

## **APPENDIX A: Analysis of Commonly Used Geospatial Job Titles Submitted by Online Feedback Mechanism Respondents**

In the online feedback mechanism, we asked respondents to list three commonly used geospatial job titles they would recommend adding to the SOC system. A total of 184 job titles were collected and they are quite varied. For clarification purpose, a few minor changes were made. For example, the title “GIS analysts” is changed to “GIS analyst” while the title “GIS analyst/programmer” is divided into two individual titles “GIS analyst” and “GIS programmer”.

Two levels of analysis were performed. First, frequency count for each unique job title is tallied. The following includes the unique titles that have at least two frequency counts. Table 1 clearly shows that the term “GIS” remains dominant even though other terms such as “Geospatial” and “Spatial” are also used. Furthermore, as indicated by the first four titles, four common functional roles are: “Technician”, “Analyst”, “Specialist”, and “Manager”. Based upon these observations, the second analysis involves systematically dividing each submitted job title into two parts. The first part relates to how the field is labeled whereas the second part links to the level of knowledge/skill/competency relevant to the function of the job. For example, the first title in Table 1, “GIS Technician” can clearly be divided into “GIS” and “Technician”. In another case, “Geospatial Data Resource Manager” is divided into “Geospatial” and “Manger, Data Resource”.

**Table A.1: Frequency Distribution of Commonly Used Job Titles**

<b>TITLE</b>	<b>FREQ</b>	<b>TITLE</b>	<b>FREQ</b>
GIS Technician	14	GIS Programmer	3
GIS Analyst	13	Remote Sensing Specialist	3
GIS Specialist	8	Remote Sensing Technician	3
GIS Manager	7	Cartographers	2
Geospatial Analyst	5	Geographic Information Manager	2
Program Manager	5	Geographic Information Specialist	2
Geospatial Technician	4	Geographic Information Technician	2
Geospatial Data Resource Manager	3	Geospatial Manager	2
Geospatial Software Developer	3	Geospatial Project Manager	2
Geospatial Technology Application Programmer	3	Geospatial Technology Specialist	2
GIS Coordinator	3	GIS Project Manager	2
GIS Developer	3	GIS Software Developer	2
GIS Programmer	3	Spatial Analyst	2

Table A.2 shows that despite the emergence of “Geospatial” as a term describing the industry, “Geographic Information” remains the key identification of these commonly used job titles. This may relate to how the industry distinguishes itself from others: that is, the reliance on information tied to geographic references and locations. The first eight descriptors (from GIS to GIScience) use some form of the term “Geographic Information” and they count for 49% of all titles submitted. The next six descriptors capture the term “Geospatial” or “Spatial”, counting for another 27% of all submitted titles. In all, 76% of all titles submitted carry one of the following descriptors “Geographic Information”, “Geospatial”, or simply “Spatial.”

Table A.2: Frequency Distribution of First Part of Common Job Title

<u>Common Descriptor</u>	<u>Freq</u>	<u>Common Descriptor</u>	<u>Freq</u>
GIS	71	Geospatial Information	1
Geographic information	10	Spatial	8
Geographical Information	1	Spatial Information	1
Geographic	1	Photogrammetrist	2
GIS/Remote Sensing	3	Remote Sensing	7
GIS/GPS	1	GPS/RFID	1
GPS/GIS	1	Cartographers	2
GIScience	2	Mapping	1
Geospatial	28	Geodesist	1
Geospatial Technology	9	IS	1
Geospatial/Geographic	3	IT	1

The second part of the job title relates to job function and level of knowledge/skill/competency. The generic job titles with the highest frequencies are identified. These include “Analyst”, “Technician”, “Specialist”, “Manager”, and “Software Developer”. Then all other job functions with slight variation, usually in the form of specification, are listed immediately following the general ones. This is easily done for the first four functions. The last group includes all functions that deal with software development and system administration. Table A.3 provides a quick summary of how they are grouped.

Table A.3: Frequency Distribution of Job Function Part of the Common Job Titles.

