FY18 NDAA Section 1606 Complementary PNT Demonstration

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Stakeholder Day Postponed
Joint Base Cape Cod
20 Mar 2020

U.S. Department of Transportation
Volpe Center
Advancing transportation innovation for the public good

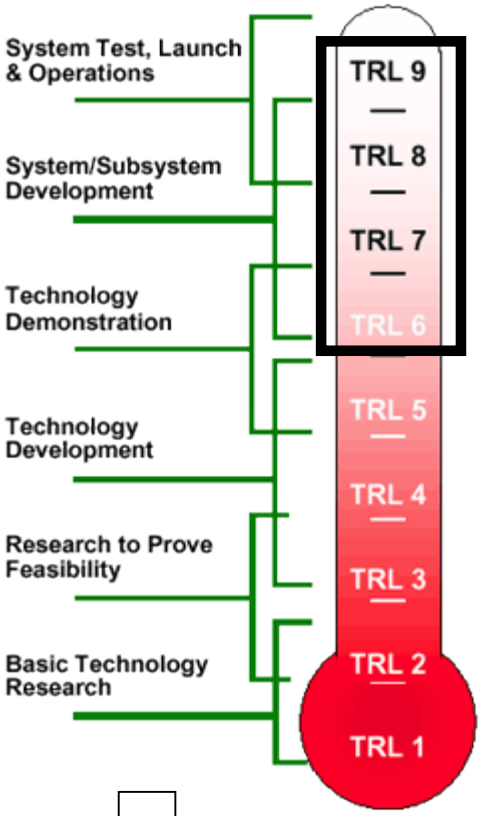
GPS Backup Demonstration Overview

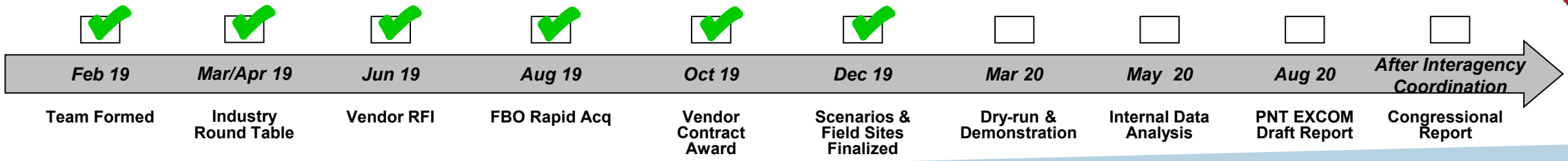
High-level Demonstration Plan Developed Under FY18 NDAA

- Joint DOT/DHS/DOD congressional briefing given Nov 2018
  - Coordination and planning efforts presented
  - DOT had yet to receive funds, transportation demonstration concept presented
  - FY20 NDAA extended period of performance to Dec 2020
- DHS Science and Technology conducted timing and positioning demonstration
  - Dec 2018 at NASA Langley/Insurance Institute for Highway Safety (IIHS) Ruckersville, VA
  - Technologies demonstrated: Locata, NextNav, Satelles (those already available at Langley)
  - Results and interim report in process
- DOT Volpe Center funded to execute demonstration Jan'19 - Dec '20

NDAA GPS Backup Demonstration Status

- Demonstration Team: 20 organizations, four field sites, six host platforms
- Executing three field campaigns, [at least] three technology demonstrations,
- Awarded 11 high TRL vendor demonstration contracts on rapid acquisition POs
- Demonstration output products:
  - Performance report with PNT roadmap and measures of effectiveness
  - PNT strategy guide and cross-departmental coordination for PNT EXCOM





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Volpe Contracted PNT Vendors

NEXTNAV

SKYHOOK

SEVEN Solutions

UrsaNav
Leaders in what's now. Innovators of what's next.

