

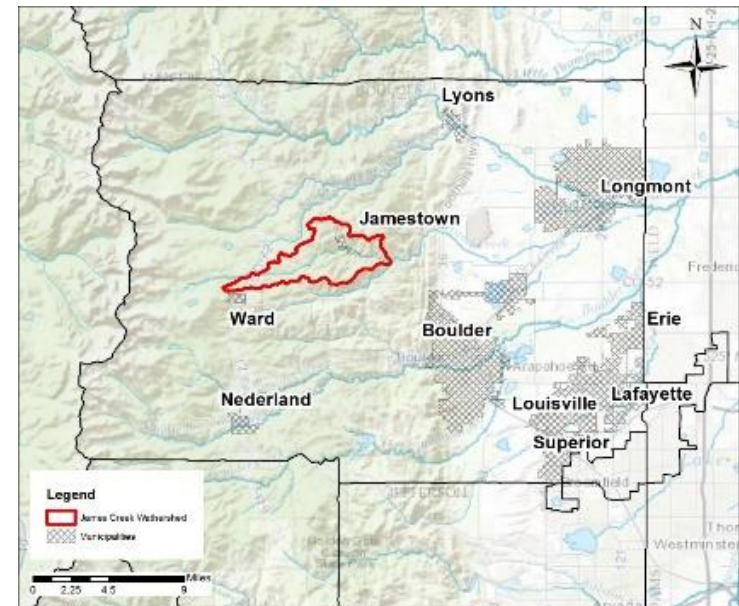
# Design Development Services For Automated Flood Warning System (AFWS)



September 11, 2017

# Agenda

- Team members
- Current state of the rain gauge network and flood alert system
- Analysis of rainfall alerts
- Recommendations
- Next steps



# The Lynker Team



## Team Members

- Graeme Aggett: Project Manager
- David Curtis: Flood Warning System Expert
- Ryan Spies: Hydrologist/Meteorologist
- Page Weil: Water Resources Engineer, GIS Specialist
- Scott Bores: Electrical Engineer, Gauge Installation Expert

## Coordination

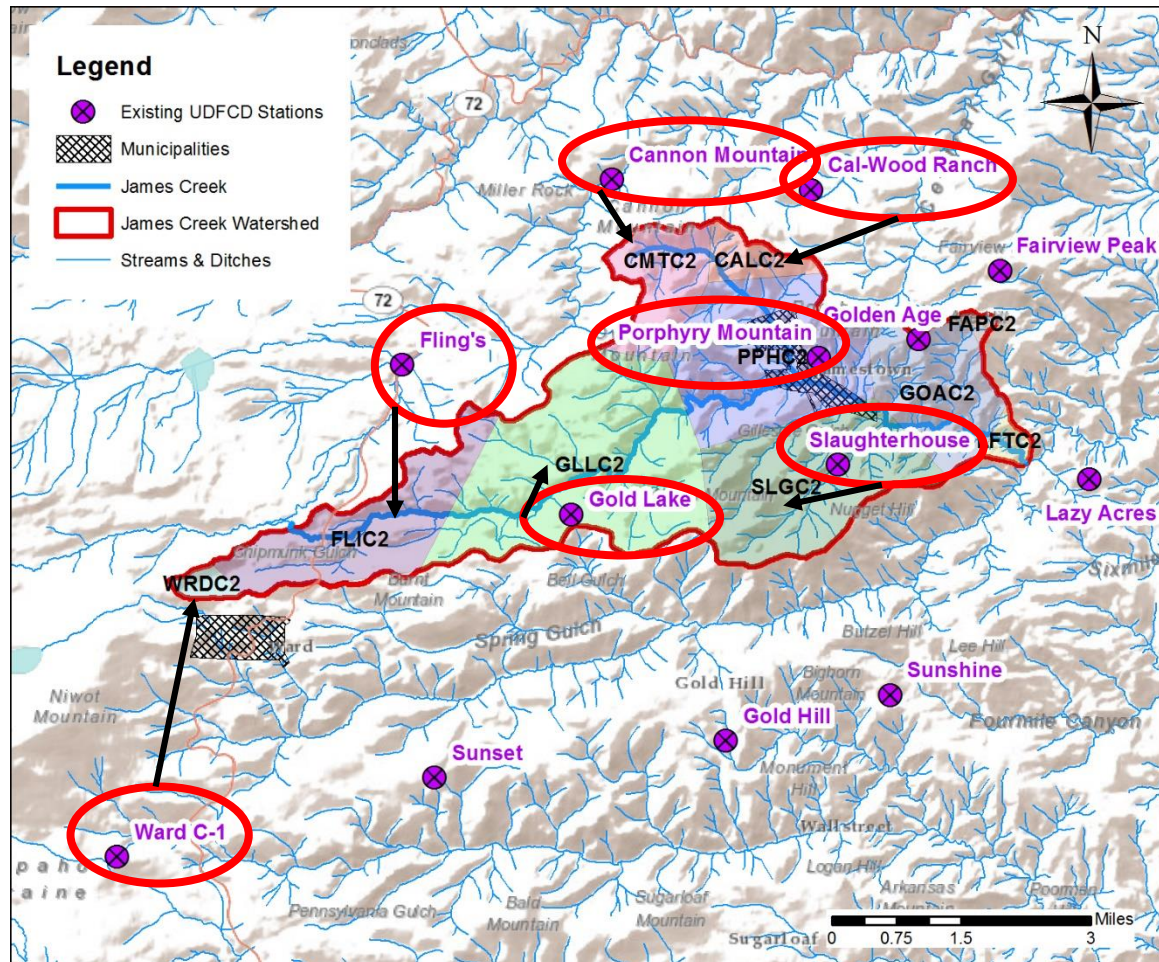
- Boulder County Office of Emergency Management: Mike Chard
- Urban Drainage and Flood Control District: Kevin Stewart
- Jamestown: Tara Schoedinger, Mark Williams, Tim Stokes, Philip Strom



