

# Cooperative ESPA Dye Tracing Program – 10 Year Review –

by:

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and

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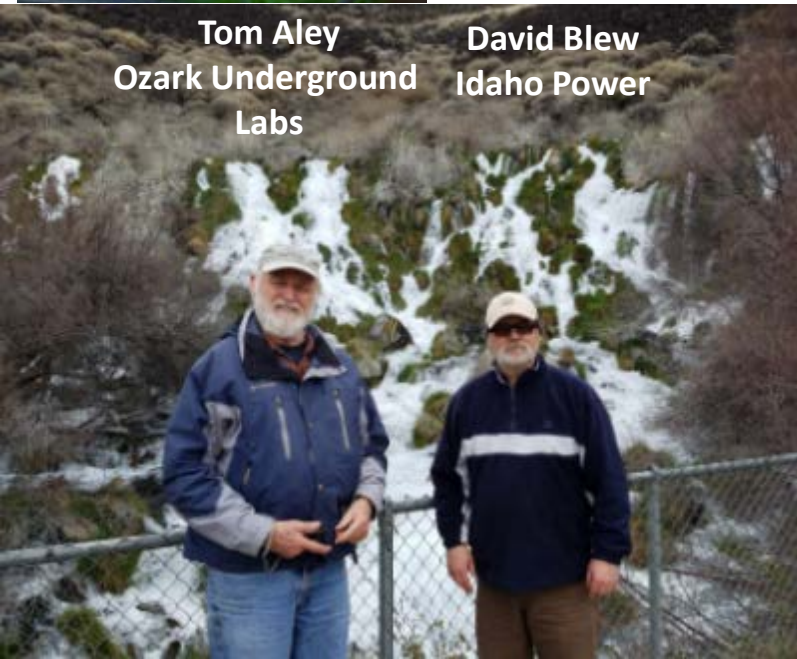
for

Idaho Senate Natural Resources Committee

February 5<sup>th</sup>, 2020

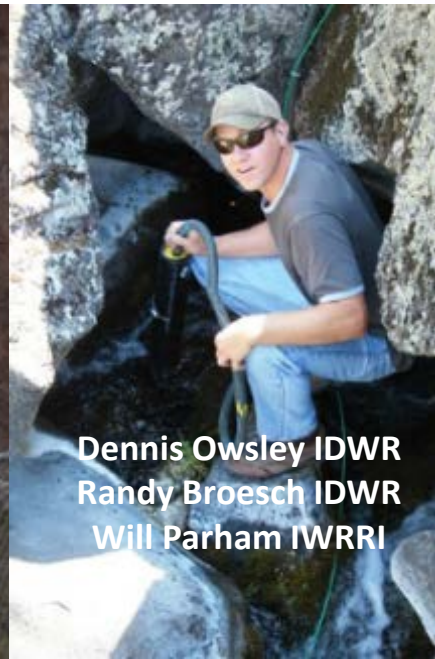


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## Background of the Dye Tracer Studies

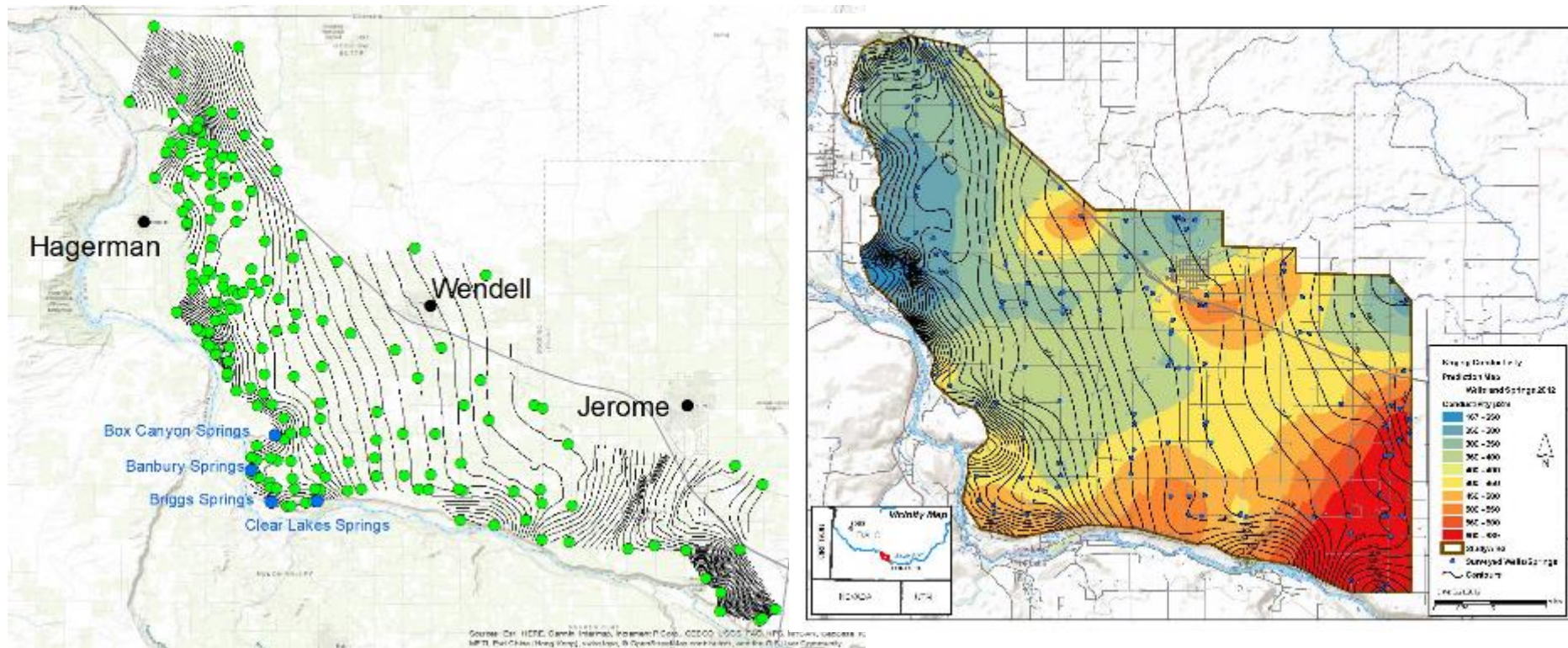
Dye tracer studies were initiated in response to the Swan Falls Reaffirmation Agreement between Idaho Power and the State of Idaho and the Completion of CAMP

Need to develop an understanding of near canyon aquifer characteristics and aquifer recharge sites.

- Spring discharge comprises the majority of flow in the Snake River below Milner Dam
- Important for maintaining hydropower production
- Important for maintaining and improving water quality of the Snake River
- Springs are important habitats for many specimens.

- Dye tracing is a ‘tool’ that is used to track aquifer recharge water by releasing a non-toxic EPA approved dye.
- Preparing for a dye trace involves a lot of planning and preparation work.