Satelles

serco & ALION

ECHO RIDGE

HELLEN systems

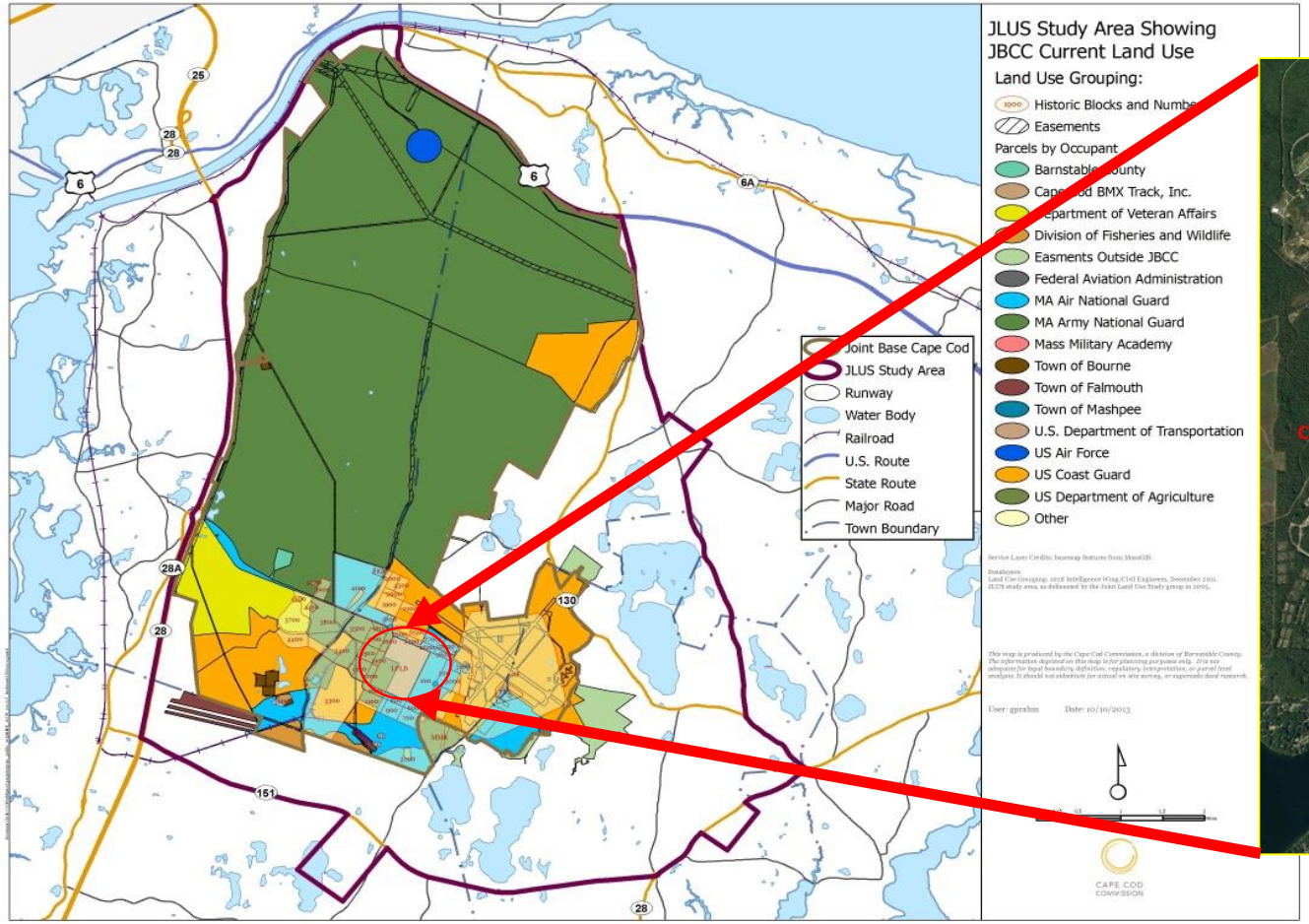
PHASORLAB
NEXT GENERATION WIRELESS TECHNOLOGIES

