# Designing a Web-Based Geotechnical Database for the St. Louis Metro Area

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# COSMOS

- Consortium of Organizations for Strong Motion Observation Systems
- Formed in Oakland, CA in Dec 1997
- Core Members are the USGS, CGS, USCOE, USBR, Puerto Rico Strong Motion Program, PG&E, Caltrans, MCEER-Buffalo, PEER-Berkeley, SCEC-Los Angeles, and the World Seismic Safety Initiative

# Purpose of this briefing

- Summarize what COSMOS has accomplished in CA, NV, OR and WA
- Summarize what kinds of geodata exists for the greater St Louis metro area
- Summarize what kind of architecture we might use to establish an *information gateway* for geo-professionals in the Midwestern USA

# Needs and Motivation

- Currently, there is no over-arching organization for geotech data in the St Louis Metro area
- In the next 5 years a state-of-the-art geotech database needs to be developed
- Need for easy access of existing geologic and geotechnical data useful for assessing potential site response and preparing seismic hazards maps of Midwestern USA
- Need for up-to-date information sharing
- Need for easy updating with new information

# Broader Motivation

- Geo-Professional Community
  - Want access to data in other organizations
    - Assist in design
  - Conduct research to advance the state-of-practice
    - Larger data sets
- Government Agencies
  - Need accurate geodata for regulatory review, facilities evaluation, hazard/risk assessment and research

# COSMOS used Electronic Surveys to Evaluate the Needs and Expectations of End Users

- The two primary goals of the survey were:

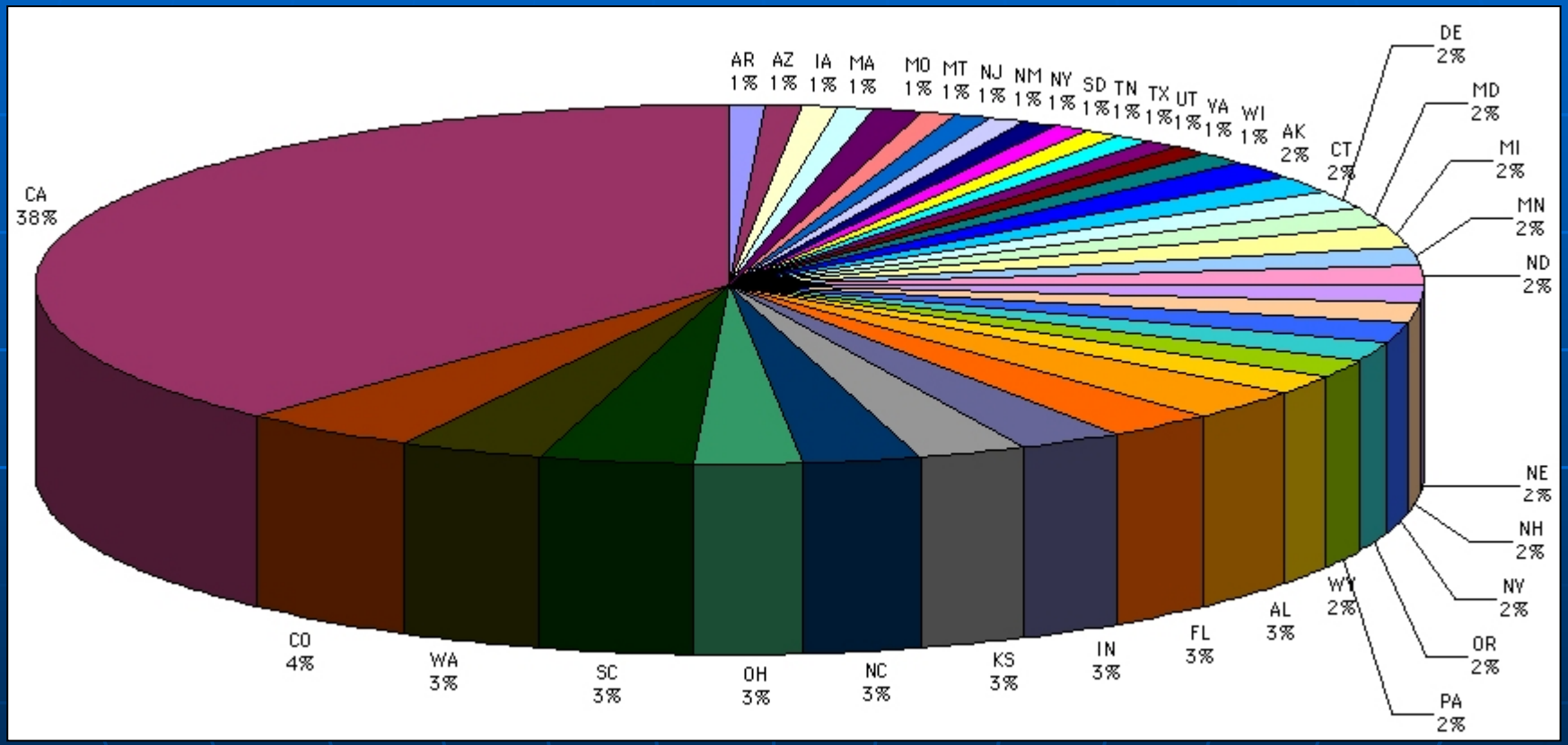
1) Establish a baseline of current practices

2) Identify desired functional requirements of a geotechnical information management system

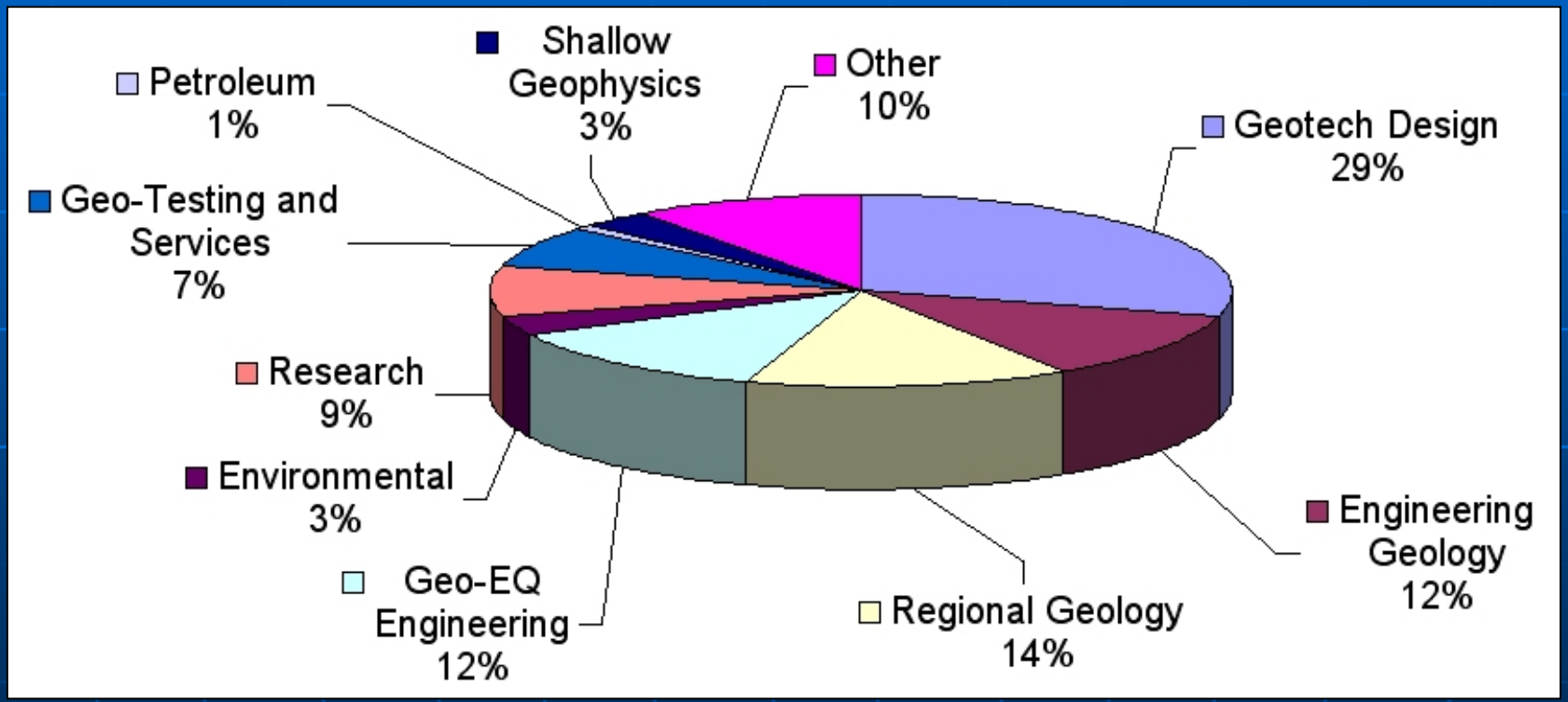
# Ascertaining the Needs of End Users

- Goal 1:
  * Users and providers of geotechnical data
  * Types of geotechnical data of interest
  * Lifecycle of the geotechnical data
  * Patterns of use
- Goal 2:
  * User interface
  * Method of access
  * Availability of data
  * Type and format of data

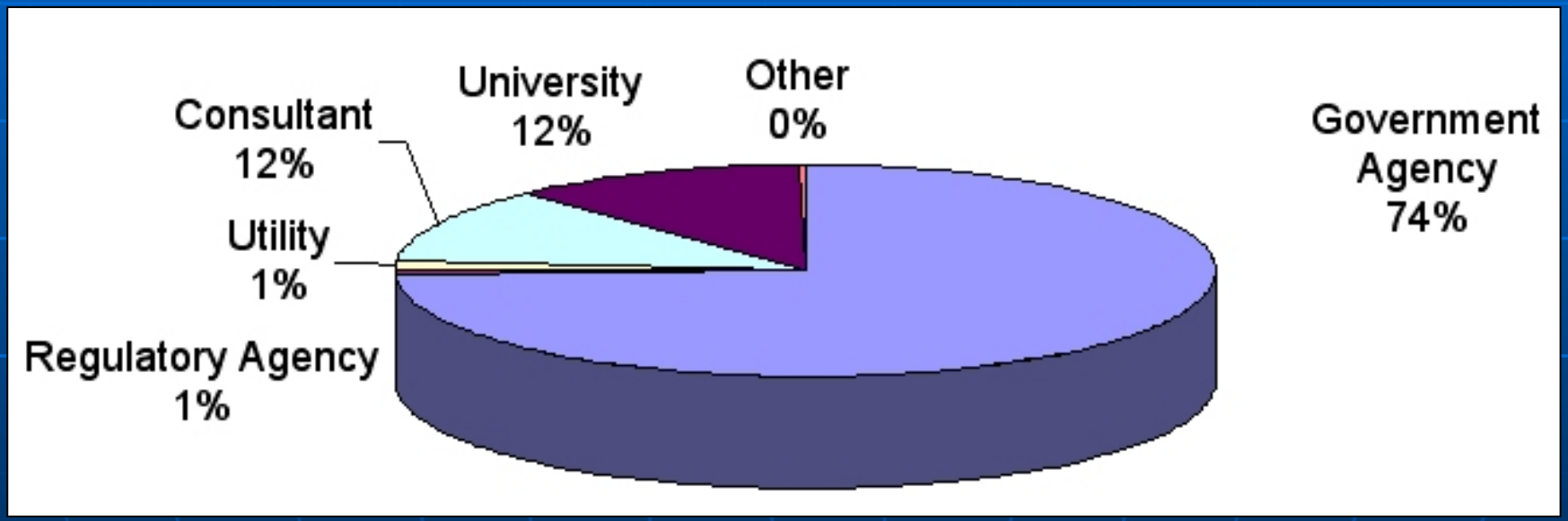
# COSMOS Survey Responses by State (2001)



