

Riverside County, California

Issued: July 22, 2021

WHY?

Riverside County's evolution to integrating GIS into its election processes likely mirrors that of many counties.

The county originally placed voters into districts using street ranges and mylar drawings. From about 1990 to 1996, the county started using Atlas GIS. This program was used to draw precincts and district boundaries, which would be hand-checked and compared to the Election Information Management System (EIMS) database of voters and districts. After 1996, the county moved to Maptitude. Methods were improving; however, the GIS was not yet fully geo-enabled. In 2010, the county moved to ESRI software. From this point forward, all voting precincts and voter addresses were maintained in GIS. This milestone gave staff the ability to quickly check voter location and led to a dramatic improvement in "voter to precinct" placement accuracy.

Several years ago, the software vendor DFM developed database "views" of the EIMS database based on our needs. The two most useful views are the "GIS View" of the voter address records and the Precinct to District Module (PDM) View. These "views" provided the opportunity for the Registrar of Voters staff to create scripting programs using the live links between the EIMS and GIS databases.

Additionally, the Riverside County Assessor's GIS was made available within county departments. The assessor parcel database helps the ROV staff maintain a very tightly controlled precinct layer. However, in some instances, district lines are based on other geographic features like census blocks. In these instances, these other features are used as secondary resources to make the precinct lines.

Presently, Riverside County Registrar of Voters is fully geo-enabled, and the GIS team conducts daily and weekly processes to maintain accurate voter placement in respective precincts. The Registrar of Voters GIS team maintains the voter address points and precincts while keeping a direct connection to the EIMS database. Base

mapping has the live link to the Assessor's data: parcels, centerlines, assessor address points, and other layers, such as city boundaries and zip codes. The Registrar of Voter's office also maintains open communications with partner agencies to quickly rectify any errors.

The Registrar of Voters GIS team continues to identify ways to improve efficiency in internal processes and direct communication with constituents. For example, the Registrar produces web maps for voters to locate a polling place, an in-person assistance center, and official mail ballot drop-off sites. An example of efficiency is using modeling tools for the consolidation of voting precincts. The process of creating mail ballot precincts, voting precincts, checking ballot types, checking consolidation parameters, etc., used to take about a week (large elections took a few weeks). Now with the technological advances provided by ESRI, it takes an hour or so to complete the same task. Riverside County looks to continually improve and implement tools and methods used to help the voter.

Voters in GIS and maintenance

The evolution from geocoding to centerlines to geocoding to assessor points took several months. Nearly six years ago, when this began, Riverside County's voter registrations stood at just under 1 million voters; now the county has 1.3 million voters. These voters could be matched to the assessor point addresses, but the assessor address format differs from the address format of voter in EIMS. The team created a model that converts the Assessor's data into the EIMS format of addresses. Due to the high number of new registrations, the Voter Mapping Model runs weekly to maximize efficiency and ensure all voters are in the correct precinct.

Here is an example of an EIMS voter that needs to be mapped (where the LINK is created by the model).

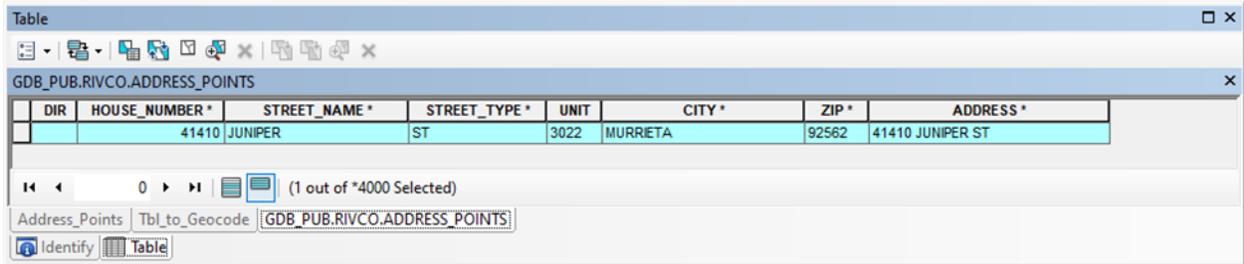


The screenshot shows a table window titled 'Tbl_to_Geocode' with the following data:

