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WATER-QUALITY CHANGE DUE TO THE CERRO GRANDE FIRE, AND ITS POTENTIAL USE AS A RECHARGE TRACER

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Presented at 13th DOE Annual Technical Information Exchange Workshop, November 13-15, 2001, Albuquerque, New Mexico

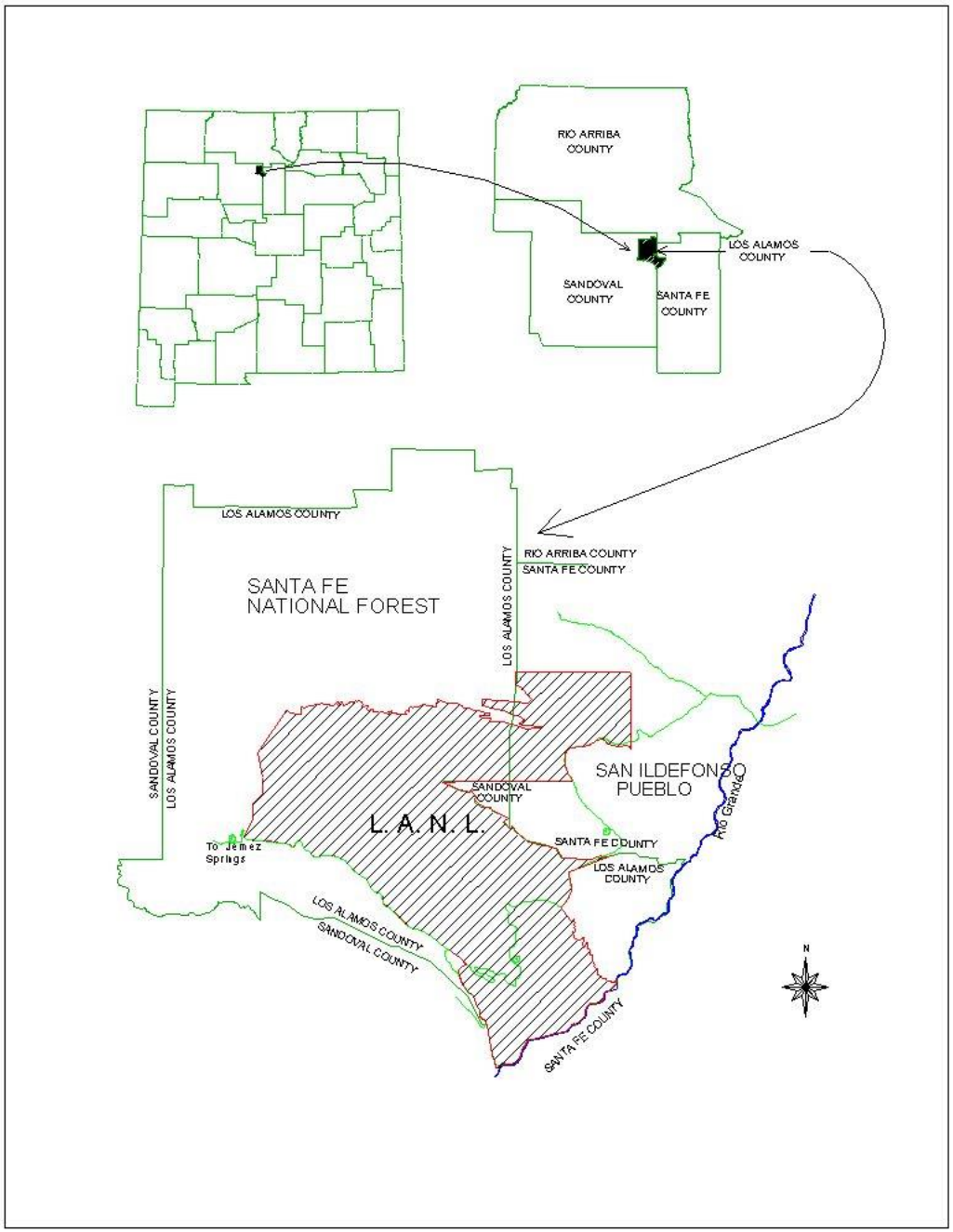
PURPOSE/OBJECTIVE

- Pre-fire: Determine the connectivity between perennial surface waters west of the Pajarito fault zone and downgradient springs to the east

- Post-fire: Assess the changes in water quality due to the fire, trace the fire-impacted surface waters through the fault zone, and determine ground-water flow velocity

IMPORTANCE OF STUDY

- Decrease the amount of hydrogeologic uncertainty (recharge, discharge, flow velocity, contaminant residence times, etc.)
- Assess the fate and transport of anthropogenic and naturally produced contaminants
- Water-resource management (quantity/usable?)
- Support modeling of ground-water flow (input parameters, etc.)
- Previous information is sparse


