

Water Resources of the Virgin River Basin



Legislative Committee on Public Lands
January 22, 2004
Caliente, Nevada



Michael Winters, General Manager
Michael Johnson, Chief Hydrologist
Virgin Valley Water District

EXHIBIT M Lands

Document consists of Cover Sheet and 30 slides.

☒ Entire document provided.

Meeting Date: 01-22-04

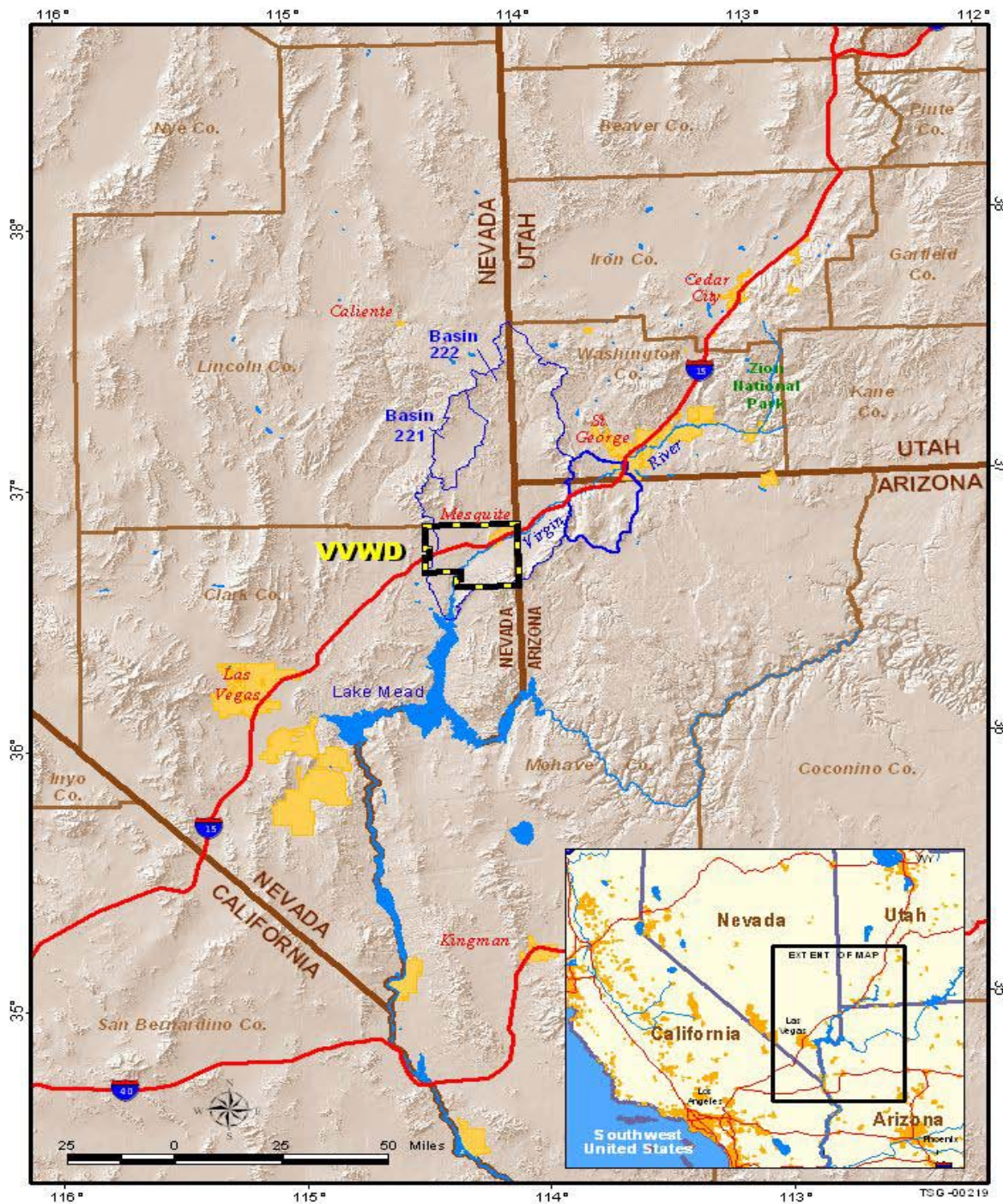
Water Resources of the Virgin River Basin

**Michael Winters, General Manger
Michael Johnson, Chief Hydrologist
Virgin Valley Water District**

for

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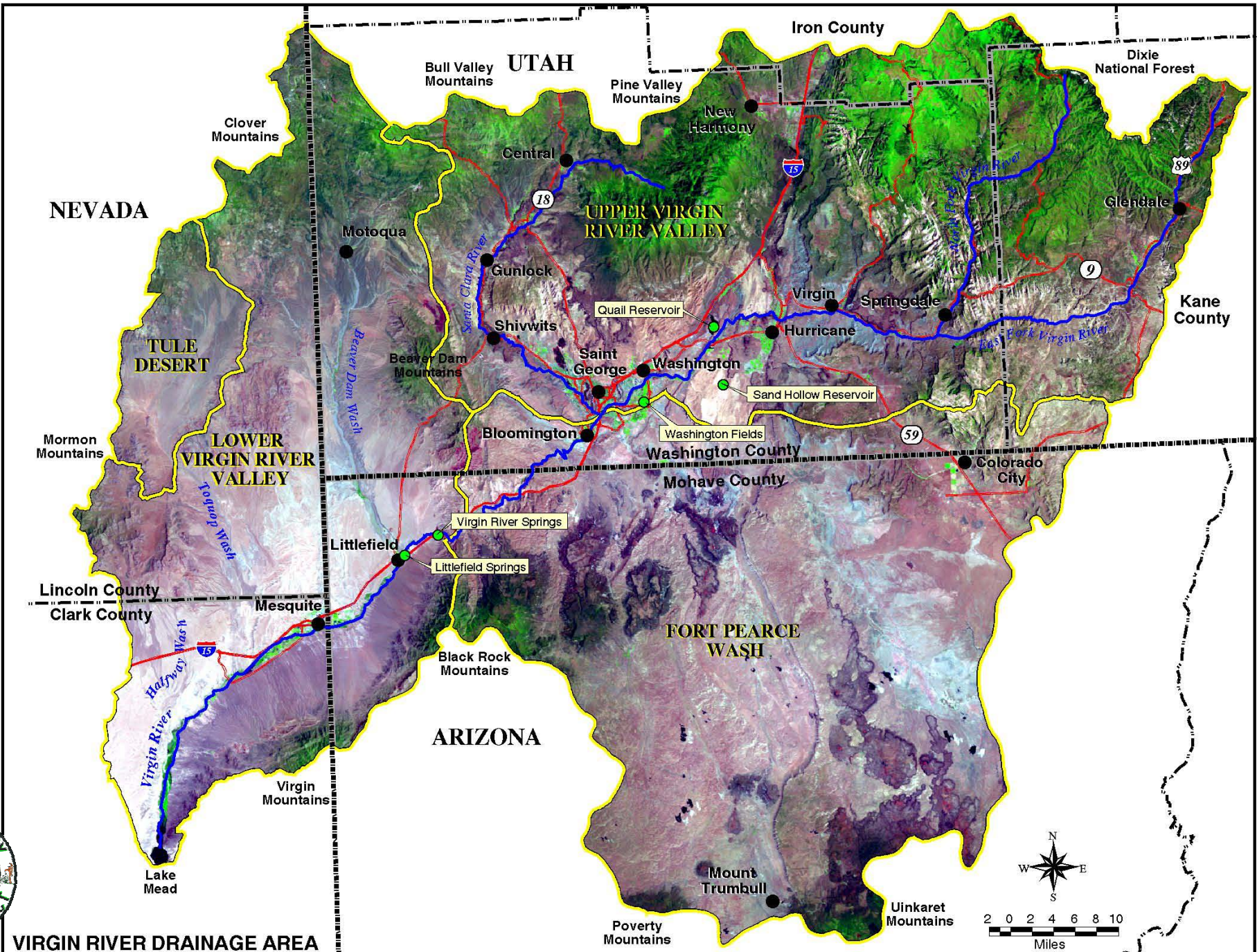




Discussion

- Virgin River Basin
- Lower Virgin River
- Ground Water Resources
- Surface Water Resources
- Population and Use
- Future Demands





