

## Explosives Safety Siting Software Overview and Status



## Explosives Safety Siting (ESS) Software

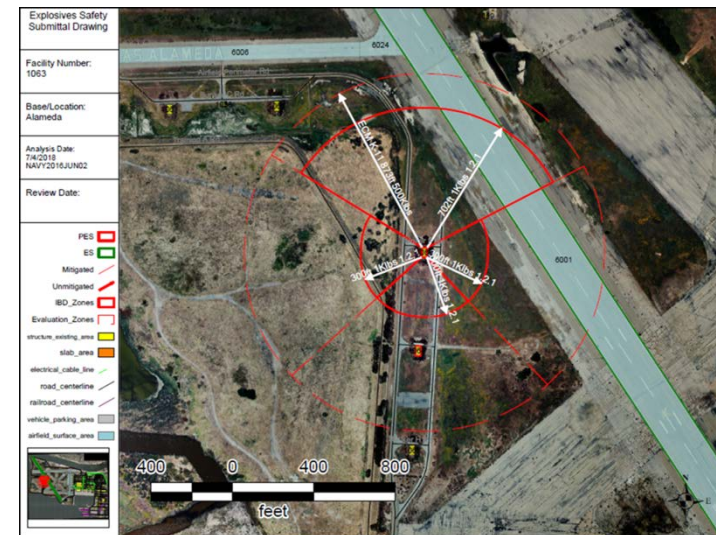


- **DoD sponsored software developed for use by all DoD services.**
- **Software developed and maintained by NAVFAC EXWC on behalf of the DDESB**
- **What does ESS do?**
  - Automates the calculation and display of explosives safety quantity distance (ESQD) arcs.
  - Automated and standardized Site Plan Package development.
  - Automated and standardized Potential Explosion Site (PES) data.

## ESS Software

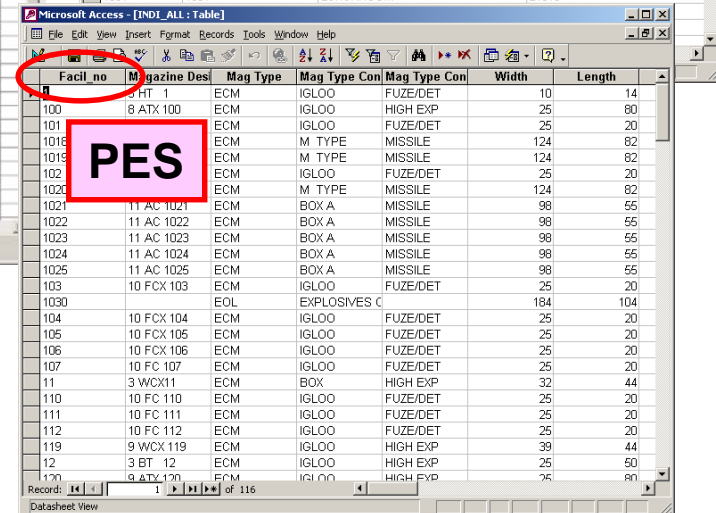
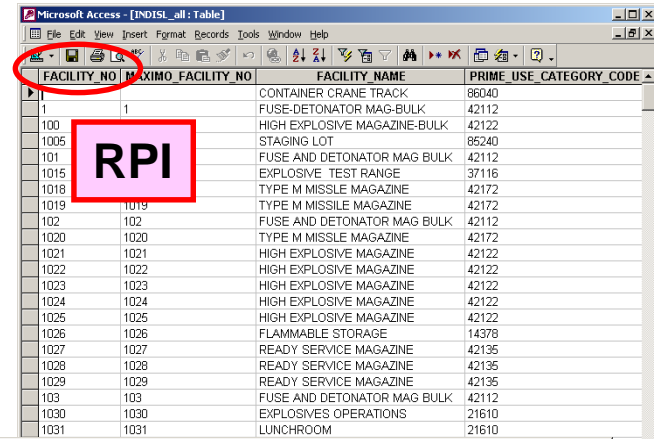
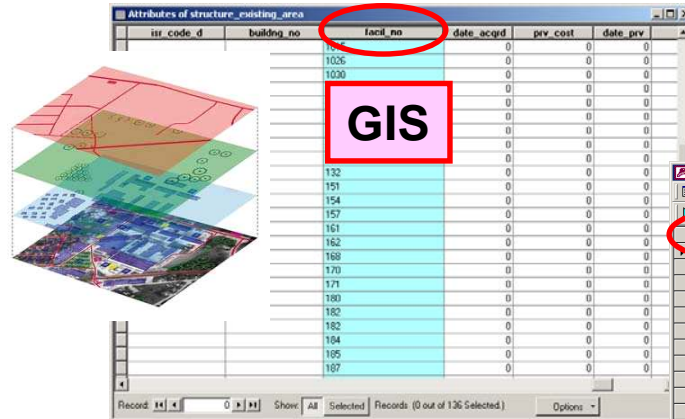
- Explosives Safety Site Plans are required when construction occurs or explosives operations are changed.
- Many site plans contain errors and in non-standard formats that are difficult to review/approve which slows down the process.
- ESS software was developed to help automate, standardize, and speed up site plans generation and the review/approval process.

EXPLOSIVES SAFETY SITE PLAN									
SECTION I - GENERAL INFORMATION									
INSTALLATION: Alameda	LOCATION:	DATE: 04 Jul 2018		QD Engine: NAVY2016JUN02 ESS: 6.1.3.1.8					
SECTION II - DATA ON FACILITY TO BE SITED									
FAC # & OWNER	FACILITY DESC	RQD IBD	RQD PTR	1.1 (xx)	1.2.1 MCE	1.2.2	1.2.3 MCE (xx)	1.3	1.4
1063 Alameda	ECM Undefined HW HIGH EXPLOSIVE MAGAZINE	Front: 702 ft Side: 300 ft Rear: 300 ft	Front: 421 ft Rear: 300 ft	150 lbs = 20' X 60'	1000 lbs 100 lbs	225000 lbs	225000 lbs	0 lbs	240000 lbs
SECTION III - PES/ES QD PAIRED RELATIONSHIPS WITH FACILITIES BEING SITED									
FAC # & OWNER	FACILITY DESC	ACT & RQD DST	ORIENTATION	1.1 (xx)	1.2.1 MCE	1.2.2	1.2.3 MCE (xx)	1.3	1.4
1064 Alameda DM	ECM Undefined HW HIGH EXPLOSIVE MAGAZINE	Actual: 446.28 ft Required: 15 ft	As PES (reverse) PES Front ES Rear	400 lbs 15 ft T7-13 ECM(FU) ECM-U(R)	20000 lbs 400 lbs 0 lb T7-18 ECM(F) T7-18 ECM(F) ECM-U(R)	200000 lbs 0 lb 0 lb T7-18 ECM(F) ECM-U(R)	200000 lbs 0 lb 0 lb T7-18 ECM(F) ECM-U(R)	70000 lbs 9 lb T7-20 FN4 T7-20	200000 lbs 0 lb 0 lb T7-22 AGS-H.DMD
1065 Alameda DM	AGM HIGH EXPLOSIVE MAGAZINE	Actual: 947.04 ft Required: 183 ft	As PES (reverse) ES Rear	4000 lbs 95 ft T7-13 AGM(U/B) ECM-U(R)		170000 lbs 0 lb T7-18 AGS-L ECM-U(R)	170000 lbs 0 lb 183 lb T7-18 AGS-L ECM-U(R)	75000 lbs 183 lb T7-20 DMD	170000 lbs 0 lb 0 lb T7-22 AGS-H.DMD
6001 Alameda TR	AMR RUNWAY / FIXED WING	Actual: 438.17 ft Required: 421 ft	As ES PES Front	300 ft 7-6.2.1.2	421 ft T7-15 PTR	415 ft T7-17 PTR	342 ft T7-20 IBD	0 lb T7-20 PTR	100 lb T7-23 IBD-3000



