

Santa Barbara County Association of Governments (SBCAG) - GIS Needs Assessment

Needs Assessment Memorandum



Prepared by:

Applied Geographics, Inc.



Empowering People with Spatial Solutions

Applied Geographics, Inc.

24 School Street, Suite 500 | Boston, MA 02108

T. 617-447-2400 | F. 617-259-1688

www.AppGeo.com

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1 Introduction

Strategic planning starts with an assessment of the current situation and two simple questions: (1) who are we? and (2) where are we? AppGeo explored these questions in the initial SBCAG GIS Existing Conditions Memorandum. We continue the analysis in this GIS Needs Assessment Memorandum. In strategic planning, the process itself is as important as the answers, and some questions are more straightforward than others. In some ways, the needs assessment and analysis portion of the planning effort is a reality check on what ultimately might be feasible.

Part of understanding “who we are and where we are” is also an assessment of strengths and weaknesses. Primarily, this is from an internal perspective, although there may be some relevant external factors. Organizational strengths in areas such as technology, people, and capabilities, may be distributed and separately controlled by different agencies or groups. Getting the commitment to harness those strengths around a common goal may be a significant challenge; however, it may also be an opportunity waiting to be realized. Strengths help position an organization to take advantage of opportunities, whereas weaknesses may make the organization vulnerable to threats, or less able to exploit opportunities.

This document turns the GIS planning process from an examination of existing conditions and organizational needs toward a future vision. The document has two primary sections. The Needs Assessment offers a Strength, Weaknesses, Opportunities, Threats (SWOT) analysis of the existing conditions, identifying strengths that can be leveraged, weaknesses that need to be addressed, opportunities that should be seized and threats that should be avoided. The Strategic Vision and Programmatic Goals section articulates a future vision and high-level goals that help achieve that vision. The next step will be to create an implementation plan that lays out how to achieve the vision.

The first section of the document, Needs Assessment, presents the SWOT analysis organized by key elements of an enterprise GIS. These are:

- a. Governance
- b. Staffing
- c. Workflow
- d. Technology & Infrastructure
- e. Data Management
- f. Knowledge & Training

The second section, Strategic Vision and Programmatic Goals, provides a Vision statement and supporting, high level goals for SBCAG that will address the organization’s geospatial needs.

2 Needs Assessment

The existing conditions assessment was organized into a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. The SWOT framework was used to identify gaps to be filled by the forthcoming GIS Improvement Implementation Plan and strengths the plan could leverage. An Existing Conditions Memorandum presented an initial summary version of the SWOT analysis, covering the factual (existing) SWOT elements.

As part of this analysis, the goals that SBCAG seeks to achieve are compared to the existing conditions, identifying gaps. Below are the *general* goals that SBCAG seeks to achieve through developing its GIS capabilities. More detailed programmatic goals are described in [Section 3.2](#) :

- Incorporate geospatial information in the work of planners and program specialists by having staff that:
 - Know how GIS can be used in planning analyses
 - Have tools appropriate for the use of geospatial data in analyses
 - Have tools appropriate for creating and disseminating maps related to planning and programming work
 - Have data that the tools use
- Support the use of geospatial technologies and data so they are efficient to use:
 - Build and maintain a library of internal data that is easy to discover for appropriate uses
 - Build and maintain a library of external, partner data and/or access to partner geospatial information services such as map services and programmatic interfaces to data (APIs)
- Strengthen and streamline relationships with agency partners to gain efficiency for SBCAG and all partners:
 - Share data with partners in appropriate ways and at appropriate points in the data development cycle
 - Collaborate on geospatial data development
 - Collaborate or contribute to each other's analyses as appropriate

These general goals inform the needs assessment presented here. The forthcoming GIS Improvement Implementation Plan will contain specific implementation steps for technology modernization, creation of a sustainable GIS program design within SBCAG's anticipated means, business system integration and targeted investment to address specific deficiencies.

2.1 SWOT Analysis Overview

Strengths, weaknesses, opportunities, and threats (SWOT) of SBCAG’s GIS situation are summarized below. The assessment of each item is inherently somewhat subjective, as a weakness to one observer may be seen as an opportunity when seen from a different vantage point. The characterization of SWOT below is based upon general business practice in the use of GIS, including its use in planning organizations.

The SWOT analysis provided key information and insight that helped form the recommendations. In general a SWOT assessment provides ideas to help, as shown in the figure below.

Strengths: *leverage them*

Weaknesses: *address and improve them*

Opportunities: *seize and capitalize on them*

Threats: *steer clear of them*

The findings are assessed in terms of the SWOT framework, and their presentation is organized by the needs of an enterprise GIS system. Table 1 lists all findings, the enterprise GIS element that pertains to a finding, and the SWOT categorization of the finding. Findings may span enterprise GIS element categories; here they are placed in their most essential category rather than being duplicated in several categories.

Table 1. Summary table of Strengths, Weaknesses, Opportunities, Threats (SWOT) organized by needs assessment category, SWOT category, and same order as discussion in following text.

