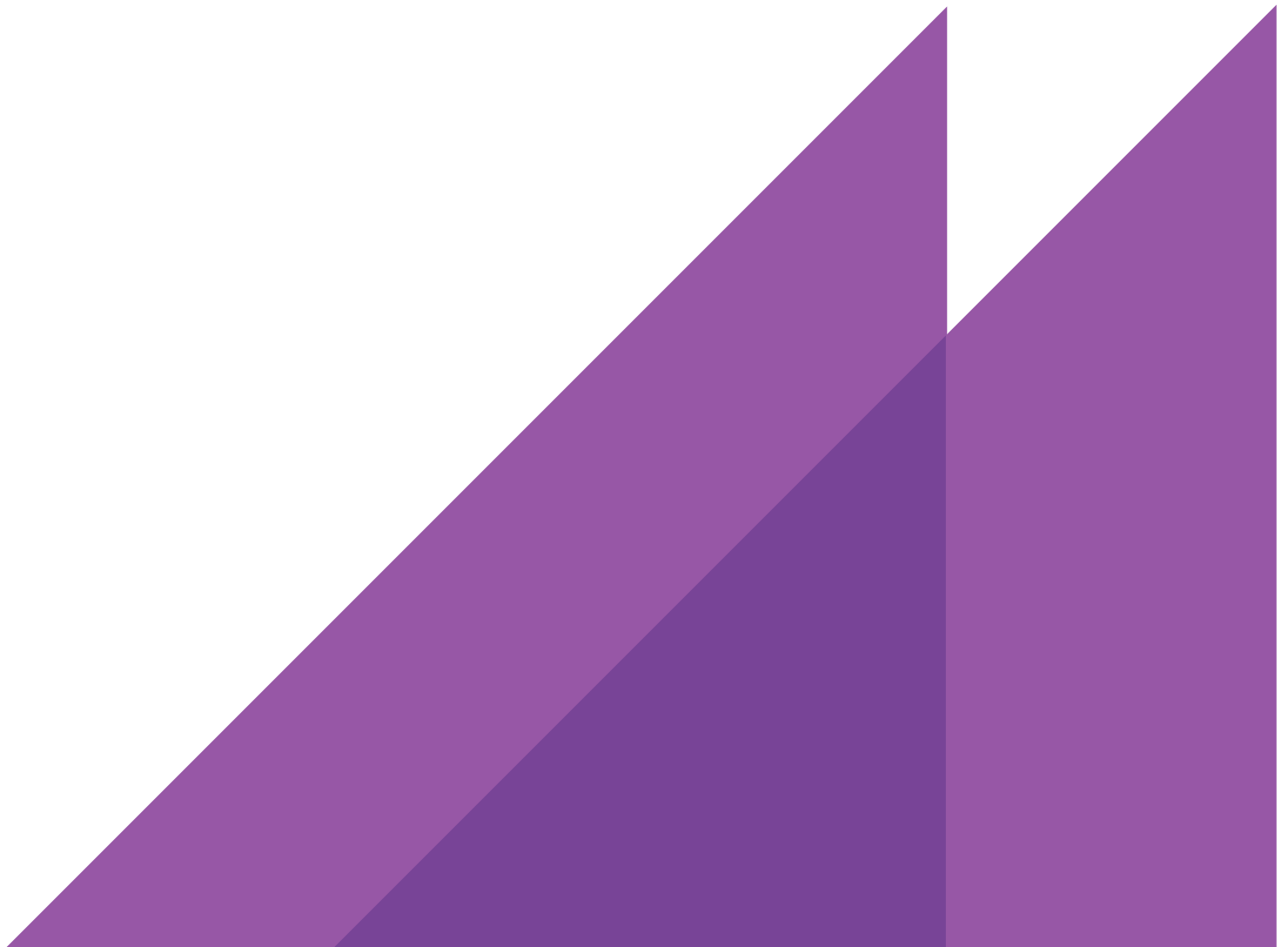


REPORT TO
DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
19 DECEMBER 2019

GEOLOGICAL SURVEY NSW REVIEW



FINAL REPORT



ACIL ALLEN CONSULTING PTY LTD
ABN 68 102 652 148

LEVEL NINE
60 COLLINS STREET
MELBOURNE VIC 3000
AUSTRALIA
T+61 3 8650 6000
F+61 3 9654 6363

LEVEL NINE
50 PITT STREET
SYDNEY NSW 2000
AUSTRALIA
T+61 2 8272 5100
F+61 2 9247 2455

LEVEL FIFTEEN
127 CREEK STREET
BRISBANE QLD 4000
AUSTRALIA
T+61 7 3009 8700
F+61 7 3009 8799

LEVEL SIX
54 MARCUS CLARKE STREET
CANBERRA ACT 2601
AUSTRALIA
T+61 2 6103 8200
F+61 2 6103 8233

LEVEL TWELVE, BGC CENTRE
28 THE ESPLANADE
PERTH WA 6000
AUSTRALIA
T+61 8 9449 9600
F+61 8 9322 3955

167 FLINDERS STREET
ADELAIDE SA 5000
AUSTRALIA
T +61 8 8122 4965
ACILALLEN.COM.AU

SUGGESTED CITATION FOR THIS REPORT

ACIL ALLEN CONSULTING (2019). GEOLOGICAL SURVEY NSW REVIEW FOR THE DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT. SYDNEY: ACIL ALLEN CONSULTING.

RELIANCE AND DISCLAIMER THE PROFESSIONAL ANALYSIS AND ADVICE IN THIS REPORT HAS BEEN PREPARED BY ACIL ALLEN CONSULTING FOR THE EXCLUSIVE USE OF THE PARTY OR PARTIES TO WHOM IT IS ADDRESSED (THE ADDRESSEE) AND FOR THE PURPOSES SPECIFIED IN IT. THIS REPORT IS SUPPLIED IN GOOD FAITH AND REFLECTS THE KNOWLEDGE, EXPERTISE AND EXPERIENCE OF THE CONSULTANTS INVOLVED.

IN CONDUCTING THE ANALYSIS IN THIS REPORT ACIL ALLEN CONSULTING HAS ENDEAVOURED TO USE WHAT IT CONSIDERS IS THE BEST INFORMATION AVAILABLE AT THE DATE OF PUBLICATION, INCLUDING INFORMATION SUPPLIED BY THE ADDRESSEE. ACIL ALLEN CONSULTING HAS RELIED UPON THE INFORMATION PROVIDED BY THE ADDRESSEE AND HAS NOT SOUGHT TO VERIFY THE ACCURACY OF THE INFORMATION SUPPLIED.

C O N T E N T S

GLOSSARY OF TERMS	I
EXECUTIVE SUMMARY	II
RECOMMENDATIONS	IX
1	
INTRODUCTION	1
1.1 This Review	1
1.2 Review methodology	1
1.3 Data limitations	2
1.4 Public Value Framework	3
2	
CONTEXT AND THE RATIONALE FOR A PUBLIC GEOLOGICAL SURVEY	5
2.1 Context	5
2.2 Responsibility for NSW mineral and petroleum resources	5
2.3 The role of public geological surveys in correcting market failure	6
2.4 Benefits of public geological information	7
3	
GSNSW'S ROLES	11
3.1 GSNSW's current roles	11
3.2 Appropriateness of GSNSW's current roles	11
3.3 Appropriateness of GSNSW's activities	21
3.4 Summary of the appropriate roles for GSNSW	23
4	
GSNSW'S PRODUCTS AND SERVICES	25
4.1 Appropriateness of GSNSW's products and services	25
4.2 Product and service usage	26
4.3 Outcome achievement	27
4.4 Trust and legitimacy	32
4.5 Service delivery quality	34
4.6 Efficiency	40
4.7 Summary of public value delivered by GSNSW's products and services	45
5	
FINDINGS AND RECOMMENDATIONS	46
5.1 Appropriate roles of GSNSW	46
5.2 An overarching strategy	47
5.3 Current and future GSNSW products, services and investments	47
5.4 The most appropriate organisational structure to deliver GSNSW in the future	50
5.5 Information collection activities to address data gaps	51

C O N T E N T S

A

REFERENCES

A-1

B

STAKEHOLDER CONSULTATION

B-1

B.1 Stakeholder interview schedule

B-1

B.2 Survey distribution and analysis

B-2

B.3 Additional survey analysis

B-3

C

GSNSW'S ROLES, ACTIVITIES AND PRODUCTS AND SERVICES: CONSULTATION TOOLS

C-1

C.1 Roles performed by industry, research and government geological surveys

C-1

C.2 Benchmarking with comparator geological surveys

C-2

D

OVERVIEW OF GSNSW AND COMPARATORS

D-1

D.1 The structure of GSNSW

D-1

D.2 Comparison of GSNSW with other geological surveys

D-3

E

GSNSW'S COLLABORATIONS

E-1

F

NSW AND NATIONAL PRIORITIES

F-1

G

GSNSW RESPONSIBILITIES UNDER NSW RESOURCES LEGISLATION

G-1

H

GSNSW ROLES AND RESPONSIBILITIES UNDER NSW NON-RESOURCES LEGISLATION

H-1

I

GSNSW'S CURRENT, ACTIVITIES AND PRODUCTS AND SERVICES ALIGNED TO BUSINESS UNITS

I-1

J

DATA GAPS AND OPPORTUNITIES IN RELATION TO GSNSW'S ACTIVITIES, PRODUCTS AND SERVICES

J-1

FIGURES

FIGURE ES 1 RECOMMENDED ORGANISATIONAL MODEL FOR GSNSW

VIII

FIGURE 1.1 PUBLIC VALUE FRAMEWORK

3

FIGURE 2.1 RELATIONSHIP BETWEEN GOVERNMENT AND INDUSTRY IN GEOLOGICAL SCIENCES

10

FIGURE 4.1 FREQUENCY OF PRODUCT AND SERVICE USE BY ALL RESPONDENTS

28

C O N T E N T S

FIGURE 4.2	END USER VIEWS ON BENEFIT DELIVERED BY GSNSW'S PRODUCTS / SERVICES	29
FIGURE 4.3	PRODUCTS OR SERVICES RESPONDENTS ARE MOST SATISFIED WITH	31
FIGURE 4.4	PRODUCTS OR SERVICES RESPONDENTS ARE LEAST SATISFIED WITH	32
FIGURE 4.5	TRUST AND LEGITIMACY OF GSNSW	34
FIGURE 4.6	END USERS VIEWS ON GSNSW'S SERVICE DELIVERY QUALITY	35
FIGURE 4.7	END USERS EXPERIENCE WITH GSNSW COMPARED TO OTHER GEOLOGICAL SURVEYS	36
FIGURE 4.8	HOW END USERS ACCESS GSNSW PRODUCTS OR SERVICES	36
FIGURE 4.9	END USERS VIEWS ON GSNSW RESPONSIVENESS TO REGULATORY, TECHNOLOGY AND ENVIRONMENTAL CHANGES	38
FIGURE 4.10	END USERS VIEWS ON WHETHER GSNSW'S PRODUCTS / SERVICES ARE INNOVATIVE	38
FIGURE 4.11	END USERS' USE OF OTHER SOURCES OF NSW GEOLOGICAL DATA	40
FIGURE 4.12	END USERS' REASONS FOR USING OTHER SOURCES OF NSW GEOLOGICAL DATA	41
FIGURE 4.13	PRODUCTS AND SERVICES DELIVERED BY GSNSW BUSINESS UNITS	42
FIGURE 4.14	STAFF AND FUNDING OF AUSTRALIAN GEOLOGICAL SURVEYS 2017-18	43
FIGURE 5.1	RECOMMENDED ORGANISATIONAL MODEL FOR GSNSW	51
FIGURE B.1	PROPORTION OF RESPONDENTS BY TYPE OF ORGANISATION	B-2
FIGURE B.2	FREQUENCY OF PRODUCT AND SERVICE USE BY INDUSTRY RESPONDENTS	B-3
FIGURE B.3	FREQUENCY OF PRODUCT AND SERVICE USE BY RESEARCH BODY RESPONDENTS	B-4
FIGURE B.4	FREQUENCY OF PRODUCT AND SERVICE USE BY GOVERNMENT RESPONDENTS	B-5
FIGURE B.5	FREQUENCY OF PRODUCT AND SERVICE USE BY REPRESENTATIVES OF GEOLOGICAL SURVEY RESPONDENTS	B-6
FIGURE B.6	FREQUENCY OF PRODUCT AND SERVICE USE BY OTHER RESPONDENTS	B-7
FIGURE B.7	PROPORTION OF RESPONDENTS BY GSNSW'S CURRENT PRODUCTS OR SERVICES THAT THEY BELIEVE WOULD BE BETTER DELIVERED BY INDUSTRY OR THE RESEARCH SECTOR	B-8
FIGURE B.8	END USER VIEWS ON THE TYPES OF BENEFITS DERIVED FROM GSNSW'S PRODUCTS / SERVICES	B-9
FIGURE B.9	END USER VIEWS ON THE ORGANISATIONS THAT COULD DERIVE BENEFITS FROM GSNSW PRODUCTS / SERVICES	B-9
FIGURE B.10	END USERS ACCESS OF DATA FROM OTHER GEOLOGICAL SURVEYS	B-10
FIGURE B.11	END USERS PERSPECTIVES OF GSNSW STAFF	B-11
FIGURE B.12	END USERS VIEW OF THE LEVEL OF IMPACT THAT WOULD BE CAUSED BY THE ABSENCE OF GSNSW	B-11
FIGURE D.1	STRUCTURE OF GSNSW	D-1
FIGURE I.1	ACTIVITIES UNDERTAKEN ACROSS BUSINESS UNITS	I-1

TABLES

TABLE ES 1	GSNSW'S PRODUCTS AND SERVICES	V
TABLE 1.1	TYPE AND NUMBER OF STAKEHOLDER INTERVIEWS	2
TABLE 1.2	TYPE AND NUMBER OF RESPONDENTS TO THE SURVEY OF GSNSW'S END USERS	2
TABLE 3.1	GSNSW'S RESPONSIBILITIES UNDER NSW RESOURCES REGULATION	12
TABLE 3.2	GSNSW'S RESPONSIBILITIES UNDER NSW NON-RESOURCES REGULATION	18
TABLE 3.3	ACTIVITIES OF GSNSW	22
TABLE 4.1	GSNSW'S PRODUCTS AND SERVICES	26
TABLE 4.2	PRIORITISATION OF GSNSW'S PRODUCTS AND SERVICES	45
TABLE 5.1	GSNSW'S ENABLING FUNCTIONS	47
TABLE 5.2	PRIORITISATION OF GSNSW'S PRODUCTS AND SERVICES	48
TABLE B.1	TYPE AND NUMBER OF STAKEHOLDER INTERVIEWS	B-1

C O N T E N T S

TABLE C.1	STRENGTHENS AND WEAKNESSES OF SECTORS PERFORMING GSNSW'S CURRENT ROLES	C-1
TABLE C.2	CURRENT ACTIVITIES OF GSNSW ALIGNED WITH COMPARATOR GEOLOGICAL SURVEYS	C-3
TABLE C.3	CURRENT PRODUCTS AND SERVICES OF GSNSW ALIGNED WITH COMPARATOR GEOLOGICAL SURVEYS	C-3
TABLE E.1	GSNSW COLLABORATIVE PROJECTS AND PROGRAMS	E-1
TABLE F.1	NSW AND NATIONAL PRIORITIES	F-1
TABLE G.1	GSNSW'S ROLES AND RESPONSIBILITIES UNDER NSW RESOURCES LEGISLATION	G-1
TABLE H.1	GSNSW'S RESPONSIBILITIES UNDER OTHER NSW LEGISLATION	H-1
TABLE I.1	PRODUCT AND SERVICE DELIVERY ACROSS GSNSW BUSINESS UNITS	I-2
TABLE J.1	DATA COLLECTION REQUIRED TO ADDRESS EXISTING DATA GAPS	J-1

BOXES

BOX 3.1	GSNSW'S CURRENT ROLES	11
----------------	-----------------------	----



GLOSSARY OF TERMS

ACIL Allen	ACIL Allen Consulting
Committee	House of Representatives Standing Committee
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Department	NSW Department of Planning, Industry and Environment
DRG	Division of Resources and Geoscience
GA	Geoscience Australia
GAS	Geoscience Acquisition and Synthesis
GDW	Geoscientific Data Warehouse
GI	Geoscience Information
GIS	Geographic Information System
GSNSW	Geological Survey of New South Wales
GSSA	Geological Survey of South Australia
GSV	Geological Survey of Victoria
GSWA	Geological Survey of Western Australia
LUTA	Land Use and Titles Advice
MinEx CRC	MinEx Cooperative Research Centre
PACE	Plan for Accelerating Exploration (South Australia)
SRAA	Strategic Resource Assessment and Advice



EXECUTIVE SUMMARY

ACIL Allen Consulting (ACIL Allen) was engaged to review the roles, functions, products and services of the Geological Survey of NSW (GSNSW) to assess whether they are delivering the best public value.