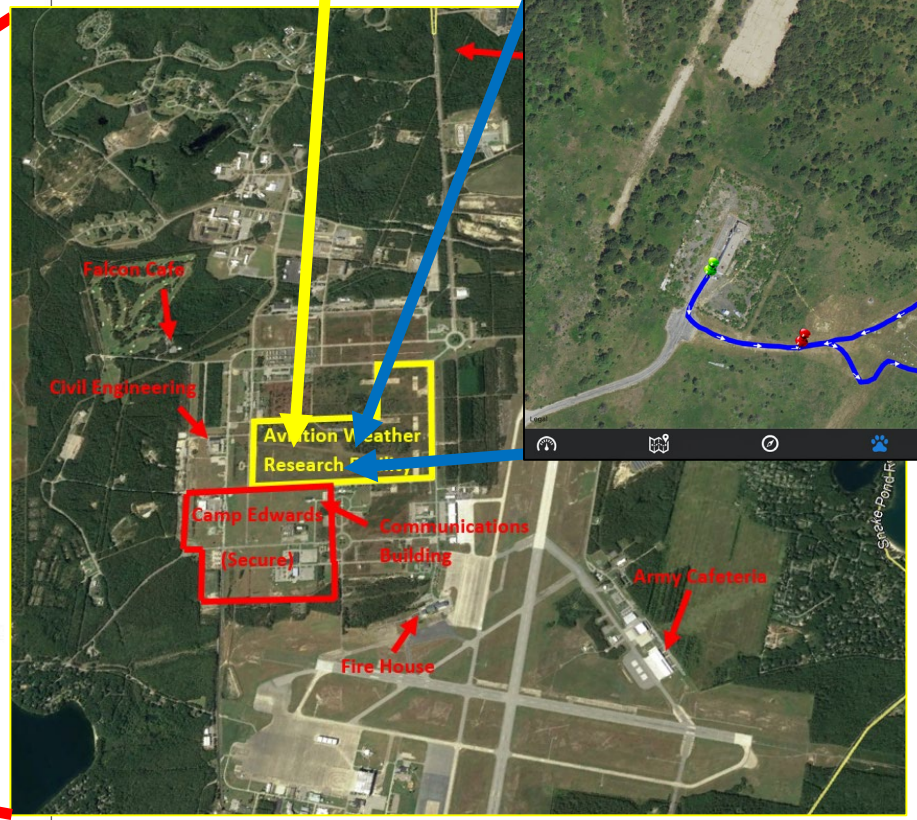
TRX systems

opnt. TIME PROVISIONING

Joint Base Cape Cod (JBCC) Volpe Field Facility

150 Acres
Volpe Test Facility





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Demonstration Plan (JBCC)

Joint Base Cape Cod (JBCC) Field Campaign

- 2 Weeks of Scenarios
- 5 Vendor Technologies
  - Hellen Systems
  - PhasorLab
  - Serco & Alion
  - Satelles
  - UrsaNav

Scenario	Monday	Tuesday	Wednesday	Thursday	Friday
72-Hour Bench Static Timing	72 Hours			As Needed	
eLoran Reference Station offset				All Day	
Dynamic Outdoor Positioning w/Hold		3.5 Hours (AM)			3.5 Hours (AM)
Static Outdoor Positioning	4.5 Hours (AM-PM)				4.5 Hours (AM)
Static Outdoor Timing	4.5 Hours (AM-PM)				4.5 Hours (AM)
Static Indoor Positioning			1.5 Hour (PM)	1.5 Hour (PM)	
Static Indoor Timing			4.5 Hour (PM)	4.5 Hour (PM)	
Static Basement Timing			2 Hours (AM)	2 Hours (AM)	
3D Pos.		4 Hours (AM-PM)	4 Hours	4 Hours	4 Hours

Planned Day
Make-up Day

Scenario	Monday	Tuesday	Wednesday	Thursday	Friday
72-Hour Bench Static Timing	72 Hours				
eLoran Reference Station offset					All Day
Static Basement Timing				4 Hours (AM)	

Planned Day
Make-up Day

2D Platform & Reference System (JBCC)