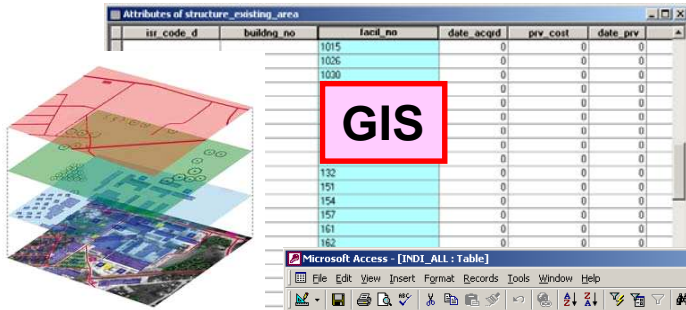
## ESS Requires 3 Sets of Data

1. Map (GIS Data)
2. Real Property Inventory (RPI Data)
3. Potential Explosive Sites (PES Data)

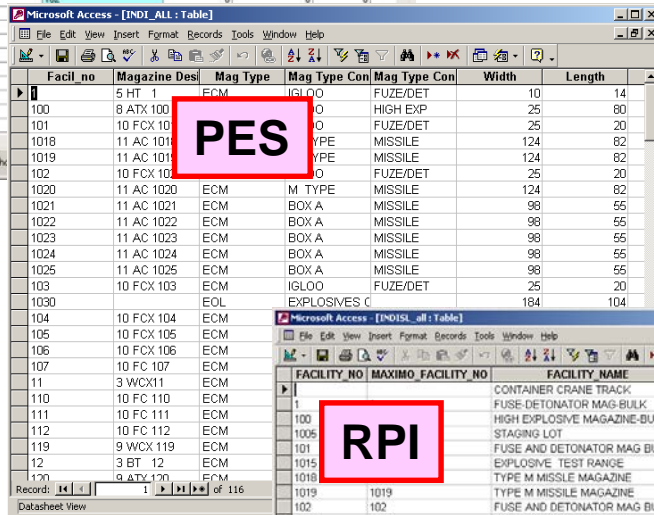


The GIS, RPI, and PES data are linked together in the ESS database using the common facility number and accessed by the ESS software interface.

## ESS Requires 3 Sets of Data



**GIS Data:** Used for the map display and spatial analysis.

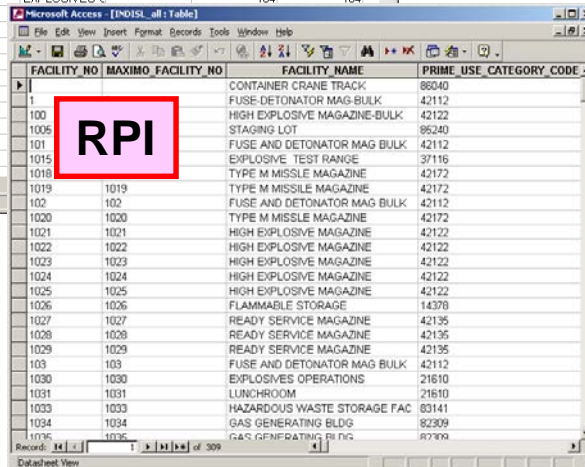


**PES**

Facil_no	Magazine Desi	Mag Type	Mag Type Con	Mag Type Con	Width	Length
	5 HT 1	ECM	IGLOO	FUZE/DET	10	14
100	8 ATX 100			HIGH EXP	25	80
101	10 FCX 10			FUZE/DET	25	20
1018	11 AC 101			MISSILE	124	82
1019	11 AC 101			MISSILE	124	82
102	10 FCX 10			FUZE/DET	25	20
1020	11 AC 1020	ECM	M TYPE	MISSILE	124	82
1021	11 AC 1021	ECM	BOX A	MISSILE	98	55
1022	11 AC 1022	ECM	BOX A	MISSILE	98	55
1023	11 AC 1023	ECM	BOX A	MISSILE	98	55
1024	11 AC 1024	ECM	BOX A	MISSILE	98	55
1025	11 AC 1025	ECM	BOX A	MISSILE	98	55
103	10 FCX 103	ECM	IGLOO	FUZE/DET	25	20
1030		EOL	EXPLOSIVES C		184	104
104	10 FCX 104	ECM				
105	10 FCX 105	ECM				
106	10 FCX 106	ECM				
107	10 FC 107	ECM				
11	3 WCX11	ECM				
110	10 FC 110	ECM				
111	10 FC 111	ECM				
112	10 FC 112	ECM				
119	9 WCX 119	ECM				
12	3 BT 12	ECM				
120	8 ATX 120	ECM				

**PES Data:** Provides details about each explosives site.

- Type (AGM, ECM, EOL, ...)
- Headwall (3-bar, 7-bar, Undefined)
- Arched, Front barricaded, etc.



**RPI**

FACILITY_NO	MAXIMO FACILITY_NO	FACILITY_NAME	PRIME_USE_CATEGORY_CODE
		CONTAINER CRANE TRACK	86340
100		FUSE DETONATOR MAG-BULK	42112
1006		HIGH EXPLOSIVE MAGAZINE-BULK	42122
		STAGING LOT	86240
101		FUSE AND DETONATOR MAG BULK	42112
1015		EXPLOSIVE TEST RANGE	37116
1018		TYPE M MISSILE MAGAZINE	42172
1019	1019	TYPE M MISSILE MAGAZINE	42172
102	102	FUSE AND DETONATOR MAG BULK	42112
1020	1020	TYPE M MISSILE MAGAZINE	42172
1021	1021	HIGH EXPLOSIVE MAGAZINE	42122
1022	1022	HIGH EXPLOSIVE MAGAZINE	42122
1023	1023	HIGH EXPLOSIVE MAGAZINE	42122
1024	1024	HIGH EXPLOSIVE MAGAZINE	42122
1025	1025	HIGH EXPLOSIVE MAGAZINE	42122
1026	1026	FLAMMABLE STORAGE	14378
1027	1027	READY SERVICE MAGAZINE	42135
1028	1028	READY SERVICE MAGAZINE	42135
1029	1029	READY SERVICE MAGAZINE	42135
103	103	FUSE AND DETONATOR MAG BULK	42112
1030	1030	EXPLOSIVES OPERATIONS	21610
1031	1031	LUNCHROOM	21610
1033	1033	HAZARDOUS WASTE STORAGE FAC	83141
1034	1034	GAS GENERATING BLDG	82309
1035	1035	GAS GENERATING BLDG	87899

**RPI Data:** Provides details about the use of each facility.

- Admin, Housing, Warehouse, Magazine, Airfield, Pier, etc.

