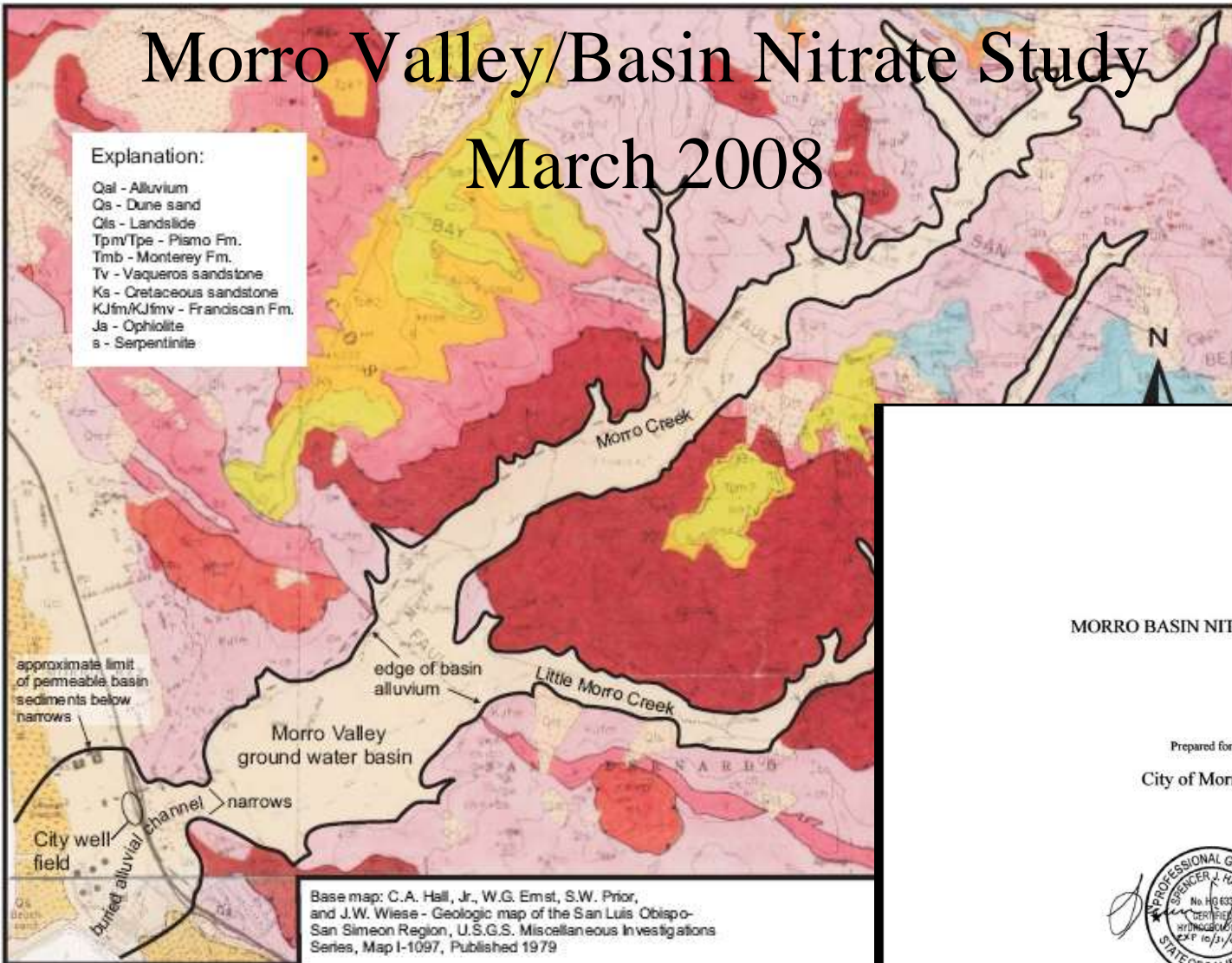


# Morro Valley/Basin Nitrate Study

March 2008

## Explanation:

- Qal - Alluvium
- Qs - Dune sand
- Qls - Landslide
- Tpm/Tpe - Pismo Fm.
- Tmb - Monterey Fm.
- Tv - Vaqueros sandstone
- Ks - Cretaceous sandstone
- KJfm/KJfmv - Franciscan Fm.
- Ja - Ophiolite
- s - Serpentinite



