The PM Fine Database and Associated Visualization Tool

Steve Boone, E.H. Pechan & Associates, Inc.

BACKGROUND

1997 Presidential Directive establishes the $PM_{2.5}$ Network to:

- Identify problem areas
- Define diurnal patterns
- Determine spatial scale of high concentration areas
- Characterize $PM_{2.5}$ compositions

BACKGROUND

- The speciation database is a product of new regulatory initiatives for $PM_{2.5}$, ozone and regional haze
- Previously the PM sites and guidelines were for PM_{10}

BACKGROUND

- More than 50 PM speciation sites established since 1999 in rural and urban areas
- PM Speciation sampling usually consists of one 24 hour sample every three days (although some operate daily)

BACKGROUND

Chemical analysis of PM speciation samples:

- Improve understanding of emissions and dynamic atmospheric processes that influence particle formation and distribution
- Determine the sources of pollutants that contribute to elevated PM concentrations

BACKGROUND

Chemical analysis of PM speciation samples (*continued*):

- Develop useful methods for decision makers in formulating and comparing candidate control strategies
- Provide a reliable means for estimating the impacts of control strategy options developed for PM

DATABASES

- Interagency Monitoring Of Protected Visual Environments (IMPROVE)
  - Rural
  - *vista.cira.colostate.edu/improve*
- Speciation Trends Network (STN)
  - Urban
  - Contained in EPA's Air Quality System (AQS)

DATA VALIDATION

Ratings

- Valid
- Valid, but suspect
- Invalid

DATA VALIDATION

Levels

- I Performed in laboratory
  - Flagging suspect data
  - Validating data entry
  - Elimination of readings from malfunctioning equipment
  - Incorporation of data from backup monitors
  - Adjustment of measurements of quantifiable calibration or interference

DATA VALIDATION

Levels (*continued*)

- II Performed on database
  - Sum of parts must be less than or equal to the whole
  - Size segregated particle concentrations must be less than total particle concentrations
  - Sum of the major species must be less than 75% of measured mass
  - Analysis of same species by different methodologies should yield compatible results

