GEOSPATIAL ENGINEERING COMPETENCIES

Geographic Information Systems Specialist Competencies

(November 2021)

Notes:

Each of the activities under the competencies must be signed-off to the standard that the applicant has achieved – more details and explanation of the levels (A, K, E and B) are contained in the quick guide to competencies.

Optimum standards of competencies:

These are the optimum levels of achievement that an applicant needs to achieve for the grades of Technical Member or Member.

The optimum standard is given against each activity statement

There is a little flex in the optimum standards, so if an applicant is not able to achieve the optimum standard in a few activities, this can be balanced out by exceeding the optimum standard elsewhere in the competencies.

Experienced applicants may be able to sign off all the competencies in one go, but we would expect trainees and apprentices to do this over the duration of their training period. Competencies may be updated annually, so if you are working on a particular revision you should be aware that you need to be familiar with the latest revision at the time of review and may be questioned on these.

GIS01		Competency	Geospatial Data capture & processing in GIS				
				Date of assessment			
	Optimum Standard		**Activity Details**	A	K	E	B
ITEM	**TECHNICAL MEMBER**	**MEMBER**					
A	E K	B B	**Data Quality** 1. Identify and discern data quality and potential sources of errors eg capture sources, currency, accuracy 2. Identify and discern the purpose of metadata (why it is important and what should be included)				
B	E E E E K E	B B B B K B	**Creation of GIS data** 1. Digitising /Creation of vector data 2. Importing CAD data 3. Import and registration of raster data 4. Import and geocoding of non-spatial data 5. Understanding the impact of importing and converting on data quality 6. Data format conversion				

C	E
	
	K
	
	E
		B
		
		K
		
		B
			Coordinate reference systems and projections
			1. Horizontal coordinate systems and projections.
			  a. Global (sphere), regional (spheroid) and local (plane) coordinate systems
			  b. Difference between coordinate reference system (Grid coordinates) and projection (Geographical coordinates)
			  c. Geodetic datum
			  d. Vertical datums
			2. Understanding how coordinate systems relate to data quality
			3. Coordinate reference system transformations and reprojections				

	K	E	4. Indirect referencing systems eg Postcodes, W3W, Google Plus, Linear reference systems				
D	One at E the rest at K	One at B, another at E and the rest at K	**Data capture sources** 1. Imagery data - eg, aerial sensors, handheld sensors, vehicle mounted sensors, satellite mounted sensors 2. Survey data eg Total station, GNSS, Terrestrial laser scanner 3. Laser scan data (LIDAR) eg Aerial laser scanning , marine laser scanning, vehicle mobile mapping, pedestrian mobile, SLAM 4. Utility detection data eg GPR, Cat and Genny 5. Handheld mobile data device eg ArcGIS Field Maps, Survey 123, Modern mobile capability 6. IoT eg APIs and data streams 7. Ground investigation eg GPR, boreholes, geophysical 8. Other				

GIS01: Geospatial Data capture & processing in GIS

Name of Supervisor	Name of Applicant
Supervisor's signature	Date

GIS02		Competency	Data management				
					Date of assessment		
	Optimum Standard						
ITEM	**TECHNICAL MEMBER**	**MEMBER**	**Activity Details**	**A**	**K**	**E**	**B**
A	E	B	**Metadata** 1. Producing, enriching and managing metadata				
B	E	B	**Standards** 1. Information Management Standards applied to GIS Data Management eg Gemini, ISO19115, INSPIRE				
C	E	B	**Data types** 1. Assessing the suitability and quality of vector and raster data models and their applications				
D	E K K A	B B B K	**Databases** 1. File-based: GIS File types 2. Relational Databases eg SQL Server, PostgreSQL, etc 3. Handling unstructured data 4. Understanding of principles of master data management				
E	A	B	**Data Interoperability** 1. Interoperability best practices during systems or data integration eg data formats exchange formats with particular attention to BIM, IOT, etc				
F	A	K	**Data Ethics** 1. Policy and best practices eg Locus charter				
G	A	K	**Data Security** 1. Policy and best practices eg ISO 27001 and GDPR				

