

*Spatial Data  
Management Using  
Oracle 9i*

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Farallon Geographics, Inc.**

# Agenda

- ◆ Oracle Spatial overview
- ◆ When is it the appropriate technology?
- ◆ Demo
- ◆ Q&A

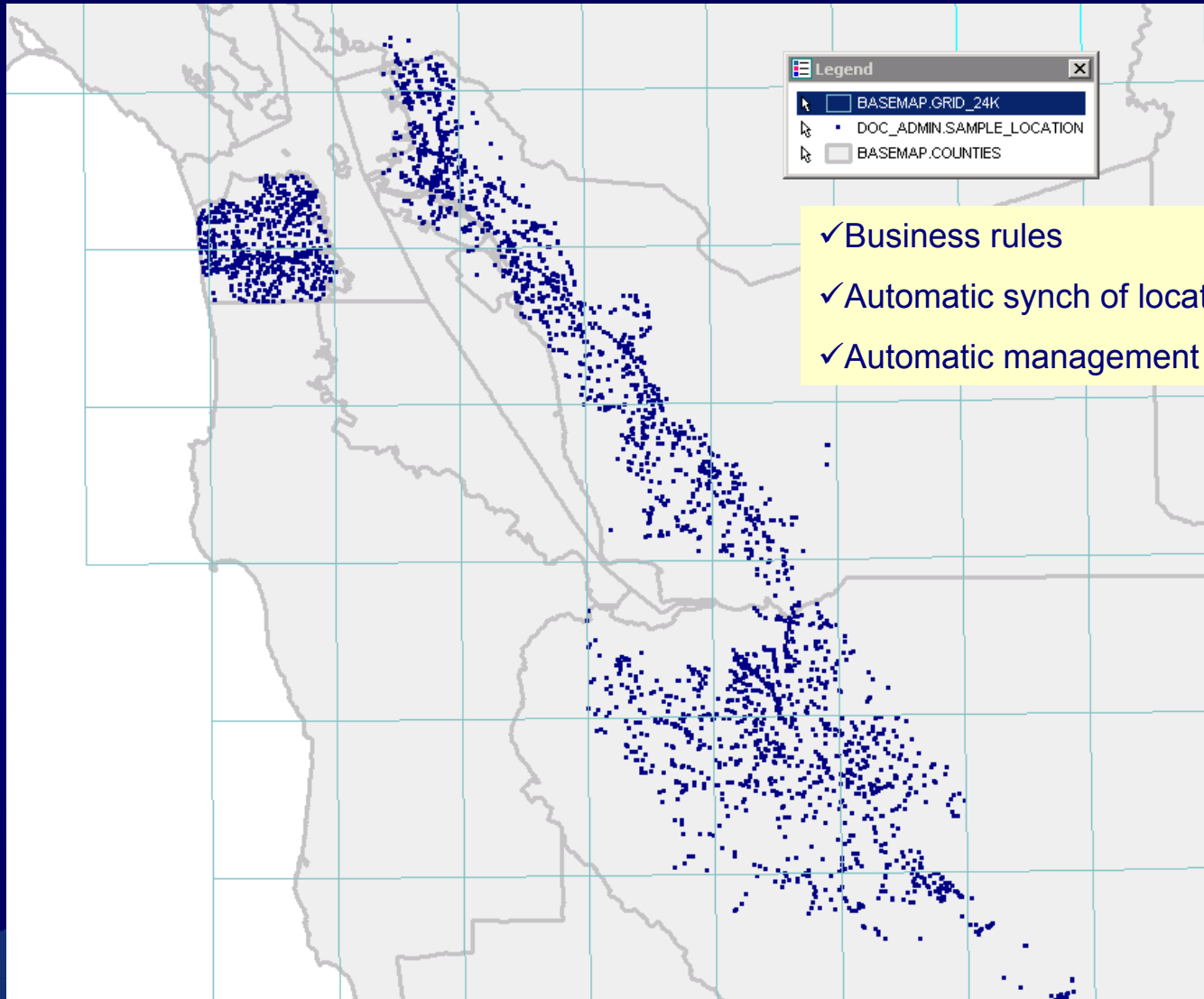
# Capability Overview

- ◆ Native spatial data type
- ◆ Seamless indexed spatial data storage
- ◆ Robust spatial API
- ◆ Cross-platform access with centralized spatial “business rules”
- ◆ Traditional Oracle advantages available for spatial data

# The Context For Spatial

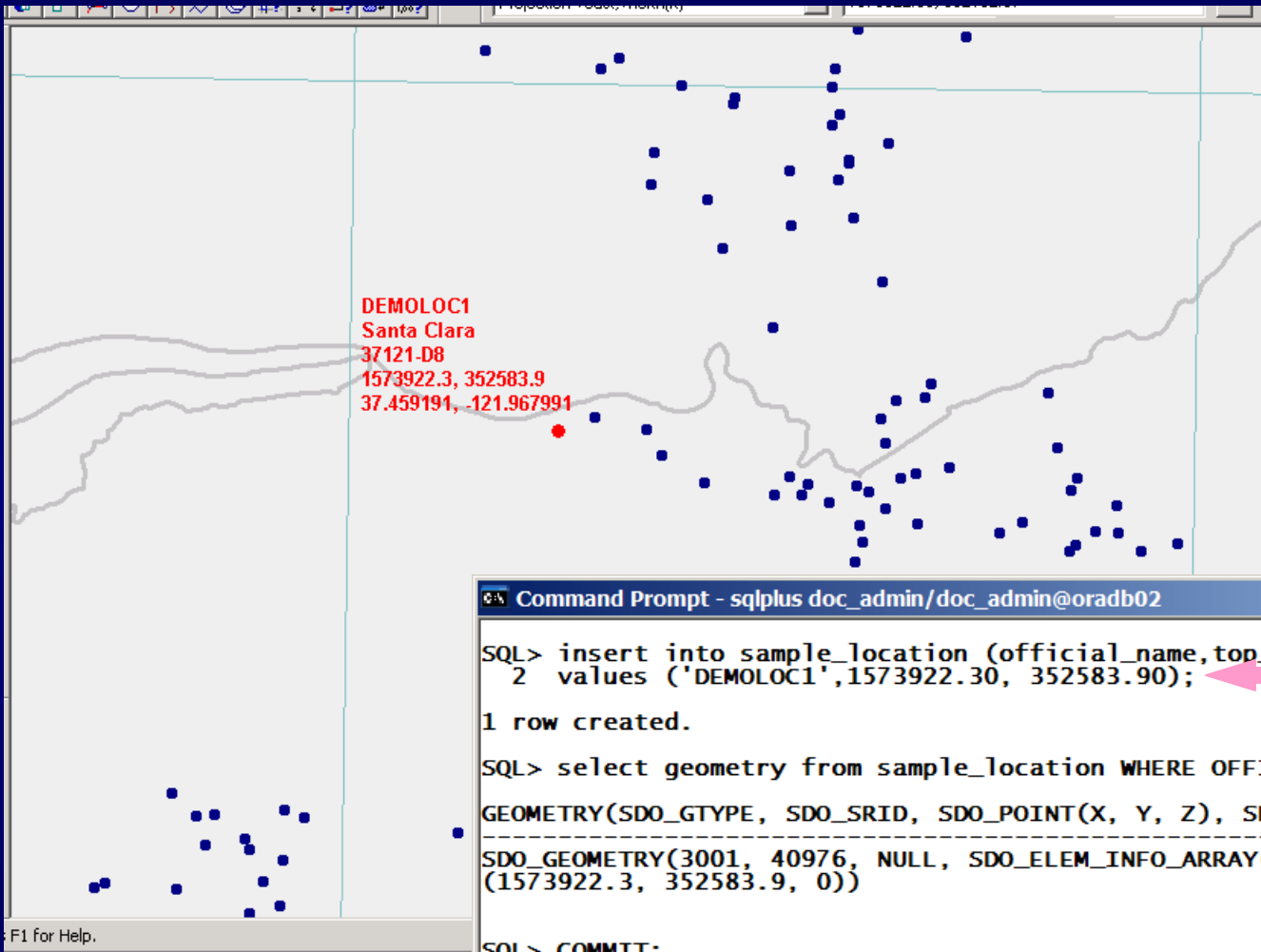
- ◆ Concurrent multi-user transactions
- ◆ Direct interoperability across GIS products
- ◆ Existing Oracle investment (systems/expertise)
- ◆ Scalability (> 500M)
- ◆ Database-centric philosophy
  - Data outlives GIS apps
  - Centralized constraints, security...
  - Fully leverage RDBMS (best practice)