# Cooperative Dye Tracing Groundwater Studies (dye trace preparation)

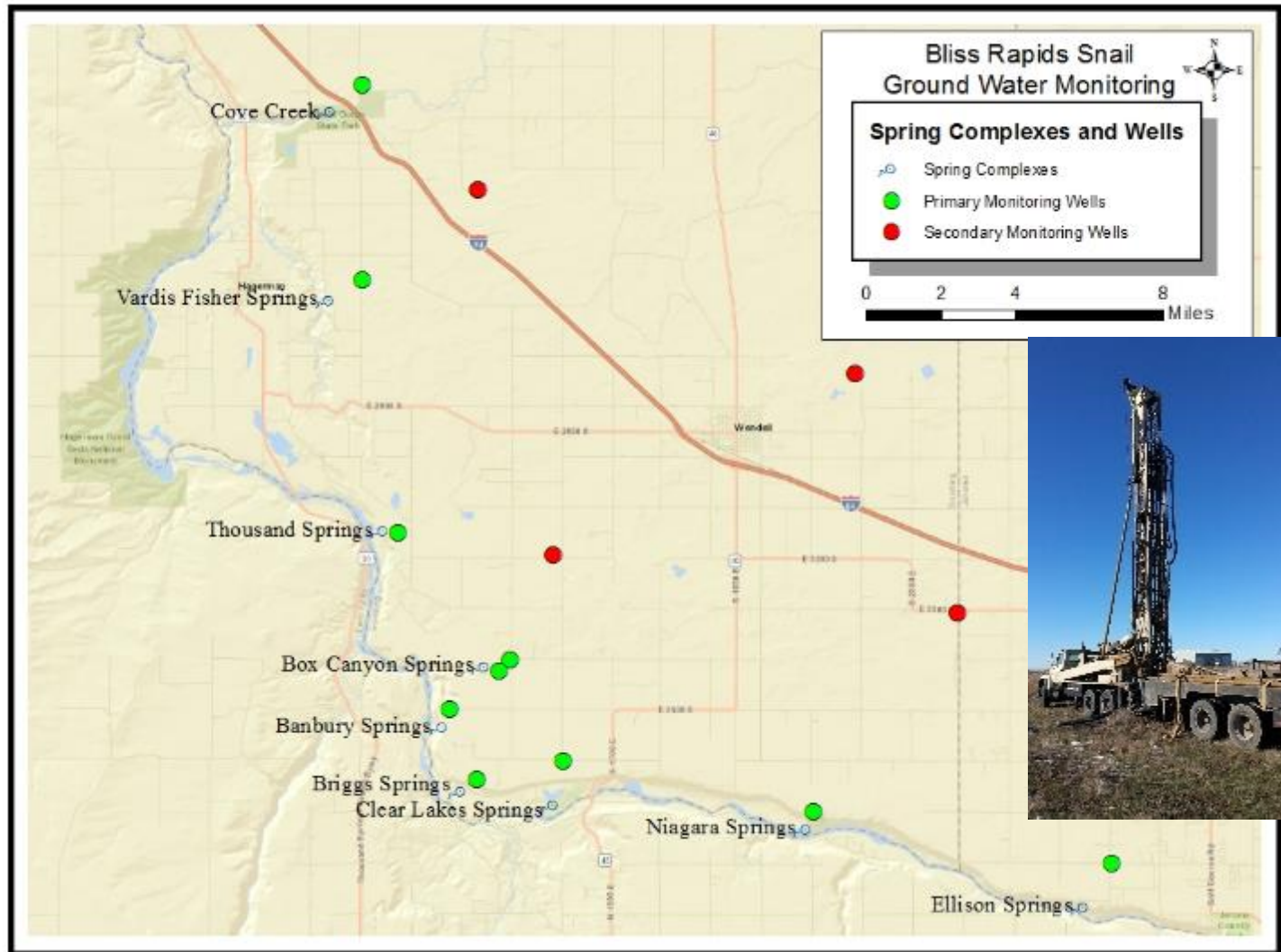


IDWR and Idaho Power participated in a cooperative effort to create a high resolution water table map for the western edge of the ESPA and aquifer chemistry.

# Cooperative Dye Tracing Groundwater Studies (dye trace preparation)

## Construction of Near Rim Monitoring Wells

- From 2013 through 2017 IDWR and Idaho Power have cooperatively developed 14 monitoring wells
  - Drilled 6 new monitoring wells
  - Retrofitted 5 unused wells
  - Equipped 3 existing domestic wells



# Financial Contributions for Tracers

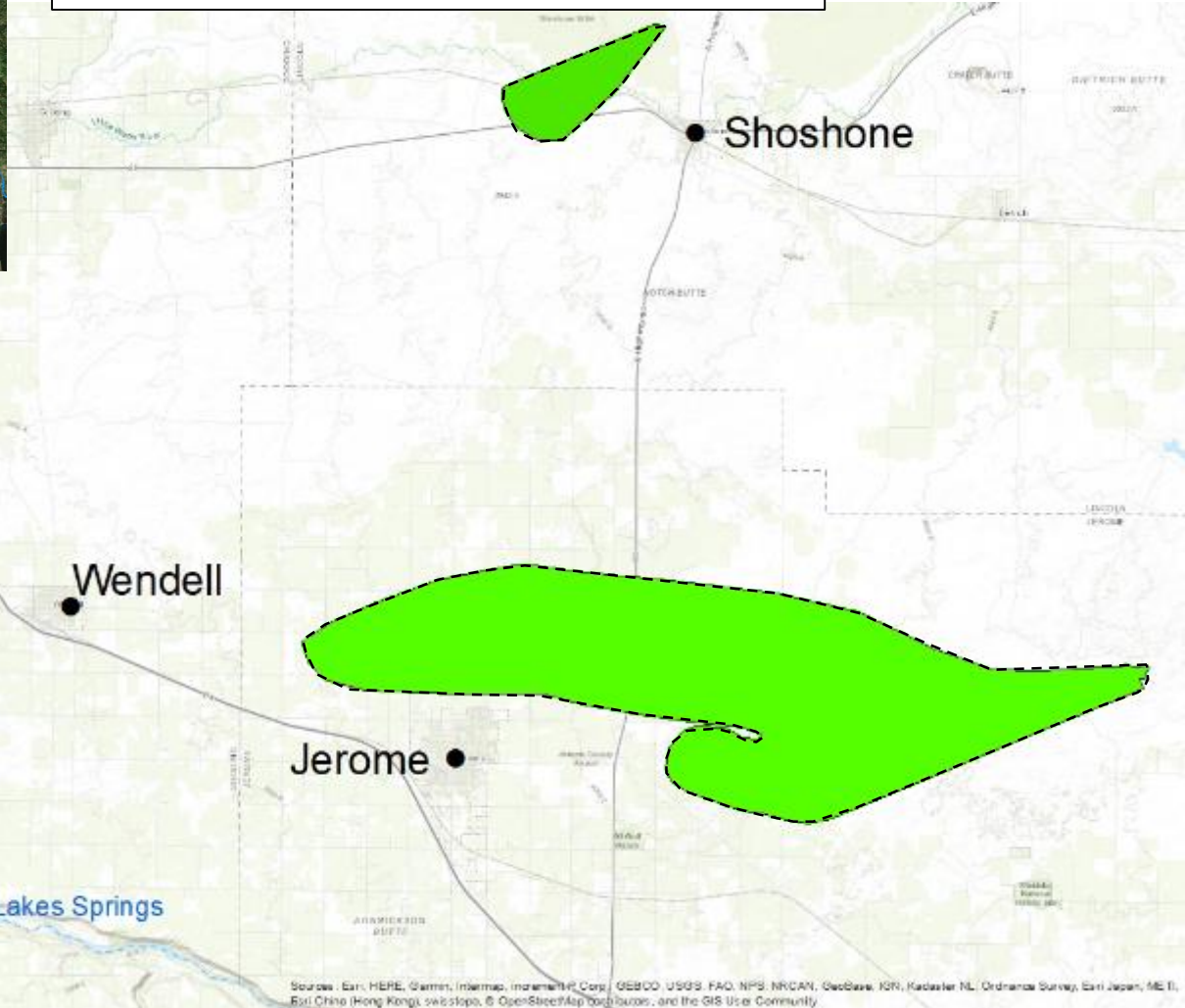
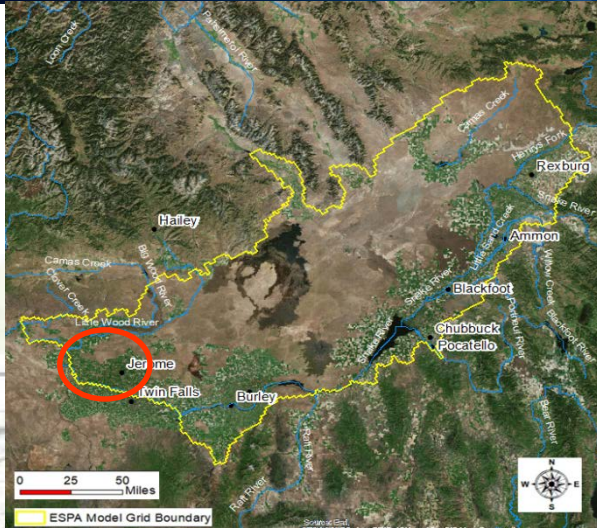
## Idaho Power