Finding #	Finding	Needs Category	SWOT Category
1	SBCAG staff generally recognize the value of geospatial technology to the organization and have an interest in deepening their use and expertise with the technology.	Governance	Strength
2	There is a strong desire for more GIS autonomy - do more with maps and data at every desk.	Governance	Strength
3	Programming and Planning Managers meet quarterly to share information.	Governance	Strength

4	In general, spatial analysis is not well-integrated into daily workflows.	Governance	Weakness
5	SBCAG uses maps / web maps in a limited way for public outreach at present.	Governance	Weakness
6	SBCAG does not have standard cartographic conventions (layouts, formats, etc.) or documented best practices.	Governance	Weakness
7	GIS responsibilities and tasks are not explicitly defined in the Overall Work Program and Budget.	Governance	Weakness
8	The annual review process of the Overall Work Program and Budget provides an opportunity for assigning and periodic recalibration of resources.	Governance	Opportunity
9	SBCAG's current Executive Director understands the value of GIS technology to a planning organization.	Governance	Opportunity
10	As a regional organization, SBCAG is in an excellent position to help coordinate GIS efforts across jurisdictional boundaries.	Governance	Opportunity
11	Santa Barbara County had an enterprise GIS approach formerly and may be interested in doing so again.	Governance	Opportunity
12	In the absence of GIS coordination, GIS has been conducted in an ad hoc manner. This could undermine key initiatives that SBCAG is aiming to promote.	Governance	Threat
101	Staff have interest and time to manage GIS.	Staffing	Strength
102	Current staff can fill GIS-related roles if these are well-defined.	Staffing	Strength
103	SBCAG does not have staff whose duties explicitly include GIS as part their job.	Staffing	Weakness
104	SBCAG does not have any internal (formal) GIS coordination.	Staffing	Weakness
105	SBCAG has identified a current staff member as a potential GIS coordinator.	Staffing	Opportunity
106	Consultants can be used to synergize the implementation of a more robust use of GIS.	Staffing	Opportunity
107	Without a coordinator, SBCAG GIS is disjointed and ad hoc, undermining user confidence.	Staffing	Threat

201	SBCAG is capable of doing most basic GIS work (cartography, simple analysis, Maptitude data overlay). Necessary maps are produced using GIS at present.	Workflows	Strength
202	Datasets are stored with projects (e.g., plan updates) as projects are completed.	Workflows	Strength
203	SBCAG staff are largely data consumers, not dataset creators.	Workflows	Strength
204	Lack of capability to easily create interactive web-based maps easily used by staff and the public.	Workflows	Weakness
205	Some potential uses of GIS in SBCAG work are not feasible at present.	Workflows	Weakness
205	Workflows for program to program (internal SBCAG) data-sharing are not well-established.	Workflows	Weakness
206	GIS work is not accomplished in the most effort/time-efficient manner.	Workflows	Weakness
207	Map production capabilities right now are limited to mostly "must have" maps.	Workflows	Weakness
208	GIS is poorly integrated with planning and programming workflows.	Workflows	Weakness
209	Disparate tools (Maptitude, etc.) make workflows laborious.	Workflows	Weakness
210	Each program area within SBCAG tends to create and use GIS data in isolation from the other programs.	Workflows	Weakness
211	GIS is seen as important to the work done by SBCAG.	Workflows	Opportunity
212	SBCAG staff are interested in using web-based interactive mapping solutions.	Workflows	Opportunity
213	SBCAG may benefit from newer technologies such as near real-time data.	Workflows	Threat
214	Continued use of the shared desktop to make use of ArcGIS will hamper more robust GIS use.	Workflows	Threat
215	Lack of agreement about standard geospatial workflows to support SBCAG's primary planning and programming work could make investing time in designing GIS workflows a waste.	Workflows	Threat
301	SBCAG is well-supported by IT staff and IT resources.	Technology & Infrastructure	Strength

302	GIS software is almost always available (with coordination) to all <i>current</i> GIS users.	Technology & Infrastructure	Strength
303	GIS software is not available on the desktop of every potential user.	Technology & Infrastructure	Weakness
304	The shared GIS workstation with other software on it limits the availability of GIS software from time to time.	Technology & Infrastructure	Weakness
305	UPlan software limits the upgrade path to "standard" workstations provided at SBCAG.	Technology & Infrastructure	Weakness
306	No consistent network drive and folder conventions (mapping, drive letters) are used on the shared workstation.	Technology & Infrastructure	Weakness
307	The County and other partners may be able to share some aspects of GIS infrastructure with SBCAG.	Technology & Infrastructure	Opportunity
308	Sharing the limited licenses for GIS has worked acceptably so far, indicating that shared licensing may work well in the future too.	Technology & Infrastructure	Opportunity
309	Open-source GIS software could be used within SBCAG to augment proprietary GIS software.	Technology & Infrastructure	Opportunity
401	External agencies supply data to SBCAG.	Data Management	Strength
402	SBCAG has no means to generate a topical catalog of GIS datasets.	Data Management	Weakness
403	GIS datasets are stored / organized at a project level, making it hard to find datasets or know what is available throughout SBCAG.	Data Management	Weakness
404	GIS datasets are organized by directories (as well as projects) and one has to understand individual directory choices to find kinds of data.	Data Management	Weakness
405	No consistent rules exist for naming dataset versions or releases.	Data Management	Weakness
406	Multiple instances of GIS datasets are stored, with no indication as to currency or authoritative status.	Data Management	Weakness
407	Little metadata exists for datasets.	Data Management	Weakness
408	A limited selection of base maps is available.	Data Management	Weakness

409	File-based data storage and receipt of datasets from partners is the norm, making data management more tedious in many cases.	Data Management	Weakness
410	SBCAG has the potential to share some aspects of data management with external partners.	Data Management	Opportunity
411	SBCAG partners would like to supply data to SBCAG through networked means (map services, APIs).	Data Management	Opportunity
412	SBCAG's data management protocols need not rely on previous practices or doctrine regarding GIS data management.	Data Management	Opportunity
413	SBCAG has staff interested and willing to take on a greater role in data management and the agency is planning to have them do so.	Data Management	Opportunity
414	Failing to address data management could jeopardize more robust use of GIS within SBCAG.	Data Management	Threat
501	SBCAG staff are talented and motivated to learn. Several staff have joined SBCAG with prior GIS technical knowledge and experience. Others have learned to use GIS on the job.	Knowledge & Training	Strength
502	SBCAG is relatively small allowing it to create a nimble, efficient support structure without the need for a complex help request system.	Knowledge & Training	Strength
503	There is a lack of formal training on GIS platforms, tools, best practices for data management and cartography.	Knowledge & Training	Weakness
504	GIS technical support is currently ad hoc with staff reaching out to a variety of resources including online videos, colleagues or software vendors.	Knowledge & Training	Weakness
505	SBCAG lacks access to external expertise to help with complex analysis or special projects.	Knowledge & Training	Weakness
506	There are a number of opportunities for training and professional development in the area and online.	Knowledge & Training	Opportunity
507	With the existing GIS knowledge/interest, there is an opportunity to form a effective GIS user group to help maintain and share best practices throughout the organization.	Knowledge & Training	Opportunity