# Case study: CA DOC



- ✓ Business rules
- ✓ Automatic synch of location fields
- ✓ Automatic management of zone fields

## Derive geometry from tabular input



```
Command Prompt - sqlplus doc_admin/doc_admin@oradb02

SQL> insert into sample_location (official_name,top_easting,top_northing)
  2 values ('DEMOLOC1',1573922.30, 352583.90);
1 row created.

SQL> select geometry from sample_location WHERE OFFICIAL_NAME='DEMOLOC1';
GEOMETRY(SDO_GTYPE, SDO_SRID, SDO_POINT(X, Y, Z), SDO_ELEM_INFO, SDO_ORDINATES)
-----
SDO_GEOMETRY(3001, 40976, NULL, SDO_ELEM_INFO_ARRAY(1, 1, 1), SDO_ORDINATE_ARRAY
(1573922.3, 352583.9, 0))

SQL> COMMIT;
Commit complete.

SQL> _
```

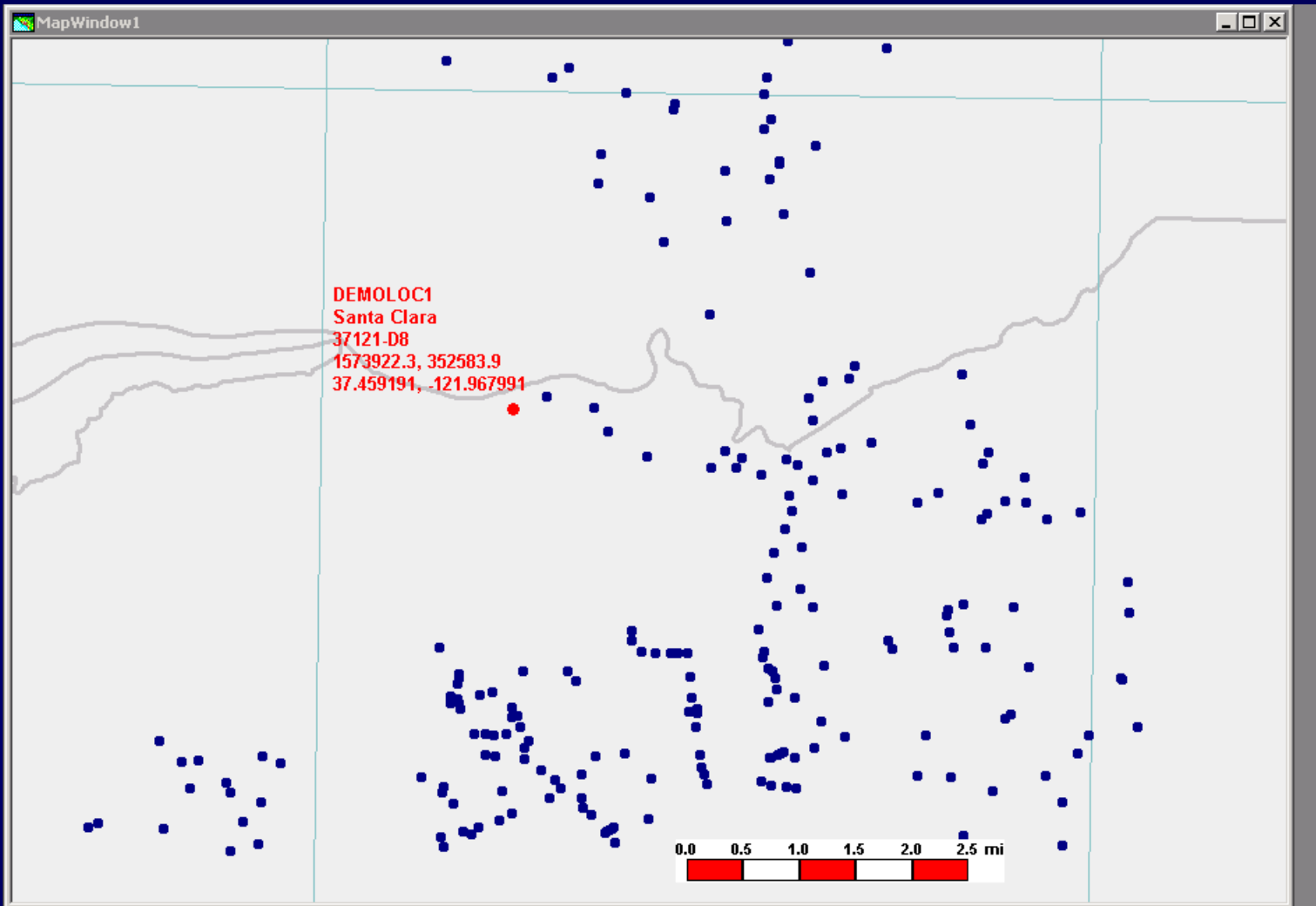
## Business rules prevent corruption

```
Command Prompt - sqlplus doc_admin/doc_admin@oradb02

SQL> insert into sample_location (official_name,top_easting,top_northing)
  2  values ('DEMOLOC3',15739220.30, 352583.90);
insert into sample_location (official_name,top_easting,top_northing)
*
ERROR at line 1:
ORA-20000: Demo business rule: sample location must be overay COUNTY coverage
ORA-06512: at "DOC_ADMIN.SAMP_LOC_TRIG", line 129
ORA-04088: error during execution of trigger 'DOC_ADMIN.SAMP_LOC_TRIG'

SQL> _
```

Again, derive geometry from tabular input (regardless of application)

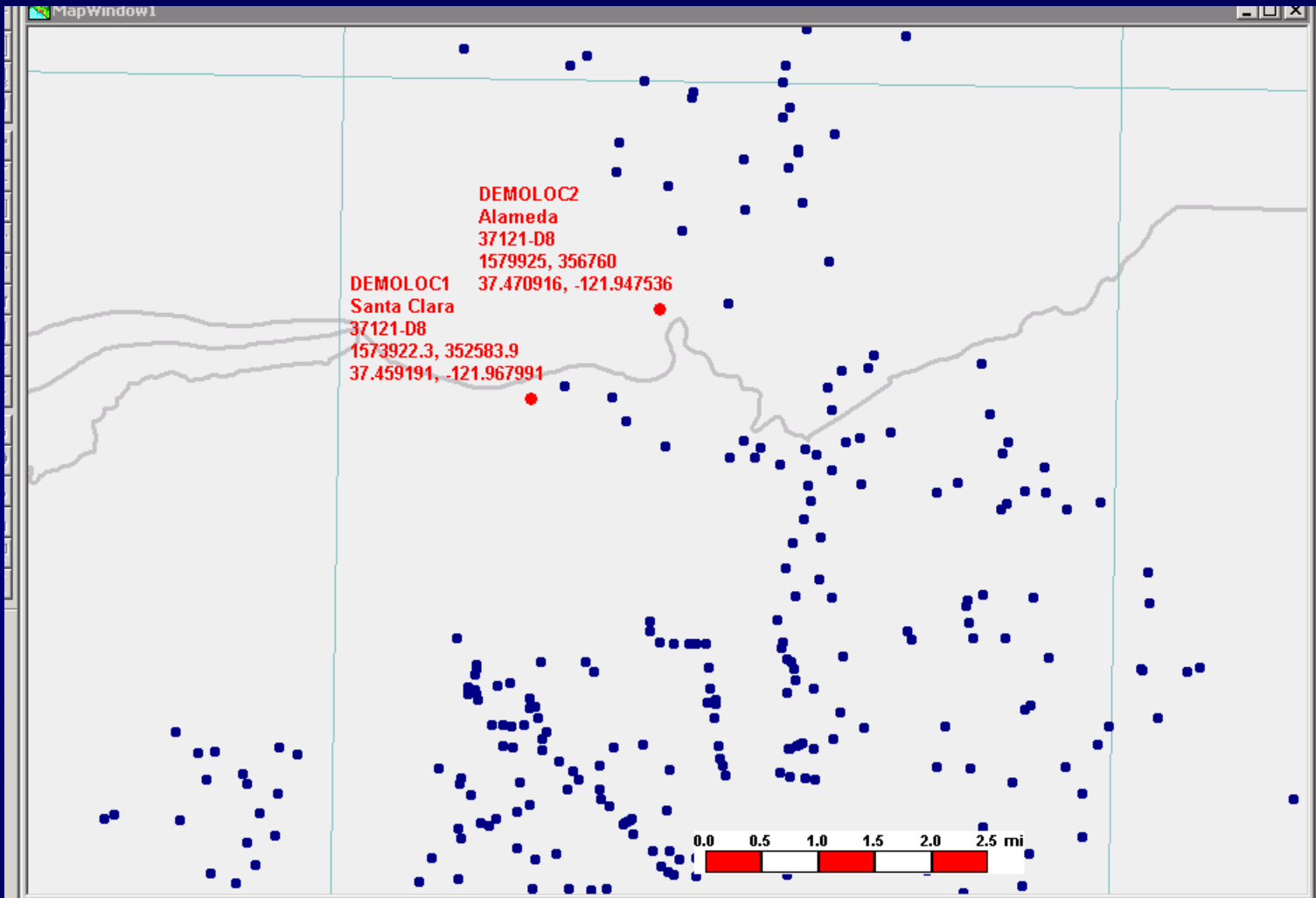


DataWindow1

DOC\_ADMIN.SAMPLE\_LOCATION

OFFICIAL_NAME	TOP_LONGITUDE	TOP_LATITUDE	TOP_EASTING	TOP_NORTHING	QUAD_CODE	CITY_CODE	COUNTY_CODE
000062_00071_37122D1	-122.01342	37.410584	1560451.67	335098.43	37122D1	2835	085
▶ DEMOLOC2		1579925	356760				