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GIS02: Data Management

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GIS03		Competency	GIS Analysis of Data				
				Date of assessment			
	Optimum Standard		**Activity Details**	A	K	E	B
ITEM	**TECHNICAL MEMBER**	**MEMBER**					
A	E	B	**Basic vector analysis** 1. Buffering, overlay etc				
B	K	B	**Advanced vector analysis** 1. Network analysis, spatial statistics, temporal analysis, cluster analysis, multi-variate analysis				
C	E	B	**Basic raster analysis** 1. Reclassification, terrain modelling, map algebra, filtering, flow, aspect, slope, basic interpolation (inverse distance weighted etc)				
D	A	K	**Advanced raster analysis** 1. Geostatistics eg kriging, spline; advanced image processing eg NDVI				
E	E	B	**Scripted analysis and modelling** 1. Scripted analysis and model building eg Esri model-builder, SQL, FME, Python, R				
F	A	K	**Data Science, Machine learning and artificial intelligence** 1. Understanding of basic terminology eg labelled/training data, Artificial Intelligence, Machine Learning, neural networks, heuristics, errors, supervised/unsupervised learning				

GIS03: GIS Analysis of Data

Name of Supervisor	Name of Applicant
Supervisor's signature	Date

GIS04		Competency	Reporting/Visualisation				
				Date of assessment			
	Optimum Standard		**Activity Details**	A	K	E	B
ITEM	**TECHNICAL MEMBER**	**MEMBER**					
A	B	B	**2D Map creation** 1. Designing and creating maps following the principles of cartographic design eg generalisation, labelling, symbology, projections, map layout (map face / map surround information - Scale, Orientation, Grid / Graticule, Legend)				
B	A	E	**3D Map creation** 1. Designing and creating 3D maps with 3D authoring tools, processes and standards eg BIM (textures, materials), 3D CAD in GIS, vertical datums				
C	B	B	**Dashboards – Data Visualisation** 1. Designing and creating spatially enabled reporting tools eg visualise statistics & quantification, report on spatial relationships between multiple features				

GIS04: Reporting/Visualisation

Name of Supervisor	Name of Applicant
Supervisor's signature	Date

GIS05		Competency	**GIS Software and Platforms**				
				Date of assessment			
	Optimum Standard		**Activity Details**	**A**	**K**	**E**	**B**
ITEM	**TECHNICAL MEMBER**	**MEMBER**					
A	E	B	**GIS Desktop software** 1. Apply desktop GIS software to undertake your role				
	K	E	2. Custom desktop GIS software eg specifying and using custom GIS software and tools				
	E	B	3. Working with web APIs and GIS servers eg adding, querying and managing web data sources				
	E	B	4. Automating workflows eg Model Builder, FME, Python, SQL				
B	one at K and the rest at A	two at E and the rest at K	**Web GIS** 1. Web GIS API development eg HTML, javascript GIS web development 2. Consuming data via APIs in the web environment 3. Sharing and managing data with GIS SaaS / PaaS / Server solutions 4. GIS Application server configuration and administration eg ArcGIS Server, GeoServer 5. Principles of web GIS architecture				
C	3 at K	2 at K, 1 at E	**Field GIS Software** 1. Field GIS data collection software options eg Esri collector, Survey 123, bespoke company tools for inspections 2. Field GIS data collection set up and configuration. 3. Using Field GIS tools				

GIS05: GIS Software and Platforms

Name of Supervisor	Name of Applicant
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GIS06		Competency	**Consultancy and Advocacy**				
				Date of assessment			
	Optimum Standard						
ITEM	**TECHNICAL MEMBER**	**MEMBER**	**Activity Details**	**A**	**K**	**E**	**B**
A	E	B	**User requirements** 1. Collecting and understanding requirements for GIS data collection, analysis, visualisation, and development eg understanding map requirements, field software requirements, web app requirements				
B	K	B	**Evaluating and consulting** 1. Translating user/customer requirements into technical and commercial specifications eg developing a benefits case, developing a proposal				
	E	B	2. Advising users/customers on best practice related to specific issues				
	K	B	3. Innovation and thought leadership eg The implementation of a new process and system within GIS				
C	E	B	**Advocacy** 1. Knowledge sharing, mentoring, and coaching in GIS best practice				
D	K	E	**Sustainability** 1. Principles of sustainable GIS practices in civil engineering eg socially, economically, and environmentally sustainable				

GIS06: Consultancy and Advocacy

Name of Supervisor	Name of Applicant
Supervisor's signature	Date