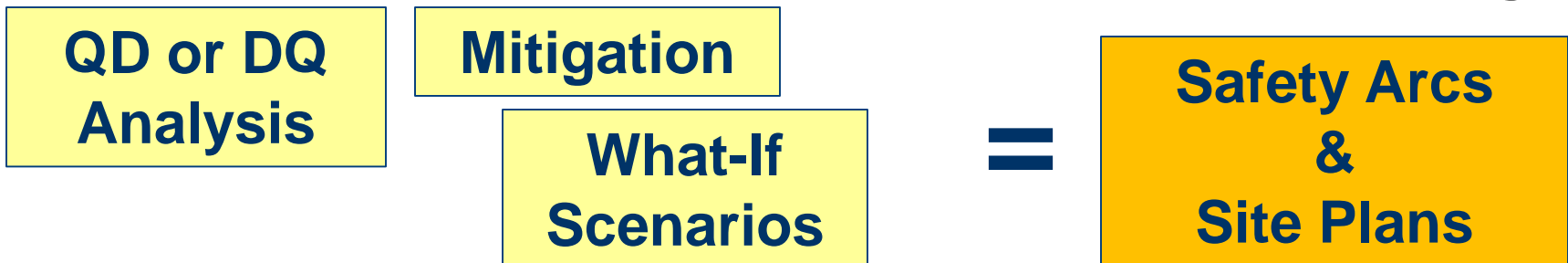


## The Basics of ESS

### Step 1: Build Database



### Step 2: Run Analysis



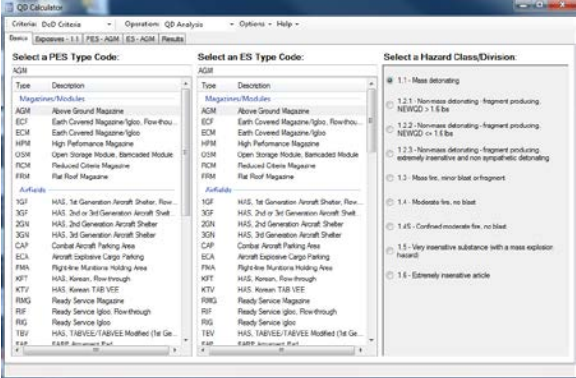
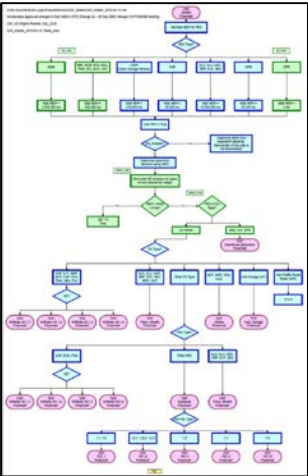
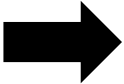
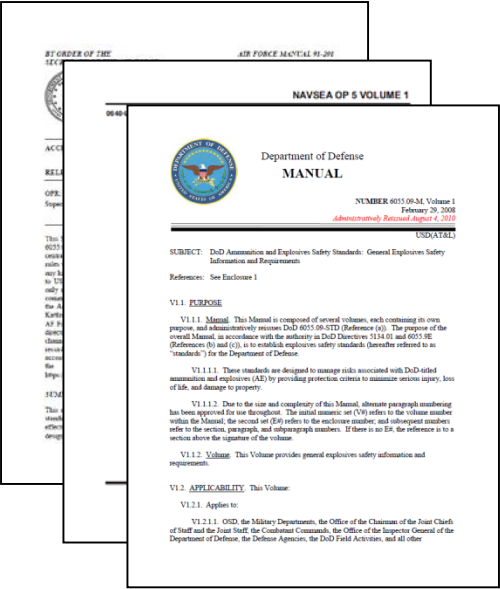
### Step 3: Generate Site Submittal Packages



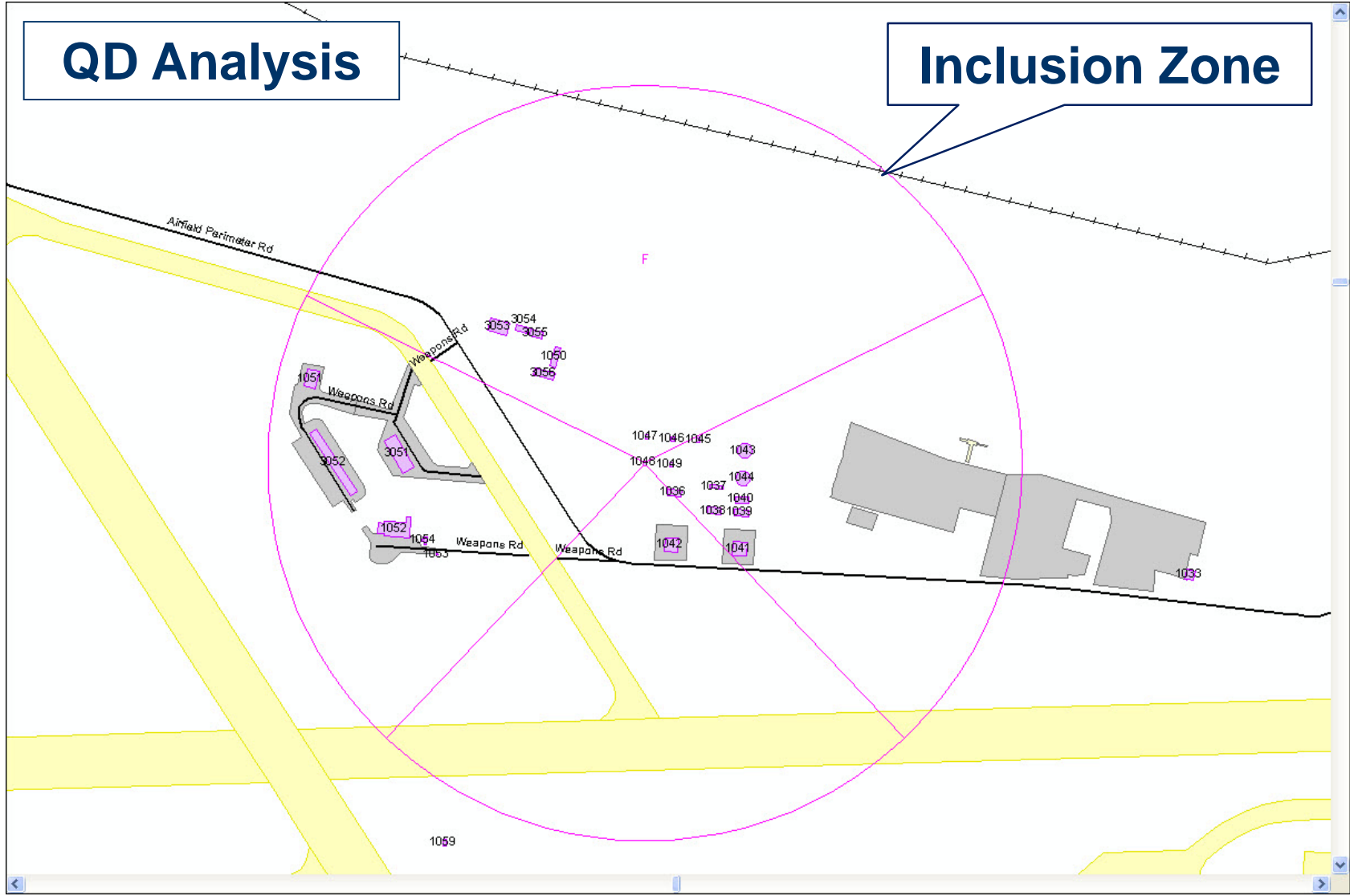
# ESS Overview and Status



- QD Analysis options
  - DoD – based on DoD 6055.09-M
  - Navy – based on NAVSEA OP-5
  - Air Force – based on AFMAN 91-201
  - Army – currently using DoD QD Engine
- Plans for NATO QD Engine in the future