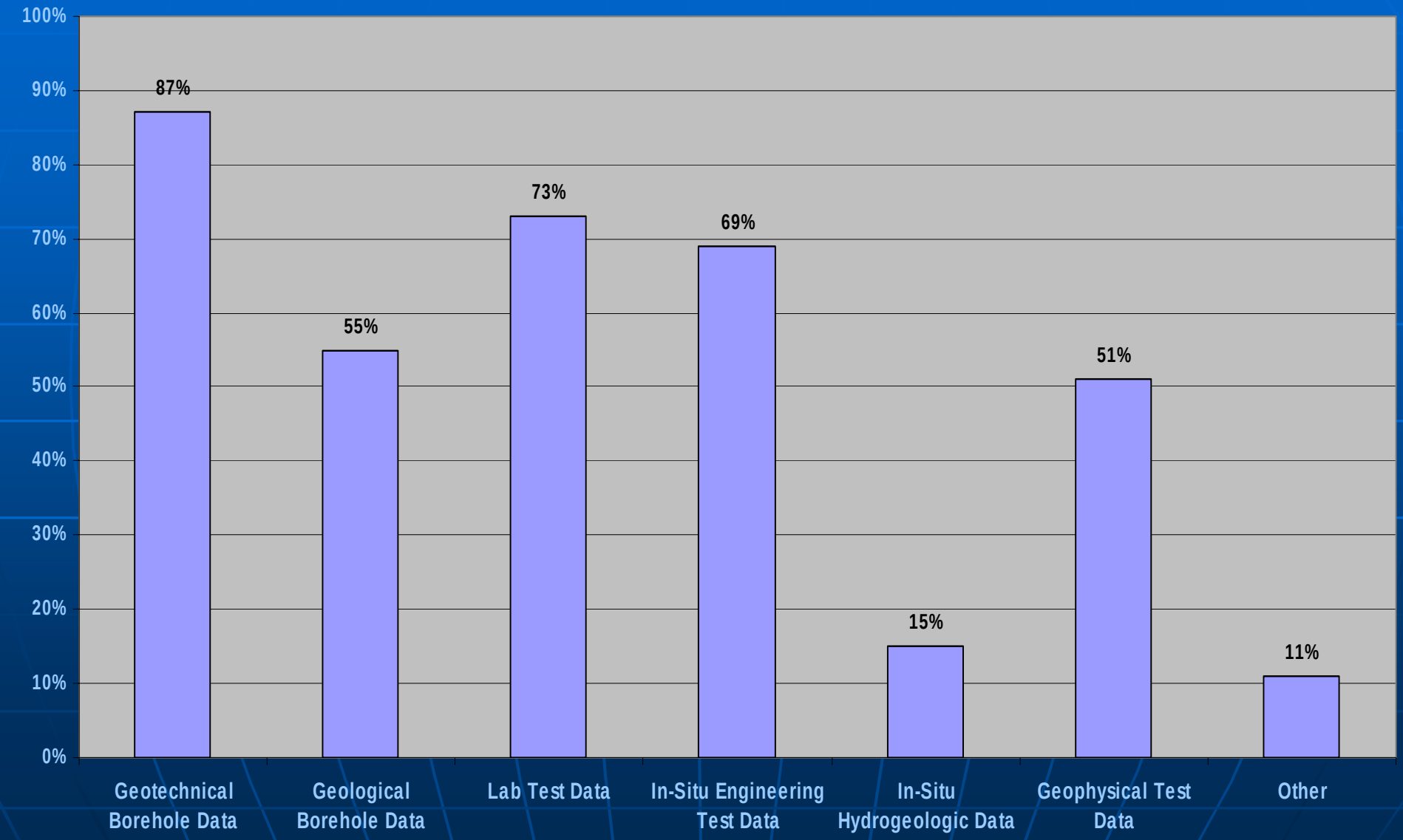
# Primary Areas of Practice of Survey Contributors



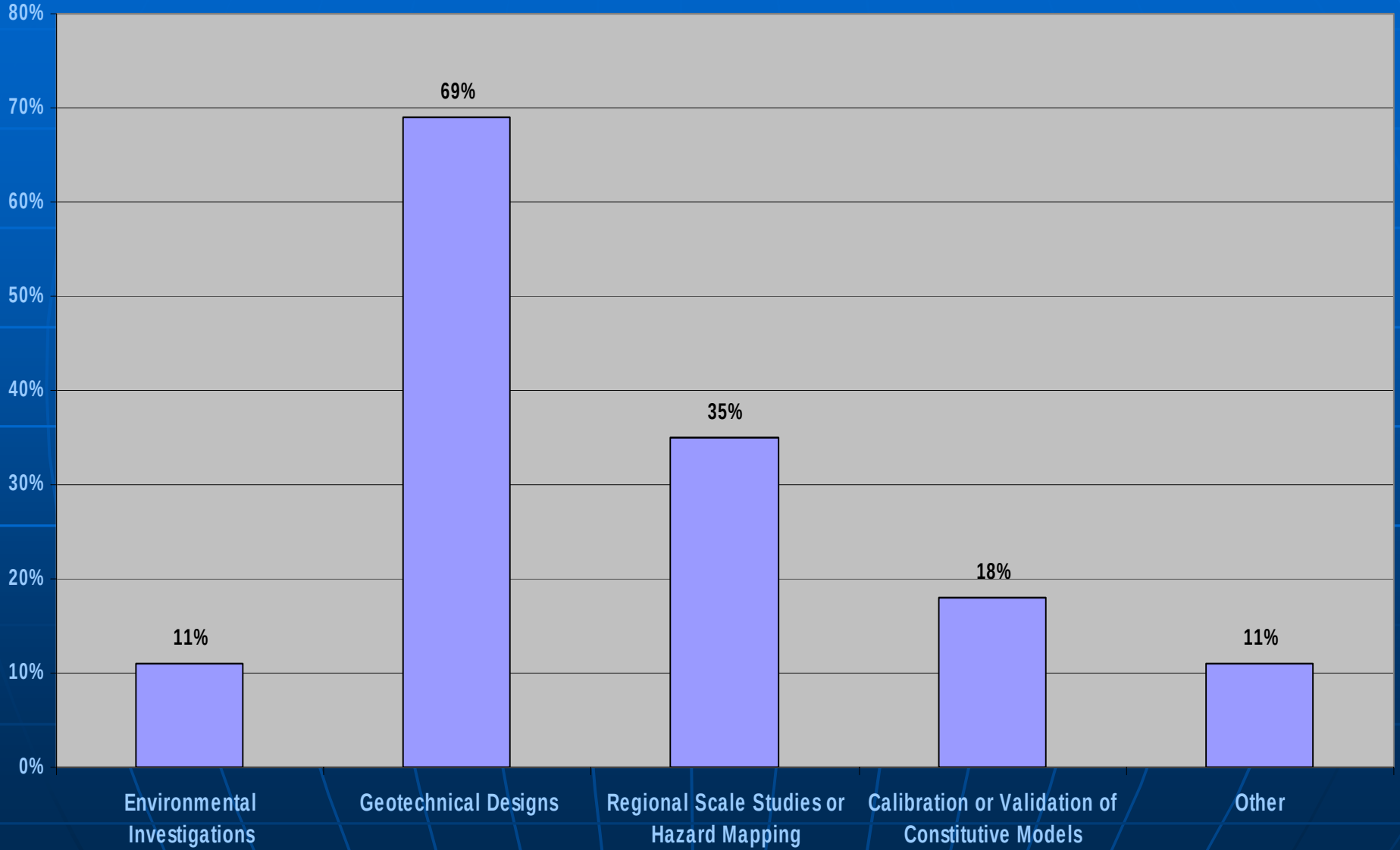
# Types of Organizations that Expressed Interested



# Data Routinely Used in the Work Place



# Main Uses of Geotechnical Data



# Virtual Database Tasks

**TASK 1:** Development of **User Scenarios** for the purpose of defining the functional requirements of the pilot web-based system.

**TASK 2:** Develop **data dictionary** and **formatting standards** for archiving and web dissemination of geotechnical data , review the draft standard in a workshop, and obtain consensus of the impacted geotechnical community for a standard dictionary.

**TASK 3:** Develop a **Pilot Virtual Geotechnical Data Center System** which can be expanded to incorporate a broad range of geotechnical data sets.

# The Web Database System

- **Partners become the "Information Gateway" Data Providers**
- **Data Dictionary & Standards**
- **Electronic Data Entry & Collection**
- **Data Warehousing**
- **Data Access**
- **Web-based Dissemination**

# Database Maintenance

- COSMOS is encouraging their partners to:
  - Put geodata and metadata into acceptable electronic format
  - Post their respective geodata on their own servers
  - Maintain quality control on geodata and metadata
  - Periodically update with new data as it becomes available

# Resolve Policy Issues

- Data ownership & maintenance
  - Individual organizations
  - Information gateway
  - Proper data attributes
- Access (and fees?)
- Liabilities?
- Quality ratings
- Establish MoU's
- COSMOS has dealt with these issues

# Facilitate Data Access and Sharing for St Louis Metro Area

- Access Data from Multiple Providers

USGS science for a changing world

Central United States Earthquake Consortium

MoDOT Missouri Department of Transportation

Illinois Department of Transportation

Geotechnical Consultant Engineering Firms

UMR University of Missouri-Rolla

Other Universities

# Scope of Data Dictionary

- Project description, borehole location, drilling methods, and tools
- Geotechnical logs of soils and geologic logs of rock with depth
- Lab test data
- In-situ test data
- Geophysical test data

# Major Issues with Standardization of Geodata

- Scope of standards
  - Reflect realistic needs of end users and providers.
  - Capture only the most relevant data.
- Use of standards
  - No need for all to adopt as an internal standards.
  - Standardize data exchange methods.

# The Plan

- Technical Approach
  - Define content
  - Identify architecture
  - Create data dictionary
- Establish Policies and/or MOUs for sharing of data
- Establish MOUs between partners for upkeep of the database

# Define Content of the Data Dictionary

- Identify users and providers.
- Define the content of the data dictionary.
  - Guided by user needs
  - Metadata to assess quality (data source, methods, calibrations, etc.)
  - Flexibility for growth

# ID Architecture

- System infrastructure
  - Physical network
    - System redundancy
    - Security
- Data transfer methods
  - Translators (e.g. RDBMS to XML; may all be in XML if we have to start from scratch)
  - Protocols (e.g. ftp, ip)
  - ID Interchange format (e.g. AGS)

# Create Data Dictionary

- Define the data structure and format.
  - Parameter name, type, units, etc.
  - Relational Database Management System (RDBMS): Tables, relationships, attributes, structure, etc.
  - Excel Spreadsheet Format (XML): Document type definition (DTDs), tags, etc.
  - Syntax
  - Guidelines for usage

# COSMOS Format

- Working group activities:
  - Data dictionary content & structure
  - System architecture
  - Establish MoUs among providers
- Technical development contracts
- Hosting of information gateway
  - Funding clearinghouse
  - Long-term maintenance

# Importance of Metadata

- Provides Point of Reference and Point of Origin
- Provides Calibration and Equipment specs
- Provides Methods for Obtaining Data
- Provides Site Specific Information
- Very important for older borehole data

So, what kind of geotechnical data do we already have?
and
What form is it in?

# Missouri DOT Data

Scanned Boring Logs

An analog system

Form T-737-1RMO
Rev 10-95

# MISSOURI DEPARTMENT OF TRANSPORTATION
Division of Materials

**Re-Typed 04/05/00 for Legibility**

## BORING DATA



| | | | | | |
|---|---|---|---|---|---|
| **Project No.** | I-44-3 (12) | | | | |
| **County** | Franklin | **Route** | I-44 (WBL.) | **Design** | K524R |
| **Over** | Bourbeuse River | | | **Skew** | |
| **Logged by** | Baker | | | **Operator** | Klick/Cavender |
| **Equipment** | | | | **Date of Report** | 12/07/66 |

| Bent | Station | Location | Surface Elevation | Log of Materials * | |
|---|---|---|---|---|---|
| | 1280+50 | 47' LT. | 499.6 | 0.0-25.0' | Silty clay. |
| | | | | 25.0-40.0' | Sand, gravel, and boulders. |
| | | | | 40.0-48.0' | Weathered dolomite and sandstone. |
| | 1280+75 | 53' LT. | 498.9 | 0.0-10.0' | Brown silty clay, few boulders. |
| | | | | 10.0-22.7' | Gray silty clay. |
| | | | | 22.7-27.0' | Sand. |
| | | | | 27.0-33.0' | Sand and gravel. |
| | | | | 33.0-41.0' | Gravel and boulders. |
| | | | | 41.0-43.0' | Dolomite. |
| | | | | 43.0-46.6' | Soft sandstone and dolomite. |
| | | | | 46.6-49.0' | Sandstone. |
| | 1281+00 | 47' LT. | 499.0 | 0.0-8.0' | Brown silty clay. |
| | | | | 8.0-23.0' | Gray silty clay. |
| | | | | 23.0-40.0' | Sand, gravel, and few boulders. |
| | | | | 40.0-48.8' | Soft sandstone and dolomite. |
| | 1281+25 | 50' LT. | 498.6 | 0.0-29.0' | Silty clay. |
| | | | | 29.0-39.0' | Sand, gravel, and few boulders. |
| | | | | 39.0-47.9' | Soft seams, sandstone and dolomite. |
| | 1281+75 | 50' LT. | 498.3 | 0.0-20.0' | Silty clay. |
| | | | | 20.0-39.0' | Sand and gravel. |
| | | | | 39.0-43.8' | Dolomite and sandstone. |
| | 1282+00 | 47' LT. | 498.3 | 0.0-30.0' | Silty clay. |
| | | | | 30.0-39.0' | Sand, gravel, and boulders. |
| | | | | 39.0-43.8' | Dolomite and sandstone. |
| | 1282+25 | 50' LT. | 498.1 | 0.0-27.0' | Silty clay. |
| | | | | 27.0-39.0' | Sand, gravel, and boulders. |
| | | | | 39.0-43.8' | Dolomite and sandstone, some soft seams. |

* Persons using this information are cautioned that the materials shown are determined by the equipment noted and accuracy of the "log of materials" is limited thereby and by judgment of the operator. THIS INFORMATION IS FOR DESIGN PURPOSES ONLY.