VoterUniqueID	AffNumber	StreetAddress	Unit	City	State	Zip	PrecinctI	GISPrecinct	Link
3533813	33NF224283	41410 Juniper St	Apt 3022	Murrieta	CA	92562	0032417	32-417	41410 Juniper St Apt 3022 92562

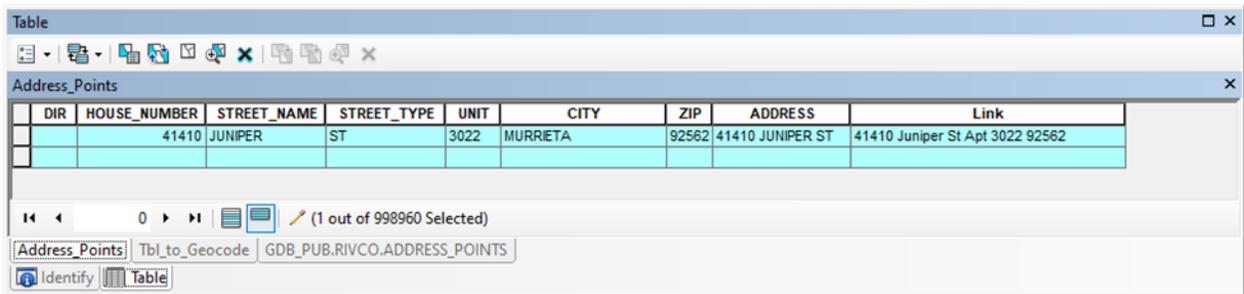
The interface also shows navigation controls, a status bar indicating '(1 out of 2955 Selected)', and a layer list at the bottom with 'Address_Points', 'Tbl_to_Geocode', and 'GDB_PUB.RIVCO.ADDRESS_POINTS'.

And below is the same address from the assessor point data.



DIR	HOUSE_NUMBER *	STREET_NAME *	STREET_TYPE *	UNIT	CITY *	ZIP *	ADDRESS *
	41410	JUNIPER	ST	3022	MURRIETA	92562	41410 JUNIPER ST

And below is the same address from the processed assessor point data (where the LINK is created by the model).



DIR	HOUSE_NUMBER	STREET_NAME	STREET_TYPE	UNIT	CITY	ZIP	ADDRESS	Link
	41410	JUNIPER	ST	3022	MURRIETA	92562	41410 JUNIPER ST	41410 Juniper St Apt 3022 92562

The example clearly shows that without an automated way of converting the assessor database of addresses into a format compatible with the EIMS voter addresses, locating unmapped voters would be a tedious, time-consuming endeavor.

Once the Voter Mapping Model was completed and thoroughly tested, Riverside County's team treated every voter as a "new voter" and ran the model. The model helped match about 80% of all Riverside County voters to the assessor address points, dramatically decreasing the amount of potential work that staff would otherwise have to complete. The remaining 20% that did not match the Assessor data consisted of: the assessor database having misspellings, missing assessor address points, the Assessor data missing tracts because of new developments, as well as the EIMS database having data entry errors. The net benefit was the ability to correct BOTH the Assessor data and EIMS voter database.

Though it took several weeks to move the unmatched voters to the assessor points or parcels, the new set of accurately placed voters formed the baseline database for all future voter placement and made mapping new voters quicker.

With the acceptance of the new voter database, the GIS team then ran another part of the model to identify and correct voters who were out of precinct. A simple overlay of the voters to the GIS precincts helped identify where the precinct assigned to the voter and the underlying GIS precinct did not match.