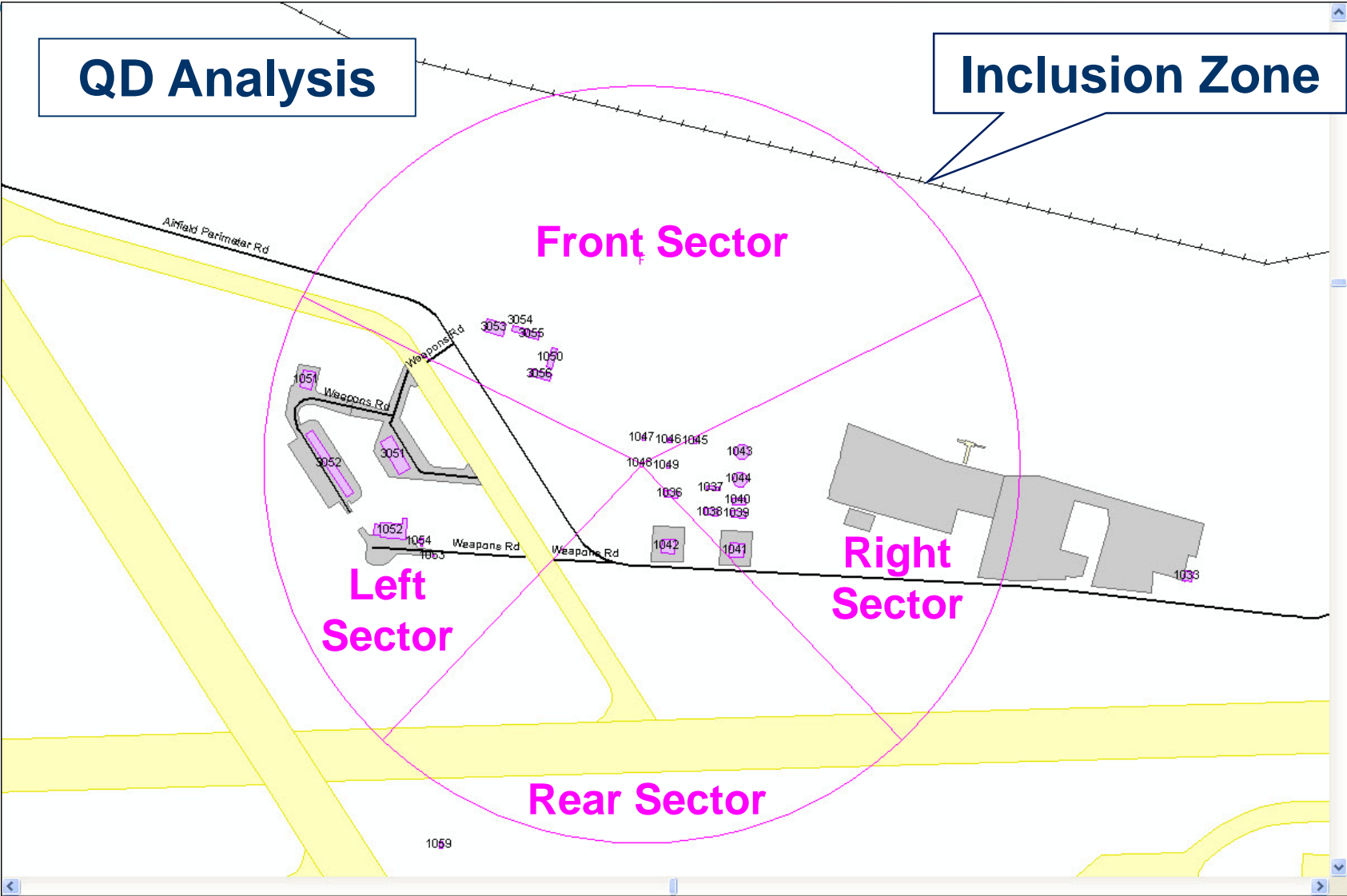


# ESS Overview and Status

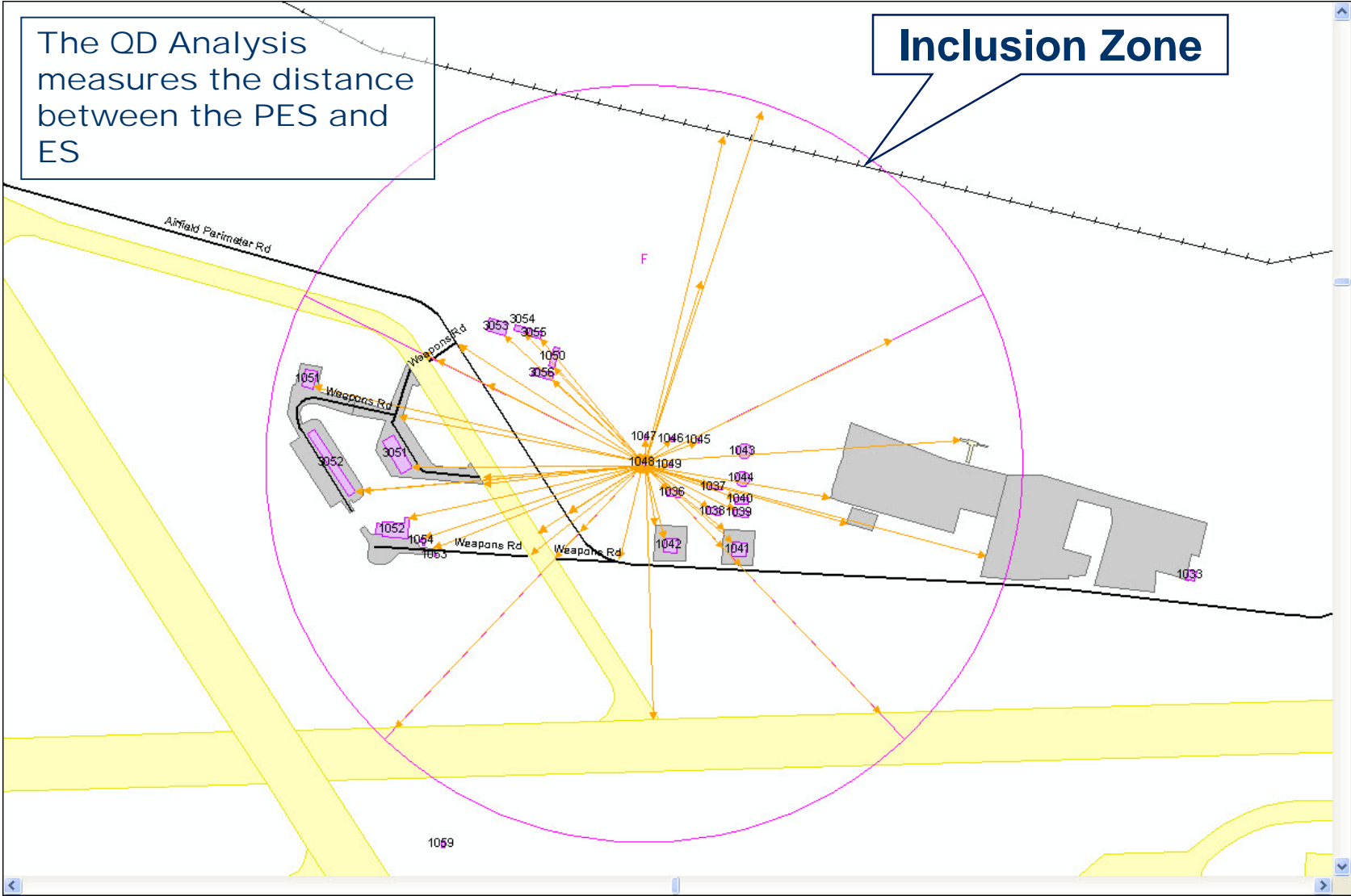




# ESS Overview and Status



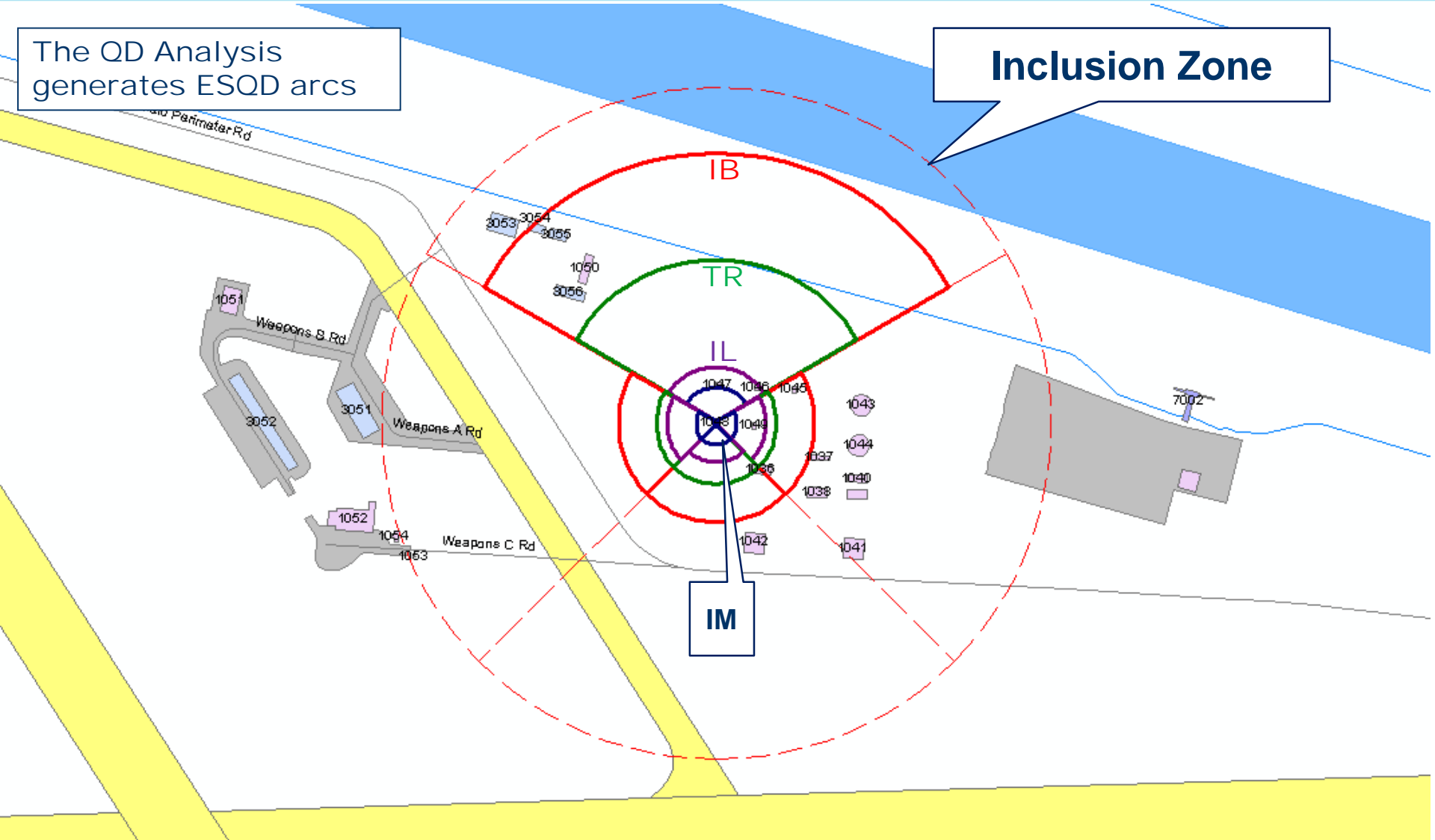
# ESS Overview and Status



# ESS Overview and Status

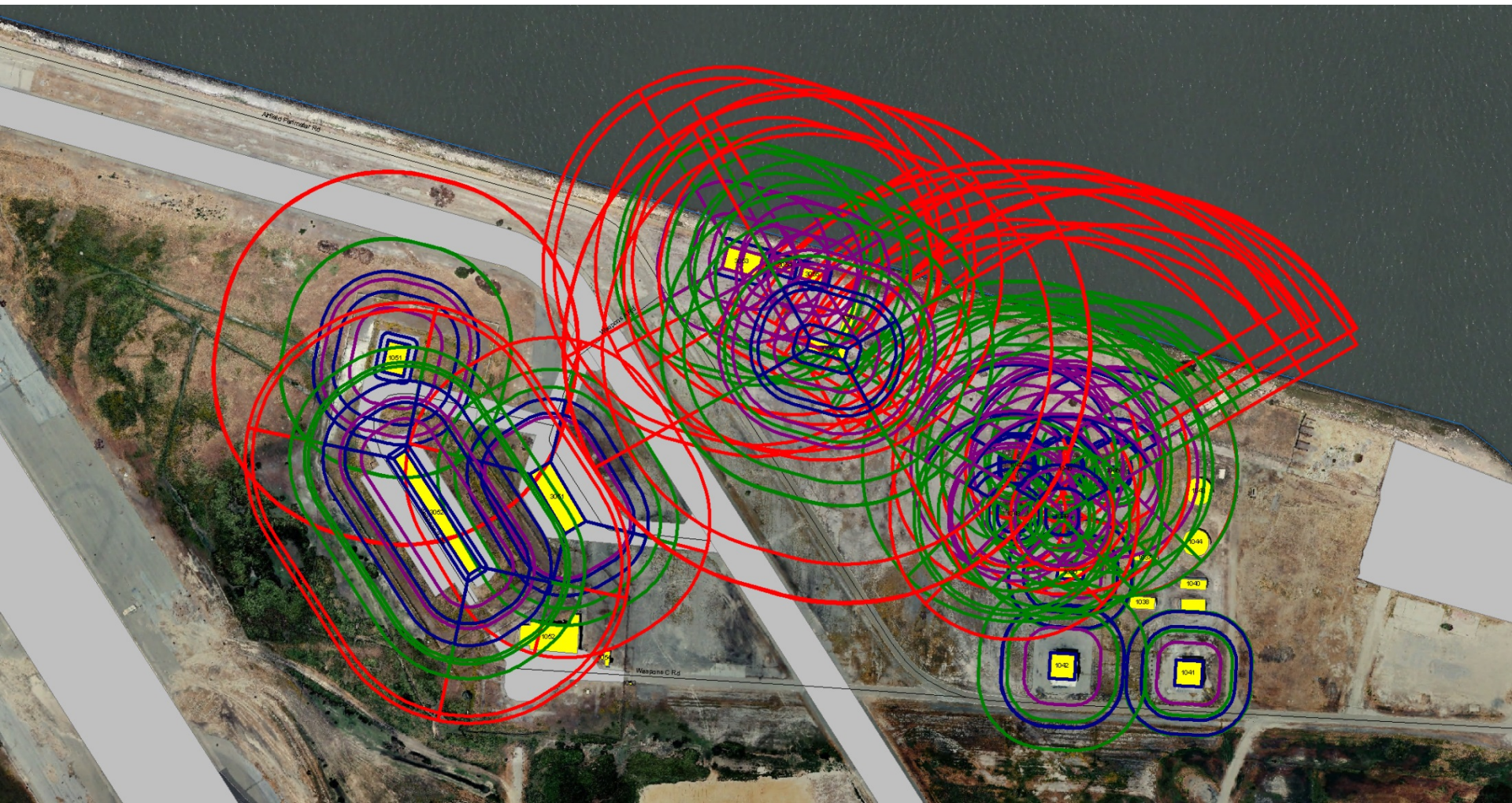
The QD Analysis generates ESQD arcs

**Inclusion Zone**



# ESS Overview and Status

ESQD arcs can be generated for one facility, a group of facilities, or for the entire base.



# ESS Overview and Status

## Union of ESQD arcs



# ESS Overview and Status



## Example of Analysis Arcs for each PES-ES pair

Analysis Results Table

Select Filter Draw Search: Columns Print Export Dimensions Details

Facility Number: 1048 Facility Description: 12x17 Box ECM Category Code:

Draw Arc	ES Number	Hazard Class	Sited NEW (lbs)	ES Type	Exposure	Related Code	Orientation	Act Dist (ft)	Rqd Dist (ft)	DQ NEW (lbs)	Governing	Arc Type	NOTES
<input type="checkbox"/>	6004	1.1	449	AMR	TR		Left - NA	1414	150	167367		Analysis	
<input type="checkbox"/>	6004	1.1	449	AMR	TR		Rear - NA	970	150	135584		Analysis	
<input type="checkbox"/>	6004	1.1	449	AMR	TR		Right - NA	1334	150	154388		Analysis	
<input type="checkbox"/>	6005	1.1	449	AMR	TR		Left - NA	1863	150	245131		Analysis	