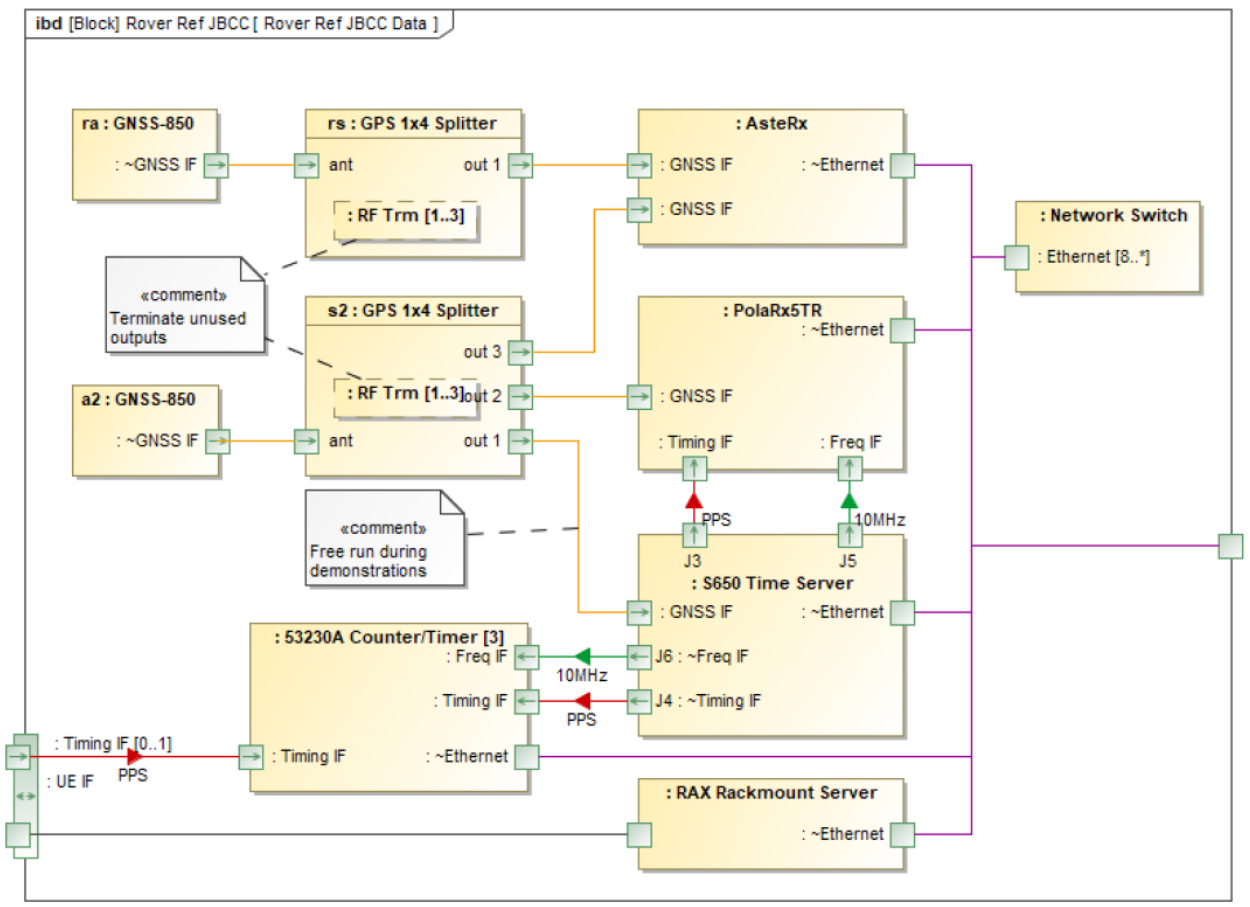


Figure 4: Rover Reference System Diagram JBCC

3D Platform & Reference System (JBCC)

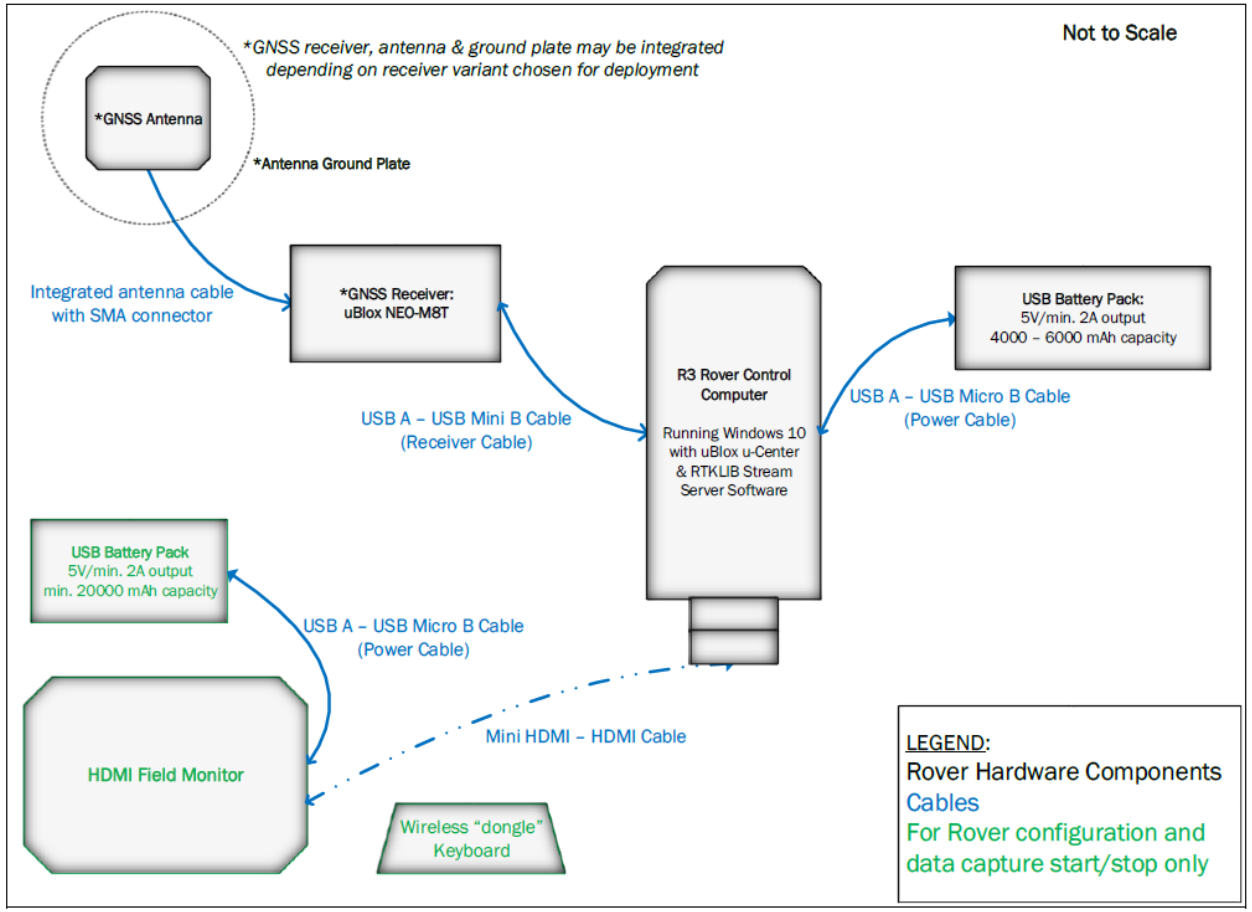
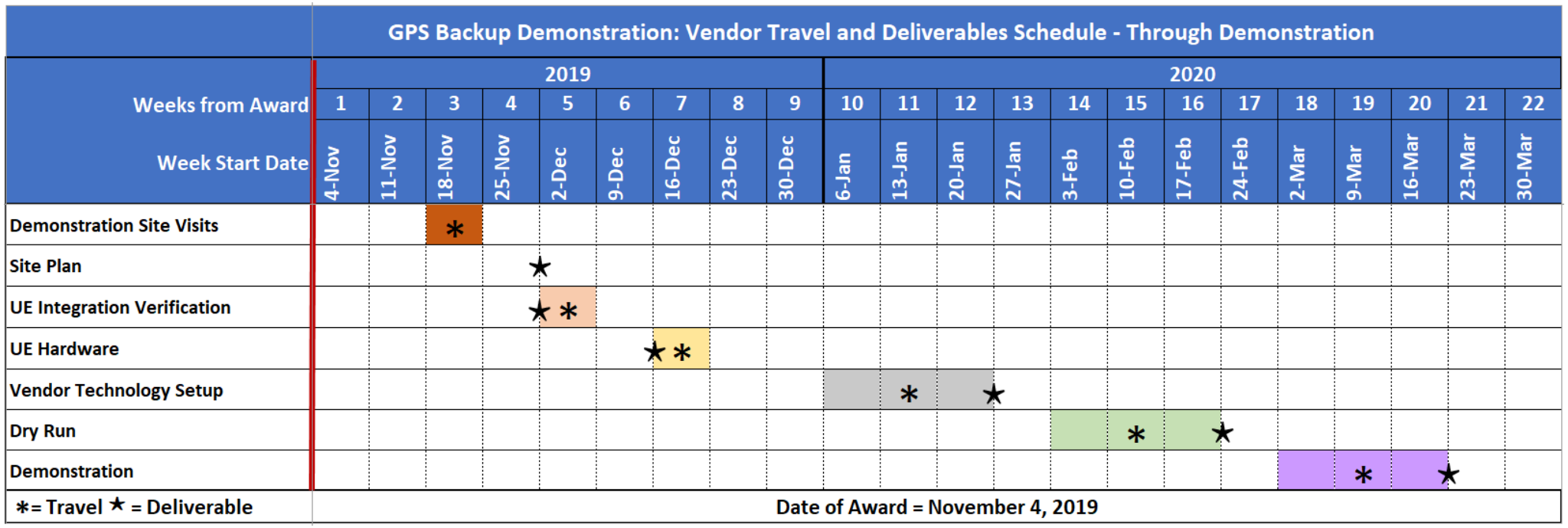