The Review addressed the following questions:

1. What role does GSNSW currently play and what public value do its products and services deliver?
2. Informed by a high-level comparison with other state geological surveys, a desktop literature review, which includes NSW legislation and policy, and feedback from government, industry, and other stakeholders, what *should* GSNSW's role be and what products and services *should* be delivered in order to maximise public value?
3. What can be done to address the gaps between GSNSW's current and optimal state?

GSNSW roles, functions and activities

Mineral and petroleum resources are owned by the Crown. NSW Government legislation provides for effective management of NSW's mineral and petroleum resource endowment, on behalf of and for the benefit of the people of NSW. GSNSW supports Government decision-making on the appropriate management of the State's resources.

GSNSW generates, curates, interprets and reports geological information that contributes significant economic and social value to NSW, primarily through industry employment and profits and increased government revenues in the form of resources royalties.

Public geological data is a valuable economic and social resource that is essential to the competitive position of the State's mining industry. Public geological surveys address market failure by acquiring and providing 'public good' pre-competitive geoscientific data that would not typically be delivered by the private market due to high risk and / or cost.

GSNSW has responsibilities including and extending beyond the *Mining Act 1992* and the *Petroleum (Onshore) Act 1991* to land use as well as advisory roles under other NSW legislation. GSNSW collaborates with stakeholders to objectively deliver on state and national priorities for resources, the environment, land use planning, water and the community. Evidence collected during this Review indicate that GSNSW provides trusted and expert advice to help Government meet a broad range of legislative and regulatory responsibilities relating to land use planning, environmental conservation and minerals.

GSNSW delivers economic and environmental benefits by:

- supporting private investment and effective management of the State's resources through:
 - de-risking exploration activities
 - promoting faster discovery of new resource deposits

- facilitating access to objective geoscientific data.
- supporting the Government to make informed decisions for appropriate and sustainable management of mineral and petroleum resources in the public interest, while retaining valuable options to adjust future mineral and petroleum resources policies and plans
- supporting the Government to make informed decisions in relation to land use planning and other land management issues, including water resources and land conservation.

This Review has found that broadly, GSNSW's roles and activities are appropriate, important for encouraging investment in mineral exploration, and deliver public value. Most of these activities are essential to the effective functioning of the survey.

At a high level, GSNSW's products and services are comparable to three comparator geological surveys (the Geological Surveys of South Australia, Victoria and Western Australia). However, the high number of GSNSW current roles (8) is a barrier to strategic planning and there is some duplication between roles, activities and products and services. For example, in the corporate documentation assessed for the Review, resource assessment is variously described as a role, activity and a service. There is scope for the current configuration of GSNSW's roles to be improved to deliver better public value.

A key outcome of the Review is the need for GSNSW's current roles to be streamlined into the following three core roles:

1. **Providing expert advice and information to government to support the sustainable management of NSW mineral and petroleum resources.** This helps government to effectively manage its responsibilities and obligations under the NSW Mining and Petroleum legislation. GSNSW should be the expert source of up-to-date geoscience knowledge. This role helps government meet its legal obligations as well as make informed and strategic policy decisions about the State's resources.
2. **Collecting and making available data to de-risk and attract exploration investment into NSW.** This recognises the Geological Survey's critical role in providing information (that attracts and facilitates investment in resource development) which would not otherwise be provided by the private market due to the risks (and costs) associated with exploration. This role delivers economic benefits to NSW because it addresses a key market failure associated with exploration of the State's resources.
3. **Providing advice and information to government to support non resource-related decision-making.** This reflects GSNSW's advisory and assessment responsibilities under land use planning, environmental and natural resources legislation. It also reflects GSNSW's advice to inform decision-making on regional development and other NSW priorities. GSNSW provides expert knowledge to inform whole-of-government consideration. This role delivers economic, environmental and social benefits to NSW.

Stakeholders consulted for this Review consider GSNSW to be a trusted, high quality and expert advisor that supports the NSW Government to meet a range of legislative and regulatory responsibilities relating to resources. GSNSW's core roles are consistent with GSNSW and Departmental responsibilities under legislation, and help to achieve NSW's strategic priorities for resources development and management. In general, these roles are also performed by the three comparator geological surveys.

Stakeholders consulted have different views on the extent to which a public geological survey such as GSNSW should be undertaking research and education and community outreach. The comparator geological surveys see education and outreach as important but not core business.

These core roles are important in helping the government to fulfill its responsibilities under legislation and in delivering public value to industry. They should drive GSNSW's multi-year strategic planning activities, as well as the annual operating budgets / plans for GSNSW. The roles should be used to allocate resources to the activities (in the form of products and services). The roles can also be used to shape the interactions and discussions GSNSW has with government and external stakeholders. The recognition of the core roles provides a strategic and operational framework that ensures GSNSW is both disciplined and focused in the future.

GSNSW's core roles should be underpinned by four enabling functions. These enabling functions are important in supporting the collection and provision of pre-competitive data and advice that are critical to the effective functioning of each core role. They are:

- **Enabling function 1.** *Provides custodianship of NSW's geoscientific data and reference collections (drillcores, economic rocks and minerals and paleontological specimens).* Custodianship is essential for developing and delivering knowledge and advice. This is intimately linked with GSNSW's core roles of collecting and making available geoscientific data and providing advice.
- **Enabling function 2.** *Supports government to manage the appropriate use of NSW's geological resources by undertaking geological assessment of resource industry activity.* This supports government to manage the efficient use of resources. Conducting and advising government on mining exploration assessment is a responsibility under legislation.
- **Enabling function 3.** *Supports promotion of resource prospectivity and exploration investment in NSW.* GSNSW supports the NSW Department of Planning, Industry and Environment to perform this role, and performs general awareness raising efforts.
- **Enabling function 4.** *Supports community engagement with and education in geological sciences.* GSNSW is considered an objective and trusted expert and should play a role in this area, particularly community outreach and education of school children.

Some stakeholders consulted for the Review do not believe GSNSW has a clear purpose or set of objectives, or a clear approach for working with organisations conducting geoscience work (such as Geoscience Australia, universities, and other state and territory geological surveys).

Some industry stakeholders consulted have suggested that GSNSW data interpretation activities may not be needed or useful. This may be the case for larger industry operators, who have the resources to carry out these activities in-house. However, smaller industry operators do not tend to have this capacity or expertise and appreciate the value-add activities conducted by GSNSW.

To provide strategic direction for GSNSW, this Review recommends that an overarching strategy should be developed that outlines its roles, priorities and objectives into the future, and articulates their relationship with their primary stakeholders: industry, government, the research sector and the public. This should be co-developed with stakeholders and communicated effectively to improve the line of sight between GSNSW's funding and outcomes, and to support more meaningful and effective collaboration with industry. The strategy should include discussion on the extent of GSNSW's value-adding and the scope of pre-competitive data acquisition. Closely collaborating with stakeholders to prioritise GSNSW activities may help mitigate the risk of GSNSW delivering products and services that are not valued.

GSNSW's products and services

As noted above, GSNSW provides products and services that at a high level are comparable with those of the comparator geological surveys. This Review has undertaken a high-level assessment of GSNSW's products and services and concluded that they are valued by stakeholders and are unlikely to be provided by the private or research sectors if not provided by GSNSW.

Many stakeholders consulted see GSNSW products and services as high-quality and objective. Overall, GSNSW's products and services are considered to be delivering economic, commercial, social and environmental outcomes.

GSNSW has built a reputation of impartial expertise and its products and services are trusted by the stakeholders consulted for this Review. Stakeholders see GSNSW staff as experts in their field, collaborative, friendly and responsive to requests for assistance. The different stakeholder groups have each identified products and services of particular value:

- Industry stakeholders use and value online services, GIS web services and The Seamless Geology of NSW. However, this observation is based on a small sample of survey respondents and stakeholders who were consulted for this Review.
- Government stakeholders identify The Seamless Geology of NSW, DIGS and Common Ground, as well as assessment of exploration reporting and work programs, and geoscientific advice that informs

government decision-making on resource allocation and assessment, regional development, land use planning, and conservation.

- Research organisations identify online services, geophysical images and data and standard geological map sheets as being of value.
- Representatives of other geological surveys value The Seamless Geology of NSW, mineral exploration highlights maps, mineral potential mapping and online services.

This Review has concluded that GSNSW should continue to deliver the majority of its current products and services in order to maximise public value and fulfil its roles. This does not preclude GSNSW from carrying out a prioritisation process to identify higher and lower priority products and services.

Table ES 1 identifies higher and lower priority products and services (see Chapter 5 for prioritisation).

TABLE ES 1 GSNSW'S PRODUCTS AND SERVICES

Type of product or service	Product or service	Priority
Assessment and advice	Geoscientific advice to other agencies, Assessment of exploration reporting and work programs	Higher
Maps	Metallogenic maps, Standard geological map sheets, Special purpose maps - general public, Special purpose maps - technical audience, Mineral potential mapping, Mineral exploration highlights map, Mobile phone maps	Higher
	3D geological mapping data	Medium
Data services	Geophysical images and data, GIS web services, Geoscience data resources, Company exploration reports, The Seamless Geology of NSW, Online services, Drillcore scanning services	Higher
Education and outreach	Geotourism maps / brochures, Books and brochures, Field excursion guides, Factsheets - commodity fliers, NSW Geotours app	Lower
Collections, publications and libraries	Explanatory notes, Presentations, Peer reviewed scientific publications, Scientific abstracts, Reference collections, Mineral resources library	Medium
	Government Geotechnical Report Database, Drillcore libraries	Higher

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW

GSNSW should discontinue, reduce or amend lower priority products and services (based on stakeholder feedback, benchmarking and a review of documentation). They include:

- NSW Geotours app, Geo-tourism maps / brochures and Field excursion guides.
- 3D models, which are less valuable to industry, who are primarily concerned with obtaining raw data. This could be supported by GSNSW carrying out additional consultation with large/small industry representatives to confirm which products are useful.
- Printed maps, which are expensive and resource intensive to produce and are 'out of date' once printed.

While Online services, including the GSNSW website, are highly valued by end users, stakeholders believe that the website is outdated and in need of redesign. The review and improvement of the Division of Resources and Geoscience website is an action in the 2019 NSW Minerals Strategy.

Moving toward digital delivery of all information would require increased short-term investment in information technology infrastructure and development, for longer-term cost savings. The Review considers that there is scope for GSNSW to be more strategic in its approach to data acquisition or delivery.

Some stakeholders consulted, particularly those from industry, suggested GSNSW is not as transparent as it could be, particularly around articulating its purpose and objectives, and allocating and spending fees collected from industry. Trust could be improved if industry feels its voice is being

heard, if it is engaged more collaboratively, if its feedback is reflected in GSNSW's work plans and if GSNSW's priorities and objectives are articulated more clearly.

A formal consultative process with a broad range of potential users should be developed to identify user needs and evaluate how well GSNSW products / services are achieving their intended outcomes. The public value delivered by GSNSW's products and services and their usefulness could be improved by:

- better aligning the products and services with end users' needs
- collaborating to leverage the capacities and capabilities of industry / research
- setting strategic data and research priorities.

Efficiency

ACIL Allen has not been able to provide a definitive view about GSNSW's efficiency due to a lack of data on the allocation of resources, particularly staff time, to individual activities, products and services. However, ACIL Allen has some observations about GSNSW's efficiency.

This Review has found no evidence of duplication between GSNSW and other parties, as the parties have different areas of focus. For example, most end users who were surveyed / consulted (and who also typically access materials provided by other jurisdictions) do not believe GSNSW duplicates information from other sources.

Data limitations prevented a detailed assessment of the distribution of effort within GSNSW. GSNSW and its South Australian (GSSA) and Victorian (GSV) counterparts all have separate geoscientific information management and advisory business units, so the existing separation of Geoscience Information (GI) and Geoscience Acquisition and Synthesis (GAS) is consistent with practice elsewhere. There are opportunities to streamline some of GSNSW's activities, products and services, where business units are currently jointly delivering some products and services.

Comparing the four jurisdictions, the Geological Survey of Western Australia (GSWA) is the largest by funding and staffing, while GSNSW is the third largest by funding and second largest by staffing. Comparing funding to workforce size, GSV has the largest budget per staff member, followed by GSWA, GSNSW, and then GSSA.

Future prioritisation and streamlining

GSNSW's efforts should be guided by a process of prioritising its products and services. Such a process would allow for effective planning and internal resourcing over the coming financial years to meet the challenges posed by the resource constraints of government. Medium term efforts (6-12 months) should focus on planning to provide business units with clarity to effectively use available resources. This prioritisation should inform the annual operating activities of GSNSW.

The data gaps in this Review have prevented ACIL Allen from undertaking a detailed and systematic prioritisation of all products and services. Recommendations for removing or amending lower value products and services are provided. Prioritisation of the other products and services could focus GSNSW's efforts, improve alignment of products and services with stakeholder needs and create efficiencies.

Prioritisation of GSNSW's current products and services should be guided by multi-criteria analysis (MCA) to assist GSNSW to work within the budget allocated by the Division of Resources and Geoscience (DRG). Over time, the outcomes from the GSNSW's MCA process should be used to inform the budget decision-making of DRG more broadly. Assessment against the criteria should be largely qualitative and based on informed judgement.

It is recommended that GSNSW's future strategic investments are guided by investment principles. They are likely to be part of GSNSW's overarching strategy as well as its operational decision-making activities.

The recommended principles for determining future investments are as follows:

- **Principle 1:** *investment should support delivery of at least one of the three core roles.*
- **Principle 2:** *investment should seek to address stakeholders' needs, as identified through a stakeholder engagement process.* The stakeholders and their needs include, but are not limited to, industry stakeholders (focused on pre-competitive data to de-risk investment), government stakeholders (focused on expert knowledge and advice required to meet GSNSW's responsibilities under legislation), the research sector (focused on data, innovation and new technologies) and the general public (focused on understanding geological sciences, how resources are used and generation of public benefits).
- **Principle 3:** *investment should align with the policies and strategies set by government.* This includes a focus on the NSW Minerals Strategy (growing mining and mineral exploration in the State) and relevant water and regional plans.
- **Principle 4:** *investment should be collaborative, where appropriate, to leverage additional resources, create efficiencies and reduce duplication.* GSNSW should collaborate with stakeholders where appropriate to improve GSNSW's effectiveness and efficiency. These stakeholders should include the research sector.
- **Principle 5:** *GSNSW should only provide products or services to industry when industry is not able to or is unwilling to provide them, but where the products or services will deliver significant benefit to the citizens of NSW.* Public benefit may include, for example, environmental (understanding the location and characteristics of ground and surface water resources), social (improving public awareness of and engagement in geological sciences) and economic benefit (understanding the location and characteristics of mineral and extractive resources and de-risking exploration and investment).