Record: 216 of 216



DataWindow1

DOC\_ADMIN.SAMPLE\_LOCATION

OFFICIAL_NAME	TOP_LONGITUDE	TOP_LATITUDE	TOP_EASTING	TOP_NORTHING	QUAD_CODE	COUNTY_CODE
000092_00083_3712	-121.9505	37.500077	1579229.32	367389.43	37121E8	001
DEMOLOC2	-121.947536	37.470916	1579925	356760	37121-D8	Alameda

Record: 8 of 249

Again, business rules enforced (regardless of application)

The screenshot shows a GIS application window titled "MapWindow1" displaying a map with numerous blue point markers. Two specific points are highlighted in red and labeled:

- DEMOLOC2**  
Alameda  
37121-D8  
1579925, 356760
- DEMOLOC1**  
Santa Clara  
37121-D8  
1573922.3, 37.459191,

A dialog box is overlaid on the map, displaying the following error message:

Could not insert a record in the database  
ORA-20000: Demo business rule: sample location must be ovr  
ORA-20000: Demo business rule: sample location must be ovr

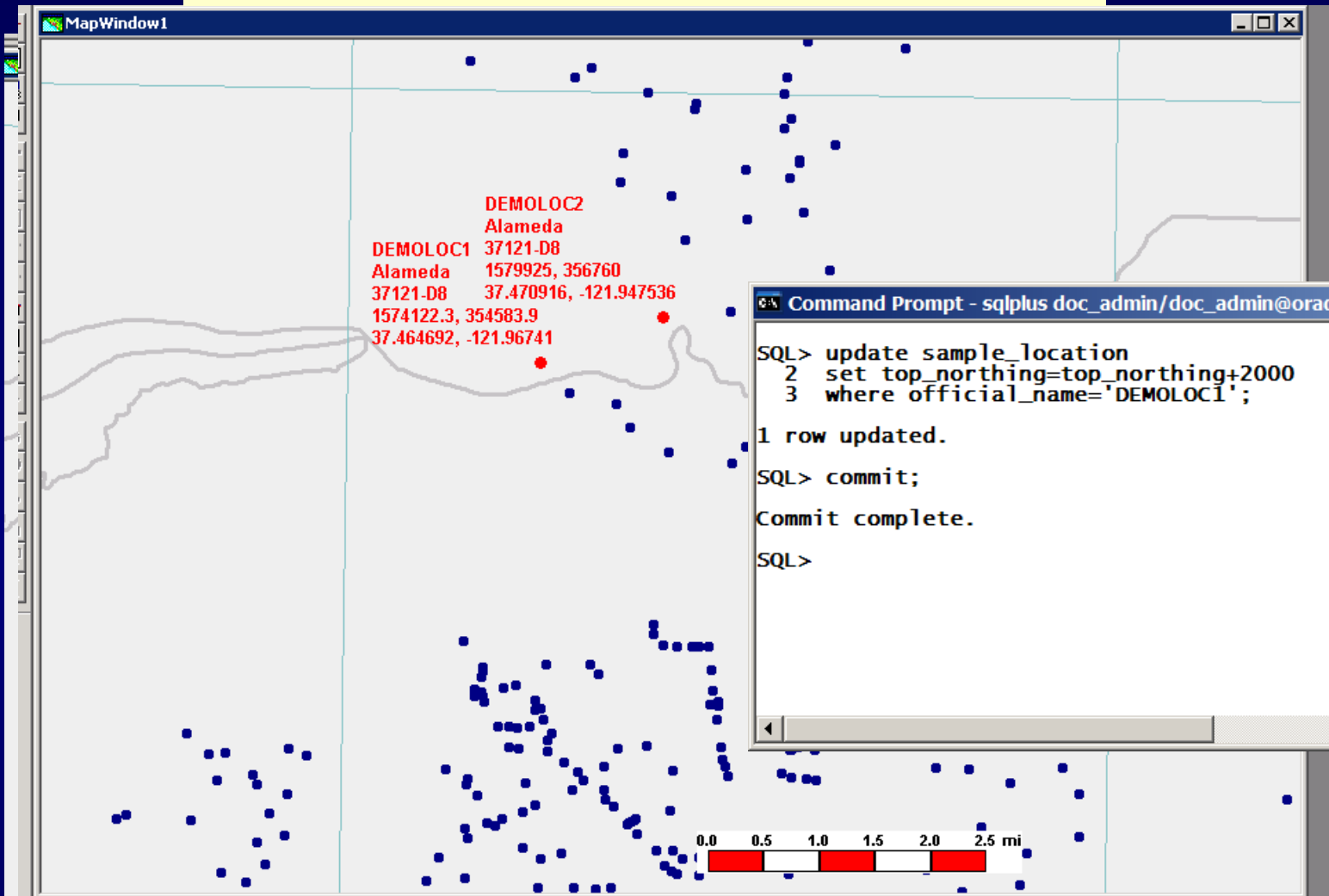
An "OK" button is visible at the bottom of the dialog box. A scale bar at the bottom of the map indicates distances from 0.0 to 2.5 miles.

Below the map is a "DataWindow1" window showing a table with the following data:

DOC_ADMIN.SAMPLE_LOCATION						
OFFICIAL_NAME	TOP_LONGITUDE	TOP_LATITUDE	TOP_EASTING	TOP_NORTHING	QUAD_CODE	COUNTY_CODE
▶ DEMOLOC3			15797550	356890		

At the bottom of the DataWindow1 window, it shows "Record: 249 of 249" and navigation controls.

# Update geometry based on tabular coordinate update



Command Prompt - sqlplus doc\_admin/doc\_admin@oradb02

```
SQL> update sample_location
  2 set top_northing=top_northing+2000
  3 where official_name='DEMOLOC1';

1 row updated.

SQL> commit;

Commit complete.

SQL>
```

DataWindow1

DOC\_ADMIN.SAMPLE\_LOCATION

OFFICIAL_NAME	TOP_LONGITUDE	TOP_LATITUDE	TOP_EASTING	TOP_NORTHING	QUAD_CODE	COUNTY_CODE
000092_00039_3712	-121.979629	37.503921	1570802.2	368921.14	37121E8	001
DEMOLOC1	-121.96741	37.464692	1574122.3	354583.9	37121-D8	Alameda