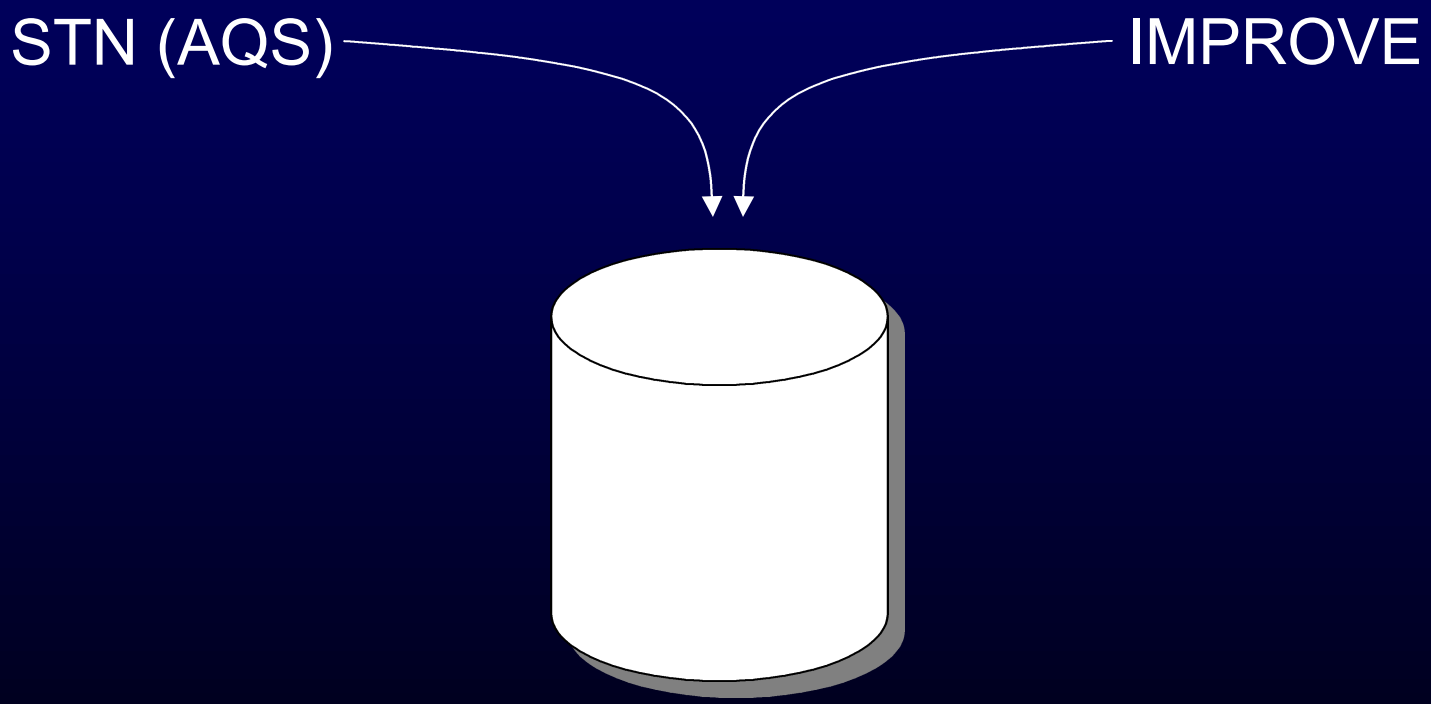
DATA VALIDATION

Both IMPROVE and STN are assumed to be at Data Validation Level II

PRIMARY FUNCTIONALITY

- Combined database
- Temporal selection
- Geographical selection
- Data and graphs
- Base data updates

