



# Offer and Acceptance

State of Arizona  
State Procurement Office  
100 N. 15<sup>th</sup> Ave. Suite 201  
Phoenix, AZ 85007

SOLICITATION NO.: ADSP016-00005912 Request  
for Qualifications: 2016 Annual Professional  
Services List

PAGE  
1

OF  
1

Offeror: Terra Systems Southwest, Inc.

## OFFER

### TO THE STATE OF ARIZONA:

The Undersigned hereby offers and agrees to furnish the material, service or construction in compliance with all terms, conditions, specifications and amendments in the Solicitation and any written exceptions in the offer. Signature also certifies Small Business status.

**Cheryl  
Thurman**

Digitally signed by Cheryl Thurman  
DN: cn=Cheryl Thurman,  
o=TerraSystems Southwest, Inc., ou,  
email=ckthurman@terrasw.com,  
c=US  
Date: 2016.03.02 15:39:05 -06'00'

TerraSystems Southwest, Inc.

Company Name

738 N. 5th Ave Suite 203

Address

Tucson

Az

85705

City

State

Zip

ckthurman@terrasw.com

Contact Email Address

Signature of Person Authorized to Sign Offer

Cheryl Thurman

Printed Name

Vice President, Senior Analyst

Title

Phone: 520.322.0334

Fax: none

By signature in the Offer section above, the Offeror certifies:

1. The submission of the Offer did not involve collusion or other anticompetitive practices.
2. The Offeror shall not discriminate against any employee or applicant for employment in violation of Federal Executive Order 11246, State Executive Order 2009-9 or A.R.S. §§ 41-1461 through 1465.
3. The Offeror has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with the submitted offer. Failure to provide a valid signature affirming the stipulations required by this clause shall result in rejection of the offer. Signing the offer with a false statement shall void the offer, any resulting contract and may be subject to legal remedies provided by law.
4. The Offeror certifies that the above referenced organization IS! IS NOT a small business with less than 100 employees or has gross revenues of \$4 million or less.

## ACCEPTANCE OF OFFER

The Offer is hereby accepted.

The Contractor is now bound to sell the materials or services listed by the attached contract and based upon the solicitation, including all terms, conditions, specifications, amendments, etc., and the Contractor's Offer as accepted by the State.

This Contract shall henceforth be referred to as Contract No. ADSP016-00005912

The effective date of the Contract is March 1, 2016

The Contractor is cautioned not to commence any billable work or to provide any material or service under this contract until Contractor receives purchase order, contract release document or written notice to proceed.

State of Arizona  
Awarded this 1<sup>st</sup> day of March 20 16

[Signature]

Procurement Officer



ATTACHMENT I – General Qualifications

ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSP016-00005912

STATE PROCUREMENT OFFICE  
Department of Administration  
100 North 15<sup>th</sup> Avenue, Suite 201  
Phoenix, Arizona 85007

**DEFINITIONS**

**Architect Services, Engineer Services, Land Surveying Services, Assayer Services, Geologist Services and Landscape Architect Services:** Those professional services within the scope of the practice of those services as provided in ARS § 32-101.

**Branch Office:** A geographically distinct place of business or subsidiary office of a firm that has a key role on the team.

**Discipline:** Primary technical capabilities of key personnel, as evidenced by academic degree, professional registration, certification, and/or extensive experience.

**Firm:** Defined in ARS § 32-101(B.19.).

**Key Personnel:** Individuals who will have major contract responsibilities and/or provide unusual or unique expertise.

**SPECIFIC INSTRUCTIONS:**

1. Complete this form for each branch office seeking work under this RFQ.
  - a. – e. **Firm (or Branch Office) Name and Address.** Self-explanatory.
  - f. **Year Established.** Enter the year the firm (or branch office, if appropriate) was established under the current name.
  - g. **Ownership.**
    - (g1). *Type.* Enter the type of ownership or legal structure of the firm (sole proprietor, partnership, corporation, joint venture, etc.).
    - (g2). *Small Business Status.* A firm is a small business if the firm has less than 100 employees **or** has gross revenues of \$4 million or less.
  - h.-j. **Point of Contact.** Provide this information for a representative of the firm that the Customer can contact for additional information. The representative must be empowered to speak on contractual and policy matters.
  - k. **Name of Firm.** Enter the name of the firm.
2. **Employees by Discipline.**
  - a. Select disciplines from the List of Disciplines (Function Code) listed on Page 3 of 4 Instructions. For employees that do not qualify for any of the disciplines, select "Other". *Note: The intended searchable database indicated in the RFQ will be populated from the Qualifications Form I Excel attachment only.*
  - b. Each person can be counted only twice; once for his/her primary function and once for his/her secondary function. Primary and secondary functions should be indicated by including a "P" or an "S" in column b after the Description Title is given.
  - c-d. If the form is completed for a firm (including all branch offices), enter the number of employees by disciplines in column c. If the form is completed for a branch office, enter the number of employees by discipline in column d and for the firm in column c.
3. **Profile of Firm's Experience and Annual Average Revenue for Last Year.**
  - a. Enter the approximate number of projects the firm (or branch) has done attributable by Profile Code listed on Page 3 of 4 Instructions over the last year.



ATTACHMENT I – General Qualifications

ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSP016-00005912

STATE PROCUREMENT OFFICE  
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- b. Enter the appropriate Profile Codes from Instructions Pages 3 of 4 that represent the type of work the firm (or branch) has done over the last year.
  - c. Using the Revenue Index Number on Page 3 of 6 Form, indicate the approximate revenue the firm has earned over the last year per Profile Code entered into the table.
4. **Resumes of Key Personnel Proposed for This Contract.** Complete this section for each key person who will participate in this contract.
- a. Self-explanatory.
  - b. Self-explanatory
  - c. Total years of relevant experience (block c1), and years of relevant experience with current firm, but not necessarily the same branch/office (block c2).
  - d. Name, City and State of the firm where the person currently works, which must correspond with one of the firms (or branch office or a firm, if appropriate) listed in Section 1.
  - e. Provide information on the highest relevant academic degree(s) received. Indicate the area(s) of specialization for each degree.
  - f. Provide information on current relevant professional registration(s) and in which State(s) they are current.
  - g. Provide information on any other professional qualifications relating to this contract, such as education, professional registration, publications, organizational memberships, certifications, training, awards, and foreign language capabilities.
  - h. Provide information on no more than five (5) projects in the last year which the person had a significant role that demonstrates the person's capability relevant to her/his proposed role in this contract. These projects do not necessarily have to be any of the projects presented in Section 5 for the project team if the person was not involved in any of those those projects or the person worked on other projects that were more relevant than the team projects in Section 5. Use the check box provided to indicate if the project was performed with any office of the current firm. If any of the professional services or construction projects are not complete, leave Year Completed blank and indicate the status in Brief Description and Specific Role.
5. **Example Projects Which Best Illustrate Firms Qualification for this contract.** Select project where multiple team members worked together, if possible, that demonstrate the team's capability to perform work similar to that required for this contract. Complete one Section 5 for each project. List no more than five (5) projects.
- a. Title and Locations of project or contract. For an indefinite delivery contract, the location is the geographic scope of the contract.
  - b. Enter the year completed of the professional services (such as planning, engineering study, or design), and/or the year completed if construction. If any of the professional services or the construction projects are not complete, leave Year Completed blank and indicate the status in Brief Description of Project and Relevance to This Contract (block f).
  - c. Project Owner or user, such as a government agency or installation, an institution, a corporation or private individual.
  - d. Provide the original budget or not to exceed dollar amount for the project.
  - e. Provide the Total Cost of the Project. If any of the professional services or construction projects is not complete, indicate the percentage complete and whether this project will be on budget, over or under budget.
  - f. Brief Description: Indicate scope, size, and length of project, principle elements and special features of the project. Discuss the relevance of the example project to this contract.
6. **Additional Information.** Use this section to provide additional information you feel may be necessary to describe your firm's qualifications for this contract.
7. **Annual Average Professional Services Revenues of Firm for Last 3 Years.** Complete this block for the firm or branch office for which this form is completed. In column a, enter an approximate percentage of total work attributable to State, Federal or Municipal Work. In column b, enter an approximate percentage of total work attributable to Non-Government work. Percentages should take into consideration work completed over the last 3 years.