Record: 1 of 249

**FARALLON**  
GEOGRAPHICS INC.

Spatial Information Solutions

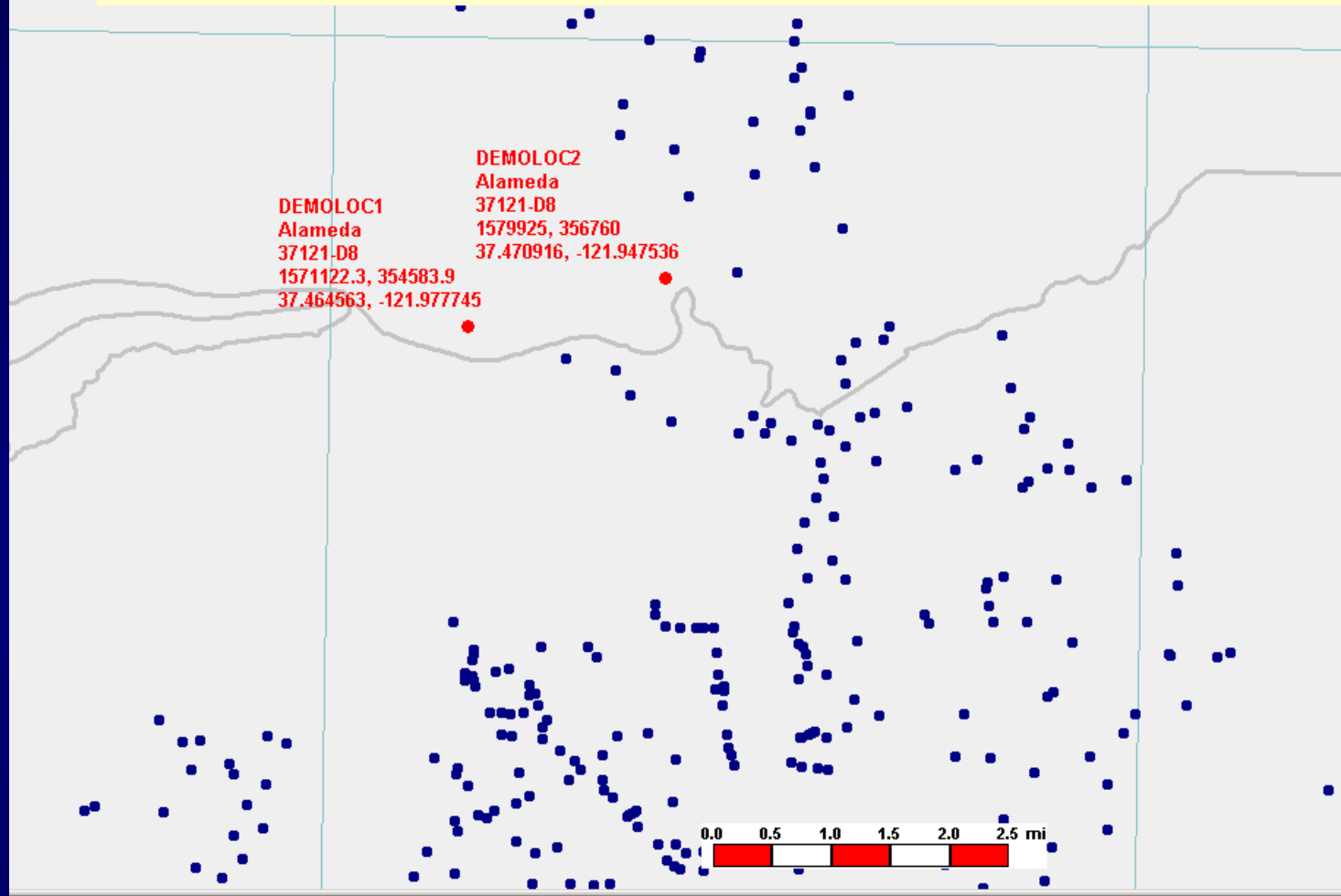
## Business rules enforced

```
Command Prompt - sqlplus doc_admin/doc_admin@oradb02

SQL> update sample_location
      2 set top_easting=top_northing+2000
      3 where official_name='DEMOLOC1';
update sample_location
*
ERROR at line 1:
ORA-20000: Demo business rule: sample location must be overay COUNTY coverage
ORA-06512: at "DOC_ADMIN.SAMP_LOC_TRIG", line 129
ORA-04088: error during execution of trigger 'DOC_ADMIN.SAMP_LOC_TRIG'

SQL>
```

Update geometry based on tabular coordinate update (regardless of application)



DataWindow1

DOC\_ADMIN.SAMPLE\_LOCATION

OFFICIAL_NAME	TOP_LONGITUDE	TOP_LATITUDE	TOP_EASTING	TOP_NORTHING	QUAD_CODE	COUNTY_CODE
000092_00039_3712	-121.979629	37.503921	1570802.2	368921.14	37121E8	001
▶ DEMOLOC1	-121.977745	37.464563	1571122.3	354583.9	37121-D8	Alameda

Record: 2 of 249

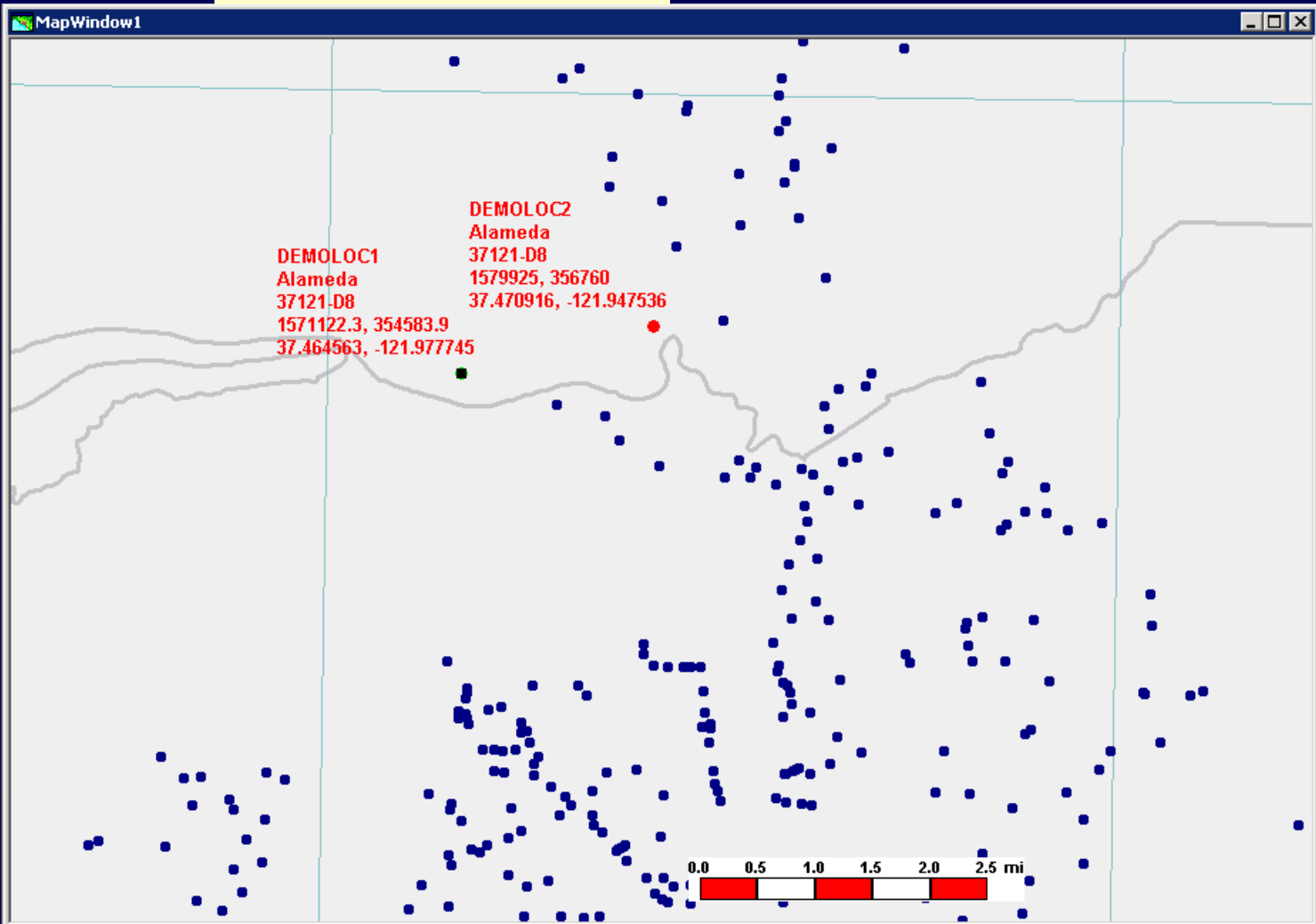
## Business rule preventing inconsistent location updates

```
Command Prompt - sqlplus doc_admin/doc_admin@oradb02

SQL> update sample_location
  2  set top_northing=top_northing+2000
  3      top_latitude=top_latitude+.000001
  4  where official_name='DEMOLOC1';
update sample_location
*
ERROR at line 1:
ORA-20000: Only update 1 of geometry, e/n, lat/lon
ORA-06512: at "DOC_ADMIN.SAMP_LOC_TRIG", line 66
ORA-04088: error during execution of trigger 'DOC_ADMIN.SAMP_LOC_TRIG'

SQL> _
```