Figure 6: R3 Reference System Diagram JBCC

Demonstration Vendor Scope and Schedule

				Technologies							Demo Platforms				
				In Situ	Terrestrial RF				Satellite	Fiber Optic	Fixed		Moving		
VIP Demo	day	start	end	Map Match	LF (Loran)	MF (R-mode)	VHF (passive)	WiFI (2.4 GHz)	L-Band (LEO)	PTP	Outdoor	Indoor	Static	2D (van)	3D (uas)
LaRC	13-Mar	9:00	16:00	x			x	x	x	x	x	x	x	x	x
JBCC	20-Mar	9:00	16:00		x	x		x	x		x	x	x	x	x
			Vendors	TRX	Hellen Systems	Serco	NextNav	PhasorLab	Echo Ridge	OPNT					
					UrsaNav			Skyhook	Satelles	Seven Solutions					



Demonstration Outdoor Scenarios (2D JBCC)

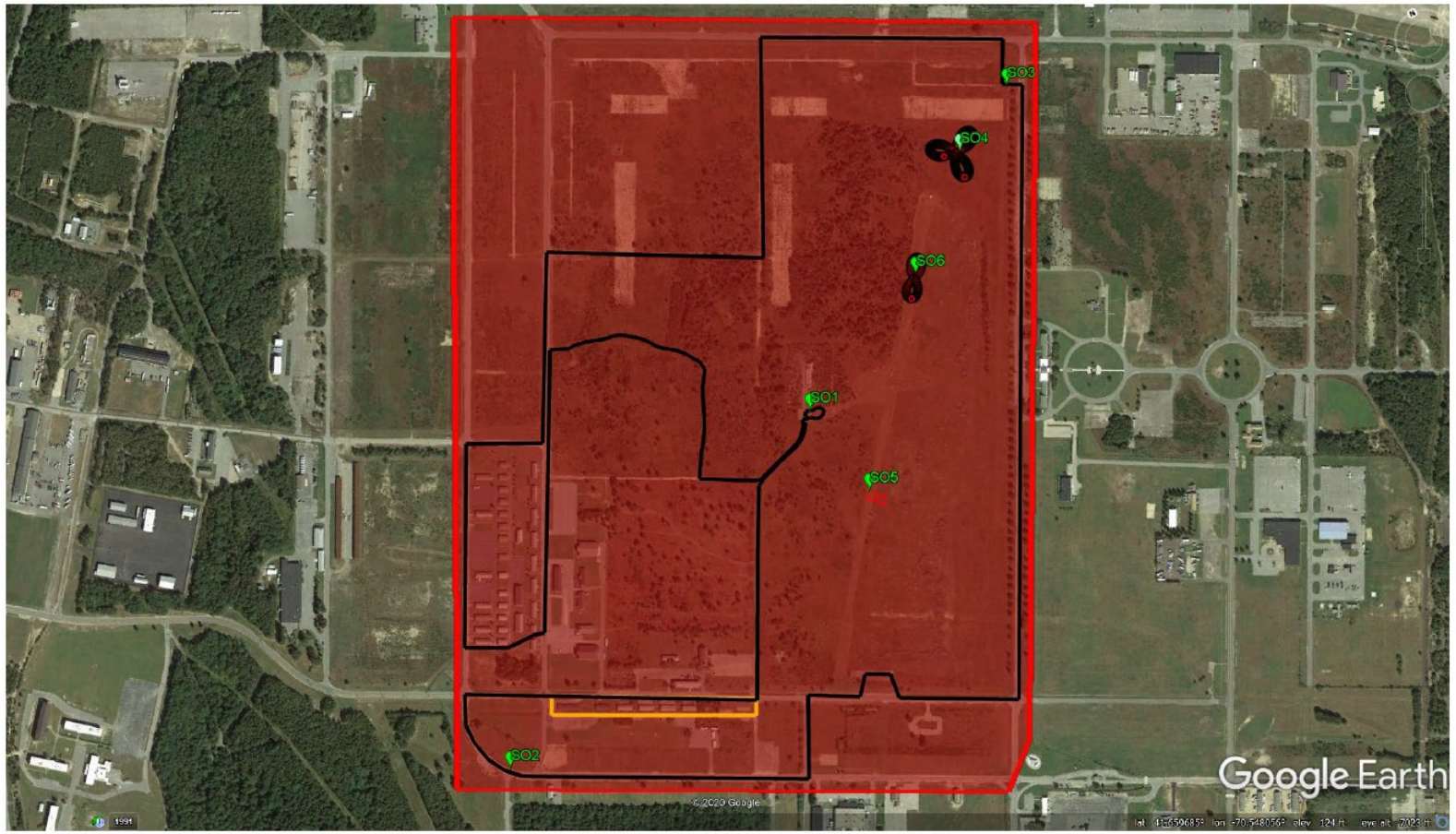


Figure 9: JBCC Dynamic Van Position with Hold Scenario

- Red area – fully instrumented
- Black track – van routes
- Green points – static points
- Orange box – dismount area

Demonstration Outdoor Scenarios (3D JBCC)