Streamlining GSNSW business units

To maximise efficiency, it is recommended that GSNSW be restructured to reflect its core roles. These relate to geoscience data and follow the logical sequence: acquire data, manage data and use data. This implies an efficient organisation of activities into three groups:

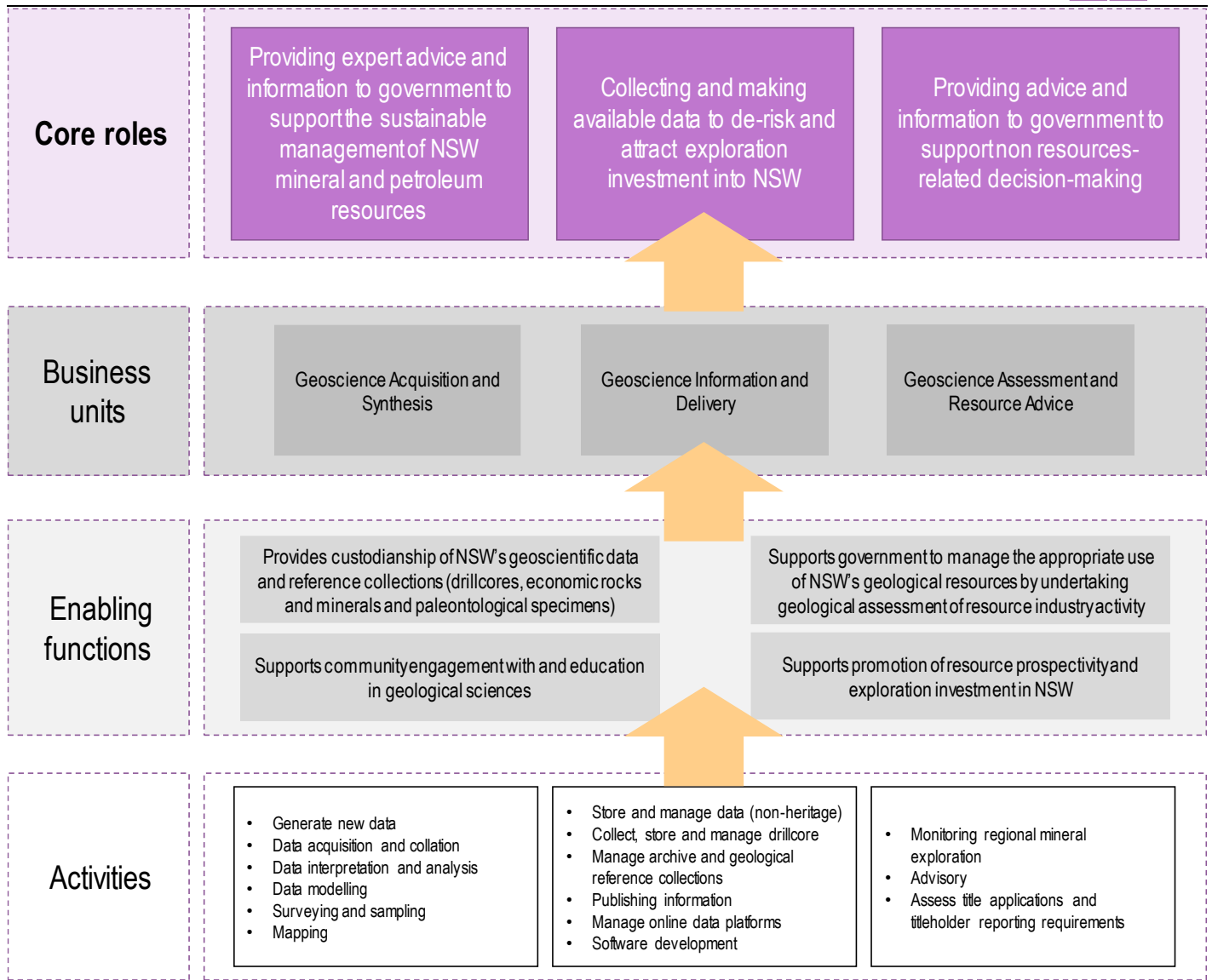
- acquiring geoscience data
- managing and organising geoscience data
- leveraging geoscience data to provide expert advice to government, industry participants, including inbound investors, and public stakeholders.

GSNSW could be efficiently organised into three units reflecting these three core functions:

1. Geoscience Acquisition and Synthesis (GAS) (corresponding to current GAS)
2. Geoscience Information and Delivery (GID) (corresponding to current GI)
3. Geoscience Assessment and Resource Advice (GARA) (corresponding to current LUTA and SSRA).

It is proposed that these business units lead the activities detailed in Figure ES 1.

FIGURE ES 1 RECOMMENDED ORGANISATIONAL MODEL FOR GSNSW



SOURCE: ACIL ALLEN CONSULTING 2019



RECOMMENDATIONS

Recommendation 1: To provide greater clarity and reduce duplication, streamline GSNSW's current roles into three core roles and four enabling functions.

The core roles and enabling functions should be as follows:

Core roles

- i. Providing expert advice and information to government to support the sustainable management of NSW mineral and petroleum resources.
- ii. Collecting and making available data to de-risk and attract exploration investment into NSW.
- iii. Providing advice and information to government to support non resource-related decision-making.

Enabling functions

- i. Provides custodianship of NSW's geoscientific data and reference collections (drillcores, economic rocks and minerals and paleontological specimens).
- ii. Supports government to manage the appropriate use of NSW's geological resources by undertaking geological assessment of resource industry activity.
- iii. Supports promotion of resource prospectivity and exploration investment in NSW.
- iv. Supports community engagement with and education in geological sciences.

Recommendation 2: To provide strategic direction for GSNSW, an overarching strategy should be developed that outlines its roles, priorities and objectives and articulates GSNSW's relationship with its primary stakeholders: industry, government, the research sector and the public. This should be co-developed with stakeholders and communicated effectively to improve the line of sight between GSNSW's funding and outcomes, and to support more meaningful and effective collaboration with industry.

Recommendation 3: Immediately revise GSNSW's current products and services to discontinue or amend lower priority products and services and move towards the digital delivery of all information.

Products and services which should be discontinued, reduced or amended are:

- i. NSW Geotours app, Geo-tourism maps / brochures and Field excursion guides.
- ii. 3D models, which are less valuable to industry, who are primarily concerned with obtaining raw data.
- iii. Printed maps, which are expensive and resource intensive to produce and are 'out of date' once printed.

Recommendation 4: In the medium-term, prioritise current GSNSW products and services using a multi-criteria analysis approach.

Criteria should include:

- i. alignment with core roles, enabling functions and strategic priorities.
- ii. end user satisfaction.
- iii. benefit or return on investment.

Recommendation 5: In the longer-term, apply principles to support strategic investments in the future, including ongoing data acquisition, management and delivery.

Public investment should be made where it:

- i. Principle 1: supports delivery of at least one of the three core roles.
- ii. Principle 2: seeks to address stakeholders' needs, as identified through a stakeholder engagement process.
- iii. Principle 3: aligns with the policies and strategies set by government, including the NSW Minerals Strategy and relevant water and regional plans.
- iv. Principle 4: is collaborative, where appropriate, to leverage additional resources, create efficiencies and reduce duplication.
- v. Principle 5: provides products or services to industry when industry is unable or unwilling to provide them and it is possible to demonstrate that the products or services will deliver significant benefit to the citizens of NSW, that is, the investment will address a market failure.

Recommendation 6: Revise GSNSW's four business unit structure into a more streamlined three business unit structure that focuses on supporting its three core roles, i.e. acquiring geoscience data, managing and organising geoscience data, and providing expert advisory services.

Recommendation 7: Address information gaps to allow for more detailed future potential analysis of GSNSW's public value.

This should comprise:

- i. developing a process for surveying a broader range of end users of GSNSW's products and services to understand the value of the products and services and inform the design of new products and services
- ii. interviewing GSNSW staff and relevant senior staff to understand how GSNSW contributes to relevant state and national agendas
- iii. conducting detailed business process mapping to understand the impact of GSNSW's efforts by collecting information on:
 - a. labour and capital costs of GSNSW products, services and activities
 - b. the role of each business unit in delivering products and services
 - c. personnel funding and budgeted personnel expenditure disaggregated by business unit function.



1.1 This Review

ACIL Allen Consulting (ACIL Allen) was engaged to review the roles, functions, products and services of the Geological Survey of NSW (GSNSW) to assess whether they are delivering the best public value. The Review was asked to address the following questions:

1. What role does GSNSW currently play and what public value do its products and services deliver?
2. Informed by a high-level comparison with other state geological surveys, a desktop literature review, which includes NSW legislation and policy, and feedback from government, industry and other stakeholders, what *should* GSNSW's role be and what products and services *should* be delivered in order to maximise public value?
3. What can be done to address the gaps between GSNSW's current and optimal state?

1.2 Review methodology

The Review methodology involved a high-level assessment of the appropriate roles for a geological survey, including roles and activities of GSNSW, identifying the current users of products and services and the public value delivered by GSNSW as a whole, and the products and services at a high-level, using the Public Value Framework as an analytical tool. The method involved:

- **Document review.** The purpose of the document review was to provide information on the roles, products and services of GSNSW and three selected comparators (the Geological Surveys of South Australia, Victoria and Western Australia). Information was collected through:
 - desktop review of relevant regional, state and national plans, strategies and reports
 - review of legislation
 - analysis of GSNSW financials.

The analysis of GSNSW's activities used general, high-level categories to describe the tasks GSNSW conducts and did not identify the explicit purpose of the activities nor their relative importance. Rather, the analysis asked which activities the comparator geological surveys conduct, and how these activities contribute to GSNSW fulfilling its roles.

- **Analysis using the Public Value Framework.** This included:
 - high-level assessment of the activities performed by GSNSW, according to business unit
 - assessment of products and services against the Public Value Framework
 - comparison of GSNSW's roles to comparator geological surveys
 - high-level assessment of efficiency.
- **Stakeholder interviews.** This included:

- stakeholder interviews with GSNSW Executive and staff, representatives from NSW government agencies, industry peak bodies and industry organisations, research bodies (i.e. universities, CSIRO and the MinEx Cooperative Research Centre, MinEx CRC), other Geological Surveys and Geoscience Australia. Community representatives were not interviewed but were identified as end users by other stakeholders.
- high-level benchmarking with comparator geological surveys: Geological Survey Victoria (GSV), Geological Survey South Australia (GSSA) and Geological Survey Western Australia (GSWA)
- survey of end users of GSNSW's products and services designed to address the elements of the Public Value Framework.

Stakeholder interviews (see Table 1.1 and Appendix B for the full list of stakeholder interviews).

TABLE 1.1 TYPE AND NUMBER OF STAKEHOLDER INTERVIEWS

Stakeholder	Number
Government	5 interviews
GSNSW staff	17 staff across two workshops
Industry	6 interviews
Research	4 interviews
Geological surveys	4 interviews

SOURCE: ACIL ALLEN CONSULTING 2019

Survey of GSNSW's end users (see Appendix B for the list of invited respondents and the survey methodology). The type and number of respondents to the survey of GSNSW's end users is provided in Table 1.2. The low number of survey respondents in certain stakeholder categories indicates the potential for sampling error. This should be considered throughout the Report.

TABLE 1.2 TYPE AND NUMBER OF RESPONDENTS TO THE SURVEY OF GSNSW'S END USERS

Stakeholder	Number of responses
Government (state / local)	2
Representatives of a Geological Survey	3
Industry	21
Research body	4
Other	2
Total	32

SOURCE: ACIL ALLEN CONSULTING 2019

1.3 Data limitations

In conducting the Review, gaps were identified where insufficient information was available to inform the analysis. The data limitations include:

- Interviewed stakeholders were asked to reflect on their experiences with, and the public value of, the products and services. Some stakeholders interviewed (largely senior, high-level NSW government agency representatives or industry representatives) lacked exposure to the individual GSNSW products and services. Stakeholders tended to reflect on the public value delivered by GSNSW as a whole and, in some cases, were able to provide comments on specific products and services. Information on the public value of products and services was also obtained from the survey of GSNSW's end users.
- The survey and stakeholder interviews targeted known users and stakeholders of GSNSW's products and services, and did not include consultations with community, environmental or landholder groups. Potential end users were not surveyed. Their possible use of GSNSW's products and services, and their perspectives of GSNSW are not known.

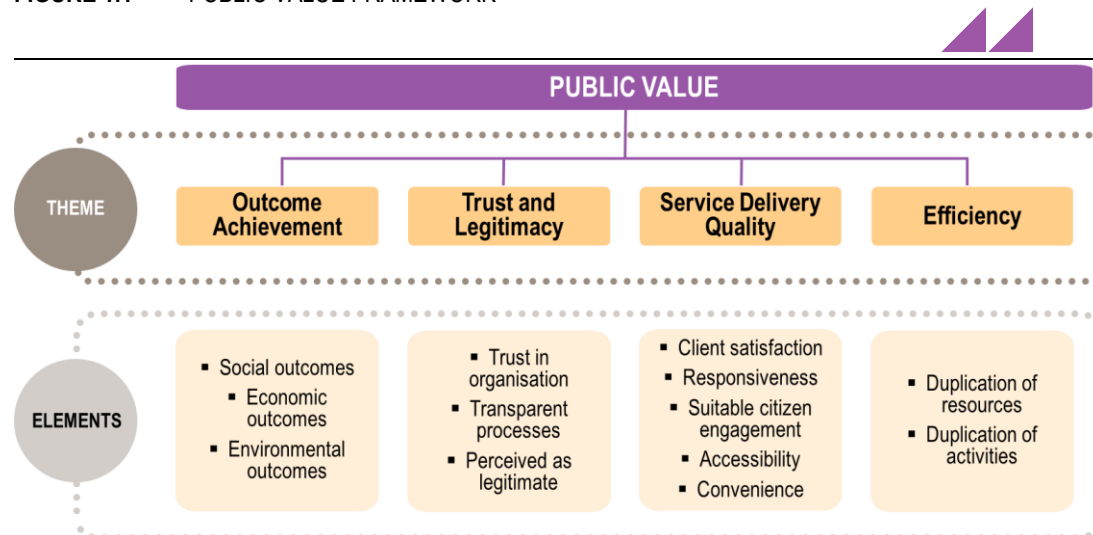
- Due to the short timeframe for this project, the release of the stakeholder survey occurred prior to the finalisation of the list of GSNSW's products and services. A small number of products and services were added to the list during the GSNSW staff workshop on 15 August 2019, and during follow up discussions with GSNSW staff on 20 August. These products and services do not have associated survey data: Conceptual Project Development Plans advice, planning advice, regional developments advice, workforce development activities.
- The number of end users who submitted a response to the survey was low, particularly in some stakeholder categories. There is potential for sampling error when the survey data is disaggregated. This should be considered throughout the Report.
- GSNSW provided financial information (total budget, staff expenses, operating expenses and number of staff) by business unit. This information is not available in a disaggregated form. It has therefore not been possible to analyse costing information of individual activities or products and services.
- Data available does not indicate the level of effort required to deliver a product or service, or to undertake an activity. Therefore, data analysis was unable to determine accurate distribution of effort between GSNSW business units, nor meaningfully compare efficiency measures between the business units.
- Furthermore, data used in the analysis of business unit roles (production versus provides information) is incomplete. This limited the identification of potential streamlining opportunities.

1.4 Public Value Framework

To determine the public value delivered by GSNSW, ACIL Allen leveraged key themes from Mark Moore's (Kennedy School, Harvard University) seminal work in the 1990s on public value, as well as more recent interpretations found in the Australian policy literature.¹

The most commonly referenced themes in this literature are outcome achievement, trust and legitimacy, service delivery quality and efficiency. These are illustrated in Figure 1.1 and described below.

FIGURE 1.1 PUBLIC VALUE FRAMEWORK



SOURCE: ACIL ALLEN CONSULTING 2019, FAULKNER, N. & KAUFMAN, S. (2017).

1.4.1 Outcome achievement

This refers to the extent to which a public organisation has improved publicly valued outcomes. The elements of outcome achievement are social, economic and environmental outcomes.

¹ Faulkner, N. & Kaufman, S. (2017). Avoiding Theoretical Stagnation: A Systematic Review and Framework for Measuring Public Value. *Australian Journal of Public Administration*, 77(1).

1.4.2 Trust and legitimacy

This refers to the extent to which an organisation and its activities are trusted and perceived to be legitimate by the public and by key stakeholders. This theme includes the extent to which the public trusts the organisation, trusts the programs or services delivered by the organisation, and perceives an organisation to be delivering services transparently and fairly.

1.4.3 Service delivery quality

This refers to the extent to which services are experienced as being delivered in a high-quality manner that is considerate of users' needs. It is expected to be maximised when individuals who interact with the service are satisfied, and when they perceive the services to be responsive to their needs, accessible, convenient, and incorporate sufficient citizen engagement.

1.4.4 Efficiency

This refers to the extent to which an organisation is achieving maximal benefits with minimal resources. It is expected to be high when the benefits provided by a public organisation are perceived to outweigh the costs of that organisation.

The elements of efficiency achievement include the avoidance of duplication of products and services across the business, the avoidance of overlap or duplication of activities across business units, and across business units and functions.