# Geometry update ...



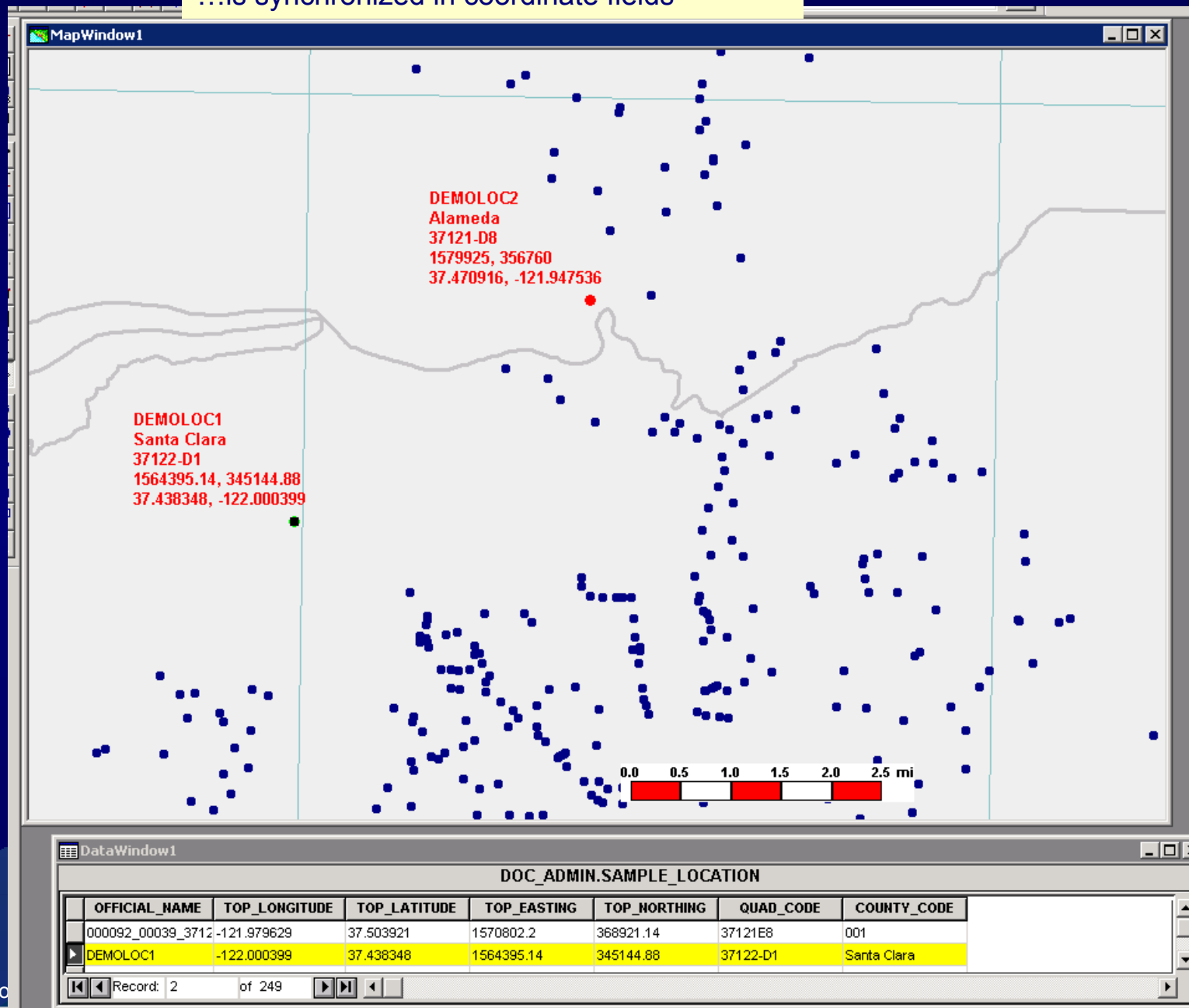
DataWindow1

DOC\_ADMIN.SAMPLE\_LOCATION

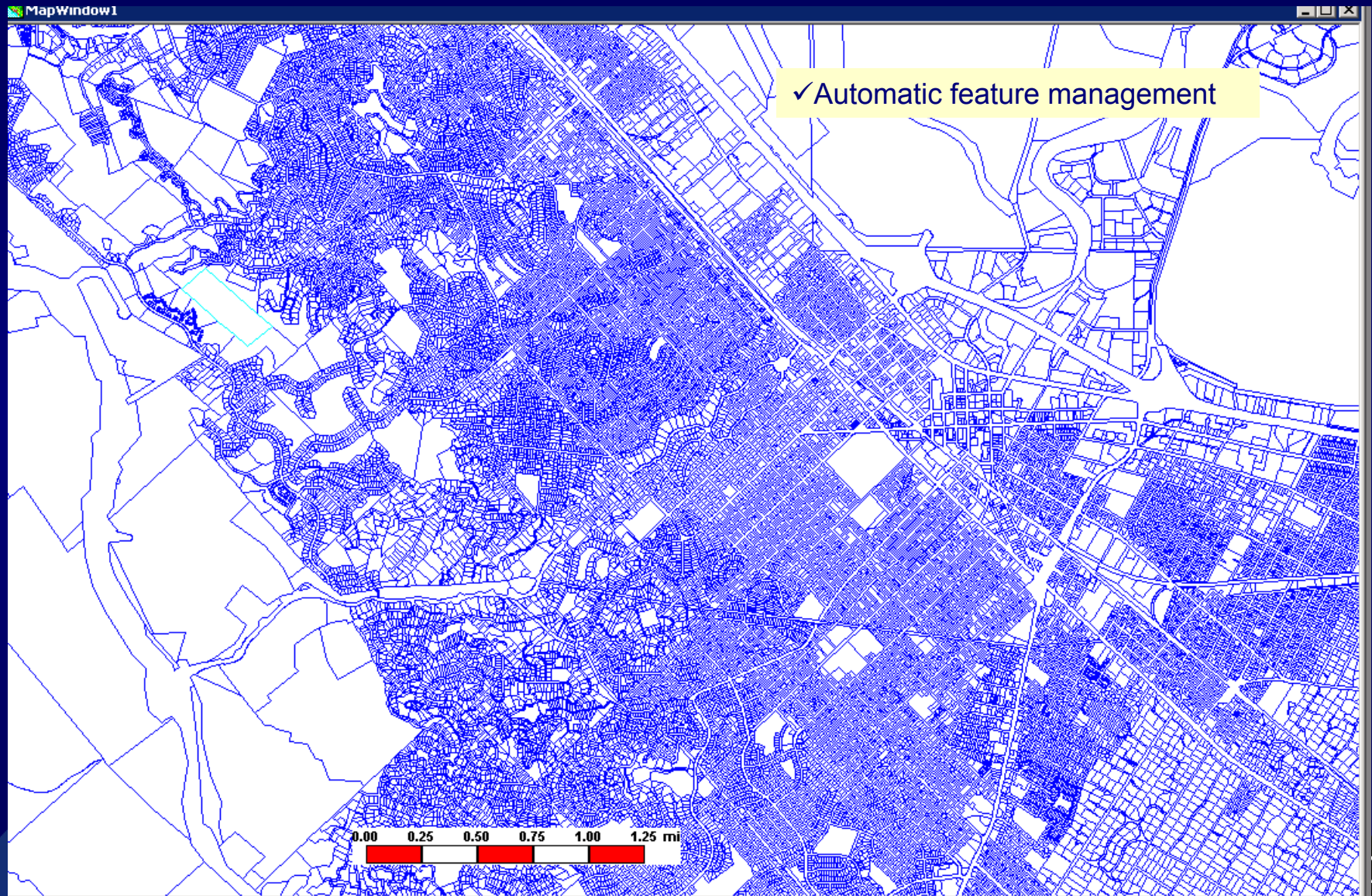
OFFICIAL_NAME	TOP_LONGITUDE	TOP_LATITUDE	TOP_EASTING	TOP_NORTHING	QUAD_CODE	COUNTY_CODE
000092_00039_3712	-121.979629	37.503921	1570802.2	368921.14	37121E8	001
DEMOLOC1	-121.977745	37.464563	1571122.3	354583.9	37121-D8	Alameda

