Tom Lutzenberger

GEOG 93

Final Project

Project Summary

The goals of this project are to show competency in spatial analysis for GEOG 93 by demonstrating a prototype analysis and utilization of CAL FIRE vendor data for use by operational resources when responding to an emergency incident. This was achieved by using vendor tax reporting data, identifying it geographically, and displaying its location along main transportation routes most likely to be used by responding CAL FIRE units.

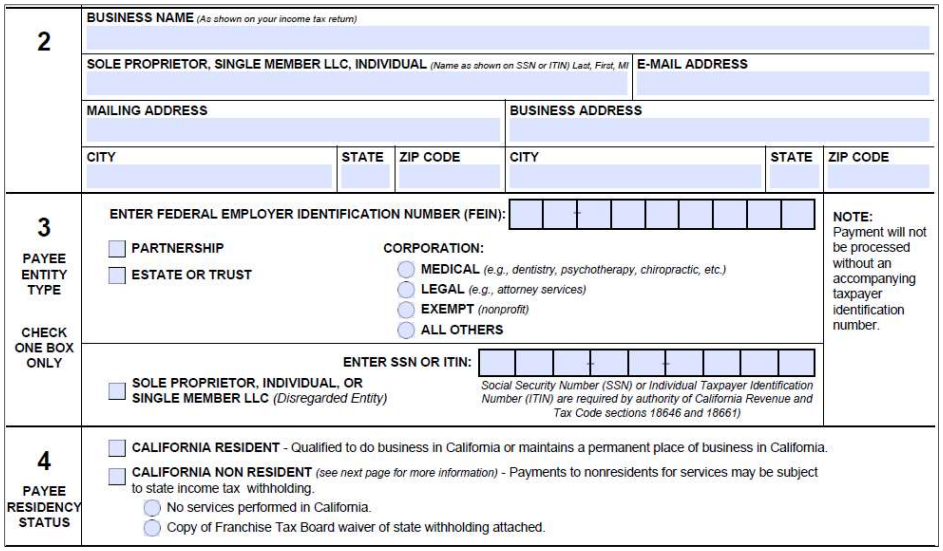
Purpose

The purpose of this project was to develop a prototype model of GIS analysis that can be translated into an operational tool for traveling emergency responders. By providing geographically based information on vendors ready to use, this prototype can visually show where responding units can find ready-to-use vendors without losing hours in additional paperwork getting suppliers ready and confirmed for state finance transactions on emergency incidents.

Process Description

The initial data to be used by this project included vendor information already collected by CAL FIRE financial staff in the course of business. Specifically, this prototype targeted restaurant vendors already registered by CAL FIRE as valid suppliers that state business can be transacted with. Under state finance rules, a vendor must be approved, on file, and documented before a state financial transaction can be initiated with that business. This is an elementary step in state procurement and required by the California State Procurement Manual as well as the statutory Government Code.

As a result, every vendor the state does business with must submit basic information to the state, including tax reporting information. The tax reporting information provides specific data associated with the valid existence of the business, its tax identification data, its contact information, and confirmation that the business is in fact legal and in compliance with state laws. This is certified by a business owner's or management representative's signature on standard forms. The most common form used is the STD 204.



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BUSINESS NAME *(As shown on your income tax return)*

SOLE PROPRIETOR, SINGLE MEMBER LLC, INDIVIDUAL *(Name as shown on SSN or ITIN) Last, First, MI* | **E-MAIL ADDRESS**

MAILING ADDRESS | **BUSINESS ADDRESS**

CITY | **STATE** | **ZIP CODE** | **CITY** | **STATE** | **ZIP CODE**

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PAYEE ENTITY TYPE

CHECK ONE BOX ONLY

ENTER FEDERAL EMPLOYER IDENTIFICATION NUMBER (FEIN): -

NOTE: Payment will not be processed without an accompanying taxpayer identification number.

☐ **PARTNERSHIP**

☐ **ESTATE OR TRUST**

CORPORATION:

○ **MEDICAL** *(e.g., dentistry, psychotherapy, chiropractic, etc.)*

○ **LEGAL** *(e.g., attorney services)*

○ **EXEMPT** *(nonprofit)*

○ **ALL OTHERS**

ENTER SSN OR ITIN: - -

☐ **SOLE PROPRIETOR, INDIVIDUAL, OR SINGLE MEMBER LLC** *(Disregarded Entity)*

Social Security Number (SSN) or Individual Taxpayer Identification Number (ITIN) are required by authority of California Revenue and Tax Code sections 18646 and 18661)

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PAYEE RESIDENCY STATUS

☐ **CALIFORNIA RESIDENT** - Qualified to do business in California or maintains a permanent place of business in California.