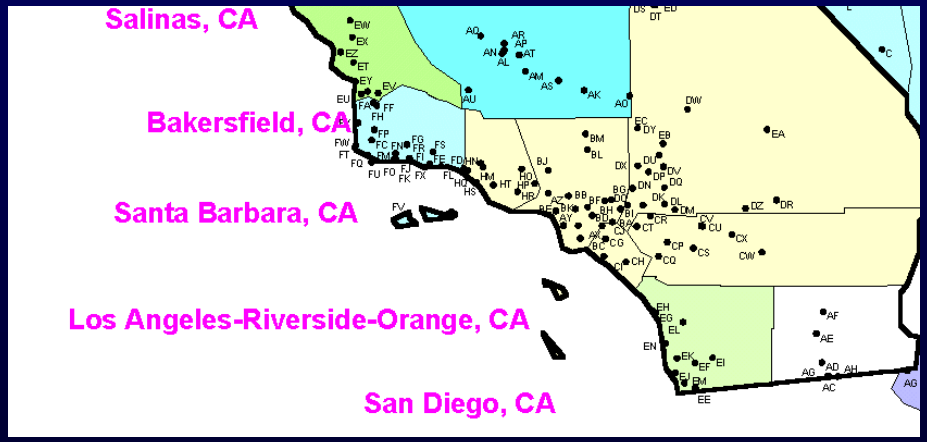
COMBINED DATABASE



TEMPORAL SELECTION

- Begin date
- End date
- By month
- Entire period

GEOGRAPHIC SELECTION

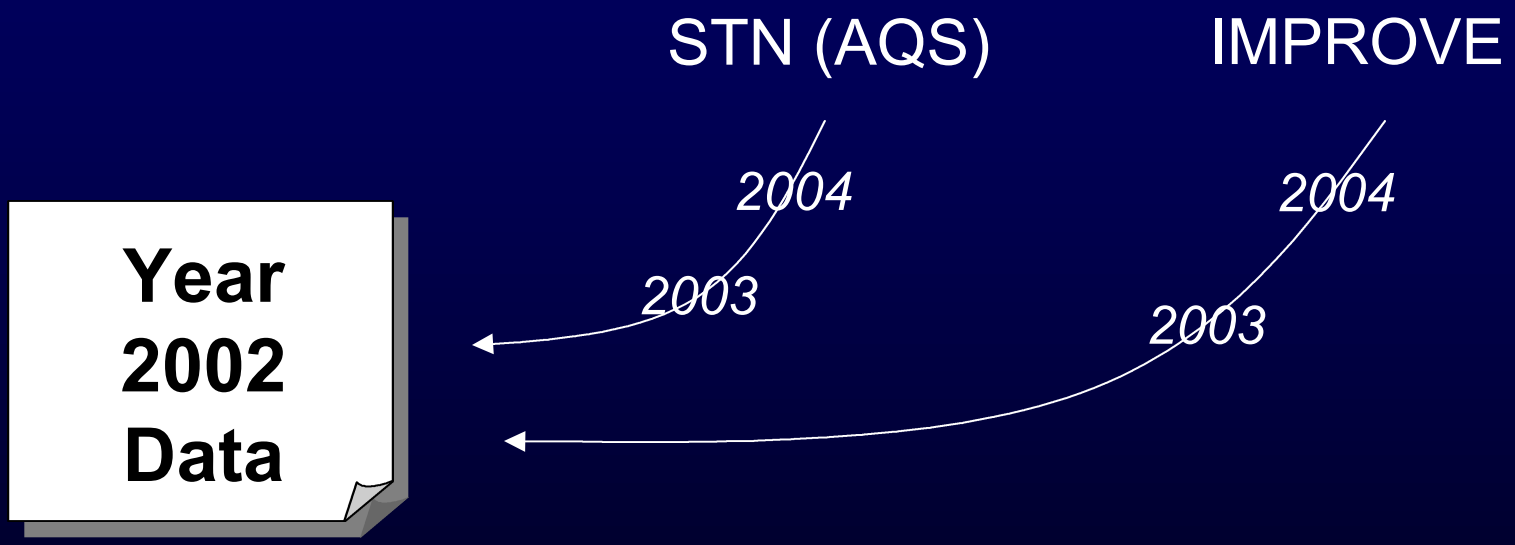


- State
- County
- Metropolitan Statistical Area (MSA)
- Health Effects Institute (HEI) Region

DATA AND GRAPHS

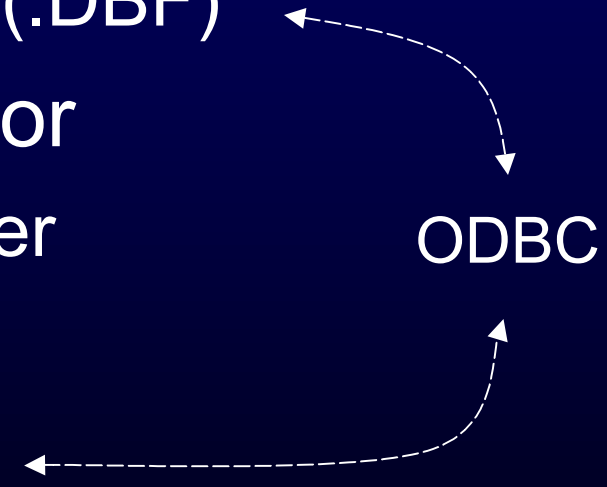
- Raw Data
- Minimum
- Maximum
- Average
- Number of Data Points
- Stacked Bar Graphs
- Pie Charts

BASE DATA UPDATES



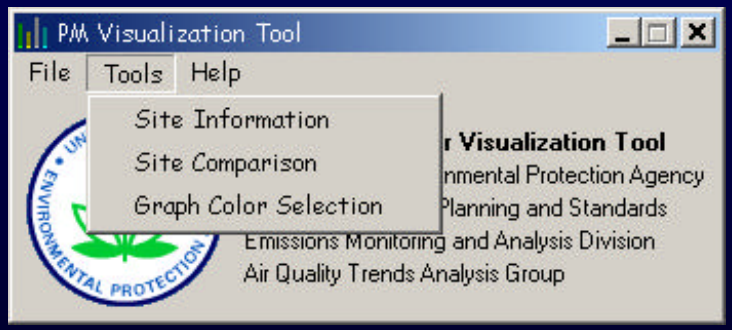
DESIGN PARAMETERS

- Database
  - Visual FoxPro (.DBF)
- Graph Generator
  - Graphics Server
- Application
  - Visual BASIC