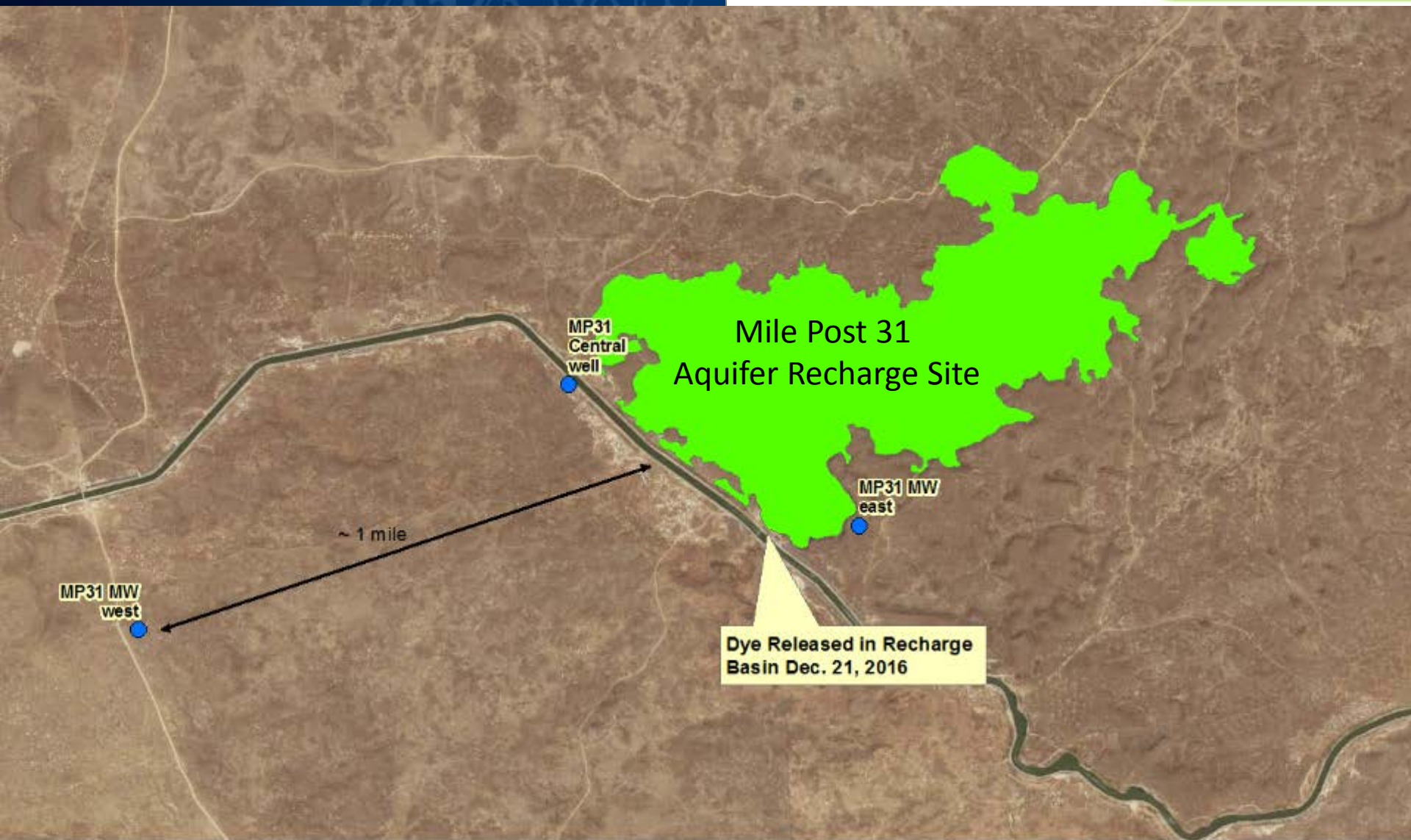
- \$127,000 - Direct Payments to IDWR
- Labor and other in kind services

## Idaho Department of Water Resources

- \$90,335 – Equipment, lab analysis, etc.
- Labor, vehicle, travel costs, and other in kind services

- Traces Completed since 2009
- 13 Locations
  - 24 Traces
  - 1,100 ft to Over18 Miles





**Mile Post 31  
Aquifer Recharge Site**

MP31  
Central  
well

MP31 MW  
east

MP31 MW  
west

~ 1 mile

Dye Released in Recharge  
Basin Dec. 21, 2016



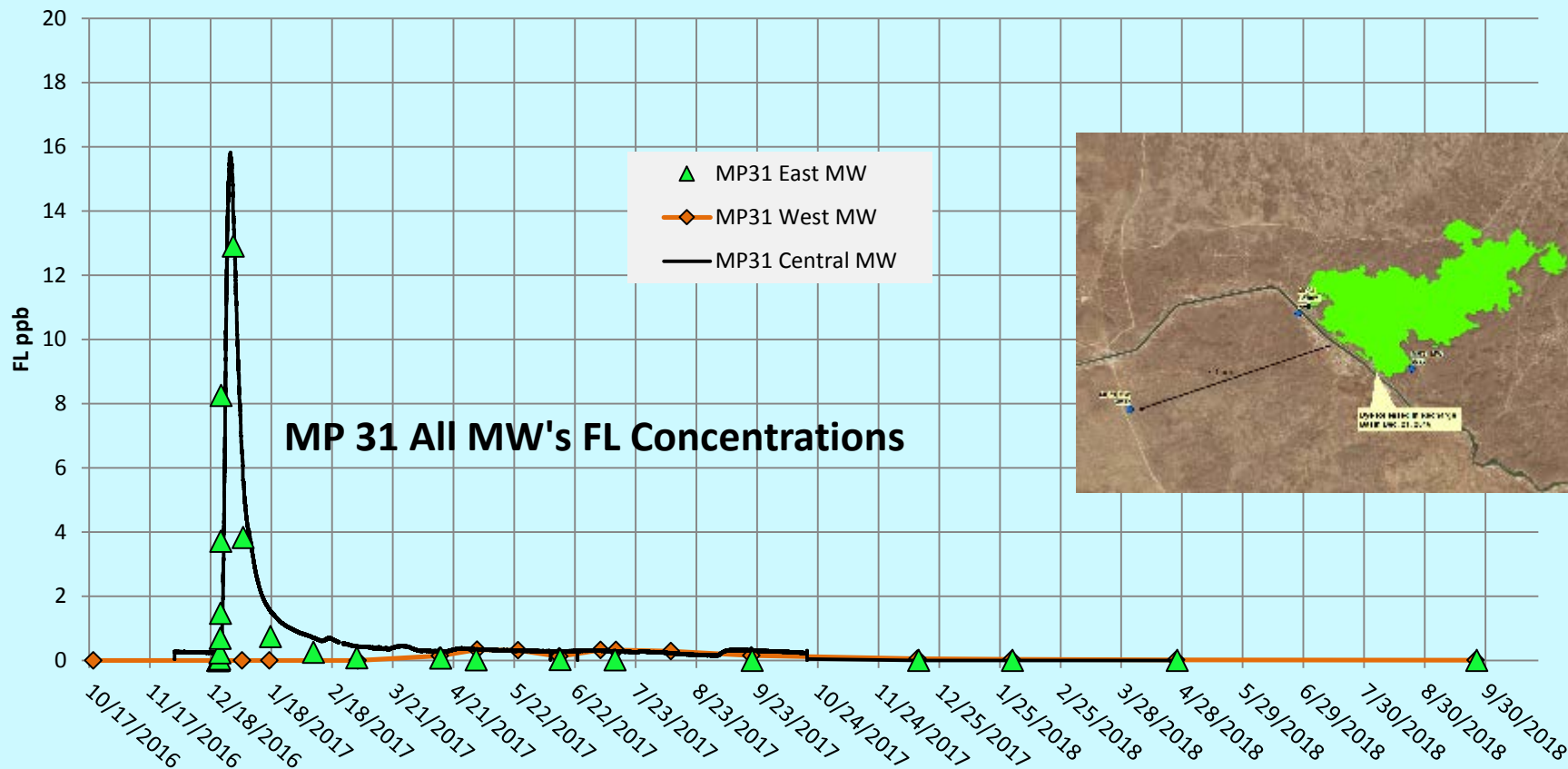
124 Pounds of FL Released Dec. 21, 2016.