Base map: C.A. Hall, Jr., W.G. Ernst, S.W. Prior, and J.W. Wiese - Geologic map of the San Luis Obispo-San Simeon Region, U.S.G.S. Miscellaneous Investigations Series, Map I-1097, Published 1979

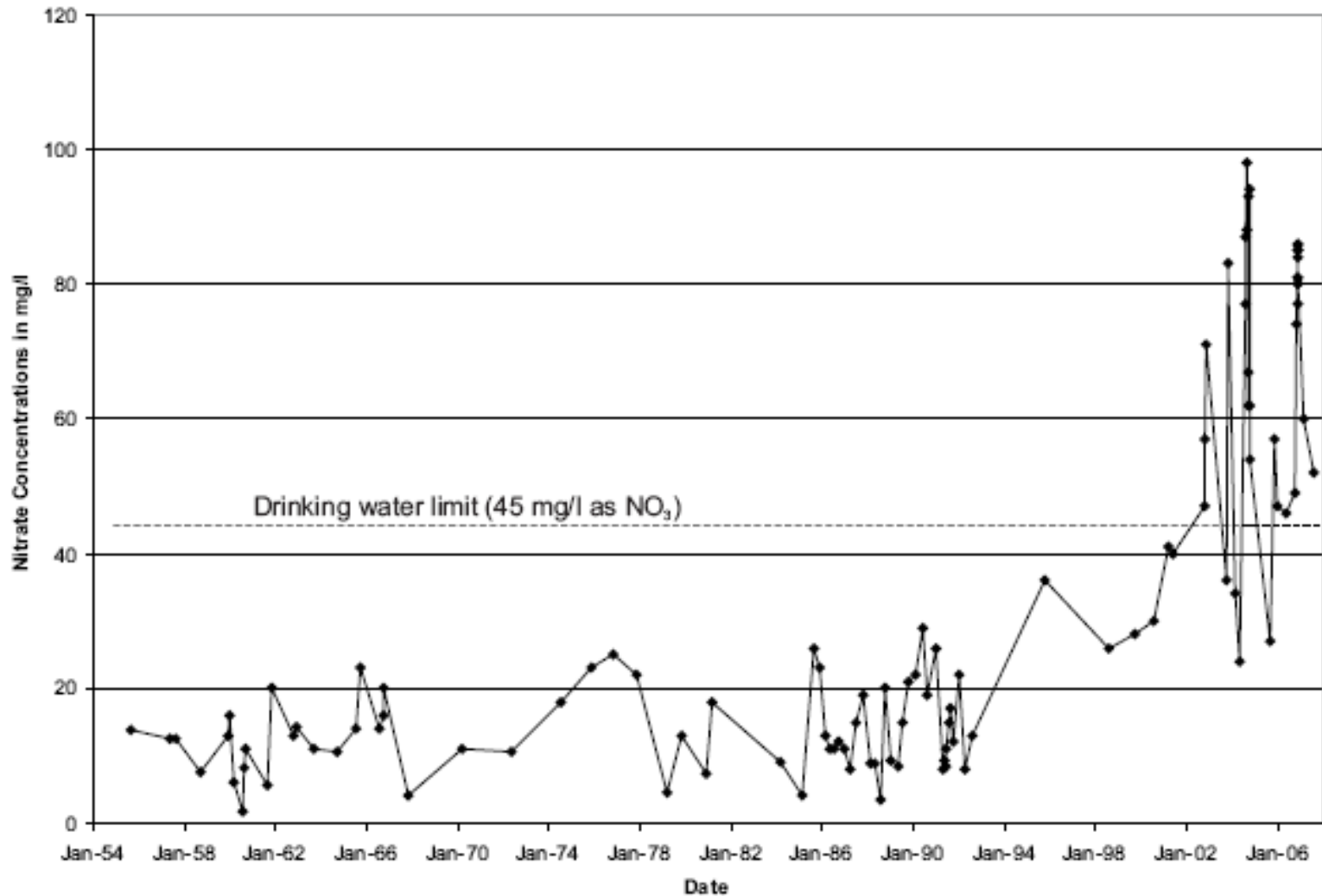