1.4.5 Benefits of leveraging the Public Value Framework

The application of a four-theme based Public Value Framework to the Review of GSNSW has several advantages. First, this Public Value Framework is highly complementary with other frameworks which consider the appropriateness, efficiency and effectiveness of a program's activities, outputs, outcomes and impacts. This Public Value Framework has the flexibility to explore themes that are commonly analysed by other evaluation frameworks (such as the efficiency and value for money of a service, product or public agency) and to integrate other evaluation concepts that are important to this Review but not overtly present in a Public Value Framework (such as appropriateness and effectiveness).

Second, it provides a means of exploring the aspects of 'trust' and 'legitimacy' which are critical to the provision of geoscientific information that promotes responsible use of the State's geological resources, and supports informed land use decisions by a range of public and private stakeholders. If the GSNSW is not seen to be a trusted and transparent provider of geoscientific information, the role of the geological survey will be undermined.

Finally, the Public Value Framework, by definition, allows us to focus on the aspects of the GSNSW that really matter to the public. By matter, this means the aspects of the GSNSW that produce outcomes (Public Value Theme 1), which are valued by the stakeholders who rely on them to make informed decisions. GSNSW currently delivers products and services across six key areas (geological mapping, mineral systems studies, geophysical surveys, information and online systems, mineral exploration assessment and land use assessment). The Public Value Framework provides an opportunity to explore the areas which are most valued by stakeholders and whether the products and services delivered are aligned with these values. Where there are gaps between what is valued by stakeholders and what is delivered, the framework provides opportunities to explore how the gaps could be addressed. It also provides ACIL Allen with opportunities to reflect on practice in other jurisdictions to consider whether there are lessons for NSW.



2.1 Context

GSNSW is part of the Division of Resources and Geoscience (DRG) in the NSW Department of Planning, Industry and Environment (Department). The current role of GSNSW is to:

Acquire, synthesise and deliver best available geoscientific information to inform the government, resource industry and the community about the state's geology, and renewable, mineral, coal and petroleum resources.²

GSNSW collects and manages geological, geophysical, geochemical and geospatial data. It provides these data to the mining industry, government and community in the form of products and services. GSNSW is a member of the international resource community. It collaborates across communities, research bodies, industry and government agencies in Australia and internationally to share information, skills and data. *The role of the Division of Resources and Geoscience, as defined at the time of this Review, is to:*

Provide a sustainable natural environment and promote the safe discovery and development of geological resources.³

GSNSW supports the delivery of DRG responsibilities.

2.1.1 GSNSW's business units

GSNSW is currently structured into four business units (see Appendix D for detail):

1. **Geoscience Acquisition and Synthesis:** palaeontology, petrography, regional mapping, geophysics and modelling, mineral systems.
2. **Geoscience Information:** geoscience data management and delivery, GeoSpatial, publications and outreach, systems, core library.
3. **Land Use and Titles Advice:** mining and exploration assessment, land use.
4. **Strategic Resource Assessment and Advice:** minerals, coal, petroleum.

2.2 Responsibility for NSW mineral and petroleum resources

The NSW Government is responsible for the effective management of NSW's mineral and petroleum resource endowment, on behalf of and for the benefit of the people of NSW. As is the case for other

² Department of Planning and Environment (2018). *Division of Resources and Geoscience Business Plan 2018-19*, pp. 91. Sydney: NSW Government.

³ Department of Planning and Environment (2018). *Division of Resources and Geoscience Business Plan 2018-19*, pp. 91. Sydney: NSW Government.

Australian State and Territory governments, the NSW Government administers a system of exploration and mining titles that allows private mining companies to explore for, extract and sell mineral and petroleum resources, subject to the conditions of those titles and in exchange for the payment of royalties. In NSW, these rights are administered under the provisions of the *Mining Act 1992* and the *Petroleum (Onshore) Act 1991* and the *Petroleum Offshore Act* (which NSW administers jointly with the Commonwealth).

For government to manage that responsibility effectively, it needs access to a reliable source of objective, expert advice regarding the State's resource endowment. As the Productivity Commission has noted, in order to make informed decisions about the best use of mineral and petroleum resources in the public interest, governments gather data about the extent and quality of these resources.⁴ This has long been the fundamental role of geological surveys.

A review of investment in Australian minerals and petroleum exploration conducted by the House of Representatives Standing Committee on Industry and Resources identified the important role of the Commonwealth and States in delivering public, pre-competitive, public good, geoscientific information.⁵ The Committee indicated that Australian geological surveys, unlike the private or research sectors, focus on greenfield areas. Geological surveys are not restricted to specific locations, commodity types or deposit styles. The data they collect serves to broaden and extend our understanding of Australia's geological endowment. As custodians of geological data, geological surveys integrate this information with existing sources and make this publicly available. As indicated by the Victorian Minerals and Energy Council submission to the House of Representatives Committee:⁶

"These pre-competitive data packages provide the fundamental building blocks upon which industry geologists develop the exploration concepts that can lead to new mineral discoveries."

2.3 The role of public geological surveys in correcting market failure

Economic theory suggests the role of a public provider of geological information should be to intervene where, otherwise, market failure would exist.^{7,8} In such cases, the public provider should deliver information that achieves 'public good', that is, it should not exclude certain users of the information or prevent simultaneous use by others.^{9,10} The Productivity Commission's 2013 inquiry¹¹ is also relevant. It indicates that government provision of pre-competitive geoscience information is characterised as a public good as it addresses market failures. The Commission identifies a number of examples and states that:

"In effect, the public provision of the information is analogous to the issuing of a prospectus to maximise the value of selling an asset — in this case a community-owned asset in the form of Australia's mineral and energy resources."

Geological surveys enable governments to retain *valuable options* to adjust its mineral resource policies in the future, or to modify its plans in response to changing circumstances. Maintaining a well-resourced geological survey function provides the *option* of changing policy in the future in relation to mineral exploration and production. As such, this:

- helps minimise the barriers to entry for private sector investors who are considering conducting exploration activities in the State
- reduces investment risk

⁴ Productivity Commission (2013), Mineral and Energy Resource Exploration Productivity Commission Inquiry Report No 65 27 September 2013.

⁵ House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

⁶ Victorian Minerals and Energy Council, Submission No. 63, p. 868. Presented in: House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

⁷ House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

⁸ Department of Finance and Deregulation (2011). *Strategic Review of Geoscience Australia*. Canberra: Commonwealth of Australia.

⁹ Productivity Commission (1995). *Research and Development: Industry Commission inquiry report*. Canberra: Australian Government.

¹⁰ CSIRO (2000). *Commonwealth Scientific and Industrial Research Organisation (CSIRO) Submission to Productivity Commission Review of Cost Recovery by Commonwealth Agencies*. Canberra: CSIRO.

¹¹ Productivity Commission (2013), Mineral and Energy Resource Exploration Productivity Commission Inquiry Report No 65 27 September 2013.

- enhances the intrinsic value of the State mineral resources.

Geological surveys address market failures by acquiring, curating, interpreting, reporting and distributing data on mineral resource prospectivity. Data interpretation and curation are conducted to the extent that they address market failures. This is important in maintaining government revenue, jobs and regional economic stimulus currently provided by the mining industries.

2.4 Benefits of public geological information

Geological surveys and geological initiatives across Australia contribute significant economic and social value to the economy and to Australia's citizens. The pre-competitive geological data developed by Australia's geological surveys are considered a high-value national asset.¹² Public availability of geological data more broadly is recognised as a highly valuable economic and social resource. For example, Geoscience Australia's (GA) topographical data has been valued at \$4.7 million per annum.¹³

Further, the Productivity Commission identified that if provision of public geoscience information is inadequate, it may discourage explorers from undertaking more intensive surveying on their own.¹⁴

The advantages of government provision of geological and other data include:^{15,16}

- data is provided freely and openly, providing a major source of innovation and economic growth, improving business decision-making and encouraging competition^{17,18,19,20,21}
- information provided is seen as coming from an objective source²²
- exploration risk and costs are reduced and shared across individuals,²³ increasing industry confidence in mineral exploration²⁴ and stimulating private sector exploration
- benefits are distributed between society and the private sector²⁵
- data generates positive externalities, which may benefit additional, unforeseen stakeholders²⁶
- improved coordination of regional and continental data is facilitated
- improved coordination and oversight of information acquisition and provision
- improved quality and efficiency of data collection, through economies of scale, resulting in faster discovery of new resource deposits²⁷
- creation of a public engagement platform.²⁸

¹² Scott, M. & Jones, M. (2014). *Management of Public Geoscience Data*. Perth: International Mining for Development Centre.

¹³ Pricewaterhouse Coopers (2010). *Economic Assessment of Spatial Data Pricing and Access: Stage 1 Report*. Canberra: ANZLIC - Spatial Information Centre.

¹⁴ Productivity Commission (2013). *Mineral and Energy Resource Exploration Productivity Commission Inquiry Report No 65*. 27 September 2013.

¹⁵ House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

¹⁶ Hallett, M., Butt, G. & Watkins, J. (2010). *Business Case for the NSW Government New Frontiers Minerals and Energy Exploration Initiative*. Maitland: State of NSW.

¹⁷ PricewaterhouseCoopers Australia (2014). *Deciding with data How data-driven innovation is fuelling Australia's economic growth*. Australia: Google Australia.

¹⁸ Deloitte (2013). *Market Assessment of Public Sector Information*. London: Department for Business, Innovation and Skills.

¹⁹ ACIL Tasman (2012). *Review of the Geological Survey of Queensland*. Report to the Queensland Department of Employment, Economic Development and Innovation. Brisbane: ACIL Tasman.

²⁰ Allen Consulting Group (2011). *Review of Victoria's earth resources programs*. Report to the Victorian Department of Primary Industries. Melbourne: Allen Consulting Group.

²¹ Geosoft (2017). *Geoscience Data Management Report*. Toronto: Geosoft.

²² Department of Finance and Deregulation (2011). *Strategic Review of Geoscience Australia*. Canberra: Commonwealth of Australia.

²³ Acemoglu, D., Golosov, M., & Tsyvinski, A. (2008). Markets versus governments. *Journal of Monetary Economics*, 55(1), 159-189.

²⁴ Johnson, J. (2014). *The role of government geoscience in the minerals industry*. Geoscience Australia's Deputy Chief Executive Officer keynote presentation at the 2014 International Mining and Resources Conference, Melbourne, 24 September 2014.

²⁵ Bureau of Communications Research (2016). *Open government data and why it matters A critical review of studies on the economic impact of open government data*. Canberra: Australian Government Department of Communications and the Arts.

²⁶ Nilsen, K. (2010). Economic theory as it applies to Public Sector Information. *Annual Review of Information Science and Technology*, 44(1), 419-489.

²⁷ Johnson, J. (2014). *Ibid*.

²⁸ Deloitte (2013). *Market Assessment of Public Sector Information*. London: Department for Business, Innovation and Skills.

2.4.1 The public value of geological surveys and exploration initiatives

The benefits and public value of the work of public geological surveys have also been demonstrated by a number of evaluations of these surveys and their programs. Examples include:

- The Department commissioned an assessment, which found that GSNSW's geological core specimens, rock and mineral specimens, and palaeontological specimens are valued at \$480.6 million.²⁹ This gives some indication of the scale of these assets. The value of GSNSW's digital data catalogue is likely to be much higher than the value of its physical collection.
- A 2011 review of GA found a one-off increase in GA expenditure on pre-competitive geoscience generated a \$31 million short-term increase in private offshore petroleum exploration expenditure, highlighting that economic benefits that significantly outweigh the annual costs of service provision.³⁰
- An evaluation of South Australia's PACE program found that government geoscience initiatives stimulate substantial private exploration expenditure, royalty payments and other taxes, employment and regional economic growth.³¹
- A similar review of GSQ found that it played an important role in "Boosting prospectivity by reducing risk through the provision of relevant and reliable information that is readily available to and usable by potential investors".³²
- An evaluation of the WA Exploration Incentive Scheme identified that the net value created through discoveries can be substantially greater than exploration expenditure.³³
- An evaluation of GSV showed that, to stimulate greenfield exploration, geoscience data programs need to clearly articulate the program objectives, design key performance indicators to determine success, and be co-designed with industry.³⁴
- A review of the NSW New Frontiers Minerals and Energy Exploration Initiative (New Frontiers Initiative) found that government geoscience initiatives stimulate substantial private exploration expenditure, royalty payments and other taxes, employment and regional economic growth. This showed that private exploration would be \$160 million higher annually in 2024-25 if the initiative continued, while a cumulative loss of \$979 million would occur to 2024-25 if the initiative ended in 2011.³⁵

Collectively, these evaluations and reviews demonstrate the public value contributed by geological surveys and the geological initiatives, including significant benefits delivered by geospatial information, water management and natural disaster mitigation. This public value depends on:

- visible and usable products and services
- how well geological surveys are resourced
- coordinated and streamlined business areas within geological surveys
- trust, which is fostered through clear program objectives and communication across government departments and industry stakeholders.

2.4.2 The relationship of state geological surveys and other geoscience organisations

The Australian Academy of Science's 2018-27 Decadal Plan for Australian Geoscience³⁶ identifies the sectors and organisations involved in developing geoscience. The organisations involved include:

²⁹ Aon (2019). *Re: DRG Collection Assets Valuation – PROC-2003590 (DRG Collection Assets Valuation FY 2019) – Scope Deliverable B – Valuation of Collection Assets as at 30 June 2019*. Sydney: Aon.

³⁰ Department of Finance and Deregulation (2011). *Strategic Review of Geoscience Australia*. Canberra: Commonwealth of Australia.

³¹ Economics Consulting Services (2014). *The Evaluation of the Plan for Accelerating Exploration (PACE) Prospectivity, Programs, Promotion and People*. Report to: Department of Manufacturing, Innovation, Trade, Resources and Energy. Perth: Economics Consulting Services.

³² ACIL Tasman (2012). *Review of the Geological Survey of Queensland*. Report to the Queensland Department of Employment, Economic Development and Innovation. Brisbane: ACIL Tasman.

³³ ACIL Allen Consulting (2015). *Exploration Incentive Scheme: Economic Impact Study*. Report to: Western Australia Department of Mines and Petroleum.

³⁴ Allen Consulting Group (2011). *Review of Victoria's earth resources programs*. Report to the Victorian Department of Primary Industries. Melbourne: Allen Consulting Group.

³⁵ ACIL Tasman (2010). *New Frontiers program – Financial and Economic assessment*. Melbourne: ACIL Tasman.

³⁶ National Committee for Earth Sciences. (2018). *Our Planet, Australia's Future: A decadal plan for Australian Geoscience 2018–27*. Australian Academy of Science.

- **Higher education institutions**, where research is ‘curiosity-driven’ and tends to reflect the interests and skills of individual geoscientists, although some more strategic or applied research is also carried out, sometimes with industry support.
- **ARC Centres of Excellence**, which are university-based and aim to be centres of expertise which develop Australia’s international standing in research areas of national priority.
- **Geoscience Australia, CSIRO and state and territory geological surveys**, whose research is strategic and research goals are determined at a corporate level. Geoscience Australia and state and territory surveys also carry out geological, geophysical and geochemical surveys and release the results as public good data.
- **Industry**, which undertakes applied research focusing on current and immediate future needs. Some peak bodies coordinate industry research on a collaborative basis. Industry benefits greatly from the ‘data infrastructure’ provided by Geoscience Australia and the geological surveys.
- **Cooperative Research Centres (CRCs)**, which support industry-led collaborative research with researchers from universities and geological surveys.
- **Professional societies**, which contribute to the effectiveness and coherence of the geoscience community through professional accreditation, support of scientific publications, sponsorship of conventions and conferences, representation of the community to government, and provision of educational programs.