Form T-737-1RMO
Rev. 10-95

# MISSOURI DEPARTMENT OF TRANSPORTATION
Division of Materials

**Re-Typed 04/05/00 for Legibility**

## BORING DATA (CORE & SPT)



| | | | | | |
|---|---|---|---|---|---|
| Project No. | I-44-3 (12) | | | | |
| County | Franklin | Route | I-44 (WBL) | Design | K524R |
| Over | Bourbeuse River | | | Skew | |
| Logged by | Baker | | | Operator | Fry |
| Equipment | | | | Drillers Hole No. | A-66-150 |
| Hole Stab. by | | | | Date of Report | 12/07/66 |
| Automatic Hammer Efficiency | | % | | Drill No. | |

| Bent | Station | Location | Surface Elevation |
|---|---|---|---|
| | 1281+50 | 47' LT. | 498.5 |

**LOG OF MATERIALS ***

| | |
|---|---|
| 0.0-25.0' | Silty clay. |
| 25.0-42.3' | Sand and gravel. |
| 42.3-48.7' | Thin dolomite cap over cavity. |
| 48.7-53.7' | Sandstone (soft). |

**TEST DATA**

| Elev. | SPT Blows/6" | $N_{60}$ | Pocket Pen., tsf | |
|---|---|---|---|---|
| 493.5' | 2-7-1 | | | |
| 488.5' | 5-9-11 | | | |
| 473.5' | 4-5-8 | | | |
| 477.5' | 2-2-3 | | | |
| 463.5' | 21-41-27 | | Gravel | |

**CORING LOG (NX Double Tube Barrel)**

| From | To | Run | Rec | Loss | % RQD | Notes |
|---|---|---|---|---|---|---|
| 42.3 | 48.7 | Thin cap (cavity) | | | | |
| 48.7 | 53.7 | 5.0 | 5.0 | 0 | | |

**WATER TABLE OBSERVATIONS**

| Date | Time Change | Depth Hole Open | Depth To Water |
|---|---|---|---|
| | | | |

$N_{60}$ = (Em/60)Nm

$N_{60}$ - Corrected N value for standard 60% SPT efficiency.
Em - Measured transfer efficiency in percent.
Nm - Observed N-value.

* Persons using this information are cautioned that the materials shown are determined by the equipment noted and accuracy of the "log of materials" is limited thereby and by judgment of the operator. THIS INFORMATION IS FOR DESIGN PURPOSES ONLY.

Form T-737-1RMO
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## BORING DATA (CORE & SPT)

Sheet 3 of 13

| | | | | | |
|---|---|---|---|---|---|
| Project No. | I-44-3 (12) | | | | |
| County | Franklin | Route | I-44 (WBL) | Design | K524R |
| Over | Bourbeuse River | | | Skew | |
| Logged by | Baker | | | Operator | Fry |
| Equipment | | | | Drillers Hole No. | A-66-151 |
| Hole Stab. by | | | | Date of Report | 12/07/66 |
| Automatic Hammer Efficiency | | % | | Drill No. | |

| Bent | Station | Location | Surface Elevation |
|---|---|---|---|
| | 1282+50 | 47' LT. | 498.1 |

**TEST DATA**

| Depth, ft. | SPT Blows/6" | $N_{60}$ | Pocket Pen., tsf | |
|---|---|---|---|---|
| | | | | |

**LOG OF MATERIALS ***

| | |
|---|---|
| 0.0-20.5' | Silty clay. |
| 20.5-23.5' | Sand. |
| 23.5-40.0' | Sand, gravel, and boulders. |
| 40.0-43.0' | Sandstone, soft. |
| 43.0-46.5' | Dolomite, pitted. |
| 46.5-50.0' | Sandstone (soft). |

**CORING LOG (NX Double Tube Barrel)**

| From | To | Run | Rec | Loss | % RQD | Notes |
|---|---|---|---|---|---|---|
| 40.0 | 45.0 | 5.0 | 4.5 | 0.5 | | |
| 45.0 | 50.0 | 5.0 | 5.0 | 0 | | |

**UNCONFINED COMPRESSIVE STRENGTH**

**TEST DATA**

| Depth, ft. | Elev. | Qu, psf | P.P., tsf |
|---|---|---|---|
| 6.0 | 492 | 2500 (ave) | 2.0-1.0 |
| 11.0 | 487 | 5000 (ave) | 3.0-2.5 |
| 16.0 | 482 | 4000 (ave) | 1.5-1.0 |

**WATER TABLE OBSERVATIONS**

| Date | Time Change | Depth Hole Open | Depth To Water |
|---|---|---|---|
| | | | |

$N_{60} = (Em/60)Nm$

$N_{60}$ - Corrected N value for standard 60% SPT efficiency.
Em - Measured transfer efficiency in percent.
Nm - Observed N-value.

* Persons using this information are cautioned that the materials shown are determined by the equipment noted and accuracy of the "log of materials" is limited thereby and by judgment of the operator. THIS INFORMATION IS FOR DESIGN PURPOSES ONLY.

# Illinois Geological Survey Data

Shear Wave Velocities

XML format

No locations or depths

# SUMMARY - Shear Wave Velocities

**Alluvium**

| | | | | | |
|---|---|---|---|---|---|
| | 173.87 | | 570.43 | Cache Valley | Illinois |
| | 174.53 | | 572.60 | Cache Valley | Illinois |
| | 199.33 | | 653.96 | Wabash Valley | Illinois |
| | 237 | | 777.55 | | Indiana |
| | 235 | | 770.99 | | Indiana |
| | 261 | | 856.29 | | Indiana |
| | 206 | | 675.84 | | Indiana |
| | 266 | | 872.69 | | Indiana |
| | 261 | | 856.29 | | Indiana |
| | 255 | | 836.60 | | Indiana |
| | 251 | | 823.48 | | Indiana |
| | 261 | | 856.29 | | Indiana |
| | 250 | | 820.20 | | Indiana |
| | 253.94 | | 833.13 | New Harmony | Indiana |
| | 189 | | 620.07 | | Kentucky |
| Avg. | 231.58 | m/s | 759.76 | ft/sec | |
| Minimum | 173.87 | m/s | 570.43 | ft/sec | |
| Maximum | 266 | m/s | 872.69 | ft/sec | |

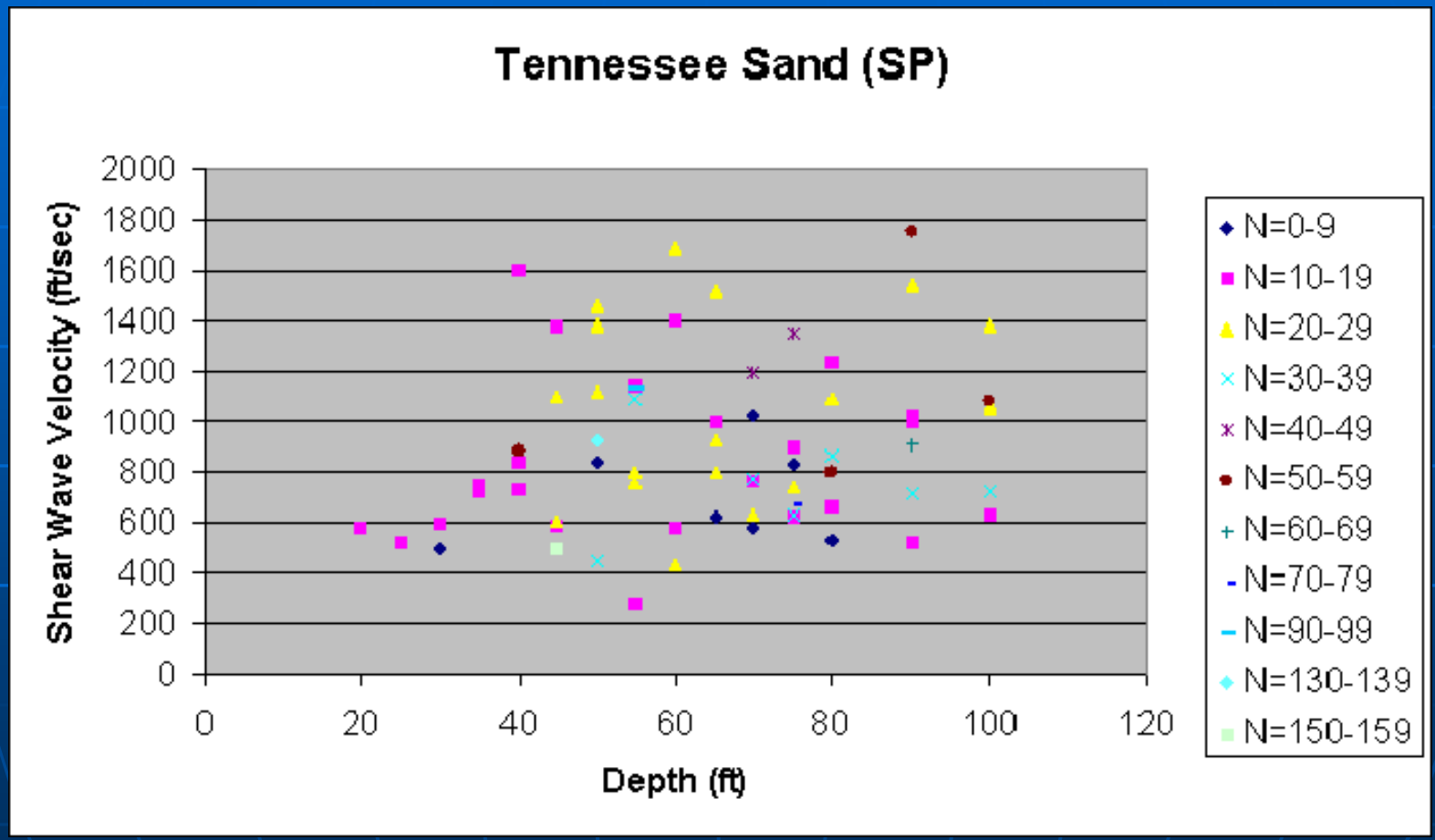
**Ordovician age**

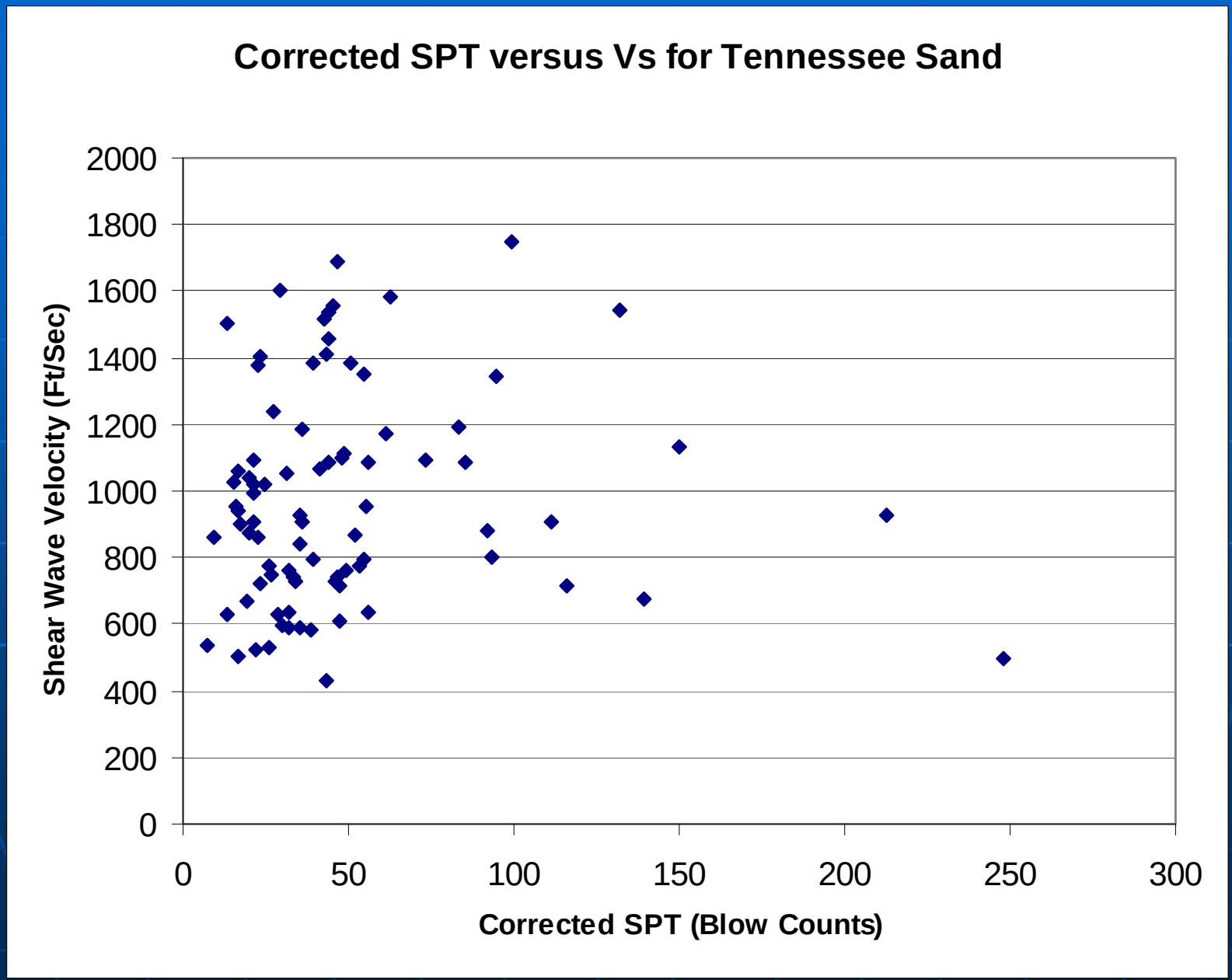
| | | | | |
|---|---|---|---|---|
| ***Dolomite*** | 2,686 | | 8,811 | Illinois |
| | 2,692 | | 8,832 | Illinois |
| | 2,869 | | 9,411 | Illinois |
| | 3,068 | | 10,065 | Illinois |
| | 2,894 | | 9,496 | Illinois |
| | 2,984 | | 9,789 | Illinois |
| | 2,987 | | 9,801 | Illinois |
| | 2,952 | | 9,686 | Illinois |
| | 2,909 | | 9,543 | Illinois |
| Avg. | 2,893 | m/s | 9,493 | ft/sec |
| Minimum | 2,686 | m/s | 8,811 | ft/sec |
| Maximum | 3,068 | m/s | 10,065 | ft/sec |

| | | | | | |
|---|---|---|---|---|---|
| **Pennsyl-vanian age** | | | | | |
| | ***Limestone*** | 1,634 | | 5,361 | Illinois |
| | | 1,627 | | 5,337 | Illinois |
| | | 2,737 | | 8,980 | Illinois |
| | | 3,156 | | 10,354 | Illinois |
| | | 2,041 | | 6,696 | Illinois |
| | | 2,926 | | 9,600 | Illinois |
| | | 1,611 | | 5,284 | Illinois |
| | | 2,655 | | 8,712 | Illinois |
| | | 2,526 | | 8,289 | Illinois |
| | Avg. | 2,324 | m/s | 7,624 | (ft/sec) |
| | Minimum | 1,611 | m/s | 5,284 | (ft/sec) |
| | Maximum | 3,156 | m/s | 10,354 | (ft/sec) |