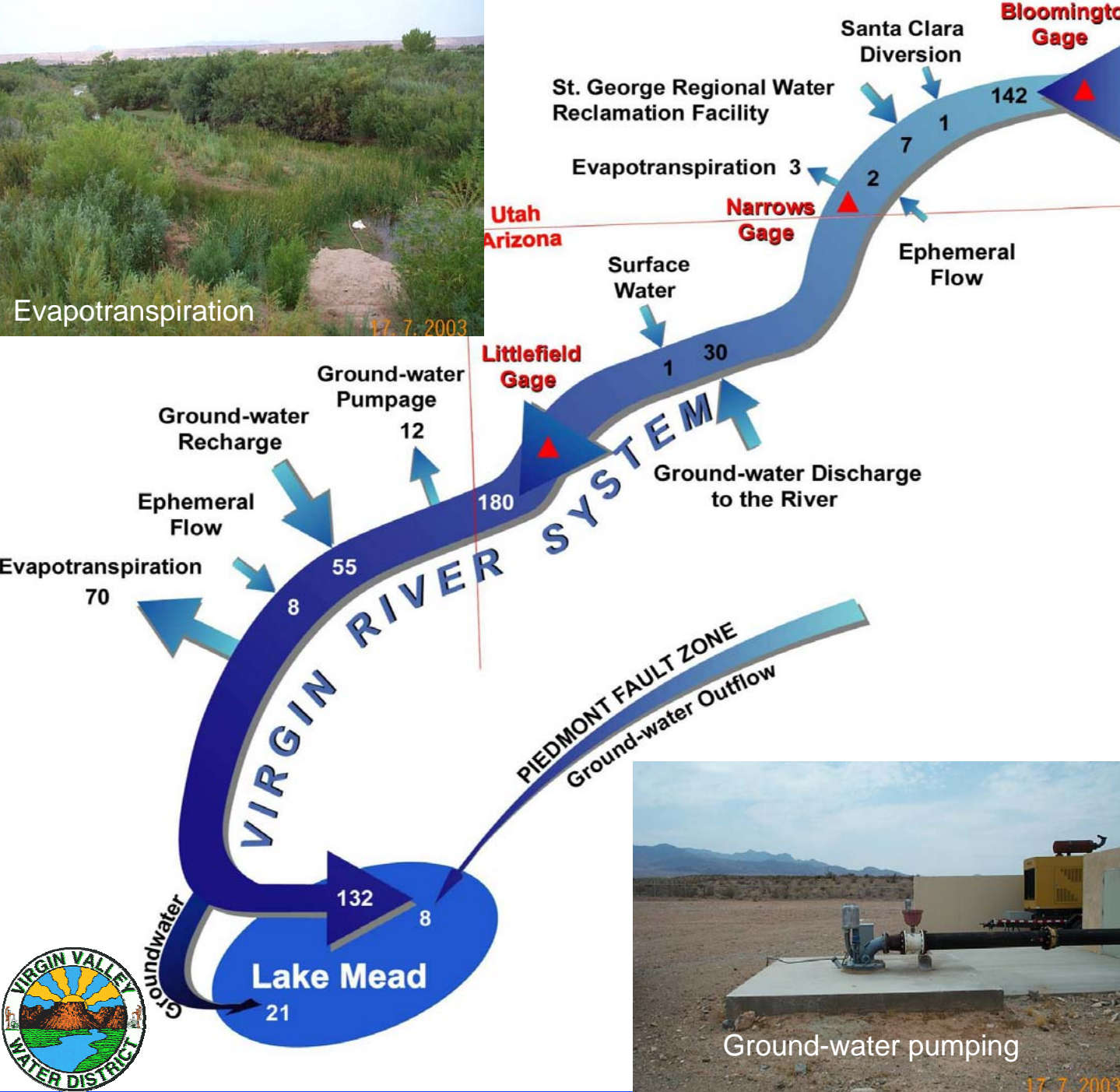
VIRGIN RIVER DRAINAGE AREA

Land Use and Demands on Virgin River

- Virgin River is not governed by any interstate compact
- Individual State water rights have been permitted
- Historical use of water was agriculture
- Virgin River Basin and adjacent area is a rapidly growing region
- Gradual change from rural-agriculture to residential-municipal land and water use
- Greater demands for water imposed by urbanization
- Balance between sustainable water resource development and habitat/species conservation

Lower Virgin River

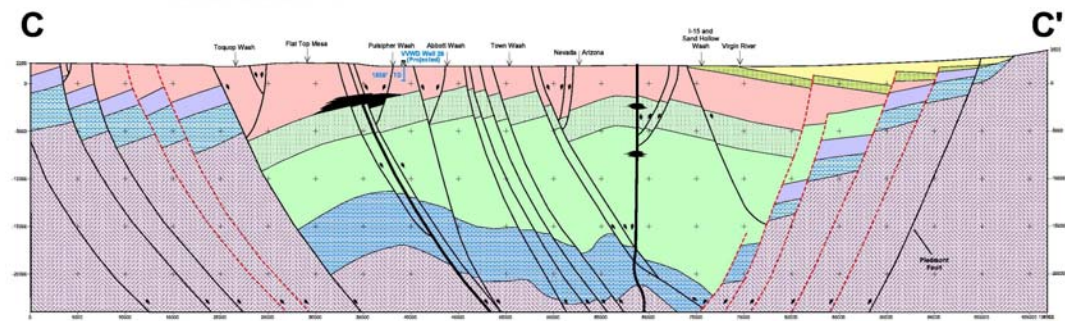
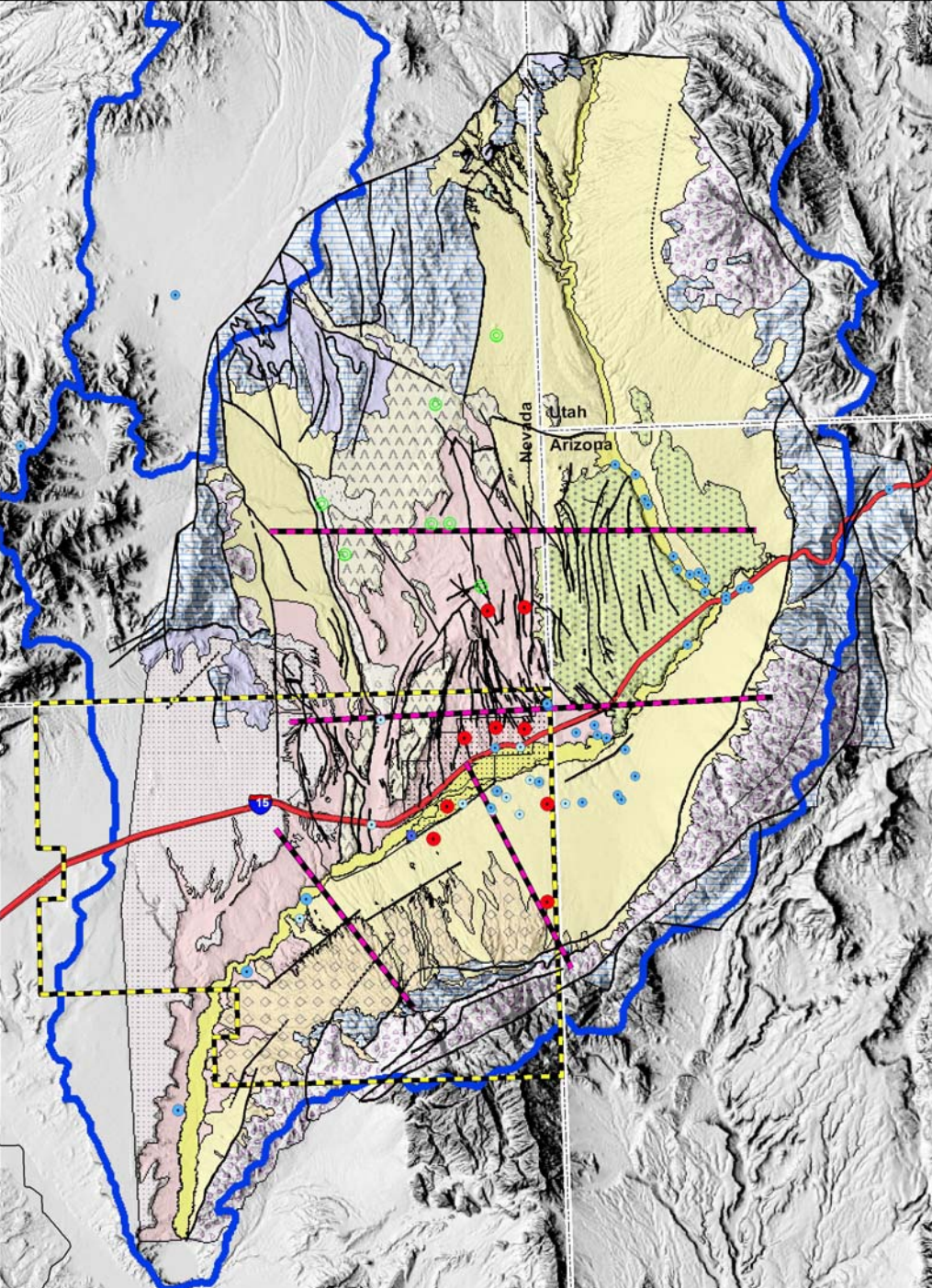
Inflow and Outflow Components



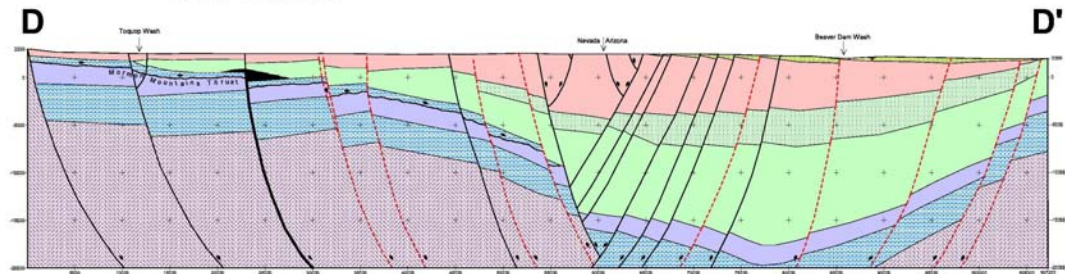
Ground Water in Lower Basin

- Interaction between ground water and surface water ???
- Estimate for VVWD by Donovan and Katzer is 85,000 based on Maxey/Eakin method and updated precipitation records
- Geologic structures control the movement of Ground Water
- Tule Desert drains and recharges the Virgin River Basin, part of the “Regional System”