## MORRO BASIN NITRATE STUDY

Prepared for the  
City of Morro Bay



# Morro Bay Wells Historic Nitrate Levels



# Growth in Irrigated Acreage 1997-2007

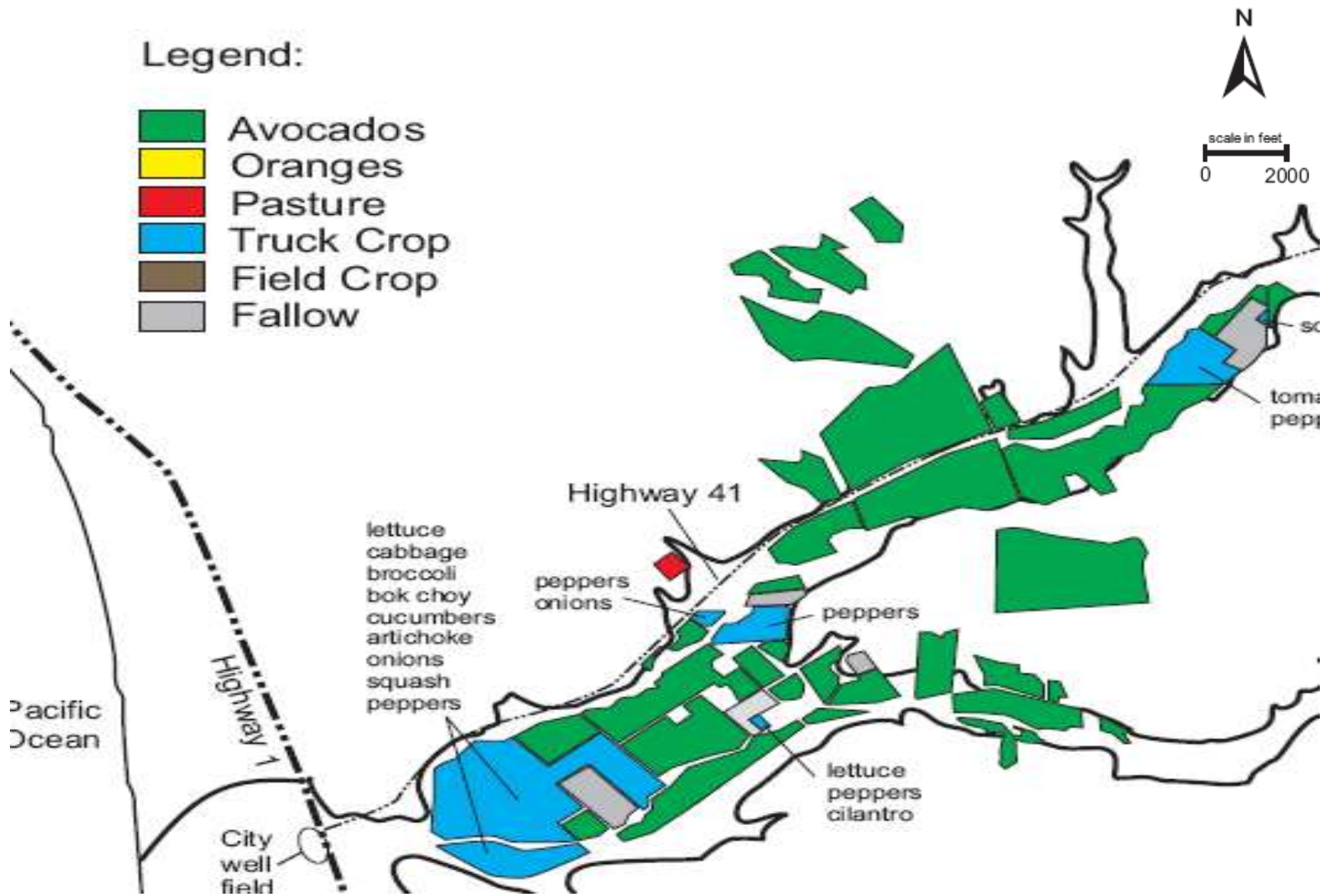
**Table 1**  
**Irrigated Acreage 1977-2007**  
**Morro/Little Morro Creek Valleys**