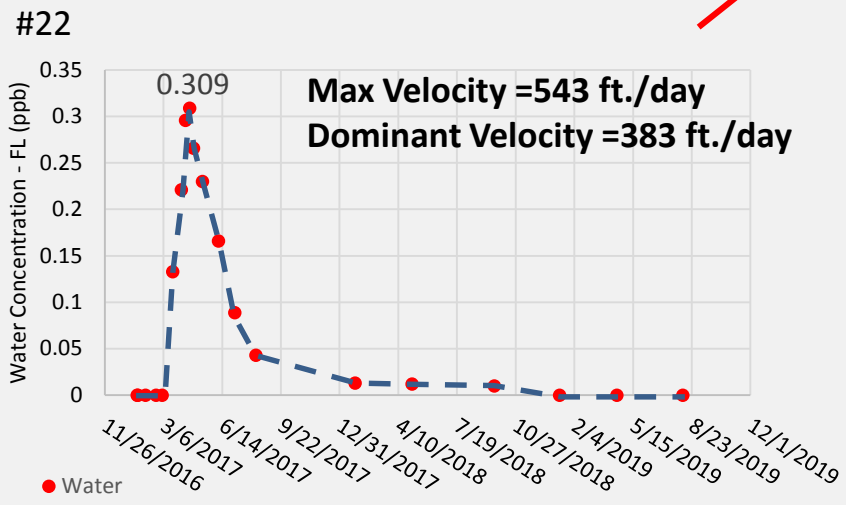
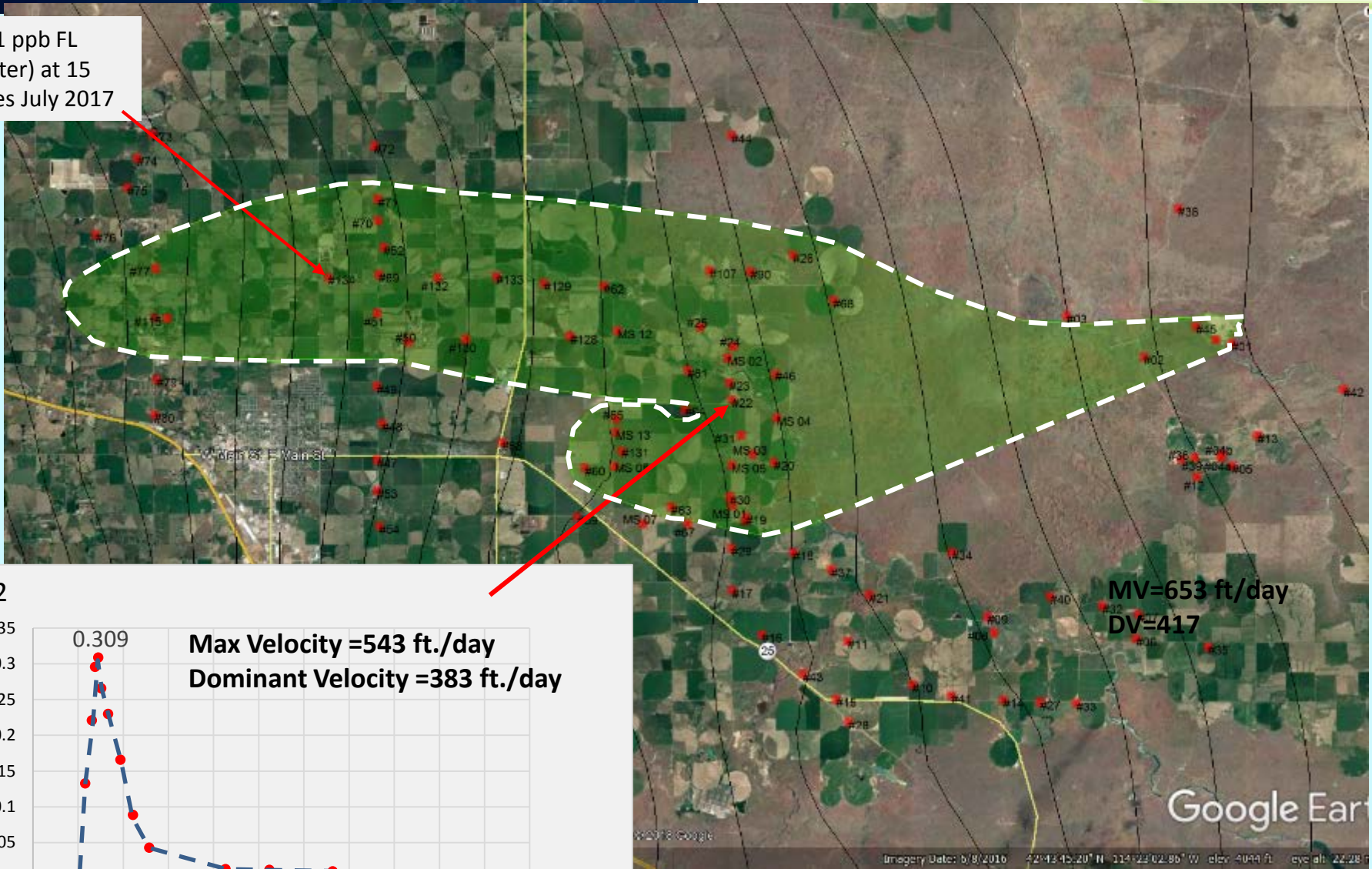


Continuous sampling in East Monitor Well after dye release.

## What Monitor Wells are in The Flow Path of Recharge Water?



0.01 ppb FL (water) at 15 miles July 2017

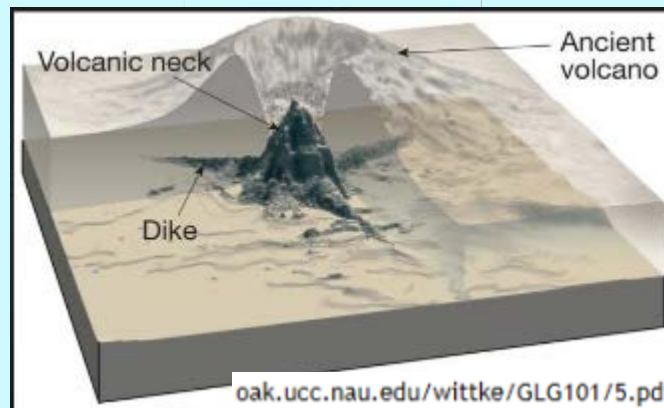
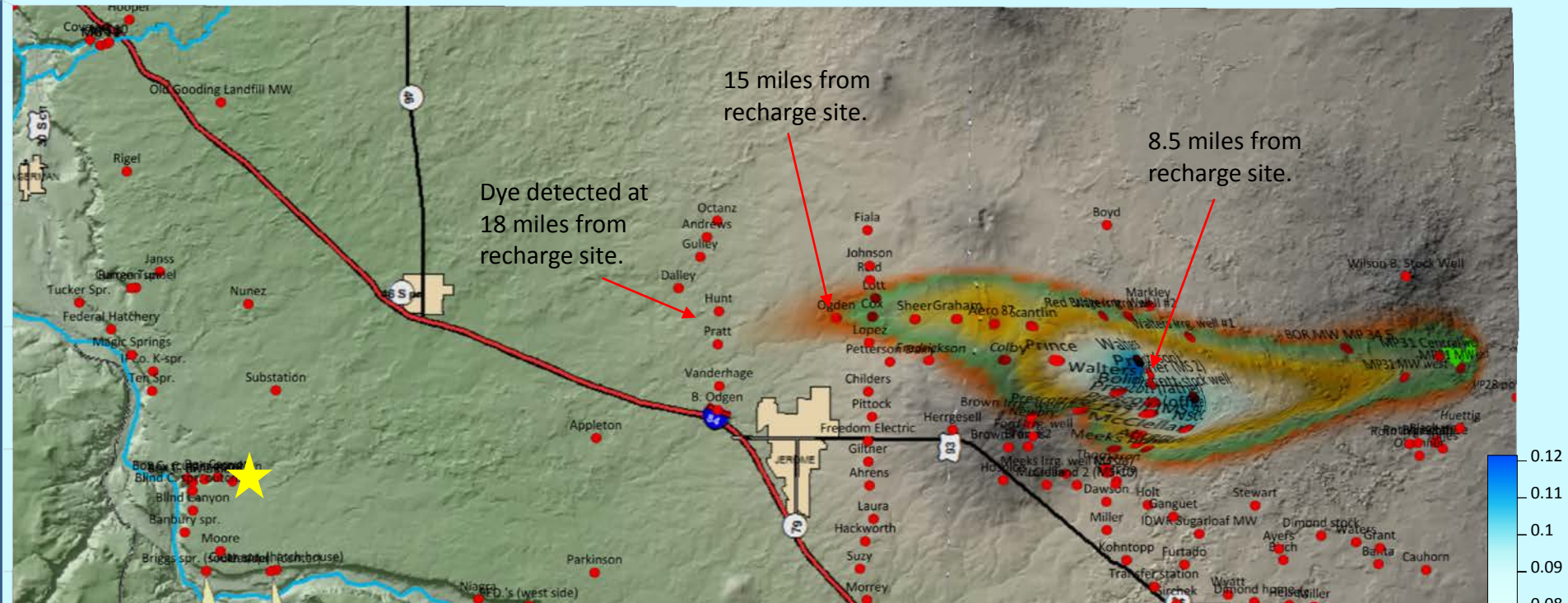


MV=653 ft/day  
DV=417

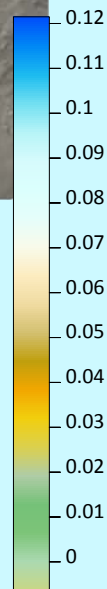
Google Earth

Imagery Date: 6/8/2016 42°43'45.20" N 114°23'02.86" W Elev: 4044 ft. Eye Alt: 22.28 ft.