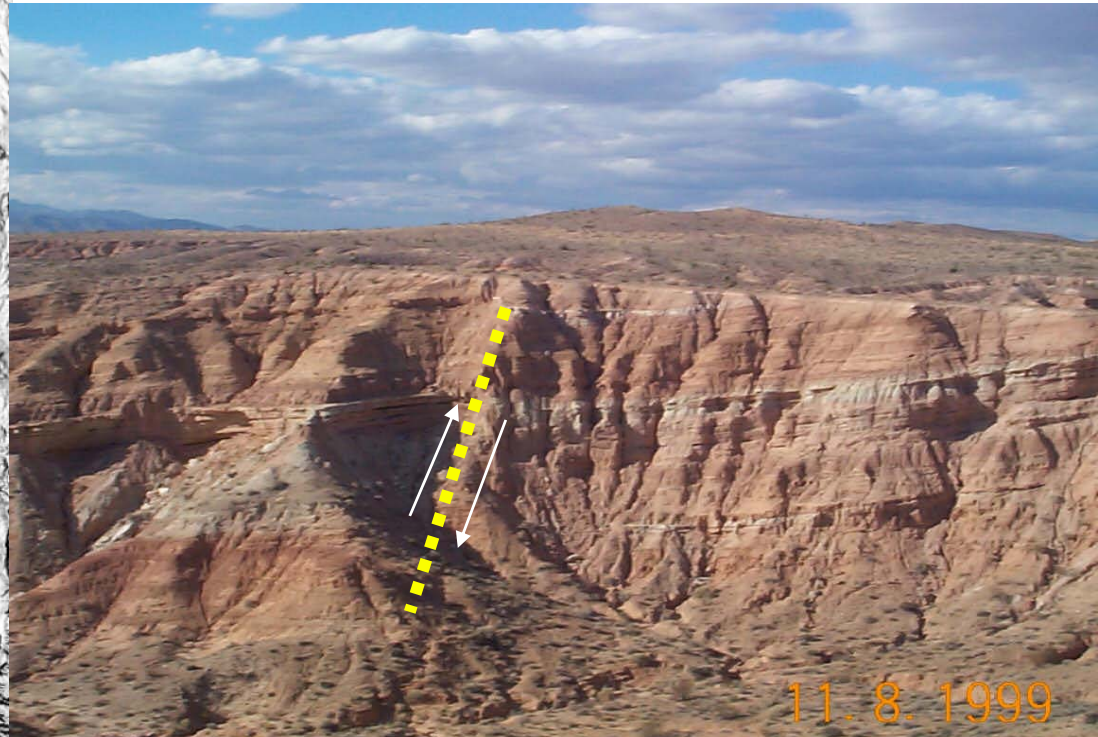




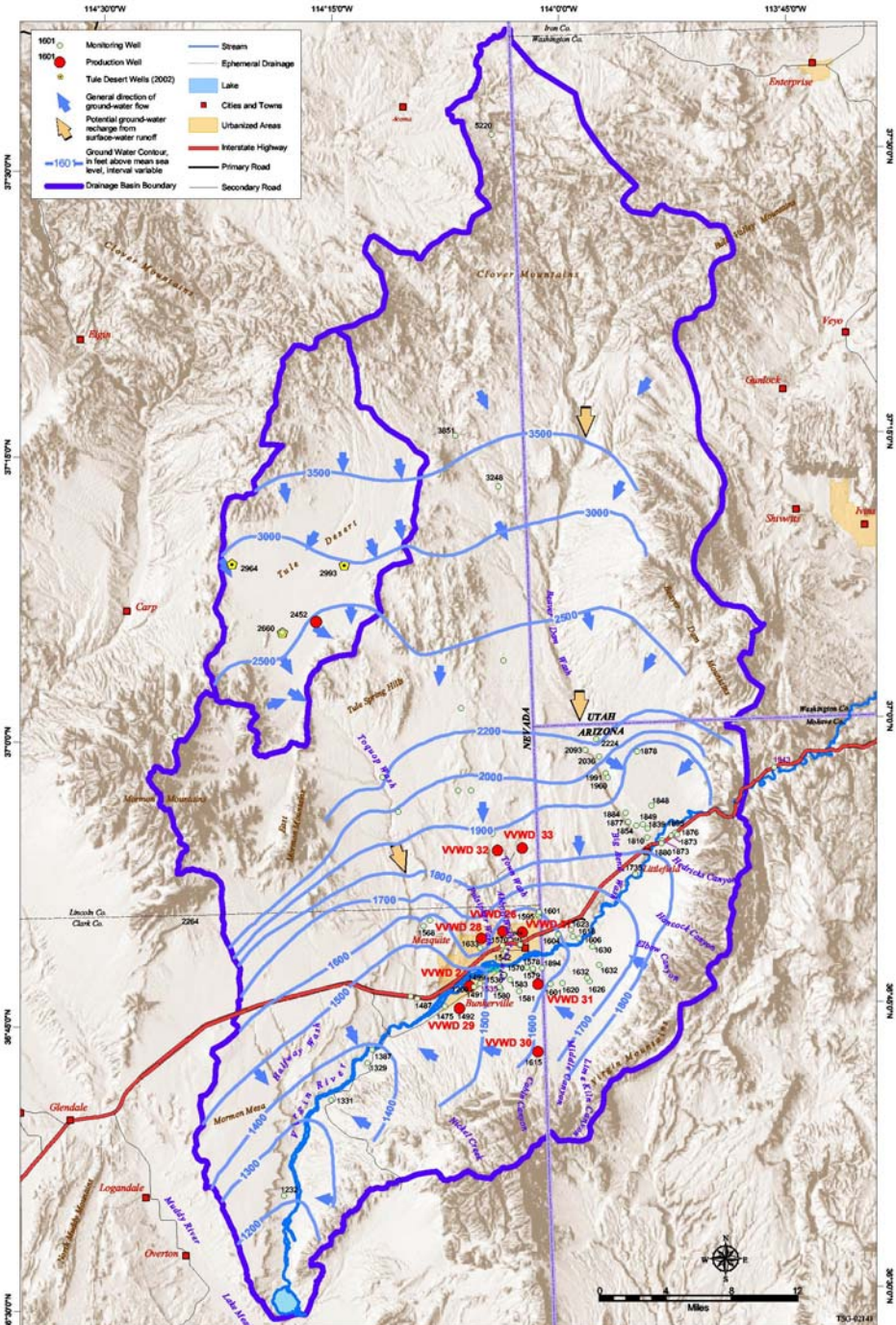
Cross Section C



Cross Section D



11. 8. 1999



Potentiometric Surface

- Ground water flow from Northeast to the Southwest
- Primarily in Muddy Creek Formation
- No active well currently producing from the carbonate rock aquifer



Virgin Valley Water District Ground Water Resources

- Nine Production Wells,
- Production rate 700 to 3,000 gallons per minute, total capacity 13,000gpm
19 mgd
- Deepest Well 3300 feet
- Total Dissolved Solids average 650 mg/L
- Arsenic $6\mu\text{g/L}$ to $80\mu\text{g/L}$
- Peak Usage 9 mgd, storage 12,000,000 gal.



Ground Water Rights in Nevada for the Lower Virgin River Basin

Permitted and Certificated Water Rights

Type of Use

Municipal & Industrial
Stockwater/Recreation
Irrigation

Virgin Valley Water District

11,447.9 afy

76.9 afy

591.1 afy

12,115.9 afy

Applications

Type of Use

Municipal & Industrial
(1989-1996)