☐ **CALIFORNIA NON RESIDENT** *(see next page for more information)* - Payments to nonresidents for services may be subject to state income tax withholding.

○ No services performed in California.

○ Copy of Franchise Tax Board waiver of state withholding attached.

Figure 1: STD 204 Data Fields

The data on the STD 204 is then entered into state financial systems for record-keeping and subsequent generation of tax reporting information on state payments made to that given business or entity. All types of businesses are included from sole proprietors to corporations. As a result, the data collection can include sensitive private information such as Social Security Identification numbers which also act as tax identification data for individuals. All of these businesses and entities are then reported on federal income tax forms (such as the MISC 1099) and state income tax forms at the end of the tax reporting period. The tax agencies use this information to then double-check that such entities report their earnings properly. Where a filer does not include income the tax agency is aware of by reporting, it can then trigger an audit examination.

The tax vendor data collected, however, is not specifically ready for any other purpose than accounting and tax reporting. As a result, it does not necessarily include ready-to-use fields such as “vendor type.” Thus, easily discerning between a food business from a vehicle mechanic from a non-profit agency is not possible by category. The data has to be manually filtered by examining each record to determine the business type. For the purposes of this project that means that if the sample population of restaurants is to be identified to then make it easy to find them geographically by an emergency responder via a map tool, those vendors must be separated from the rest of state vendor data manually, which of course takes considerable work “data scrubbing.”

The goal of this project is to demonstrate how financial data that already exists can take on a new beneficial life for CAL FIRE. For this model, one of the easiest, low-hanging-fruit benefits would be to identify which financial vendors are ready-to-go as one travels across the state responding to emergencies. Every year CAL FIRE sends thousands of personnel up and down the state responding to wild fires and other disasters. That in turn triggers the need to feed personnel and house them in hotels enroute to and from disasters as well as at the incident location. Because of state finance rules, strike team leaders must carry an assortment of forms and paperwork to fill out at each hotel and restaurant to ensure the vendor is tracked by the state properly. Additionally, with the start of FI$CAL, the state’s

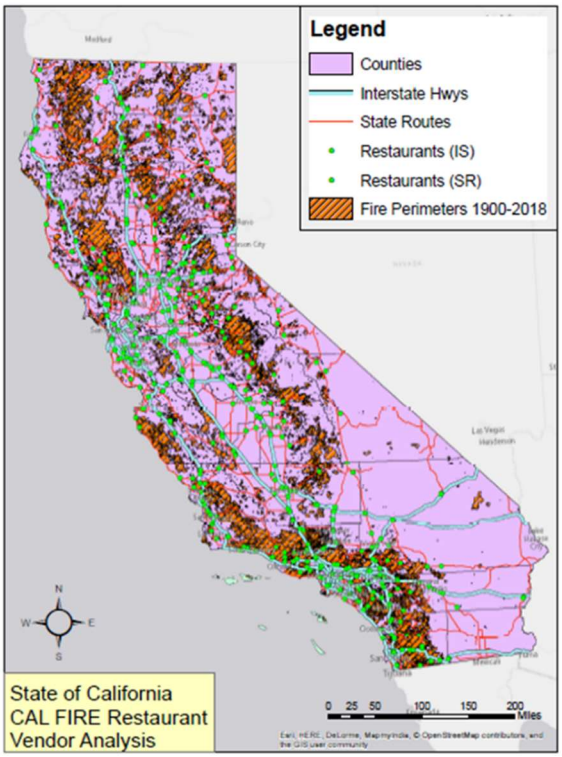
new financial system, the same data must be inputted digitally and processed to clear such transactions. This multi-step process can trigger hours of workload that can back up quickly for a Fire Captain in charge of a strike team, much of which ends up getting completed after he or she returns from a fire.

To avoid the above work, the prototype is intended to take what is already known about approved vendors and identify them spatially so a strike team can use such vendors as they move into or out of California geographic areas. This would process would culminate in an easy to use mobile platform that the Strike Team leader can pull up on his or her device as the Team pulls into town to feed or sleep. Instead of facing more hours of paperwork, the Team Leader simply processes the roster of which employee ate or slept at the location, collects the payment receipts, and processes the transaction data to clear the credit card charge after the fact in FI$CAL by referencing the already-approved vendor in the system.

Again, this model targeted restaurants as the test population. The target group was filtered manually from the total population of vendor data (33,000 records) known by CAL FIRE at the start of this project as in "approved" status. After several weeks of manual filtering, again due to the data category absence noted above, the target population of several hundred restaurants was finally achieved.