508	A lack of coordinated training could result in duplicated effort, conflicting information, or an investment in obsolete platforms.	Knowledge & Training	Threat
509	The failure to document best practices could result in a loss of knowledge or wasted investment.	Knowledge & Training	Threat
510	Without steady, continuous, investment in professional development and training, GIS benefits to the organization will diminish over time.	Knowledge & Training	Threat

2.2 Governance



Governance consists of how key elements of the organizational setting of the geographic information system are managed. These elements include the overall approach or attitude toward use of GIS, planning including budget projections, staffing including job and role definitions, and intra-agency and interagency structured coordination. Governance is the substrate within which, and upon which, the information system grows. Consequently, strengths, weaknesses, opportunities, and threats to achieving GIS goals described above, must be addressed first as governance issues.

Governance - Strengths

- SBCAG staff generally recognize the value of geospatial technology to the organization and have an interest in deepening their use and expertise with the technology. Transportation planning is inherently location-based with the need to understand traffic movement and patterns, population and demographic distribution, land use types and resources, and the locations of assets such as park and ride hubs and train stations. Once barriers to usage are removed, we anticipate that the tools will be widely adopted and used to effectively support day to day work.
- Staff expressed a desire to take advantage of GIS independently throughout the interviews. Rather than rely on colleagues to create a simple map graphic, answer a question about existing conditions or assets in a location or perform some sort of spatial query, staff wish they could readily perform these tasks at their desks. This desire to be autonomous is a strength to the organization as it will lead to greater adoption of the tools and technology and broader realization of the benefits.
- The quarterly Programming and Planning Managers meeting is a foundation for the agency-wide coordination and communication that will make SBCAG’s GIS program strong and efficient. A strong GIS program requires good communication across the organization to build awareness of

new projects and uses of the technologies and ensure that users learn about new capabilities and data resources.

Governance - Weaknesses

- In general, mapping and spatial analysis are often treated as a bit of an “afterthought” throughout the organization. Deep analysis is conducted, reports are written and presentations are prepared but typically the map graphic appears to be tacked on at the end in order to illustrate a key point or message. There are certainly instances where spatial analysis is being conducted effectively, for example with UPlan and TransCAD, but analysis tools could be better integrated into day to day processes.
- Maps are included in many reports but the use of GIS technology for communicating with the public is fairly limited. Transportation Planning is inherently location-based and a map is often the most effective way to communicate current conditions, proposed solutions, or potential impacts. Through this lens, the public will intuitively understand the issues and challenges and more readily get behind potential solutions. Through geospatial analysis, outreach and communication can be directed to those most impacted and through interactive, web-based maps the public can explore scenarios and resources at a neighborhood scale.
- SBCAG does not currently have standard cartographic conventions or best practices, such as layouts, feature symbolization, color palettes, or labeling formats. This is evident in SBCAG’s current maps, handouts, web maps, etc. Standardized cartography will make it easier to interpret information correctly, including information from different divisions or from different periods of time. It also serves as a valuable communication and analysis tool and will help readers interpret and understand information more readily and builds trust in the end product.
- SBCAG has several staff members who perform GIS tasks but these duties are not explicitly defined in the Overall Work Program and Budget. Currently none of these GIS users have been assigned responsibility for data management, license management or overall best practices throughout the organization. Dedicated staff time and clearly defined responsibilities are necessary for the success of the GIS program within SBCAG.

Governance - Opportunities

- The annual process in place for reviewing, updating and publishing the Overall Work Program and Budget, can be leveraged to define a GIS program, assign responsibilities and staff time, and establish implementation goals. As implementation gets underway, the Work Program review process will allow for annual re-calibration of resources, staff time, and goals as demands for technology change and capabilities evolve.
- SBCAG’s current Executive Director understands the value of GIS technology to a planning organization. Having come from another region in the state where GIS was used effectively, she has experienced the benefits and supports the investment in GIS at SBCAG. Under her executive

leadership, SBCAG can build a successful GIS program that serves staff in their day to day work as well as the residents and businesses in the region.

- As a regionally-focused organization, SBCAG has a unique cross-jurisdictional perspective and the opportunity to help coordinate data sharing and information exchange across regional agencies. Among agency partners interviewed, there is generally interest in data sharing with SBCAG and willingness to assist in establishing the exchange processes. Partners also indicated that they would welcome and encourage SBCAG to increase participation in GIS initiatives and meetings, such as the County Office of Emergency Management (OEM) meetings. Regular GIS meetings would serve as a forum for two-way sharing about new data sources, relevant projects, or opportunities for resource sharing. It is important to note that this collaboration should extend outside of Santa Barbara County, specifically into Western Ventura County and Southern San Luis Obispo County. This coordination would serve SBCAG's regional interests as well as those of local jurisdictions, resulting in better informed decisions and reduced duplication of effort.
- Santa Barbara County is pursuing an enterprise approach to its GIS and is interested in SBCAG's participation in its efforts. County staff interviewed as part of this project said that SBCAG would be a welcome collaborator or even full participant in the County's eventual enterprise GIS. This is an opportunity for SBCAG to build a close partnership with the County for data-sharing (at a minimum) and perhaps for federated data management in which both SBCAG and the County share data creation, update, and posting for users. It might even be an opportunity to share technologies, such as a common web-map platform.