# Evaluation and Suggestions for Alert Thresholds

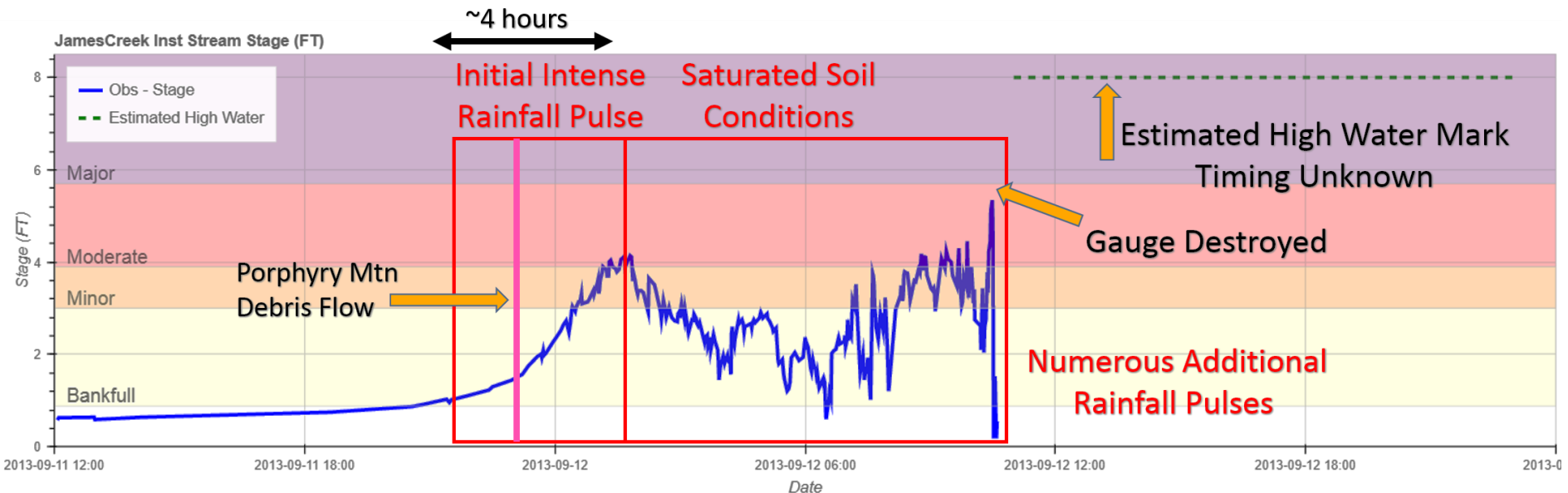
## James Creek Rainfall Alert Gauge Network:

- Ward C-1 (Hills Mills): WRDC2
- Fling's: FLIC2
- Gold Lake: GLLC2
- Cannon Mountain: CMTC2
- Cal-Wood Ranch: CALC2
- Porphyry Mountain: PPHC2
- Slaughterhouse: SLGC2