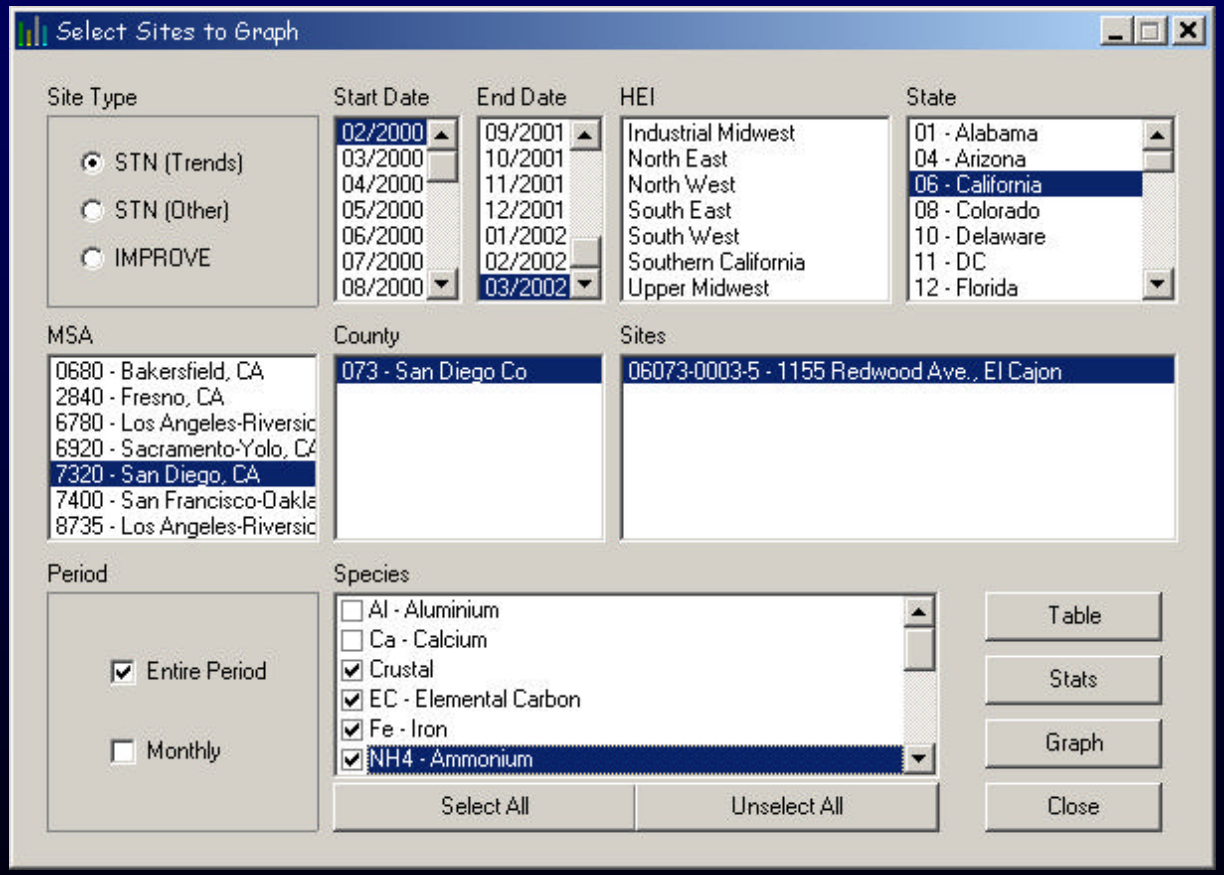


PROGRAM FLOW

Two main tools



SITE INFORMATION TOOL SELECTION SCREEN



SITE INFORMATION TOOL DATA TABLE

Site 06073-0003-5 Data

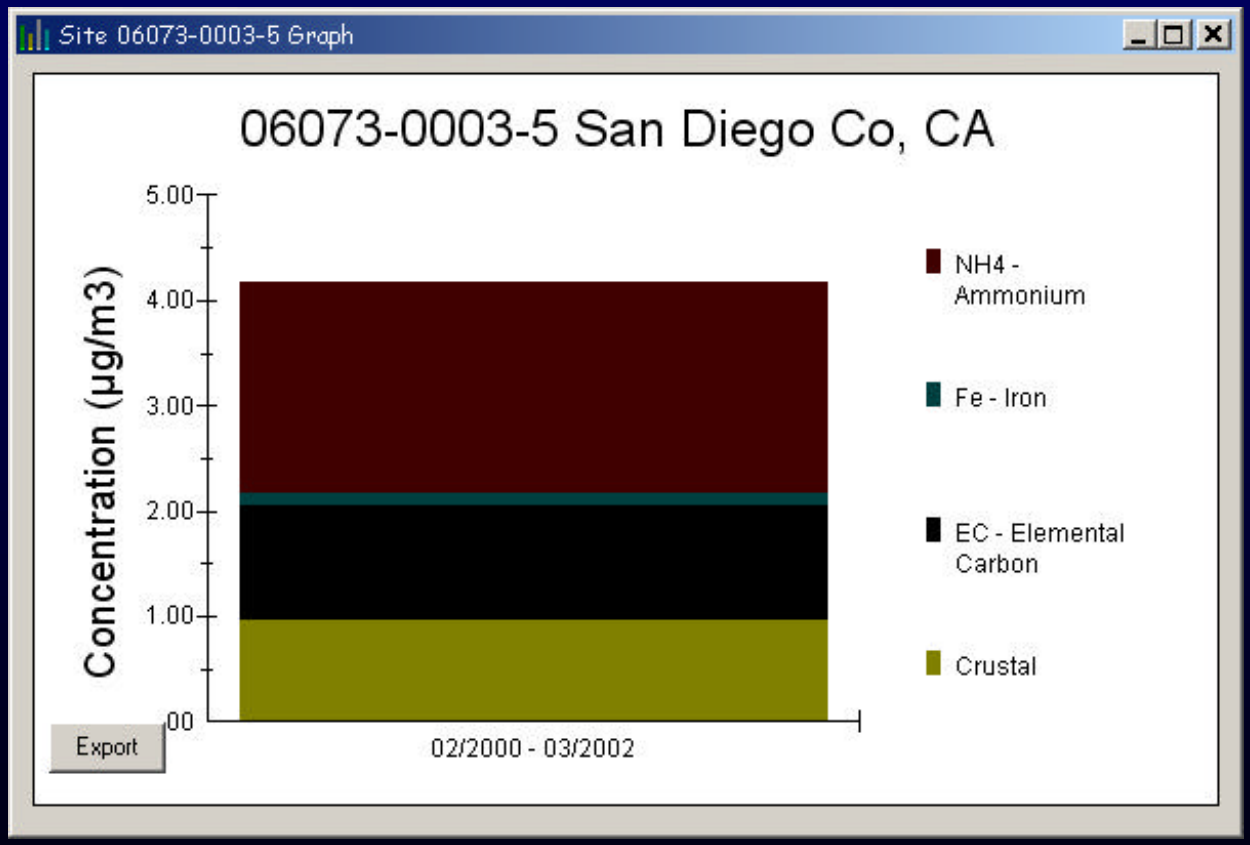
Site ID	POC	Site Type	Sampler	Latitude	Longitude	Lab	Date	Al	Ca	Crustal	EC	Fe
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/05/13	0.069	1.129	0.260	0.105	1.010
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/05/19	0.022	0.272	0.290	0.036	1.370
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/05/25	0.024	0.380	0.580	0.053	3.360
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/05/31	0.028	0.566	0.820	0.087	5.060
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/06/06	0.061	0.637	0.610	0.082	4.620
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/06/12	0.055	0.440	0.410	0.042	1.120
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/06/18	0.063	0.700	0.590	0.098	1.010
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/06/24	0.049	0.389	0.320	0.045	1.030
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/06/30	0.043	0.428	0.560	0.064	2.020
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/07/06	0.034	0.310	0.460	0.034	0.980
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/07/12	0.025	0.370	0.310	0.054	0.720
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/07/24	0.058	0.707	0.474	0.093	1.670
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/07/30	0.065	0.584	0.460	0.068	1.480
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/08/05	0.066	0.949	0.462	0.127	2.200
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/08/11	0.061	0.540	0.440	0.078	2.700
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/08/17	0.099	1.167	0.657	0.153	3.450
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/08/23	0.071	1.152	0.529	0.128	1.770
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/08/29	0.069	0.826	0.355	0.092	2.840
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/09/04	0.063	0.986	0.519	0.125	1.160
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2001/09/10	0.002	0.047	0.308	0.003	1.940