Governance - Threats

- While not a "threat" per se, in the absence of GIS governance and coordination, SBCAG divisions have approached the use of geospatial tools and publishing of GIS maps resources in a fairly ad hoc manner. For example, one of the few interactive web maps on the SBCAG website was launched by Traffic Solutions to help commuters explore carpooling or public transportation options (see <https://smartride.org/#/>). From the public's perspective, it is difficult to understand if or how the map relates back to SBCAG's initiative and, in general, the mapping tools and resources appear disjointed. This may leave the viewer with doubts about the published content and how it relates back to the very initiative that SBCAG is trying to promote. SBCAG can unify its mapping web presence through active coordination and governance, implementing standards and ensuring that maps (both static and web-based, interactive) are based on authoritative data.

2.3 Staffing



Staffing, in terms of SBCAG’s GIS needs, consists of the SBCAG personnel who are responsible for staff roles that perform the governance of GIS work, the management of that work, and the actual GIS work. In a large organization, staff involved in these roles are typically executives, managers, and technicians, respectively. SBCAG is a small organization, so the association of GIS staff roles is not as clear-cut. The following SWOT discussion examines GIS staff roles, not SBCAG personnel lines of authority.

Staffing - Strengths

- SBCAG Planning and Programming staff with GIS skills and experience recognize that they may not be using it to its fullest potential and have an interest in improving their approach. This eagerness to improve their skills and take on more responsibility for the success of SBCAG’s GIS Program should be leveraged.
- SBCAG is a small organization and has a small number of power users and the potential for a (proportionally) larger number of end users. The current staffing numbers at SBCAG are sufficient for supporting a GIS program but will need clearer definition of roles and responsibilities.

Staffing - Weaknesses

- Although several staff “do GIS”, SBCAG staff state that there is no one whose duties explicitly include GIS tasks. Until dedicated time is included in the Overall Work Program and Budget, it will be difficult to advance any operational improvements or professional development.
- SBCAG GIS currently operates in a mostly ad-hoc manner without any formal GIS coordination within or across divisions. Assigning the coordinator role, and allocating the appropriate time to fulfill this role will be essential to operationalize the forthcoming GIS Improvement Implementation Plan efficiently.
- There is no regular mechanism in place for GIS knowledge sharing or advising among SBCAG staff. Having regularly scheduled meet-ups to discuss GIS related business at SBCAG or to share information about current project or problems will foster deeper collaboration and confidence.

Staffing - Opportunities

- As of the writing this document, an existing Planning Division staff member has already been identified as having the bandwidth, aptitude and interest in taking on more responsibility in the coordination of GIS at SBCAG. The Division Manager has included placeholders in the draft

Overall Work Program and Budget for allocating time for this role. This indicates SBCAG's earnest desire to properly staff their program.

- SBCAG can utilize support services from qualified GIS Consultants to assist with the implementation of the GIS Improvement Plan. Consultants can also supplement internal staff where appropriate to provide a comprehensive and cost effective way to accomplish specific tasks such as advanced analysis, training and support to staff, or developing/hosting web mapping applications.

Staffing - Threats

- Without a coordinator, SBCAG GIS is disjointed and ad hoc, undermining user confidence and causing duplication of effort, data silos, lack of or loss of institutional knowledge and sharing, data management/versioning issues, lack of trust in data, inconsistent map publishing styles, loss of collaboration with partners, and lack of communication and workflow processes within the organization.

2.4 Workflows



GIS workflows are the structure upon which SBCAG business use cases for GIS are implemented. Workflows are the operating procedures sequenced intentionally to move SBCAG staff's daily work tasks from conception to closure in an efficient manner by applying industry best practices and subject matter expertise. Well defined workflows are designed to simplify tasks in an organized and standardized way so that staff can perform their work with confidence that no crucial step was missed.

Workflows - Strengths

- SBCAG is capable of doing most basic GIS work (cartography, simple analysis, Maptitude data overlay). This enables SBCAG to produce the minimum necessary maps using the GIS programs currently in place.
- Datasets and maps are stored with projects (e.g., plan updates) as projects are completed. This workflow provides traceability and acts as documentation should a project or plan need to be revisited in the future. A downside of this workflow is that it may create duplicate datasets on the network storage drives or in personal folders. In addition, other staff or partners would not have a way to know that any new or derivative datasets were created during the project and it may not be easily discoverable.
- SBCAG staff are largely data consumers, not dataset creators. Most of the datasets used by SBCAG are from external agencies (ex: Census, County) or are outputs from third-party products (ex: TransCAD). This means there is not a large need for deep expertise in GIS data development

and editing among SBCAG staff. Albeit SBCAG is responsible for the maintenance of some datasets (ex: jurisdictional boundaries, projects, ALUP and TAZ layers, etc.) and often performs basic editing tasks such as geocoding and adding features and attributes.