Record: 2 of 249

...is synchronized in coordinate fields



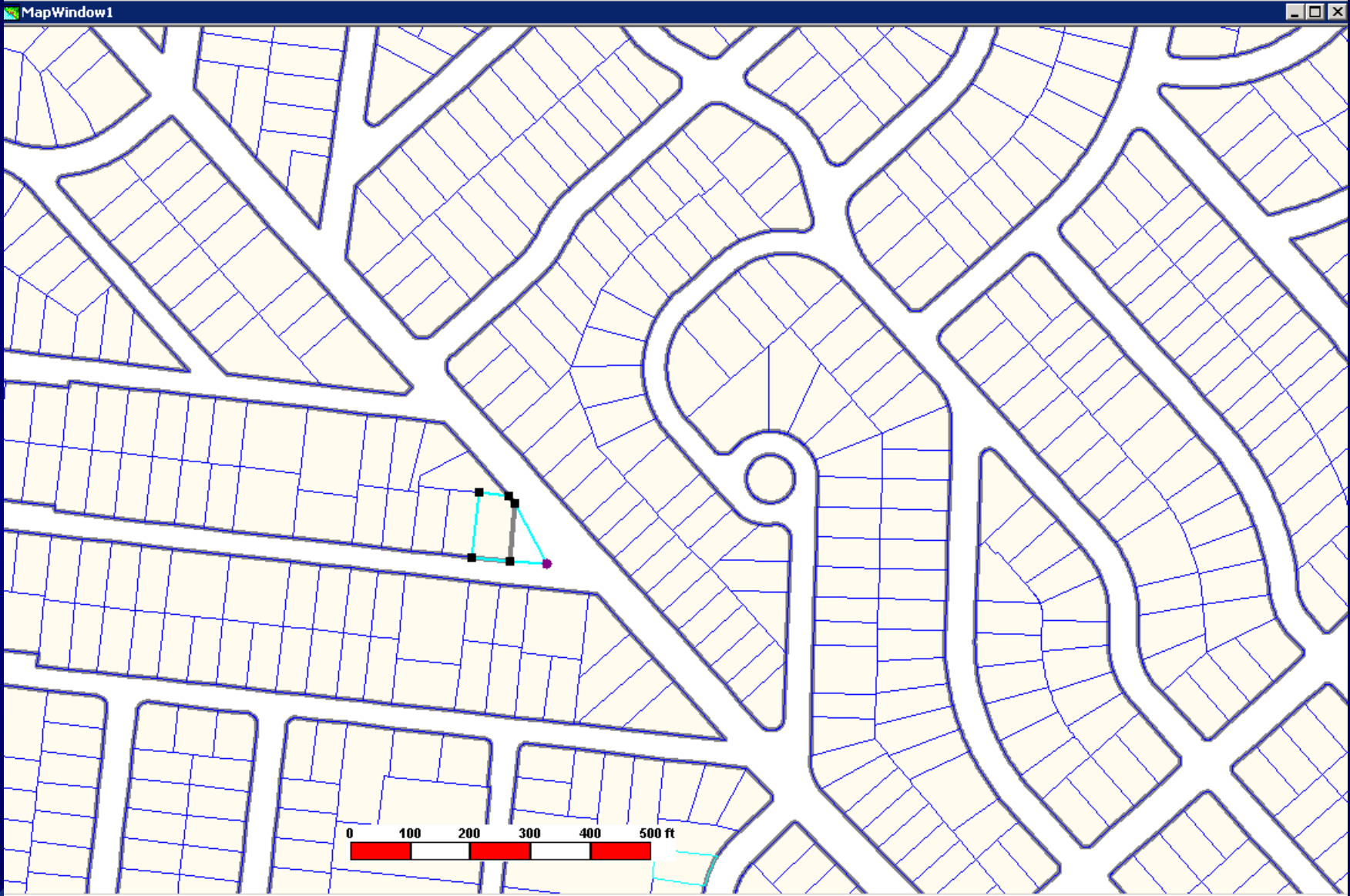
# Case study: San Mateo CO



# ROWBLOCK maintenance

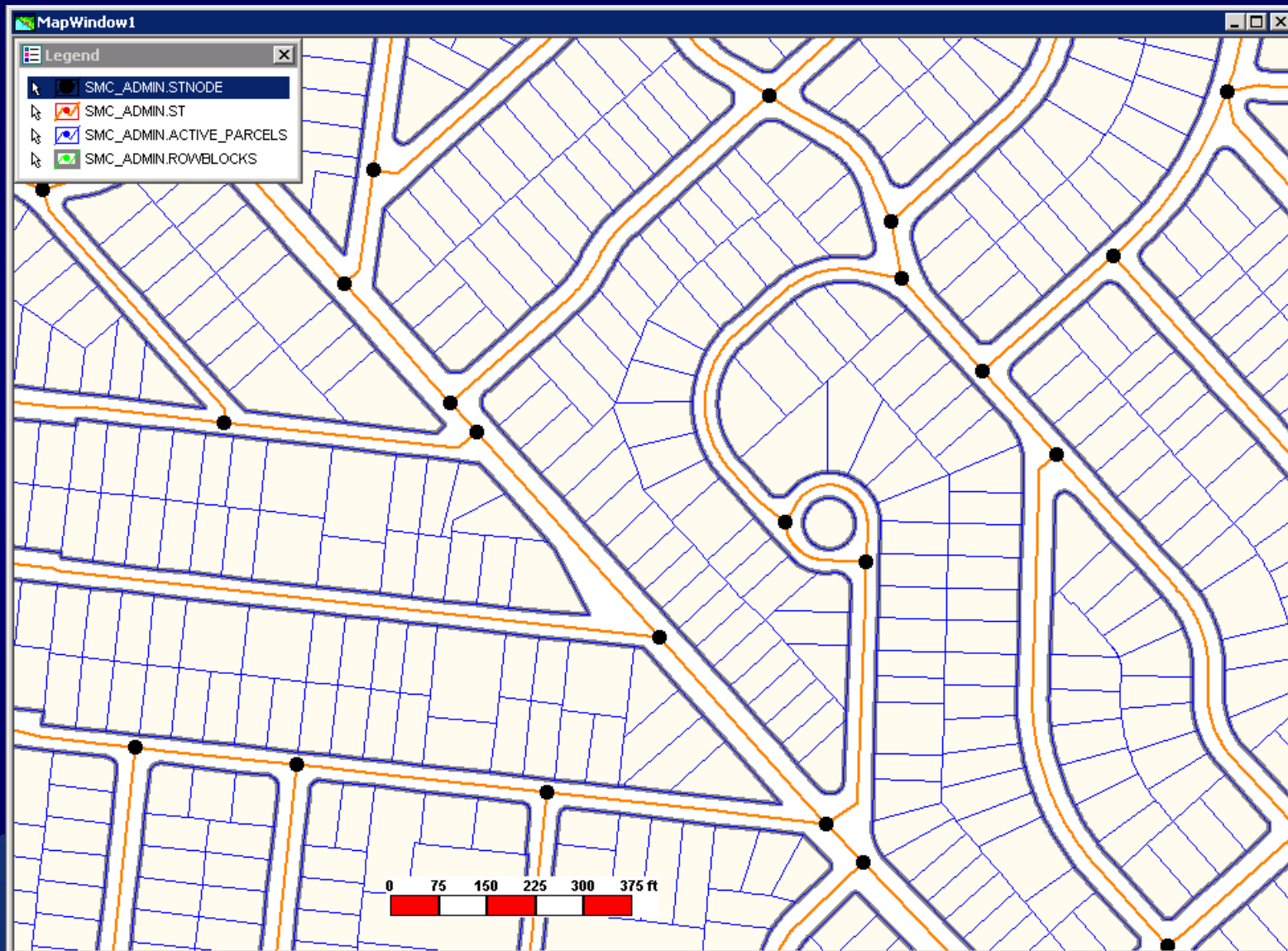


Leverage parcel maintenance...