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ADSP016-00005912

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8. **Authorized Representative.** An authorized representative of the firm or branch office must sign and date the completed form. Signing attests that the information provided is current and factual. Provide the name and title of the authorized representative who signed the form.

List of Disciplines (Function Codes) for Question 2

- |                           |  |                          |
|---------------------------|--|--------------------------|
| Aeronautical Engineer     | Environmental Engineer                   | Mining Engineer          |
| Agricultural Engineer     | Environmental Scientist                  | Nuclear Engineer         |
| Archeologist              | Fire Protection Engineer                 | Petroleum Engineer       |
| Architect                 | Geodetic Surveyor                        | Photogrammetrist         |
| Architectural Engineering | Geographic Information System Specialist | Project Manager          |
| Biologist                 | Geological Engineer                      | Sanitary Engineer        |
| CADD Technician           | Geologist                                | Soils Engineer           |
| Chemical Engineer         | Hydrographic Surveyor                    | Structural Engineer      |
| Civil Engineer            | Hydraulic Engineer                       | Technician/Analyst       |
| Construction Manager      | Hydrologist                              | Transportation Engineer  |
| Construction Inspector    | Industrial Engineer                      | Water Resources Engineer |
| Control Systems Engineer  | Landscape Architect                      |                          |
| Cost Engineer/Estimator   | Mechanical Engineer                      |                          |
| Ecologist                 | Metallurgical Engineer                   |                          |
| Electrical Engineer       |  |                          |

List of Experience Categories (Profile Codes for Question 3)

- |   |  |
|---|--|
| Acoustics, Noise Abatement  | Dams ( <i>Concrete; Arch</i> )                                       |
| Aerial Photography; Airborne Data and Imagery Collection and Analysis           | Dams ( <i>Earth; Rock</i> ); Dikes; Levees                           |
| Activity Centers  | Desalinization ( <i>Process and Facilities</i> )                     |
| Air Pollution Control   | Design-Build - Preparation of Requests for Proposals                 |
| Airports; Navajds; Airport Lighting; Aircraft Fueling                           | Digital Elevation and Terrain Model Development                      |
| Airports; Terminals and Hangars; Freight Handling                               | Digital Orthophotography   |
| Agricultural Development; Grain Storage; Farm Mechanization                     | Dining Halls; Clubs; Restaurants                                     |
| Animal Facilities   | Dredging Studies and Design  |
| Anti-Terrorism/Force Protection   | Design & Planning Structured Parking Facilities                      |
| Area Master Planning  | Detention Security Systems   |
| Auditoriums and Theaters  | Disability / Special Needs   |
| Automation; Controls; Instrumentation   | Ecological and Archeological Investigations                          |
| Barracks; Dormitories   | Educational Facilities; Classrooms                                   |
| Bridge Design: Bridges  | Electrical Studies and Design  |
| Cartography   | Electronics  |
| Cemeteries ( <i>Planning and Relocation</i> )                                   | Elevators; Escalators; People-Movers                                 |
| Chemical Processing and Storage   | Energy / Water Auditing Savings                                      |
| Child Care/Development Facilities   | Energy Conservation; New Energy Sources                              |
| Codes; Standards; Ordinances  | Environmental Impact Studies, Assessments or Statements              |
| Cold Storage; Refrigeration and Fast Freeze                                     | Fallout Shelters; Blast-Resistant Design                             |
| Commercial Building ( <i>Low Rise</i> ); Shopping Centers                       | Fire Protection  |
| Community Facilities  | Fisheries; Fish Ladders  |
| Communications Systems; TV; Microwave   | Forensic Engineering   |
| Computer Facilities   | Garages; Vehicles Maintenance Facilities; Parking                    |
| Conservation and Resource Management  | Gas Systems ( <i>Propane; Natural, Etc.</i> )                        |
| Construction Management   | Geodetic Surveying: Ground and Airborne                              |
| Construction Surveying  | Heating; Ventilating; Air Conditioning                               |
| Corrosion Control; Cathodic Protection Electrolysis                             | Highways; Streets; Airfield Paving; Parking Lots                     |
| Cost Estimating; Cost Engineering and Analysis; Parametric Costing; Forecasting | Historical Preservation  |
| Cryogenic Facilities  | Hospital and Medical Facilities                                      |
| Construction Materials Testing  | Hotels; Motels   |
|   | <i>Housing (Residential, Multi-Family; Apartments; Condominiums)</i> |



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Hotels; Motels  
Hydraulics and Pneumatics  
Hydrographic Surveying  
Industrial Buildings; Manufacturing Plants  
Industrial Processes; Quality Control  
Industrial Waste Treatment  
Intelligent Transportation Systems  
Infrastructure  
Irrigation; Drainage  
Judicial and Courtroom Facilities  
Laboratories; Medical Research Facilities  
Land Surveying  
Landscape Architecture  
Libraries; Museums; Galleries  
Lighting (*Interior; Display; Theater, Etc.*)  
Lighting (*Exteriors; Streets; Memorials; Athletic Fields, Etc.*)  
Labs - General  
Labs – Research – Dry  
Labs – Research – Wet  
LEED Accredited A/E  
LEED Independent 3<sup>rd</sup> Party Building Commissioning  
Mapping Location/Addressing Systems  
Materials Handling Systems; Conveyors; Sorters  
Metallurgy  
Materials Testing  
Measurement / Verification / Conservation Water Consumption Savings  
Mining and Mineralogy  
Medical Related  
Modular Systems Design; Fabricated Structures or Components  
Mold Investigation  
Museums  
Nuclear Facilities; Nuclear Shielding  
Office Buildings; Industrial Parks  
Outdoor Recreation  
Petroleum and Fuel (*Storage and Distribution*)  
Photogrammetry  
Pipelines (*Cross-Country - Liquid and Gas*)  
Phase I Environmental  
Prisons & Correctional Facilities  
Plumbing and Piping Design  
Prisons and Correctional Facilities  
Product, Machine Equipment Design Pneumatic Structures, Air-Support Buildings Power Generation, Transmission, Distribution Public Safety Facilities  
Radar; Sonar; Radio and Radar Telescopes  
Radio Frequency Systems and Shielding's  
Railroad; Rapid Transit  
Recreation Facilities (*Parks, Marinas, Etc.*)  
Refrigeration Plants/Systems  
Rehabilitation (*Buildings; Structures; Facilities*)  
Research Facilities  
Resources Recovery; Recycling  
Roof Infrared Imaging to Identify Water Leaks

Roofing  
Safety Engineering; Accident Studies; OSHA Studies  
Security Systems; Intruder and Smoke Detection  
Seismic Designs and Studies  
Sewage Collection, Treatment and Disposal  
Soils and Geologic Studies; Foundations  
Solar Energy Utilization  
Solid Wastes; Incineration; Landfill  
Special Environments; Clean Rooms, Etc.  
Structural Design; Special Structures  
Surveying; Platting; Mapping; Flood Plain Studies  
Sustainable Design  
Swimming Pools  
Storm Water Handling and Facilities  
Specifications Writing  
Toxicology  
Testing and Inspection Services  
Traffic and Transportation Engineering  
Topographic Surveying and Mapping  
Towers (*Self-Supporting and Guyed Systems*)  
Tunnels and Subways  
Traffic Studies  
Transportation  
Urban renewals; Community Development  
Utilities (*Gas and Steam*)  
Value Analysis; Life-Cycle Costing  
Warehouse and Depots  
Water Resources; Hydrology; Ground Water  
Water Supply; Treatment and Distribution  
Wind Tunnels; Research/Testing Facilities Design  
Waste Water Treatment Facility  
Water Well Rehabilitation; Water Well Work  
Zoning; Land Use Studies



ATTACHMENT I – General Qualifications  
**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSP016-00005912**

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(If a firm has branch offices, complete for each specific branch office seeking work.)