Workflows - Weaknesses

- SBCAG lacks the capability to easily create interactive web-based maps. An intuitive, map-based presentation of project and related funding data, performance measures, and planning analyses (such as those included in the RTP-SCS, Airport Land Use Compatibility Plan) would be beneficial to all. This technology could also be helpful for engaging with the public -- collecting input, allowing them to explore scenarios, and providing an integrated address look-up tool. There are many web mapping platforms available to SBCAG with varying levels of technical expertise required for deployment and maintenance. Some options include ArcGIS Online, Carto, or even using consultant provided applications and services.
- Some barriers to the broader use of GIS in SBCAG planning work include a lack of data (cf. data management discussion in this document) and lack of standard workflows for handling spatial data in planning analyses. For example, there is no standard way in which census data are apportioned when a “spatial intersection” is performed between census polygons and a second polygonal dataset. In addition, there is no clear creator/consumer workflow model in which a staff member has a well-defined path for requesting GIS products from GIS specialists or requesting assistance in using GIS. This limits the feasibility of using GIS in some work because it can seem that each project has to invent workflows from scratch.
- GIS work is currently not accomplished in the most effort/time-efficient manner. For example, Programming staff create a basemap and map layout on the shared remote GIS computer and then export the image to Adobe to create the finished map product. This workflow does not allow for the creation or stewardship of a dataset that can be reused in other maps and analyses. In addition, the use of a shared remote computer and GIS software licence limits access for staff, sometimes requiring them to postpone work or request that another staff member to log off. Furthermore, while Programming staff are technically savvy, the map creation workflow often requires work by the SBCAG graphic designer to polish the final map product. This extra step can add a day or two to the task timeline.
- SBCAG has a strength in its ability to produce the maps it needs most. However, this also indicates a weakness in that map production focuses on "must have" maps. As SBCAG develops its in-house GIS capabilities and geospatial thinking and technology are more deeply integrated into daily workflows, SBCAG will be in a position to take GIS beyond the “must have” maps.
- SBCAG’s professionals recognize the value of geospatial analyses within planning and programming work, but can find it difficult to integrate GIS into daily work. There are many reasons for this, including lack of familiarity with GIS software, challenges finding data, or

difficulties in performing an analysis. For staff whose training and focus is on planning and not on geospatial data analysis, these barriers can be especially limiting.

- A wide variety of tools (Maptitude, etc. for full list see Existing Conditions Memorandum) are employed at SBCAG often making workflows complex and more laborious than necessary. Having to export data from one application and import to another can be time consuming and may result in duplicative datasets.
- Workflows for program-to-program (internal SBCAG) data sharing are not well established thus creating data silos within the organization. These silos lead to duplication of effort, mistrust in data, and unnecessary time spent researching or recreating data. Improvements to data management will improve internal data sharing workflows. Any processes developed should be clearly documented, and the documentation should be easy to find and widely shared.

Workflows - Opportunities

- SBCAG recognizes that GIS is important to its mission and daily work and there is sufficient support and motivation to investigate and improve operations and workflows. The investment in this Needs Assessment and the stated intention to following through on its recommendations demonstrates a commitment to improving the use and management of geospatial assets within the organization.
- SBCAG staff have a keen interest in expanding the use of web-based mapping. Web mapping is ubiquitous and the options for publishing and hosting web-based maps in a cost-effective manner are abundant. This is a good time to invest in a platform that will enable SBCAG to increase transparency and provide partners and the public with timely and accurate information in an accessible and intuitive manner. A web mapping platform would provide casual end users with common data views and workflows (ex: generating mailing lists and labels for residents around a construction project) which alleviates the burden of desktop GIS use for simple, repetitive tasks. Furthermore, web mapping capabilities would likely decrease the number of requests for specialized maps. For instance rather than creating a custom map, SBCAG could simply send a web map link to a city official showing projects within their jurisdiction.
- SBCAG may benefit from investigating and investing in newer technologies. For example, SBCAG staff indicated that having real-time and historical traffic data would be beneficial for analyzing traffic congestion and transit use patterns. Understanding the real behavior of commuters would help Traffic Solutions develop more effective commuter benefit packages. Companies like Waze, and now Google, capture and provide access to aggregated real-time data via their proprietary applications. These products also stay current with ever-changing transit information providing useful commercial alternatives to the SBCAG trip planning tool. It may be a mid-term future opportunity for SBCAG to investigate some type of partnership with Waze or other commercial entities as sensor technology will improve and more of this type of data will become available.

Workflows - Threats

- The current method for using desktop GIS software is to use the single seat of Esri ArcGIS installed on a virtual workstation via a remote desktop session. This has caused frustration and reluctance among some staff to use the tools at all. If SBCAG continues with this model of access to the software, support for GIS and interest in it will diminish.
- Currently there is no common approach for performing GIS analyses. Tasks are performed in an ad-hoc manner using an individual's preferred tools and platform. This approach to GIS has allowed savvy users to act independently, but it will pose challenges when SBCAG moves toward standardizing workflows across the organization. For example, if different programs within SBCAG use the UPlan software, TransCAD and GIS analyses in divergent ways to accomplish similar goals, establishing a common workflow might be difficult. Standardization may require users to change their current workflows, adopt new tools that are unfamiliar to them, or learn new platforms.

2.5 Technology & Infrastructure



Technology and infrastructure are the raw materials for a geographic information system, comprising the available and planned computing hardware, operating systems, storage loci, application software, physical network connections both internal to SBCAG (LAN) and to the internet, and logical network (permissions and access rights for users, computing hardware, and automated processes). In most organizations, technology and infrastructure choices are made external to GIS implementation, so GIS development has to work within these choices.

Infrastructure - Strengths

- SBCAG is well-supported in information technology (IT) infrastructure, including LAN and WAN network connections, storage, and general network security. The current capabilities of SBCAG's infrastructure is well-suited to an enterprise approach to SBCAG GIS. SBCAG can continue to build on this strength by involving IT support staff in the planning for a more robust use of GIS.
- GIS software is available to *current* GIS users and, from interviews with staff, is correctly installed and updated, save for an older version requirement. This indicates that SBCAG's IT support staff can install and configure additional GIS software in the future without external assistance. This strength should be retained by involving IT staff when making decisions about GIS software packages and version updates to installed software.