This data then needed to be geocoded. With assistance from Professor Jennings, the target set was completed quickly and ready for use. The initial test model was then built within ArcMap.

In addition to the vendor data now geocoded, additional data sets were needed. These include:



- California government county borders
- California state borders
- California state routes
- California federal interstates
- California fire perimeter history

The expanded data sets were identified because the existing of the information create a secondary benefit of vendor absence analysis to be discussed in detail below.

With the data sets collected, the initial map layers were constructed in ArcMap first to generate the base geographic display. This included defining the state boundaries, that of counties, and all major transportation routes. The next step was to load and create the display of the vendor information. All of these were established as geodatabases or gdb files in the ArcMap environment.

From this point, the initial map could be constructed in the software. There was some cleanup that needed to be applied as much of the standard

transportation data was not specific to California's borders. This was resolved by applying the geoprocessing clip function to clean up the presentation and remove any interstate or state routes outside of California's borders.

Subsequently, the restaurant data now needed to be married with the available transportation routes. This was made possible by using the geoprocessing intersect tool with a range of 5 miles from the interstate or state route. Thus, the valid restaurant location was now represented with a useful relationship associated with a likely road or highway to be used by responders and within easy access range of that transportation route.

With the vendors and routes completed, it became apparent that two benefits could be achieved with the prototype: 1) the immediate location of a usable vendor being identified, and 2) where the absence of approved vendors in a given operational area existed could also be identified for action and recruitment. Thus, an additional step using the geoprocessing tool buffer was applied to point out where in given areas approved vendors were missing versus known historical fire activity. The fire activity was added by using a CAL FIRE shapefile of known fire perimeters from 1900 to the year 2018.