Southern Nevada Water Authority

65,158 afy

Virgin Valley Water District

161,667 afy

J & J Building Supply

362 afy

Irrigation

Lincoln/Vidler

14,480 afy

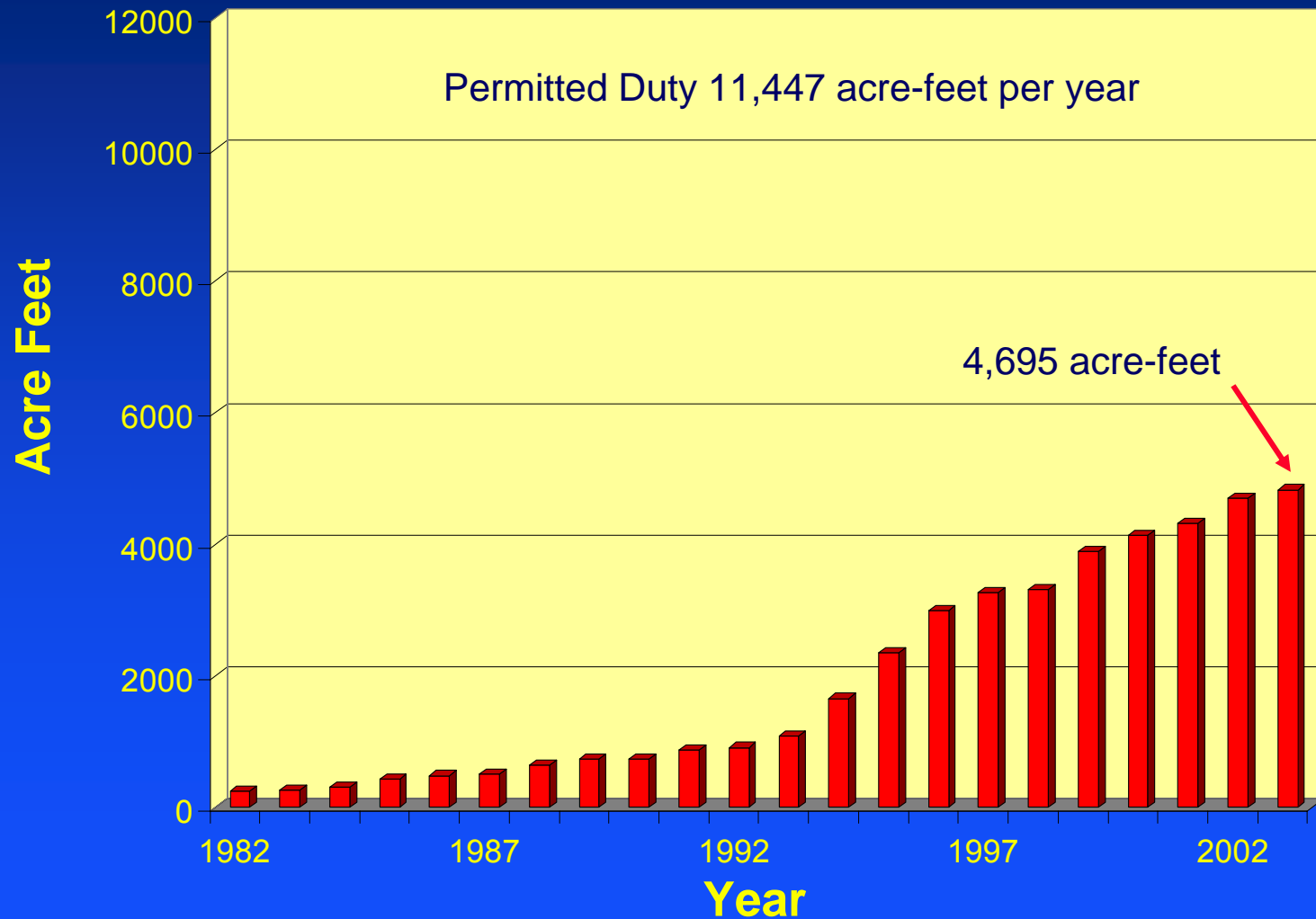
(1999)

241,667 afy

Data source Nevada Division of Water Resources



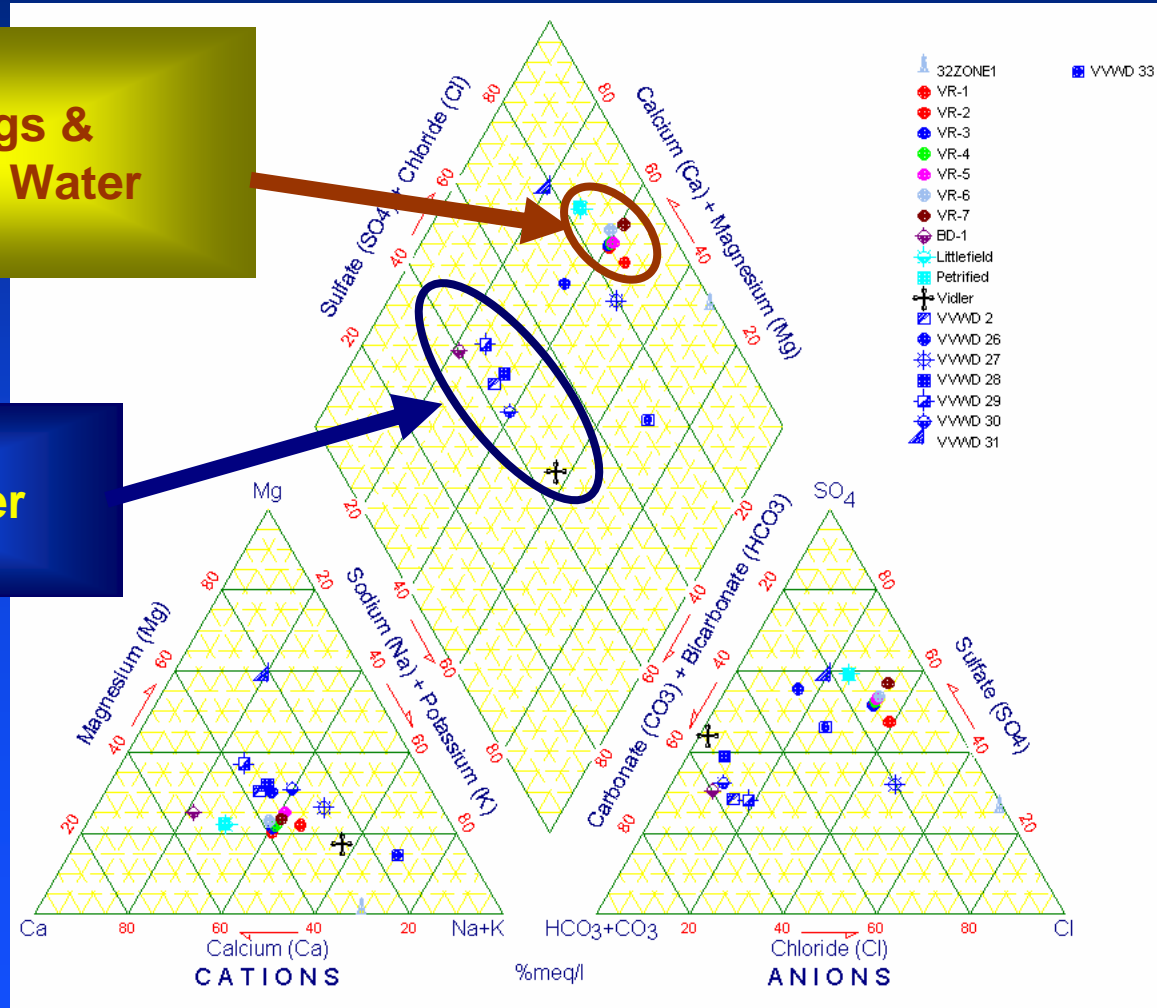
Annual Delivery of Water by Virgin Valley Water District from 1982 to 2003



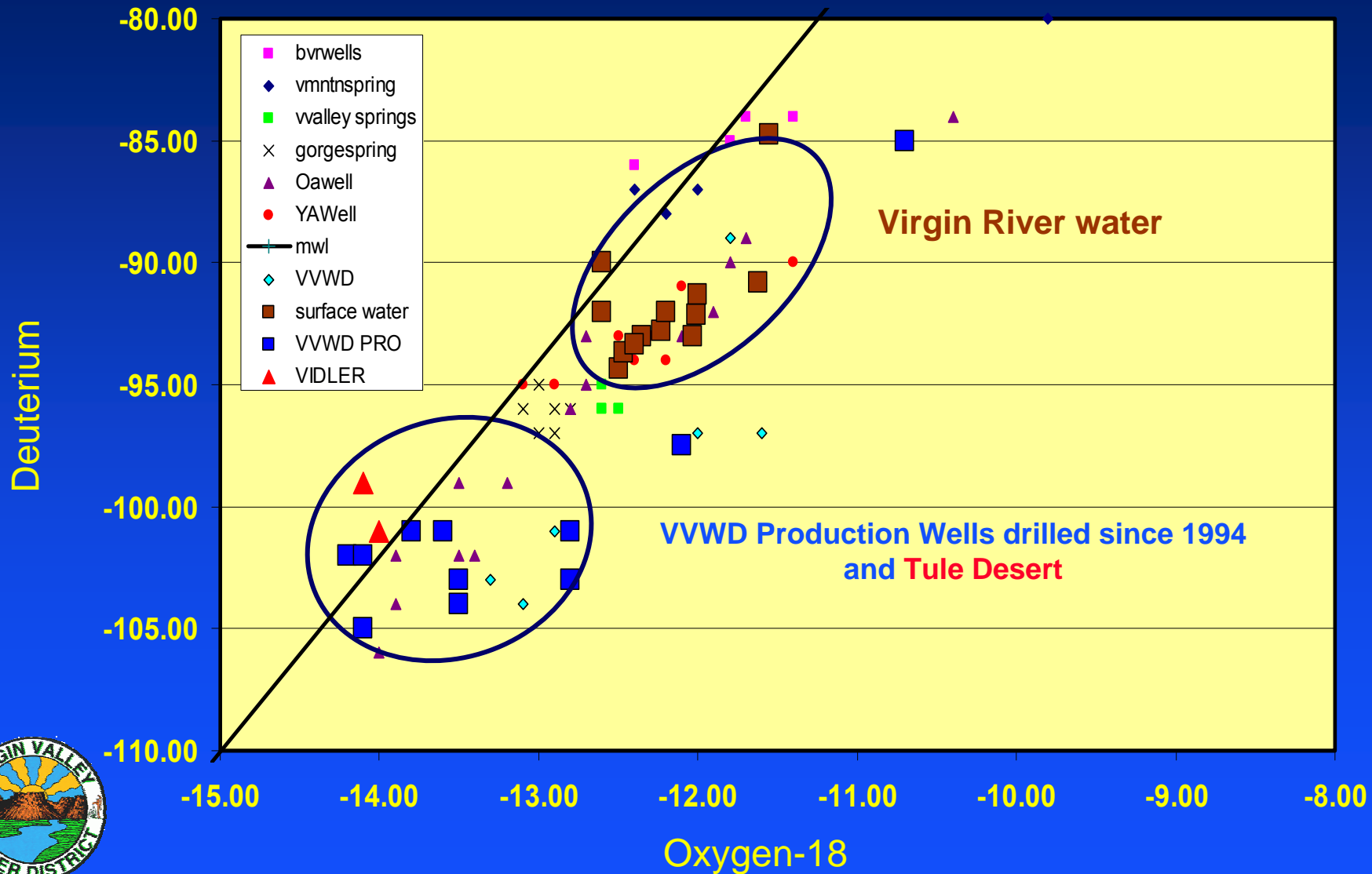
Water Chemistry of the Lower Virgin River Basin