1. **Annual Request for Qualifications**

a. FIRM (OR BRANCH OFFICE ) NAME:	TerraSystems Southwest, Inc.
b. FIRM (OR BRANCH OFFICE) STREET:	738 N. 5th Avenue, Suite 203
c. FIRM (OR BRANCH OFFICE) CITY:	Tucson
d. FIRM (OR BRANCH OFFICE) STATE:	Arizona
e. FIRM (OR BRANCH OFFICE) ZIP CODE:	85705

f. YEAR ESTABLISHED:	1998
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(g1). OWNERSHIP - TYPE:	Corporation
(g2) OWNERSHIP - SMALL BUSINESS STATUS:	Small Business with less than 100 employees & gross revenues of less than \$4 million

h. POINT OF CONTACT NAME AND TITLE:	Cheryl Thurman, Vice President/Senior Analyst
i. POINT OF CONTACT TELEPHONE NUMBER:	520.322.0334 or 520.990.8366
j. POINT OF CONTACT E-MAIL ADDRESS:	ckthurman@terrasw.com

k. NAME OF FIRM (If block 1a is a branch office):	TerraSystems Southwest, Inc.
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**ATTACHMENT I – General Qualifications**  
**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:**  
**ADSP016-00005912**

**STATE PROCUREMENT OFFICE**  
**Department of Administration**  
**100 North 15<sup>th</sup> Avenue, Suite 201**  
**Phoenix, Arizona 85007**

**2. EMPLOYEES BY DISCIPLINE**

a. Discipline Title	b. Function: Primary (P) or Secondary (S)	c. No. of Employees - Firm	d. No. of Employees - Branch
Geographic Information System Specialist	P	2	2
Other	S	2	2
<b>Total</b>		2	2



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**ADSP016-00005912**

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**3. PROFILE OF FIRM'S EXPERIENCE AND ANNUAL AVERAGE REVENUE FOR LAST YEAR**

a. Approximate No. of Projects	b. Experience	c. Revenue Index Number (see below)
12	Aerial Photography; Airborne Data and Imagery Collection and Analysis	1
8	Cartography	1
2	Conservation and Resource Management	1
1	Digital Elevation and Terrain Model Development	1
12	Digital Orthophotography	1
1	Ecological and Archeological Investigations	1
1	Environmental Impact Studies, Assessments or Statements	1
8	Intelligent Transportation Systems	1
12	Mapping Location/Addressing Systems	2
4	Surveying; Platting; Mapping; Flood Plain Studies	1
9	Topographic Surveying and Mapping	1
12	Transportation	2
1	Urban renewals; Community Development	1
1	Zoning; Land Use Studies	

**PROFESSIONAL SERVICES REVENUE INDEX NUMBER**

- |   |   |
|---|---|
| 1. Less than \$100,000                  | 6. \$2 million to less than \$5 million   |
| 2. \$100,000 to less than \$250,000     | 7. \$5 million to less than \$10 million  |
| 3. \$250,000 to less than \$500,000     | 8. \$10 million to less than \$25 million |
| 4. \$500,000 to less than \$1 million   | 9. \$25 million to less than \$50 million |
| 5. \$1 million to less than \$2 million | 10. \$50 million or greater               |



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**ADSP016-00005912**

**STATE PROCUREMENT OFFICE**  
**Department of Administration**  
**100 North 15<sup>th</sup> Avenue, Suite 201**  
**Phoenix, Arizona 85007**

**4. Resumes of Key Personnel Proposed for this Contract** *(Complete one Section #4 for each key person.)*

a. NAME Howard Ward	b. ROLE IN THIS CONTRACT Principal	c. YEARS EXPERIENCE	
		1. TOTAL 28	2. WITH CURRENT FIRM 18

d. LOCATION *(City and State)*  
Tucson, Arizona

e. EDUCATION <i>(DEGREE AND SPECIALIZATION)</i> Bachelor of Science - Natural Resources Planning; Masters of Business Administration	f. PROFESSIONAL TRAINING - REGISTRATIONS <i>Certified Geographic Information Systems Professional (GISP) by the GIS Certification Institute</i>
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g. OTHER PROFESSIONAL QUALIFICATIONS *(Organizations, Awards, etc.)*

Arizona Geographic Information Council (AGIC) – Private Sector Representative (2007-2012)  
 AGIC – Data Committee member

Past President, AZ Chapter of Geospatial Information Technology Association

Associate Member, Arizona Public Land Surveyors

Tucson Clean and Beautiful  
 Past Vice President, Executive Board  
 Board Member (15 years)

**H. RELEVANT PROJECTS**

1.	(1) TITLE AND LOCATION <i>(City and State)</i> <b>State of Arizona – 9-1-1 Professional Services Map Development and Enhancement Project Statewide – Arizona</b>	(2) YEAR COMPLETED 2012-2015	Construction (if applicable)
	(3) BRIEF DESCRIPTION <i>(Brief scope, size, cost, etc.)</i> AND SPECIFIC ROLE Starting in March 2012 to the present, TSSW has provided GIS support services for the 9-1-1 Program Office related to the assessment, development and enhancement of 9-1-1 GIS data layers including street centerlines, addresses, ESN/ESZ boundaries and community boundaries. Mr. Ward and TSSW staff, together with the 9-1-1 Program Office, have worked to coordinate with rural counties for the development of Scopes of Work related to street network development for three rural Arizona counties, as well as enhancement of existing datasets. An important part of this effort includes identifying and correcting GIS errors with aforementioned 9-1-1 GIS data layers to ensure conformance with the <i>Attribute Accuracy Requirements</i> section of the <i>Arizona 9-1-1 GIS Standards</i> . Mr. Ward and TSSW staff are developing and implementing complex quality-assurance procedures for work completed by the selected Contractor(s) for the street network development. Mr. Ward and TSSW staff are also developing programs and procedures for at least bi-annual assembly of statewide geocodable street networks based on county-level E-911 road networks. This project demonstrates Mr. Ward’s ability to work with multiple parties in evaluating and documenting their existing data sets, defining and justifying an E-911 database schema based on our data evaluation, identifying and developing very specific requirements for creation of street networks, Emergency Service Zone and MSAG Community boundaries and integrating all resulting datasets with a comprehensive data quality assurance program.	<input checked="" type="checkbox"/> Check if project performed with current firm	
2.	(1) TITLE AND LOCATION <i>(City and State)</i> <b>State of Arizona – Arizona Broadband Mapping Project Statewide - Arizona</b>	(2) YEAR COMPLETED 2010-2014	Construction (if applicable)
	(3) BRIEF DESCRIPTION <i>(Brief scope, size, cost, etc.)</i> AND SPECIFIC ROLE Beginning in late 2009 through December 2014, Mr. Ward provides GIS services for this leading-edge nationwide project. Mr. Ward and staff are responsible for a variety of complex database design and processing tasks. This work required extensive coordination with technical staff at the National States Geographic Information Council and the National	<input checked="" type="checkbox"/> Check if project performed with current firm	



**ATTACHMENT I – General Qualifications**  
**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:**  
**ADSP016-00005912**

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**Department of Administration**  
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**Phoenix, Arizona 85007**

Telecommunications Information Administration to refine the initial NSGIC geodatabase model to be compatible with Congressional requirements for the submittal of broadband information. Mr. Ward developed, tested, and refined a very detailed workflow to process data coming from scores of different broadband providers into a standardized series of tables and geodatabase feature classes. This work is documented in a series of working papers, checklists and applications that ensure repeatability when the State takes over the maintenance of the broadband database in 2015. Millions of records of raw data have been processed, and almost 500,000 features are submitted to the NTIA bi-annually. Mr. Ward also provides post submittal analysis and mapping products to the Arizona Broadband Mapping team, including mapping maximum download speed and number of providers across the State and across both rural and urban geographies. Analysis of coverage by technology, speed and residential densities is performed each submittal cycle, both statewide and for six regional subareas. Mr. Ward also creates 3D cartographic products for illustration of various spatial analyses conducted.