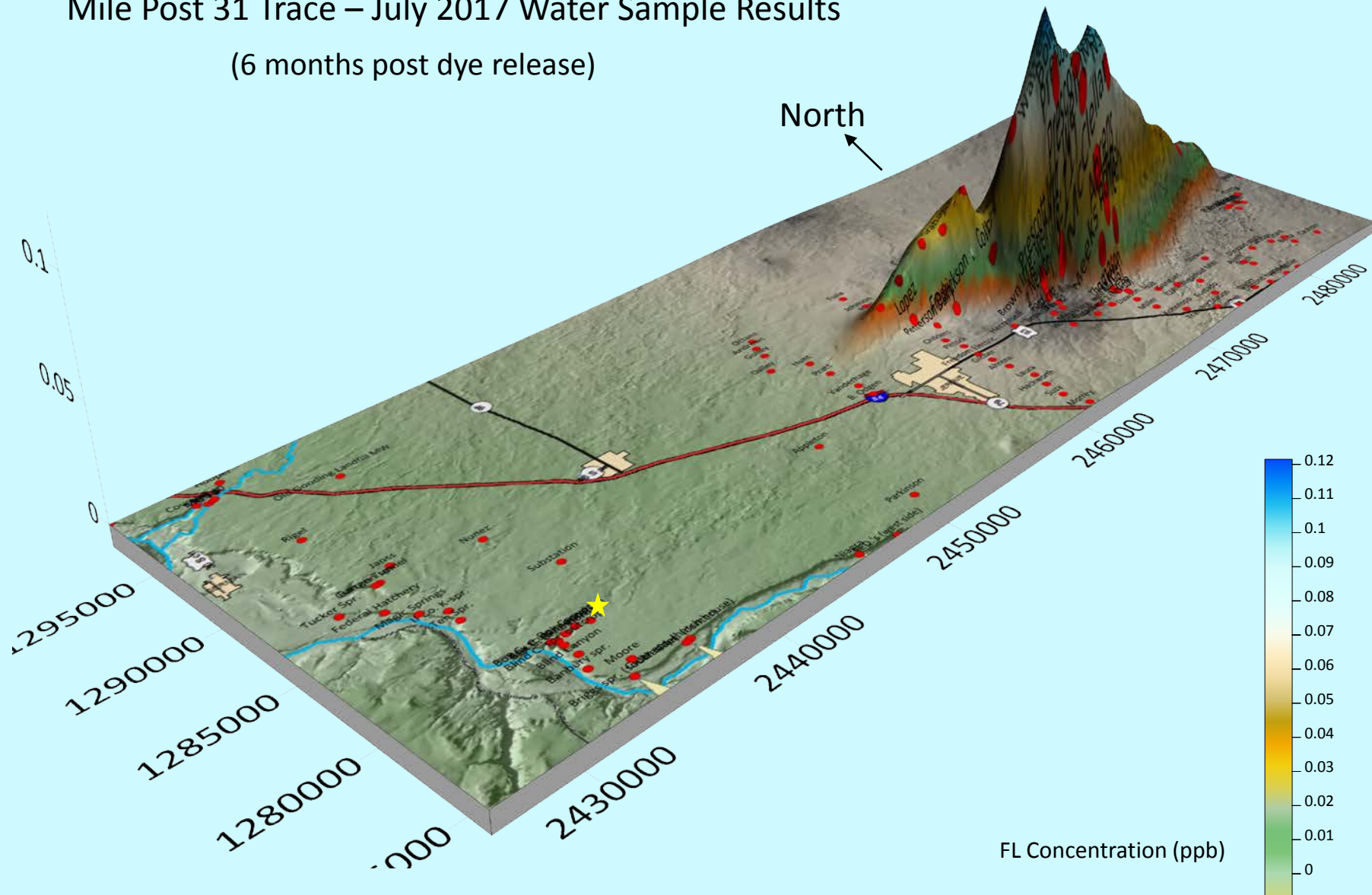
## Mile Post 31 Trace Flow Path Deflection (6 months post dye release – dye cloud is 5 miles wide & 18 miles long)

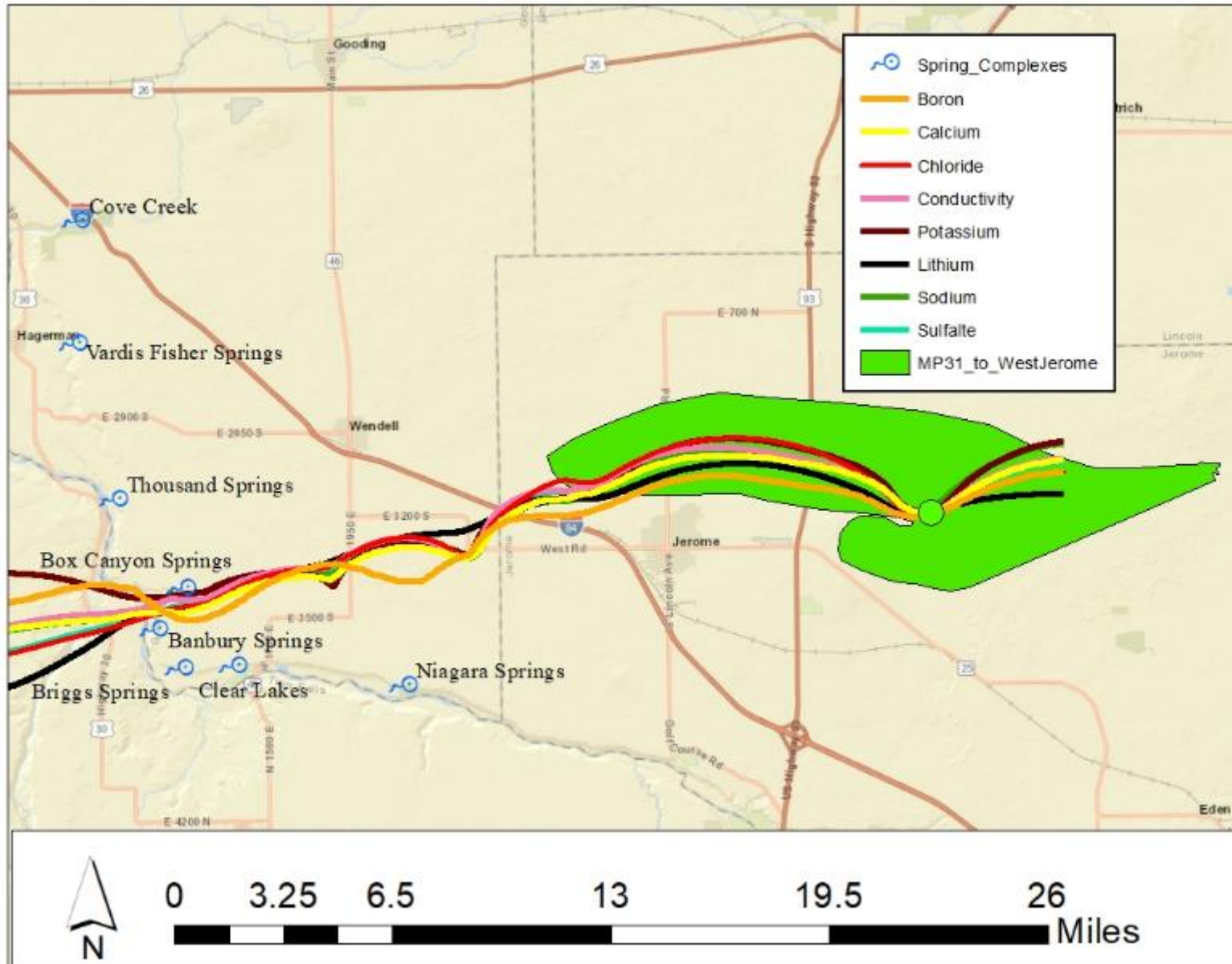


FL Concentration (ppb)