Infrastructure - Weaknesses

- GIS software is not available on the desktop computers of staff who are, or are likely to be, significant users of GIS desktop software. This limits the current use of GIS, because one must coordinate with others to use a system that has desktop GIS.
- One of the two ArcGIS licenses available is installed on a shared workstation accessible via Windows Remote Desktop (the shared system is a virtual computer). This workstation also hosts other software (Adobe Illustrator). This configuration limits the availability of the GIS software (or conversely the other software), requiring coordination when there is competition for the workstation. This weakness should be addressed by installing GIS software on those staff who need it regularly (see discussion above) and then determining if GIS software should be shared on a different virtual computer system to avoid competition with users who need other non-GIS software on the current virtual computer system.
- The UPlan software (see <http://ice.ucdavis.edu/project/uplan>; <https://www.esri.com/news/arcnews/summer12articles/how-uplan-works-in-california.html>) constrains SBCAG's ability to use current versions of Esri ArcGIS Desktop, since it only runs correctly on a Windows 7 computer. The UPlan version 4 software is a set of Python scripts used within ArcGIS Desktop (<https://github.com/rmboynt/UPlan4>); it is unclear why this will only work with Windows 7 systems. This weakness prevents IT support from standardizing the desktop operating systems used by SBCAG staff and therefore, makes IT support more difficult for GIS purposes. This weakness should be addressed by (a) deciding if UPlan software will continue to be used by SBCAG; (b) determining what prevents UPlan from running correctly on the SBCAG "standard" desktop operating system (currently Windows 10). *[Update: This weakness has been addressed with a plan to upgrade UPlan to the latest version next fiscal year.]*
- The shared workstation that hosts GIS does not use a consistent drive-mapping / lettering scheme, so each user has created their own. This limits the portability of GIS project files since User A's data sources may be mapped to a different drive letter than the same data source in User B's network / drive configuration.

Infrastructure - Opportunities

- SBCAG may be able to share some aspects of infrastructure related to GIS by combining efforts with the County. As discussed above, the County appears to be interested in SBCAG as a collaborator in building a shared enterprise GIS. If the shared enterprise GIS contains infrastructure useful to SBCAG, then this relationship may be an opportunity for SBCAG. For example, if the County decides to create some kind of web-mapping server, it could be a useful platform for SBCAG to disseminate geospatial information (maps, analytical results) to the public and internally. SBCAG should take advantage of this opportunity by ensuring that discussions

with the County about GIS collaboration explore whether shared infrastructure elements are feasible.

- Shared licensing of GIS software is both a weakness and an opportunity. The weakness, discussed above, is that a software license may not be available when needed. The opportunity for SBCAG lies in the continued sharing of licensing, because staff have worked out ways to coordinate with each other to get the most use out of the least licenses.
- Open-source desktop GIS software provides an opportunity for SBCAG to install GIS software on every desktop. QGIS (www.qgis.org), for example, is a full-featured GIS application. Open-source software could augment Esri ArcGIS for Desktop, especially for SBCAG users who just need to browse data since they would not have to learn how to edit data in a slightly different desktop software. Of course, there is also the opportunity that open-source software is the primary GIS desktop application with use of Esri software by only those who need it. However, multiple varieties of GIS could be a training and support weakness.

Infrastructure - Threats

No infrastructure-related threats relevant to GIS were identified in the assessment.

2.6 Data Management



Data management is a topic that is central to every information system. Data is information stored in an organized, accessible fashion. In aggregate, the information stored as data can be considered the “data resources” of a system. Often, one thinks of data as information stored in some sort of tabular (i.e., rectilinear) form. Data can be stored in many other forms and formats though: collections of images or documents are commonly part of the data resources of many information systems, GIS included.

Organizing information into data usually involves at least implicit standards for the content and relationships between data values. Data is typically kept within an information system in order for it to be available for later use and by other systems or users. Data management includes these parts of the data lifecycle too: how data are stored, how it is made available (i.e., “published”) and the rules governing availability to users of the native information system, to other information systems, or for other purposes and people by export.

At a general level, data management is independent of an information system technology. How information is organized and made available will vary in details (e.g., file format, type of relational database used, and so on). The strengths, weaknesses, opportunities, and threats discussed in this section are at the general level of data management. SBCAG’s GIS should be built upon logical data management principles, regardless of which technologies are used for spatial information.

Data Management - Strengths

- SBCAG has many external partners willing to continue sharing data with SBCAG or interested in doing so in the future. The nature of SBCAG’s work is that it must rely upon information from many other organizations. Receiving data from these organizations in GIS form has benefits: there is no need to create the dataset in-house and the information is authoritative from its appropriate source. Conversely, SBCAG has many external partners interested in obtaining GIS datasets that may result from SBCAG’s work. Sharing data from authoritative sources (whether SBCAG or external partners) provides all participants in the exchange the same set of basic “facts” with which to accomplish their work.

Data Management - Weaknesses

- There is no way, currently, to get a general list of GIS data available at SBCAG by topic or content. This makes it difficult to know if SBCAG already has data for a topic.

- GIS data management at SBCAG is organized at a project level, not an office-wide level. This is a point of weakness because finding a GIS dataset requires first finding the project that has the most recent version of the dataset or finding the person who knows the most current version of a dataset and where it is stored.
- GIS data storage at SBCAG is organized by directory structures that are not easy to navigate and lack a catalog. There is no perfect solution for directory-organized data that might make it easy to navigate in all cases. However, the absence of a catalog or guide to the datasets or even directories is a weakness because it makes finding datasets difficult.
- GIS data management has no standard naming methods or conventions. This is a weakness because the name of a GIS dataset may not contain the three pieces of information most often needed by users: the data content, extent, and currency or date last updated.
- Datasets may exist in several places, with no indication as to which dataset is most authoritative. GIS datasets could be stored in a user's personal directories (folders). Or, as discussed above, data may get copied into project folders as part of a given work. This creates a "source for project" version of the dataset, which is generally good because it documents the source used for the work. However, when one tries to find the most up to date version of a dataset, or a dataset of a particular date / version, it is impossible to do so. This weakens the value of GIS to the organization, because it decreases the certainty that the correct dataset is used and it takes additional staff time to find or verify the correct source of data.
- There is no storehouse of GIS dataset metadata ("data about data"). Metadata typically contains information on the content, spatial extent, currency, creation and update methods, contacts, and appropriate uses of a dataset. The lack of metadata erodes confidence in data and hampers discovery of appropriate datasets for SBCAG's work.
- SBCAG has a somewhat limited set of base maps for GIS-based cartography. In part, this weakness stems from a lack of organized datasets, including those available from partners. In other words, SBCAG may have all the data it needs to create more base maps of different types but it would take some effort to find all the right datasets and bring them together correctly. This weakness may also stem from a lack of knowledge (thus, training) about the types of base maps available through online services.
- File-based GIS dataset storage is the norm within SBCAG. Most datasets are stored as shapefiles, which have distinct limitations: column names in attribute tables are limited to 10 characters; the three mandatory files (.shx, .shp, dbf) must be accompanied by a separate file (.prj) that specifies the data projection and is often forgotten in transmittal; shapefiles are somewhat "brittle" in that an error in a file (especially the .shp file) can make all of the data unusable; shapefiles contain only a single class of GIS features. The contemporary approach to data storage is to use more comprehensive storage structures such as Esri file geodatabases (directory-based storage) or portable single file databases (e.g., SQLite, Geopackage) for storage outside of enterprise relational database management systems. These formats allow storage of