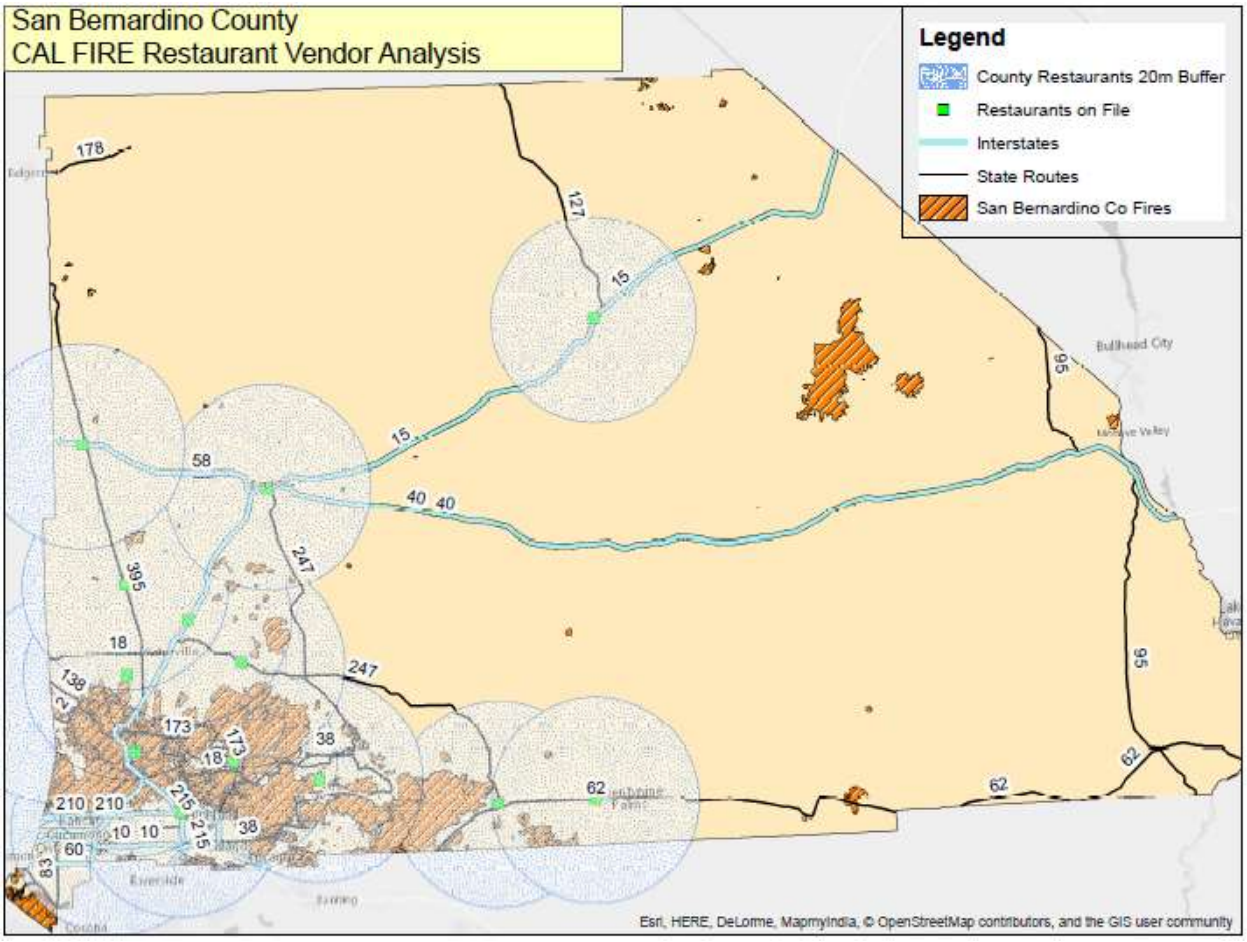


Figure 2: San Bernardino Co. 20-mile Buffer Example

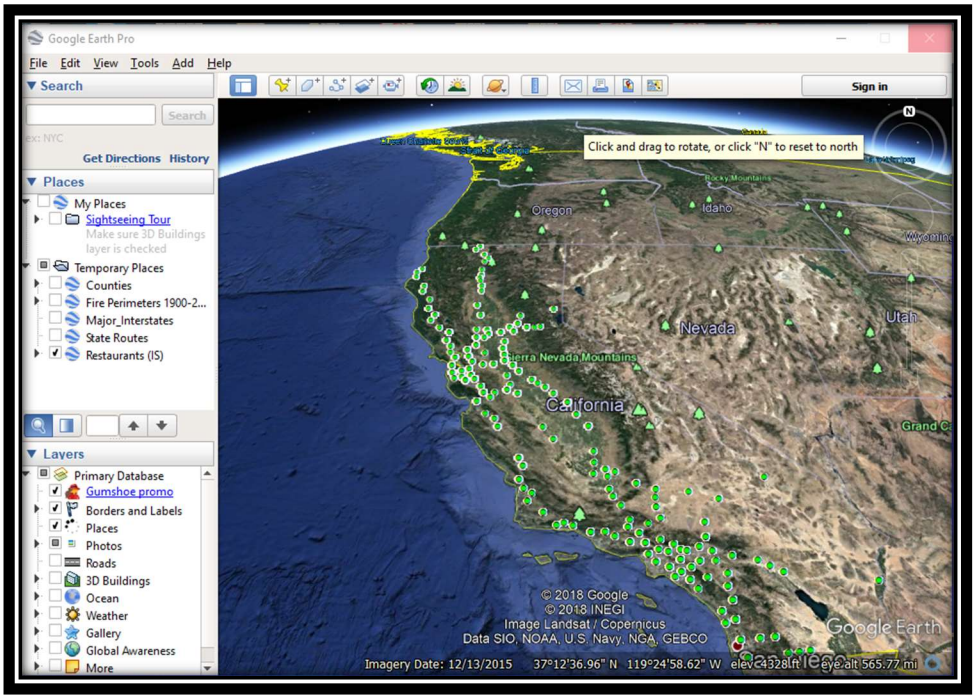
With all the above information now complete and displayed visually, maps could be generated showing the completed analysis. This is provided in four maps:

- Map A – Vendor Data and State Routes
- Map B – Vendor Data, Routes and Fire Perimeters
- Map C – Sonoma County Example of Absence Analysis
- Map D – San Bernardino County Example of Absence Analysis

The final stage involved how to transfer the now-completed data sets into a mobile platform. Originally, ArcPro was intended to be used. However, in discussion with experienced GIS users it was recommended the same benefit could be achieved in an easier access format, Google Earth.

The Google Earth process involved taking specific layers and converting them to a KML file format. The processed files are then transferred and opened in Google Earth to display in the same environment. The beauty of the Google Earth approach is that it is widely available, easy to access by any user with a Google account, and little or not cost to distribute – a perfect mix for a prototype testing.

The KML conversion process was easy to complete after finding instructions online and using the geoprocessing conversion tool to make the change of specific layer files already created. The data did display in Google Earth as expected and was functional. However, an additional challenge appeared in production discussed below.



Difficulties and Challenges

The first big challenge was realizing what was needed to geocode large amounts of data quickly. Several "free" online tools were attempted, and they did not work at all. When the possibility of using ArcMap was then examined, the service was not available through my agency. This meant an out-of-pocket approach, which would have been prohibitive for the purposes of this class project ($500 plus). With the help of Professor Jennings, this problem was overcome quickly, and the project could move forward.