<u>Job Function</u>	<u>Frequency</u>	<u>Group</u>
analyst	28	Analyst
analyst and manager	1	
analyst, business & technical	1	
analyst, business	1	
analyst, data	1	
analyst, data integration	1	
analyst, database	1	
technician	27	Technician
technician, QA	1	
technologist	1	
specialist	15	Specialist
specialist, application	1	
specialist, data integration	1	
specialist, data management	1	
specialist, location based	1	
specialist, software	1	
manager	14	
manager, program	5	
manager, business	1	
manager, customer relations	1	
manager, data resource	3	
manager, project	4	
manager, data	1	
software developer	7	Developer/ Programmer
software development	1	
developer	5	
project developer	1	
programmer	4	
application developer	3	
application programmer	3	
application	2	
application designer	1	
administrator, data	1	
administrator, database development	1	
administrator, database management	1	
system engineer	1	
systems architect	2	
data and systems architecture	1	
data software engineer	1	
database architect	1	

Table A.3 (Con't)

<b>Job Function</b>	<b>Frequency</b>	<b>Group</b>
professional	5	
coordinator	3	
coordinator, data acquisition	1	
chief information officer	1	
officer	2	
design	1	
project designer	1	
graphics	1	
marketing	1	
sales	1	
renditionist, dynamic segmentation	1	
dispatch	1	
logistics	1	
network designer	1	
network mapper	1	
program director	1	
consultant	1	
photogrammetrist	2	
planner	1	
geodesist	1	
cartographer	2	
educator	1	
scientist	2	
researcher and developer	1	
trainer	1	
(blank)	1	
<b>Grand Total</b>	<b>184</b>	

## **APPENDIX B: Analysis of Commonly Used Geospatial Job Titles Based On Online Job Advertisement**

On September 8, 2005, we extracted all job listings posted on the following online job resources (listed in the GITA career center URL

<http://www.gita.org/resources/careercenter.html>): Directions Magazine, Earthworks, GeoCommunity, GIS Cafe, GIS Careers, GIS Connection, GISjobs.com, GIS Jobs Clearinghouse, GIS Lounge, GeoSearch, GISUser.

There were a total of 336 job listings posted in the above URLs. All job titles were extracted “as is” and then modified to remove specific levels (such as “I”, “II”, “Senior”, “Entry Level”, etc) as well as vendor-specific software knowledge (such as “ArcObject”, “ENVI”, etc). This survey was aimed at making a quick observation of the most common job titles and functions. Of the 336 job listings, we identified a total of 176 unique modified job titles. It is important to note that some job listings use multiple job titles (such as “GIS Analyst/Programmer”). For the purpose of our analysis, we extracted both “GIS Analyst” and “GIS Programmer” as unique job titles. Table B.1 shows the frequency distribution by commonly job titles.

The three most frequently used job titles are GIS Analyst (12%), GIS Specialist (19%) and GIS Technician (19%). No attempt at this point has been made to examine the difference between these three job titles in terms of their functionalities and responsibilities. These terms are grouped coarsely into two groups: (1) Technology Component; and (2) Function/Role. The latter is very similar to the geospatial work roles identified by Gaudet et al (2003).

Table B.1: Frequently used terms in the 336 job listings

<b>Group</b>	<b>Term</b>	<b>Frequency</b>
Technology Component	GIS, Geographic Information, Geomatics, Geospatial	174
	Photogrammetry+Photographer+Aerial+Image+Remote Sensing	28
	Survey, Geodetic	9
	Cartography, Map	6
	CAD or CADD	4
Function/Role	Engineering	24
	Software	16
	Analyst	78
	Specialist	46
	Technician, Technical	32
	Programmer	23
	Developer	29
	Application	11
	Database	12
	Manager, Management	39
	Marketing	6
	Sales	11
	Coordinator	12
	Training	4
	Professor	11
	Scientist	8
	Research	10

## **APPENDIX C: List of Occupations (SOC System) Related to Geographic Education and Training**

The Association of American Geographers (AAG) has identified occupations (by SOC) that are related to geospatial education and training. A committee of experts identified 146 relevant occupations (Table C.1). It is important to note that not all of these occupations are directly related to the geospatial technology industry. However, as the geospatial industry is cross-cutting, these 146 occupations provide a broad view of how the technology is integrated into many occupations.