# Analysis of September 2013 Flood

## James Creek @ Jamestown River Stage



# Current Rainfall Alert Thresholds

- Alert system actively monitors gauge rainfall and sends subscription email/text alerts when rainfall thresholds are exceeded
- Rainfall accumulation calculated every 5 minutes
- Time interval is a window of time (“1 hour rainfall” is previous hour total – recalculated every 5 minutes)
- Default thresholds are used throughout the Front Range

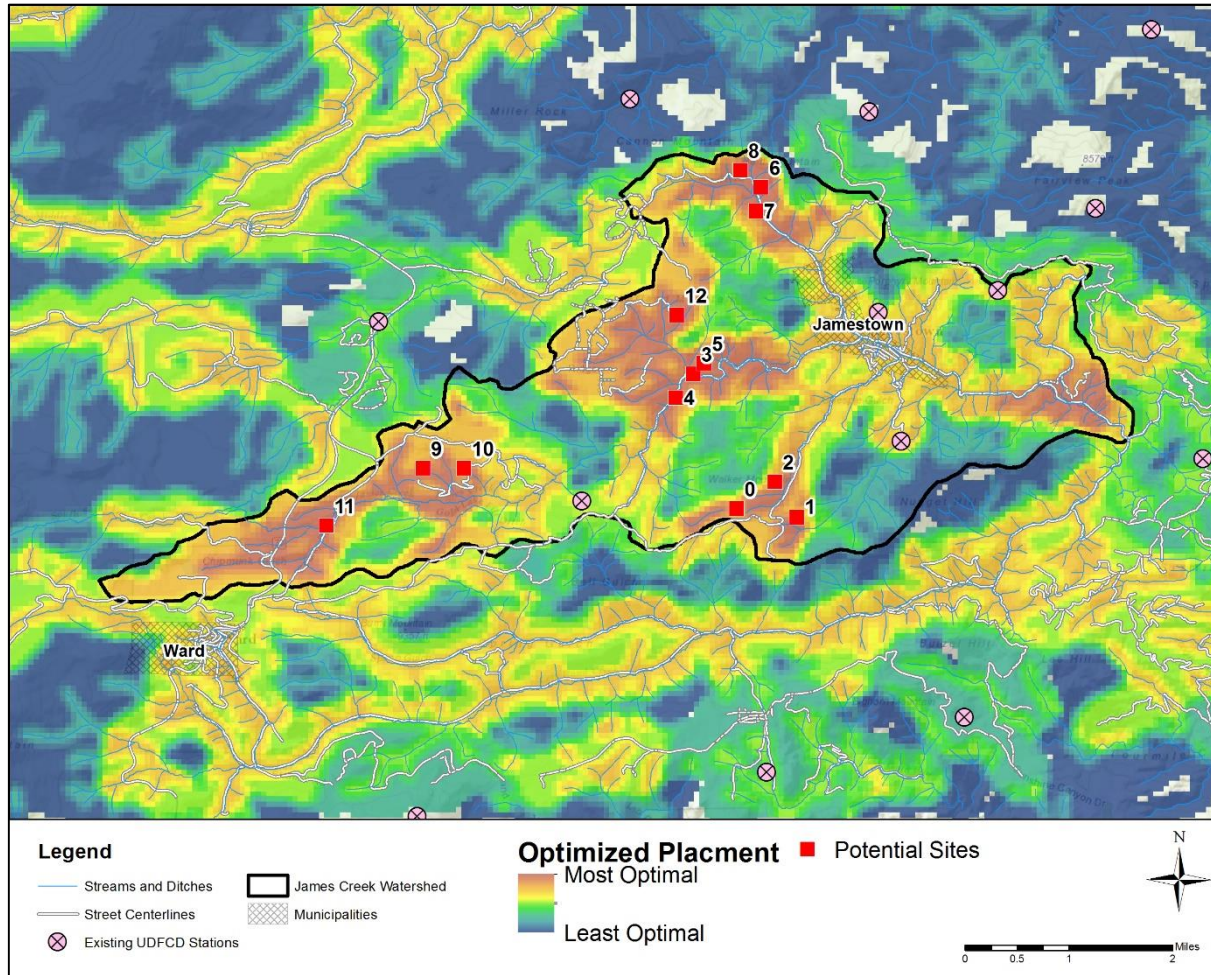
Time Interval	Default Rainfall Accumulation Alert (inches)
10-minutes	0.5 in
1-hour	1.0 in
2-hours	3.0 in
6-hours	5.0 in
24-hours	5.0 in
72-hours	10.0 in



# Project Questions

- Does the James Creek watershed region have adequate rain gauge coverage to provide flood threat warnings or could the network benefit from additional gauges?
- Is there opportunity for Jamestown to further partner with BoCo OEM to obtain early warnings?
- Are the current default alert thresholds appropriate for Jamestown given its location and terrain?