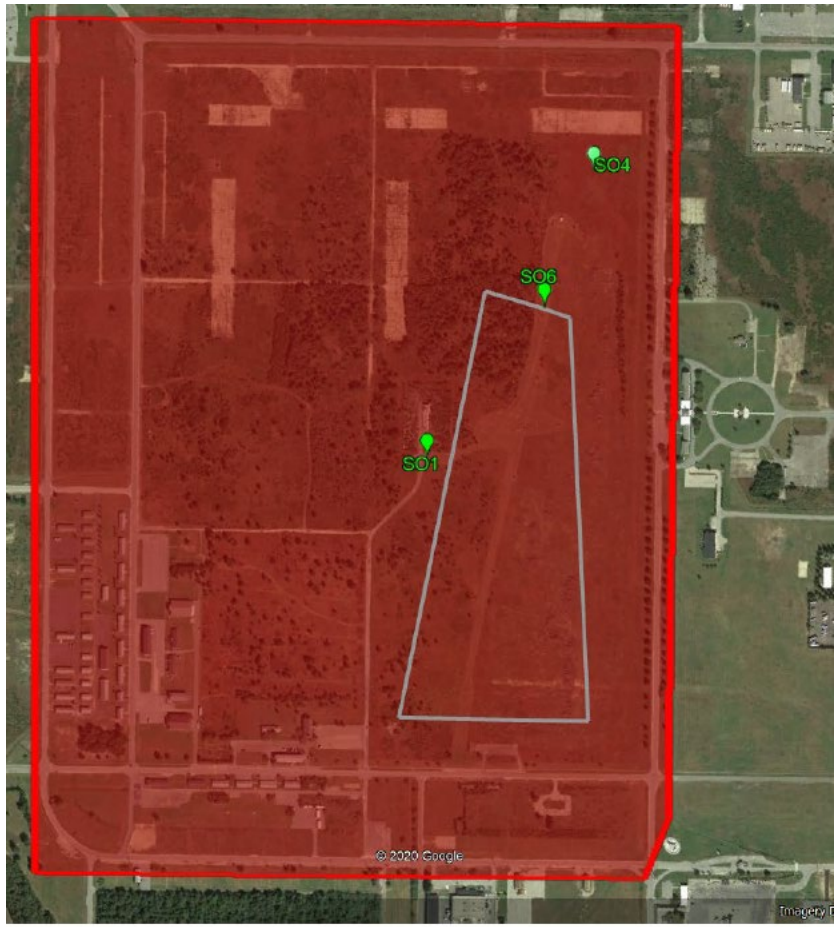


Figure 13: JBCC UAS Grey Route and Points

Figure 15: JBCC 3-Petal UAS Shape

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Demonstration Indoor/Denied Scenarios (JBCC)

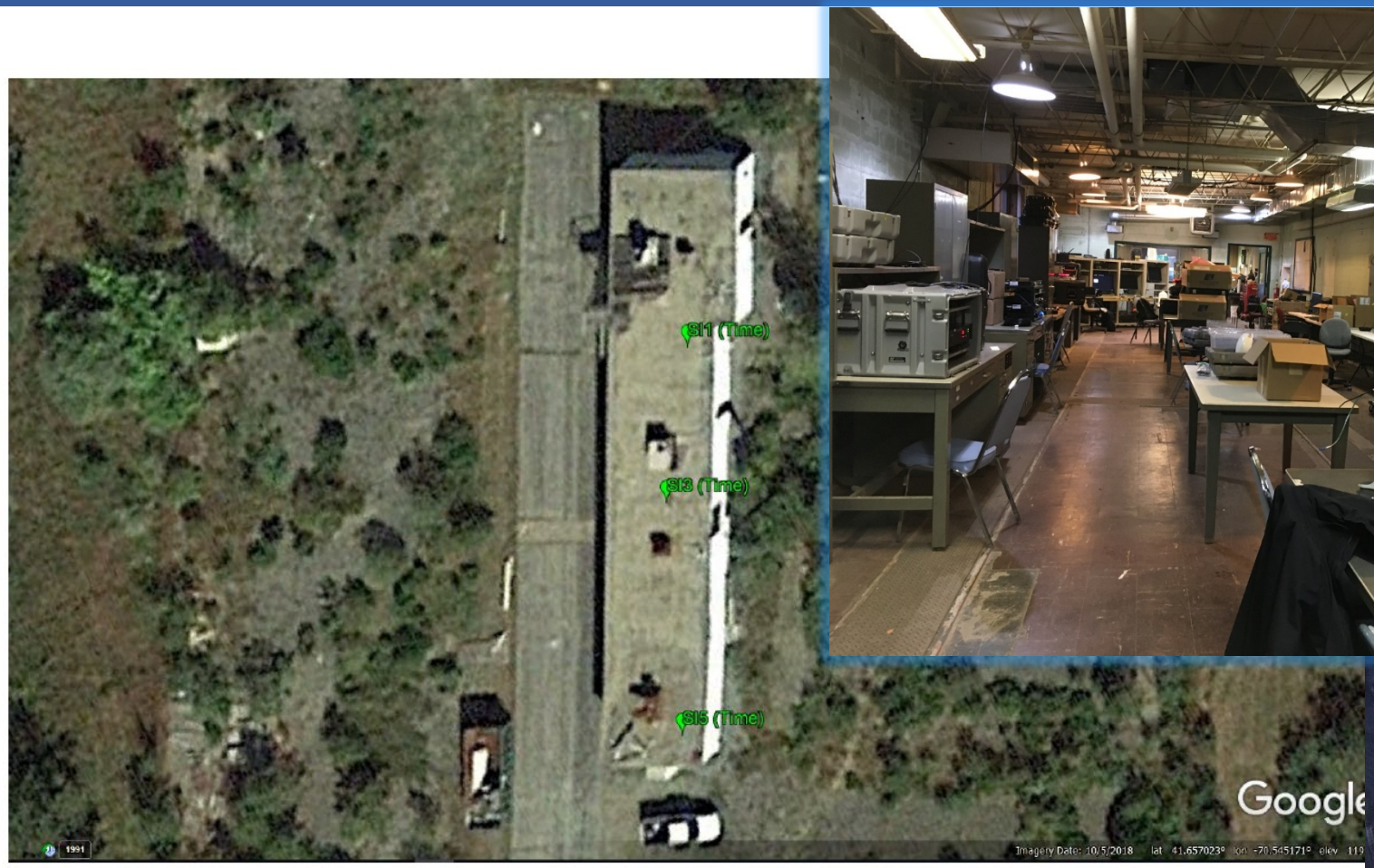

Figure 12: JBCC Static Indoor Timing Scenario

LF Reference Station Offset Scenarios (JBCC)