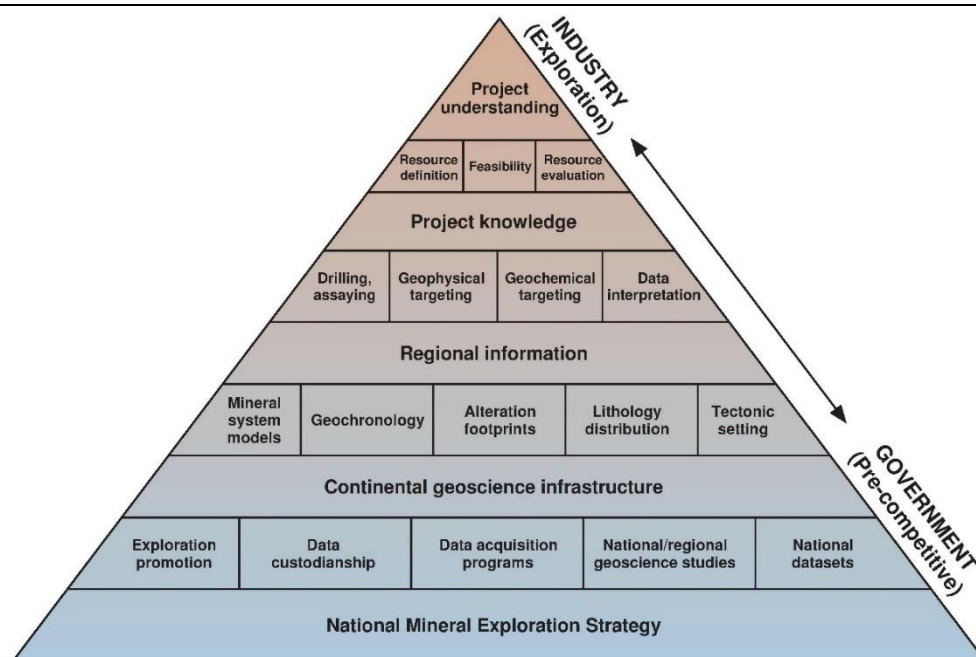
The spectrum of activities between government and industry is presented in Figure 2.1. This shows there is a role for government in providing pre-competitive data, specifically exploration promotion, data custodianship, data acquisition programs, national / regional geoscience studies and national datasets. In contrast, industry plays an important role in exploration, specifically resource definition, feasibility and resource evaluation.³⁷

The focus of activity, including the mineral and location focus, narrows as the responsibility shifts from government to industry. This reflects a shift from pre-competitive acquisition to near market to commercial activities. Industry performs roles closer to the commercial end of the spectrum.^{38,39}

³⁷ Scott, M. & Jones, M. (2014). *Management of Public Geoscience Data*. Perth: International Mining for Development Centre.

³⁸ Productivity Commission (2000). *Review of Cost Recovery: Australian Geological Survey Organisation*. Canberra: Productivity Commission.

³⁹ Parliament of Australia (n.d.). *Pre-Competitive Geoscience Data Acquisition*. Canberra: Australian Government.

FIGURE 2.1 RELATIONSHIP BETWEEN GOVERNMENT AND INDUSTRY IN GEOLOGICAL SCIENCES

Note: "A triangle figure showing complementary roles of Government pre-competitive data acquisition through to industry's role in mineral exploration. Government responsibilities are shown near the base of the triangle and Industry's near the top." This figure does not distinguish between GA and the state and territory geological surveys.

SOURCE: JOHNSON, J. (2014). THE ROLE OF GOVERNMENT GEOSCIENCE IN THE MINERALS INDUSTRY. GEOSCIENCE AUSTRALIA'S DEPUTY CHIEF EXECUTIVE OFFICER KEYNOTE PRESENTATION AT THE 2014 INTERNATIONAL MINING AND RESOURCES CONFERENCE, MELBOURNE, 24 SEPTEMBER 2014.

SUMMARY OF CONTEXT AND THE RATIONALE FOR PUBLIC GEOLOGICAL SURVEYS

- The roles of public geoscience in providing expert advice to inform responsible government management of state resources and address market failure are well established.
- Geological surveys are essential for generating, curating, interpreting, reporting and distributing data, and supporting private investment.
- There is considerable evidence that public geoscience delivers significant economic and social value and is essential for resources industry operation.
- Geological surveys enable Government to retain *valuable options* to adjust resource policies and plans.
- A broad range of sectors and organisations are involved in the development of geoscience in Australia.



3.1 GSNSW's current roles

GSNSW's current roles are set out in Box 3.1.

BOX 3.1 GSNSW'S CURRENT ROLES

The Geological Survey of NSW collects and manages geological, geophysical and geospatial data to inform government, engage with the resources industry and educate the community about the state's geology, and its mineral, coal, petroleum, groundwater and extractive resources.

GSNSW provides expert geoscientific advice to NSW Government agencies and collaborates with state, national and international government agencies and scientific bodies to share skills and data, and to promote coherent information exchange.

Specifically, GSNSW:

1. serves as the custodian of NSW's geoscientific data⁴⁰ and reference collections of drillcores, economic rocks and minerals and paleontological specimens
2. is the authoritative source of up-to-date knowledge about the geology and geological evolution of the state
3. undertakes an ongoing program of pre-competitive fit-for-purpose data acquisition to improve understanding of the state's geology and geological resource potential
4. collates, manages, interprets and delivers self-collected and third-party (industry, government and research) geoscientific data
5. provides expert geological advice for land use planning, regional development and natural resource management at all levels of government
6. undertakes geological assessment of resource industry activity to ensure that the state's geological resources are appropriately used
7. promotes NSW resource prospectivity and attracts exploration investment into the state
8. supports geoscience education and delivers geoscientific outreach to the community.

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW

3.2 Appropriateness of GSNSW's current roles

At a high-level, interviewed stakeholders consider GSNSW's eight current roles to be appropriate and important for encouraging investment in mineral exploration in NSW. However, all interviewed stakeholders, including comparator jurisdictions, believe the primary focus should be on collecting and

⁴⁰ Geoscientific data comprises geological, geophysical geochemical and geospatial data.

making available data, including data custodianship (current role 1), pre-competitive fit-for-purpose data acquisition (current role 3) and self-collected and third-party geoscientific data collection (current role 4). The remaining roles are seen as enablers to the primary role of obtaining and making available pre-competitive geological data. Discussion on GSNSW's roles is provided below.

3.2.1 Advice and information to support NSW government resources decision-making

As detailed in Chapter 2, one of the primary roles of a public geological survey is to deliver information and advice to ensure ongoing management of mineral endowments. GSNSW provides expert geological advice and information to:

- increase knowledge about the nature, location and use of NSW geological resources
- support efficient and sustainable development and management of these resources
- support achievement of objects of the *Mining Act 1992*, *Petroleum (Onshore) Act 1991* and *Petroleum (Offshore) Act 1991*
- deliver economic and social benefits
- support development and implementation of NSW's strategic resources priorities.

All comparator geological surveys carry out this role and see it as important. GSNSW also provides information and advice to support specific provisions under NSW Mining and Petroleum legislation.

The literature supports GSNSW's role in providing advice to the NSW Government to underpin policy decision making as an expert source of information on the geology of NSW.^{41,42} A 2009 Productivity Commission report identified several legitimate roles for government in managing oil and gas resources. These include providing pre-competitive data and in preventing negative 'spill over' effects, such as damage to the environment or heritage places, or threats to public and / or employee safety.⁴³

GSNSW's responsibilities under legislation include those across the *Mining Act 1992* and *Petroleum (Onshore) Act 1991*. These are overviewed in Table 3.1 and detailed in Appendix G. GSNSW assists in fulfilling the Government's requirements under this legislation. GSNSW supports the referenced parties.

TABLE 3.1 GSNSW'S RESPONSIBILITIES UNDER NSW RESOURCES REGULATION

Responsibility	Act, Regulation, Instrument
Assessment and advice relating to resources exploration and production	<i>Mining Act 1992</i> and <i>Mining Regulation 2016</i>
	<i>Petroleum (Onshore) Act 1991</i>
	<i>Petroleum (Offshore) Act 1982</i>
	<i>Offshore Minerals Act 1999</i>

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW

A review of relevant NSW priorities, regional water management strategies and growth plans, and national priorities (Appendix F) shows the strong focus on NSW and national plans and strategies on mineral and resource sectors. This includes reducing uncertainty and technical risk in mineral exploration,⁴⁴ the sustainable management of mineral, coal and petroleum resources,⁴⁵ development of critical minerals domestically⁴⁶ and boosting innovation, developing new technologies and attracting investment.^{47,48}

⁴¹ Johnson, J. (2014). *The role of government geoscience in the minerals industry*. Geoscience Australia's Deputy Chief Executive Officer keynote presentation: 2014 International Mining and Resources Conference. Melbourne, 24 September 2014.

⁴² House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

⁴³ Productivity Commission (2009). *Review of Regulatory Burden on the Upstream Petroleum (Oil and Gas) Sector*. Canberra: Australian Government.

⁴⁴ Department of Planning and Environment (2019). *NSW Minerals Strategy*. NSW: State of NSW.

⁴⁵ Various NSW Regional Plans.

⁴⁶ The Resources 2030 Taskforce (2018). *Australian resources—providing prosperity for future generations*. Australia: Commonwealth of Australia.

⁴⁷ MinEx CRC (2019). *A New Frontier in Mineral Exploration*. WA: MinEX CRC.

⁴⁸ Department of Industry, Innovation and Science (2019). *Australia's Critical Minerals Strategy*. Canberra: Commonwealth of Australia.

All interviewed stakeholders agree that GSNSW plays an important role in providing information and advice to inform government decision-making regarding the state's resources.

"The fundamental driver is economic. Industry are the prime benefactors, the State benefits from royalties, jobs and the community benefits through the extraction of resources and benefit to economy and broader community." – Government stakeholder

"Through the provision of information, geological surveys better inform stakeholder [including government] decisions. This leads to better economic use of the resource whilst considering environmental implications." – Industry stakeholder

Industry stakeholders expressed strong opinions about mineral allocations and resource sterilisation. Several stakeholders felt GSNSW should play a greater role in providing information, in consultation with industry, to prevent sterilisation of highly prospective regions.

"There was poor gazetting of regions a few years ago, with minimal industry consultation. This meant that some of the most prospective areas of the state were sterilised and no new exploration could occur in the area." – Industry stakeholder

Geological assessment of resources industry activity

GSNSW carries out geological assessments of all resource industry activity. While this is currently described as a 'role', it is better characterised as a function, which enables GSNSW to fulfil its advisory role to support NSW Government decision-making on appropriate use and management of geological resources.

GSNSW assesses exploration titleholder progress and activity by assessing titleholder reports required under the *Mining Act*. GSNSW also supports DRG's regulatory responsibilities under the *Mining Act* in the administration of mining and exploration titles, by providing expert geological advice in relation to title applications, renewals, transfers and cancellations (a full list is at Appendix G).

The only interviewed stakeholder to discuss the issue of assessing resource industry activity during the consultations was a representative from a public geological survey.

"They have a range of functions that could be moved elsewhere in DRG but could not be eliminated altogether. You could make GSNSW smaller, but you would need to make DRG bigger. However, there is value in retaining them [functions not related to collection / curation of data] in GSNSW." – Member of a geological survey

Two of the three comparator geological surveys discussed in the report conduct assessment of resource industry activity. GSV does not perform this function as it is seen to be important to separate the roles of investment attraction (performed by GSV) from licensing / enforcement or the "policing role" (performed by regulatory authorities). However, GSWA and GSSA perform both investment attraction and licensing / enforcement activities. In contrast, GSNSW's role is to provide relevant technical advice to the operational area of the DRG, which is responsible for conducting the titles assessments. This Review has not found strong evidence on whether investment attraction and licensing / enforcement should both be performed by a geological survey, or should be separately performed by, in this case, GSNSW and another part of DRG.

While transferring the assessment function from GSNSW to another area of DRG could be an option, this may increase operating costs for DRG as this role would still need to be performed (it is one of GSNSW's responsibilities under legislation) and a separate centre of technical expertise would need to be maintained. This Review did not identify enough evidence to determine where this function should lie if it were to be separated from GSNSW.

3.2.2 Pre-competitive data acquisition and delivery

The literature confirms that geological surveys should focus on providing pre-competitive geoscientific data and information to open greenfield areas and correct market failures. This includes collaborating with industry and being the custodian of geoscientific data and information. GSNSW performs the

custodian role in collaboration with other state and Commonwealth geological surveys, integrating newly collected data with existing, publicly available data sets.^{49,50} Relevant documents include:

- The NSW Minerals Strategy, which identifies a clear role for GSNSW participation in the MinEx CRC, making available historical exploration data, conducting high-tech metal resources mapping and contributing to a 'future of minerals' report.
- The Decadal Plan for Geoscience, which sees GA, GSNSW and other state geological surveys playing a role in creating strategically targeted public good data sets.⁵¹
- Australia's Critical Mineral Strategy 2019, which refers to the MinEx CRC as the world's largest mineral exploration collaboration. The GA and the geological surveys are involved in leading the National Drilling Initiative to systematically map regional geology and architecture and define potential undercover mineral systems.⁵²

These NSW and national priorities are delivered through collaborative and other efforts by a range of stakeholders, including Government (Commonwealth, State and local), industry, research, non-government organisations and the community. GSNSW plays an important role in delivering on these priorities, or collaborating with stakeholders, to deliver aspects of these priorities. Examples include working with government to ensure appropriate land use decisions, and with industry to ensure a strong minerals and resources industry. These roles have downstream effects on the available knowledge of geological and water resources, community understanding of geology and the ways in which built environments should be developed.

GSNSW performs similar roles compared with the comparator geological surveys. However, the extent to which these roles are prioritised varies across the comparators. The primary focus for the three comparators is on collecting pre-competitive geoscientific data to address market failures.⁵³ The market failure rationale provides an important foundation to drive prioritisation of efforts, such that information is only provided where the market fails to provide the information required for investment attraction.

There is strong support from all interviewed stakeholders for GSNSW continuing to perform the primary role of obtaining and making available pre-competitive geological data. This is highly valued and seen as 'core business'. This primary role is seen as particularly important by industry and research stakeholders who use this data to make key exploration decisions.

All stakeholders interviewed and some surveyed stakeholders concur that GSNSW:

- Directly delivers commercial and economic benefits which include:
 - Increased knowledge of location or characteristics of geological resources
 - Increased understanding of the value of geological knowledge
- Indirectly supports the private and other sectors to deliver commercial and economic benefits which include:
 - Expanding existing or develop new mining operations
 - Enabling industry to create jobs and contribute to the economy through levies and fees
 - Enabling regional development (including jobs both in and out of the mining industry)
 - Enabling industry to make better investment and exploration decisions, resulting in reduced exploration costs
 - Supporting industry operations
 - Reducing private sector investment risk
 - Supporting exploration and characterisation of the State's mineral resource endowment and provides the *option* of resuming mineral exploration and production
 - Reducing exploration risk

⁴⁹ Johnson, J. (2014). *The role of government geoscience in the minerals industry*. Geoscience Australia's Deputy Chief Executive Officer keynote presentation: 2014 International Mining and Resources Conference. Melbourne, 24 September 2014.

⁵⁰ House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

⁵¹ National Committee for Earth Sciences (2018). *Our Planet, Australia's Future: A decade of transition in Geoscience, A decadal plan for Australian Geoscience 2018–27*. Canberra: Australian Academy of Science.

⁵² Department of Industry, Innovation and Science (2019). *Australia's Critical Minerals Strategy 2019*. Canberra: Commonwealth of Australia.

⁵³ House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

- Commercialising new technologies or techniques.

“The value of geoscience bodies is about providing certainty to companies to de-risk mineral and petroleum exploration activities” – Industry stakeholder

Scope of data and information developed by GSNSW

The literature and practice elsewhere provide limited guidance on GSNSW's role in exploring new technologies, concepts and methodologies. Two reports have suggested that geological surveys are unconstrained by market competition and hence, could perform this role.^{54,55}

The scope of data and information developed by comparator geological surveys involves strategic prioritisation through a consultation processes with industry, government and public stakeholders.^{56,57} The priorities of the different comparator geological surveys reflect:

- The source of funding: for example, geological surveys funded solely by government take an approach directed by government. This does not, however, preclude industry or other stakeholder involvement in priority setting. In contrast, where funded partially by industry, industry is more involved in identifying strategic priorities.
- State geology: Australian jurisdictions have fundamentally different geological endowments, which drive strategic priorities. For example, NSW has large coal deposits, and thus has a focus on coal exploration and extraction. In contrast, South Australia has large copper reserves, which has resulted in a focus on exploring for and extracting copper. This is reflected in the current PACE Copper initiative.⁵⁸
- National priorities: for example, one of the comparator surveys is focusing on mapping under cover resources. This aligns with the Decadal Plan⁵⁹ and the UNCOVER Australia initiative.⁶⁰

“GSNSW should provide data products that support exploration by industry. They should only do pre-competitive drilling to show a region has potential, not do exploration or secondary targeted drilling -. This should be done by industry.” – Research stakeholder

GSNSW's involvement in data acquisition delivery programs and research

Government has an important role to play in delivering basic research. Basic research is an essential driver of innovation yet is unlikely to be undertaken by industry due to the high risk, large investment and long lead times required to realise outcomes and impacts. Government is able to provide initial research and support, which in turn, enables industry to deliver public good.^{61,62} This is evidenced by the role and value of CSIRO^{63,64,65} and Defence Science and Technology.⁶⁶

There is a risk that the benefits of academic research, which is not overtly strategic or aligned with the objects of the *Mining and Petroleum Acts*, may be limited to the research sector. This is recognised in

⁵⁴ House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

⁵⁵ Johnson, J. (2014). *The role of government geoscience in the minerals industry*. Geoscience Australia's Deputy Chief Executive Officer keynote presentation: 2014 International Mining and Resources Conference. Melbourne, 24 September 2014.

