

Geospatial Analysis and Technical Assistance for Power Plant Siting Interagency

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Technical Memo

Central GIS Database Survey Results

For the California Energy Commission

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Project title and number: Geospatial Analysis and Technical Assistance for Power Plant Siting Interagency, Agreement 700-98-018, Work Authorization 1

Background

The focus of this contract (in the summer and fall of 2001) was originally to help the California Energy Commission (CEC) locate and evaluate potential sites for electric power generation facilities and to assist the CEC in addressing areas of congestion on transmission lines and natural gas supply line corridors. Subsequent events have reduced the immediate urgency, although not the ultimate need for such analyses.

Software technology for deploying interactive geographic information systems (GIS) accessible over the Internet have developed to the point that it is now practical to develop and publish GIS web sites that have substantial viewing, movement, query, and even map-making capabilities. As part of a separate project not funded by the CEC, the GIS Center at LLNL, on an experimental basis, has developed a web site to explore the technical difficulties as well as the interest in such a web site by agencies and others concerned with energy research. This exploratory effort offers the potential of developing an interactive GIS web site for use by the CEC for energy research, policy analysis, site evaluation, and permit and regulatory matters.

To help ground the geospatial capabilities in the realistic requirements and needs of the CEC staff, the CEC requested that the GIS Center conduct interviews of several CEC staff persons to establish their current and envisioned use of spatial data and requirements for geospatial analyses. This survey will help define a web-accessible central GIS database for the CEC, which will augment the well-received work of the CEC Cartography Unit. Individuals within each siting discipline have been contacted and their responses to three question areas have been summarized.

The web-based geospatial data and analytical tools developed within this project will be available to CEC staff for initial area studies, queries, and informal, small-format maps. It is not designed for fine cartography or for large-format posters such as the Cartographic Unit is excellent at producing for public meetings. Nor is it designed for the specialized geospatial analyses that the Cartographic Unit maintains a deservedly excellent reputation for producing. The web-based system could be used by the Cartographic Unit staff in support of CEC technical and policy staff to respond during meetings to questions posed by senior management or the public.

The following is a compilation of responses by CEC staff in nine discipline areas to three basic questions.

The three questions were as follows:

1. What spatial data is most important to you and where do you prefer to get it?
2. What data would be on your wish list and do you know a source for it?
3. What GIS analytical capability would be helpful to have built into a web site?

Question 1: What spatial data is most important to you and where do you prefer to get it?

T-Line Issues

- Location of facilities. This data is becoming harder to obtain from local utilities since 9/11.
- Rights of way for specific projects.
- Currently rely on the Cartographic Unit to produce hard copy maps for review.

T-Line Engineering

- Maps: These are secured (both hard and soft) from CEC cartography and industry sources such as WSCC, NERC, Cal-ISO and Terraserver.com
- Power flow and electrical one-line diagrams: Generally these are provided by applicants, the Cal-ISO, Utilities, and occasionally from our staff power flow modeling capabilities. Our utility service area electrical one-line diagrams are dated and need to be updated. These are sometimes available from the utilities.
- Powerflow Base Cases: These are available generally from applicants in Northern California and from the Cal-ISO, WSCC. And PG&E, SMUD and Western. Base cases for generating units are not available from SDG&E and SCE, but 5 year and RMR studies are available for these areas from the Cal-ISO, etc.
- Resource Planning Studies: These are available from other Division Units/Offices. Also, available from Cal-ISO. List of Transmission Lines with configuration, voltage, from and to, conductor size, normal and emergency capacity updated each year. Source: Cal-ISO, Utilities (Legislation may be forthcoming to require this info).

Air Quality

- ARB ambient air quality data from online search tools. Hardcopy of hourly, summary, etc. web screens.
- ARB emission inventory. Same as above.
- Toxics and criteria pollutant emissions data collected by ARB & Local air pollution agencies. Same as above.
- DOE EIA database on emissions and generation. Download Access2.0 application to produce analysis.
- US EPA E grid data of environmental characteristics of electrical generation plants. Either as downloaded excel spreadsheets or a downloadable application.
- Maps of environmental justice status by census block group polygon from the CEC Cartography Unit. Basis for flagging meaningfully greater block groups within a 6-mile radius can vary by site.

- Site specific toxic release data.

Generation System/Facility Design

- Maps: Hard copy maps of sensitive receptors (primarily residential neighborhoods) from CEC Cartography
- Noise data estimates from applicants.

Biology

- Maps: Mainly hardcopy submitted by applicants or from CEC cartography. Now have to manually overlay site to calculate acreages.
- CDFG Natural Diversity Database (occurrence database)
- Wildlife Habitat Relationships (WHR) for distribution of species by habitat.
- Wetlands Inventory maps.
- Statewide ownership 1:100k scale (old Teale data)

Soils & Water

- Maps: Mainly hardcopy submitted by applicants or from CEC cartography. Access to several of the following via annual subscription.
- CDFG Natural Diversity Database (occurrence database)
- Wildlife Habitat Relationships (WHR) for distribution of species by habitat
- Calif. Native Plant Society, Rarefind program.
- Wetlands Inventory maps produced by CEC.
- Bound, hard copy county soil surveys.