# Tennessee Data

Shear Wave Velocities
from publications
XML spreadsheets


Tennessee Sand (SP)
Shear Wave Velocity (ft/sec)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
20
40
60
80
100
120
Depth (ft)
N=0-9
N=10-19
N=20-29
N=30-39
N=40-49
N=50-59
N=60-69
N=70-79
N=90-99
N=130-139
N=150-159


Corrected SPT versus Vs for Tennessee Sand
Shear Wave Velocity (Ft/Sec)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
Corrected SPT (Blow Counts)

# Database Descriptors for COSMOS Database Dictionary

# Database Descriptors Used by COSMOS – e.g. SPT data

The standard penetration test (SPT) involves driving a split-spoon sample barrel into the ground from the bottom of a borehole by dropping a 140 lb (63.5 kg) hammer a height of 30 inches (0.76 m). From the test, a penetration resistance or blowcount (N) is obtained which equals the number of blows to drive the sampler over the depth interval between 6 and 18 inches (150 to 450 mm). The N-value is reported in blows per foot (blows per 300 mm). Standard testing procedures are described in ASTM D 1586. Relevant testing parameters are described in this table.

| Definition | Type | DB name | XML Path |
|---|---|---|---|
| A code or simple name for Standard Penetration Test Parameters. This value is intended to be a foreign key for referencing this data instance. | code | ID | SPT/Id |
| A value that describes the context for the development of the Id value. The Id is unique within this context | text | CODESPACE | SPT/CodeSpace |
| The length of the split-spoon sampler barrel. Standard lengths are 18 inches (450 mm) and 24 inches (600 mm). | quantity | SAMPLER LENGTH<br>SAMPLER LENGTH_UOM | SPT/Length[@uom] |
| The inside diameter of the split-spoon sampler. | quantity | SAMPLER INSIDE DIAMETER<br>SAMPLER INSIDE DIAMETER_UOM | SPT/InsideDiameter[@uom] |
| The use of a liner to produce a constant inside diameter is permitted and should be noted. | boolean | LINER | SPT/Liner |
| The use of a basket retainer is permitted and should be noted. | boolean | BASKET | SPT/Basket |
| The hammer mass used to drive the split-spoon sampler. The standard mass is 140 lb (63.5 kg). | quantity | HAMMER_MASS<br>HAMMER_MASS_UOM | SPT/HammerMass[@uom] |
| The type of hammer or drive-weight assembly used for the sampling and penetration. Typical hammer types include the following: a) donut, b) safety, or c) other. | text | HAMMER_TYPE | SPT/HammerType |

| Definition | Type | DB name | XML Path |
|---|---|---|---|
| The mechanism used to lift and drop the hammer or drive-weight assembly. Typical hammer release mechanisms include the following: a) rope and cathead, b) trip, c) semi-automatic, d) automatic, or e) other. | text | HAMMER_RELEASE | SPT/HammerRelease |
| The hammer drop height for SPT penetration. The standard procedure requires a drop of 30 inches (0.76 m). | quantity | HAMMER DROP HEIGHT HAMMER DROP HEIGHT_UOM | SPT/HammerDropHeight[@uom] |
| The type of sampling rods used for SPT penetration. Standard nomenclature can be used such as A-rod or N-rod. | text | ROD TYPE | SPT/RodType |
| The external diameter of the sampling rods used for SPT penetration. | quantity | ROD EXTERNAL DIAMETER ROD EXTERNAL DIAMETER_UOM | SPT/RodExternalDiameter |
| The drive rod weight per unit length (typically given per meter or per foot). | quantity | ROD WEIGHT ROD WEIGHT_UOM | SPT/RodWeight |
| The diameter of the cathead used to pull the rope attached to the hammer. Typical diameters range from 6 to 10 inches (150 to 250 mm). | quantity | CATHEAD DIAMETER CATHEAD DIAMETER_UOM | SPT/CatheadDiameter[@uom] |
| The number of rope turns on the cathead for performing the SPT. Maximum allowed number of turns is 2 1/4. | quantity | ROPE TURNS | SPT/RopeTurns |
| A description of the equipment used to measure energy during the SPT penetration. | text | ENERGY | SPT/Energy |
| A text descriptor providing additional information relevant to the SPT parameters and equipment especially if those differ from standard requirements. | text | REMARKS | SPT/Remarks |
| The date of the last update to the data in this table | date | UPDATE | SPT/Update |

# Example of Additional DB Descriptors- e.g. Atterberg Limits

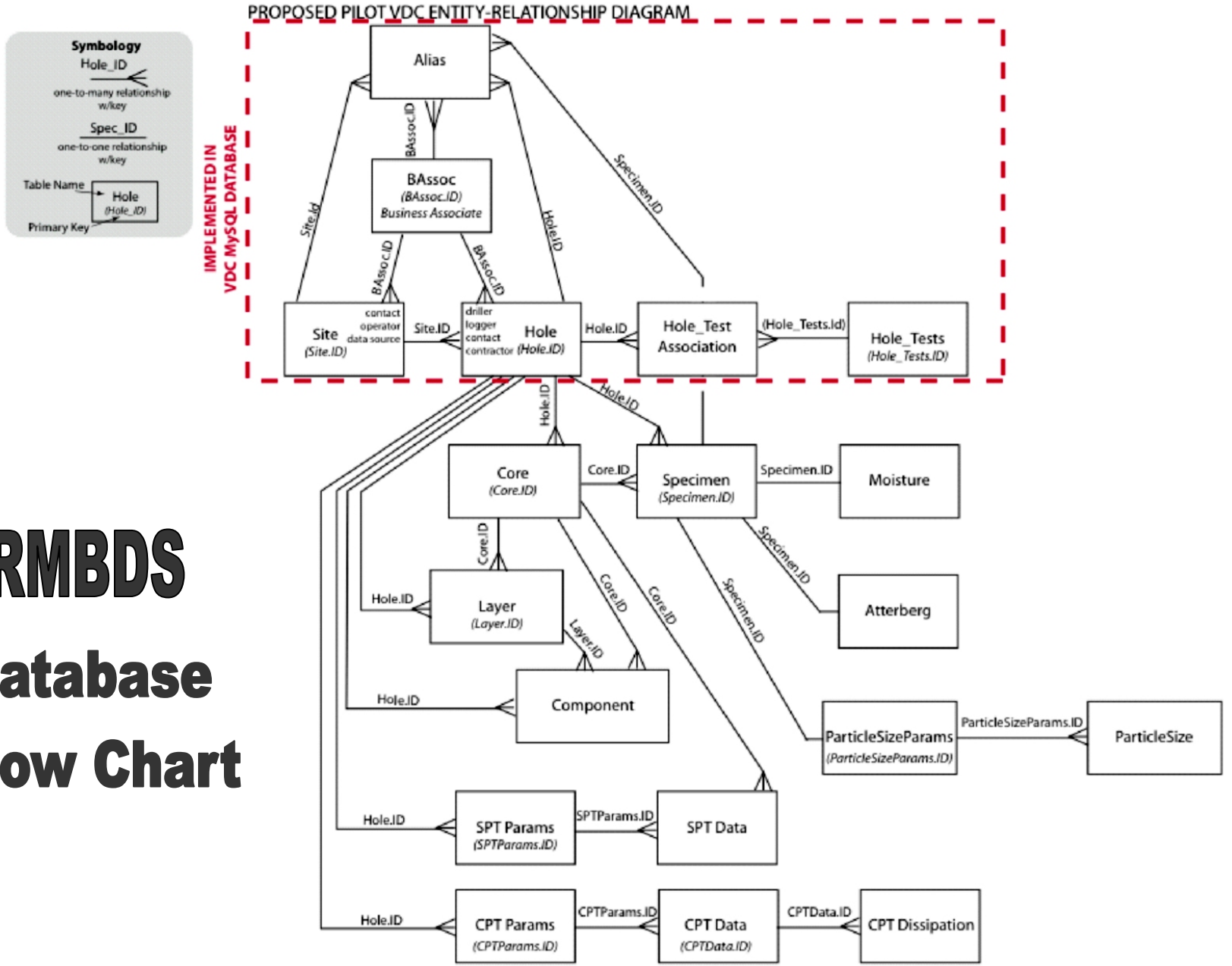
**Atterberg Limits**

The consistency of plastic soils defined in terms of shrinkage, plastic and liquid limits.

| Name | Definition | Type | DB name | XML Path |
|---|---|---|---|---|
| Id | A code or simple name for Atterberg limits. This value is intended to be a foreign key for referencing this data instance. | code | ID | Atterberg/Id |
| Code Space | A value that describes the context for the development of the Id value. The Id is unique within this context | text | CODESPACE | Atterberg/CodeSpace |
| Specimen | The specimen, of which these Atterberg limits test results are a part. The Atterberg limits test results must be related to a Specimen. This value is a foreign key that should select an instance of Specimen based on the Id value of the Specimen. | code | SPECIMEN_ID | Atterberg/PartOfSpecimen |
| Liquid Limit | The water content of a soil at the arbitrary boundary between the semi-liquid and plastic states, generally expressed in percent. | quantity | LIQUIDLIMIT<br>LIQUID_UOM | Atterberg/LiquidLimit[@uom] |
| Liquid Limit Method | The name of the method used to determine the liquid limit. Methods include the Liquid Limit Device and the Fall Cone. | text | LIQUIDLIMIT_METHOD | Atterberg/LiquidLimitMethod |

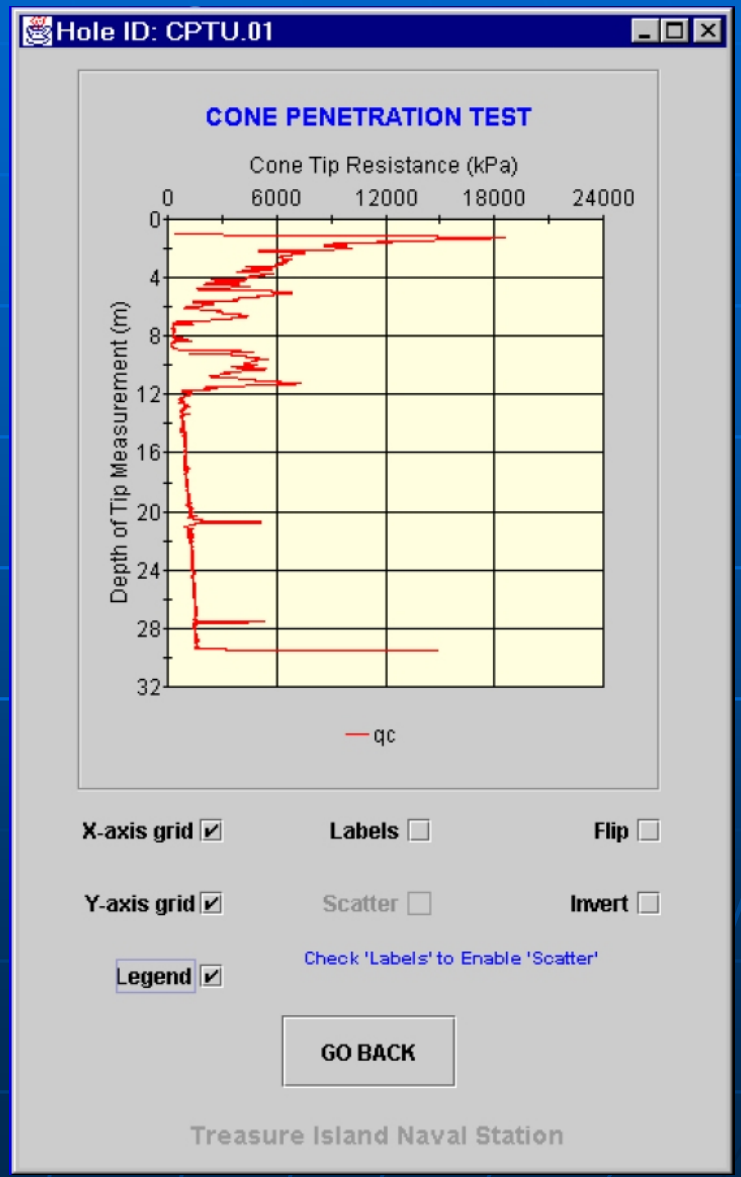
| Name | Definition | Type | DB name | XML Path |
|---|---|---|---|---|
| Preparation Method | The name of the method used to prepare the specimen for the liquid limit test. Methods include the Dry and Wet preparation. | text | LIQUIDLIMIT_PREP | Atterberg/LiquidLimitPrep |
| Plastic Limit | The water content of a soil at the arbitrary boundary between the plastic and semi-solid states, generally expressed in percent. | quantity | PLASTICLIMIT PLASTIC_UOM | Atterberg/PlasticLimit[@uom] |
| Shrinkage Limit | The maximum water content at which a reduction in water content will not cause a decrease in volume of the soil mass, generally expressed in percent. | quantity | SHRINKAGELIMIT SHRINKAGE_UOM | Atterberg/ShrinkageLimit[@uom] |
| Shrinkage Limit Method | The name of the method used to determine the shrinkage limit. Methods include the use of mercury or wax. | text | SHRINKAGELIMIT_METHOD | Atterberg/ShrinkageLimitPrep |
| Natural Water Content | The water content of a soil in it's natural in situ moisture condition, generally expressed in percent. | quantity | NATURALWATERCONTENT NATURALWATER_UOM | Atterberg/NaturalWaterContent[@uom] |
| Remarks | A text descriptor providing additional information relevant to the Atterberg Limit test. | text | REMARKS | Atterberg/Remarks |