SITE INFORMATION TOOL STATISTICS TABLE

Site 06073-0003-5 Stats

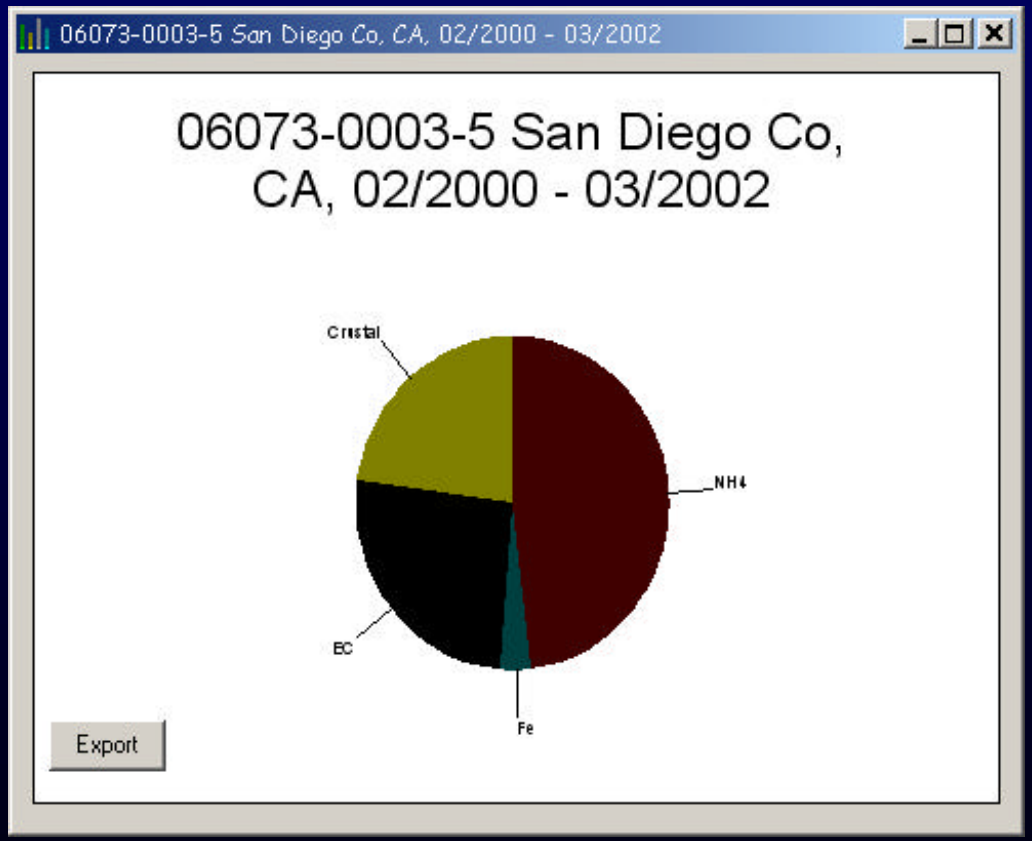
SiteID	Entire Period	Data Points	Crustal Min	Crustal Avg	Crustal Max	EC Min	EC Avg	EC Max
06073-0003-5	02/2000 - 03/2002	64	0.047	0.957	2.806	0.260	1.083	3.450