The database design, tracking mechanism, documentation and related analyses TSSW developed were acknowledged by the Geospatial Information Officer (GIO) of the Federal Communications Commission as an important contribution to the development and maintenance of the National Broadband Map.

This project was a large, multi-year project, with the overall scope crossing multiple organizations and disciplines. The overall cost of the GIS portion of this project was \$425,000.

(1) TITLE AND LOCATION (*City and State*)  
**State of Arizona – Address Improvement Project**  
**Statewide – Arizona**

(2) YEAR COMPLETED  
 2014-2015

Professional Services  
 GIS Project Manager

Construction (if applicable)

(3) BRIEF DESCRIPTION (*Brief scope, size, cost, etc.*) AND SPECIFIC ROLE  
 Mr. Ward and TSSW staff provide project management and technical

Check if project performed with current firm

assistance to the State E 9-1-1 Program Office in their efforts to create a statewide address database as well as the tools and workflows to support its adoption and maintenance by local data providers. Mr. Ward and TSSW staff supervise a team of 12 professionals and student interns to (1) collect, inventory, prepare and process parcels and/or address points from 7 of the 15 Arizona Counties, the ones that lacked an address point database at the time of the project; (2) develop a web-based address-editing application to allow community-wide participation in reviewing address point locations and attributes; and (3) develop GIS desktop-based tools for data inventory, quality assurance and loading into a statewide address repository. The address processing involved flagging addresses with attribute errors that need priority attention and moving address points onto the primary structure on each parcel based on current aerial imagery. The web-based address editor was implemented in Javascript and HTML5 using open source mapping libraries and an open source GeoServer backend. The data loading tools were developed in desktop FME and integrated into ArcGIS 10.x desktop software. The scope of this project crosses various institutions, including the University of Arizona and Arizona State University. The estimated project cost for this effort is \$160,000.

(1) TITLE AND LOCATION (*City and State*)  
**Maricopa Association of Governments - Existing Land Use Data and**  
**Procedure Development**  
**Phoenix, Arizona**

(2) YEAR COMPLETED  
 2015

Professional Services  
 GIS Project Manager; Programmer,  
 Senior Analyst

Construction (if applicable)



ATTACHMENT I – General Qualifications

ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
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(3) BRIEF DESCRIPTION (*Brief scope, size, cost, etc.*) AND SPECIFIC ROLE

Mr. Ward is currently developing the procedures and programs to create and quality-check an existing land use layer for Pinal County, Arizona. To date this has involved the adaptation and documentation of MAG procedures for Maricopa County land use to the widely different set of input layers available in Pinal County. The process entails scores of Esri 10.x GIS operations all documented so that they can be repeated in future years by MAG staff that may be unfamiliar with the process. A first draft of Pinal Land Use has been created and is under review. In a prior phase, TSSW develop, tested and documented a series of incremental update procedures for Maricopa County land use so that the process does not have to be run from scratch each update cycle. All data being processed for the MAG projects has been quality assured, with results documented and approved by MAG. Issues surrounding the cadastral representation of right of ways are routinely reviewed and resolved during the creation of the existing land use layer.

Check if project performed with current firm

(1) TITLE AND LOCATION (*City and State*)

**Maricopa Association of Governments**  
**Phoenix, Arizona**  
**On-Call GIS Consulting Services – Modeling and Research Support:**  
**Existing Land Use Database Enhancement**

(2) YEAR COMPLETED  
2011-2012

Professional Services  
GIS Project Manager

Construction (if applicable)

(3) BRIEF DESCRIPTION (*Brief scope, size, cost, etc.*) AND SPECIFIC ROLE

As an On-Call Professional Services consultant, Mr. Ward supervised and participated in a complex data creation/update process for inclusion in MAG’s Arizona Socioeconomic Modeling, Analysis and Reporting Toolbox (AZ--SMART) modeling suite. AZ-SMART is a platform from which MAG builds, calibrates and analyzes socioeconomic projections and model projections for its’ 25 member jurisdictions, as well as other Councils of Government and Metropolitan Planning Organizations throughout the State of Arizona. The existing land use dataset is critical to this process and its’ update and improvement was necessary to improve model output. Mr. Ward and TSSW staff innovatively overcame several technical obstacles created from the 1.4 million polygon Maricopa County parcel base, resulting in an “empty space” feature class defining neighborhood and major road right-of-ways (ROWS) as well as other areas not defined in the County parcel base. Multiple specific datasets were then created to fill “holes” in the parcel fabric, supplement additional detail of a secondary land use on a specific parcel, and correctly identifying land use on existing parcels where the previous land use was incorrect or a new land use code was added to the defined MAD LU codes. Mr. Ward implemented and supervised the use of inventive techniques to facilitate the creation of this data, minimizing any slivers created and ensuring that parcel line integrity was maintained in the new feature classes (i.e. any new linework which shared boundaries with an existing parcel was identical or “snapped” to each node in the parcel linework). Public ownership, major road and freeway ROWs, railroad and canal ROWs, parks (municipal and neighborhood/hoa) and desert preserves, watercourses, gravel/sand operations and multi-family common areas were all created to fit seamlessly into the existing parcel fabric where appropriate, overriding existing parcel boundaries where necessary, and redefining land use where required. This project was completed within one year, at a cost of \$58,000.

Check if project performed with current firm

5.



**ATTACHMENT I – General Qualifications**  
**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:**  
**ADSP016-00005912**

**STATE PROCUREMENT OFFICE**  
**Department of Administration**  
**100 North 15<sup>th</sup> Avenue, Suite 201**  
**Phoenix, Arizona 85007**

**4. Resumes of Key Personnel Proposed for this Contract** *(Complete one Section 4 for each key person.)*

a. NAME Cheryl Thurman	b. ROLE IN THIS CONTRACT Senior Analyst	c. YEARS EXPERIENCE	
		1. TOTAL 21	2. WITH CURRENT FIRM 18
d. LOCATION <i>(City and State)</i> Tucson, Arizona			
e. EDUCATION <i>(DEGREE AND SPECIALIZATION)</i> Bachelor of Science - Geosciences		f. PROFESSIONAL TRAINING - REGISTRATIONS Certified Geographic Information Systems Professional (GISP) by the GIS Certification Institute	

g. OTHER PROFESSIONAL QUALIFICATIONS *(Organizations, Awards, etc.)*

**Arizona Geographic Information Council (AGIC) –**

AGIC – Conference Committee member, Map and App Challenge Coordinator  
 AGIC – Outreach Committee, Co-Chair

Tucson Area GIS Cooperative member

Southern Arizona Geographic Information Systems Consortium

**H. RELEVANT PROJECTS**

(1) TITLE AND LOCATION <i>(City and State)</i> <b>State of Arizona – Arizona Broadband Mapping Project</b> <b>Statewide - Arizona</b>	(2) YEAR COMPLETED 2010-2014	
	Professional Services Senior Analyst	Construction (if applicable)
(3) BRIEF DESCRIPTION <i>(Brief scope, size, cost, etc.)</i> AND SPECIFIC ROLE Beginning in late 2009 through December 2014, TSSW provides GIS database and conversion support for this leading-edge nationwide project. The TSSW Team is responsible for a variety of complex database design and processing tasks that have required extensive coordination with technical staff from the National States Geographic Information Council (NSGIC) and the National Telecommunications Information Administration (NTIA) to refine the initial NSGIC geodatabase model to be compatible with Congressional requirements for the submittal of broadband information.  1. The TSSW Team developed, tested, and refined a very detailed workflow to process data coming from scores of different broadband providers into a standardized series of tables and geodatabase feature classes. This work is documented in a series of working papers, checklists and applications that ensure repeatability when the State takes over the maintenance of the broadband database in 2015. Millions of records of raw data have been processed, and almost 500,000 features are submitted to the NTIA bi-annually.  TSSW team also provides post submittal analysis and mapping products to the Arizona Broadband Mapping team, including mapping maximum download speed and number of providers across the State and across both rural and urban geographies. Analysis of coverage by technology, speed and residential densities is performed each submittal cycle, both statewide and for six regional subareas.  Specifically, Ms. Thurman had participated in many areas of this project over the past 5 years, including but not limited to, conducting many specific spatial analyses and created untold number of cartographic products in support of this project. This project was a large, multi-year project, with the overall scope crossing multiple organizations and disciplines. The	<input checked="" type="checkbox"/> Check if project performed with current firm	



ATTACHMENT I – General Qualifications

ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSP016-00005912

STATE PROCUREMENT OFFICE  
Department of Administration  
100 North 15<sup>th</sup> Avenue, Suite 201  
Phoenix, Arizona 85007

overall cost of the GIS portion of this project was \$425,000.