# Desktop Planning – Gauge Placement

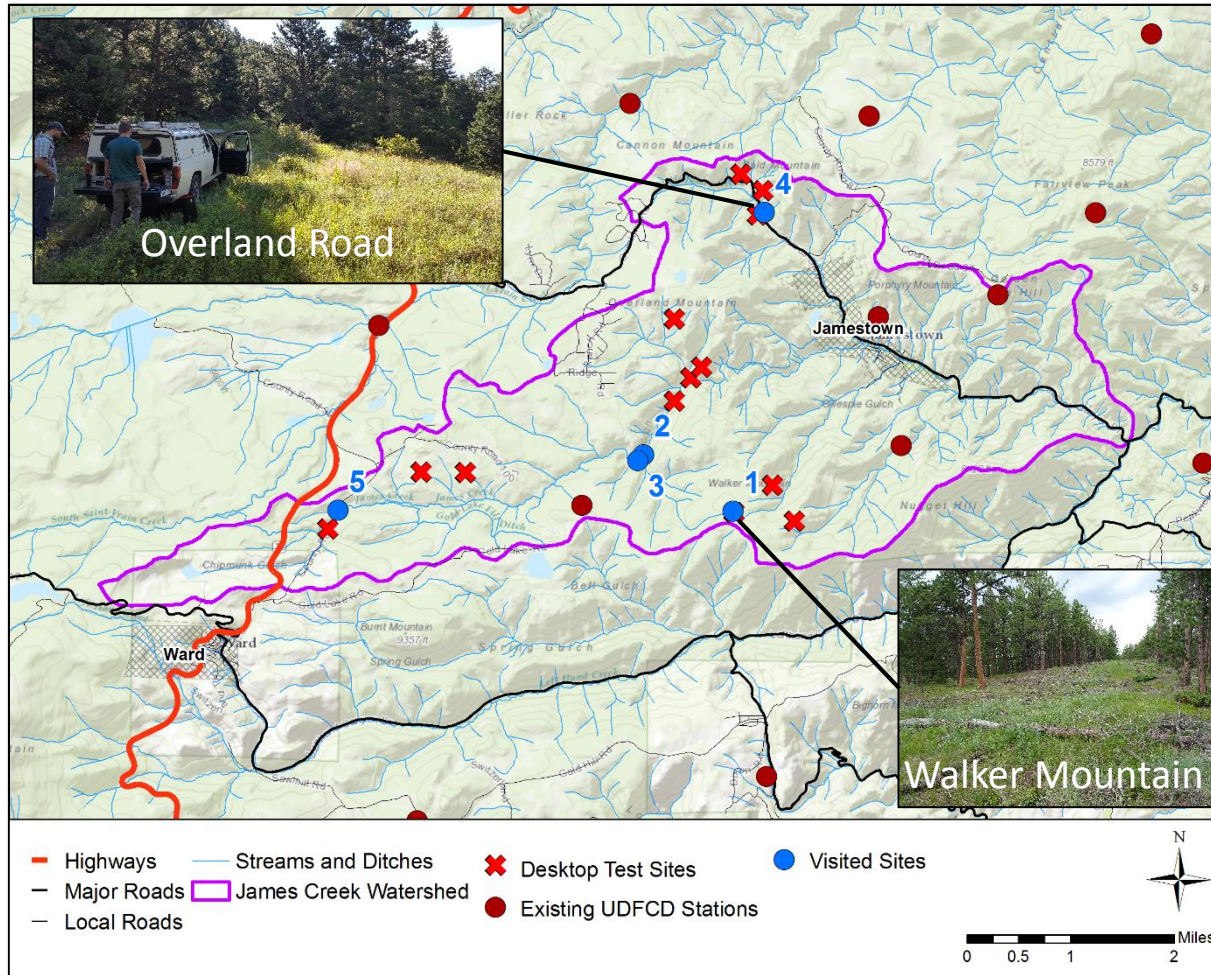


## Heat Map:

- Red colors indicate more preferential gauge placement regions
- Identified 13 test locations (4 regions) for further evaluation