many types of features and stand-alone tables in a robust data structure and avoid the other issues inherent to shapefiles. The use of shapefile-based GIS dataset storage is a weakness because it limits the attribute descriptors that can be used, can result in huge sets of small files, and is awkward for associating metadata and projection information.

Data Management - Opportunities

- Data-sharing partnerships are valuable opportunities for SBCAG. As discussed above, SBCAG has many partner agencies interested in routinely sharing data with SBCAG. This can not only strengthen the data resources of both partners, it also promotes sharing of expertise, approach, and sometimes even various kinds of project work when both partners have similar needs.
- Some of SBCAG's partners are interested in supplying GIS data as networked (internet-based) services that can be used by SBCAG's desktop GIS software. By using web map services or application programming interfaces (APIs) instead of copies of actual datasets, SBCAG can be assured it is using a partner's most current, published, data. The concomitant need that is part of this opportunity is that SBCAG create workflows that archive copies of spatial data used for particular projects, so that the source datasets at the time of the project are available if needed in the future.
- SBCAG's use of GIS is just beginning to blossom, and this presents an opportunity to create protocols and standards for data management. Unlike organizations that bring the burden of historical methods to broadening the use of GIS internally, SBCAG is in the enviable position of being able to create practical, appropriate, data management techniques.
- SBCAG has staff who have GIS experience and are willing to take on more managerial roles or duties with regard to data management. This is an extremely valuable opportunity for the agency.

Data Management - Threats

- Failing to address data management issues will cripple SBCAG's ability to implement a more effective use of GIS. Lack of data management protocols will perpetuate the current way GIS is used at SBCAG.

2.7 Knowledge & Training



This section assesses staff technical expertise and identifies opportunities for professional development and learning as well as providing technical support to non-GIS staff.

Knowledge & Training - Strengths

- A great strength for SBCAG is its talented pool of staff. Several have joined SBCAG with prior GIS technical knowledge and experience while others have learned to perform GIS tasks on the job. Those who currently use or have exposure to GIS tools are motivated to make things better, learn new tools and take on new challenges. They have been successful in “getting by” with current constraints and producing requested map outputs and graphics but acknowledge that system, data management and technical skill improvements will result in better use of the tools and more effective, compelling outputs. Staff with GIS skills also show great willingness to help others in the organization by fulfilling technical requests or training colleagues on appropriate tools.
- Another strength for the organization with regard to Knowledge and Training is its relatively small size. A small organization can be nimble in its support structure without the need for a complex help request ticketing or tracking system. Dissemination of information won’t require a lot of overhead and staff persons designated as GIS technical resources should be easy to find and communicate with.

Knowledge & Training - Weaknesses

- In general there is a lack of formal training on GIS platforms, tools, best practices for data management and cartography. As stated above, many staff have some experience and certainly the capacity to master these aspects of a GIS program, but they don’t have the knowledge to take full advantage of the technology or produce the most effective outputs. As SBCAG evolves toward a more formally managed program, a GIS Coordinator will need to establish best practices and be trained on new data analysis tools, web applications, data management best practices, industry standards for cartography. Technical GIS users will need to be trained on desktop tools and how to comply with the organizations best practices for data management and cartography. Non-technical GIS users will need to be trained on how GIS can support daily activities and how to use web-based maps and other available tools.
- The survey and interviews revealed that GIS technical support is currently ad hoc with staff reaching out to a variety of resources including youtube videos, colleagues or software vendors.

While this has allowed users to “get by”, the ad hoc nature of technical support leads to inconsistent approaches, processes, outputs and knowledge among divisions and staff. As staff adopt personal approaches to GIS and problem solving, they tend to store data locally for personal use resulting in a lack of authoritative data.

- Outside of the current strategic planning contract, SBCAG lacks access to external expertise to help with complex analysis, special mapping projects, data creation/maintenance, application development/maintenance or overall strategic guidance. As coordination improves and demand for GIS presumably increases in the future, this lack of external “on call” expertise may pose a challenge to SBCAG. Without a relief valve to help perform short term or especially complex tasks, SBCAG staff will have to bear the burden of all organizational GIS needs.

Knowledge & Training - Opportunities

- SBCAG has several training opportunities that could be advantageous. UCSB and Santa Barbara City College offer academic courses in GIS, and there are numerous online classes with organizations such as Esri or Linda.com. In general, the academic classes will take a broader approach to GIS education providing more background on the technology and a broader foundation for future learning. Online courses will tend to focus on a specific platform or process and can often be self-paced. Consultants can serve as a valuable resource for training on a workflow specific to the organization (e.g. “This is how to create a map using the SBCAG map template”).
- With the existing knowledge and interest in GIS among Planning and Programming staff, there is an opportunity to form a GIS Working Group to reinforce training and help in the dissemination of knowledge and best practices throughout the organization. The GIS Working Group can help identify new knowledge or training requirements and resources as well as share the burden of updating best practices documentation.