Riverside County has been able to reap the reward of the model. This high match rate is especially critical during large elections. Riverside County can get anywhere between 2,000 to 10,000 new voters (and voter change of address) each day, so having an efficient way to map new voters daily, rapidly, and accurately is critical. There will always be a few dozen voters that need to be mapped by hand, so the model separates them, matches them to their precinct, and staff members move them by hand. Having an efficient model, with a six-year track record of success, helps us identify errors so we can immediately fix them.

District and precinct generation and maintenance

Riverside County does not keep a separate database of district boundaries. The county has 165 unique districts, with a total of 475 subdistricts. All the districts are kept in EIMS based on precincts, and some precincts contain several districts. The county can instantaneously link GIS precincts to the EIMS database using the PDM view shown below.

DistrictID	SubDistrict	DistrictName	DistrictType	PrecinctID	GISPrecinct	AreaName
1540CC	0	Riverside Community College Dist	Community College Districts	0011233	11-233	RIVERSIDE/WD 2
2066US	0	Moreno Valley Unified School District	Unified School Districts	0011233	11-233	RIVERSIDE/WD 2
3500BE	0	Riverside Board of Education	County Board of Education Districts	0011233	11-233	RIVERSIDE/WD 2
3500BE	13	Riverside Board of Education TA 3	County Board of Education Districts	0011233	11-233	RIVERSIDE/WD 2
4000CS	0	Edgemont Community Services District	Community Services Districts	0011233	11-233	RIVERSIDE/WD 2
585	0	City of Riverside	Cities	0011233	11-233	RIVERSIDE/WD 2

This process allows any district to be accessed, queried, mapped, and printed on demand. In addition, the Registrar of Voters office uses this connectivity before every election to create maps of each district and to send a letter and map to each district to verify with the jurisdiction that the boundaries are accurate. When there is a change to a district, the GIS team works with stakeholders and their consultants to obtain the latest shapefile to create or split new precincts in both the election management system and GIS.

Once the modified or new information is entered into the election management system, the Riverside team uses GIS to check that the modified precincts and modified districts match. Since districts are maintained at the precinct level and the Riverside County Registrar of Voters has a live ODBC connection from GIS to its election management system, the team can do a spatial join on the GIS precinct to the precinct in the election management system. They can then query the database from GIS and dissolve all the precincts into a district. The team can also add an overlay from the results of the GIS process with the stakeholder-provided shapefile and compare results.

WHO?

Riverside County maintains an outward-facing site where the public can download information from the Assessor's office and other departments. According to Chuck Skaggs, GIS Supervisor for the Registrar of Voters, the best relationship-sharing experience he has had in his 33-year career is the Assessor's office granting a live link to their GIS. "I remember years ago when there was no sharing, or the data simply did not exist," Skaggs said. Based on the experience of Skaggs and the Riverside GIS team, we discovered that each county election office in California is essentially on its own. The Riverside team has reached out to other counties and exchanged ideas, but there is room for improving knowledge of the programs and skill-building. Riverside County Registrar's GIS team believes that a regional or state platform where participating election offices (or county GIS staff) could share ideas and tools would be a powerful resource.

The tools that Riverside County's Registrar of Voters GIS team uses to complete tasks have been developed and modified over the years. The GIS team always looks for ways to create tools to streamline work. For example, when placing new voters into the GIS database, the team sees common occurrences such as single-family homes having an apartment number in EIMS. Another common occurrence is

known apartment complexes in EIMS not having the unit number in a consistent format. To rectify this situation, the team developed a model that matches voters to the street master index from EIMS. So, if the street master from EIMS says an address is matched to an apartment, those voters with an erroneous unit number or no unit number assigned can be isolated and the data can be corrected. The model also works if the data is incorrect for condos, mobile home parks, and single dwelling units. If the data in EIMS does not match the street designation or have other inappropriate units assigned, these entries are moved into an Excel database, researched, and fixed. This prevents the Riverside's Registrar of Voters from sending undeliverable ballots to its voters.