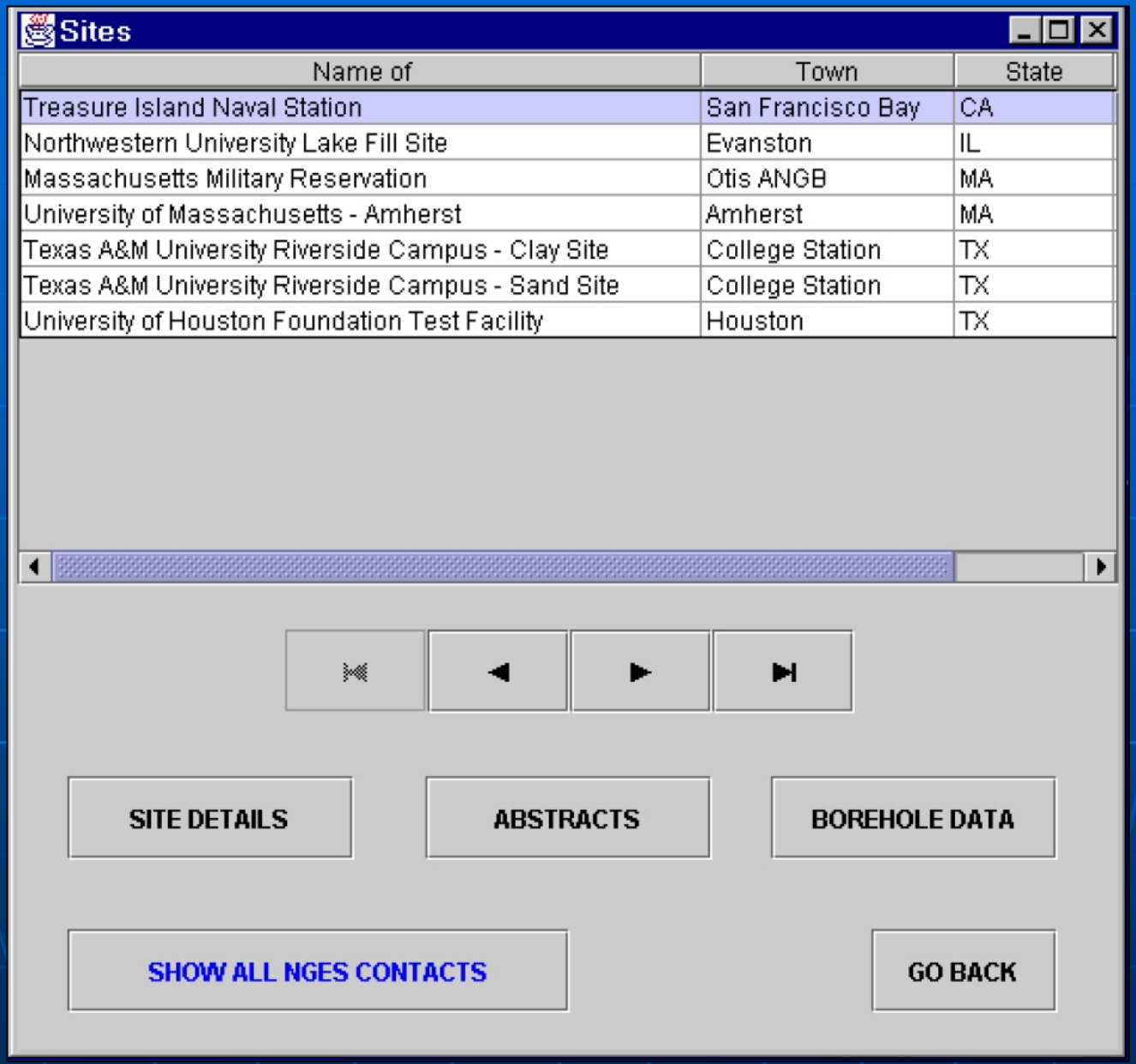
# RMBDS Database Flow Chart

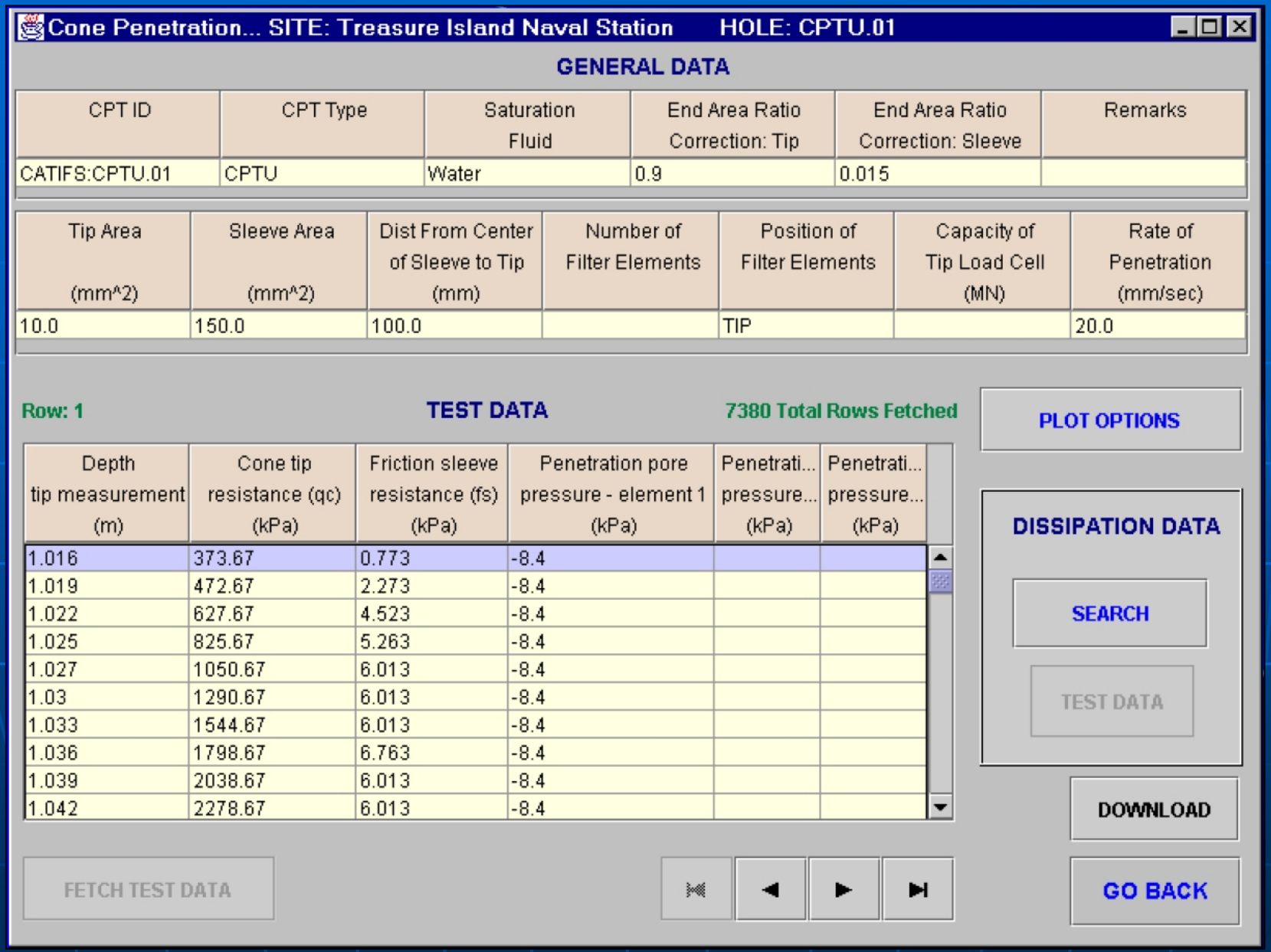


# Example CPT Data on NGES site

- ID
- Code Space
- CPT ID
- Depth
- Tip Resistance
- Friction Resistance
- Pore Pressure
- Inclination
- Remarks
- Updates




Sites
Name of
Town
State
Treasure Island Naval Station
San Francisco Bay
CA
Northwestern University Lake Fill Site
Evanston
IL
Massachusetts Military Reservation
Otis ANGB
MA
University of Massachusetts - Amherst
Amherst
MA
Texas A&M University Riverside Campus - Clay Site
College Station
TX
Texas A&M University Riverside Campus - Sand Site
College Station
TX
University of Houston Foundation Test Facility
Houston
TX
SITE DETAILS
ABSTRACTS
BOREHOLE DATA
SHOW ALL NGES CONTACTS
GO BACK


Cone Penetration... SITE: Treasure Island Naval Station HOLE: CPTU.01
GENERAL DATA
CPT ID
CPT Type
Saturation Fluid
End Area Ratio Correction: Tip
End Area Ratio Correction: Sleeve
Remarks
CATIFS:CPTU.01
CPTU
Water
0.9
0.015
Tip Area (mm^2)
Sleeve Area (mm^2)
Dist From Center of Sleeve to Tip (mm)
Number of Filter Elements
Position of Filter Elements
Capacity of Tip Load Cell (MN)
Rate of Penetration (mm/sec)
10.0
150.0
100.0
TIP
20.0
Row: 1
TEST DATA
7380 Total Rows Fetched
PLOT OPTIONS
Depth tip measurement (m)
Cone tip resistance (qc) (kPa)
Friction sleeve resistance (fs) (kPa)
Penetration pore pressure - element 1 (kPa)
Penetrati... pressure... (kPa)
Penetrati... pressure... (kPa)
1.016 373.67 0.773 -8.4
1.019 472.67 2.273 -8.4
1.022 627.67 4.523 -8.4
1.025 825.67 5.263 -8.4
1.027 1050.67 6.013 -8.4
1.03 1290.67 6.013 -8.4
1.033 1544.67 6.013 -8.4
1.036 1798.67 6.763 -8.4
1.039 2038.67 6.013 -8.4
1.042 2278.67 6.013 -8.4
DISSIPATION DATA
SEARCH
TEST DATA
DOWNLOAD
FETCH TEST DATA
GO BACK

Select Data to Plot

Select y-axis Item
Click on Arrow for More Choices

Depth of Tip Measurement

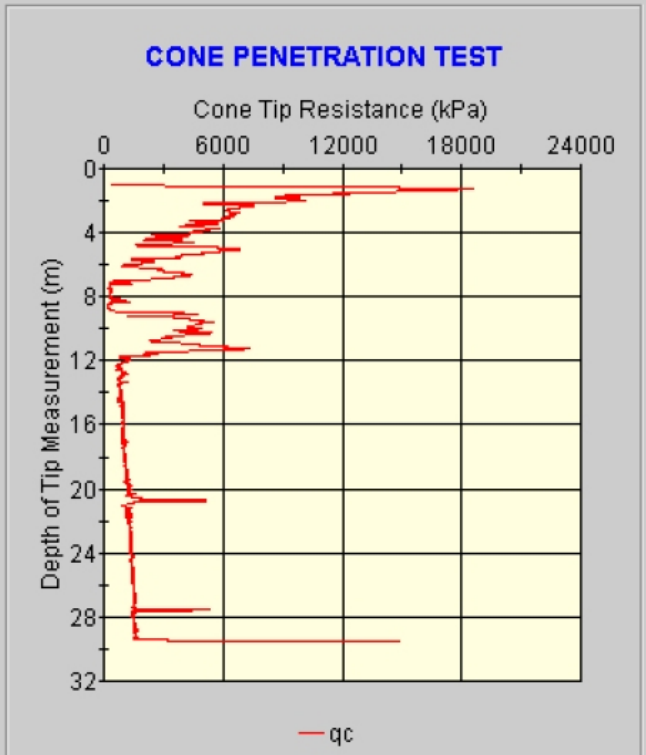
PLOT

GO BACK

Select x-axis Item(s); To Select Multiple Items,
Press 'ctrl' Key and Click on the Desired Items

- Cone Tip Resistance
- Friction Sleeve Resistance
- Penetration Pore Pressure - Cell 1
- Penetration Pore Pressure - Cell 2
- Penetration Pore Pressure - Cell 3
- Shear Wave Velocity