The second big challenge was the computing speed needed to make Google Earth work. The laptop computers being used were not fast enough to process the large amounts of data crunching needed to make the model work effectively. While it was completed, as evidenced below, a robust multi-tested model was not possible to create because the software and tools would lockup. This even occurred with Sierra College lab computers.

However, the tool did work, and with a faster computer the prototype can be completed easily. So, in short, the project is 95 percent on the way to success. CAL FIRE Executive management reviewed the prototype and was impressed with the visible results and potential. Approval has been given to continued forward, which was the ultimate goal of the prototype development.

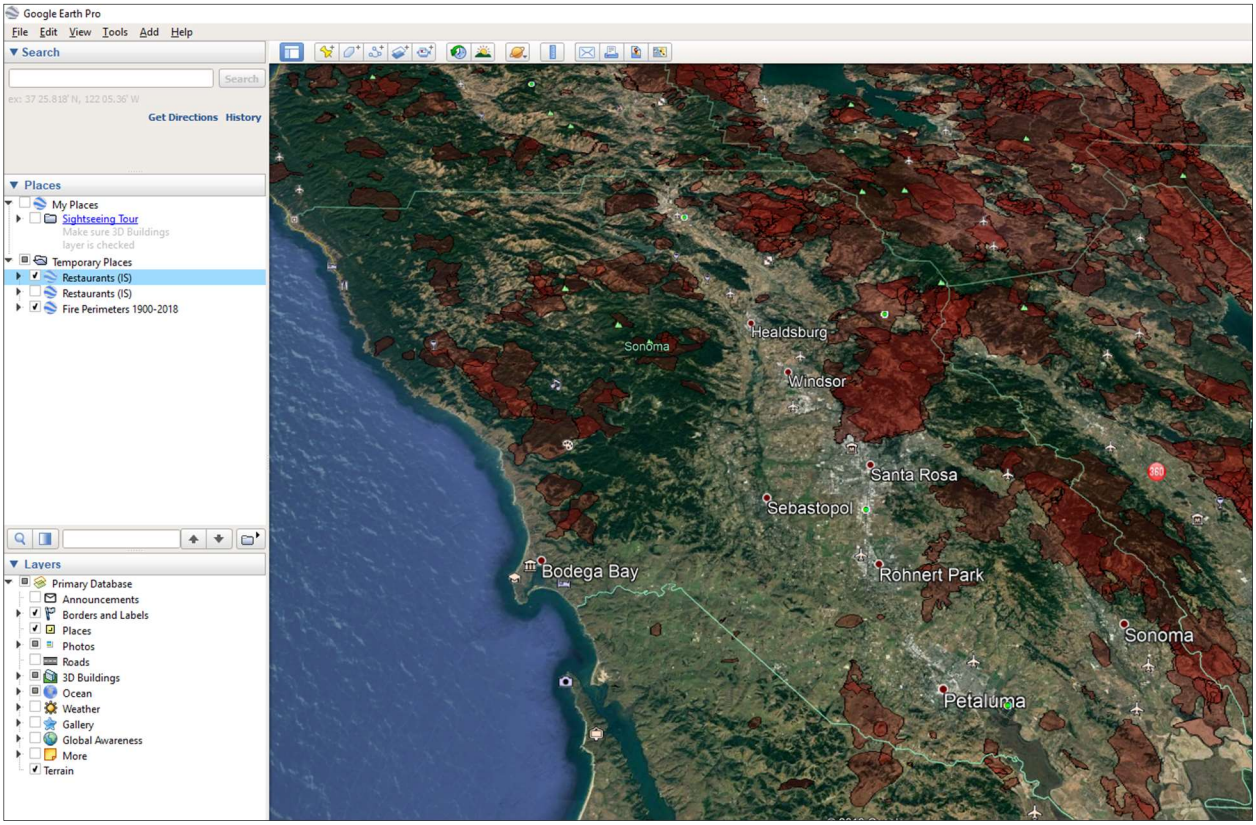


Figure 3: Sonoma County Google Earth Example

Lessons Learned

The first lesson learned was that a far faster and stronger computer is needed for viable spatial work. This was not a surprise, but it became very evident.

The second lesson was a good understanding of exactly what tools would be needed to make this kind of work a regular production task in CAL FIRE, as well as what training would be needed for the staff involved.

Deliverables Attached

- Map A – Vendor Data and State Routes Displayed
- Map B – Vendor Data, Routes and Fire Perimeters
- Map C – Sonoma County Example of Absence Analysis
- Map D – San Bernardino County Example of Absence Analysis
- PowerPoint Class Presentation File