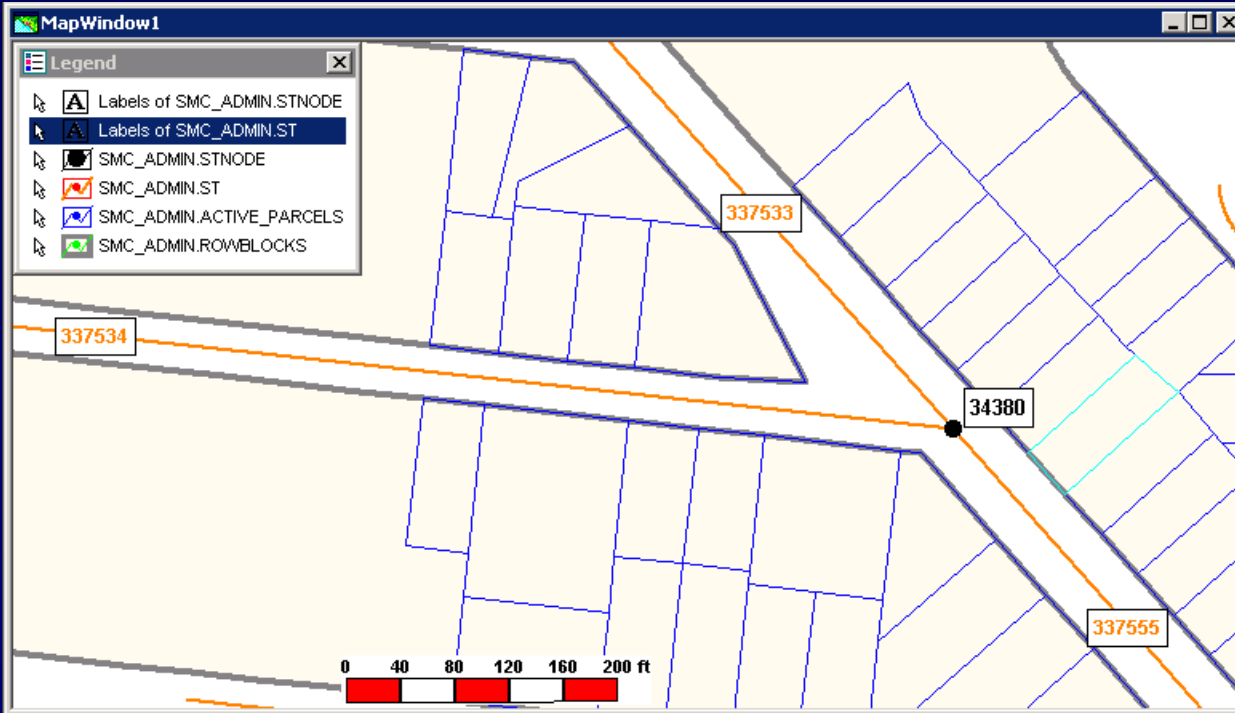


...for ROWBLOCK maintenance





## Leverage centerline maintenance...

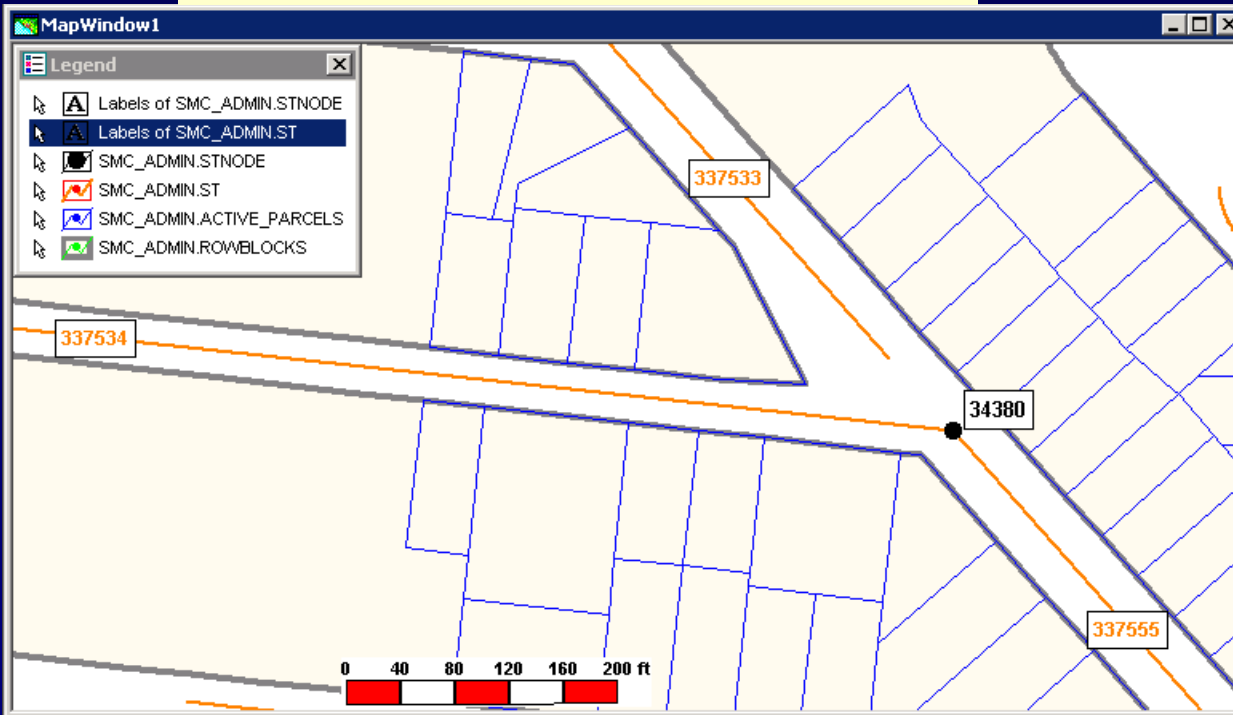


```
6% Command Prompt - sqlplus doc_admin/doc_admin@oradb02
Connected.
SQL> select * from stodelist where stnode_id=34380;

STNODE_ID  STREET_ID  AUTO_ID
-----
34380      337533    110576
34380      337534    110579
34380      337555    110642

SQL>
```

...for STNODE maintenance



Command Prompt - sqlplus doc\_admin/doc\_admin@oradb02

Connected.

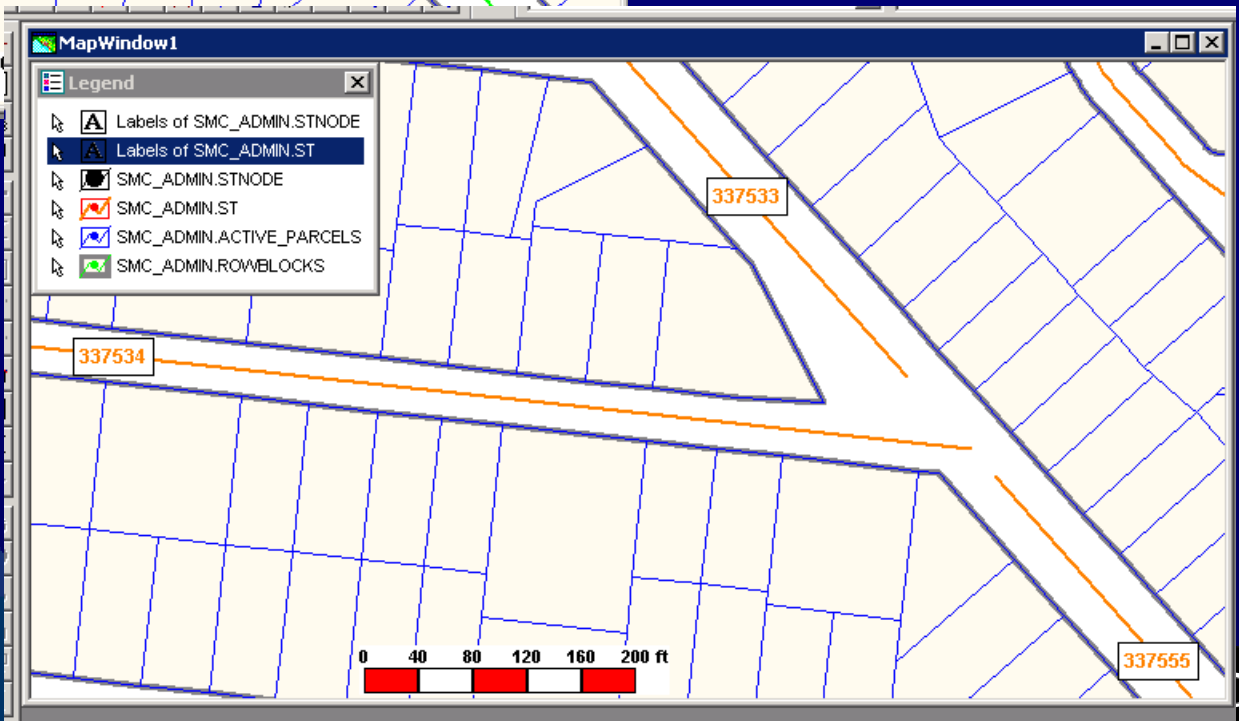
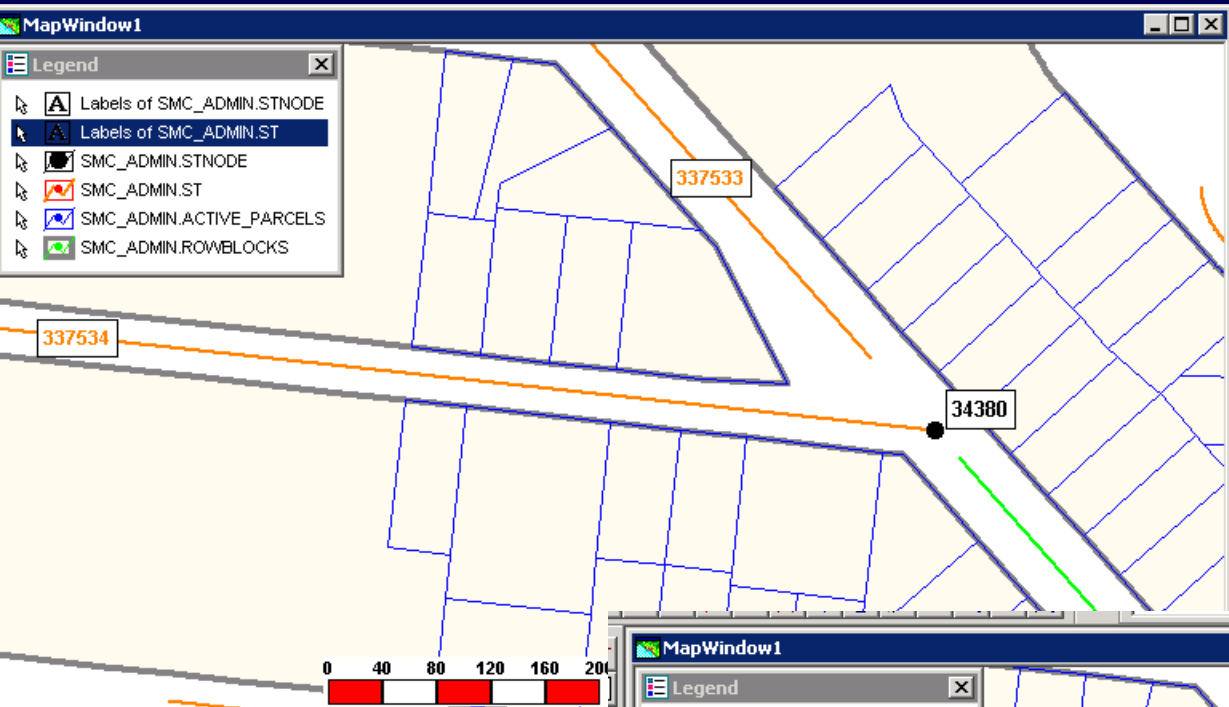
```
SQL> select * from stodelist where stnode_id=34380;
```