# Field Site Evaluations



## Site evaluation:

- Placement evaluations at each of the 4 preferred regions (5 sites)
- Transmission test to nearby receivers/repeaters

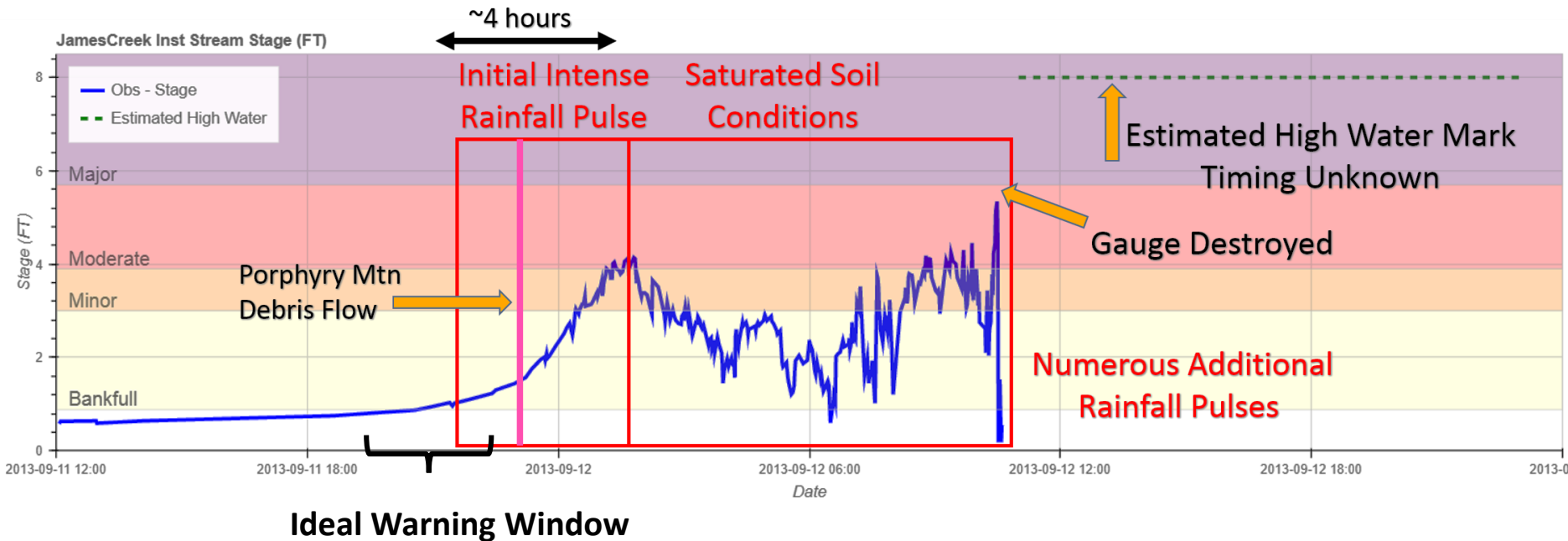
# Recommendations for Next Phase

## Recommendation 1:

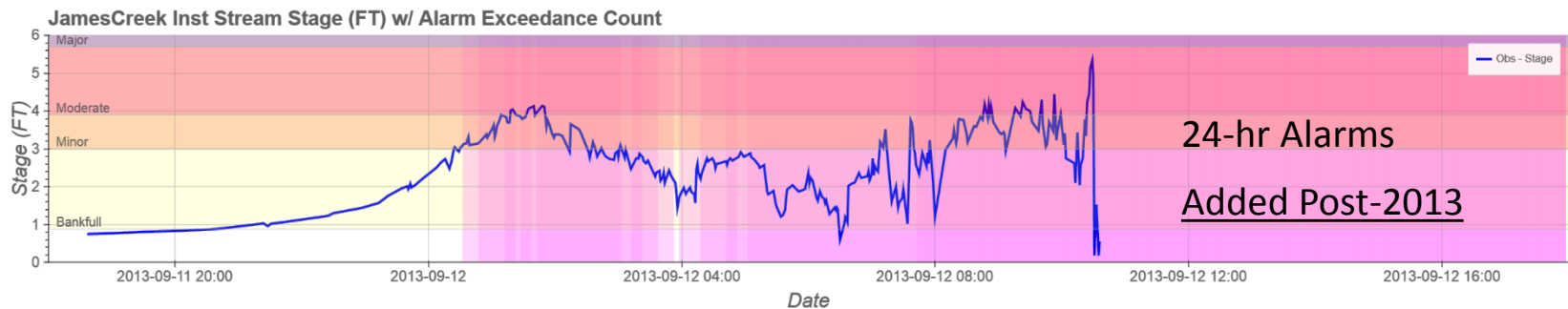
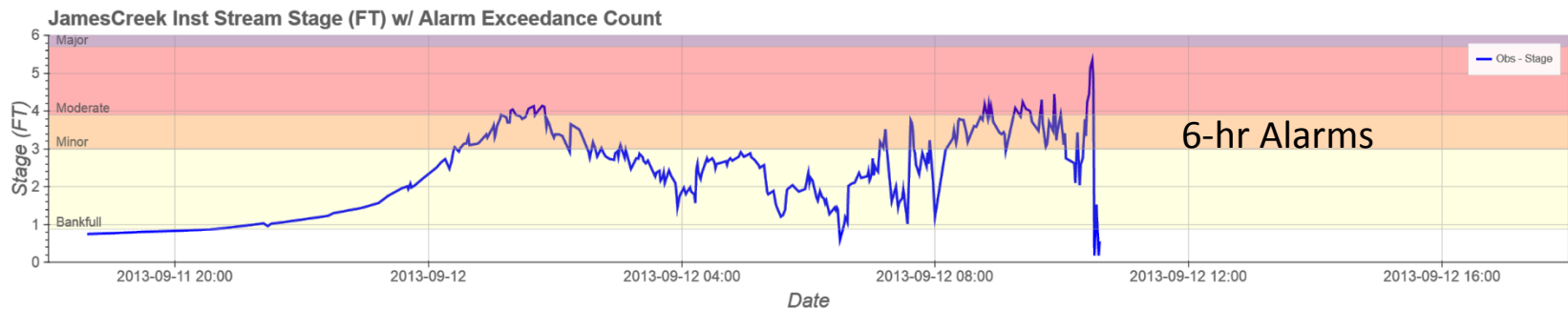
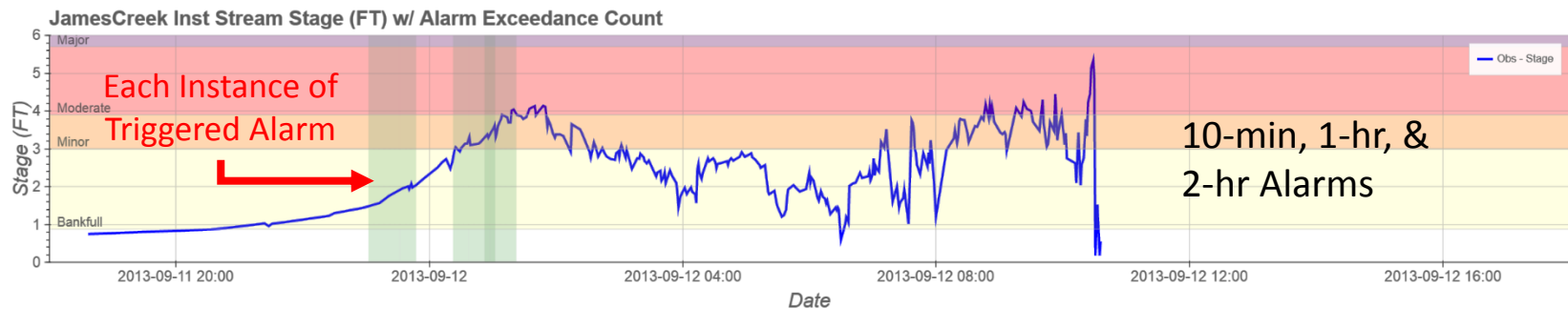
- Single rain gauge installation
  - Funding assured for future maintenance
  - Primary location: Walker Mountain
  - Backup location: Overland Road

Site Location Name	Gauge Type	Priority	Estimated Equipment and Install Cost	Estimated Annual Maintenance Cost	Expected Installation Effort
Walker Mountain	Rain	Moderate	\$7,000	\$2,500	1 day
Overland Road	Rain	Moderate	\$7,000	\$2,500	1 day