<input type="checkbox"/>	6006	1.1	449	CAP	TR		Left - NA	2233	230	412250	Yes	Analysis	
<input type="checkbox"/>	6006	1.1	449	CAP	TR		Rear - NA	2094	230	340214	Yes	Analysis	
<input type="checkbox"/>	6007	1.1	449	AMT	IL		Rear - NA	481	92	64488	Yes	Analysis	
<input type="checkbox"/>	6007	1.1	449	AMT	IL		Left - NA	470	123	25362	Yes	Analysis	
<input type="checkbox"/>	6010	1.1	449	AMT	IL		Right - NA	2272	123	500000	Yes	Analysis	
<input type="checkbox"/>	6011	1.1	449	NEP	IB		Right - NA	2917	250	224884		Analysis	
<input type="checkbox"/>	6011	1.1	449	NEP	IB		Rear - NA	3478	250	336567		Analysis	
<input type="checkbox"/>	6018	1.1	449	NEP	IB		Right - NA	3285	250	283519		Analysis	
<input type="checkbox"/>	6024	1.1	449	AMT	IL		Rear - NA	1941	92	500000		Analysis	
<input type="checkbox"/>	1001	1.1	449	IHB	IB		Right - NA	3602	250	373720		Analysis	
<input type="checkbox"/>	1002	1.1	449	IHB	IB		Right - NA	3772	250	429245		Analysis	
<input type="checkbox"/>	1036	1.1	449	AGM	IM		Rear - NA	129	46	9956		Analysis	
<input type="checkbox"/>	1036	1.1	449	AGM	IM		Right - NA	139	46	12425		Analysis	
<input type="checkbox"/>	1039	1.1	449	IHB	IB		Right - NA	299	250	449	Yes	Analysis	

312 rows found.