RIO ARRIBA COUNTY
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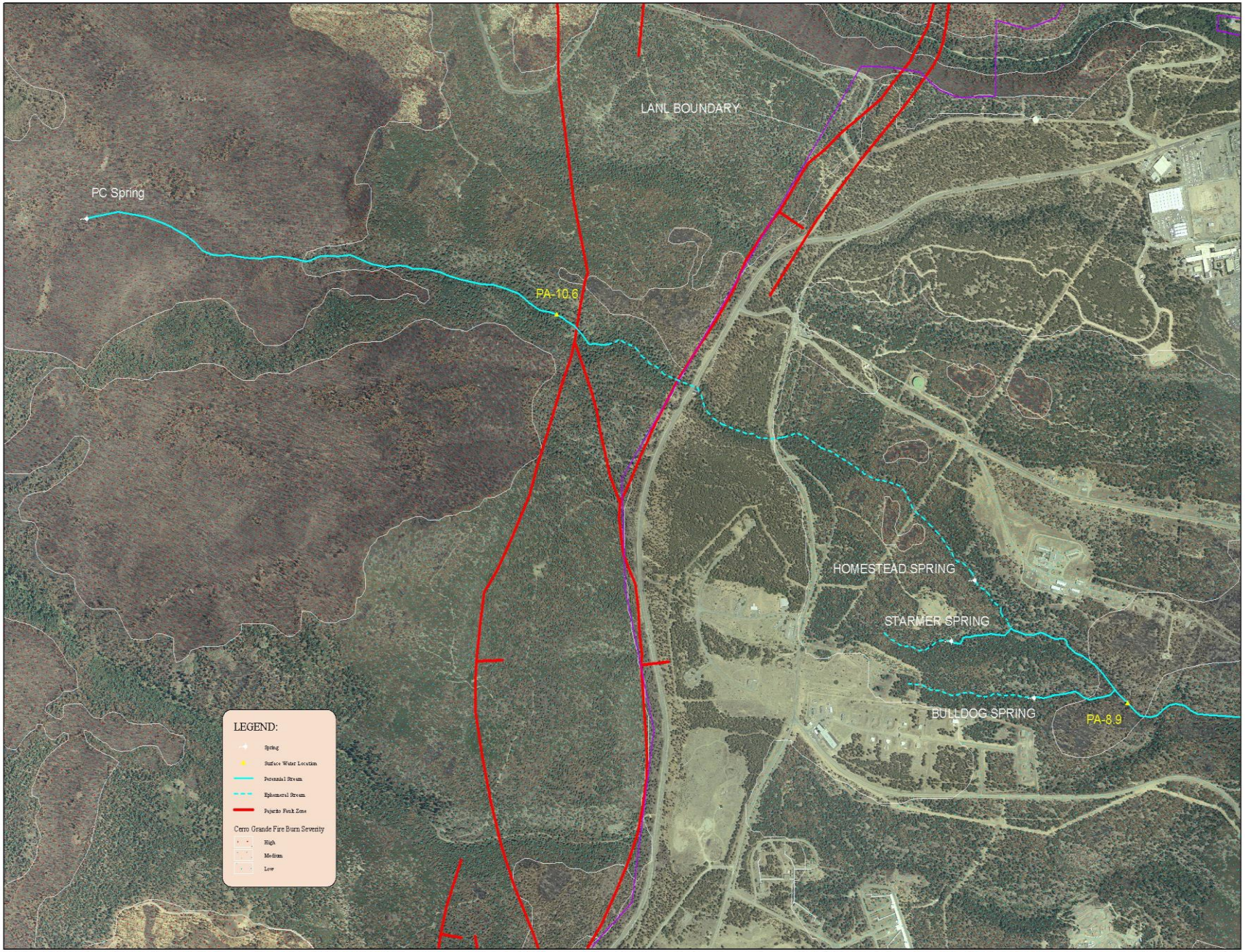

900 0 900 1800 Feet

1:8000

Orthophoto Showing Study Area and Cerro Grande Fire Burn Severity

New Mexico SPCS Central Zone
North American Datum 1983

Map produced by Kim Granzow, November, 2001
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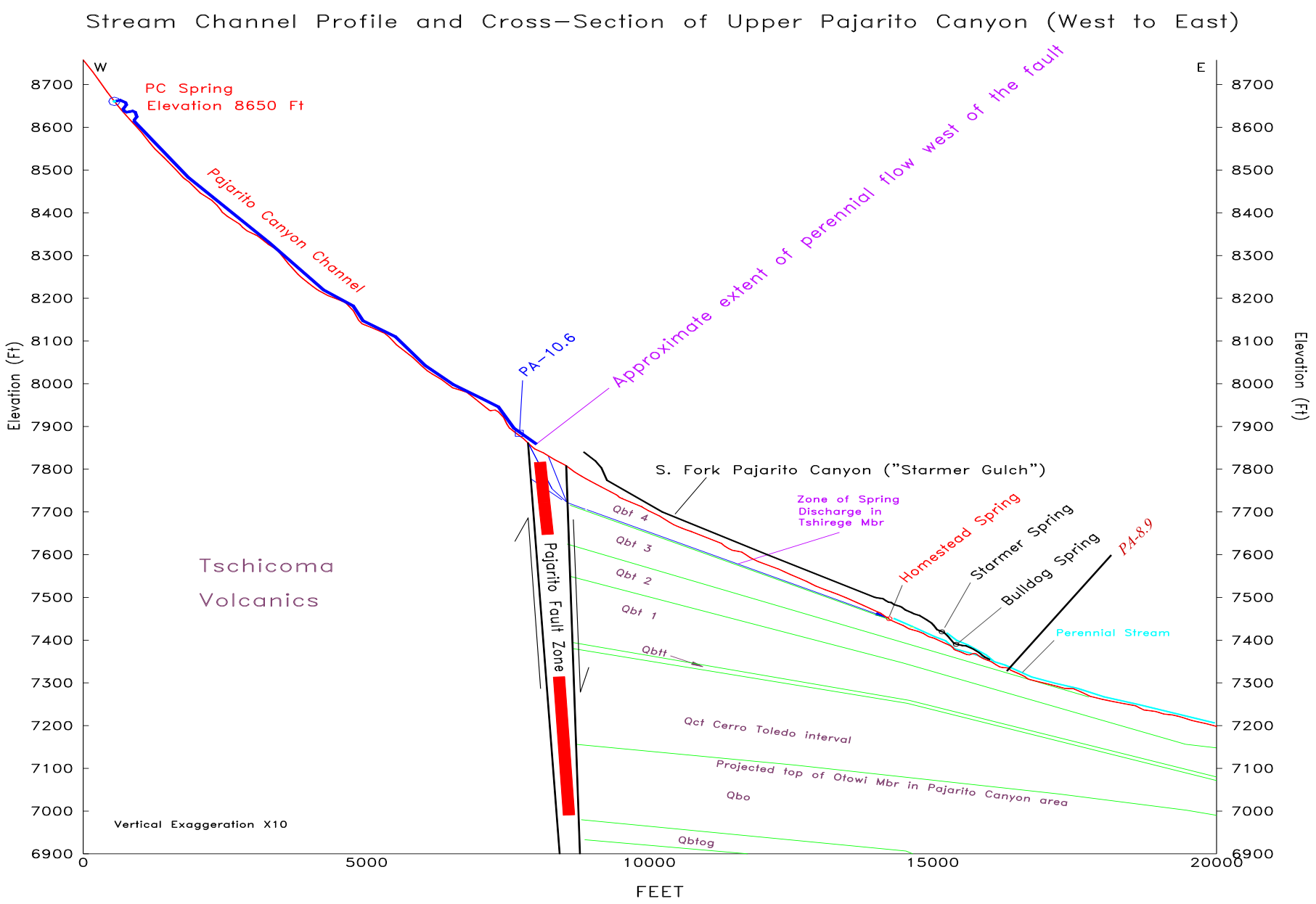
DATA SOURCE:
GISLab, EES-10, Los Alamos National Laboratory