Springs &
Surface Water

Ground Water



Isotope Data of Lower Virgin River

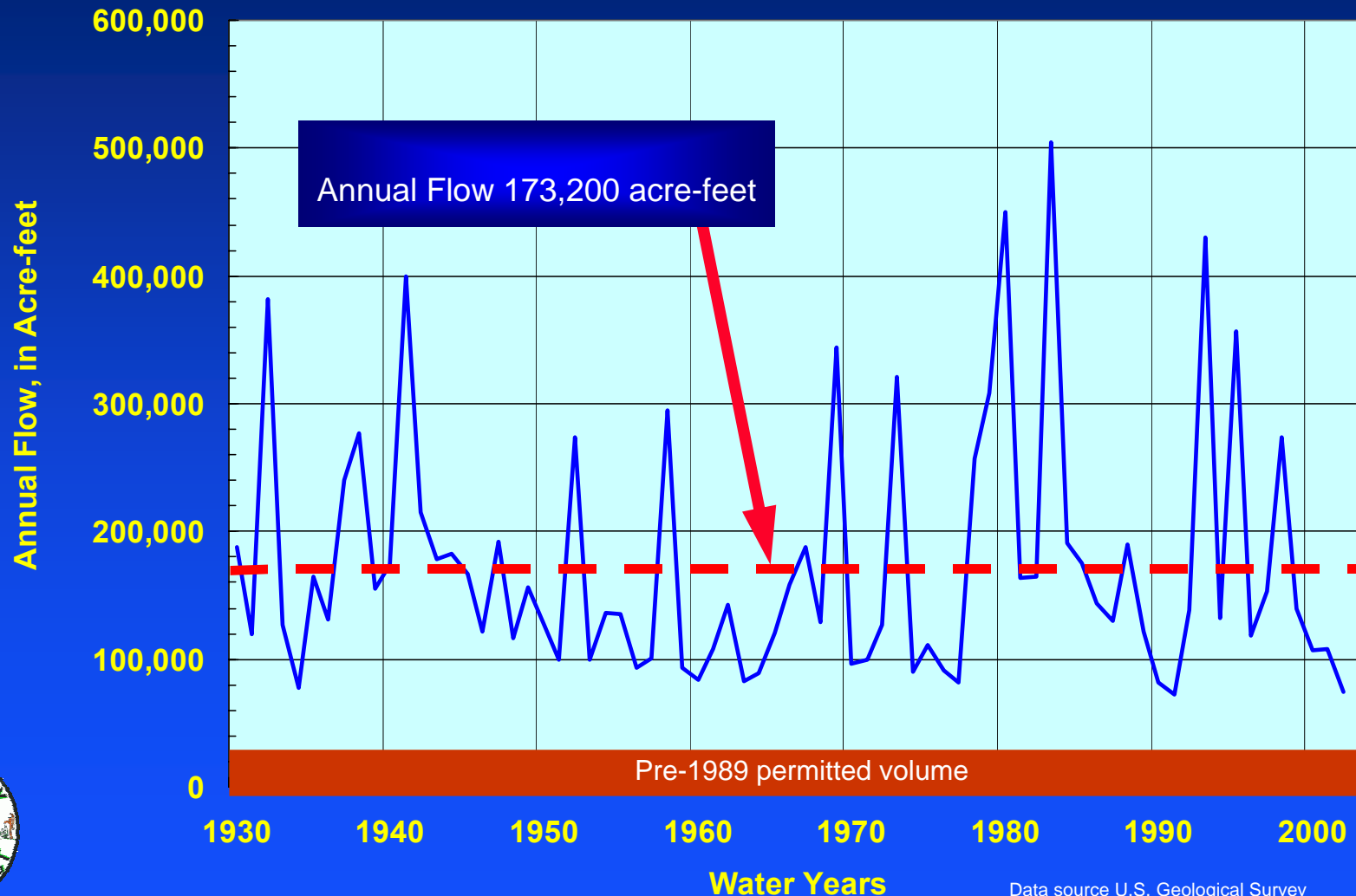


Surface Water Rights on Lower Virgin River

- Virgin River Decree –date 1927
 - Bunkerville Irrigation 8,116 afy
 - Mesquite Irrigation 9,670 afy
 - Priority Date 1905 17,786 afy
- Other NV permitted priority 1914 - 1956
 - Mesquite Irrigation 2,106 afy
 - Bunkerville Irrigation 1,496 afy
 - Riverside 1,916 afy
 - 5,518 afy
- SNWA 113,000 afy average annual diversion up to a maximum 190,000 afy; priority 1989

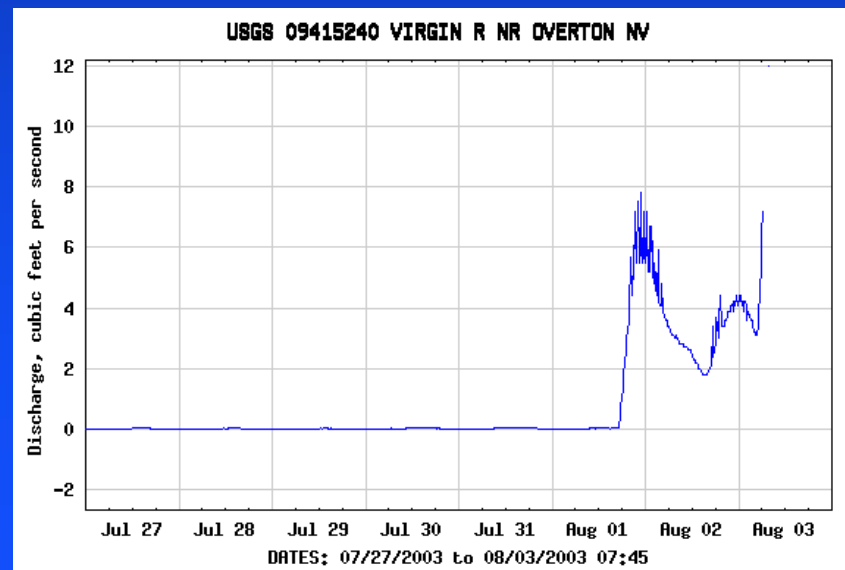
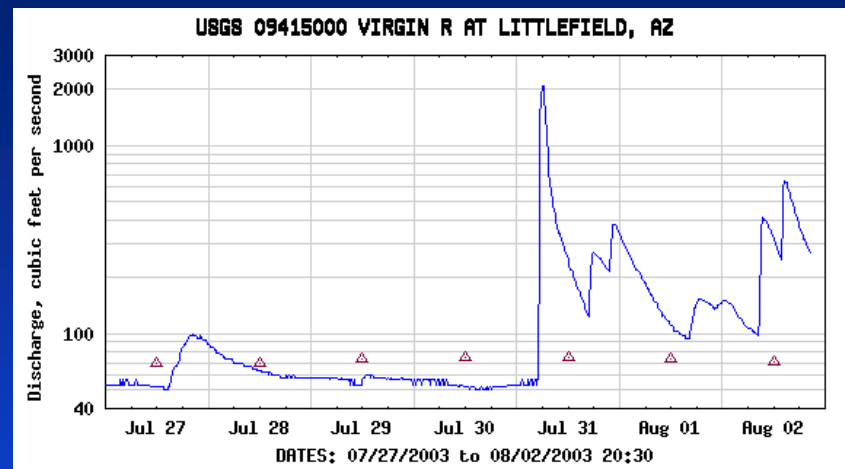