Tools used daily include:

- Converting and standardizing assessor points so that voter addresses can be matched to assessor points
- Tools for mapping new voters to assessor points
- Consolidating precincts for an election
- Language analysis and more

IMPROVEMENTS

One of the things that Riverside County's Registrar of Voters could use to refine their districts is ensuring the office has the legal descriptions (usually a street-by-street description) provided to them, especially when they are new.

Riverside County has learned that having a good relationship with an agency and its consultants, where errors can be identified and fixed quickly, is a critical part of geo-enabling elections. A broken or non-existent communication line can provide a serious challenge to effective data management and accurate voting precincts.

CHALLENGES

The Registrar's GIS team has found that a good working relationship with the Assessor's office is vital to geo-enable the voting process. But there have been challenges. For example, if there is a problem with the Assessor's GIS system, and it is unavailable, the Registrar of Voter's work can be seriously impacted. In

anticipation of this type of scenario, the team created a model that pulls relevant assessor data from their servers on a recurring basis.

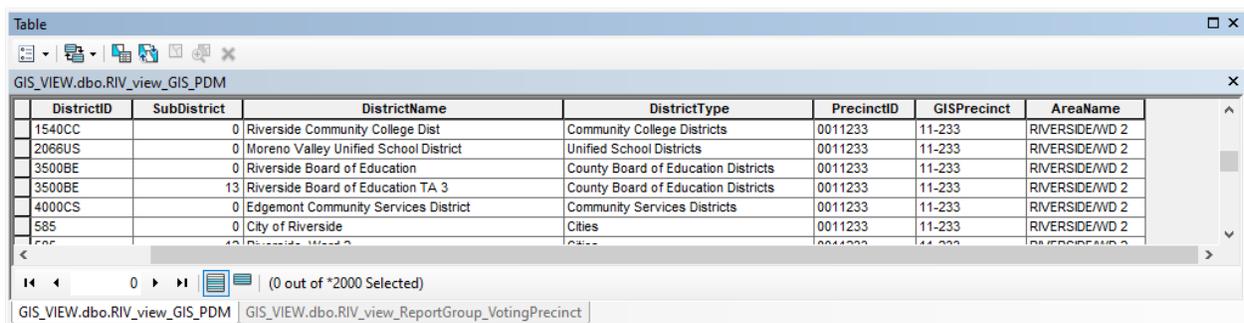
Another challenge is not receiving notification from jurisdictions when changes are made. Although one of the larger contractors for these districts in Riverside County maintains a website of approved boundary changes and notifies the Registrar of Voters once they are posted, others do not. Sometimes the GIS team only finds out something has changed when the Registrar of Voters office sends each jurisdiction a sign-off letter, a map, and the current GIS boundary on file before each election. Once GIS staff finds out the data is incorrect, it is fixed immediately.

SUCCESSSES

Lessons learned

Team members have engaged in conversations with other counties and found that only a few are aware that their election management system providers can connect them with live links to the election database. Riverside County Registrar's GIS staff urges others to use GIS to its fullest potential. Riverside has saved countless hours using the EIMS database connections, which eliminates conversion errors. And with the live link, any changes in EIMS are immediately available to GIS. This information, combined with a few models, allows staff to quickly make maps for an election, verify election parameters, and more. Below are a few images to show how the EIMS data can be attached and mapped in GIS.