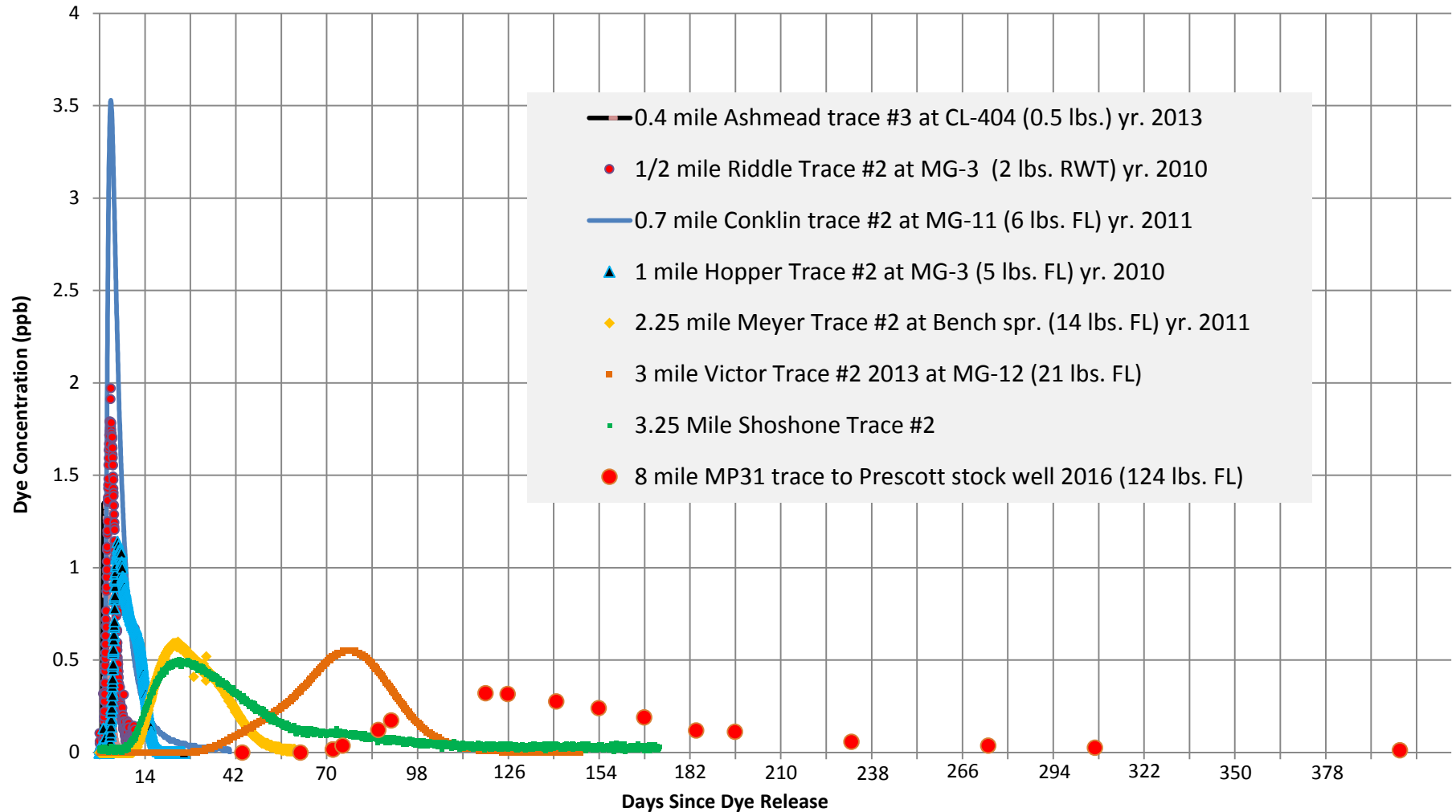


### Mile Post 31 Trace – July 2017 Water Sample Results (6 months post dye release)



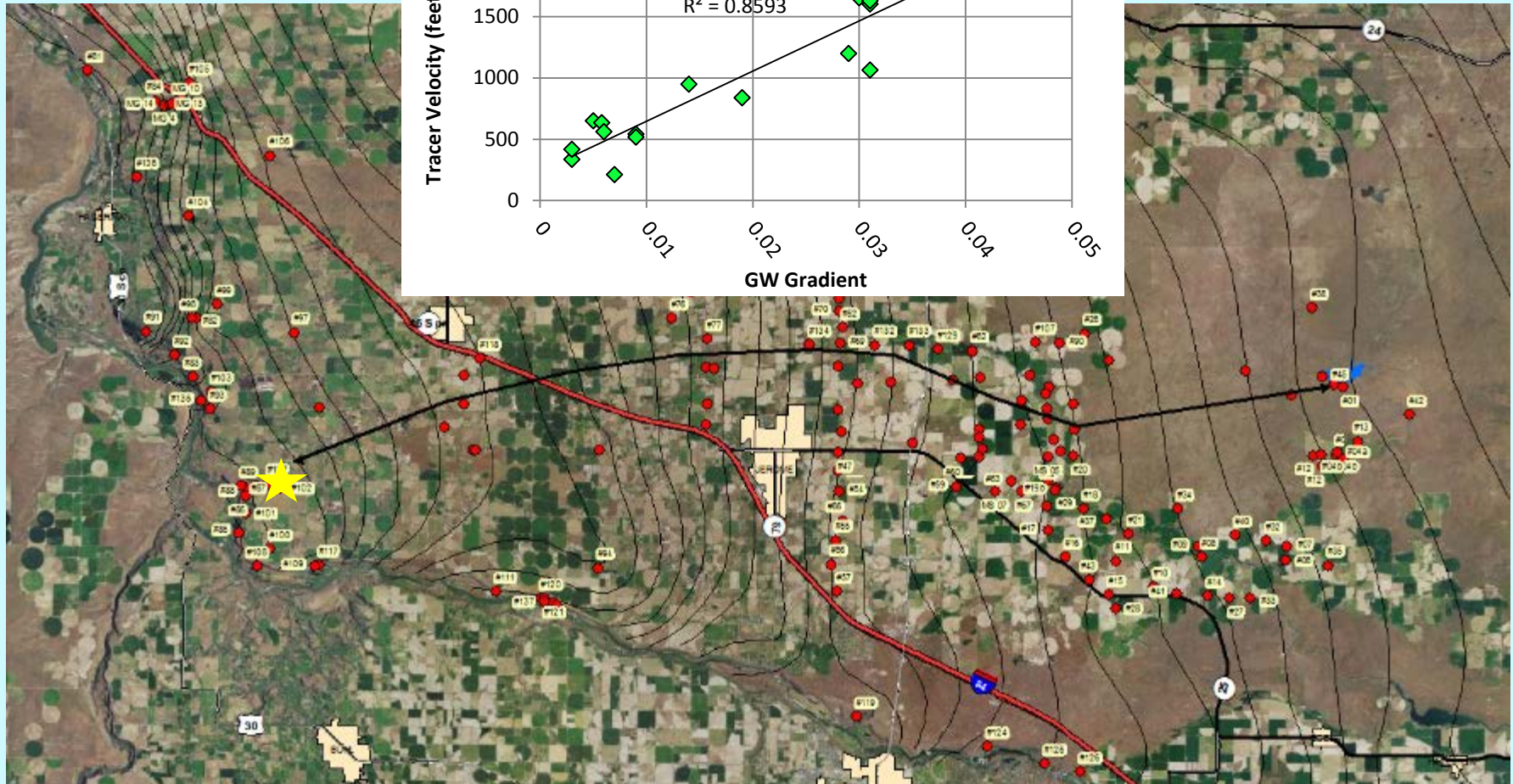
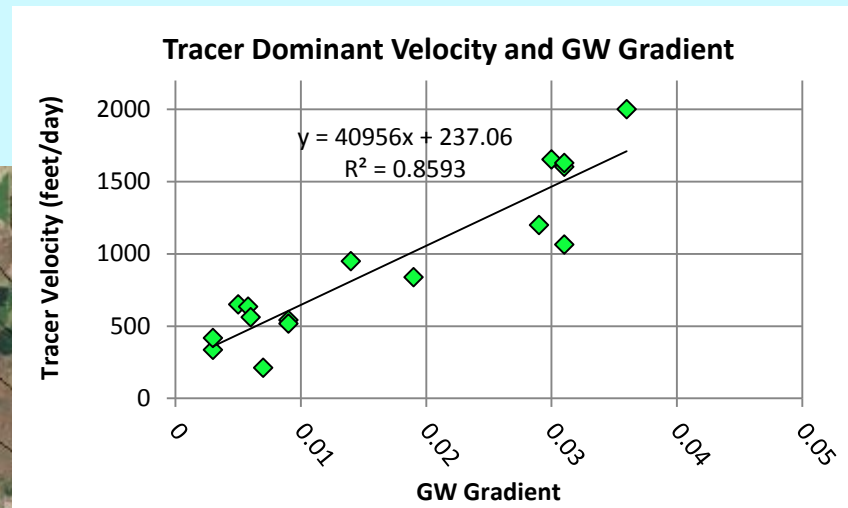