Knowledge & Training - Threats

- A lack of coordination with SBCAG’s training approach could result in duplicated effort, conflicting information on technical approaches to tasks, or an investment in time and money in training on obsolete platforms. To avoid these outcomes, training should be coordinated across the organization to promote consistent use and to allow for a “train the trainer” approach where a single staff person (perhaps the Coordinator) pays for formal training on a topic or tool followed by knowledge sharing with other interested SBCAG staff.
- The failure to document best practices could result in a loss of knowledge and wasted investment in training as key information is stored away in people’s heads, inaccessible to colleagues, or staff leave the organization taking their expertise with them. While it is not feasible to expect every process to be documented in extreme detail, general documentation

about best practices should be captured and accessible to all current and future SBCAG employees.

- Finally, investments in training and professional development will need to be continuous. Technology changes rapidly and GIS is no exception to this rule. The GIS Coordinator will need to stay current on industry best practices and, as software platforms and tools change, GIS users will need to know how leverage new functions and features.

3 Strategic Vision and Programmatic Goals for a Modern, Enterprise GIS

An important part of strategic planning is articulating a future vision for what an Enterprise GIS looks like for SBCAG and then defining the steps that are necessary to achieve the with success. It is important to make sure participants in the process understand and agree that the goals are important and relevant.

The emphasis in this section is on articulating the programmatic goals that support the overarching strategic vision. The emphasis herein is not on capturing all of the costs associated with achieving the desired end-state, but there should be some boundaries set with regard to what is realistic. A detailed implementation plan will follow with specific recommendations and associated costs. Also, the goal here was to create goals that are challenging yet feasible.

3.1 Strategic Vision

The following vision statement will set a course and define success for the GIS program going forward.

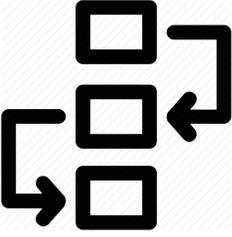
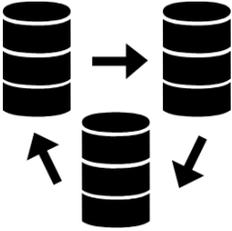


Geospatial information and GIS technologies will be integrated within SBCAG's mission of regional transportation planning and coordination. Geospatial information and tools will increase the effectiveness, innovation, reliability, and accuracy of SBCAG's work, by serving as a source for innovative data analysis and visualization; and by sharing information with stakeholders.

3.2 Programmatic Goals

The programmatic goals presented here support the Vision Statement as well as the overall strategic goals presented in SBCAG’s Overall Work Program and Budget. For the planning process to succeed, it is important that the programmatic goals be achievable and compatible with one another.

 <p>Governance</p>	<ol style="list-style-type: none"> 1. Include the GIS program in to the annual Overall Work Program and Budget for annual progress assessment for goal setting, resourcing 2. Define an executive leadership structure 3. Strengthen partnerships, improving data sharing <ol style="list-style-type: none"> a. Increased participation in regional GIS 4. Monitor progress of GIS implementation toward GIS strategic goals across all areas and adjust as appropriate 5. Create an SBCAG GIS Working Group
 <p>Staffing</p>	<ol style="list-style-type: none"> 1. Designate an internal SBCAG staff person to serve as GIS Coordinator managing: <ol style="list-style-type: none"> a. Best practices b. Technical support c. GIS project support for Divisions d. Coordinate the GIS Working Group e. Communications to SBCAG staff regarding data updates, capabilities, resources available to them; Serving as point of contact for internal customers/consumers. f. Point of contact for external partners g. Provide resource requirements to GIS executive leadership 2. Designate advanced GIS users in Programming and Planning to participate in GIS Working Group 3. Promote GIS use as appropriate within Divisions

 <p>Workflows</p>	<ol style="list-style-type: none"> 1. Make GIS data and tools available for common workflows through interactive browser-based map tools 2. Make GIS data and tools available for more advanced project workflows through desktop GIS tools and data that are easily accessible as appropriate 3. Integrate GIS into SBCAG daily workflows 4. Integrate GIS in work effort planning for major projects
 <p>Technology & Infrastructure</p>	<ol style="list-style-type: none"> 1. Leverage web-based tools, new SaaS technologies 2. Establish and maintain the hardware, network and workstations to support GIS activities 3. Ensure that staff have access to GIS software as needed
 <p>Data Management</p>	<ol style="list-style-type: none"> 1. Create and maintain a comprehensive data catalog making sure that GIS datasets are easily discoverable based upon spatial extent, topical categories, or both 2. Maintain relevant metadata 3. Establish MOU for sharing project data (or other enhanced data created by SBCAG) with partners
 <p>Knowledge & Training</p>	<ol style="list-style-type: none"> 1. SBCAG staff (Coordinator, Working Group and Users) have the training they need to use GIS effectively <ol style="list-style-type: none"> a. Coordinator understands industry best practices b. GIS Working Group understands SBCAG established best practices about data management, cartography, map templates, workflows c. GIS Users (current and potential) know how GIS can be used in general, to recognize opportunities where GIS may be helpful to their work, and which tools are appropriate for the task 2. Define an annual formal training plan for GIS Coordinator and users

	<ol style="list-style-type: none">3. SBCAG staff have access to the technical support they need to use GIS effectively<ol style="list-style-type: none">a. Internal support resources are well-defined (people, how-to documents, etc.)4. Establish on-call and/or project support contracts with one or more commercial GIS consultants for ongoing strategic guidance, advanced technical support, application development/maintenance, data development.
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