State of New Mexico
Environment Department

DOE Oversight Bureau


Westward view of Upper Pajarito Canyon Watershed (10/24/01)

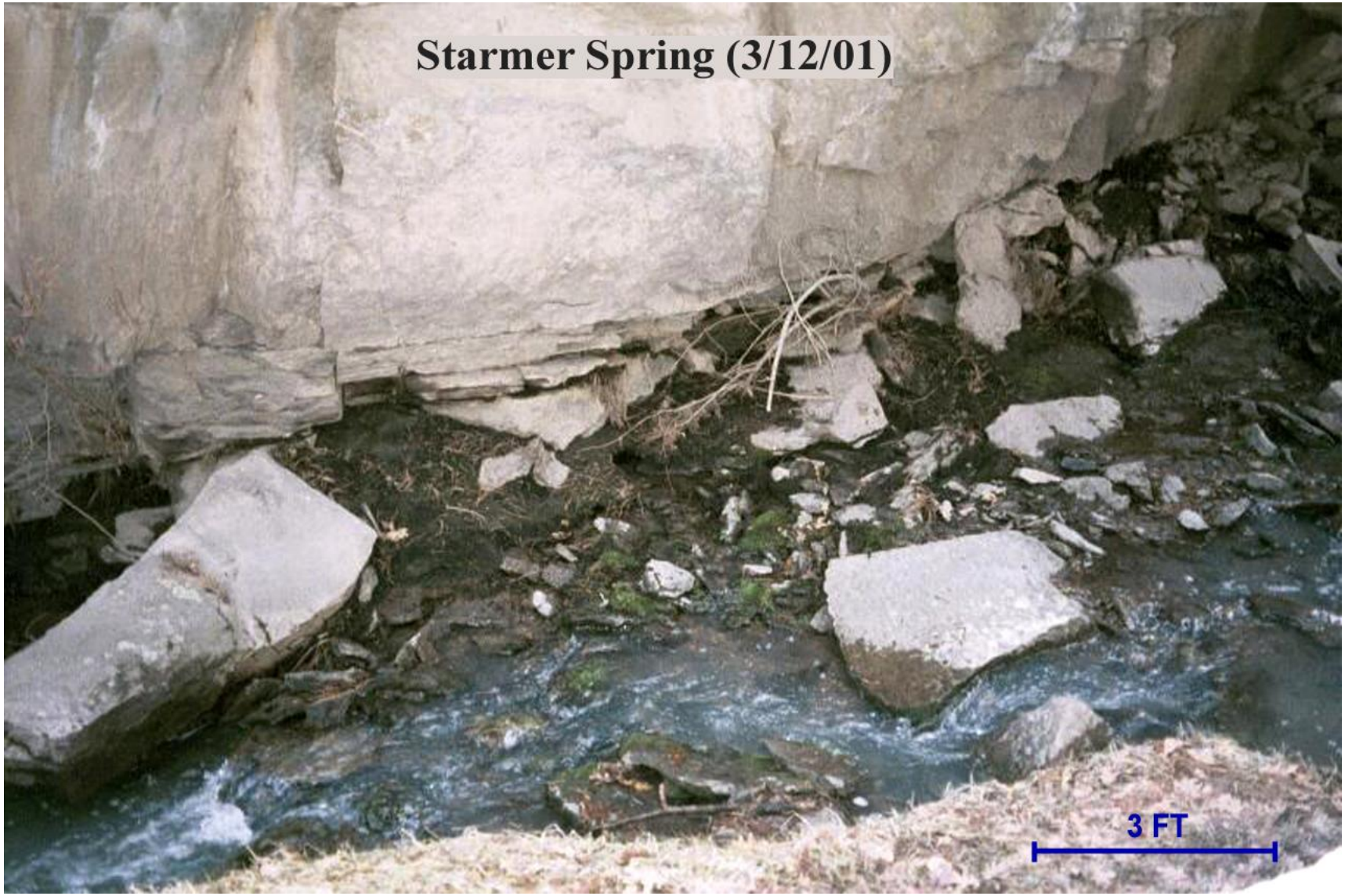

Stream Channel Profile and Cross-Section of Upper Pajarito Canyon (West to East)
W
E
PC Spring
Elevation 8650 Ft
Pajarito Canyon Channel
PA-10.6
Approximate extent of perennial flow west of the fault
S. Fork Pajarito Canyon ("Starmer Gulch")
Zone of Spring
Discharge in
Tshirege Mbr
Homestead Spring
Starmer Spring
Bulldog Spring
PA-8.9
Perennial Stream
Qbt 4
Qbt 3
Qbt 2
Qbt 1
Qbtt
Tschicoma
Volcanics
Pajarito Fault Zone
Qct Cerro Toledo interval
Projected top of Otowi Mbr in Pajarito Canyon area
Qbo
Qbtog
Vertical Exaggeration X10
Elevation (Ft)
8700
8600
8500
8400
8300
8200
8100
8000
7900
7800
7700
7600
7500
7400
7300
7200
7100
7000
6900
0
5000
10000
15000
20000
FEET