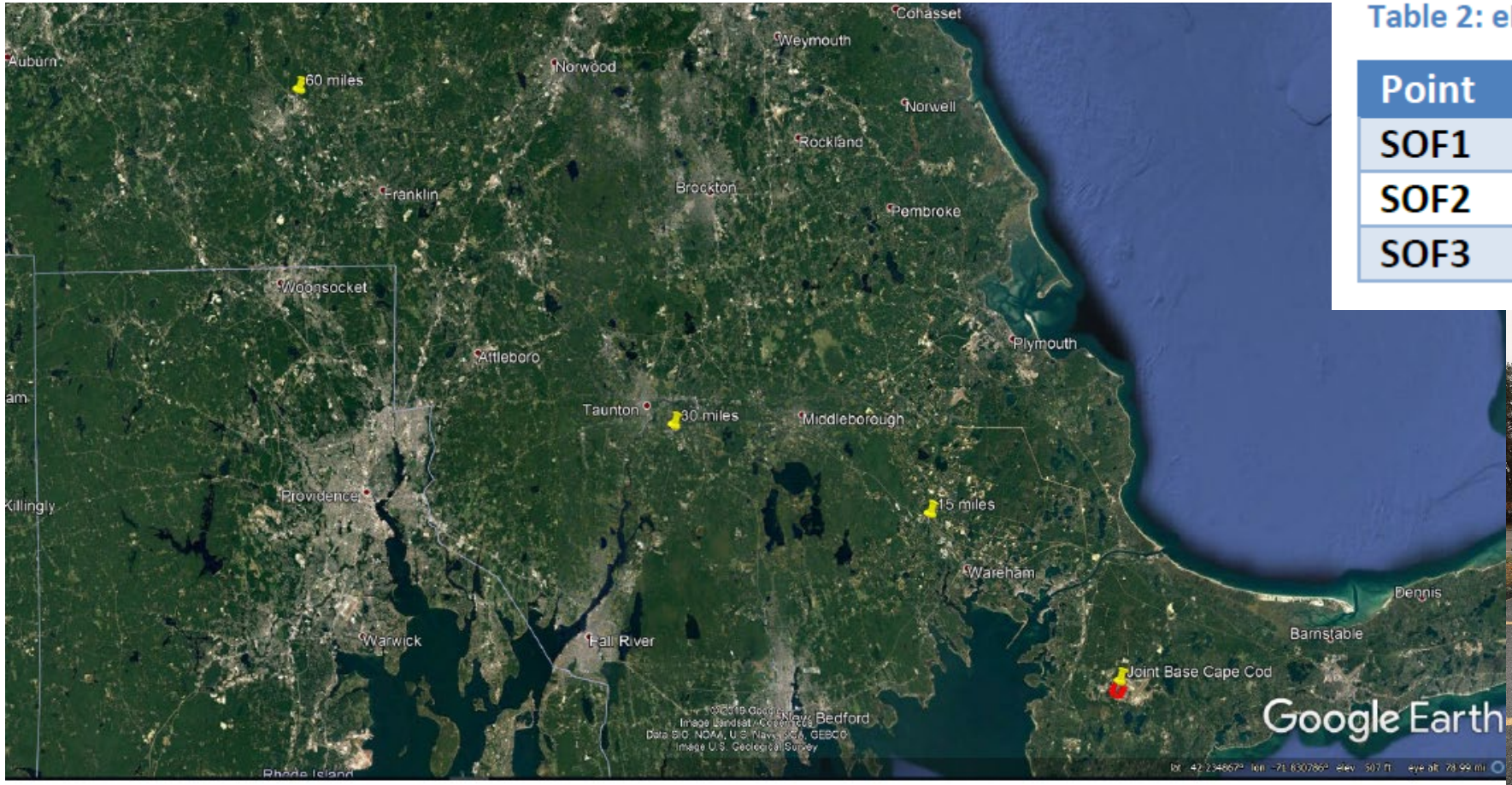

Figure 17: eLoran Reference Station Offset Scenario Positions

Table 2: eLoran Reference Offset Positions

Point	Location
SOF1	41.802306° -70.771671°
SOF2	41.875072° -71.062101°
SOF3	42.160462° -71.499288°

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