Hole ID: CPTU.01




X-axis grid ☑ Labels ☐ Flip ☐

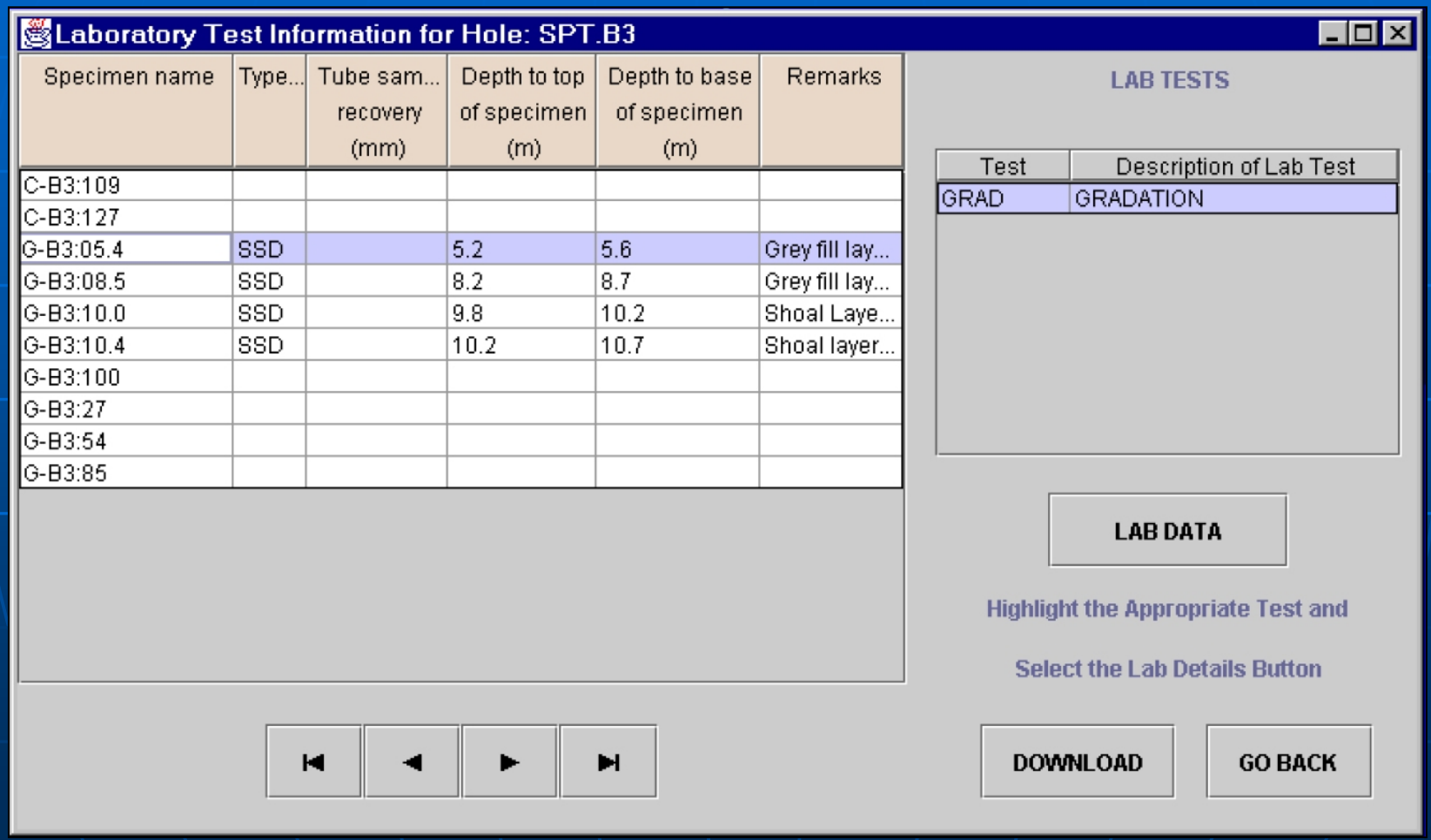
Y-axis grid ☑ Scatter ☐ Invert ☐

Legend ☑ Check 'Labels' to Enable 'Scatter'

GO BACK

Treasure Island Naval Station

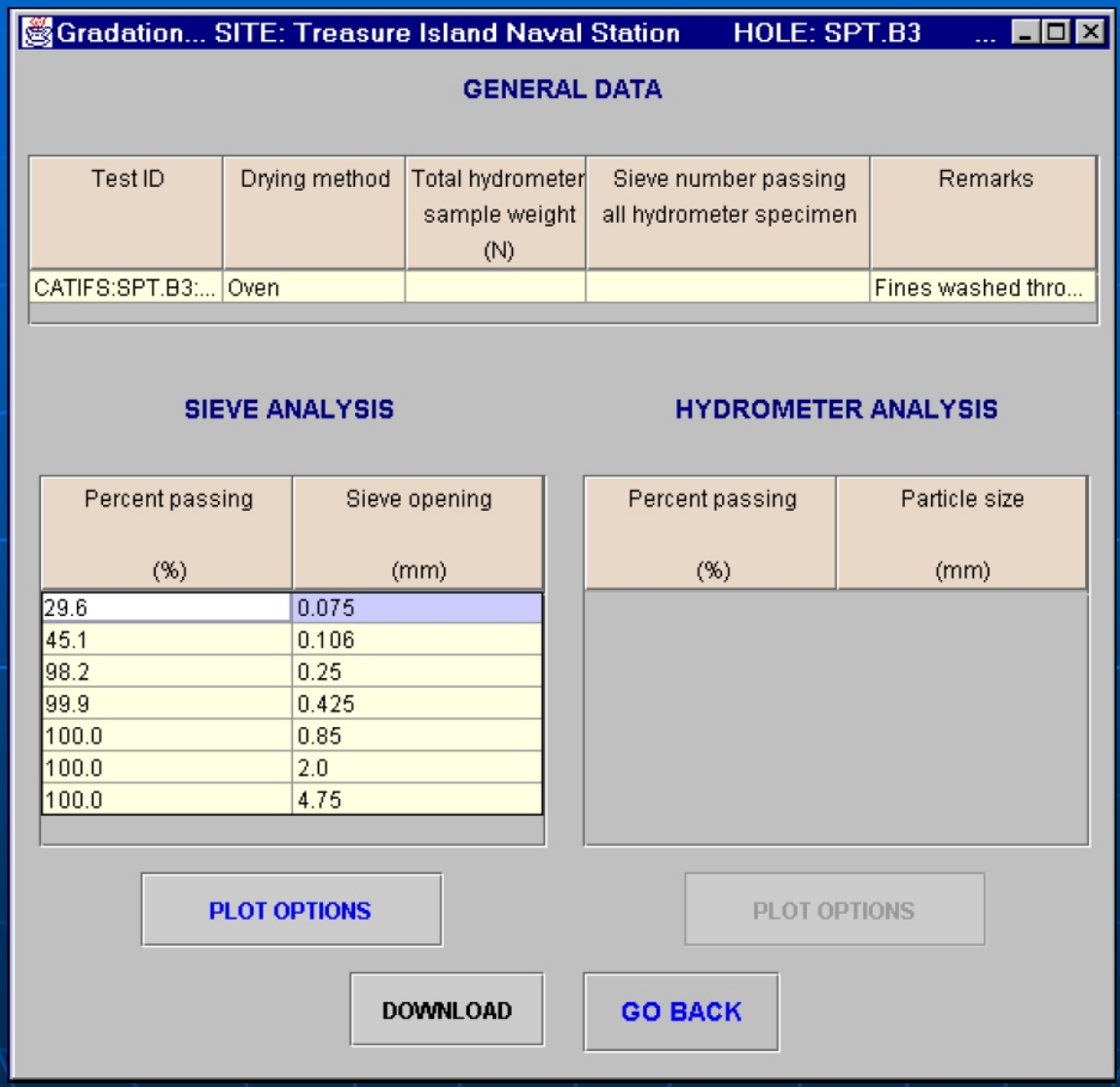
# SPT Data at the same NGES site



# CPT Data in Database Form

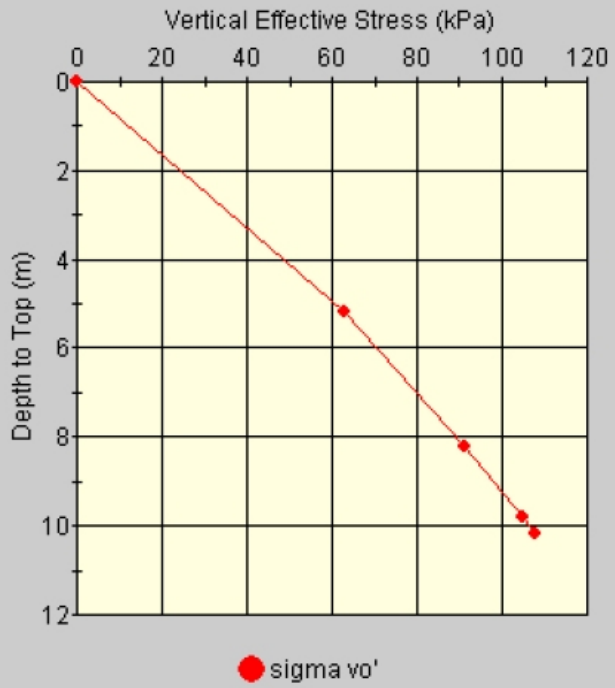
| CPT ID | DEPTH | | TIP RESISTANCE | | FRICTION RESISTANCE | | PORE PRESSURE | INCLINATION DEGREES | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 731 TC | 0.05 | ft | 893.87 | ton | 2.3355 | na | | 0.45 | |
| 731 TC | 0.1 | ft | 594.47 | ton | 4.4059 | na | | 0.6 | |
| 731 TC | 0.15 | ft | 415.73 | ton | 3.4361 | na | | 0.1 | |
| 731 TC | 0.2 | ft | 265.97 | ton | 2.5304 | na | | 0.09 | |
| 731 TC | 0.25 | ft | 223.64 | ton | 2.0594 | na | | 0.06 | |
| 731 TC | 0.3 | ft | 207.76 | ton | 1.9412 | na | | 0.12 | |
| 731 TC | 0.35 | ft | 158.67 | ton | 1.6396 | na | | 0.07 | |
| 731 TC | 0.4 | ft | 121.87 | ton | 0.9642 | na | | 0.22 | |
| 731 TC | 0.45 | ft | 88.03 | ton | 0.859 | na | | 0.22 | |

# Sieve Analysis



Vertical Effective Stress Profile: SPT.B3

## SAMPLE/SPECIMEN INFORMATION




X-axis grid ☑ Labels ☑ Flip ☐

Y-axis grid ☑ Scatter ☐ Invert ☐

Legend ☑

Check 'Scatter' for a Scatter Plot

GO BACK

Treasure Island Naval Station

# COSMOS Virtual Geotechnical Database Architecture

- ESRI ArcIMS - Front Door
- XML (Excel) and COSMOS Database File System
- Java Script - Back end

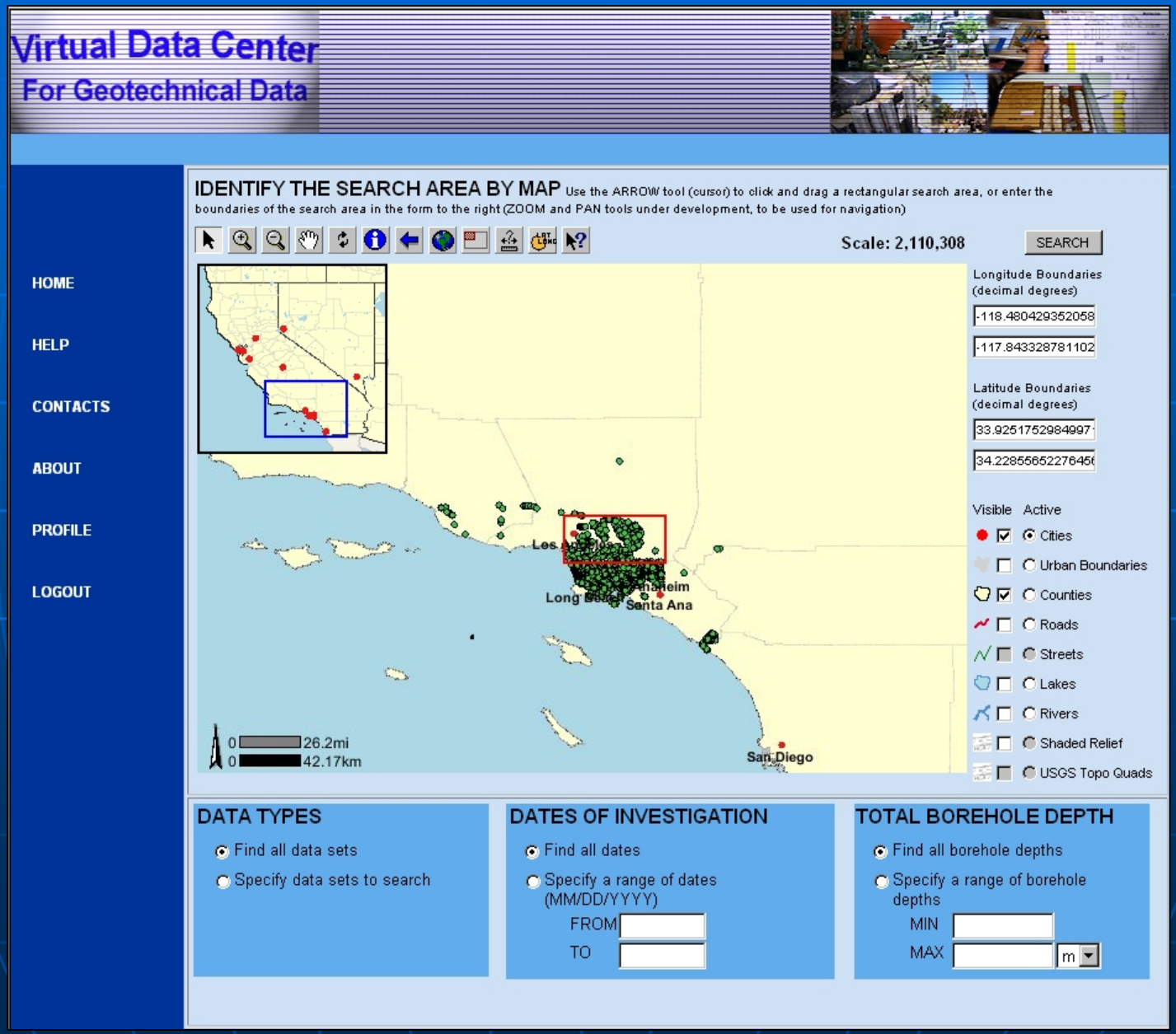
# Long-Term Objective

- Extend the pilot system and develop a web-based system linking multiple data sets
- Capable of serving the broad needs of practicing geotechnical and earthquake hazards professionals for efficient access to geotechnical data
- Create GIS based hazard maps that can be incorporated into the geotechnical data set