PA-10.6 (5/25/00)


PA-8.9 (6/28/99)

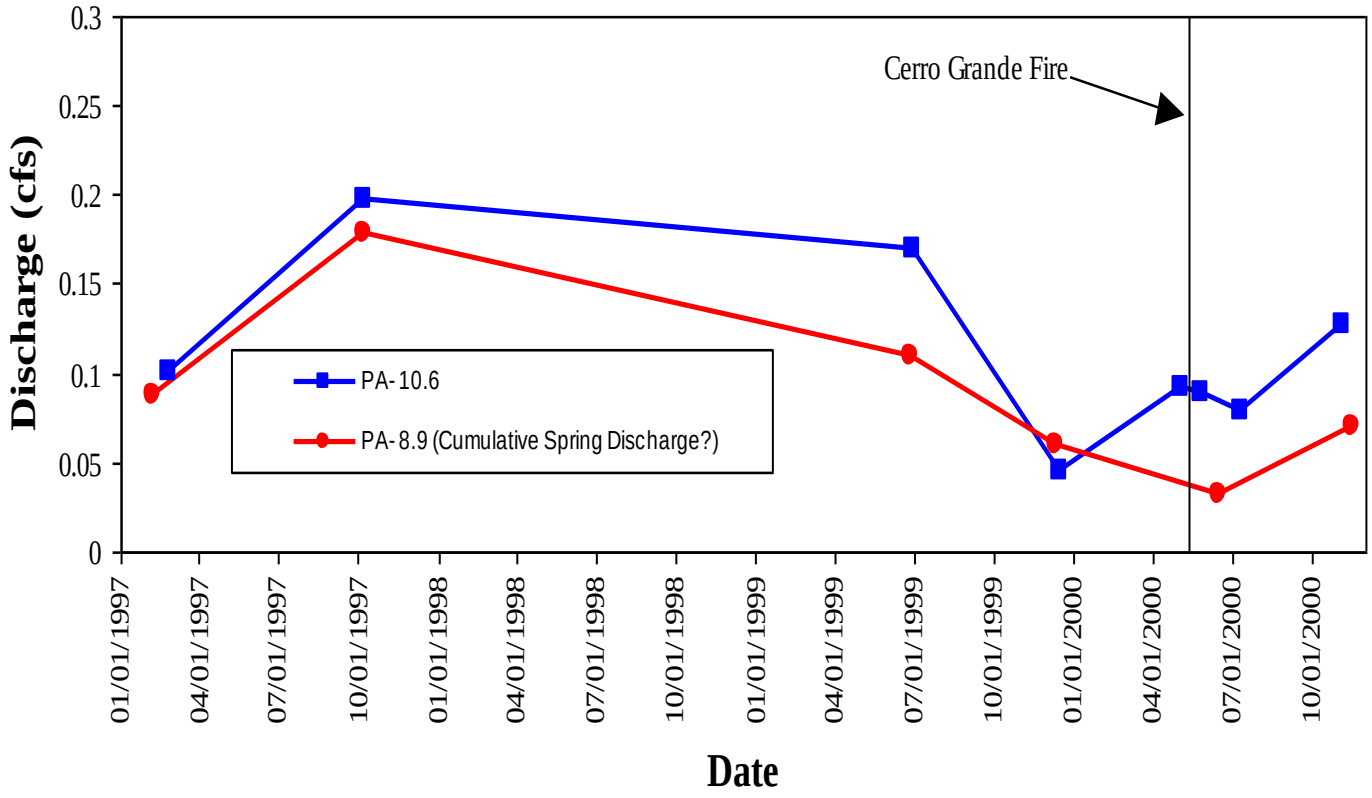

View of surface expression
of fault zone exposed by
scouring, approximately
200 feet east of PA-10.6 (6/29/00)
6 29 00


