

STATEMENT OF WORK

DEVELOPMENT OF CURRENT YEAR (2000-04) GIS DATABASES FOR AIR QUALITY AND EMISSIONS INVENTORY DEVELOPMENT AND ANALYSIS FOR THE WRAP

INTRODUCTION

The Western Regional Partnership (WRAP) is a collaborative effort of tribal governments, state governments and various federal agencies to implement the recommendations of the Grand Canyon Visibility Transport Commission (GCVTC) and to develop the technical and policy tools needed by western states and tribes to comply with the U.S. Environmental Protection Agency's (EPA) regional haze rule (RHR). Other common western regional air quality issues raised by the WRAP membership may also be addressed. WRAP activities are conducted by a network of committees and forums composed of WRAP members and stakeholders who represent a wide range of viewpoints.

This document presents a scope of work, cost estimate and schedule for updating geographic information system (GIS) databases for use in air quality and emission inventory development and analysis for the WRAP.

Objective

The overall objective of the proposed study is to develop updated, current year (2000-04) GIS databases for use in air quality and emission inventory development efforts. Specific uses of these data may include the following:

- air quality analysis and support of source attribution/apportionment activities;
- improvement of near-field activity data and analysis of emissions strengths; and
- provide more uniform landuse and demographic data to make temporally consistent regional estimates of biogenics, ammonia, and windblown dust emissions, as well as providing a consistent baseline for area source activity data and planning
- development of appropriate GIS data layers for Canada and Mexico

Background

A variety of GIS data are necessary in regional air quality model development and evaluation. These include data required to characterize various features of the land (vegetation, landuse/landcover, soils, etc.), transportation networks (roads, railways, shipping lanes, airports, and marine ports), and socioeconomic data (population, housing statistics). In the development of emission inventories, spatial surrogates are required for allocating regional or county-level emissions to modeling grid cells for air quality modeling. Spatial surrogates are generally dependent on the type of activity that produces the emissions for each source category and can

be developed using a variety of GIS databases. In addition, for biogenic, windblown dust and ammonia emissions, the GIS data form the basis for the emissions factors as well as the “activity” data for developing emissions estimates.

GIS data is also used in air quality modeling and analysis, specifically land use data for the estimation of deposition. The evaluation of emission inventories and air quality modeling results can be aided by the analysis of GIS data. Spatial relationships between source regions and underlying geography and demographics may reveal various patterns that can help in the evaluation of modeling results, model performance and emission inventory quality assurance and evaluation. For those emissions sources inherently related to the land characteristics (biogenics, ammonia, windblown dust), GIS data is required and can be used in the determination and assessment of appropriate control strategies and implementation.

Thus, the development and availability of GIS data that is accurate, detailed and representative of the time period for which air quality and emissions modeling is conducted and/or analyzed is of paramount importance. Many recent emission inventories and air quality modeling databases have been developed using data that are outdated by several years, and in some cases, even decades. One of the primary reasons for this is the need for data covering relatively broad geographic areas. Relatively few GIS databases of this nature with the required attributes are available within the public domain. The purpose of the proposed work is to address the need for, and develop, these detailed and up-to-date databases. The data identified and evaluated for this project will also provide a resource for various planning activities. Recommendations for the application of these updated GIS databases by the WRAP Regional Modeling Center (RMC) and their expected impacts will also be provided.

An example of the types of data that may be evaluated is presented in Figures 1 and 2, which display land use in the San Francisco Bay Area for 1986 and 1993, respectively. Various changes in land use during this time period can be seen. These data were obtained from the NOAA Coastal Services Center, an office within the National Oceanic and Atmospheric Administration devoted to serving the nation's state and local coastal resource management programs. Similar types of data for other coastal areas of the country and for other years (including the 2000-04 period) can be obtained from the Center's website at <http://www.csc.noaa.gov/>.