| Crop Type              | Irrigated Acreage |      |      |      |      |      |
|------------------------|-------------------|------|------|------|------|------|
|                        | 1977              | 1984 | 1992 | 1995 | 2001 | 2007 |
| Truck (except legumes) | 35                | 48   | 150  | 167  | 151  | 174  |
| Legumes                | 11                | 89   | 228  | 371  | 193  | --   |
| Field                  | 70                | 69   | --   | --   | --   | 6    |
| Pasture                | 61                | 57   | 10   | 18   | 9    | 5    |
| Orchard                | 59                | 187  | 258  | 361  | 562  | 798  |
| Total                  | 236               | 450  | 646  | 917  | 915  | 983  |

Notes: Orchard planting is not restricted to the valley floor.

Survey by DWR in 1977, 1984 and 1995.

Survey by Cleath & Associates in 1992, 2001, and 2007 w/ assistance from County records.

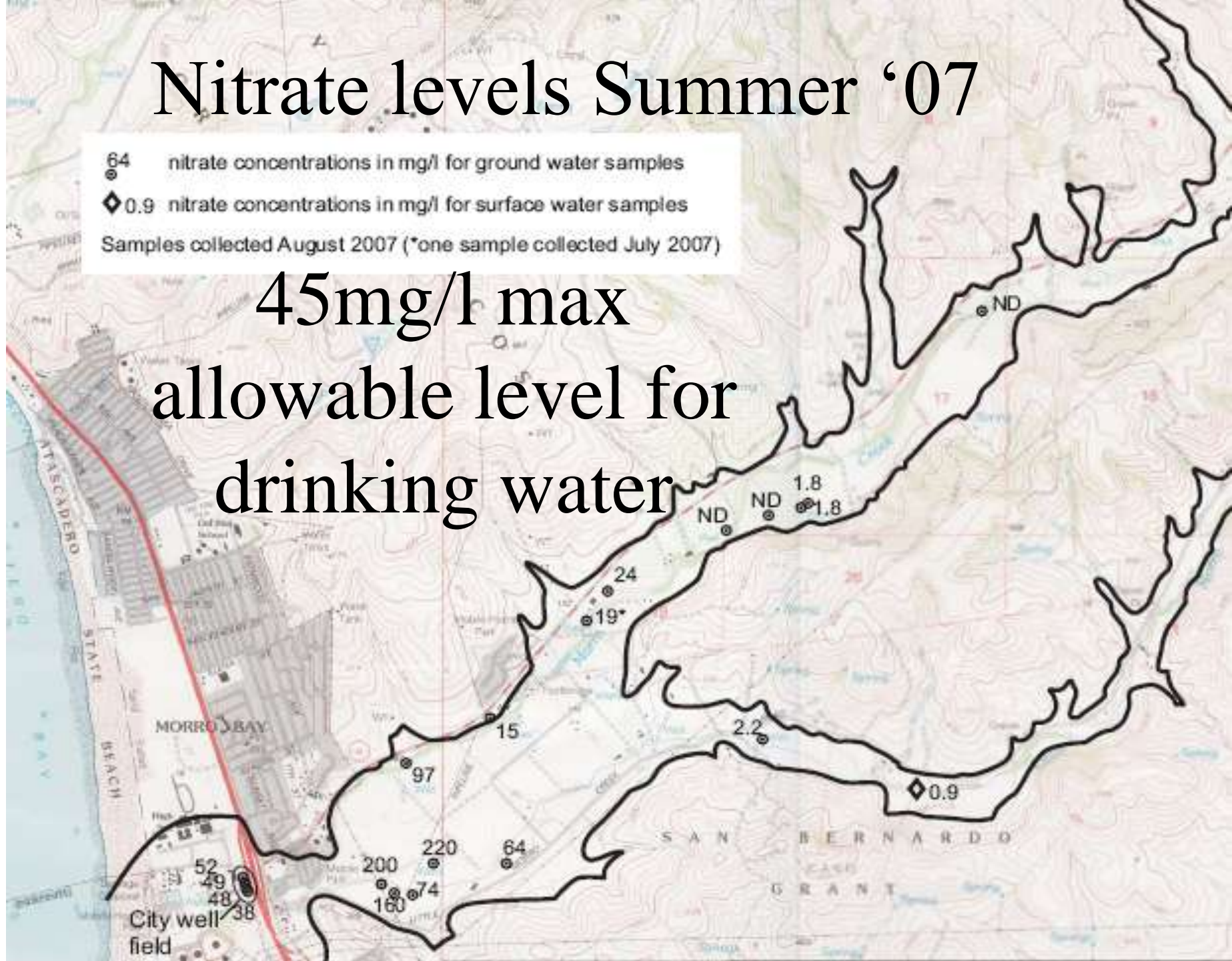


Current land usage in the valley

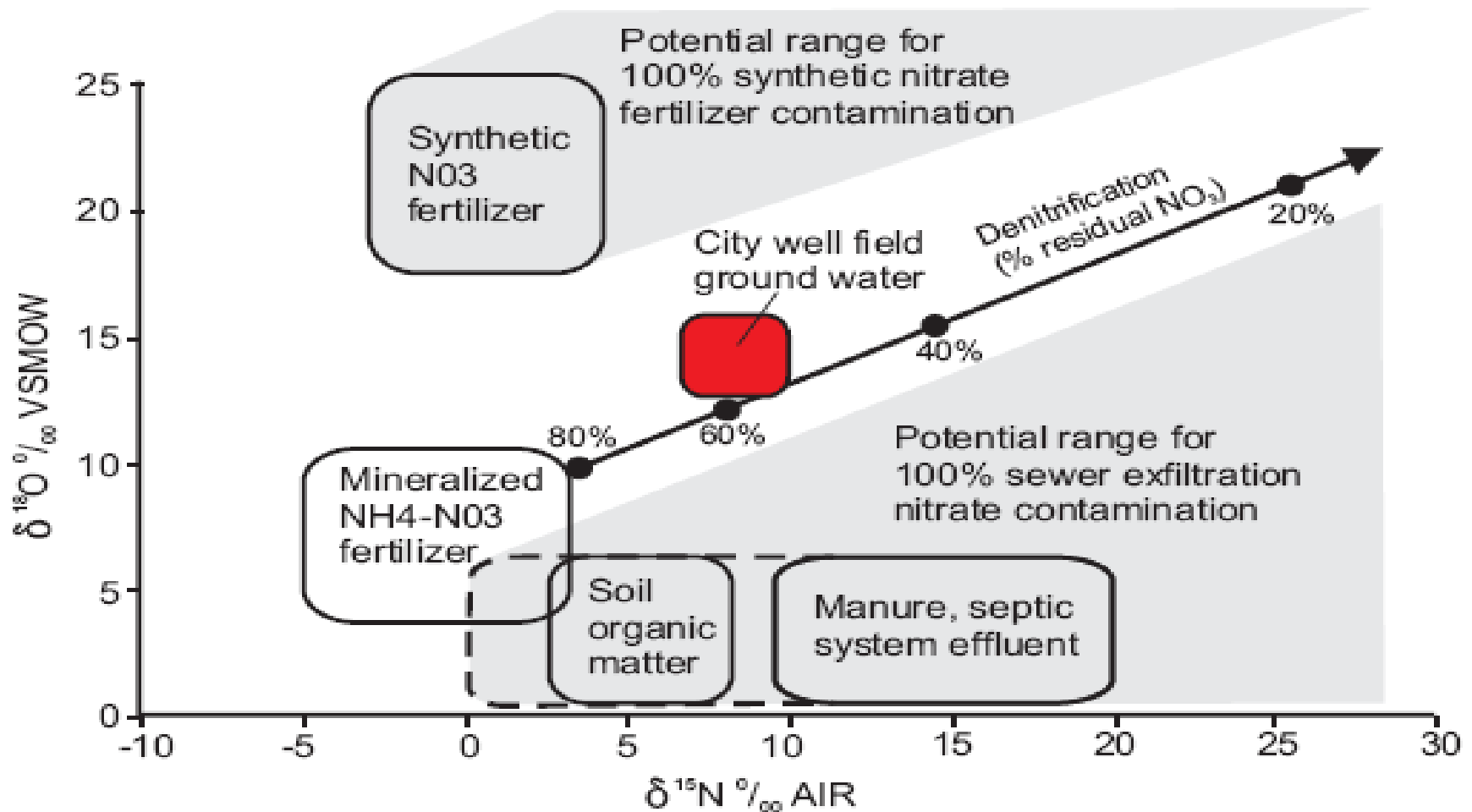
# Nitrate levels Summer '07

64 nitrate concentrations in mg/l for ground water samples  
◆ 0.9 nitrate concentrations in mg/l for surface water samples  
Samples collected August 2007 (\*one sample collected July 2007)

