Completed By	Status
Design Features	Consider mitigating turn areas to minimize the possibility of trucks leaving the paved surface.	ARFF Design Team	2022-Dec-31 00:00	Not Started

See Appendix A for a list of hazards associated with the mitigations.

Appendix A - Risk Matrix

The following table represents all the hazardous conditions identified and the consequences. Because the consequences are germane to all the hazardous conditions listed they should NOT be attributed to one, individual hazardous condition. The table includes the hazards, risks, risk assessments, proposed mitigation, residual risks, and responsible party(ies). Note: The definitions of Severity and Likelihood outlined in the Severity and Likelihood Classification Chart and Risk Matrix, as provided by the POS, are included in Appendix B for reference.

Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Exhaust Fumes into ARFF station.	Carbon Monoxide and PM-10 infiltration leading to health issues.	Minor 4	Probable B	M12	Yes	<ul style="list-style-type: none"> Building Safety Measures 	<ul style="list-style-type: none"> ARFF Design Team
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
ARFF equipment coordination with Taxiway (Q) to exit the ARFF station.	Concern that an ARFF truck may be blocked by passing or holding, delaying an emergency response.	Hazardous 2	Probable B	H21	Yes	<ul style="list-style-type: none"> Coordination Plan 	<ul style="list-style-type: none"> Airport Operations
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Jetblast into ARFF station area	Concerned for injuries for ARFF personnel.	Minor 4	Remote C	L8	Yes	<ul style="list-style-type: none"> Model Jetblast 	<ul style="list-style-type: none"> AVPMG
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Facility underneath part 77 surface	A portion of the design may encroach into the navigable airspace (antenna/ladder/lighting) which would require modification to the design or a change in airspace.	Major 3	Extremely Remote D	L10	Yes	<ul style="list-style-type: none"> Part 77 Airspace Compliance 	<ul style="list-style-type: none"> AVPMG
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Possible negative affects to navigational aids	Radar reflectivity (ASDE-X) / ADS-B issue on TWY Q may result in additional capitol expenses.	Major 3	Frequent A	H20	Yes	<ul style="list-style-type: none"> FAA Equipment and Airfield Coordination 	<ul style="list-style-type: none"> Airport Operations,AVPMG,AV/Planning
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
NOTES: General FAA regulatory concerns - what is the set back for full 747-8 compared to the planned OFA							
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Access to facility via starling drive (bridge clearance)	Possible that ARFF vehicle may not pass under the bridge.	Minor 4	Probable B	M12	Yes	<ul style="list-style-type: none"> Verify Heights 	<ul style="list-style-type: none"> ARFF Design Team
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Proximity of ARFF station to aircraft operations due to noise	Hearing loss	Major 3	Extremely Remote D	L10	Yes	<ul style="list-style-type: none"> Noise Control Hearing Protection 	<ul style="list-style-type: none"> ARFF Design Team ARFF Team
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
ILS critical areas related to facility usage	Vehicle or personnel would interfere with ILS system resulting perception/reputation issue with FAA partners.	Major 3	Remote C	M14	Yes	<ul style="list-style-type: none"> Entering ILS areas 	<ul style="list-style-type: none"> Airport Operations,Fire Dept
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Reflectivity of ARFF station windows (glare)	Glare from the building may effect visibility for pilots.	Minimal 5	Extremely Improbable E	L1	No		
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Need for alternative routes in case of significant aircraft traffic.	Delay in response time for ARFF vehicles (stuck in mud)	Catastrophic 1	Remote C	H23	Yes	<ul style="list-style-type: none"> Coordination Plan 	<ul style="list-style-type: none"> Airport Operations
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Need to assess gate exit for ARFF to starling drive to 188th re: mutual aid	For arriving/departing mutual aid response this would be possible delay.	Hazardous 2	Remote C	M17	Yes	<ul style="list-style-type: none"> Future Implementation 	<ul style="list-style-type: none"> ARFF Design Team,ARFF Team
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Permanent location for ARFF trainer	Not having permanent parking causes issues for the FD availability and accessibility issues.	Minor 4	Probable B	M12	Yes	<ul style="list-style-type: none"> Permanent Location Coordination 	<ul style="list-style-type: none"> Airport Operations,ARFF Team,AV/Planning,ARFF Design Team
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party

Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
Consideration for fueling availability/routes for ARFF vehicles.	ARFF vehicles out of service during transition.	Minor 4	Probable B	M12	Yes	<ul style="list-style-type: none"> Interim Fuel Permanent Fueling Solution 	<ul style="list-style-type: none"> ARFF Design Team ARFF Design Team
Hazard	Credible Outcome	Severity	Likelihood	Risk Rating	Is Mitigation Required/Recommended?	Mitigations	Responsible Party
During maneuvering of ARFF trucks in the vicinity of the ARFF station, they may cross into the infield areas during turns, picking up and throwing mud/grass/rocks onto nearby surfaces.	This increases the risk that FOD may be thrown onto AMA surfaces from the trucks, resulting in an ingestion hazard.	Major 3	Extremely Remote D	L10	Yes	<ul style="list-style-type: none"> Training for Awareness of Drivers Design Features 	<ul style="list-style-type: none"> ARFF Team ARFF Design Team

Appendix B - Severity and Likelihood Classification Chart

SEVERITY AND LIKELIHOOD CLASSIFICATION CHART AND RISK MATRIX

		SEVERITY					
		People	No to slight injury	Injury w/ Medic Response	Injury with transport	Multiple injuries or fatalities	Mass Casualty
		Community Of Operations (COOP)	No impact	Minor Disruption to Normal Ops Recovery time = immediate	Major Disruption to Normal Ops Recovery time = 24-48 hours	Sever Disruption to Normal Ops Recovery time = > 48 hours	Widespread Regional Disruption to Ops Recovery time = indefinite
		Environmental	No impact	Non Reportable-Containable minimal volume of hazardous material	Reportable – Non-Containable minimal volume of hazardous material	Reportable – Containable moderate volume of hazardous material	Reportable – Non-Containable significant volume of hazardous material
		Perception/ Reputation	No impact	Minimal media inquiries	Local Media coverage	Local and national media coverage for > 48 hours	Widespread international media coverage and reduction of air travel
		Assets	< \$50K	\$50K - < \$1million	\$1 million - \$100 million	\$100 Million to \$ 1 Billion	Over \$1 Billion
		Severity	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
LIKELIHOOD	Likely to occur:	Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
	once a day or multiple times per week	Frequent A	L5	M13	H20	H22	H25
	multiple times per year or once per month	Probable B	L4	M12	M15	H21	H24
	once a year or multiple times within 5 years	Remote C	L3	L8	M14	M17	H23
	once in every five years or multiple times within 10 years	Extremely Remote D	L2	L7	L10	M16	M19
	only once in 10 to 100 years	Extremely Improbable E	L1	L6	L9	L11	M18
High Risk			Medium Risk			Low Risk	
<ul style="list-style-type: none">Analyze for mitigation to medium or lowChange cannot be implemented unless the hazards' associated risks are mitigatedTracking, monitoring, and management require mitigation so that the risks are reduced to medium or low levels			<ul style="list-style-type: none">Analyze for mitigation to lowMinimum acceptable safety objectiveChange may be implemented, but tracking, monitoring, and management required			<ul style="list-style-type: none">No mitigation necessaryAcceptable without restriction or limitationHazard must be documented	