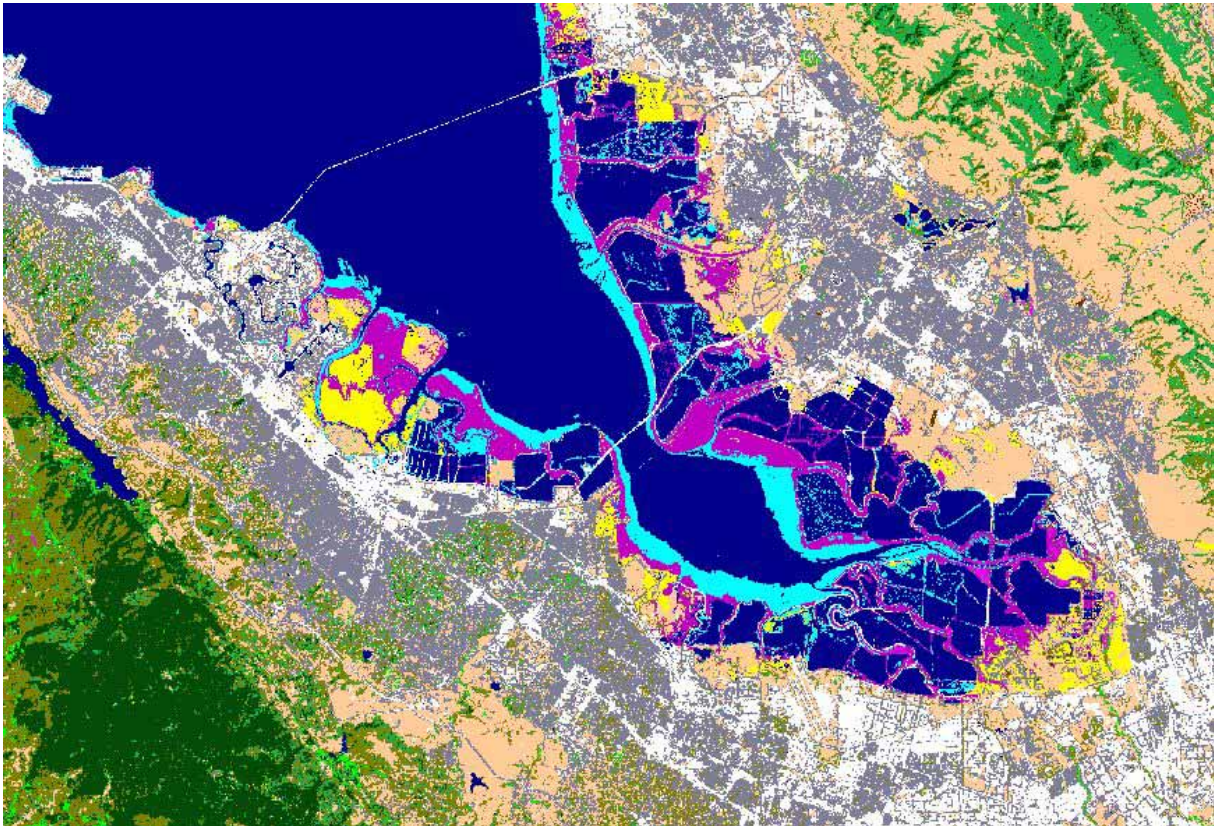


Figure 1. San Francisco Bay Area landuse/landcover for 1986.