SITE INFORMATION TOOL
STACKED BAR GRAPH



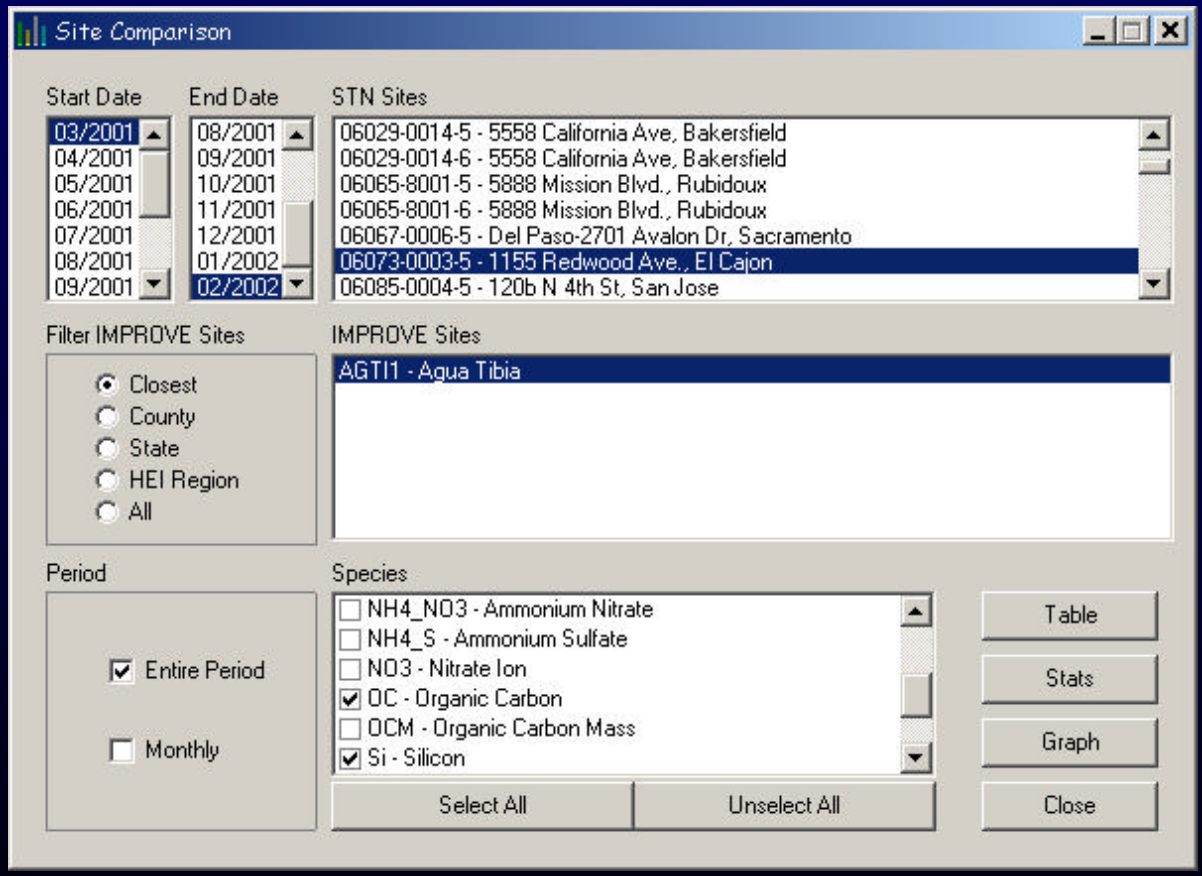
PECHAN

SITE INFORMATION TOOL
PIE CHART



PECHAN

SITE COMPARISON TOOL SELECTION SCREEN



PECHAN

SITE COMPARISON TOOL DATA TABLE

Site 06073-0003-5, AGTI1 Comparison Data

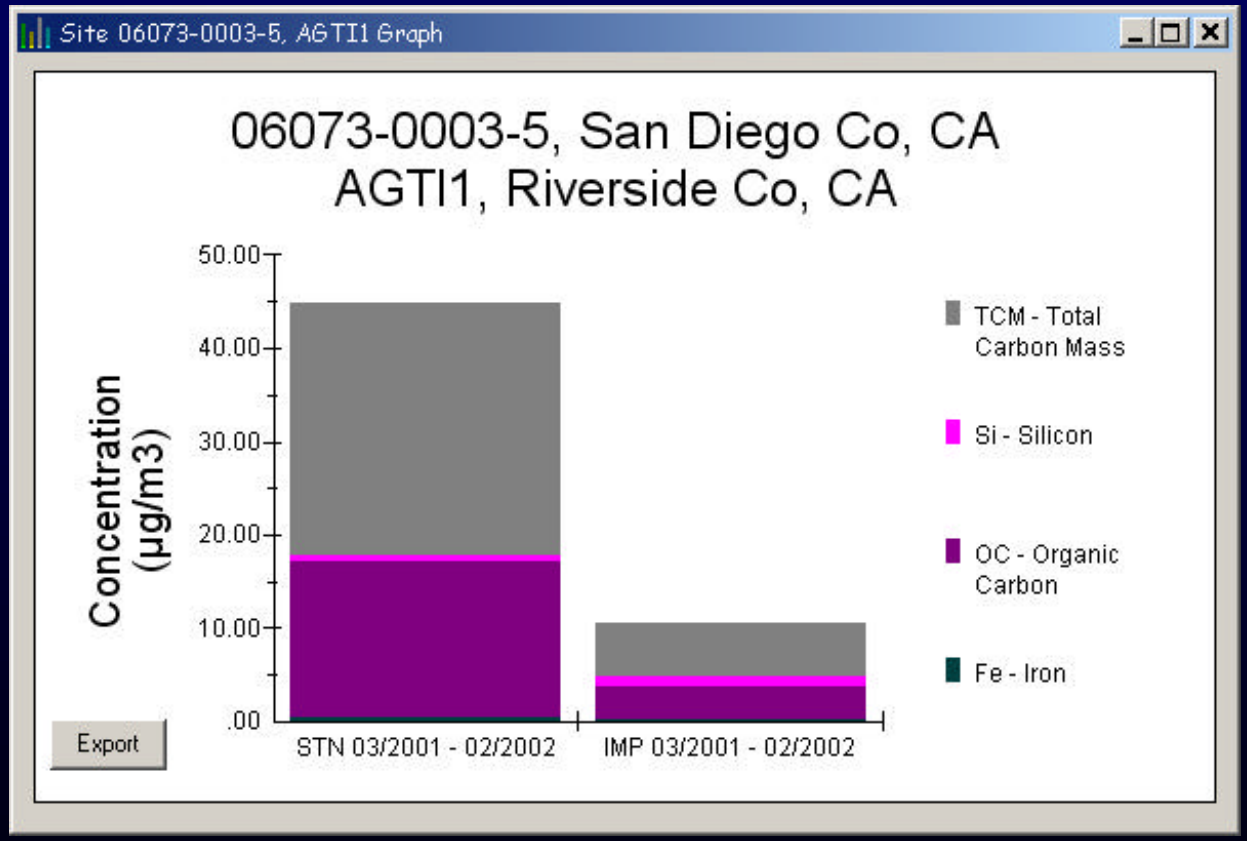
Site ID	POC	Site Type	Sampler	Latitude	Longitude	Lab	Date	Al	Ca	Crustal	EC	Fe
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2002/01/29	0.009	0.182	0.880	0.035	0.180
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2002/02/01	0.067	1.132	2.760	0.203	1.050
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2002/02/07	0.090	1.183	1.500	0.210	4.750
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2002/02/10	0.118	1.722	0.910	0.177	0.130
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2002/02/13	0.113	1.817	1.150	0.245	2.350
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2002/02/16	0.037	0.613	0.570	0.085	5.090
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2002/02/22	0.109	1.774	1.170	0.290	0.080
06073-0003-5	5	TRENDS	SASS	32.7914	-116.942	RTI	2002/02/28	0.061	0.842	0.800	0.093	4.650
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/02	0.014	0.165	0.559	0.029	0.000
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/05	0.016	0.149	0.493	0.019	0.000
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/08	0.012	0.151	0.619	0.028	0.000