Mapping district polygons



DistrictID	SubDistrict	DistrictName	DistrictType	PrecinctID	GISPrecinct	AreaName
1540CC	0	Riverside Community College Dist	Community College Districts	0011233	11-233	RIVERSIDE/WD 2
2066US	0	Moreno Valley Unified School District	Unified School Districts	0011233	11-233	RIVERSIDE/WD 2
3500BE	0	Riverside Board of Education	County Board of Education Districts	0011233	11-233	RIVERSIDE/WD 2
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4000CS	0	Edgemont Community Services District	Community Services Districts	0011233	11-233	RIVERSIDE/WD 2
585	0	City of Riverside	Cities	0011233	11-233	RIVERSIDE/WD 2

Mapping reporting group polygons

Table

GIS_VIEW.dbo.RIV_view_ReportGroup_VotingPrecinct

szReportGroupName	szReportGroupItemName	sVotingPrecinctID	IElectionHndI	GISVotingPrecinct
Range Inspector	Riverside County Waste Management (5)	0050403	74	50-403
Range Inspector	Riverside County Waste Management (5)	0050407	74	50-407
Range Inspector	Riverside County Waste Management (5)	0050408	74	50-408
Recruiter Language Requirements	Griselda June 2018	0025519	91	25-519
Recruiter Language Requirements	Griselda June 2018	0025522	91	25-522
Recruiter Language Requirements	Griselda June 2018	0025525	91	25-525
Collection Center	Grace Mellman Library	0033027	77	33-027
Collection Center	Grace Mellman Library	0033028	77	33-028
Collection Center	Grace Mellman Library	0033030	77	33-030
Collection Center	Grace Mellman Library	0033032	77	33-032
Collection Center	Grace Mellman Library	0033036	77	33-036
Collection Center	Grace Mellman Library	0033038	77	33-038

83453 (0 out of 83453 Selected)

GIS_VIEW.dbo.RIV_view_ReportGroup_VotingPrecinct

Mapping voters (names turned off for privacy)