# Virtual Geotechnical Database ArcIMS / XML System

Example Inquiry

# Virtual Geotechnical Database



# Virtual Data Center
## For Geotechnical Data

HOME

HELP

CONTACTS

ABOUT

PROFILE

LOGOUT

## Search Results

Your search returned 550 data sets from the following data sources:

| PROJECT NAME | DATA TYPE | DATA SOURCE | PROJECT DATE | LAST UPDATED | DOWNLOADS/ CONTACT |
|---|---|---|---|---|---|
| ORANGE FWY 57 AND TONNER CANYON BRIDGE | DGC, FLL, BLG, SPT | 50 | 1989-12-10 | 2002-03-14 | |
| ORANGE FWY 57 | BLG, DGC, FLL, SPT | 60 | 1989-12-10 | 2002-03-14 | |
| ORANGE FWY 57 | DGC, FLL, BLG, SPT | 85 | 1989-12-10 | 2002-03-14 | |
| C.C. Industries | BLG, DGC | 51 | 1989-12-10 | 2002-03-14 | |
| Kayo Oil Company - Jet Gas Station | BLG, DGC, FLL, SPT | 57 | 1989-12-10 | 2002-03-14 | |
| Mobil Oil Corporation Service Station No. 18-F34 | SPT, BLG, DGC, FLL | 50 | 1989-12-10 | 2002-03-14 | |
| Mobil Oil Corporation - Service Station No.18-F34 | SPT, FLL, BLG, DGC | 31.5 | 1989-12-10 | 2002-03-14 | |
| Mobil Station 11-E13 | BLG, DGC, FLL, SPT | 51.5 | 1989-12-10 | 2002-03-14 | |
| City of La Habra Fire Station No. 2 | SPT, BLG, DGC, FLL | 31 | 1989-12-10 | 2002-03-14 | |
| Lincoln Mortgage | BLG, DGC, FLL, SPT | 60 | 1989-12-10 | 2002-03-14 | |
| Former Chevron Station No. 9-2214 | BLG, DGC, FLL, SPT | 35 | 1989-12-10 | 2002-03-14 | |
| Air Conditioning Systems, Inc. | FLL, SPT, DGC, BLG | 50 | 1989-12-10 | 2002-03-14 | |
| Cleere Property | FLL, SPT, DGC, BLG | 28 | 1989-12-10 | 2002-03-14 | |
| UGST Site Assessment | BLG, DGC, FLL, SPT | 36 | 1989-12-10 | 2002-03-14 | |

# Virtual Data Center
## For Geotechnical Data

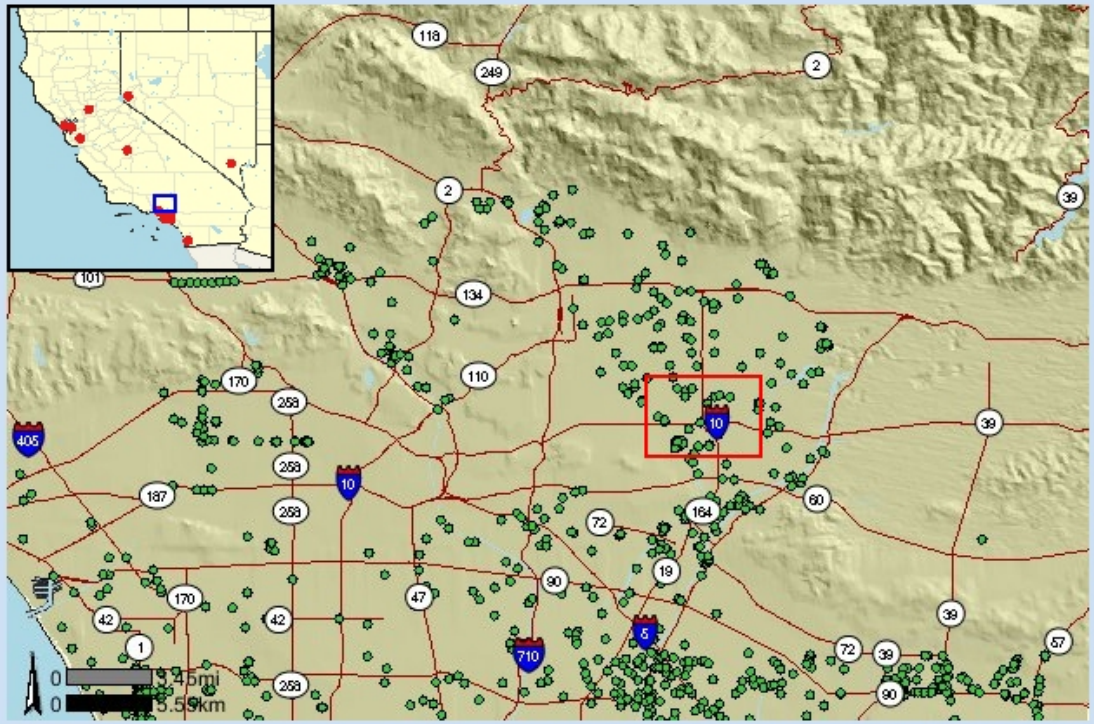
- HOME
- HELP
- CONTACTS
- ABOUT
- PROFILE
- LOGOUT

## IDENTIFY THE SEARCH AREA BY MAP

Use the ARROW tool (cursor) to click and drag a rectangular search area, or enter the boundaries of the search area in the form to the right (ZOOM and PAN tools under development, to be used for navigation)

Scale: 420,013

SEARCH




Longitude Boundaries (decimal degrees)

-118.106474253112

-118.038590878051

Latitude Boundaries (decimal degrees)

34.052298362054

34.1002160385671(

| | Visible | Active |
|---|---|---|
| Cities | ☑ | ◉ |
| Urban Boundaries | ☐ | ○ |
| Counties | ☑ | ○ |
| Roads | ☑ | ○ |
| Streets | ☐ | ○ |
| Lakes | ☐ | ○ |
| Rivers | ☑ | ○ |
| Shaded Relief | ☑ | ○ |
| USGS Topo Quads | ☐ | ○ |

### DATA TYPES

- ◉ Find all data sets
- ○ Specify data sets to search

### DATES OF INVESTIGATION

- ◉ Find all dates
- ○ Specify a range of dates (MM/DD/YYYY)

FROM

TO

### TOTAL BOREHOLE DEPTH

- ◉ Find all borehole depths
- ○ Specify a range of borehole depths

MIN

MAX m

# Virtual Data Center
## For Geotechnical Data

- HOME
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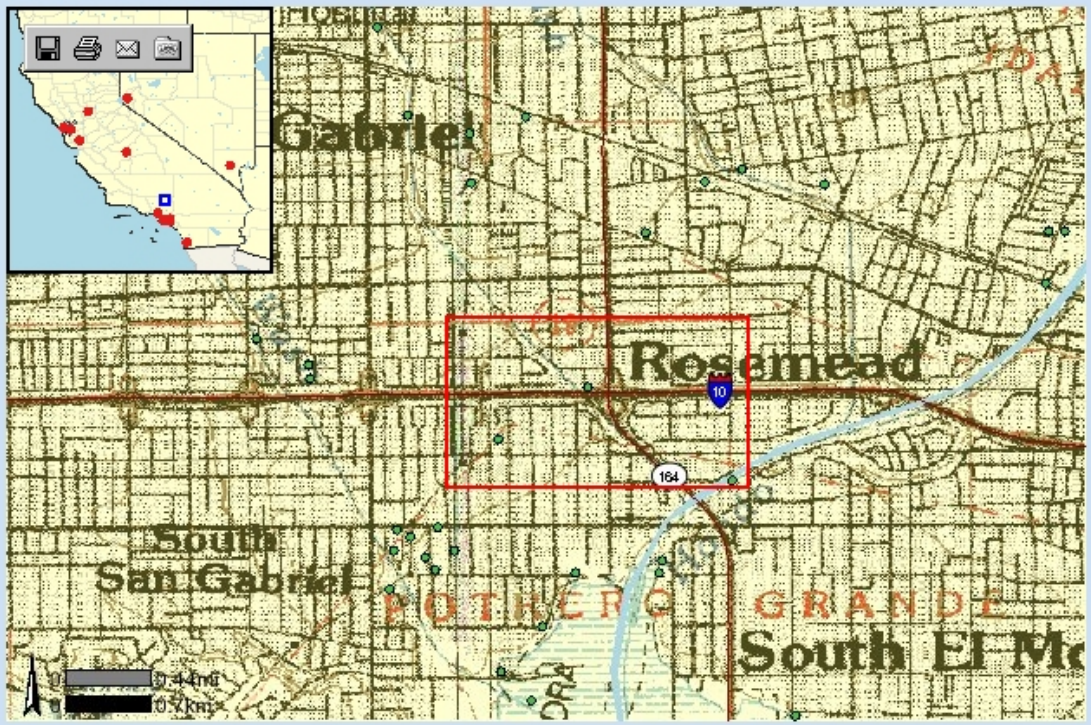
- LOGOUT

### IDENTIFY THE SEARCH AREA BY MAP

Use the ARROW tool (cursor) to click and drag a rectangular search area, or enter the boundaries of the search area in the form to the right (ZOOM and PAN tools under development, to be used for navigation)

Scale: 53,011

SEARCH




Longitude Boundaries (decimal degrees)

-118.084894822134

-118.062719327825

Latitude Boundaries (decimal degrees)

34.06518883732952

34.07778855000498

| Visible | Active | |
|---|---|---|
| ● | ☑ | ◉ Cities |
| | ☐ | ○ Urban Boundaries |
| | ☑ | ○ Counties |
| | ☑ | ○ Roads |
| | ☐ | ○ Streets |
| | ☐ | ○ Lakes |
| | ☑ | ○ Rivers |
| | ☐ | ○ Shaded Relief |
| | ☑ | ○ USGS Topo Quads |

### DATA TYPES

- ◉ Find all data sets
- ○ Specify data sets to search

### DATES OF INVESTIGATION

- ◉ Find all dates
- ○ Specify a range of dates (MM/DD/YYYY)

FROM

TO

### TOTAL BOREHOLE DEPTH

- ◉ Find all borehole depths
- ○ Specify a range of borehole depths

MIN

MAX

m

# Virtual Data Center
## For Geotechnical Data

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## Search Results

Your search returned 2 data sets from the following data sources:

| PROJECT NAME | DATA TYPE | DATA SOURCE | PROJECT DATE | LAST UPDATED | DOWNLOADS/ CONTACT |
|---|---|---|---|---|---|
| 2922 | BLG | Unknown | 1700-01-01 | 2004-02-04 | |
| 2913K | BLG | Unknown | 1700-01-01 | 2004-02-04 | |

**Key to DOWNLOADS/CONTACT INFO:**

*Download available in Microsoft Excel Format*

*Download available in COSMOS XML Format*

PREVIEW *Graphical Preview of data is available*

NEW SEARCH

# CPT Data in Database Form

| CPT ID | DEPTH | | TIP RESISTANCE | | FRICTION RESISTANCE | | PORE PRESSURE | INCLINATION DEGREES | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 731 TC | 0.05 | ft | 893.87 | ton | 2.3355 | na | | 0.45 | |
| 731 TC | 0.1 | ft | 594.47 | ton | 4.4059 | na | | 0.6 | |
| 731 TC | 0.15 | ft | 415.73 | ton | 3.4361 | na | | 0.1 | |
| 731 TC | 0.2 | ft | 265.97 | ton | 2.5304 | na | | 0.09 | |
| 731 TC | 0.25 | ft | 223.64 | ton | 2.0594 | na | | 0.06 | |
| 731 TC | 0.3 | ft | 207.76 | ton | 1.9412 | na | | 0.12 | |
| 731 TC | 0.35 | ft | 158.67 | ton | 1.6396 | na | | 0.07 | |
| 731 TC | 0.4 | ft | 121.87 | ton | 0.9642 | na | | 0.22 | |
| 731 TC | 0.45 | ft | 88.03 | ton | 0.859 | na | | 0.22 | |