⁵⁶ Department of Economic Development, Jobs, Transport and Resources (2018). *Helping Victoria Grow: Extractive Resources Strategy*. Melbourne: State of Victoria.

⁵⁷ Department of Economic Development, Jobs, Transport and Resources (2018). *State of Discovery Mineral Resources Strategy 2018–2023*. Melbourne: State of Victoria.

⁵⁸ Department of Energy and Mining (2019). *PACE Copper*. Accessed 18 October 2019: http://www.energymining.sa.gov.au/minerals/geoscience/pace_copper.

⁵⁹ National Committee for Earth Sciences. (2018). *Our Planet, Australia's Future: A decadal plan for Australian Geoscience 2018–27*. Australian Academy of Science.

⁶⁰ UNCOVER Australia (n.d.). UNCOVER. Accessed 18 October 2019: <https://www.uncoveraustralia.org.au/>.

⁶¹ Pietruszkiewicz, J. (1999). *What are the Appropriate Roles for Government in Technology Deployment? A White Paper with Author's Response to Comments*. U.S.: National Renewable Energy Laboratory.

⁶² Bernanke, B.S. (2011). *Promoting Research and Development: The Government's Role*. Conference presentation: New Building Blocks for Jobs and Economic Growth, Washington, D.C. May 16, 2011.

⁶³ ACIL Allen Consulting (2014). *CSIRO's Impact and Value*. Melbourne: ACIL Allen Consulting.

⁶⁴ ACIL Allen Consulting (2017). *The Value of CSIRO: An estimate of the impact and value of CSIRO'S portfolio of activities*. Melbourne: ACIL Allen Consulting.

⁶⁵ ACIL Allen Consulting (2018). *The Impact and Value of CSIRO research: 2018 Update report*. Melbourne: ACIL Allen Consulting.

⁶⁶ ACIL Allen Consulting (2015). *Economic Impact Case Studies: Establishing the broad economic value of the Defence Science and Technology program*. Melbourne: ACIL Allen Consulting.

the Decadal Plan,⁶⁷ which states that geological surveys conduct strategic or mandated research, while university-based scientists conduct predominantly curiosity-driven geoscientific research. For GSNSW, strategic priorities consistent with the core roles, are required for driving the allocation of resources and research effort.

Stakeholders have varying views on the scope of some data acquisition and delivery programs (collectively termed 'research' by most stakeholders). While interviewed industry stakeholders see value in research generally, they lack an understanding of its nature and do not believe significant funding should be allocated to it.

Some stakeholders feel that GSNSW is focussing too much on academic research, while others feel research was appropriate if it delivers public good to NSW. This includes promoting new technologies and processes to advance the NSW mining industry and developing new data collection approaches to meet emerging priorities, such as environmental data.

"Industry would love to see GSNSW follow a different direction – some work is for academic interest only – not for industry." – Industry stakeholder

"Although GSNSW is strong in providing basic research, no one wants to increase the scope of a geological survey, as academics will be the primary party benefiting. This comes with a cost that will keep coming and will get more expensive." – Research stakeholder

"The research sector can do work using their infrastructure, say, for geochronological, geochemical, geophysical work. This is not appropriate for GSNSW to perform, so they need to partner with researchers. In my area of work, there is nothing that the research sector should perform in place of what GSNSW currently performs." – Research stakeholder

One industry stakeholder believes research serves purely academic interests, while two other industry stakeholders expressed an interest in GSNSW increasing its research efforts. GSNSW's research collaboration in the MinEx CRC is a case in point. Under the NSW Minerals Strategy, The NSW Government contributed \$16 million to this CRC. Some industry stakeholders who are not involved in the MinEx CRC want more industry consultation regarding the work program of the CRC. Some stakeholders do not appear to be aware of the benefit to NSW and to GSNSW through GSNSW's participation in the MinEx CRC, which is achieved through leveraging Commonwealth Government funding.

GSNSW should continue to support research led by research organisations. This will ensure that GSNSW is at the forefront of new developments in the geological sciences and reduce duplication of effort. GSNSW does not necessarily need to lead such research activities.

Scope of value adding

GSNSW carries out value adding activities in some of its most high-profile programs. For example, the MinEx CRC's National Drilling Initiative involves drilling multiple holes in case study areas to map the regional geology and architecture and define the potential for new mineral systems in 3D. All comparator geological surveys carry out value adding to some degree. Further, the literature confirms that geological surveys should provide data interpretation or 'value-adding' to the extent this increases investment and reduces exploration risk.

Interviewed industry stakeholders presented conflicting views on the extent to which GSNSW should move beyond pre-competitive data acquisition and provide interpretation and value-add to the data. This includes how the scope of exploration activity should be defined. Some industry stakeholders believed the scope of GSNSW's work should focus on highly prospective areas. Others valued a broad scope, insisting this was necessary to build the State's geological and geoscientific knowledge.

"GSNSW should focus on the more prospective parts of the state. GSNSW shouldn't be taking risk where private investors aren't going to be. I don't know if they've got the balance right, however, we'd like to see the investment going to things that industry would get benefit from." – Industry stakeholder

Representatives from larger industry organisations believed GSNSW should provide only raw data. They feel that exploration companies are best placed (and resourced) to perform value-adding

⁶⁷ National Committee for Earth Sciences. (2018). *Our Planet, Australia's Future: A decadal plan for Australian Geoscience 2018–27*. Australian Academy of Science.

activities. This contrasts with organisations representing smaller companies, who would prefer GSNSW to provide interpretation and value-add. While detailed review of the benefits of value-added products was outside the scope of this Review, providing less value-adding could increase the exploration risks, which smaller companies are less well placed to manage. This is consistent with the findings of South Australia's evaluation of its PACE exploration program.⁶⁸ This evaluation considered that interpreting and integrating pre-competitive datasets to generate an understanding of the geology and exploration opportunities is standard work for geological surveys.

Providing less value-adding could reduce the ability and competitiveness of smaller companies to identify and progress new exploration activities. However, this could be mitigated by engaging stakeholders to align GSNSW's strategic objectives and priorities with their needs. Close consultation with peak bodies and individual exploration companies would address this issue and support the development of fit-for-purpose data value-adding.

"Data needs to be clean and organised rather than interpreted." – Industry stakeholder

"Smaller companies benefit more from one-on-one interactions from GSNSW (due to knowledge transfer and expertise) than bigger companies who are just trying to access information and do all value-add in house." – Research stakeholder

Promoting resource prospectivity and attracting exploration investment

Interviewed stakeholders, particularly those from industry, regarded promoting and attracting investment as important for a public geological survey to carry out. Several interviewed stakeholders indicated industry has experienced difficulties in entering the NSW mining industry. They believe GSNSW should do more to encourage investment.

"It's not just about mining coal, there's a mineral industry as well. We need to attract investment – this is about having good procedures, plans and legislation." – Government stakeholder

"Everyone was impressed with [GSWA's] strategies and the steps they have taken to attract investment." – Industry stakeholder

Industry and research stakeholders believe GSNSW has suffered reputational damage as a result of not participating in investment promotion activities over recent years (for example, attendance at conferences). They believed GSNSW should focus on rebuilding its reputation and brand.

"GSNSW has a history of not promoting resources. It should do more in this area." – Research stakeholder

"The line is blurry as some activities look like exploration but are actually trying to promote exploration. For example, the MinEx CRC is drilling to try to increase exploration. They are taking a risk that industry doesn't want to take in the current climate. This will drive investment in the region. This is a role for Government." – Research stakeholder

The comparator geological surveys all undertake investment promotion. However, promoting resource prospectivity and attracting exploration investment would be more appropriately seen as an enabling function, undertaken to the extent that it supports the use of pre-competitive data to facilitate and attract exploration investment and resource development.

3.2.3 Providing expert advice to support NSW government decision-making on non-resources issues

GSNSW provides expert geological advice and information to:

- make informed decisions about land use assessment and natural resource management
- support achievement of objects of the various non resource-related regulations
- support decisions by the Minister for Regional NSW, Industry and Trade on whether to give concurrence for the declaration of a state conservation area under the *National Parks and Wildlife Act 1974*

⁶⁸ Economics Consulting Services (2014). *The Evaluation of the Plan for Accelerating Exploration (PACE) Prospectivity, Programs, Promotion and People*. Report to: Department of Manufacturing, Innovation, Trade, Resources and Energy. Perth: Economics Consulting Services.

- support informed local and NSW decision-making about land use planning under the *Environmental Planning & Assessment Act 1979* and related instruments, and is supporting achievement of objects of these Acts
- support government decision-making on water use through hydrological mapping in the central west, thus potentially supporting regional water plans
- support knowledge about hazards and adapting to climate change.

“GSNSW helps [my government department / agency] achieve environmental outcomes. This is the immediate / primary outcome. They also deliver social outcomes through improved community health / wellbeing and economic outcomes by promoting areas of new resources that flow to socioeconomic benefits.” – Government stakeholder

Government, private and research sector stakeholders and GSNSW staff considered that GSNSW delivers social and environmental benefits including:

- enabling industry to create jobs and contribute to the economy and regional development
- supporting new research
- facilitating more effective urban planning
- enabling informed decisions about appropriate land use and land management
- ensuring better and more efficient resource management and use.

GSNSW has responsibilities under legislation relating to land use assessment and natural resource management. These are overviewed in Table 3.2 and detailed in Appendix H. GSNSW’s advice is one of a series of key inputs for Government, along with, for example, information from the National Parks and Wildlife Service. NSW Government stakeholders responsible for land use planning and water particularly value this information and advice.

TABLE 3.2 GSNSW’S RESPONSIBILITIES UNDER NSW NON-RESOURCES REGULATION

Responsibility	Act, Regulation, Instrument
Assessment and advice to support decision making on non-resources land use and management	<i>Environmental Planning & Assessment Act 1979</i>
	Ministerial planning direction 1.3 - Mining, Petroleum Production and Extractive Industries
	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
	Sydney Regional Environmental Plan (Central Coast Plateau Areas) and Sydney Regional Environmental Plan - Extractive Industry (1995)
	<i>National Parks and Wildlife Act 1974</i>
	<i>Biodiversity Conservation Act 2016</i>
	<i>Forestry Act 2012</i>
	<i>Crown Land Management Act 2016</i>
	<i>Roads Act 1993</i>
	<i>Aboriginal Land Rights Act 1983</i>

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW

Appendix F shows the strong focus of the relevant NSW and national plans and strategies on effective environmental and land use planning. This includes:

- protecting the natural environment⁶⁹
- appropriately managing land use compatibility for environmental assets and agricultural and resource lands⁷⁰
- building an environmental management economy⁷¹

⁶⁹ Greater Sydney Commission (2018). *Greater Sydney Regional Plan: A Metropolis of Three Cities*. NSW: State of NSW.

⁷⁰ Various NSW Regional Plans.

⁷¹ The Resources 2030 Taskforce (2018). *Australian resources—providing prosperity for future generations*. Australia: Commonwealth of Australia.

- improving data management to ensure the use of key geological, environment and heritage data sets.⁷²

Regional planning has a focus on securing water resources. This includes ensuring the sustainability, quality, security and environmental management of regional, groundwater and coastal water resources.⁷³

“GSNSW provides analysis that can be used to advise the Minister [non-resources]. This is essential. We could do without this service, and instead externally contract this. But the costs would be higher. And the external consultants would need to rely on GSNSW baseline data anyway. GSNSW is efficient.”
– Government stakeholder

“If GSNSW didn’t provide it [advice] – this wouldn’t impact the quality of our decisions, but it could influence government expectations on developing the mineral industry.” – Government stakeholder

Outcomes delivered by GSNSW

All stakeholders interviewed identify economic outcomes as the primary outcome delivered by GSNSW. This largely related to mining industry promotion, resource extraction, royalties, and jobs.

“The focus should only be on economic outcomes; they shouldn’t be focusing on social or environmental.” – Industry stakeholder

“The fundamental driver is economic. Industry are the prime benefactors, the State benefits from royalties, jobs and the community benefits through the extraction of resources and benefit to economy and broader community.” – Government stakeholder

Some government and research stakeholders interviewed believe GSNSW delivers social and / or environmental outcomes by providing expert information and advice to government. This enables the NSW Government to make better decisions for the environment and community. In contrast, a small minority of industry stakeholders interviewed believe that either GSNSW achieves limited social or environmental outcomes, or that GSNSW should not attempt to achieve social or environmental outcomes.

“Through the provision of information, geological surveys better inform stakeholder (including government) decisions. This leads to better economic use of the resource whilst considering environmental implications.” – Industry stakeholder

All those interviewed stakeholders who commented on the benefit GSNSW delivers indicated that GSNSW provides benefits to them or their organisation. The examples provided include:

- leading to the discovery of new mines
- informing government strategy
- supporting their research.

One stakeholder believed that GSNSW provides more benefit to prospectors by providing information to those who lack a basic understanding of geology.

“GSNSW has a role in assisting in the general education of the populous of the geology of the state and in assisting their understanding of the natural environment.” – Research stakeholder

“GSNSW supports other institutions and universities and contributes to broader state functioning and wealth, education.” – Research stakeholder

GSNSW’s expert geological advice informs land use assessment and natural resource management. This delivers high public value and should be continued. There is an opportunity for GSNSW to take a more strategic approach to developing information and advice in this area to support future priorities.

3.2.4 Data management and custodianship

All comparator jurisdictions have general data custodianship and management functions. To improve the usefulness and availability of the data collected, GSNSW staff feedback emphasised the importance of managing and developing effective data infrastructure.

⁷² Department of Industry, Innovation and Science (2019). *Australia’s Critical Minerals Strategy*. Canberra: Commonwealth of Australia.

⁷³ Various NSW Regional Water Management Strategies and NSW Regional Plans.

Data custodianship and management are currently identified as roles, but could be more appropriately characterised as enabling functions, without which GSNSW would not be able to perform its three core roles (collecting and making available pre-competitive data and providing resources and non-resources related advice to government).

3.2.5 Supporting geoscientific education and outreach and being an authoritative source of geoscientific knowledge for NSW

Supporting geoscientific education

The literature and practice elsewhere provide limited guidance on the role of a public geological survey in:

- Educating geologists: one report noted that industry and universities may be better placed to collaboratively deliver these functions⁷⁴ in order to bolster the development of their workforce pipeline.⁷⁵ GSNSW could contribute to geological education by seeking to collaborate with the Australasian Institute of Mining and Metallurgy, which provides ongoing professional development.
- Conducting community outreach: this is essential for shaping public attitudes to mining. Industry is unlikely to be trusted to perform this role.⁷⁶

“GSNSW needs to engage with high schools and teach the principals of economic / environment with regard to geology.” – Industry respondent

Most interviewed stakeholders believe that a public geological survey should deliver education and community outreach. One stakeholder suggested that GSNSW should play a role in communicating scientific information to stakeholders of different backgrounds. These activities can foster greater community support for and understanding of the importance of the mining industry.

All three comparator geological surveys carried out education and outreach activities. However, these are not seen as core roles and were noted to be of lower priority.

“It’s not core business, but we believe it’s important for a community to understand.” – Member of a Geological Survey

GSNSW’s community outreach and education activities are highly regarded by Government and small industry stakeholders, particularly for GSNSW’s work in schools. While some interviewed stakeholders believed funding for these activities should be increased, some larger industry stakeholders do not see this as a primary role of GSNSW, with one stakeholder suggesting this role could be delivered by GA.

Further, one stakeholder believed that GSNSW provides more benefit to prospectors by providing information to those who lack a basic understanding of geology.