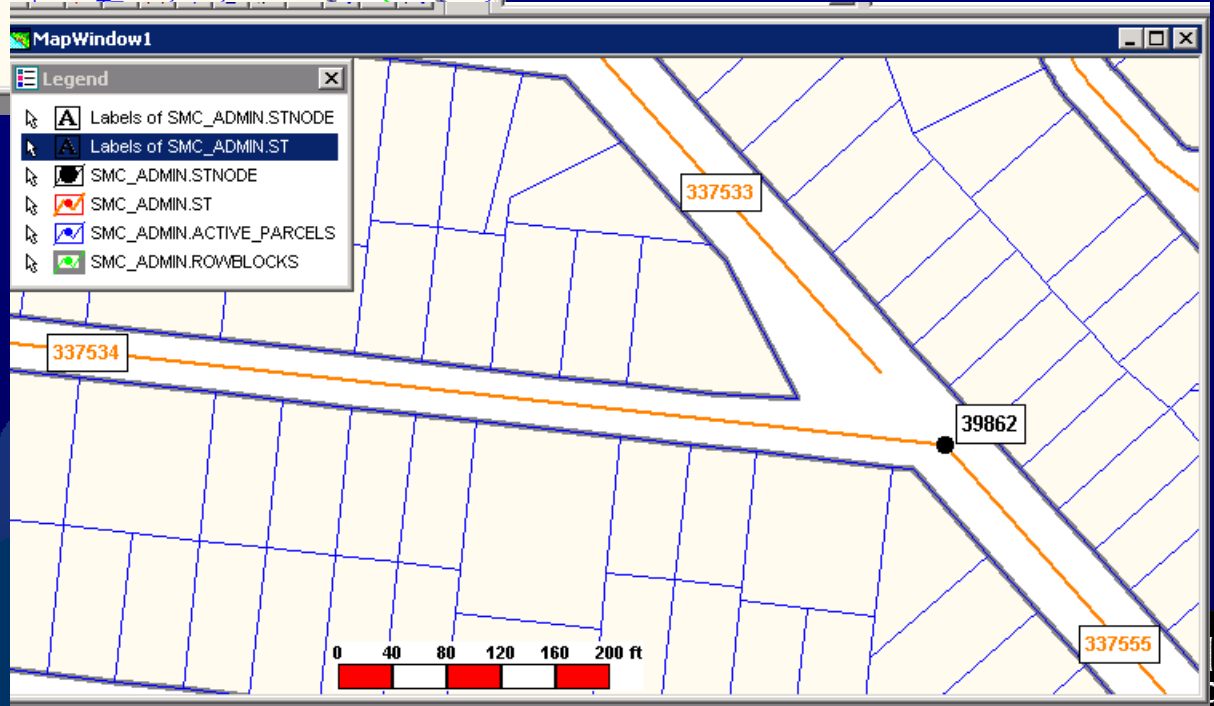
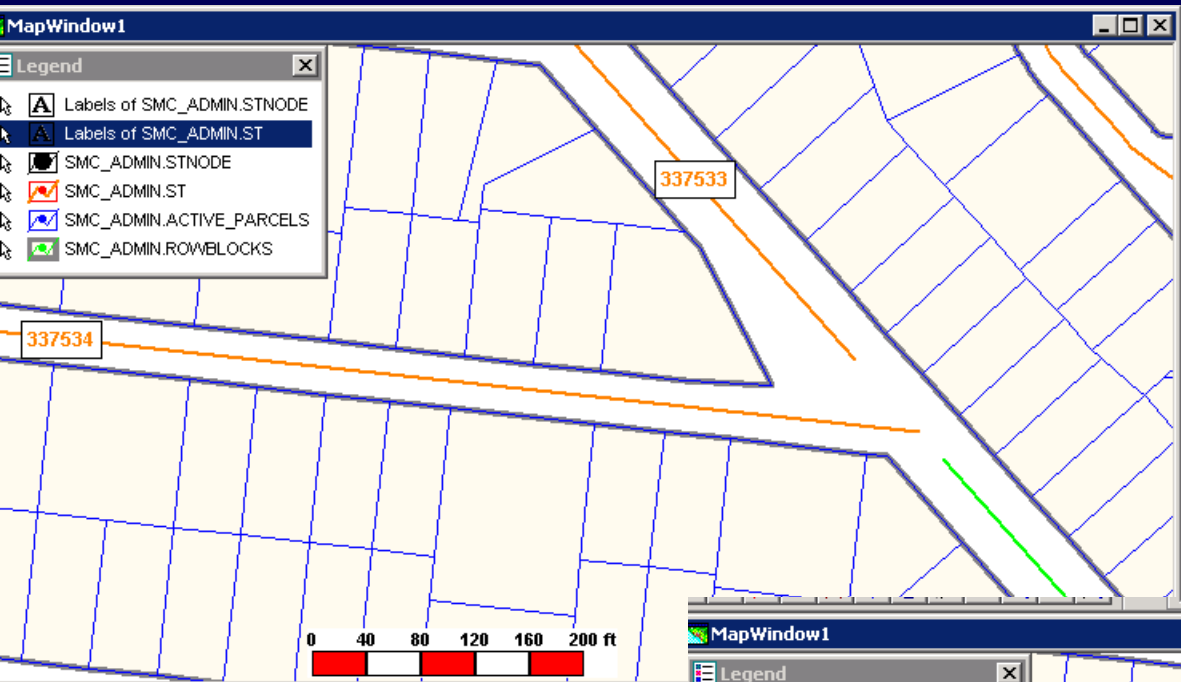
STNODE_ID	STREET_ID	AUTO_ID
34380	337533	110576
34380	337534	110579
34380	337555	110642

```
SQL> /
```

STNODE_ID	STREET_ID	AUTO_ID
34380	337534	110579
34380	337555	110642

```
SQL> _
```





# 9i Enhancements

- ◆ Spatial capability in every Oracle database
- ◆ “Spatial” product for high end functions
- ◆ “Locator” for basic functions
- ◆ Many performance and stability improvements
- ◆ Many new functions (i.e. utility functions, aggregate functions...)

# 10g Enhancements

- ◆ Topology
- ◆ GeoRaster
- ◆ Network
- ◆ Simplified spatial SQL
- ◆ Performance improvements
- ◆ Many utility subprograms

(i.e., SDO\_UTIL.TO\_GMLGEOMETRY)

Thank you for attending.

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