Homestead Spring (3/12/01)
1 FT

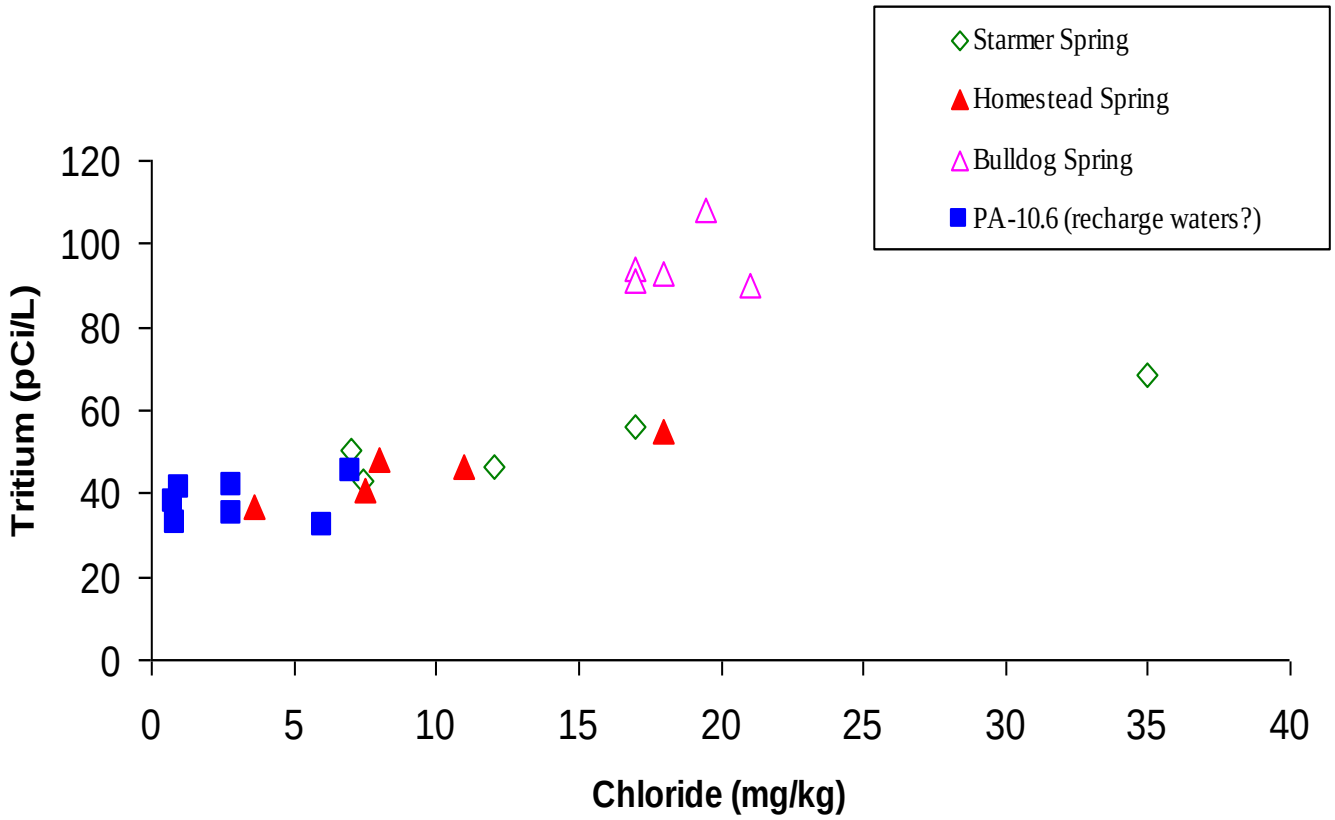

Starmer Spring (3/12/01)
3 FT


Bulldog Spring (3/12/01)
3 FT

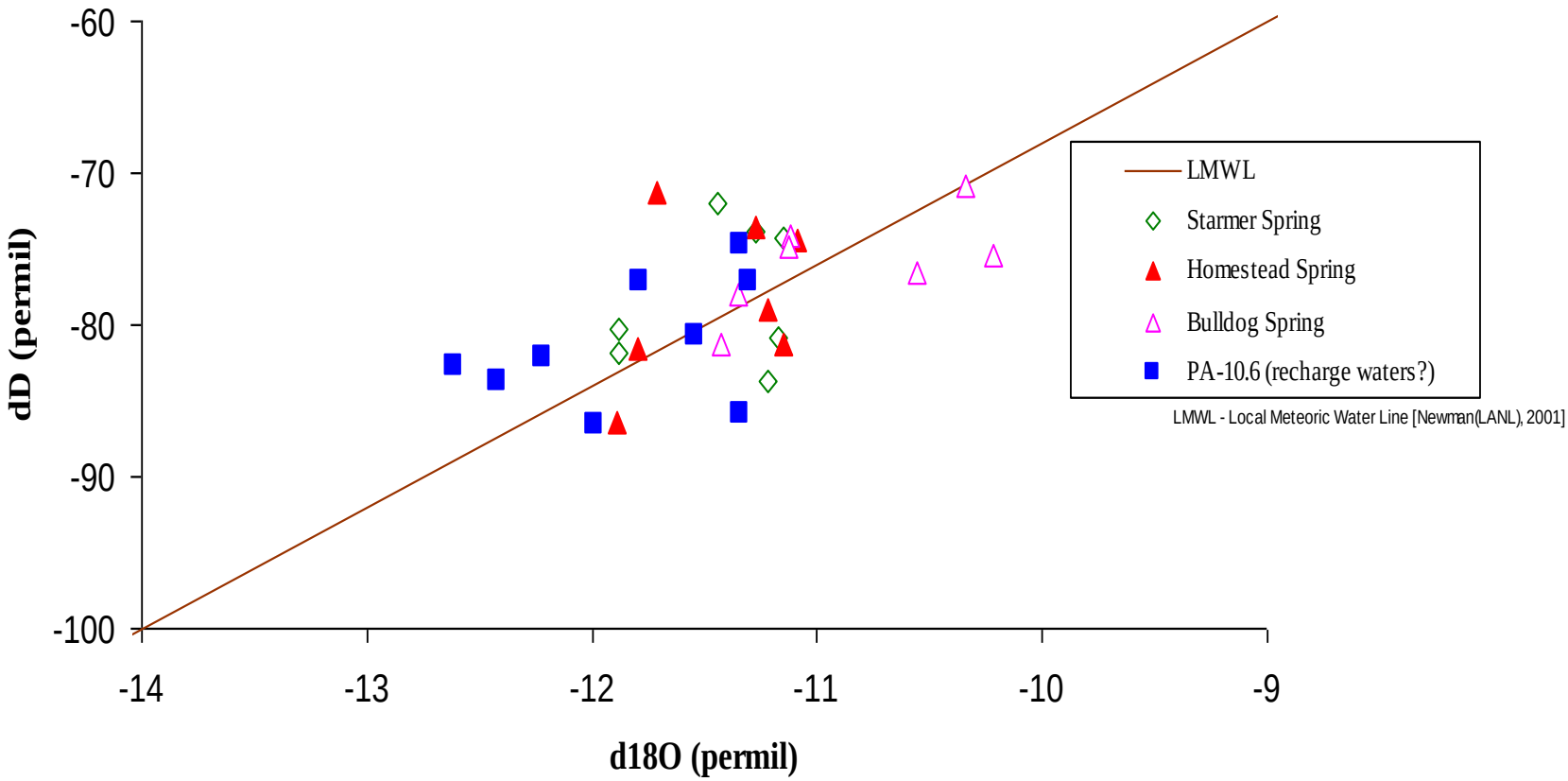
Comparison of Discharge Rates Through Time for Surface-Water Stations PA-10.6 and PA-8.9 (Cumulative Spring Discharge?)