“We would love them to do more education for the industry. They do some outreach, which is great, and should do more.” – Industry stakeholder

“A geological survey should also play an education role and engage industry. Also, their community outreach program (of school education seminars) is a good initiative and should receive increased funding from GSNSW.” – Industry stakeholder

Some GSNSW staff feel that more support is needed for community education and outreach, which primarily delivers social benefits. Education and outreach should be seen as an enabling function which supports the three core roles.

Authoritative source of knowledge about NSW’s geology and geological evolution

GSNSW plays a role in being the authoritative source of knowledge about NSW’s geology and geological evolution. However, this could be streamlined to reduce duplication with its other roles and functions.

⁷⁴ House of Representatives Standing Committee on Industry and Resources (2003). *Exploring: Australia’s Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.

⁷⁵ Minerals Council of Australia (2019). *Minerals Council of Australia Pre-Budget Submission 2019-20*. Canberra: Minerals Council of Australia.

⁷⁶ Moffat, K., Pert, P., McCrea, R., Boughen, N., Rodriguez, M. & Lacey, J. (2017). *Australian attitudes toward mining*. Canberra: CSIRO.

Appendix E demonstrates that there is a relatively broad range of organisations involved in Australia geoscience, who likely hold knowledge about NSW geology and geological evolution: for example, GSNSW's various government, university and industry research partners. By working with these organisations, GSNSW can avoid any duplication of information about NSW geology. This is supported by the strategic aims of the Decadal Plan, which strongly emphasises the importance of a collaborative, interdisciplinary approach in the Australian geoscience community.

"The survey should be a 'giant library' of all of the States geological knowledge and ensure that it's protected." – Government stakeholder

3.2.6 Implementation of GSNSW current roles

GSNSW's relationship with other geoscience organisations and sectors

The number of geoscience-focused organisations means that it is important for GSNSW to collaborate in implementing its roles. For example, industry input is particularly important to guide GSNSW's collection of precompetitive information to ensure it is fit-for-purpose.

"One of the roles that isn't well defined yet is whether GSNSW should produce raw data for researchers or be a custodian for raw research data. I'm not sure who should have responsibility for this, but this should be a strategic approach across Australia." – Research stakeholder

"GSNSW have longevity in funding so have the potential to provide ongoing, long-term storage of data." – Research stakeholder

Survey respondents indicated that GSNSW needs to align with industry needs, review its strategic directions to align with the long-term interests of NSW and conduct more education and outreach.

"Although the level of exploration expenditure for minerals in NSW has started to increase again, this rate would be accelerated if GSNSW listened more to industry and responded by implementing collaboratively-designed programs. This would significantly reduce the inherent exploration risk and would also fast-track the rate of new discoveries." – Industry respondent

"The issue is not the products that the GSNSW is delivering, the issue is the poor prioritisation and design of the programs of work that are going to generate new products in the future and how such programs are poorly considered and unaligned with the needs of industry and the long-term interests of NSW." – Industry respondent

GSNSW is seen as indispensable, expert and unbiased. It is seen to perform activities that would not otherwise be performed by the private or research sectors. Survey results suggest that GSNSW has improved the accessibility of its data, is focused on providing leading geoscience products in response to user needs, and is staffed by innovative and proficient personnel.

3.3 Appropriateness of GSNSW's activities

This Review has identified 19 broad types of activities that GSNSW performs in support of its roles (see Table 3.3). GSNSW staff also identified 'Represent resources portfolio in government forums' and 'Data and research collaboration' as activities. However, attending government forums was not included as this is considered an essential feature of working in NSW government. Further, collaboration was not included as this is a means of carrying out existing activity rather than a standalone activity.

TABLE 3.3 ACTIVITIES OF GSNSW

Activities
1. Generate new data
2. Data acquisition and collation (existing and new)
3. Data interpretation and analysis
4. Data modelling
5. Surveying and sampling
6. Mapping
7. Monitoring regional mineral exploration
8. Store and manage data (non-heritage)
9. Collect, store and manage drillcores
10. Carry out resource assessments
11. Advisory
12. Manage archive and geological reference collections
13. Publishing information
14. Manage online data platforms
15. Education and outreach activities
16. Software development
17. Industry investment promotion activities
18. Assess title applications and titleholder reporting requirements
19. Drilling grants program

SOURCE: ACIL ALLEN CONSULTING 2019, VARIOUS

Almost all of GSNSW's activities are performed by the three comparator surveys (see Appendix Section C.1). Two exceptions to this were:

- Assessing title applications and titleholder reporting requirements: as noted in Section 3.2.1, GSV does not assess title applications and titleholder reporting requirements. Separating this function from GSNSW would likely increase operating costs for DRG, as this role would still need to be performed (it is a responsibility under legislation) and a separate centre of technical expertise would need to be maintained. For GSV, this is performed by the Earth Resources Regulator. This was supported by interviews with the comparator geological surveys.
- Drilling grants program: this was a key part of GSSA through the PACE initiative, which has shifted recently to focus on PACE Copper. At present, GSSA is not administering a drilling grants program.

"We're not a university. If [an activity] is of benefit to the state, such as investment attraction, we would do it, but it's not core business." – Member of a geological survey

Of the interviewed stakeholders, only representatives of the comparator geological surveys and GSNSW staff were asked to comment on GSNSW's activities. The former generally consider GSNSW's current activities to be appropriate and important in supporting GSNSW's roles.

GSNSW staff agree that the activities are appropriate for a public geological survey. GSNSW staff consider that GSNSW should perform additional activities, including strategic planning to ensure GSNSW is preparing for the future. These comments related particularly to emerging technologies and enhanced data capacity and capability (see Section 3.2.2).

SUMMARY OF APPROPRIATE ACTIVITIES FOR GSNSW

- GSNSW performs 19 broad types of activities, which are intended to support its roles.
- Almost all of the activities performed by GSNSW are:
 - considered essential to deliver on GSNSW's roles
 - considered appropriate for GSNSW to conduct.
- Almost all of GSNSW's activities are performed by the comparators. The exception is the separation of the investment promotion and assessment activities by GSV, and that GSSA does not currently deliver a drilling grants program (following transition of the successful PACE initiative to PACE Copper).
- The roles and activities should be streamlined to reduce overlap and improve clarity.

3.4 Summary of the appropriate roles for GSNSW

The desktop review, benchmarking and stakeholder interview analysis detailed above were used to refine GSNSW's roles into three core roles, with four enabling functions. The enabling functions should be undertaken to the extent that they support GSNSW to fulfil its core roles. These are detailed below.

Core role 1: Providing expert advice and information to government to support the sustainable management of NSW mineral and petroleum resources.

This core role helps government to effectively manage its responsibilities and obligations under the NSW Mining and Petroleum legislation. GSNSW should be the expert source of up-to-date knowledge. This role is important in helping government to meet its legal obligations as well as make informed and strategic policy decisions about the State's resources. This core role focuses on achieving economic benefits for NSW.

Core role 2: Collecting and making available data to de-risk and attract exploration investment into NSW.

This core role recognises that the critical role of the geological survey is in providing information (that attracts and facilitates investment in resource development) which would not otherwise be provided by the private market due to the risks associated with exploration.

GSNSW should undertake fit-for-purpose pre-competitive data acquisition to open greenfield areas across NSW. This should avoid focussing on particular commodities or private company project areas. Data acquisition should align with NSW's strategic priorities and be developed in close consultation with government and industry stakeholders to ensure a focus on the most prospective areas of the State and meet stakeholders' needs. This would enhance GSNSW's reputation among industry stakeholders and improve the attractiveness of NSW for exploration activity.

The self-generated and third-party NSW geological data should continue to be curated and integrated with existing data. This should be made publicly available in a timely manner and in an easily accessible format. GSNSW should provide minimal interpretation, except where doing so would improve investment prospects and reduce the risk of exploration. This aligns with GSNSW's responsibilities under legislation to gather and make publicly available data from industry participants.

This role delivers economic benefits to NSW because it addresses a key market failure associated with exploration of the State's resources.

Core role 3: Providing advice and information to government to support non resource-related decision-making.

This core role reflects GSNSW's advisory and assessment responsibilities under land use planning, environmental and natural resources legislation. It also reflects GSNSW's advice to inform decision-making on regional development and other NSW priorities. GSNSW provides expert knowledge to inform whole-of-government consideration.

This core role focuses on achieving economic, environmental and social benefits for NSW.

Enabling function 1. Provides custodianship of NSW's geoscientific data and reference collections (drillcores, economic rocks and minerals and paleontological specimens).

GSNSW maintains NSW's geoscientific data and reference collections in order to develop and deliver knowledge and advice. This is intimately linked with GSNSW's role as the source of the State's knowledge, the acquisition, collation, management, interpretation and delivery of geoscientific data (core role 1) and provision of advice, a responsibility under legislation (core roles 2 and 3).

Enabling function 2. Supports government to manage the appropriate use of NSW's geological resources by undertaking geological assessment of resource industry activity.

GSNSW provides objective technical advice to support government's role in ensuring efficient use of resources. GSNSW is in a unique position to facilitate technical assessments and has legislative support to conduct and advise government on mining exploration assessment.

This is intimately linked with GSNSW's roles in providing advice, a responsibility under legislation (core roles 2 and 3).

Enabling function 3. Supports promotion of resource prospectivity and exploration investment in NSW.

GSNSW supports the NSW Department of Planning, Industry and Environment to perform this role, and performs general awareness raising efforts. GSNSW should not lead this enabling function but should support general awareness raising efforts, such as attending conferences and demonstrating its geoscience data services.

Enabling function 4. Supports community engagement with and education in geological sciences.

GSNSW is considered an objective and trusted expert and should play a role in community outreach and education of school children. In alignment with the comparator geological surveys, this should be of lower priority for GSNSW.



4.1 Appropriateness of GSNSW's products and services

GSNSW currently delivers five broad types of products and services, which are broken down into 30 more detailed categories. With a few exceptions, this review did not assess individual products and services (see Table 4.1). The specific purpose of these products and services, and potential users, were also out of scope for this Review.

The extent to which comparator geological surveys deliver GSNSW's 30 products and services is presented in Appendix Section 0. Most of GSNSW's current products and services are provided by the comparator geological surveys with the following exceptions:

- Geo-tourism maps / brochures, which GSV and GSWA do not provide.
- Geotours app, which GSV and GSWA do not produce. Although GSSA does not have an app, they provide a similar online product called Discovery Trails that is a visual tour of the geological history of a region.
- Government Geotechnical Report Database, The Seamless Geology of NSW, Factsheets - commodity fliers, Mineral exploration highlights map and Mobile phone maps, which GSSA does not provide.
- GSSA does not currently have an equivalent to GSNSW's Seamless Geology product. They are however, examining the GSNSW product as they develop their own geological mapping approach.
- GSV and GSWA advised that they have stopped producing printed maps, instead migrating to digital delivery, such as GSNSW has done with Seamless Geology. Additionally, GSV and GSWA are moving away from grid maps (standard map sheets covering the whole of the land mass) and towards unit-based or terrain-based maps. This reflects the increasing focus on priority areas with greater opportunity for exploration. Stakeholders interviewed indicated printed maps and books and brochures are labour intensive, and that:

"Anything printed is obsolete." – Member of a geological survey

"The delivery of seamless, digital, scalable mapping data will be a benchmark that all geological surveys will need to meet in future and GSNSW is well ahead of this curve." – Member of a geological survey

- GSNSW staff agree that printed maps are time consuming and resource intensive to produce. This could be stopped, in favour of transitioning to digital maps, and is occurring, with the incorporation of standard geological map sheets into The Seamless Geology of NSW.
- Neither GSV nor GSWA conduct geotourism. However, GSWA provides technical input to support geotourism activities conducted by the Government, including the production and promotion of geotourism fossicking maps. GSV and GSWA suggested geotourism may deliver community benefits

but is not consistent with its role of delivering information based on potential market failures. One geological survey wants to support geotourism but indicated that this is not core business.

TABLE 4.1 GSNSW'S PRODUCTS AND SERVICES

Type of product / service	Product or service
Assessment and advice	<ol style="list-style-type: none"> 1. Assessment of exploration reporting and work programs 2. Geoscientific advice to other agencies
Collections, publications and libraries	<ol style="list-style-type: none"> 3. Drillcore libraries 4. Explanatory notes 5. Government Geotechnical Report Database 6. Mineral resources library 7. Peer reviewed scientific publications 8. Presentations 9. Reference collections 10. Scientific abstracts
Data services	<ol style="list-style-type: none"> 11. Company exploration reports 12. Drillcore scanning services 13. Geophysical images and data 14. Geoscience data resources 15. GIS web services 16. Online services 17. The Seamless Geology of NSW
Education and outreach	<ol style="list-style-type: none"> 18. Books and brochures 19. Factsheets - commodity fliers 20. Field excursion guides 21. Geotourism maps / brochures 22. NSW Geotours app
Maps	<ol style="list-style-type: none"> 23. 3D geological mapping data 24. Metallogenic maps 25. Mineral exploration highlights map 26. Mineral potential mapping 27. Mobile phone maps 28. Special purpose maps - general public 29. Special purpose maps - technical audience 30. Standard geological map sheets

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW

The stakeholders interviewed for this Review were mostly senior, NSW government agency representatives or industry representatives and so often lacked exposure to individual products and services (see Section 1.3).

The majority of respondents to the survey of end users (63 per cent, 20 of 32) believe industry or the research sector are not better placed to deliver any of the products or services currently delivered by GSNSW (see Appendix Section B.3.2). Exceptions to this included mobile phone maps (13 per cent, 4 of 32) and special purpose maps for the general public (9 per cent, 3 of 32).

4.2 Product and service usage

In order to deliver public value, the products and services need to be used and valued by stakeholders. Data on the use of GSNSW's products and services has been obtained from GSNSW, interviewed stakeholders and from the survey of end users. This data and perceptions from stakeholders show that the users of GSNSW's products and services include, but are not limited to,

Government (state and local), industry, research organisations and other geological surveys. The end users and the products and main services they use are:

- Industry stakeholders primarily use online services, GIS web services and The Seamless Geology of NSW.
- Government (state and local) stakeholders primarily use The Seamless Geology of NSW, DIGS and Common Ground, assessment of exploration reporting and work programs, and geoscientific advice, including advice which informs regional development, land use and planning decision-making (based on a limited response).
- Research organisations use expertise and experience provided through partnerships such as the MinEx CRC and other collaborative projects. From the survey, examples of commonly used products and services include online services, geophysical images and data and standard geological map sheets.
- Representatives of geological surveys use The Seamless Geology of NSW, mineral exploration highlights maps, mineral potential mapping and online services (based on a limited response).

Interviewed stakeholders also suggested that community groups are end users of GSNSW's products and services. They are perceived to use products and services that provide general and simplified geological information, for example, geotourism products, newsletters, field trips. However, community members were not consulted as part of this review.

As discussed in Section 3.2.6 and Appendix E, GSNSW partners with numerous collaborators who use GSNSW's expertise, experience and resources. GSNSW is currently involved in approximately eleven collaborative programs and projects including the MinEx CRC, Mineral potential mapping and AuScope National Virtual Core Library.

The survey of end users identified the frequency of use across GSNSW's products and services (Figure 4.1). This does not necessarily indicate the quality of the product or service. The products and services with the highest number of users are 'geoscience data resources' (29 of 32 respondents), 'standard geological map sheets', geophysical images and data, online services (each used by 28 of 32 respondents) (Figure 4.1). The products least frequently used are the 'NSW Geotours app' (7 of 31 respondents), 'factsheets – commodity fliers' and Geotourism maps / brochures (each used by 10 of 32 respondents). This reflects the demographics of the respondents, who were primarily from industry.

The products and services most commonly used:

- daily was 'online services' (8 of 32 respondents)
- weekly was 'The Seamless Geology of NSW' (11 of 32 respondents)
- monthly was 'Geoscience data resources' (12 of 32 respondents)
- a few times a year was 'Presentations' (17 of 32 respondents)

Survey responses disaggregated by respondent type are provided at Appendix B.3.1.