Table C.1: List of Select Occupations

<b>SOC</b>	<b>Occupational Titles</b>
<b>11-0000</b>	<b>Management occupations</b>
11-1011	Chief executives
11-1021	General and operations managers
11-2021	Marketing managers
11-2022	Sales managers
11-3021	Computer and information systems managers
11-3051	Industrial production managers
11-3071	Transportation, storage, and distribution managers
11-9011	Farm, ranch, and other agricultural managers
11-9021	Construction managers
11-9032	Education administrators, elementary and secondary school
11-9033	Education administrators, postsecondary
11-9041	Engineering managers
11-9071	Gaming managers
11-9081	Lodging managers
11-9111	Medical and health services managers
11-9121	Natural sciences managers
11-9141	Property, real estate, and community association managers
11-9151	Social and community service managers
<b>13-0000</b>	<b>Business and Financial Operations Occupations</b>
13-1021	Purchasing agents and buyers, farm products
13-1022	Wholesale and retail buyers, except farm products
13-1023	Purchasing agents, except wholesale, retail, and farm products
13-1041	Compliance officers, except agriculture, construction, health and safety, and transportation
13-1061	Emergency management specialists
13-1121	Meeting and convention planners
13-2021	Appraisers and assessors of real estate

13-2053	Insurance underwriters
<b>15-0000 Computer and Mathematical Science Occupations</b>	
15-1011	Computer and information scientists, research
15-1021	Computer Programmers
15-1031	Computer Software Engineers, Applications
15-1032	Computer Software Engineers, Systems Software
15-1041	Computer Support Specialists
15-1051	Computer Systems Analysts
15-1061	Database Administrators
15-1071	Network and Computer Systems Administrators
15-1081	Network Systems and Data Communications Analysts
15-2031	Operations research analysts
<b>17-0000 Architecture and Engineering Occupations</b>	
17-1011	Architects, Except Landscape and Naval
17-1012	Landscape Architects
<b>17-1021</b>	<b><i>Cartographers and Photogrammetrists</i></b>
<b>17-1022</b>	<b><i>Surveyors</i></b>
17-2021	Agricultural Engineers
17-2051	Civil Engineers
17-2081	Environmental Engineers
17-2111	Health and safety engineers, except mining safety engineers and inspectors
17-2121	Marine Engineers and Naval Architects
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers
17-2171	Petroleum engineers
17-3011	Architectural and Civil Drafters
17-3013	Mechanical drafters
17-3022	Civil Engineering Technicians
17-3023	Electrical and electronic engineering technicians
17-3024	Electro-mechanical technicians
17-3025	Environmental Engineering Technicians
<b>17-3031</b>	<b><i>Surveying and Mapping Technicians</i></b>
<b>19-0000 Life, Physical, and Social Science Occupations</b>	
19-1010	Agricultural and food scientists
19-1023	Zoologists and wildlife biologists
19-1031	Conservation Scientists
19-1032	Foresters
19-1041	Epidemiologists
19-2021	Atmospheric and Space Scientists
19-2041	Environmental Scientists and Specialists, Including Health
19-2042	Geoscientists, Except Hydrologists and Geographers