OK Cancel

# ESS Overview and Status



## Example of ESQD Arcs for each hazard class, orientation, and exposure

Analysis Results Table

Select Filter Draw Search: Columns Print Export Dimensions Details

Facility Number: 1048 Facility Description: 12x17 Box ECM Category Code:

Draw Arc	ES Number	Hazard Class	Sited NEW (lbs)	ES Type	Exposure	Related Code	Orientation	Act Dist (ft)	Rqd Dist (ft)	DQ NEW (lbs)	Governing	Arc Type	NOTES
<input type="checkbox"/>		1.1	449		IB		Front		700			ESQD	
<input type="checkbox"/>		1.1	449		TR		Front		420			ESQD	
<input type="checkbox"/>		1.1	449		IL		Front		138			ESQD	
<input type="checkbox"/>		1.1	449		IM		Front		84			ESQD	
<input type="checkbox"/>		1.1	449		IB		Right		250			ESQD	
<input type="checkbox"/>		1.1	449		TR		Right		150			ESQD	
<input type="checkbox"/>		1.1	449		IL		Right		123			ESQD	
<input type="checkbox"/>		1.1	449		IM		Right		46			ESQD	
<input type="checkbox"/>		1.1	449		IB		Rear		250			ESQD	
<input type="checkbox"/>		1.1	449		TR		Rear		150			ESQD	
<input type="checkbox"/>		1.1	449		IL		Rear		92			ESQD	
<input type="checkbox"/>		1.1	449		IM		Rear		46			ESQD	
<input type="checkbox"/>		1.1	449		IB		Left		250			ESQD	
<input type="checkbox"/>		1.1	449		TR		Left		150			ESQD	
<input type="checkbox"/>		1.1	449		IL		Left		123			ESQD	
<input type="checkbox"/>		1.1	449		IM		Left		46			ESQD	
<input type="checkbox"/>		1.2.1	1096		IB		Front		718			ESQD	
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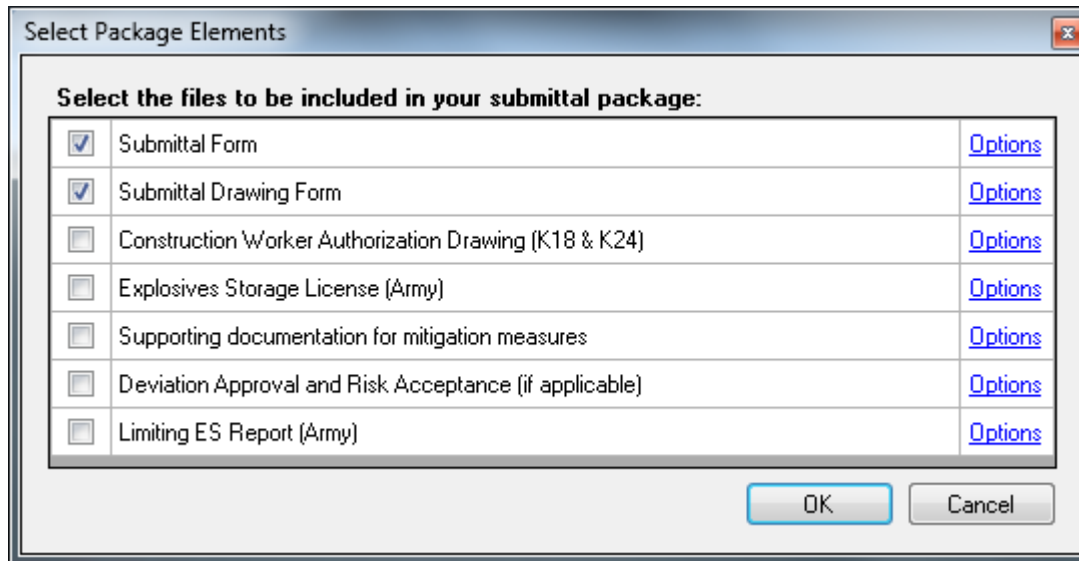
96 rows found.

OK Cancel

## Site Submittal Packages

Navy, Marine Corps, Army, Air Force and DOD Business Practice Compliant

- Enclosures



Select Package Elements

Select the files to be included in your submittal package:

<input checked="" type="checkbox"/>	Submittal Form	<a href="#">Options</a>
<input checked="" type="checkbox"/>	Submittal Drawing Form	<a href="#">Options</a>
<input type="checkbox"/>	Construction Worker Authorization Drawing (K18 & K24)	<a href="#">Options</a>
<input type="checkbox"/>	Explosives Storage License (Army)	<a href="#">Options</a>
<input type="checkbox"/>	Supporting documentation for mitigation measures	<a href="#">Options</a>
<input type="checkbox"/>	Deviation Approval and Risk Acceptance (if applicable)	<a href="#">Options</a>
<input type="checkbox"/>	Limiting ES Report (Army)	<a href="#">Options</a>

OK Cancel

- Electronic Submittal and Review



# EXPLOSIVES SAFETY SITE PLAN

Submittal  
Form

## SECTION I - GENERAL INFORMATION

INSTALLATION: Alameda	LOCATION:	DATE: 04 Jul 2018	QD Engine: NAVY2016JUN02 ESS: 6.1.3.19.8
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## SECTION II - DATA ON FACILITY TO BE SITED

FAC # & OWNER	FACILITY DESC	RQD IBD	RQD PTR	1.1 (xx)	1.2.1 MCE	1.2.2	1.2.3 MCE (xx)	1.3	1.4
1063 Alameda	ECM Undefined HW HIGH EXPLOSIVE MAGAZINE	Front: 702 ft Side: 300 ft Rear: 300 ft	Front: 421 ft Side: 300 ft Rear: 300 ft	150 lbs >= 26' X 60'	1000 lbs 100 lbs	225000 lbs	225000 lbs	0 lbs	240000 lbs

## SECTION III - PES/ES QD PAIRED RELATIONSHIPS WITH FACILITIES BEING SITED














FAC # & OWNER	FACILITY DESC	ACT & RQD DIST	ORIENTATION	1.1 (xx)	1.2.1 MCE	1.2.2	1.2.3 MCE (xx)	1.3	1.4
1064 Alameda IM	ECM Undefined HW  HIGH EXPLOSIVE MAGAZINE	Actual: 446.28 ft Required: 15 ft	As PES (reverse) PES Front ES Rear	400 lbs 15 ft T7-13 ECM(FU) :ECM-U(R)	20000 lbs 400 lbs 0 ft T7-18 ECM(F) :ECM-U(R)	200000 lbs 0 ft T7-18 ECM(F) :ECM-U(R)	200000 lbs 0 ft T7-18 ECM(F) :ECM-U(R)	70000 lbs 9 ft T7-20 FN4 T7-20	200000 lbs 0 ft T7-22 AGS- H:IMD
1065 Alameda IM	AGM  HIGH EXPLOSIVE MAGAZINE	Actual: 947.04 ft Required: 185 ft	As PES (reverse) ES Rear	4000 lbs 95 ft T7-13 AGM(UB) :ECM-U(R)		170000 lbs 0 ft T7-18 AGS-L :ECM-U(R)	170000 lbs 0 ft T7-18 AGS-L :ECM-U(R)	75000 lbs 185 ft T7-20 IMD	170000 lbs 0 ft T7-22 AGS- H:IMD
6001 Alameda TR	AMR  RUNWAY / FIXED WING	Actual: 430.17 ft Required: 421 ft	As ES PES Front	300 ft 7-6.2.1.2	421 ft T7-15 PTR	415 ft T7-17 PTR	242 ft T7-20 IBD	0 ft T7-20 PTR	100 ft T7-22 IBD>=3000