45mg/l max  
allowable level for  
drinking water







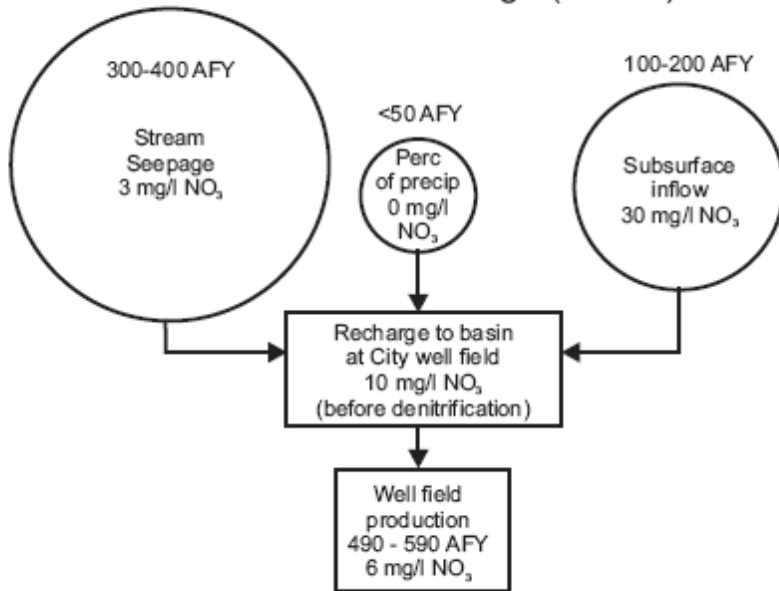
Modified from Clark and Fritz (1997) to extend range of septic system / sewer exfiltration based on Kendall (1998)

$\delta^{18}\text{O}$  values for nitrate vary according to the values of local ground waters. Ranges shown are for ground water with  $\delta^{18}\text{O} (\text{H}_2\text{O})$  values of  $-10 \text{ ‰}$  (Clark and Fritz, 1997).

# Isotope Testing

Figure 14  
Isotope Data Interpretation

## Historical Recharge (1980's)



## Current Conditions

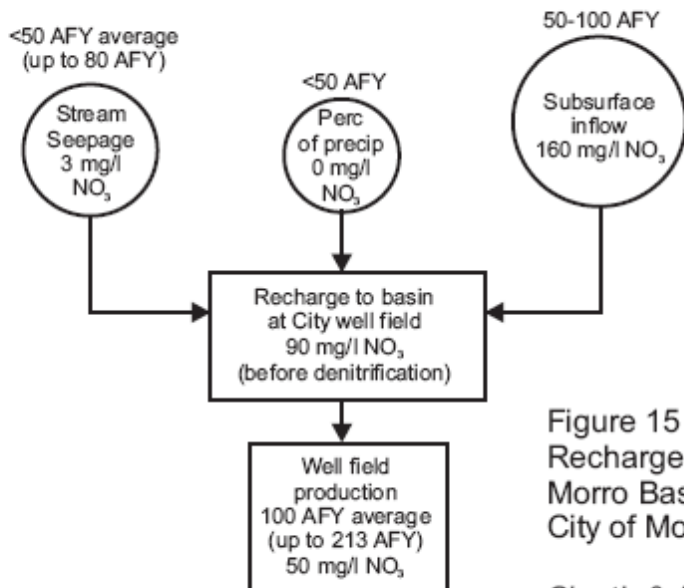


Figure 15  
Recharge Dynamics  
Morro Basin Nitrate Study  
City of Morro Bay

Cleath & Associates

## Future Steps

- Morro Bay is installing nitrate treatment equipment
- Once the equipment is in place, wells can be run to increase flushing action of aquifer
- Morro Bay is looking to the farm community to manage their nitrate contribution to the ground water basin.
- Questions?