# California Geological Survey
# Seismic Hazard Mapping ArcIMS System

Example Inquiry

Welcome to California

Seismic Hazard Mapping HOME

Zone Maps, Reports, & GIS Data

About the Maps

Laws and Guidelines

Affected Cities and Counties

Probabilistic Seismic Hazard Assessment Maps

Alquist-Priolo Earthquake Fault Zones

Seismic Hazards Mapping Bulletins

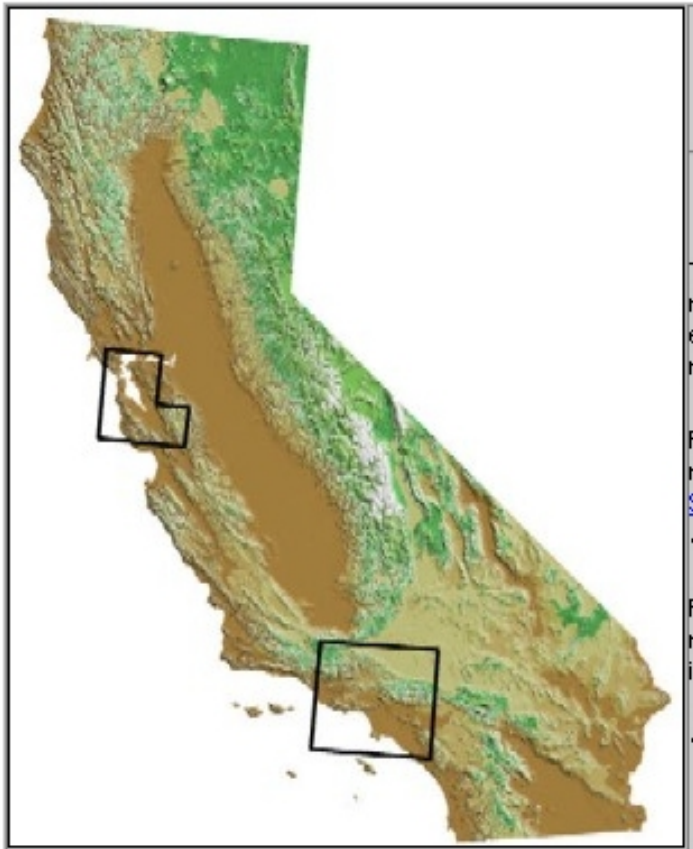
## Mapping Options:

- ○ Download Data
- ◉ Review Maps

**Click on the Map of California to Select a SHMP Map Area**

# Welcome to the CGS's Seismic Hazard Mapping Program (SHMP) Data Access Page

**See Left Navigation Bar for Mapping Options**



## Choose a mapping option from the Left Navigation Bar

## Purpose of the Map

This map will assist cities and counties in fulfilling their responsibilities for protecting the public safety from the effects of earthquake-triggered ground failure as required by the Seismic Hazards Mapping Act

For information regarding the general approach and recommended methods for preparing this map, See DMG Special Publication 118, *Recommended Criteria for Delineating Seismic Hazard Zones in California*

For information regarding the scope and recommended methods to be used in conducting the required site investigations, see DMG Special Publication 117, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*

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Seismic Hazards Mapping Bulletins

## Mapping Options:

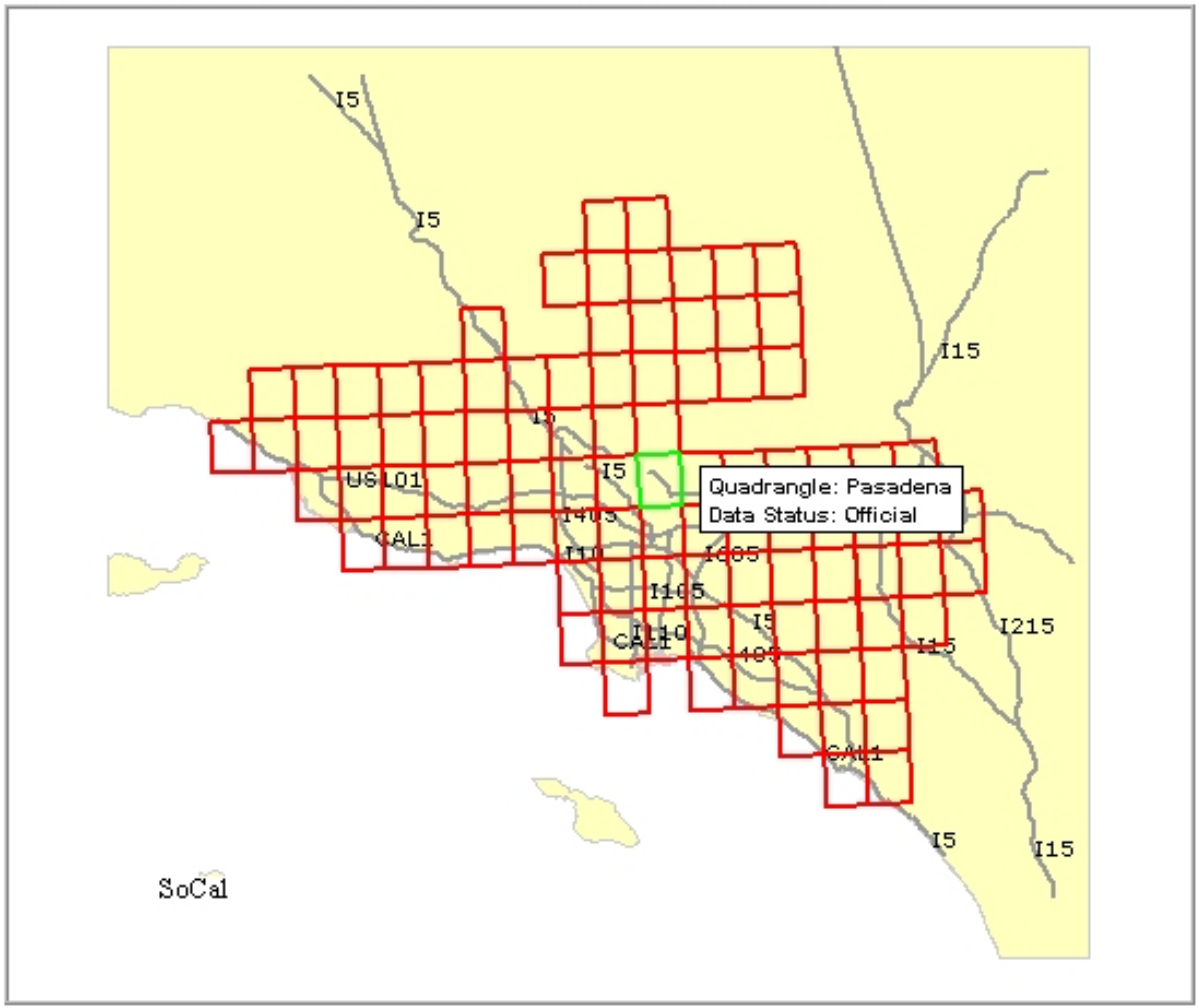
Select Map Area By:

By County
By Zip Code
By Quadrangle
By City

Go to NORTHERN California

# Southern California Interactive Quadrangle Map

**Click on a Quadrangle to Begin Interactively Building SHMP Maps**



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Alquist-Priolo Earthquake Fault Zones

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## Mapping Options:

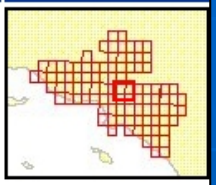
Select Map Area By:
By County
By Zip Code
By Quadrangle
By City

Go to NORTHERN California

**Feature Legend:** Refresh Map

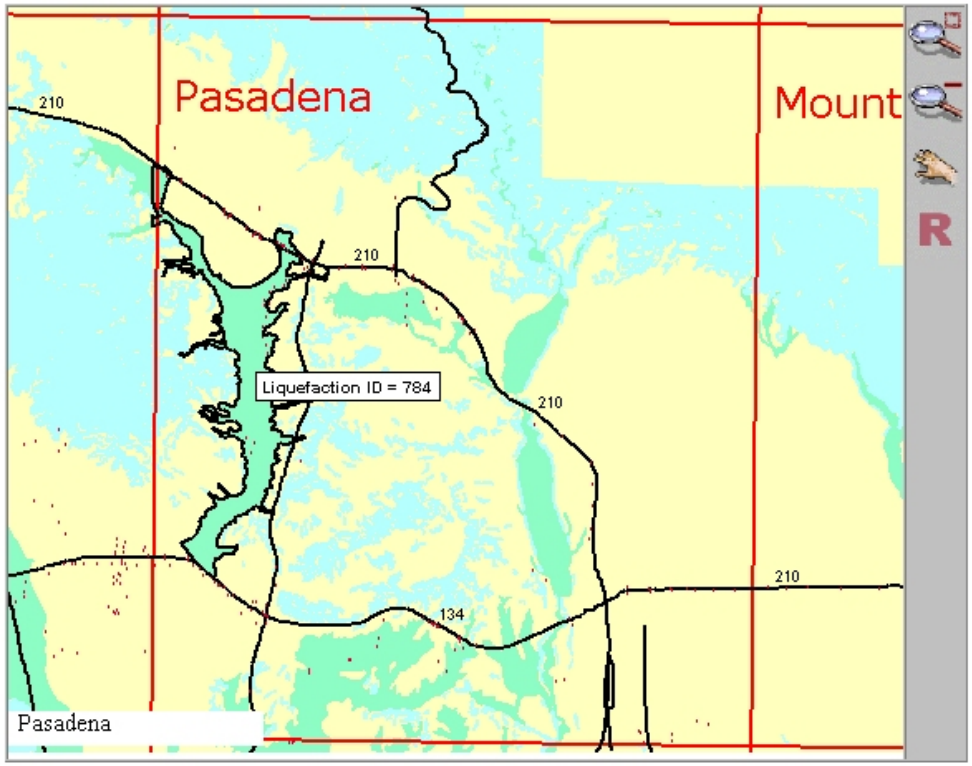
☑ Liquefaction Zones ☑ Landslide Zones ☑ Boreholes
☑ Highways ☐ Cities

**Vicinity Map:**



NOTE: Legend features are scale dependant. Zoom in to Quad level display all features.

**Current Map Width: 17165 meters**




**USGS Quadrangles Available for Download in Current Map:**

Los Angeles Hollywood Mount Wilson Pasadena Burbank Condor Peak Los Angeles Hollywood Mount Wilson Pasadena Burbank Condor Peak

Welcome to California

Seismic Hazard Mapping HOME

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## Mapping Options:

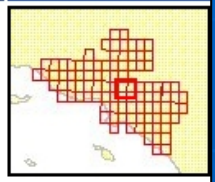
Select Map Area By:
By County
By Zip Code
By Quadrangle
By City

Go to NORTHERN California

**Feature Legend:** Refresh Map

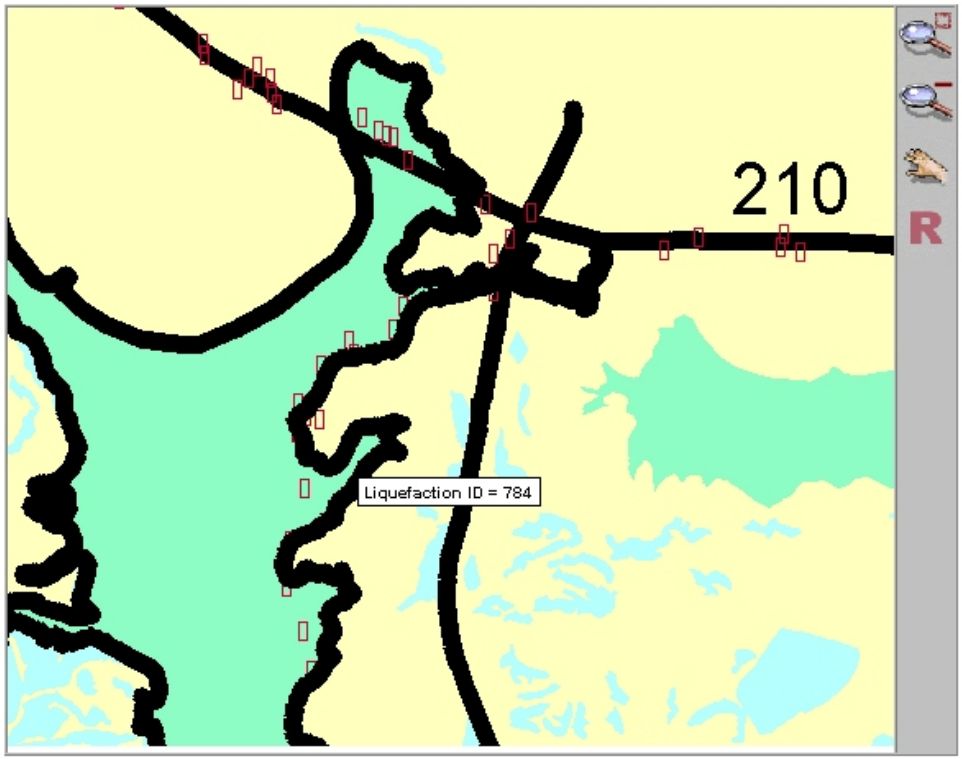
☑ Liquefaction Zones ☑ Landslide Zones ☑ Boreholes
☑ Highways ☐ Cities

**Vicinity Map:**



NOTE: Legend features are scale dependant. Zoom in to Quad level display all features.

**Current Map Width: 17165 meters**




**USGS Quadrangles Available for Download in Current Map:**

Los Angeles Hollywood Mount Wilson Pasadena Burbank Condor Peak Los Angeles Hollywood Mount Wilson Pasadena Burbank Condor Peak