<p>(1) TITLE AND LOCATION (<i>City and State</i>) <b>State of Arizona – 9-1-1 Professional Services Map Development and Enhancement Project</b> <b>Statewide – Arizona</b></p>	<p>(2) YEAR COMPLETED 2012- 2014</p> <table border="1"> <tr> <td data-bbox="950 459 1234 537">Professional Services Senior Analyst</td> <td data-bbox="1234 459 1489 537">Construction (if applicable)</td> </tr> </table>	Professional Services Senior Analyst	Construction (if applicable)				
Professional Services Senior Analyst	Construction (if applicable)						
2.	<p>(3) BRIEF DESCRIPTION (<i>Brief scope, size, cost, etc.</i>) AND SPECIFIC ROLE Starting in March 2012 to the present, TSSW was selected to provide GIS support services for the 9-1-1 Program Office related to the assessment, development and enhancement of 9-1-1 GIS data layers including street centerlines, ESN/ESZ boundaries and community boundaries. Ms. Thurman and TSSW staff, together with the 9-1-1 Program Office, has worked to coordinate with rural counties for the development of Scopes of Work related to upcoming street network development for 3 rural Arizona counties, as well as enhancement of existing datasets. An important part of this effort includes identifying and correcting GIS errors with aforementioned 9-1-1 GIS data layers to ensure conformance with the <i>Attribute Accuracy Requirements</i> section of the <i>Arizona 9-1-1 GIS Standards</i>. Ms. Thurman and TSSW staff are developing and implementing complex quality-assurance procedures for work completed by the selected Contractor(s) for the street network development. Ms. Thurman and TSSW staff are also developing programs and procedures for at least bi-annual assembly of statewide geocodable street networks based on county-level E-911 road networks. Specifically, Ms. Thurman created a new fire districts GIS dataset for Navajo and Apache Counties, which required the research and coordination with local fire departments and districts within these two counties to ascertain legal descriptions for each department/district boundary. Also mapped from legal descriptions were the EMS boundaries. Ms. Thurman also analyzed and recreated a jurisdictional boundaries dataset for all city and town boundaries within Navajo and Apache Counties. This required the resolution of various boundary conflicts to create an update, accurate boundary dataset. These three datasets together were used to create, through a series of complex joins and unions, a new Emergency Service Zone dataset, which is being deployed in the 911 dispatch centers for Navajo and Apache County. Given a location, this dataset will inform 911 dispatchers which emergency response agency should be dispatched. This project demonstrates TSSW’s ability to work with multiple parties in evaluating and documenting their existing data sets, defining and justifying an E-911 database schema based on our data evaluation, identifying and developing very specific requirements for creation of street networks, Emergency Service Zone and MSAG Community boundaries and integrating all resulting datasets with a comprehensive data quality assurance program. This has been a multi-year effort, with a time &amp; materials cost of roughly \$150,000.</p>						
3.	<table border="1"> <tr> <td data-bbox="152 1453 950 1570"> <p>(1) TITLE AND LOCATION (<i>City and State</i>) <b>State of Arizona – Address Improvement Project</b> <b>Statewide – Arizona</b></p> </td> <td data-bbox="950 1453 1489 1570"> <p>(2) YEAR COMPLETED 2014</p> <table border="1"> <tr> <td data-bbox="950 1495 1234 1570">Professional Services Senior Analyst</td> <td data-bbox="1234 1495 1489 1570">Construction (if applicable)</td> </tr> </table> </td> </tr> <tr> <td data-bbox="152 1570 950 1934"> <p>(3) BRIEF DESCRIPTION (<i>Brief scope, size, cost, etc.</i>) AND SPECIFIC ROLE Ms. Thurman and TSSW staff provide project management and technical assistance to the State E 9-1-1 Program Office in their efforts to create a statewide address database as well as the tools and workflows to support its adoption and maintenance by local data providers. Ms. Thurman, together with fellow Principal Howard Ward, supervise a team of 12 professionals and student interns to (1) collect, inventory, prepare and process parcels and/or address points from 7 of the 15 Arizona Counties, the ones that lacked an address point database at the time of the project; (2) develop a web-based address-editing application to allow community-wide participation in reviewing address point locations and attributes; and (3) develop GIS desktop-based tools for data inventory, quality assurance and loading into a statewide address repository. The address processing involved flagging addresses with attribute errors that need priority attention and moving address points onto the primary structure on</p> </td> <td data-bbox="950 1570 1489 1934"> <p><input checked="" type="checkbox"/> Check if project performed with current firm</p> </td> </tr> </table>	<p>(1) TITLE AND LOCATION (<i>City and State</i>) <b>State of Arizona – Address Improvement Project</b> <b>Statewide – Arizona</b></p>	<p>(2) YEAR COMPLETED 2014</p> <table border="1"> <tr> <td data-bbox="950 1495 1234 1570">Professional Services Senior Analyst</td> <td data-bbox="1234 1495 1489 1570">Construction (if applicable)</td> </tr> </table>	Professional Services Senior Analyst	Construction (if applicable)	<p>(3) BRIEF DESCRIPTION (<i>Brief scope, size, cost, etc.</i>) AND SPECIFIC ROLE Ms. Thurman and TSSW staff provide project management and technical assistance to the State E 9-1-1 Program Office in their efforts to create a statewide address database as well as the tools and workflows to support its adoption and maintenance by local data providers. Ms. Thurman, together with fellow Principal Howard Ward, supervise a team of 12 professionals and student interns to (1) collect, inventory, prepare and process parcels and/or address points from 7 of the 15 Arizona Counties, the ones that lacked an address point database at the time of the project; (2) develop a web-based address-editing application to allow community-wide participation in reviewing address point locations and attributes; and (3) develop GIS desktop-based tools for data inventory, quality assurance and loading into a statewide address repository. The address processing involved flagging addresses with attribute errors that need priority attention and moving address points onto the primary structure on</p>	<p><input checked="" type="checkbox"/> Check if project performed with current firm</p>
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ATTACHMENT I – General Qualifications

ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSPO16-00005912

STATE PROCUREMENT OFFICE  
Department of Administration  
100 North 15<sup>th</sup> Avenue, Suite 201  
Phoenix, Arizona 85007

each parcel based on current aerial imagery. The web-based address editor was implemented in Javascript and HTML5 using open source mapping libraries and an open source GeoServer backend. The data loading tools were developed in desktop FME and integrated into ArcGIS 10.x desktop software. The scope of this project crosses various institutions, including the University of Arizona and Arizona State University. The estimated project cost for this effort is \$160,000.