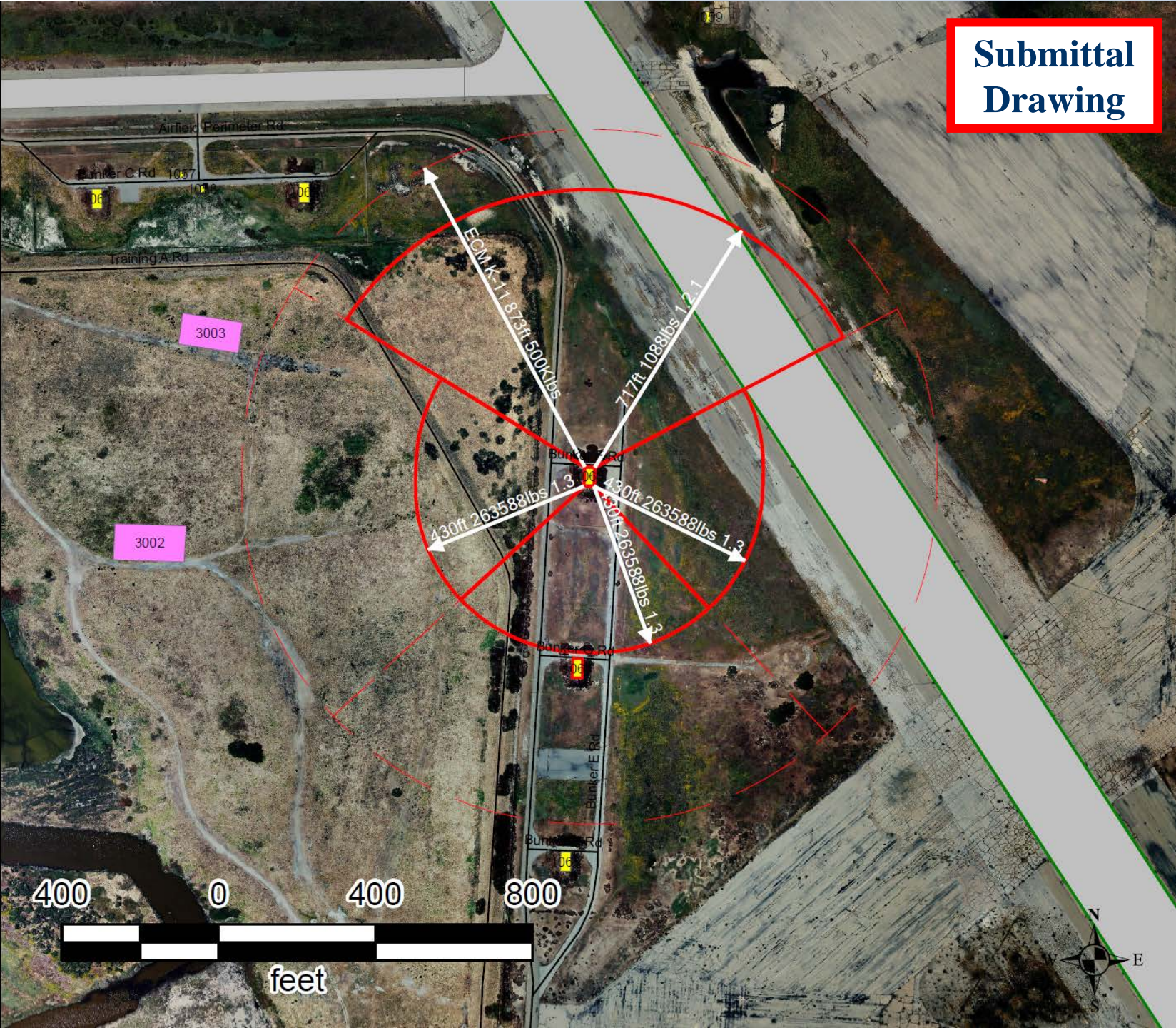
Facility Number:  
1063

Base/Location:  
NAS Alameda

Analysis Date:  
7/20/2018  
NAVY2016JUN02

Review Date:

- PES 
- ES 
- Mitigated 
- Unmitigated 
- IBD\_Zones 
- Evaluation\_Zones 
- RoadCenterline 
- Rail Track 
- ePriOHLineSegment 
- DocksAndWharfs 
- Building Area 
- Structure Area 
- MilitaryRange 



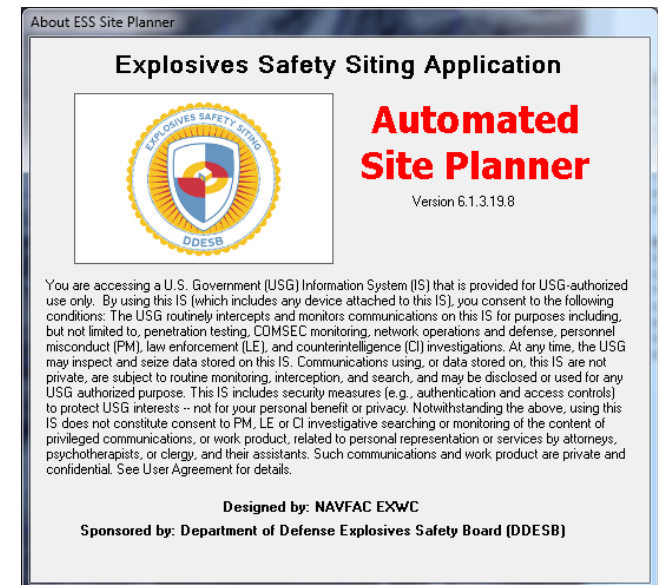
## ESS Software Status

### ESS 6.1.3:

- Latest version of ESS in use at Army, Navy, USMC, and Air Force installations.
- Approximately 600 users at 200 installations.
- Used by Facility Planners, Explosives Safety Officers, and GIS managers.
- Used on desktop computers and over Citrix & Internet at the NAVFAC Information Technology Center (NITC).

### Software Requirements:

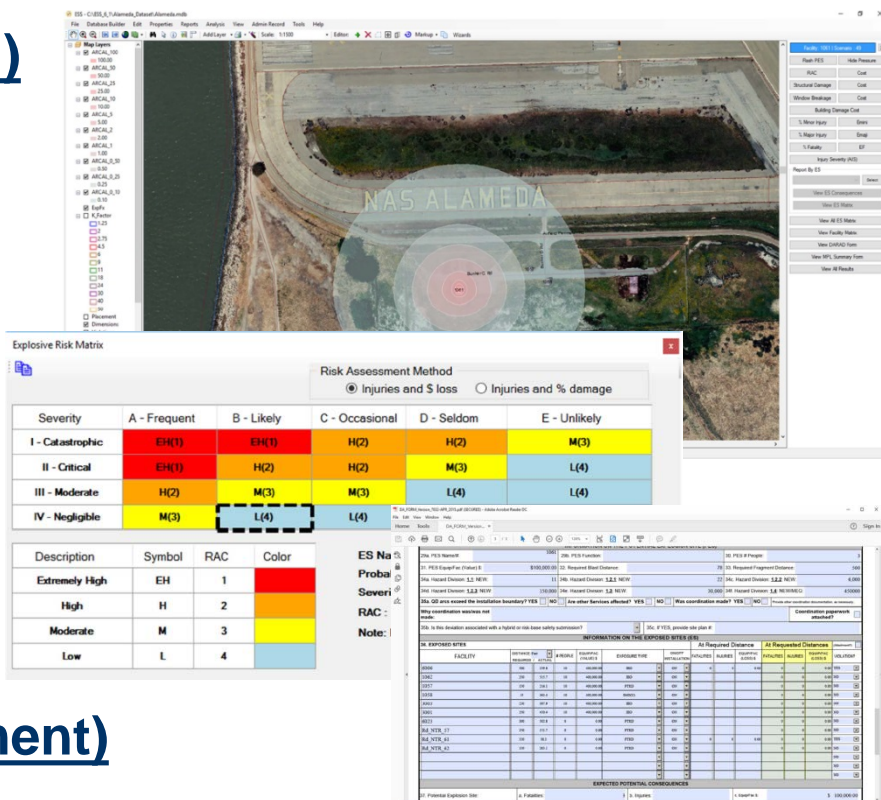
- Windows 7 or 10
- ArcGIS software versions 10.1 to 10.6
- 4GB RAM or more
- 2GHz process or better
- 32 or 64 bit operating system