Land Use, Traffic and Transportation

- City & County general plan maps, either online images or hardcopy.
- Sphere of Influence maps from SACOG, etc.
- Specific plan boundary from applicant usually.
- Potential school site locations via phone conversations
- Estimates of traffic loads on major and arterial streets near sites from applicant or online searches.
- National Parks and other recreational areas from the CEC Cartographic Unit.

Visual/Cultural/Socioeconomic

- Environmental Justice calculations for census block group polygons. Classically minority or poverty over 50% or meaningfully greater than region.
- CHRIS, California Historical Information System. A restricted collection of text descriptions of historical features and references including: buildings, ditches and former locations.
- Location of residences, recreation areas, and public roads that would have a view of a proposed project.
- Number of residences within different view areas (neighborhoods, etc.)
- Property ownership in the vicinity of a project site.
- The location, identification, and capacity of linear facilities, including transmission lines and roadways, as well as public and private easements and rights-of-way for such facilities, in the vicinity of a site

- Boundaries of federal, state, and local government jurisdictions.
- Boundaries of governmental planning units, such as specific plan areas.
- Boundaries of planned developments in the project vicinity, including residential subdivisions, shopping centers, industrial parks, and recreation areas.
- Location of surface hydrologic features, including lakes, rivers, and streams.
- Locations and capacities of existing and planned water supply lines, waste water disposal lines, and natural gas supply lines in the vicinity of a proposed power plant

Facility Safety

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Question 2: What data would be on your wish list and do you know a source for it?

T-Line Issues

- Satisfied by the data provided by the CEC Cartographic Unit. Maps.

T-Line Engineering

- More and easily accessed transmission maps (Have CEC Cartography catalog and provide readable electronic copies of existing maps and those that are done each two weeks or monthly).
- Updated system one-line diagrams (also called operating diagrams). Source: Utilities, CPUC, Cal-ISO.
- 1:24,000 scanned quad maps.

Air Quality

- More current inventory data. Complete and real time emission & rate data. Currently have past year s aggregate data.
- Toxic emission data for individual sites (both criteria and non-criteria)
- Sensitive receptors.
- Currently permitted and/or approved facilities from the Air District that will add to existing source load in the near future. These could be included into cumulative analyses.
- Database of Western System Coordinating Council plant sites and their emissions.

Generation System/Facility Design

- Existing noise level data.
- Identify parcels with residences as primary or secondary in rural areas. (Identify vacation home, etc.)

Biology

- Establish locations of nesting trees and vernal pools.
- Noise level polygons.
- Scanned, registered hard copy maps.
- High quality (10m or better) DEM for drainage impacts.
- GPS location of wind turbines with database of turbine information. Type, rotor swept area, min./max. Effective speed, etc.
- Distribution line network. Configuration, type of cross arm.

Soils & Water

- Any water data in form suitable for analysis, such as ground water depletion data, surface water availability.
- Locations of Super Fund Sites affecting groundwater.
- Data on existing plants water source, usage, etc.
- Regulatory planning efforts: Spatial location of state s fresh water usage demand vs. location of ground and surface water sources.

Land Use, Traffic and Transportation

- Digital GIS layers for question #1 data: locations for potential schools, residential areas, other sensitive receptors, etc.
- ADT, road capacity and level of service threshold for road network within 6mile+ radius of site in GIS format.
- Digital general plan and sphere of influence boundaries.

Visual/Cultural/Socioeconomic

- ADT traffic studies from CalTrans and cities.
- Digital form of the historical surveys (Locations of old telegraph lines, buildings, etc.)

Facility Safety

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Question 3: What GIS analytical capability would be helpful to have built into a web Site.**All Sites shared the following requests**

- Ability for staff to produce simple, custom maps (either hard copy, pdf or image) utilizing zoom, pan, add/remove layers, etc. around a site.
- Ability to measure distances from one selected spot to another on the screen.
- Display data over a raster ortho image to verify completeness and accuracy of datasets. Alternately use the ortho image as the base map for a site review map.

T-Line Issues

- Ability to review existing sites and T-line right of way.
- Identify landowners being crossed by rights of way.
- Show line locations within specific area, such as City of San Francisco.

T-Line Engineering

- Ability to search through a catalog and view transmission maps.
- Provide select staff with ability to block (crop?) select areas of our California transmission Maps for our use.