(1) TITLE AND LOCATION (*City and State*)

**State of Arizona – Secretary of State Office  
GIS Support Services for Election Mapping Software  
Statewide – Arizona**

(2) YEAR COMPLETED 2012, 2014

Professional Services  
Senior Analyst

Construction (if applicable)

(3) BRIEF DESCRIPTION (*Brief scope, size, cost, etc.*) AND SPECIFIC ROLE

Check if project performed with current firm

Beginning in summer 2010, TerraSystems Southwest, Inc. (TSSW) was

selected to provide GIS support for use in the development of a third party Election Night Reporting (ENR) web-based software. For the years of 2010 and 2012 election cycles, Ms. Thurman created statewide Congressional and Legislative District datasets following the necessary input requirements of the ENR software. Ms. Thurman uncovered and corrected serious topological issues with the original Legislative dataset provided to the State by the AIRC contractor. She also created a precinct level dataset for Greenlee County, as they had no GIS dataset showing 2012 precinct locations. Using strict QA/QC procedures and requirements, she also reviewed all 14 additional county datasets for the State of Arizona, creating outputs necessary for the ENR software.

Ms. Thurman also conducted a similar project for SOS Office in 2014, recreating the Greenlee County Voter Precinct District GIS dataset using Bing Imagery to digitize in natural feature boundaries to create much more accurate representations of the Voter Precincts boundaries than had previously existed. Ms. Thurman recreated the voter precinct linework defined by streets or highways by snapping new linework to the TSSW recently created Statewide 911 Street Centerline dataset. The scope of this project crossed multiple years and was done on a time and materials budget. Total cost for work completed on all three election cycles was under \$5,000.

(1) TITLE AND LOCATION (*City and State*)

**Maricopa Association of Governments  
On-Call GIS Consulting Services – Modeling and Research Support:  
Existing Land Use Database Enhancement**

(2) YEAR COMPLETED 2011/2012

Professional Services  
Senior Analyst

Construction (if applicable)

(3) BRIEF DESCRIPTION (*Brief scope, size, cost, etc.*) AND SPECIFIC ROLE

Check if project performed with current firm

As an On-Call Professional Services consultant, Ms. Thurman, together

with fellow Principal Mr. Ward, supervised and participated in a complex data creation/update process for inclusion in MAG's Arizona Socioeconomic Modeling, Analysis and Reporting Toolbox (AZ--SMART) modeling suite. AZ-SMART is a platform from which MAG builds, calibrates and analyzes socioeconomic projections and model projections for its' 25 member jurisdictions, as well as other Councils of Government and Metropolitan Planning Organizations throughout the State of Arizona. The existing land use dataset is critical to this process and its' update and improvement was necessary to improve model output. TSSW staff innovatively overcame several technical obstacles created from the 1.4 million polygon Maricopa County parcel base, resulting in an "empty space" feature class defining neighborhood and major road right-of-ways (ROWs) as well as other areas not defined in the County parcel base. Multiple specific datasets were then created to fill "holes" in the parcel fabric, supplement additional detail of a secondary land use on a specific parcel, and correctly identifying land use on existing parcels where the previous land use was incorrect or a new land use code was added to the defined MAD LU codes. TSSW implemented and supervised the use of inventive techniques to facilitate the creation of this data, minimizing any slivers created and ensuring that parcel line integrity was maintained in the new feature classes (i.e. any new linework which shared boundaries with an existing parcel was identical or "snapped" to each node in the parcel linework). Public ownership, major road and freeway ROWs, railroad and canal ROWs, parks (municipal and neighborhood/hoa) and desert preserves, watercourses, gravel/sand operations



**ATTACHMENT I – General Qualifications**

**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSPO16-00005912**

**STATE PROCUREMENT OFFICE  
Department of Administration  
100 North 15<sup>th</sup> Avenue, Suite 201  
Phoenix, Arizona 85007**

and multi-family common areas were all created to fit seamlessly into the existing parcel fabric where appropriate, overriding existing parcel boundaries where necessary, and redefining land use where required. Ms. Thurman was specifically responsible for the creation of the parks and desert preserves, watercourses and gravel/sand operations and multi-family common areas portion of the project. This project was completed within one year, at a cost of \$58,000.



**ATTACHMENT I – General Qualifications**

**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSP016-00005912**

**STATE PROCUREMENT OFFICE  
Department of Administration  
100 North 15<sup>th</sup> Avenue, Suite 201  
Phoenix, Arizona 85007**

**5. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT**

*(Present no more than five (5) projects. Complete one Section 5 for each project.)*

a. TITLE AND LOCATION <i>(City and State)</i> <b>State of Arizona – 9-1-1 Professional Services Map Development and Enhancement Project Statewide – Arizona</b>	b. YEAR COMPLETED 2012*2015	
	PROFESSIONAL SERVICES GIS Services	CONSTRUCTION <i>(If applicable)</i>

**23. PROJECT OWNER'S INFORMATION**

c. PROJECT OWNER State of Arizona – 911 Program Office	d. ORIGINAL BUDGET/NTE AMOUNT OF PROJECT Under Master Blanket PO, service cost as needed	e. TOTAL COST OF PROJECT \$150,000
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f. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (include scope, size, and length of project)

Starting in March 2012 to the present, TSSW was selected to provide GIS support services for the 9-1-1 Program Office related to the assessment, development and enhancement of 9-1-1 GIS data layers including street centerlines, ESN/ESZ boundaries and community boundaries. Mr. Ward, together with the 9-1-1 Program Office, has worked to coordinate with rural counties for the development of Scopes of Work related to upcoming street network development for 3 rural Arizona counties, as well as enhancement of existing datasets. An important part of this effort includes identifying and correcting GIS errors with aforementioned 9-1-1 GIS data layers to ensure conformance with the *Attribute Accuracy Requirements* section of the *Arizona 9-1-1 GIS Standards*. Mr. Ward and TSSW staff are developing and implementing complex quality-assurance procedures for work completed by the selected Contractor(s) for the street network development. Ms. Thurman and TSSW staff are also developing programs and procedures for at least bi-annual assembly of statewide geocodable street networks based on county-level E-911 road networks. This project demonstrates TSSW's ability to work with multiple parties in evaluating and documenting their existing data sets, defining and justifying an E-911 database schema based on our data evaluation, identifying and developing very specific requirements for creation of street networks, Emergency Service Zone and MSAG Community boundaries and integrating all resulting datasets with a comprehensive data quality assurance program.

**5. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT**

*(Present no more than five (5) projects. Complete one Section 5 for each project.)*

a. TITLE AND LOCATION <i>(City and State)</i> <b>State of Arizona – 9-1-1 Address Data Improvement Project Statewide – Arizona</b>	b. YEAR COMPLETED 2015	
	PROFESSIONAL SERVICES GIS Services	CONSTRUCTION <i>(If applicable)</i>

**23. PROJECT OWNER'S INFORMATION**

c. PROJECT OWNER State of Arizona – 911 Program Office	d. ORIGINAL BUDGET/NTE AMOUNT OF PROJECT Under Master Blanket PO, service cost as needed	e. TOTAL COST OF PROJECT \$80,000
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f. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (include scope, size, and length of project)



**ATTACHMENT I – General Qualifications**  
**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:**  
**ADSP016-00005912**

**STATE PROCUREMENT OFFICE**  
**Department of Administration**  
**100 North 15<sup>th</sup> Avenue, Suite 201**  
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TSSW provides project management and technical assistance to the State E 9-1-1 Program Office in their efforts to create a statewide address database as well as the tools and workflows to support its adoption and maintenance by local data providers. TSSW supervised a team of 12 professionals and student interns to (1) collect, inventory, prepare and process parcels and/or address points from 7 of the 15 Arizona Counties, the ones that lacked an address point database at the time of the project; (2) develop a web-based address-editing application to allow community-wide participation in reviewing address point locations and attributes; and (3) develop GIS desktop-based tools for data inventory, quality assurance and loading into a statewide address repository. The address processing involved flagging addresses with attribute errors that need priority attention and moving address points onto the primary structure on each parcel based on current aerial imagery. The web-based address editor was implemented in Javascript and HTML5 using open source mapping libraries and an open source GeoServer backend. The data loading tools were developed in desktop FME and integrated into ArcGIS 10.x desktop software.

5. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT		
<i>(Present no more than five (5) projects. Complete one Section 5 for each project.)</i>		
a. TITLE AND LOCATION <i>(City and State)</i>	b. YEAR COMPLETED 2010-2014	
<b>ARIZONA BROADBAND MAPPING PROJECT</b>	PROFESSIONAL SERVICES GIS Services	CONSTRUCTION <i>(If applicable)</i>
23. PROJECT OWNER'S INFORMATION		
c. PROJECT OWNER	d. ORIGINAL BUDGET/NTE AMOUNT OF PROJECT	e. TOTAL COST OF PROJECT
State of Arizona – State Cartographer's Office	Overall Project Budget – 5 million	Cost of GIS portion: \$425,000

f. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (include scope, size, and length of project)

Beginning in late 2009, TerraSystems Southwest, Inc. (TSSW) was selected to provide GIS database and conversion support for this leading-edge nationwide project. The TSSW Team is responsible for a variety of complex database design and processing tasks that have required extensive coordination with technical staff from the National States Geographic Information Council (NSGIC) and the National Telecommunications Information Administration (NTIA) to refine the initial NSGIC geodatabase model to be compatible with Congressional requirements for the submittal of broadband information.

The TSSW Team developed, tested, and refined a very detailed workflow to process data coming from scores of different broadband providers into a standardized series of tables and geodatabase feature classes. This work is documented in a series of working papers, checklists and applications that ensure repeatability when the State takes over the maintenance of the broadband database in 2015. Millions of records of raw data have been processed, and almost 500,000 features are submitted to the NTIA bi-annually.

The TSSW team's database design, tracking mechanism, documentation and related analyses were acknowledged early on by the Geospatial Information Officer (GIO) of the Federal Communications Commission as an important contribution to the development and maintenance of the National Broadband Map; and our analytical approach was noted by the GIO as a technique that the National Broadband Mapping unit and other states could learn from. He further commented that our novel insightful approach, together with our long history of GIS expertise, has resulted in exceptional data.

TSSW team also provides post submittal analysis and mapping products to the Arizona Broadband Mapping team, including mapping maximum download speed and number of providers across the State and across both rural and urban geographies. Analysis of coverage by technology,



**ATTACHMENT I – General Qualifications**  
**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:**  
**ADSP016-00005912**

**STATE PROCUREMENT OFFICE**  
**Department of Administration**  
**100 North 15<sup>th</sup> Avenue, Suite 201**  
**Phoenix, Arizona 85007**

speed and residential densities is performed each submittal cycle, both statewide and for six regional subareas.

Over the years, untold numbers of spatial analyses were conducted for various purposes, as well as associated 2D and 3D cartographic products.

*“TerraSystems Southwest (TSSW) provided GIS services for the Arizona Broadband Mapping Project. As the Arizona State Cartographer, I coordinated with TSSW on the project. The services TSSW provided included processing data obtained from broadband service providers into NTIA and FCC compliant geospatial data format, conducting QC/QA on the processed data and developing improved data processing methodologies. In addition, TSSW provided GIS services for the Broadband Address Mapping Project. This included working with the Arizona 9-1-1 State Office to complete the development of 9-1-1 address data throughout the state, developing improved statewide GIS address data standards, integrating Arizona county GIS data into a statewide address database and developing an Arizona geocoding service for use by the Broadband Mapping Project and authorized agencies. TSSW has also contributed advice on a wide variety of topics. Their extensive knowledge of GIS and project management has proved to be a very valuable asset to the Broadband Mapping Project and State Cartographer’s Office.” – Gene Trobia, former State Cartographer for the State of Arizona, retired Jan 2014, May 2014*

*“TerraSystems Southwest, Inc. (TSSW) has been a subcontractor and valued partner for the last five years on high-level broadband data collection and mapping projects. TSSW’s knowledge of the telecom and technology arena, especially GIS, is phenomenal. Working with TSSW on projects is a pleasure and the professional and committed efforts have proved consistently reliable and invaluable over time.” – Mark Goldstein, Project Manager, Data Site Consortium, Inc. May 2014*

5. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT		
<i>(Present no more than five (5) projects. Complete one Section 5 for each project.)</i>		
a. TITLE AND LOCATION <i>(City and State)</i>	b. YEAR COMPLETED	
<b>State of Arizona – Secretary of State’s Office - GIS Support Services for Election Mapping Software</b>	PROFESSIONAL SERVICES GIS Services	CONSTRUCTION <i>(If applicable)</i>
23. PROJECT OWNER’S INFORMATION		
c. PROJECT OWNER State of Arizona – Secretary of State’s Office	d. ORIGINAL BUDGET/NTE AMOUNT OF PROJECT Done as Time & Materials	e. TOTAL COST OF PROJECT Under 10k

f. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (include scope, size, and length of project)

Beginning in summer 2010, TerraSystems Southwest, Inc. (TSSW) was selected to provide GIS support for use in the development of a third party Election Night Reporting (ENR) web-based software. TSSW created statewide Congressional and Legislative District datasets following the necessary input requirements of the ENR software. TSSW uncovered and corrected serious topological issues with the original Legislative dataset provided to the State by the AIRC contractor. TSSW also created a precinct level dataset for Greenlee County, as they had no GIS dataset showing 2012 precinct locations. Using strict QA/QC procedures and requirements, TSSW also reviewed all 14 additional county datasets for the State of Arizona, creating outputs necessary for the ENR software.

TSSW also conducted a similar project for SOS Office in 2014, recreating the Greenlee County Voter Precinct District GIS dataset using Bing Imagery to digitize in natural feature boundaries to create much more accurate representations of the Voter Precincts boundaries than had previously existed. Ms. Thurman recreated the voter precinct linework defined by streets or highways by snapping new linework to the TSSW recently created Statewide 911 Street Centerline dataset.



**ATTACHMENT I – General Qualifications**

**ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSP016-00005912**

**STATE PROCUREMENT OFFICE  
Department of Administration  
100 North 15<sup>th</sup> Avenue, Suite 201  
Phoenix, Arizona 85007**

**5. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT**

*(Present no more than five (5) projects. Complete one Section 5 for each project.)*

a. TITLE AND LOCATION <i>(City and State)</i> <b>On-Call GIS Consulting Services</b>  <b>Maricopa &amp; Pinal Counties</b>	b. YEAR COMPLETED 2010-2015	
	PROFESSIONAL SERVICES GIS Services	CONSTRUCTION <i>(If applicable)</i>

**23. PROJECT OWNER'S INFORMATION**

c. PROJECT OWNER Maricopa Association of Governments	d. ORIGINAL BUDGET/NTE AMOUNT OF PROJECT \$150,000- combined	e. TOTAL COST OF PROJECT \$150,000- combined
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f. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (include scope, size, and length of project)

As an On-Call Professional Services consultant, TSSW completed a complex data creation/update process for inclusion in MAG's Arizona Socioeconomic Modeling, Analysis and Reporting Toolbox (AZ-SMART) modeling suite. AZ-SMART is a platform from which MAG builds, calibrates and analyzes socioeconomic projections and model projections for its' 25 member jurisdictions, as well as other Councils of Government and Metropolitan Planning Organizations throughout the State of Arizona. The existing land use dataset is critical to this process and its' update and improvement was necessary to improve model output. TSSW innovatively overcame several technical obstacles created from the 1.4 million polygon Maricopa County parcel base, resulting in an "empty space" feature class defining neighborhood and major road right-of-ways (ROWS) as well as other areas not defined in the County parcel base. Multiple specific datasets were then created to fill "holes" in the parcel fabric, supplement additional detail of a secondary land use on a specific parcel, and correctly identifying land use on existing parcels where the previous land use was incorrect or a new land use code was added to the defined MAD LU codes. TSSW employed inventive techniques to facilitate the creation of this data, minimizing any slivers created and ensuring that parcel line integrity was maintained in the new feature classes (i.e. any new linework which shared boundaries with an existing parcel was identical or "snapped" to each node in the parcel linework). Public ownership, major road and freeway ROWs, railroad and canal ROWs, parks (municipal and neighborhood/hoa) and desert preserves, watercourses, gravel/sand operations and multi-family common areas were all created to fit seamlessly into the existing parcel fabric where appropriate, overriding existing parcel boundaries where necessary, and redefining land use where required.