# ESS Overview and Status

## ESS v6.1.4 (Planned - Near Completion)

- Planned Release Date- Second Half 2018
- RBESS (Risk Based Explosives Safety Siting)
  - Tier 1- Hazard Zone Model ASAP-X
  - Tier 2a- Physics-based model HAZX
  - Tier 2b planned for later versions of ESS
- MRAS (Munitions Risk Assessment System)
  - ASAP-X algorithms
  - Port assessment procedure
- NEES (Navy Enterprise Explosives Safety) database



The screenshot displays the ESS v6.1.4 software interface. At the top, there is an aerial view of a facility with a red circular hazard zone overlaid. Below this is the 'Explosive Risk Matrix' table, which is a 4x5 grid of colored cells representing risk levels. To the right of the matrix is a 'Risk Assessment Method' section with radio buttons for 'Injuries and \$ Loss' (selected) and 'Injuries and % damage'. Below the matrix is a legend table with columns for Description, Symbol, RAC, and Color. At the bottom of the screenshot is a detailed table titled 'INFORMATION ON THE EXPOSED SITE' with columns for FACILITY, DISTANCE, HAZARD, EXPOSURE, and various risk metrics.

Severity	A - Frequent	B - Likely	C - Occasional	D - Seldom	E - Unlikely
I - Catastrophic	EH(1)	EH(1)	H(2)	H(2)	M(3)
II - Critical	EH(1)	H(2)	H(2)	M(3)	L(4)
III - Moderate	H(2)	M(3)	M(3)	L(4)	L(4)
IV - Negligible	M(3)	L(4)	L(4)		

Description	Symbol	RAC	Color
Extremely High	EH	1	Red
High	H	2	Orange
Moderate	M	3	Yellow
Low	L	4	Light Blue

## ESS v6.1.5 (Planned- Under Development)

- Release Date – 2019
- One last build to bridge the gap between the ESS desktop and the Web version
- Merged QD engine
- Critical capabilities that can't wait for the Web version
- Critical bug fixes

# ESS Overview and Status

## Web-Based ESS

### ESS Desktop



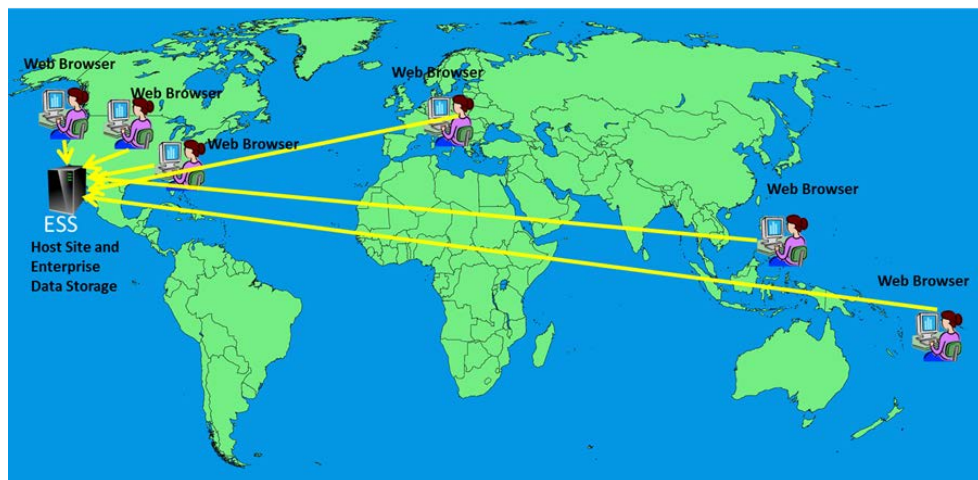
- Currently runs on stand-alone computers.
- ESS database is stored on the local computers.
- Single user access.



### Web-based ESS

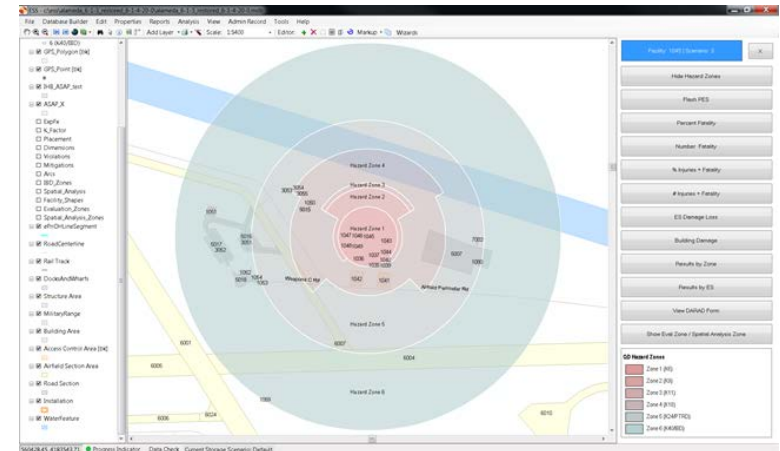


- Users access through Internet browser.
- Centralized storage of ESS datasets.
- ESS Web Beta V1.0 Dec 2018.
- v1.1 Site Plans Summer 2019.



## ESS Software Support & Training

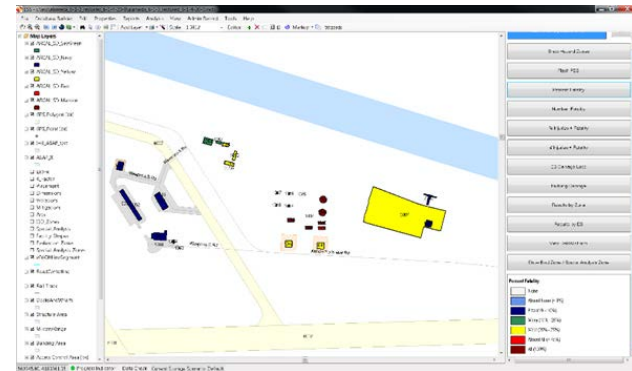
- ESS Help Desk support and training are offered by the NAVFAC Engineering and Expeditionary Warfare Center (EXWC), Army Technical Center for Explosives Safety (USATCES), and Air Force Safety Center.
- Over 1000 students trained.
- Classroom and Web meeting training.
- Training videos are currently being updated.
- Training guides, Reference guides, Configuration guides, and Workbook exercises



# ESS Benefits



- Fewer errors interpreting/implementing complex explosives safety criteria.
- Elimination of “math” errors in measurements and calculations.
- Significantly less time to create submittal packages.
- More accurate, complete, and standardized submittal packages.
- Faster review/approval of submittal packages.
- Data organized to DoD standards, saved in database readily available for analysis.
- Greatly enhanced “what-if” analysis capabilities.
- Identification of unknown violations.
- Optimized explosives storage capacity.





# Questions

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