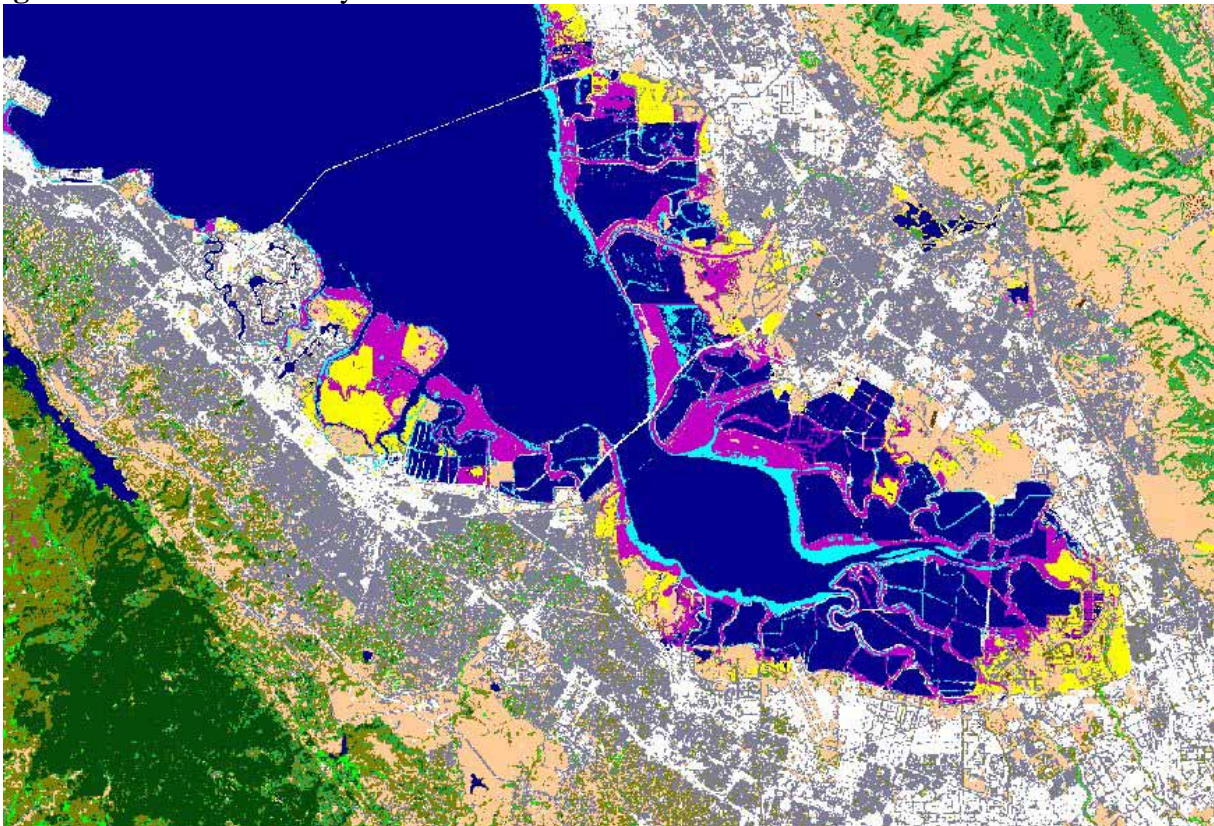


Figure 2. San Francisco Bay Area landuse/landcover for 1993.



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Proposed Work Tasks

ENVIRON proposes to complete this study in four core tasks as follows:

1. Identification of relevant GIS data and sources
2. GIS data evaluation
3. Process and develop final updated GIS databases
4. Recommendations and Reporting

A more detailed discussion of each of these proposed tasks is presented below.

It should be noted that there is the possibility that improved current year GIS data may not be found as part of the Task 1 work efforts. In this case, the subsequent tasks may need to be revised and/or abandoned as appropriate.

PROPOSED WORK TASKS

The work tasks proposed for the completion of the study are described below.

Task 1: Identification of Relevant GIS Data and Sources

Updated and recent GIS data and sources will be identified under this task. The determination of relevant data sources will be based on a number of considerations, primarily the GIS data requirements of the various regional emissions and air quality modeling tools used by WRAP. In addition, data representing broad geographical regions and for recent years (i.e., post-1993, preferably in the 2000-2004 time period) will be identified. The attributes available in the databases will also be a prime consideration. As a starting point, for each of the general types of GIS data to be identified (e.g., landuse/landcover characteristics, transportation networks, population and housing statistics), the following known sources of data will be reviewed:

- Landuse/Landcover
 - USGS
 - Gap Analysis Program (GAP)
 - BLM
 - STATSGO
 - NOAA
 - State GIS Department websites
- Population and Housing
 - US Census Bureau
 - USGS
- Transportation Networks
 - US Census Bureau
 - US Department of Transportation

- BTS
- USGS
- State Departments of Transportation

On-line searches of other relevant sources of GIS data will be conducted to provide as many GIS databases as possible for review and consideration. In addition, possible sources of GIS data for Canada and Mexico will be identified. A web site will be established to disseminate project information as well as links to relevant GIS databases and project documents.

To initiate this task, a Letter of Request will be sent out to appropriate state representatives within the WRAP requesting any available datasets and/or contacts that could provide relevant sources of information.

Deliverable: The deliverable for this will be a Technical Memorandum tabulating and summarizing all sources of data identified, the types of data available from each data source, the data's spatial coverage and format, and any other relevant information associated with the sources identified. The Technical Memorandum will also provide recommendations with respect to the GIS data and sources for further review and evaluation.