Annual Flow of the Virgin River at Littlefield, Arizona 1930 to 2002



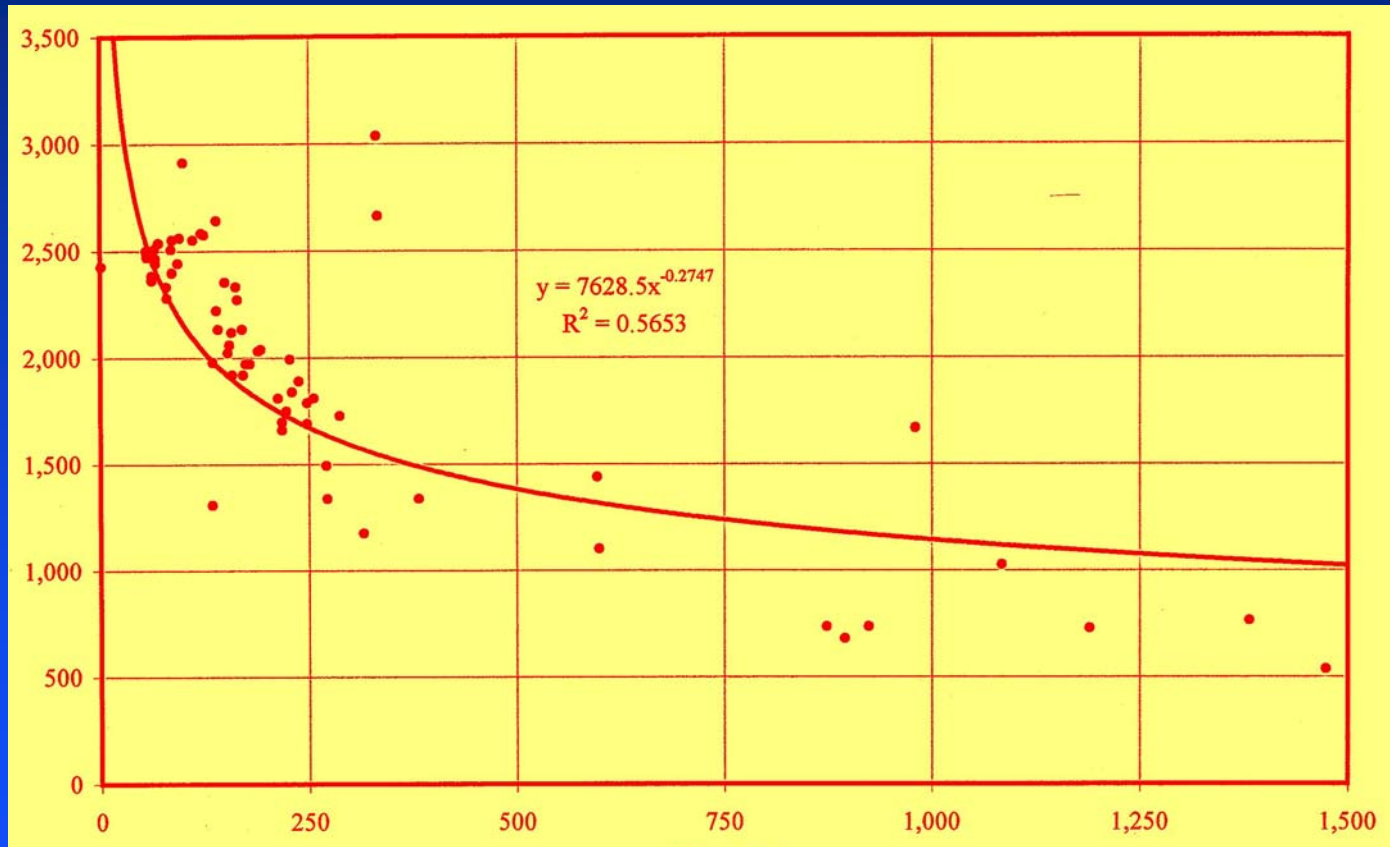
Data source U.S. Geological Survey

Virgin River Flow



Virgin River Salinity vs Flow at Littlefield, Arizona from 1985 to 1993

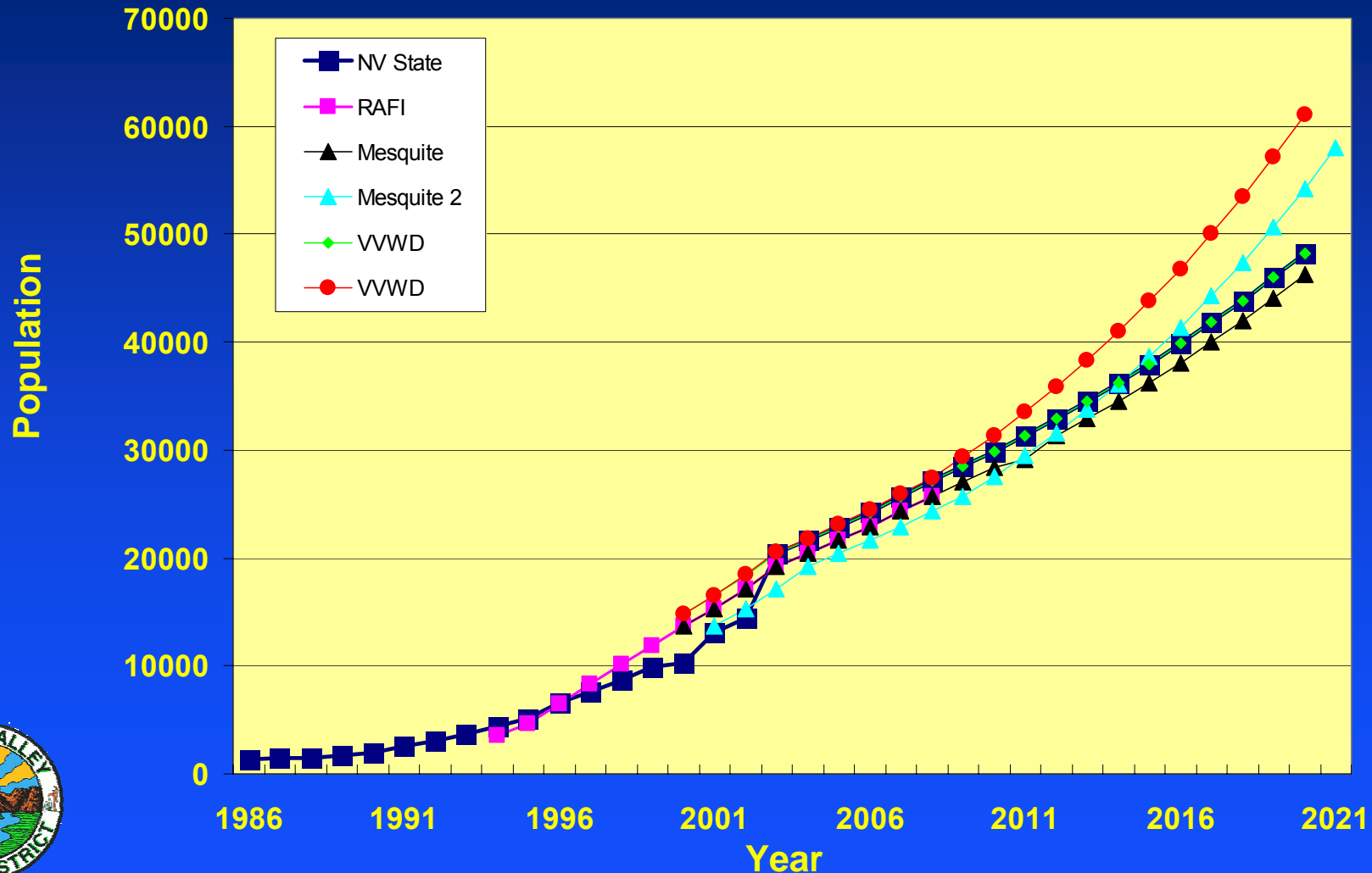
Total Dissolved Solids (mg/L)



Flow (cfs)