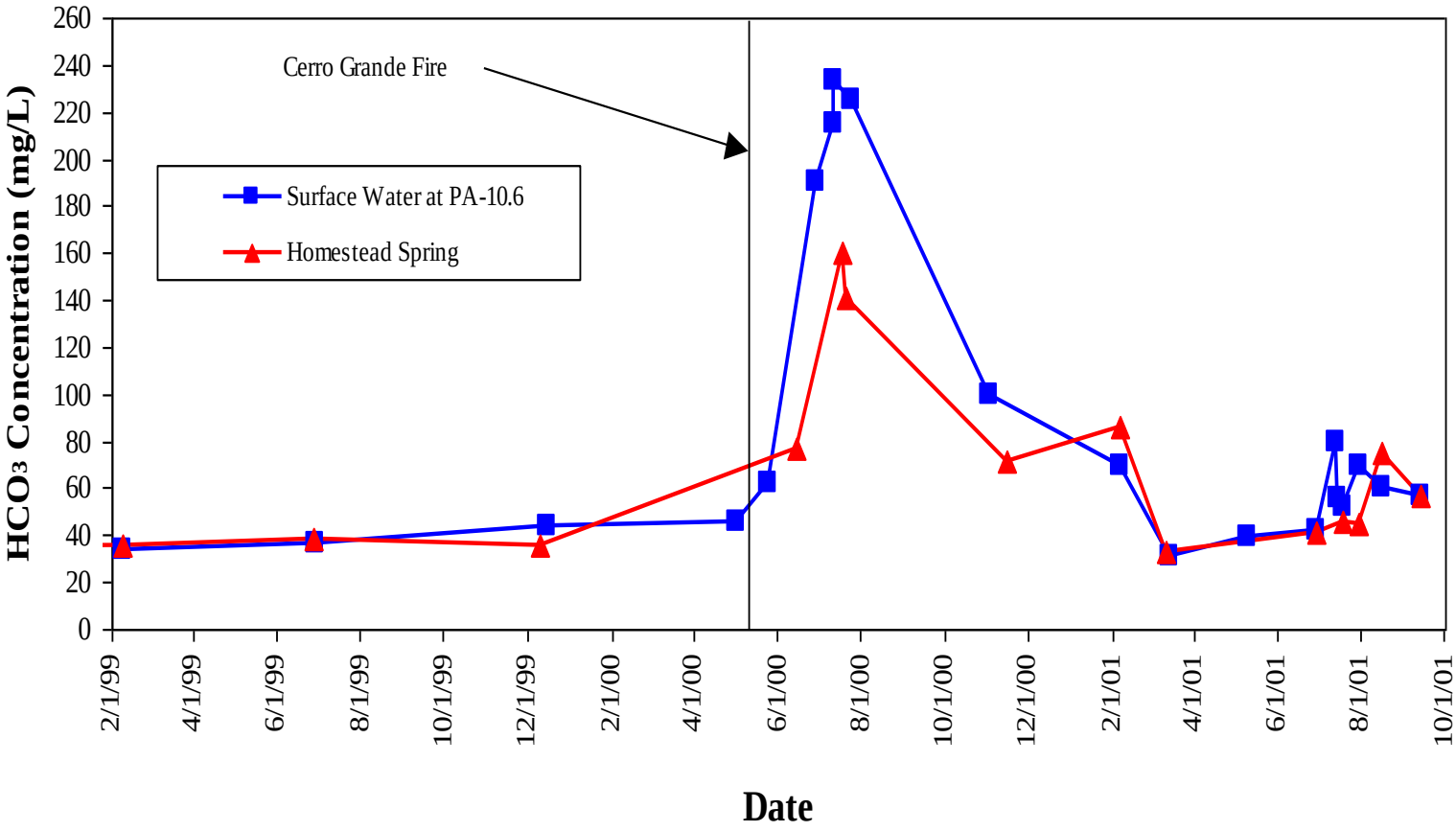
Chloride Concentration Versus Tritium Activity for Springs and Surface-Water Station PA-10.6