Task 2: GIS Data Evaluation

Work under this task will involve the evaluation of the data identified under Task 1. The evaluation will consider a number of attributes of the data including:

- Vintage, spatial resolution and extent, data quality and cost
- Specific characteristics of the data
- Required data processing resources
- Intended uses of the data

Clearly, there will be a number of trade-offs that will need to be made among the desired data characteristics listed above. These relate to the need to balance the advantages of updating and improving upon a specific dataset versus the resources required for data processing. In addition, the expected benefits which derive from these updated data will need to be considered with respect to the subsequent improvements associated with their intended use among the various modeling tools used in the emission and air quality related analyses. Emphasis will be placed on those databases and geographic regions which are expected to exhibit the most pronounced changes over the time, for example, landuse data that characterize rapid urban growth.

Deliverable: The deliverable for this task will be a Technical Memorandum summarizing the GIS data evaluation. The summary will include a discussion of each of the databases evaluated with respect to the attributes listed above, as well as a discussion of the pros and cons of each. The Technical Memorandum will also provide recommendations concerning which GIS datasets should be further processed and assembled for use in the various emissions and air quality modeling tools currently in use by WRAP.

Task 3: Process and Develop Final GIS Database

The GIS databases evaluated and recommended for modeling use under Task 2 will be processed and assembled under this task. All GIS data layers will be assembled into a consistent format, as appropriate, for use in the various emissions and air quality modeling tools and software used by the WRAP. As part of the data processing efforts, all GIS layers will be quality assured and internally documented. At minimum, internal documentation will include: source of data, vintage, coordinate projection and geographic extent of coverage, spatial resolution, data attributes and characteristics. Additional internal documentation will be included as appropriate.

A project Final Report documented all work performed during the course of the study will be prepared under this task.

Deliverable: The deliverable for this task will be the final updated GIS data layers assembled during the course of the study. The GIS data will be delivered to WRAP on appropriate electronic media.

Task 4: Recommendations and Reporting

This task will include documenting all work performed and preparation of a project Final Report. The Final Report will include a detailed listing and description of all databases identified during the project. Summaries of the characteristics and attributes of each dataset and procedures used in the evaluation will be included. The Final Report will also include a discussion of the relevance and applicability of each database with respect to the various emissions and air quality analysis tools in use by WRAP. Recommendations for appropriate uses of the data bases prepared during the project will be provided. Comparisons of the updated data with the current databases used in the analysis tools will also be included.

A variety of emissions and air quality analysis tools are currently in use by the WRAP. These include the following:

- SMOKE emissions processing system
- Windblown Dust Emissions Model
- NH3 Landuse Model
- WRAP Near Class I Area Analysis

Currently the SMOKE system uses the most recent spatial surrogate data as developed by the EPA based on the 2000 US Census data and the National Land Cover Database (NLCD). Several dozen surrogates and assignments are available, although the system does not currently make use of all those available. ENVIRON would provide recommendations with respect to making updates to these data based on the findings of this study.

Both the Windblown Dust Emission model and the NH3 model require the specification of land cover and soils characteristics. Currently the models rely on the NLCD for land cover and the STATSGO soils database for specifying soil texture. It is expected that these models could



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make use of any updated GIS data layers with minimal effort and resources.

Another possible recommendation for using these data is in the WRAP Near Class I Area Analysis. This project involved the processing and displaying of county-level emission data near Class I areas across the Western States. The project used the WRAP 1996 emission inventory and processed county-level data using spatial surrogates based on population, roadways and landuse. The data used in developing the spatial allocation surrogates were derived from GIS data developed by the EPA. This included populations and roadways developed from the 1990 US Census. Landuse data was based on pre-1993 databases. Based on the finding of the proposed study, a possible recommendation is to update the GIS databases used for the Near Class I Area Analysis, as well as the emission inventory, and evaluate the impact these updated GIS data have on the resulting analysis.

Finally, a discussion of relevant GIS data for Canada and Mexico and recommendations for their applicability within the overall WRAP modeling and planning efforts will be provided.

Deliverable: The deliverable for this task will be a Project Final Report documenting all work performed during the course of the study and providing recommendations for appropriate uses of the updated GIS databases.

SCHEDULE

Schedule

ENVIRON proposes to complete the study in approximately four (4) months from project initiation. Assuming a March 15, 2005 project initiation date, the schedule for completion of the study by work task will be as follows:

- Task 1 would be completed in four weeks with a Technical Memorandum submitted by April 15, 2005
- Task 2 would be completed within four weeks of approval of the Task 1 Technical Memorandum.
- Task 3 would be completed by June 15, 2005
- Task 4 would be completed by June 30, 2005



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