Population Projections for the Service Area of the Virgin Valley Water District



Lincoln County

Arizona

Clark County



1992 Landsat Image of the Mesquite Area

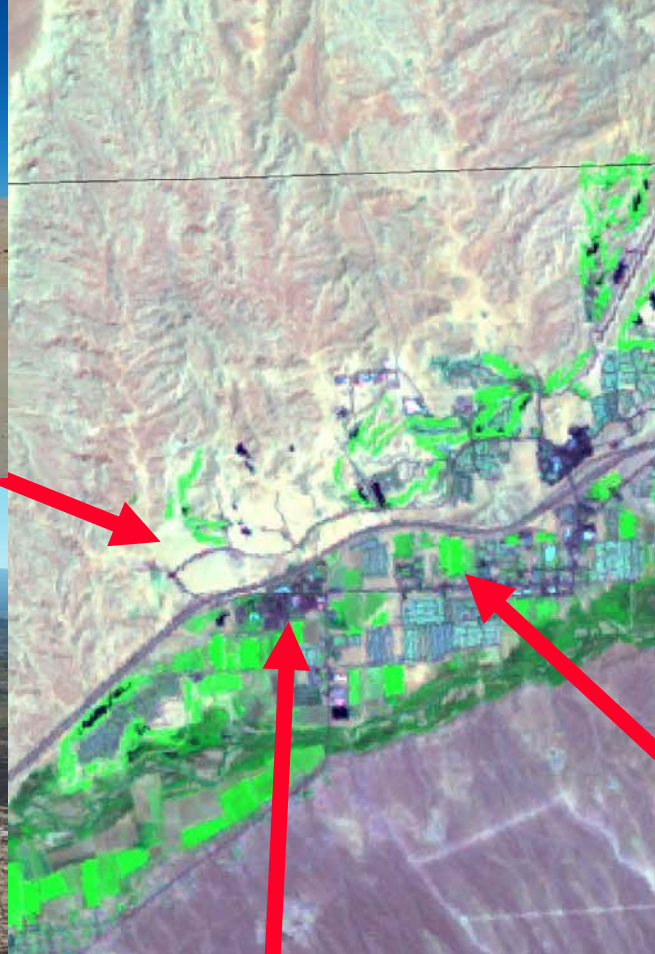
Lincoln County

Arizona

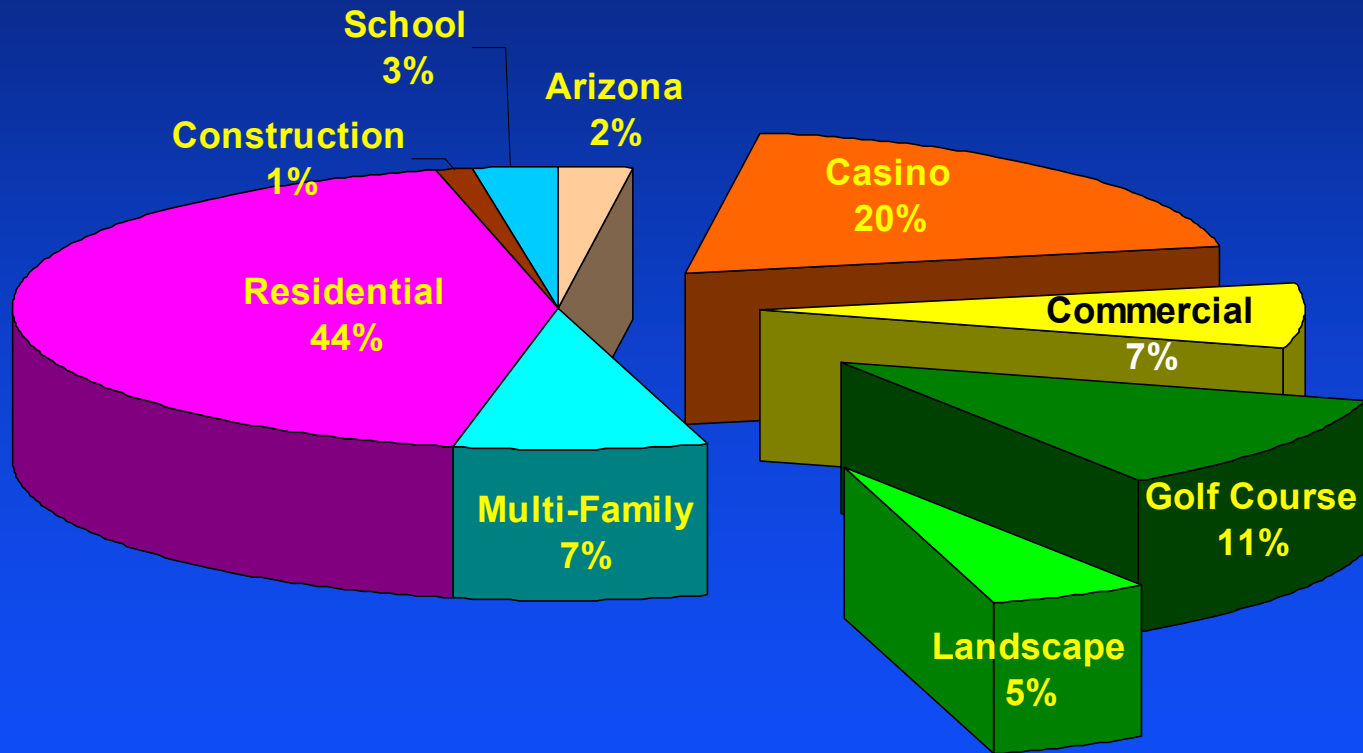
Clark County



2002 Landsat Image of the Mesquite Area



Water Use by Category in the Service Area of the Virgin Valley Water District in 2003



Conservation

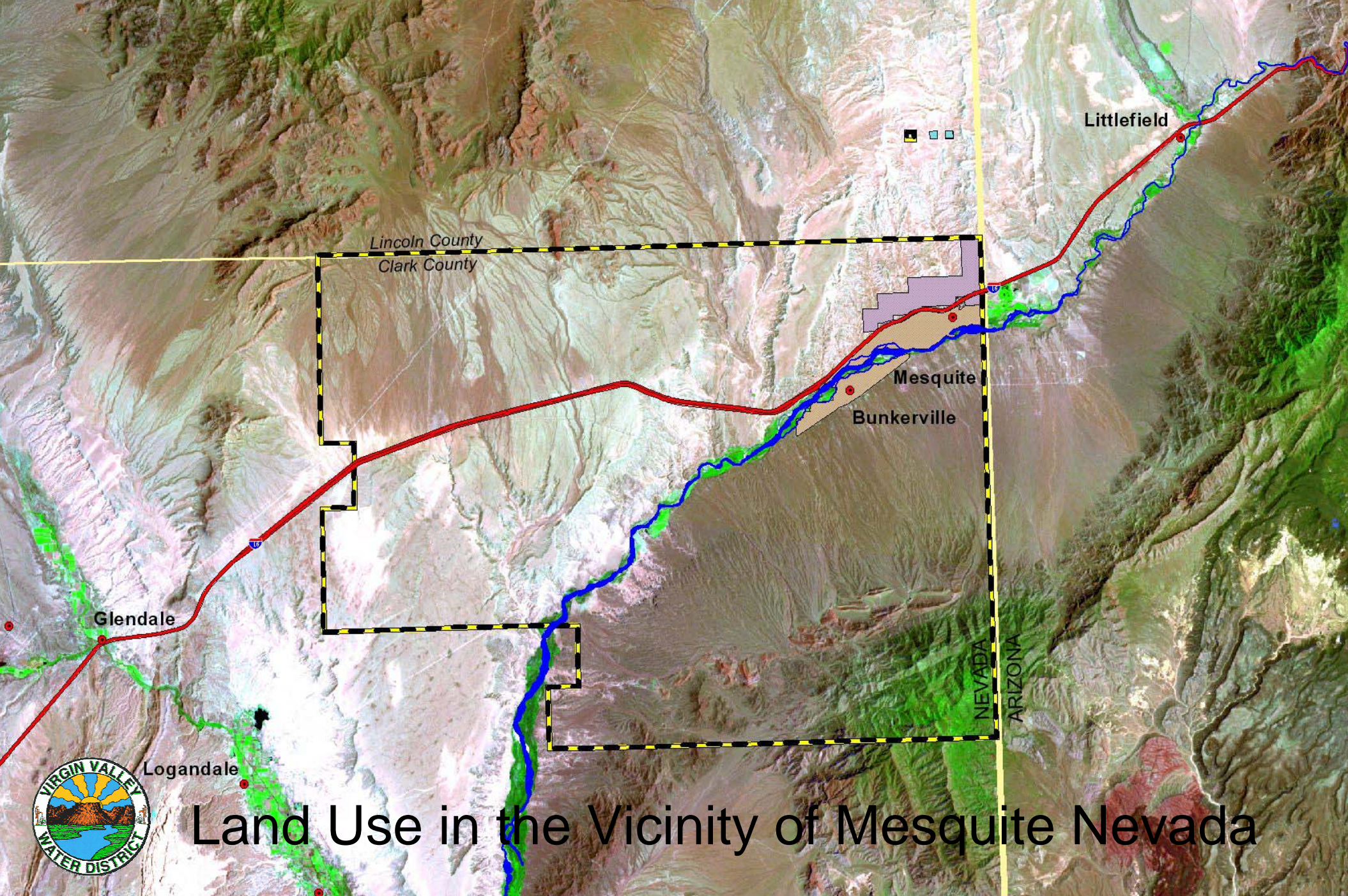
- Tiered Rate Structure to promote conservation
- Virgin River/recycled water utilized at parks and golf courses
- Secondary System for domestic use in Bunkerville