### Dye Concentration Breakthrough Curves Define Groundwater Velocities





Relationships between groundwater gradient and groundwater flow velocities which allow for prediction at other recharge sites for planning purposes.

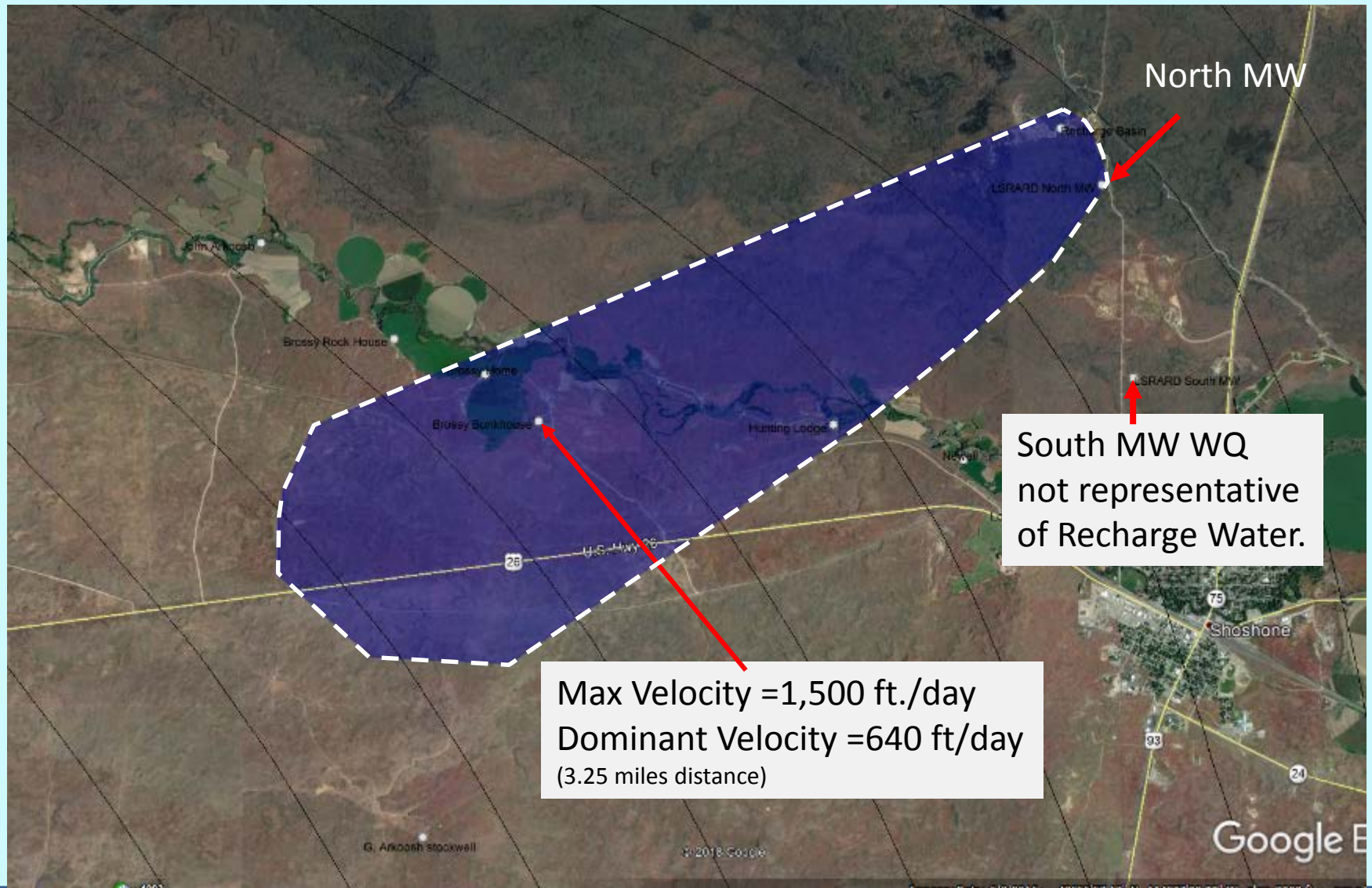


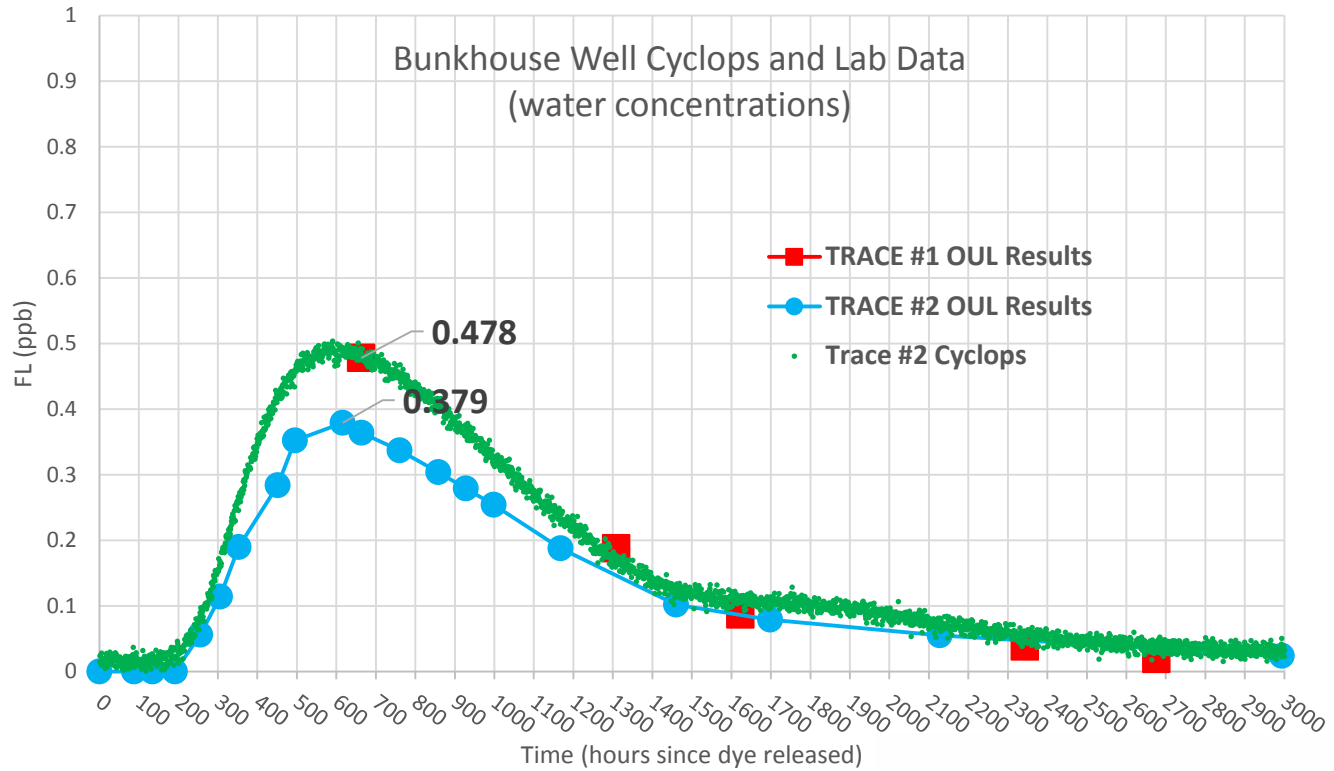
Shoshone Dye Trace from Aquifer Recharge Site June 15  
(59 pounds FL @ 75% concentration)



**160 ppb FL**

Shoshone Dye Trace delineates wells that are in the flow path and others that are not.