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/11	0.030	0.131	0.124	0.010	0.000
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/14	0.000	0.000	0.000	0.000	0.000
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/17	0.000	0.000	0.000	0.000	0.000
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/20	0.000	0.000	0.000	0.000	0.000
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/23	0.000	0.000	0.761	0.000	0.000
AGTI1	-99	IMPROVE	IMPROVE	33.4636	-116.971	IM...	2001/03/26	0.024	0.252	0.497	0.031	0.000

SITE COMPARISON TOOL STATISTICS TABLE

Site 06073-0003-5, AGTI1 Stats

SiteID	Period	Data Points	Fe Min	Fe Avg	Fe Max	OC Min	OC Avg	OC Max	Si Min
delta (06073-0003-5 - AGTI1)	01/03/2	...	0.003	0.086	0.108	2.360	5.679	13.388	0.009
06073-0003-5	03/2001 - 02/2002	61	0.003	0.132	0.348	2.360	6.860	16.900	0.009
AGTI1	03/2001 - 02/2002	122	0.000	0.046	0.240	0.000	1.180	3.512	0.000

SITE COMPARISON TOOL STACKED BAR GRAPH



NEXT STEPS

- Initial release imminent
- Possible enhancements
  - Allow increased user control on graphics
  - Prove preset species combinations
  - Incorporating additional graph types
  - Allowing for multiple temporal periods in single analysis
  - Adding a GIS front end for geographical selections and on the back end to display analysis results
  - Web enable

PECHAN

PM FINE DATABASE AND ASSOCIATED VISUALIZATION TOOL

End of presentation