30. 12. 2003



17. 7. 2003

6. 6. 1999



Lincoln County
Clark County

Littlefield

Mesquite

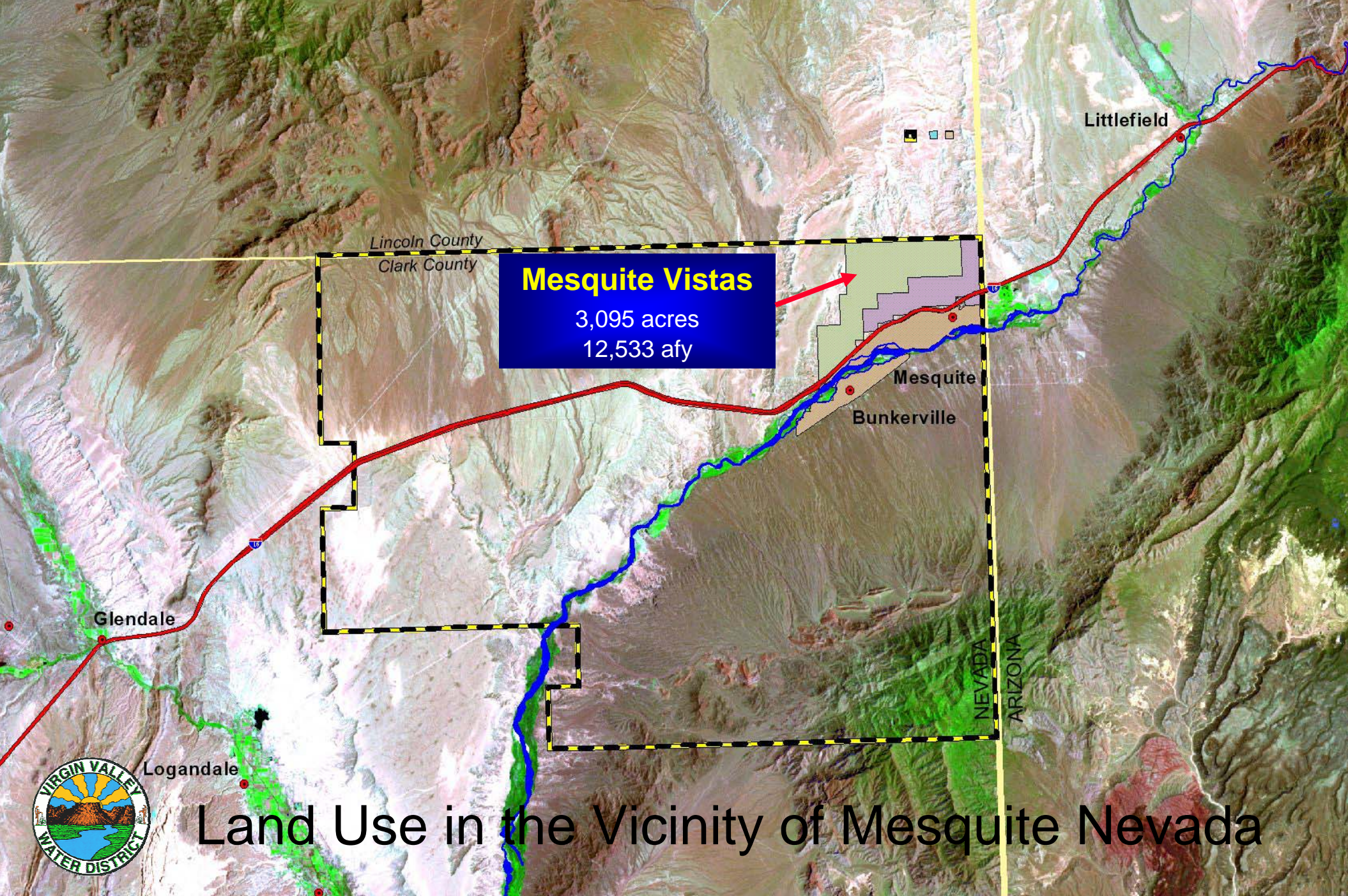
Bunkerville

Glendale

Logandale



Land Use in the Vicinity of Mesquite Nevada



Lincoln County
Clark County

Mesquite Vistas

3,095 acres
12,533 afy



Littlefield

Mesquite

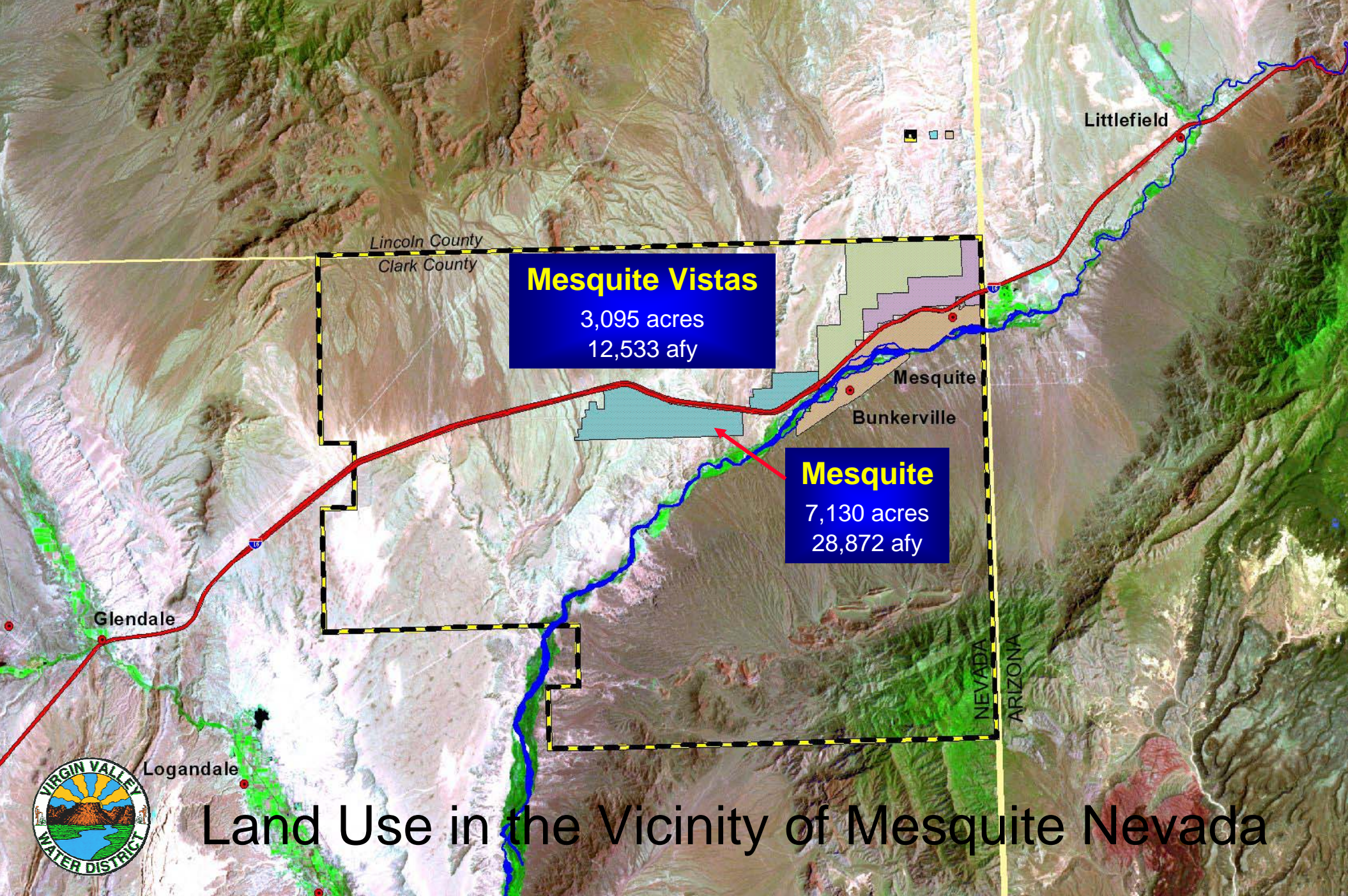
Bunkerville

Glendale

Logandale



Land Use in the Vicinity of Mesquite Nevada



Lincoln County
Clark County

Mesquite Vistas

3,095 acres
12,533 afy

Mesquite

7,130 acres
28,872 afy

Mesquite

Bunkerville

Littlefield

Glendale

Logandale



Land Use in the Vicinity of Mesquite Nevada

Lincoln County Land Act

13,000 acres

52,642 afy

Lincoln County
Clark County

Mesquite Vistas

3,095 acres

12,533 afy

Mesquite

7,130 acres

28,872 afy

Littlefield

Mesquite

Bunkerville

Glendale

Logandale



Land Use in the Vicinity of Mesquite Nevada

Toquop Energy

1,000 mega-watt Power Plant (?)
2,100 to 7,000 afy

Lincoln County Land Act

13,000 acres
52,642 afy

Mesquite Vistas

3,095 acres
12,533 afy

Mesquite

7,130 acres
28,872 afy

Lincoln County
Clark County

Mesquite

Bunkerville

Littlefield

Glendale

Logandale



Land Use in the Vicinity of Mesquite Nevada

Toquop Energy

1,000 mega-watt Power Plant (?)
2,100 to 7,000 afy

Lincoln County Land Act

13,000 acres
52,642 afy

Mesquite Vistas

3,095 acres
12,533 afy

Mesquite Airport

2,560 acres

Mesquite

7,130 acres
28,872 afy

Total Acreage

31,025 acres

Future Water Resource

94,047 afy



Land Use in the Vicinity of Mesquite Nevada

Challenges for Development in the Virgin River Valley

- Water Quality,
 - new Arsenic standard of 10 $\mu\text{g/L}$,
 - Desalination of Virgin River water
- Growth and infrastructure development
- Environmental Issues, NEPA and ESA compliance associated with land acts
- Competing water resource demand with Arizona and Utah