Air Quality

- Model direct impacts for NOX, SOX, CO2, etc. in region around site.
- Display the current power generators in an area, by selected SIC codes, that are often under pressure to run under bad pollution conditions, such as boilers, diesel and bakeries.
- Model a new developments impact on existing plant site.
- Model any extra transportation impacts.

Generation System/Facility Design

- Produce site map with sensitive receptors shown.
- Place custom annotation & field notes on map for inclusion into memos, etc.

Biology

- Map buffer analysis against the various datasets listed under Question #1.
- Screen-capture a polygon for a habitat type or vernal pool.
- Visualize the topography through hillshade or 3D view.
- Model effects on site drainage from some aspect such as a road cut.
- Generate a noiseshed

Soils & Water

- Annotate site maps with notes or comments.
- Map data for groundwater and surface water around site.
- Analyze how water demand of new plant may accelerate spread of existing groundwater contaminants.

Land Use, Traffic and Transportation

- Map sensitive receptors by type and add potential school sites via geocoded address or screen click.
- Map traffic data for ADT and level of service of D or below.

Visual/Cultural/Socioeconomic

- Map line of site (viewshed) of plant over sensitive receptors, etc.
- Map historical features or notes and pointers, then analyze potential impacts to these features.
- Analyze number of residences within different viewshed areas (neighborhoods)
- Map boundaries of planned developments in the project vicinity, including residential subdivisions, shopping centers, industrial parks, and recreation areas
- Map environmental justice block group polygons within 6-mile radius of site.
- Map ADT for road segments within 6 miles.

Facility Safety**•
Matrix of CEC data/analysis users and data details**

The responses outlined above were collated into a spreadsheet; duplicate responses were combined (with shades of meaning preserved where appropriate), along with type of data, comments, source, format, and status (do we have it or need to acquire it). A matrix need for each data layer by discipline shows who uses and would use the data.

Data vary considerably in difficulty of processing for use in a desktop GIS application. Further processing is required to make it accessible via a web browser. However, one of the powerful advantages of setting up the data for the web is that each data layer becomes a map service that is also available to users, such as the Cartographic Unit staff, who are given access, and they can incorporate these layers into a desktop project they are working on with their own data on their machines.

	Discipline										Comments	Source	Format	Status
	TL-I	TL-E	AIRQ	GSFD	FACS	BIO	SOWA	LUTT	VISC					
31	Location of residences, rec areas, roads, etc with view of proposed projects											Viewshed and line-of-sight analysis: see GIS Analytical capability, below		
32	Number of residences (residents?) in different view areas (neighborhoods)											Census, digital phone book combined with viewshed and line-of-sight analysis: see GIS Analytical capability, below		
33	Property ownership in vicinity of proposed projects											County parcel data		
34	Location, ID, description of linear features (TL, roadways, public and private easements and ROWs in vicinity of projects)											County or title company data		
35	Boundaries of federal, state, county, special district jurisdictions; planning areas													
36	Boundaries of planned developments in vicinity of projects (subdivisions, shopping centers, commercial, industrial parks, recreation and park areas)											County and city planning department records		
37	Location of surface hydrologic features (lakes, rivers, streams, bays, estuaries, ocean shores, etc.)										Regional scale?			
38	Locations and capacities of existing and planned water supply lines, waste water discharge lines, natural gas supply lines											County and city public works and planning department records; CEC; EIA; WSCC		
New "wish-list" Data Layers														
1	Distribution Line right-of-way shapes & data											CEC Cartographic Unit catalog updated periodically		need
2	Easier access to TL maps													
3	Updated system one-line (operating) diagrams											utilities, CPUC, Cal-ISO		
4	1:24K scanned, registered, rectified Quad maps													
5	More current "real-time" emissions, inventory, and rate data													
6	Toxic emission data--both criteria and non-criteria													
7	Sensitive (human) receptors													
8	Currently permitted/approved facilities										Calculate cumulative source loads in near future	Local ARBs		
9	WSCC plant sites and emissions											WSCC		
10	Existing noise level data													
11	Identify parcels as primary or secondary (vacant) residence in rural areas													

	Discipline										Comments	Source	Format	Status	
	TL-I	TL-E	AIRQ	GSFD	FACS	BIO	SOWA	LUTT	VISC						
Custom annotation, legends, symbology, field notes on maps for working memos, etc.				x			x								
Buffer analysis						x									
Screencapture a polygon for habitat type or vernal pool location						x									
Visualize topo via hillshade, 3-D						x									
Model effects on site drainage of road cuts, foundations, other development						x									
Generate a "noiseshed" (model)						x									
Break down sensitive receptors by "type"? and add schools								x							
Select specific LOS or ADT and map								x							
Map line of site/viewshed over sensitive receptors, estimate population within viewsheds											x				
Map historic features, analyze impacts?											x				
High-quality maps/posters produced by Cartographic Unit	x	x	x	x	x	x	x	x	x	x					