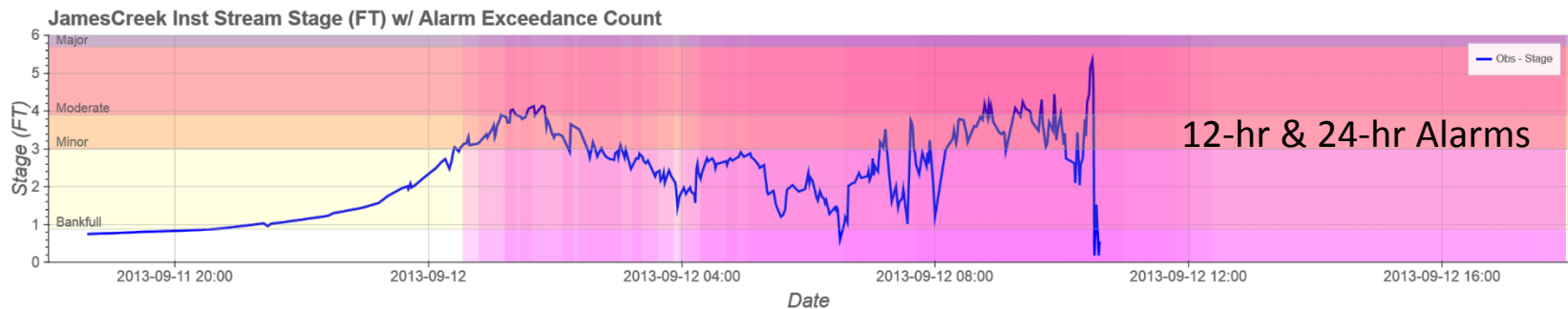
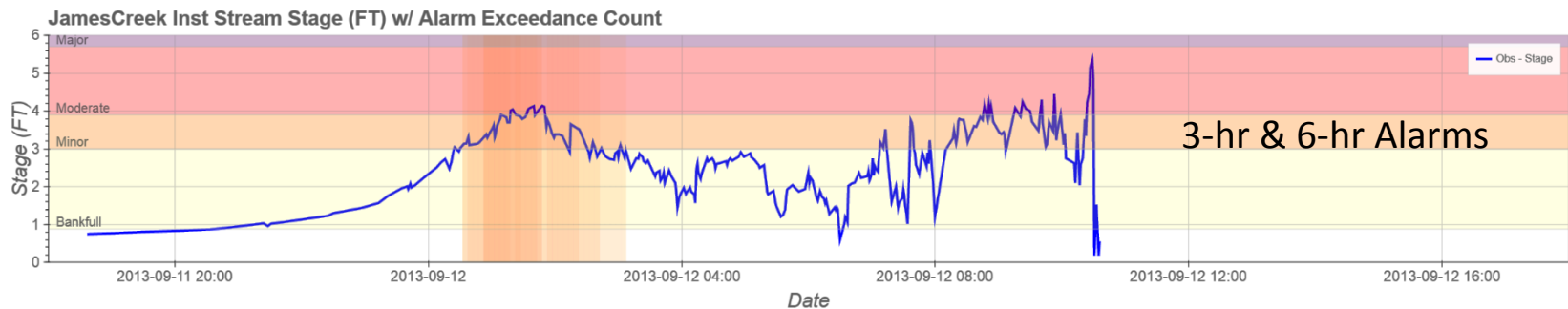
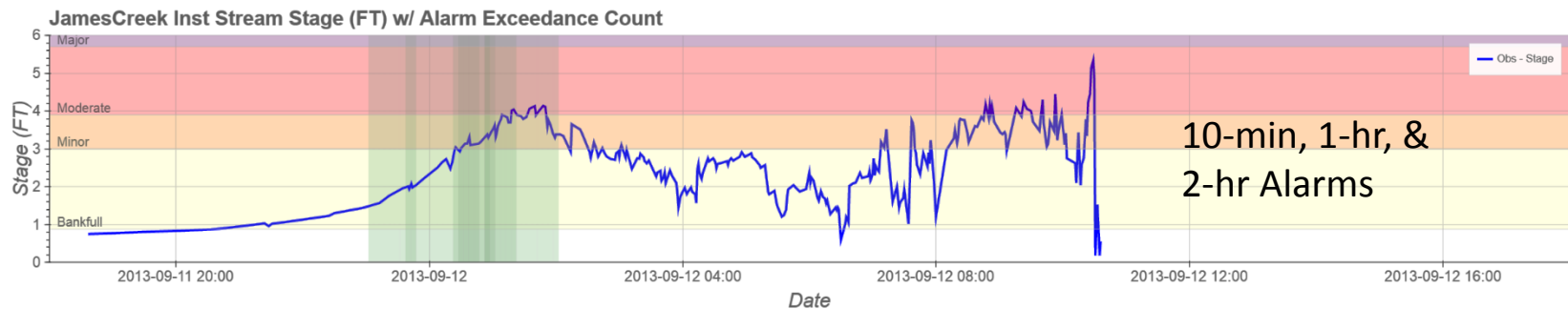
# Analysis of September 2013 Flood