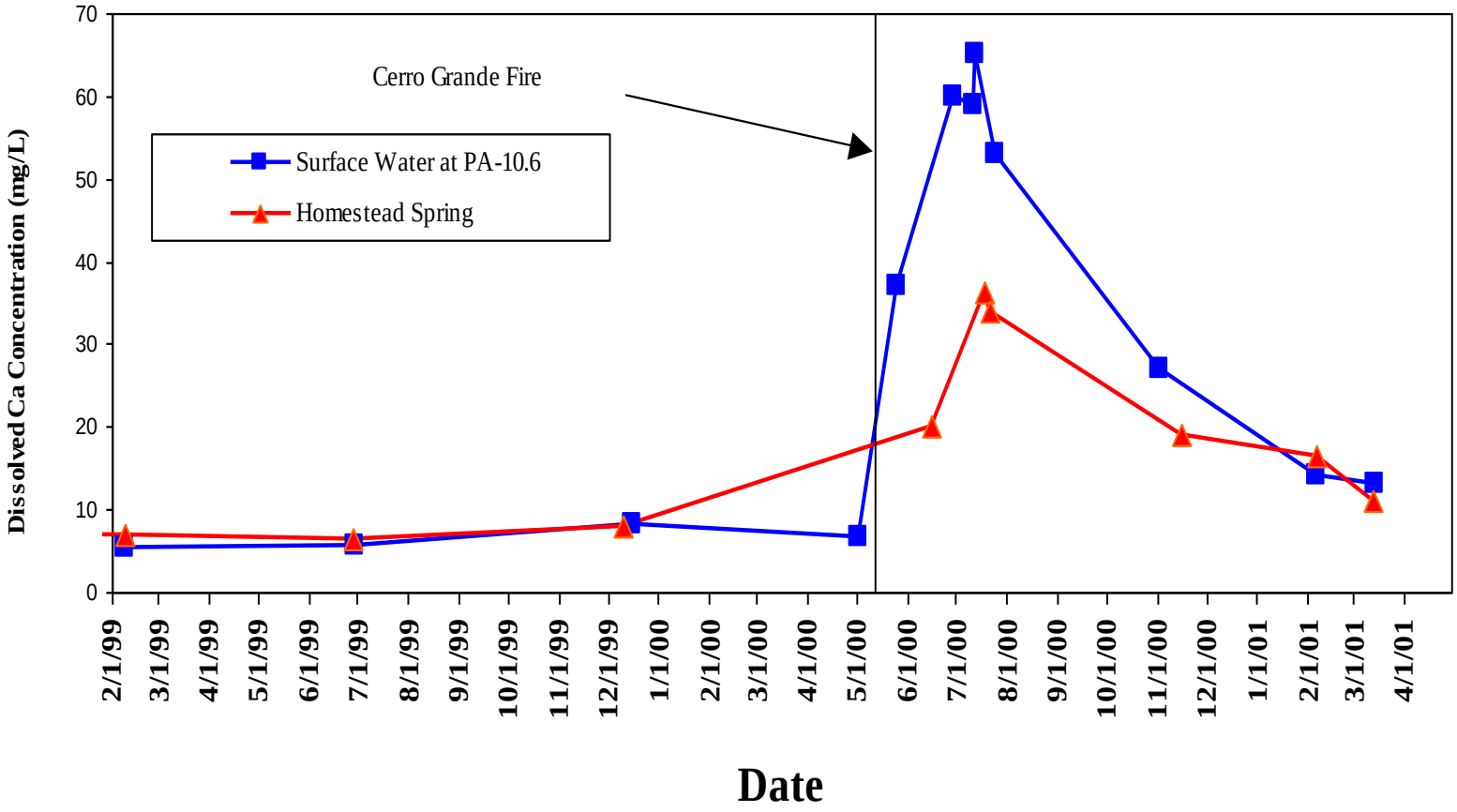
Plot of the Stable Isotopes Deuterium Versus Oxygen-18 for Springs and Surface-Water Station PA-10.6



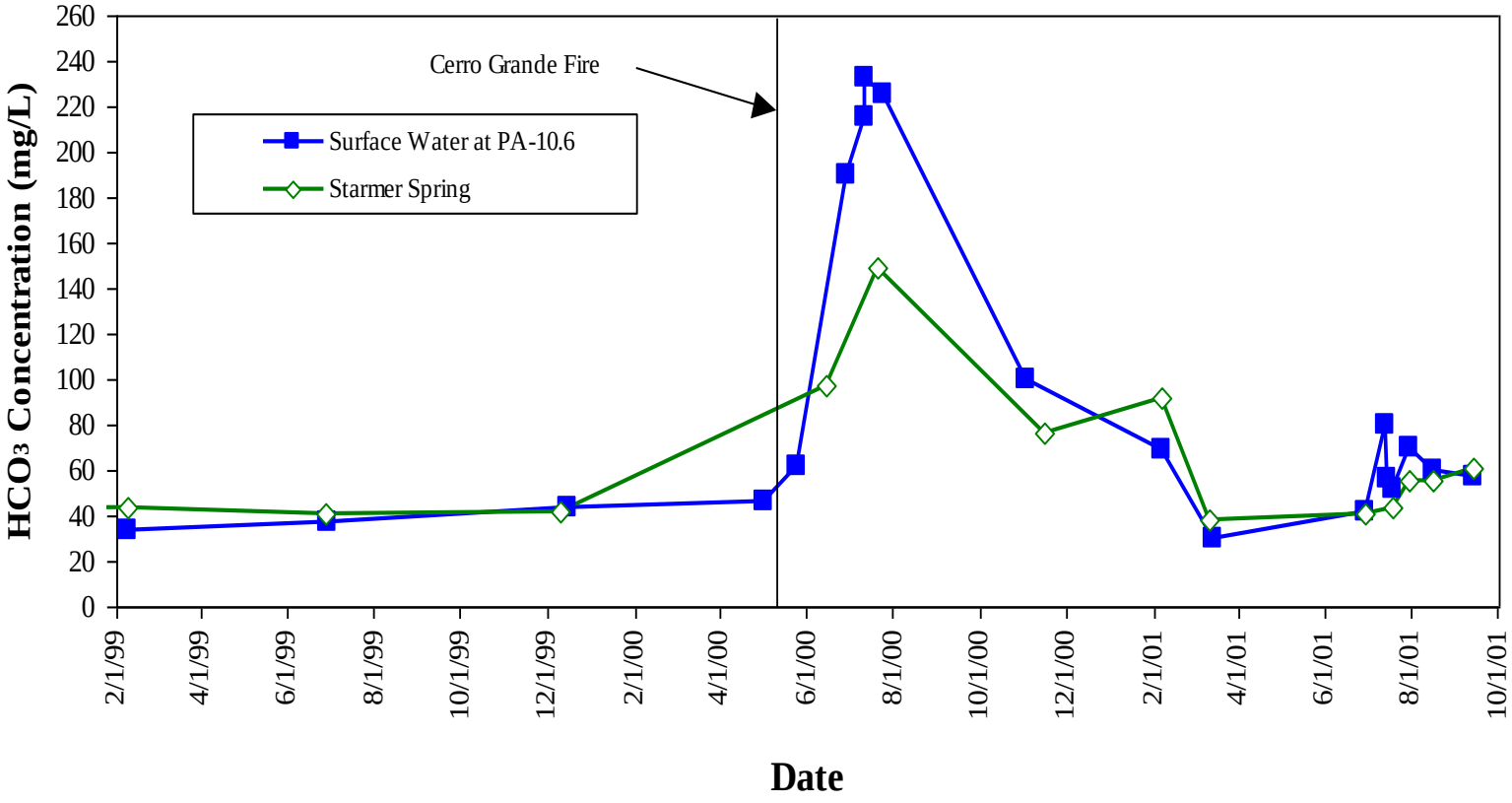
Bicarbonate Concentrations Through Time at Homestead Spring and Surface-Water Station PA-10.6