TSSW is currently developing the procedures and programs to create and quality-check an existing land use layer for Pinal County, Arizona. To date this has involved the adaptation and documentation of MAG procedures for Maricopa County land use to the widely different set of input layers available in Pinal County. The process entails scores of Esri 10.x GIS operations all documented so that they can be repeated in future years by MAG staff that may be unfamiliar with the process. A first draft of Pinal Land Use has been created and is under review. In a prior phase, TSSW develop, tested and documented a series of incremental update procedures for Maricopa County land use so that the process does not have to be run from scratch each update cycle. All data being processed for the MAG projects has been quality assured, with results documented and approved by MAG. Issues surrounding the cadastral representation of right of ways are routinely reviewed and resolved during the creation of the existing land use layer.



ATTACHMENT I – General Qualifications

ANNUAL REQUEST FOR QUALIFICATIONS AND EXPERIENCE NO:  
ADSP016-00005912

STATE PROCUREMENT OFFICE  
Department of Administration  
100 North 15<sup>th</sup> Avenue, Suite 201  
Phoenix, Arizona 85007

6. ADDITIONAL INFORMATION

a. PROVIDE ANY ADDITIONAL INFORMATION YOU FEEL MAY BE NECESSARY TO DESCRIBE YOUR FIRMS QUALIFICATIONS. (ATTACH ADDITIONAL SHEETS AS NEEDED.)

**Company Overview**

TerraSystems Southwest, Inc. (TSSW) is a Geographic Information Systems (GIS) consulting firm and an ESRI Business Partner with the main office located in Tucson, Arizona. Founded in 1998, the mission of TerraSystems is to assist organizations, both public and private sector, efficiently acquire and successfully apply GIS technology to enhance planning and decision-making processes. TSSW offers a full spectrum of GIS-related services including strategic planning, system design and installation, data conversion, spatial analyses, application development, decision support tools, on-call technical support and customized training. Our team of professionals has a wide range of experience, with over 35 years of GIS technical and managerial experience. TSSW is nationally recognized for our innovative use of technology, analytical methodologies and sharp attention to detail resulting in exceptional products and accomplished goals for our clients.

**Valued Clients**

Since its inception, TSSW has been involved with a number of progressive GIS projects throughout the southwestern United States, as well as such diverse locals as the Triangle-J area in North Carolina, Bozeman Montana, and Oahu, Hawaii. As a client-oriented consulting firm, TSSW has fostered a long list of successful projects and satisfied clients ranging from governmental agencies to planning and consulting firms, utilities, non-profit organizations and for-profit corporations.

As demonstrated by our partial list of clients, they are as varied in their size as they are in their mission. TSSW works closely with each client to define and customize a solution that meets their specific needs. From simple data conversion to complex application development, on-call technical support or strategic planning, TSSW has the flexibility to respond to the needs of our varied clientele.

**AREAS OF EXPERTISE**

**Needs Analysis and Strategic Planning** – TSSW has conducted and participated in numerous GIS needs assessments and strategic planning processes for organizations of varying size and complexity. Beginning with Mr Ward’s leadership of Pima County’s effort to acquire and deploy an enterprise-wide GIS database in the early 1990’s through successful plans for Tucson Water, the Town of Oro Valley, the City of Casa Grande and the Central Arizona Association of Governments, TSSW has a proven record of listening to clients and helping them design GIS approaches that fit their culture and budget. TSSW can help any size organization adopt and adapt to the ever-changing GIS technology landscape by thinking carefully about what needs to be done and then identifying the right technology at the right scale to accomplish the goals.

**Database Design and Implementation** – TSSW staff have designed and implemented numerous complex spatial and non-spatial databases over the course of their careers. While at PCDOT, Mr. Ward directed the creation of the multi-million dollar parcel and street network databases. This was a complex task involving the design and implementation of workflows, programs and procedures for converting parcel data from its source in AutoCAD into a single, county wide GIS layer. TSSW staff assisted Tucson Water in the conceptual design of the GIS representation of their AutoCAD valve map database. TSSW Staff assisted the Maricopa Association of Governments convert and quality control numerous socio-economic and transportation databases for use in their GIS modeling efforts in Maricopa County. We regularly research, acquire, evaluate, convert and quality check spatial databases using ESRI products. This work includes a number of spatial and attribute cross-checks as well as topology rules and validation. We build and maintain our own internal SQL Server geodatabase and we are familiar with the workflows for installation, operation and maintenance of enterprise-level geodatabases. We are also power users of Access and Excel products and use them to do extensive database translation and prototyping.

**Data Creation/Conversion, Spatial Analyses, GIS Support Services** – TSSW has completed countless data creation/conversion efforts for a variety of clientele, from small consulting and engineering firms, to large governmental entities, to local and national non-profit entities working under tight budget constraints. Often intertwined with data acquisition/creation/conversion is geospatial analyses – ranging from simple overlay analyses to complex suitability analyses built in ModelBuilder. TSSW has the capacity to meet the specialized needs of each client regardless of their size or the scale of their needs.

TSSW has extensive experience in supporting Conceptual Plan and General Plan project requirements, using innovative techniques to support the often complex planning process, as well publication quality cartographic products to communicate clearly to those unfamiliar with mapping and planning conventions. We routinely work as an extension of several planning firms which we have developed long lasting, supportive relationships over the years. Community by Design (CBD) is one such firm. TSSW and CBD have had a very successful collaborative relationship since 2000. CBD, nationally recognized for its dynamic urban design and sustainable community development, has included TSSW as a team member in countless Conceptual Plans, General Plans, Growth Management Plans as well as Downtown Development plans in Arizona, New Mexico and Colorado. TSSW provides CBD with a range of services from data research and acquisition, data creation/conversion, cartography, to complexity suitability analyses and growth modeling.



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Another long time collaborative partner is David Williams & Associates. DWA has utilized TSSW for GIS services support on a wide variety of projects ranging from small rezoning applications, to large scale planning projects such as the Town of Oro Valley Environmentally Sensitive Lands Project, culminating in a new ESL ordinance for the Town in 2010.

**GIS Application Development and Integration** - TSSW staff and our independent contractors have written numerous GIS applications for data processing and analyses, including apps for data translation and loading, data quality control, infrastructure management programs, and spatial analysis. We program using Python, .NET/ArcObjects, VB/ArcObjects, JavaScript, VBScript, VBA and others. TSSW built a population Build-Out Model (BOM) for the Central Arizona Association of Government and a Spatial Growth Model (SGM) for the Global Climate Change Program at Prescott College. The CAAG BOM is written in Python, runs in ArcToolbox, and estimates the total dwelling units, population and jobs in Pinal County at build out. This application has reduced the time for model update from weeks to less than one hour. The Spatial Growth Model (SGM) is designed to assist communities address future growth issues and help them better manage and prepare for that growth. SGM has been applied in various communities nationwide and was part of a project that won a National Reinventing Government Award.

**Cartography** - TSSW is known for its high quality cartographic products and inventive use of desktop graphics software to display GIS data, analyses and model results. TSSW works with clients to create 3D visualizations which can be used as an effective decision-making support tool.

**\*\*Please see our TerraSystems Southwest References and Project Description document for additional information, including Reference names and contact information, as well as testimonial quotes provided by our clients.**

7. ANNUAL AVERAGE PROFESSIONAL SERVICES REVENUES OF FIRM FOR LAST 3 YEARS

a. Percentage of Total Work Attributable to State, Federal and Municipal Government Work:	75%
b. Percentage of Total Work Attributable to Non-Government Work:	25%

8. AUTHORIZED REPRESENTATIVE. The foregoing is a statement of facts.

Signature: \_\_\_\_\_ Date: 3/2/16

Name: Cheryl Thurman Title: Vice President \_\_\_\_\_