Table

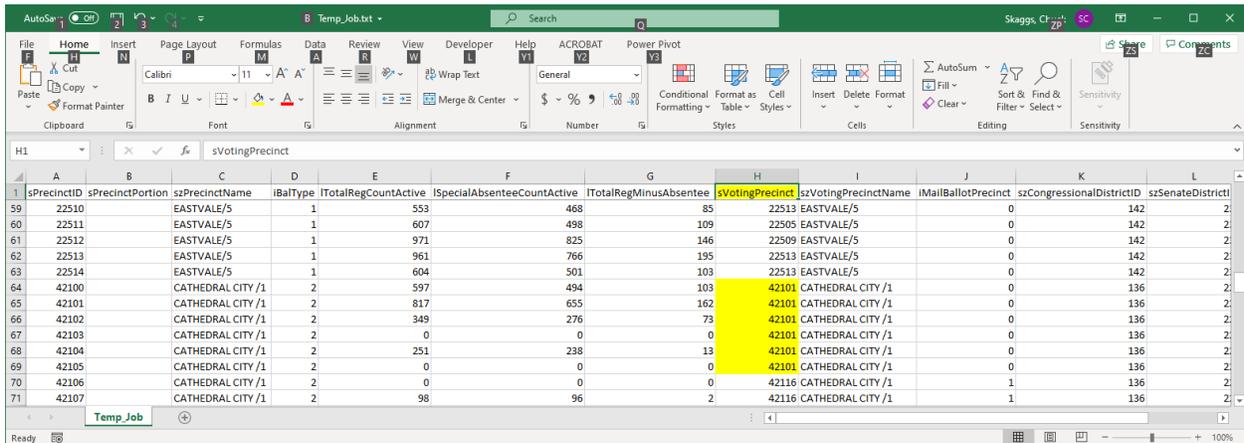
GIS_VIEW.dbo.RIV_view_GIS

VoterUniqueID	AffNumber	StatusCode	StreetAddress	Unit	City	State	Zip	PrecinctID	PrecinctPortion	GISPrecinct
3551516	65CB14352	A	26550 Cortrite Ave		Hemet	CA	92545	0037635	<Null>	37-635
3153175	33Z1937943	A	26410 Cortrite Ave		Hemet	CA	92545	0037635	<Null>	37-635
3563641	65C1938184	A	26550 Cortrite Ave		Hemet	CA	92545	0037635	<Null>	37-635
3282482	65CB284391	A	26370 Cortrite Ave		Hemet	CA	92545	0037635	<Null>	37-635
2613509	33Z1186597	A	17111 S Main Divide Rd		Lake Elsinore	CA	92530	0012756	<Null>	12-756
475962	65CB307503	A	17111 S Main Divide Rd		Lake Elsinore	CA	92530	0012756	<Null>	12-756
2054542	70E826227	A	11908 Hudden St		Riverside	CA	92505	0011715	<Null>	11-715
453622	00ZD858678	C	11908 Hudden St		Riverside	CA	92505	0011715	<Null>	11-715
1502126	91AH813375	A	11924 Hudden St		Riverside	CA	92505	0011715	<Null>	11-715
2948239	33ZK488236	A	11924 Hudden St		Riverside	CA	92505	0011715	<Null>	11-715
453626	19YZ394811	C	11916 Hudden St		Riverside	CA	92505	0011715	<Null>	11-715
2939101	33ZK488733	A	11908 Hudden St		Riverside	CA	92505	0011715	<Null>	11-715

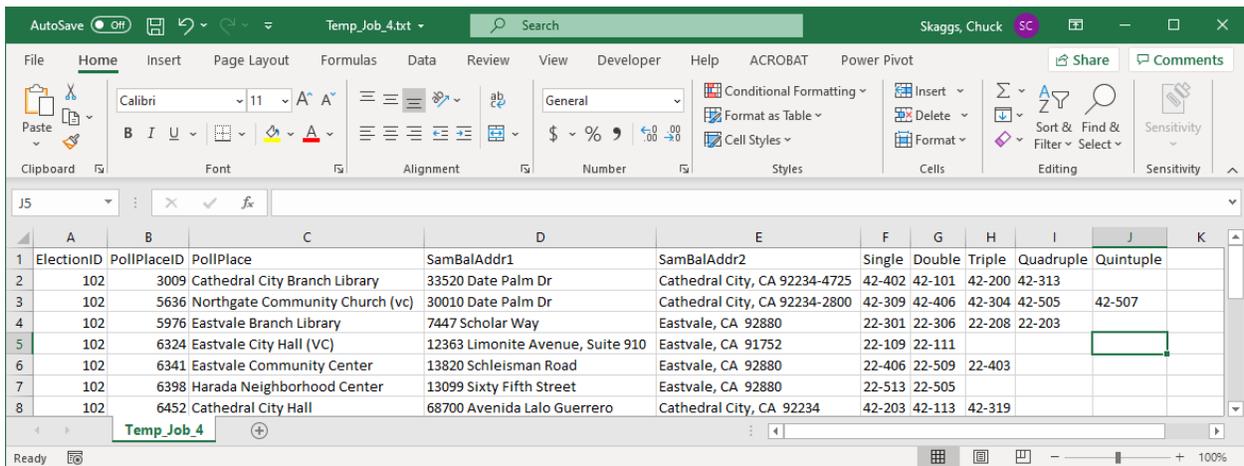
1 (0 out of *4000 Selected)

GIS_VIEW.dbo.RIV_view_ReportGroup_VotingPrecinct GIS_VIEW.dbo.RIV_view_GIS

The vendor has provided a script, that creates tables for the consolidation of the election and voting location.