# Evaluation and Suggestions for Alert Thresholds (Default)



# Evaluation and Suggestions for Alert Thresholds (Modified)





# Evaluation and Suggestions for Alert Thresholds

Time Duration	Default Rainfall Accumulation Alert (inches)	Modified Rainfall Accumulation Alert (inches)	General Alarm Classification	Jamestown Emergency Response
10-minutes	0.5 in	0.5 in	Flash Flooding Potential – minor flooding (curb and gutter full)	<i>e.g. Standby for future rainfall monitoring</i>
1-hour	1.0 in	1.0 in	Flash Flooding Potential	<i>To be developed by Jamestown and Boulder County OEM</i>
2-hours	3.0 in	1.5 in	Flash Flooding Potential	
*3-hours	--	2.0 in	Short-term Flooding; Saturated Conditions Alert	
6-hours	5.0 in	3.0 in	Short-term Flooding; Saturated Conditions Alert	
*12-hours	--	4.0 in	Large Scale Flooding Potential	
24-hours	5.0 in	5.0 in	Large Scale Flooding Potential	

\* Newly tested time duration rainfall threshold

Red values require additional threshold evaluation

# Recommendations for Next Phase

## Recommendation 2:

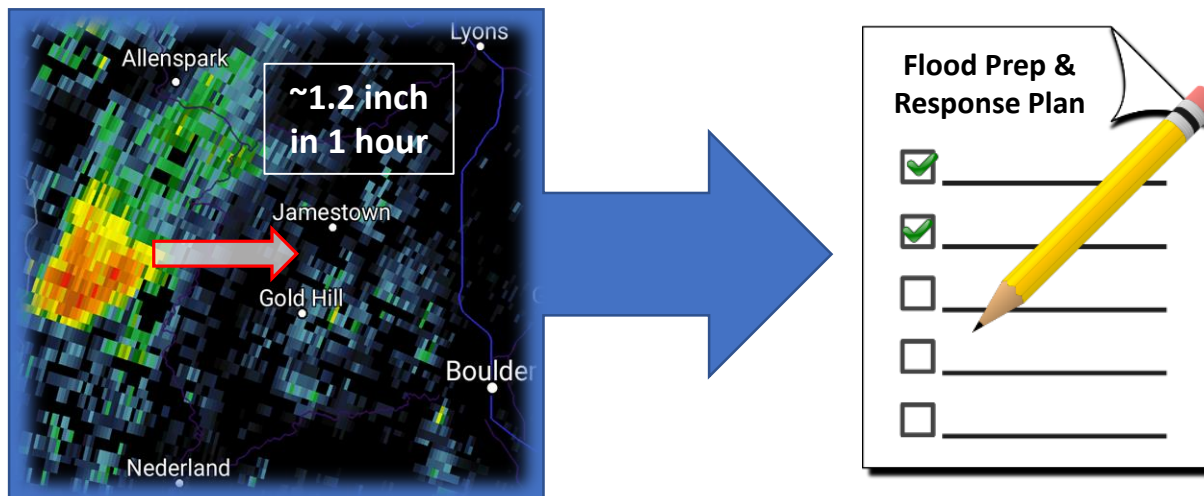
- Jamestown and Boulder County OEM define response plan protocol
- Further refine rainfall alert threshold values for James Creek



# Recommendations for Next Phase

## Recommendation 3:

- Develop a radar estimated rainfall projection tool
  - Use historical Gauge Adjusted Radar Rainfall (GARR) to generate an impact-based threshold product linked to pre-configured flood emergency monitoring and response plans





# Questions?

[rspies@lynkertech.com](mailto:rspies@lynkertech.com)