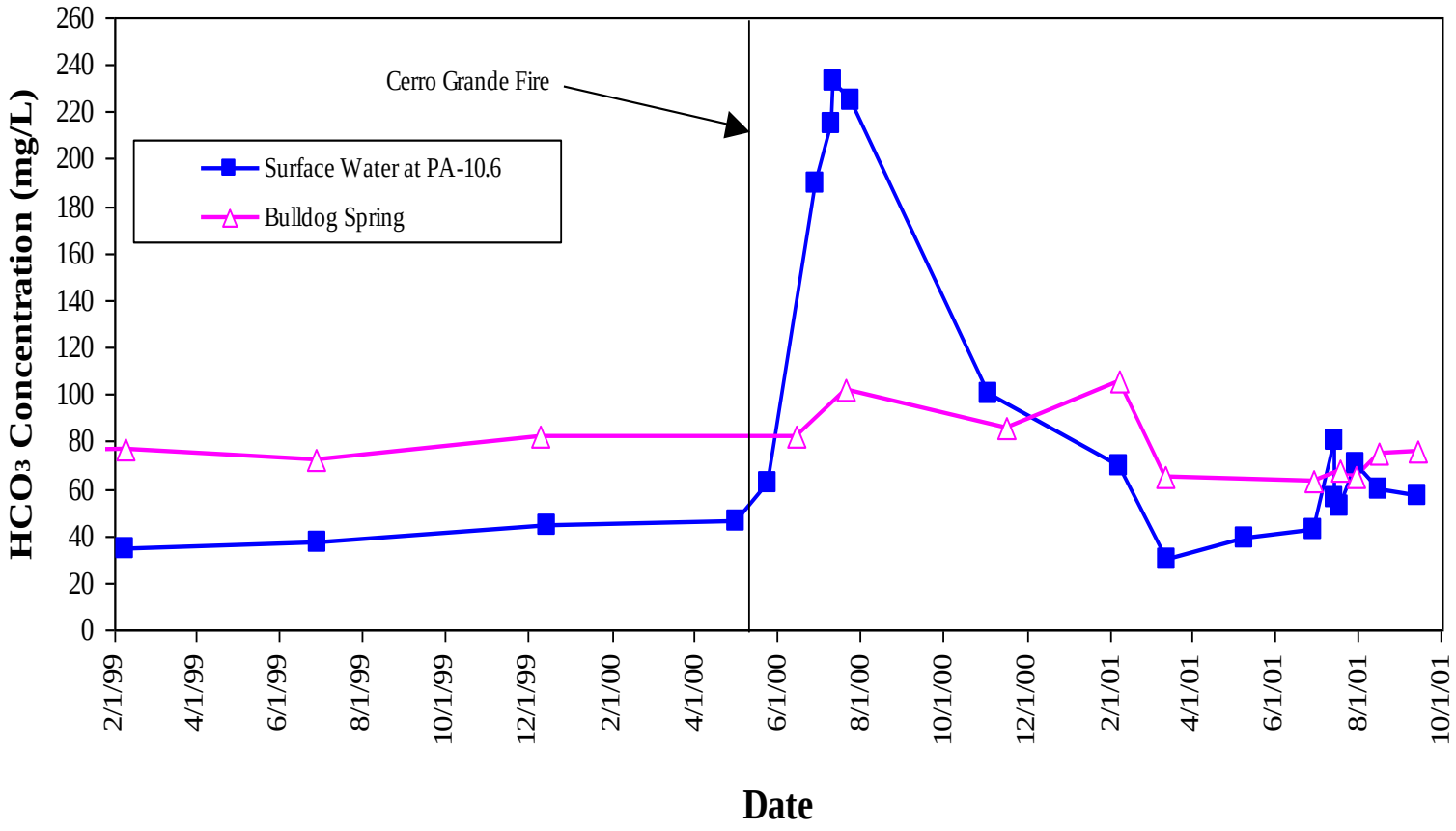
Dissolved Calcium Concentrations Through Time at Homestead Spring and Surface-Water Station PA-10.6



Bicarbonate Concentrations Through Time at Starmer Spring and Surface-Water Station PA-10.6



Bicarbonate Concentrations Through Time at Bulldog Spring and Surface-Water Station PA-10.6



CONCLUSIONS

- Connectivity was determined
- Water-balance data indicate that the fault zone may play a major role in shallow recharge versus deep recharge
- Ground-water flow velocities through the system appear to be about a month or less
- Bulldog Spring appears to have different recharge source(s), i.e., outfalls, Cañon de Valle?

CONCLUSIONS cont'd

- Fire-related impacts on water quality decreased during the winter of 2000 and 2001, but increased during summer of 2001
- Hydrochemical characteristics for recharge (stream) and discharge waters (springs) tracked well during the entire study period
- Information/data will support modeling ground-water flow and contaminant transport

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Acknowledgements

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