sPrecinctID	sPrecinctPortion	s2PrecinctName	iBalType	TotalRegCountActive	ISpecialAbsenteeCountActive	TotalRegMinusAbsentee	sVotingPrecinct	s2VotingPrecinctName	iMailBallotPrecinct	s2CongressionalDistrictID	s2SenateDistrictID
59	22510	EASTVALE/5	1	553	468	85	22513 EASTVALE/5	0	0	142	2
60	22511	EASTVALE/5	1	607	498	109	22505 EASTVALE/5	0	0	142	2
61	22512	EASTVALE/5	1	971	825	146	22509 EASTVALE/5	0	0	142	2
62	22513	EASTVALE/5	1	961	766	195	22513 EASTVALE/5	0	0	142	2
63	22514	EASTVALE/5	1	604	501	103	22513 EASTVALE/5	0	0	142	2
64	42100	CATHEDRAL CITY /1	2	597	494	103	42101 CATHEDRAL CITY /1	0	0	136	2
65	42101	CATHEDRAL CITY /1	2	817	655	162	42101 CATHEDRAL CITY /1	0	0	136	2
66	42102	CATHEDRAL CITY /1	2	349	276	73	42101 CATHEDRAL CITY /1	0	0	136	2
67	42103	CATHEDRAL CITY /1	2	0	0	0	42101 CATHEDRAL CITY /1	0	0	136	2
68	42104	CATHEDRAL CITY /1	2	251	238	13	42101 CATHEDRAL CITY /1	0	0	136	2
69	42105	CATHEDRAL CITY /1	2	0	0	0	42101 CATHEDRAL CITY /1	0	0	136	2
70	42106	CATHEDRAL CITY /1	2	0	0	0	42116 CATHEDRAL CITY /1	1	1	136	2
71	42107	CATHEDRAL CITY /1	2	98	96	2	42116 CATHEDRAL CITY /1	1	1	136	2



ElectionID	PollPlaceID	PollPlace	SamBalAddr1	SamBalAddr2	Single	Double	Triple	Quadruple	Quintuple
2	102	3009 Cathedral City Branch Library	33520 Date Palm Dr	Cathedral City, CA 92234-4725	42-402	42-101	42-200	42-313	
3	102	5636 Northgate Community Church (vc)	30010 Date Palm Dr	Cathedral City, CA 92234-2800	42-309	42-406	42-304	42-505	42-507
4	102	5976 Eastvale Branch Library	7447 Scholar Way	Eastvale, CA 92880	22-301	22-306	22-208	22-203	
5	102	6324 Eastvale City Hall (VC)	12363 Limonite Avenue, Suite 910	Eastvale, CA 91752	22-109	22-111			
6	102	6341 Eastvale Community Center	13820 Schleisman Road	Eastvale, CA 92880	22-406	22-509	22-403		
7	102	6398 Harada Neighborhood Center	13099 Sixty Fifth Street	Eastvale, CA 92880	22-513	22-505			
8	102	6452 Cathedral City Hall	68700 Avenida Lalo Guerrero	Cathedral City, CA 92234	42-203	42-113	42-319		

Additional benefits

Since the main stakeholder of Riverside County’s base mapping data is the Assessor’s office, this role was not something the Registrar of Voters office actively pursued. Still, just having the ability to handle customer requests for districts, voting precincts, regular precincts, and analysis of voting patterns is essential.

Geo-enabling our elections has many added benefits, one of which is sharing election information with the public via web mapping. Using all the tools described previously, allows us to provide our internal results externally with voters, who can quickly locate where they need to vote and obtain directional mapping from their

home to a voting location. The voter can now see the hour and day of operations at their assigned voting location in real time, as well as mail ballot drop-off locations. The voter experience and their satisfaction has been greatly enhanced by Riverside County's adoption of geo-enabled election technology.

In summary

Riverside County has faced a few growing pains as we geo-enabled our elections. Evolving from manually running an election to a geo-enabled SMART system of technology and internal processes has increased voter confidence, eliminated errors, and greatly reduced the number of hours needed to ensure "one voter, one vote."

Riverside County is now embarking on implementing the full suite of ArcGIS solutions to take advantage of the advances the department has made in the past few years. Having a well-maintained voter database, tools proven to work over several generations of elections, Riverside County adoption of any new geo-enabled processes should be smooth. And with staff's acceptance and general desire to improve on what has been accomplished, the voters will be better informed and confident that their vote matters to all.

Please contact Chuck Skaggs if you have any questions. Thank you.

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