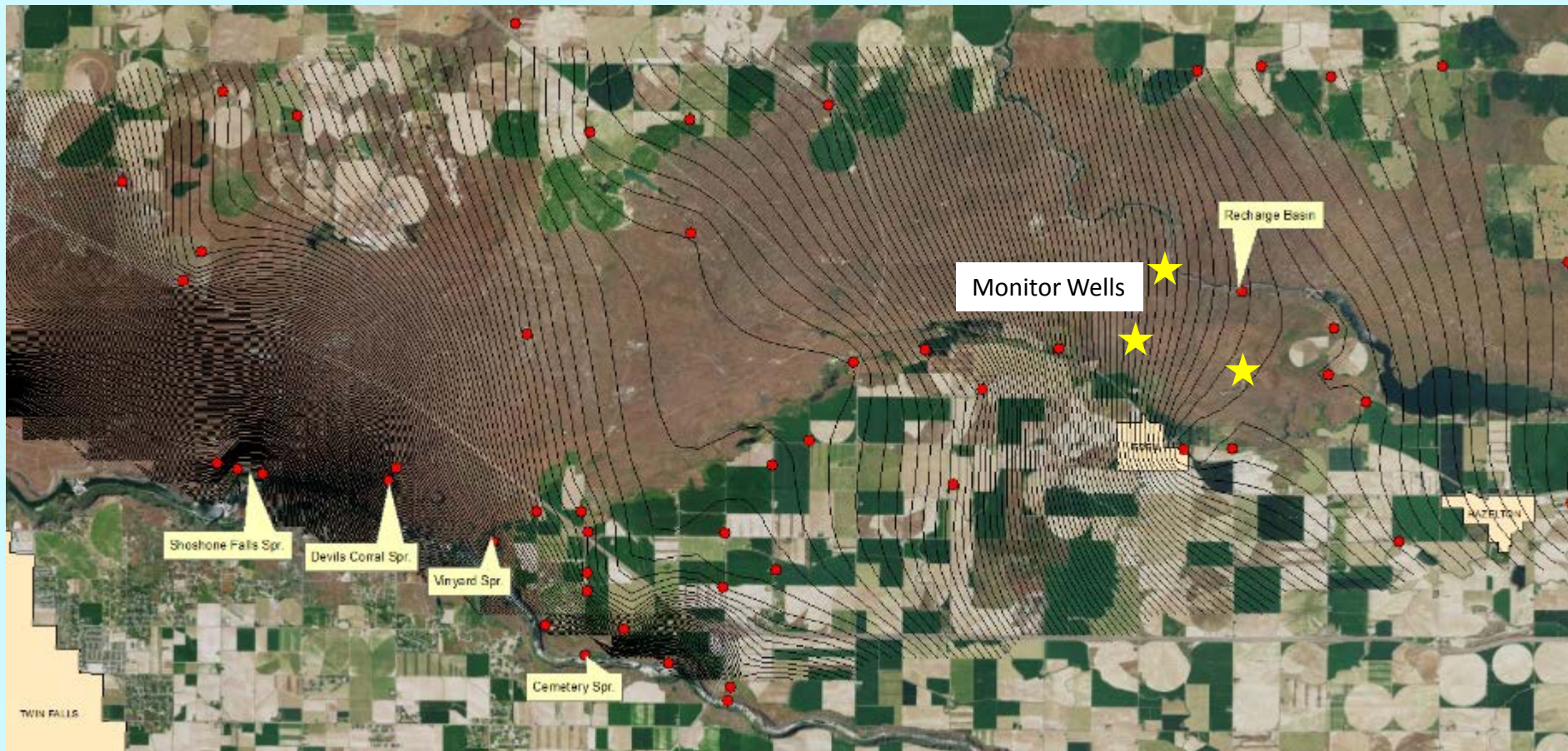


## 'Spin Off' Technology



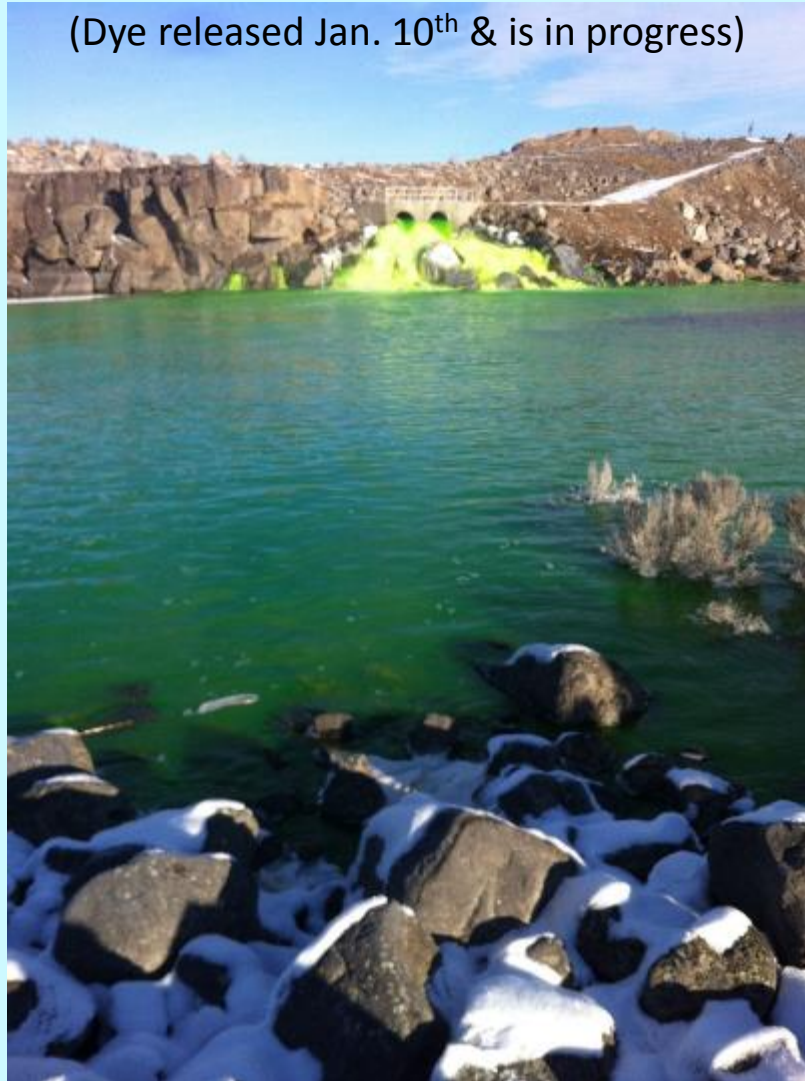
# Wilson Canyon Recharge Site Trace Preparation

- Built high resolution water table maps to assist with prediction of dye flow paths and establish monitoring sites.
- Install monitor wells and telemetry to increase our abilities to monitor recharge and the aquifer.



# Wilson Canyon Recharge Site Trace

(Dye released Jan. 10<sup>th</sup> & is in progress)



## Summary

- Tracks Groundwater Flow for improved understanding of the aquifer.
- Tracing shows where the water flows but not necessarily the area influenced by water level rise due to recharge.
- Dye tracing has confirmed which monitor wells are and are not in the flow path of recharge waters helping to improve water quality monitoring at recharge sites.
- What we've learned at a local scale: using empirical data from dye tracing, water levels and water quality provides important information for developing and monitoring individual recharge sites, and can help improve a regional or sub-regional model.
- The Tracing Program has prompted developing new field instruments by private industry.
- Cooperative effort between Idaho Power, IDWR, IWRB.