19-2043	Hydrologists
19-3021	Market Research Analysts
19-3022	Survey Researchers
19-3041	Sociologists
19-3051	Urban and Regional Planners
19-3091	Anthropologists and Archeologists
19-3092	Geographers
19-3093	Historians
19-3094	Political Scientists
19-4011	Agricultural and Food Science Technicians
19-4041	Geological and Petroleum Technicians
19-4091	Environmental Science and Protection Technicians, Including Health
19-4093	Forest and Conservation Technicians
<b>21-0000 Community and Social Services Occupations</b>	
21-1012	Educational, vocational, and school counselors
21-1022	Medical and public health social workers
21-1093	Social and human service assistants
<b>23-0000 Legal Occupations</b>	
23-2093	Title examiners, abstractors, and searchers
<b>25-0000 Education, training, and library occupations</b>	
25-1021	Computer science teachers, postsecondary
25-1031	Architecture Teachers, Postsecondary
25-1032	Engineering Teachers, Postsecondary
25-1041	Agricultural Sciences Teachers, Postsecondary
25-1043	Forestry and Conservation Science Teachers, Postsecondary
25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary
25-1053	Environmental Science Teachers, Postsecondary
25-1061	Anthropology and Archeology Teachers, Postsecondary
25-1062	Area, Ethnic, and Cultural Studies Teachers, Postsecondary
25-1064	Geography Teachers, Postsecondary
25-1065	Political Science Teachers, Postsecondary
25-1067	Sociology Teachers, Postsecondary
25-1081	Education teachers, postsecondary
25-1111	Criminal justice and law enforcement teachers, postsecondary
25-1125	History Teachers, Postsecondary
25-1191	Graduate Teaching Assistants
25-1193	Recreation and fitness studies teachers, postsecondary
25-2021	Elementary School Teachers, Except Special Education
25-2022	Middle School Teachers, Except Special and Vocational Education
25-2023	Vocational education teachers, middle school

25-2031	Secondary School Teachers, Except Special and Vocational Education
25-2032	Vocational education teachers, secondary school
25-3021	Self-enrichment education teachers
25-4010	Archivists, curators, and museum technicians
25-9031	Instructional coordinators
25-9041	Teacher Assistants
<b>27-0000 Arts, Design, Entertainment, Sports, and Media Occupations</b>	
27-3020	News analysts, reporters and correspondents
27-3031	Public relations specialists
27-3041	Editors
27-3042	Technical Writers
27-3043	Writers and Authors
27-4021	Photographers
<b>31-0000 Healthcare Support Occupations</b>	
31-9093	Medical equipment preparers
<b>33-0000 Protective Service Occupations</b>	
33-1012	First-line supervisors/managers of police and detectives
33-1021	First-line supervisors/managers of fire fighting and prevention workers
33-2022	Forest fire inspectors and prevention specialists
33-3021	Detectives and criminal investigators
33-3031	Fish and game wardens
33-9031	Gaming surveillance officers and gaming investigators
<b>37-0000 Building and Grounds Cleaning and Maintenance</b>	
37-3011	Landscaping and groundskeeping workers
<b>39-0000 Personal Care and Service Occupations</b>	
39-6021	Tour Guides and Escorts
39-6022	Travel Guides
39-6031	Flight attendants
39-6032	Transportation attendants, except flight attendants and baggage porters
39-9032	Recreation workers
<b>41-0000 Sales and Related Occupations</b>	
41-3041	Travel Agents
41-9021	Real estate brokers
41-9022	Real estate sales agents

<b>43-0000</b>	<b>Office and Administrative Support Occupations</b>
43-4081	Hotel, motel, and resort desk clerks
43-4181	Reservation and transportation ticket agents and travel clerks
43-5011	Cargo and freight agents
<b>45-0000</b>	<b>Farming, Fishing, and Forestry Occupations</b>
45-1011	First-line supervisors/managers of farming, fishing, and forestry workers
45-2092	Farmworkers and laborers, crop, nursery, and greenhouse
45-2093	Farmworkers, farm and ranch animals
45-4011	Forest and Conservation Workers
<b>53-0000</b>	<b>Transportation and Material Moving Occupations</b>
53-1011	Aircraft cargo handling supervisors
53-1021	First-line supervisors/managers of helpers, laborers, and material movers, hand
53-1031	First-line supervisors/managers of transportation and material-moving machine and vehicle operators
53-2011	Airline pilots, copilots, and flight engineers
53-2012	Commercial pilots
53-2021	Air Traffic Controllers
53-2022	Airfield Operations Specialists
53-5021	Captains, mates, and pilots of water vessels
53-6041	Traffic Technicians
<b>55-0000</b>	<b>Military Specific Occupations</b>
55-3015	Command and Control Center Specialists
55-3017	Radar and Sonar Technicians