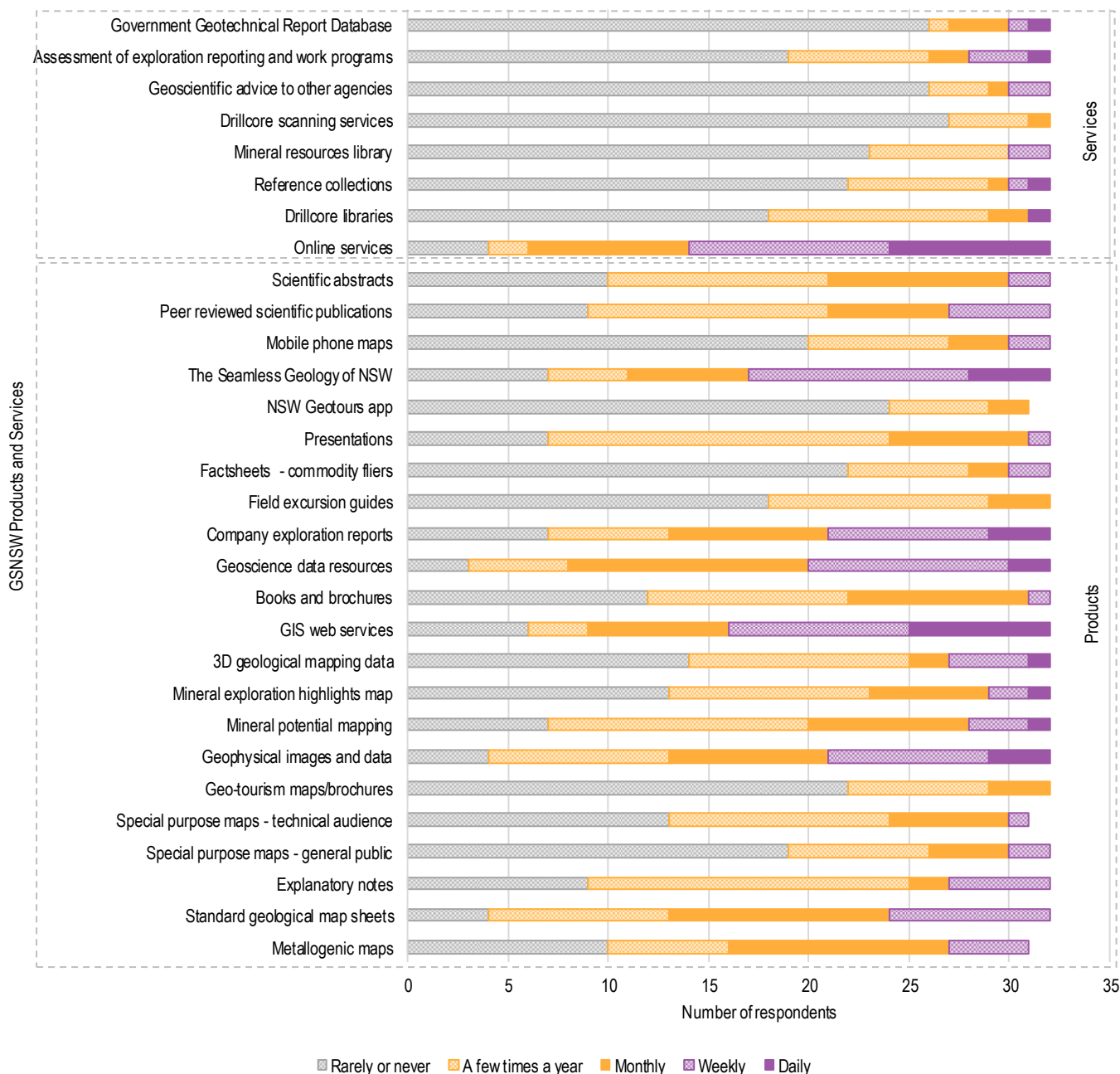
4.3 Outcome achievement

The analysis below is presented according to the type of outcomes delivered by GSNSW and GSNSW's products and services: social, economic and environmental. A review of the literature identifies that significant economic and social benefits are derived from geological surveys and geological initiatives. See Section 2.4.1 for a summary of previous reviews.

The majority of respondents (81 per cent, 26 of 32) agreed that GSNSW's products and services deliver social, economic, commercial and environmental benefits. Survey respondents identified (Figure 4.2) six products and services as delivering the most benefits to their organisation:

- Company exploration reports, 41 per cent (13 of 32)
- Geophysical images and data, GIS web services and The Seamless Geology of NSW, all 34 per cent (11 of 32)
- Standard geological map sheets and Geoscience data resources, both 22 per cent (7 of 32)

FIGURE 4.1 FREQUENCY OF PRODUCT AND SERVICE USE BY ALL RESPONDENTS

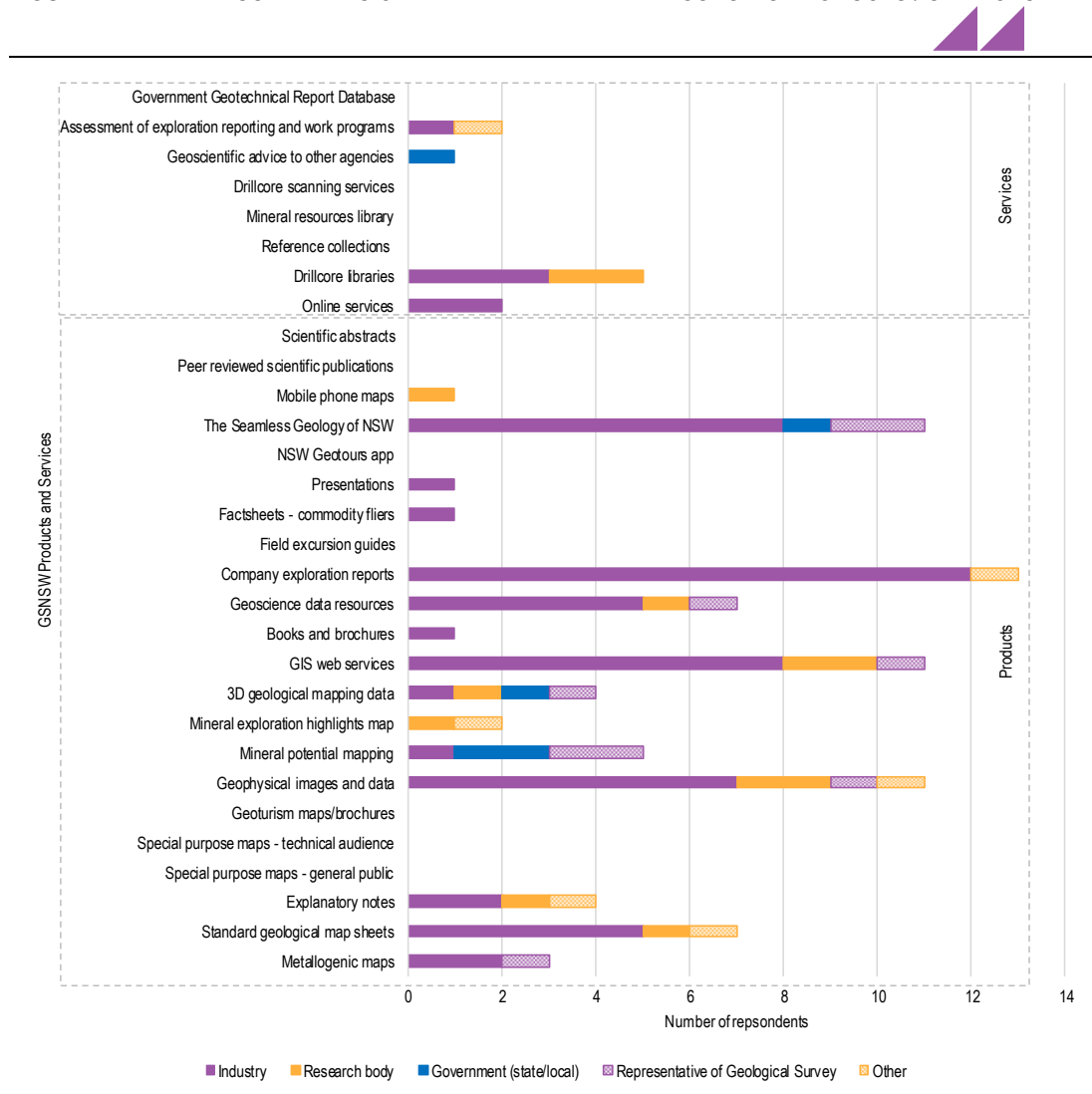


This graph relates to the survey question: How frequently do you use the following GSNW products? This shows combined data for use on the basis of daily, weekly, monthly and a few times a year. Number of respondents = 32, except for metallogenic maps, special purpose maps – technical audience, and NSW Geotours app where number of respondents = 31.
 SOURCE: SURVEY OF GSNW'S END USERS.

These six products and services are practical products that are integral to exploration and planning by industry and industry organisations. These findings likely reflect the large proportion of industry survey respondents. Industry respondents varied widely in their use of GSNW's products and services.

The economic and commercial benefits co-occurred across the products and services, while products that delivered high social benefit were less likely to be identified as delivering economic or commercial benefits. Respondents least frequently identified that the products and services delivered environmental benefits.

FIGURE 4.2 END USER VIEWS ON BENEFIT DELIVERED BY GSNSW'S PRODUCTS / SERVICES



This graph relates to the survey question: Which products / services deliver the greatest benefit to your organisation / members? (Select top 3). Number of respondents = 32

SOURCE: SURVEY OF GSNSW'S END USERS

The greatest benefits achieved across the products and services were, in order of magnitude, economic, commercial, social and environmental. Survey respondents identified the products and services delivering the most benefits as:

- Economic benefits: Geoscience data resources, The Seamless Geology of NSW, Geophysical images and data and GIS web services. GSNSW staff also identified online services.
- Commercial benefits: Mineral potential mapping, Geoscience data resources, The Seamless Geology of NSW and Online services.
- Social benefits: NSW Geotours app, Geo-tourism maps / brochures, Field excursion guides and Online services.
- Environmental benefits: Online services, Geoscientific advice to other agencies, GIS web services and The Seamless Geology of NSW.

These findings likely reflect the large proportion of industry survey respondents who generally placed lower value on social and environmental outcomes. This is important to note, considering that a recommended role for GSNSW is to provide pre-competitive data.

In addition to the above, GSNSW staff also identified that exploration reporting and work programs had economic benefits, Government Geotechnical Report Database had social benefits and

geoscientific advice (including planning advice, Conceptual Project Development Plans advice, advice to former OEH and Department of Primary Industries) had environmental benefits.

The majority of survey respondents identified that GSNSW delivered the following specific benefits (see Appendix Section B.3.3):

- increased knowledge of location or characteristics of geological resources (81 per cent, 26 of 32)
- increased understanding of the value of geological knowledge (56 per cent, 18 of 32)
- facilitated their organisations' expansion of existing mining operations (56 per cent, 18 of 32)
- reduced their organisations' risk of exploration of mining activities (50 per cent, 16 of 32)
- provided support to conduct research (50 per cent, 16 of 32).

Survey respondents indicated GSNSW could benefit many other organisations, including (see Appendix Section B.3.3) primary and secondary education sectors and landholders (each 84 per cent, 27 of 32), industry investors (81 per cent, 26 of 32), geoscientific researchers (78 per cent, 25 of 32) and water users (75 per cent, 24 of 32).

GSNSW staff were asked to identify the top three products and services they believe produce the greatest social, economic and environmental outcomes. The most commonly identified products and services that produce benefits were, by benefits category:

- Economic:
 - Assessment of exploration reporting and work programs.
 - Regional developments advice.
 - Government Geotechnical Report Database. Staff noted this is essential for urban planning.
 - Geoscience data resources.
 - Online services. An example of this is company exploration reports. These are released on an annual basis at the end of a mining title and were noted as essential for industry stakeholders.
- Social: planning advice, followed by Government Geotechnical Report Database, geoscience data resources and online services, and Geotourism maps / brochures and NSW Geotours app.
- Environmental: planning advice, followed by Conceptual Project Development Plans advice and geoscientific advice to other agencies. Regional developments advice was also identified. Geoscientific advice included advice to former Office of Environment and Heritage, Department of Primary Industries – Water and in reserve establishment. Other important products and services mentioned were the Seamless Geology of NSW, important for a range of land use planning activities, and the DIGS database, important for company exploration reports and environmental reports.

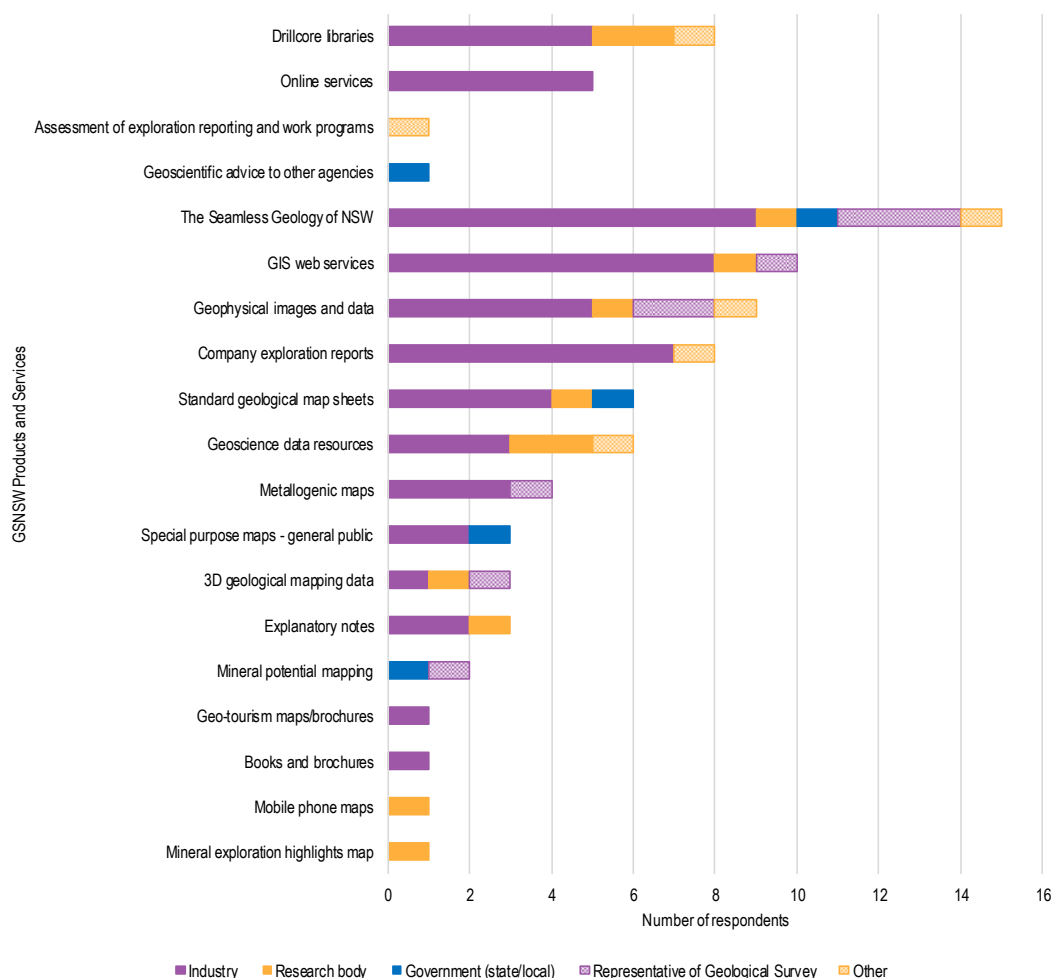
GSNSW Staff consider that the Geoscientific data service warehouse (containing MinView) is essential for providing industry and researchers with an understanding of the work that has already been conducted to inform new exploration in the area.

The results from the survey of end users show some differing views to GSNSW staff on the benefits of products and services:

- Economic benefits: end user survey respondents were more likely to identify products that they use, such as geoscience data resources and The Seamless Geology of NSW. This likely reflects the higher response level from industry. As well as identifying geoscience data resources, GSNSW staff identified strong economic value for regional developments advice (likely used predominantly by government), and assessment of exploration reporting and work programs.
- Social benefits: these were similar between GSNSW staff and the survey of end users.
- Environmental benefits: overlapped between GSNSW staff and the survey of end users, including Geoscientific advice to other agencies and The Seamless Geology of NSW.

Respondents were asked to identify the products / services they were most (Figure 4.3) and least (Figure 4.4) satisfied with. Respondents were most satisfied with:

- The Seamless Geology of NSW (47 per cent, 15 of 32)
- GIS web services (31 per cent, 10 of 32)
- Geophysical images and data (28 per cent, 9 of 32)

FIGURE 4.3 PRODUCTS OR SERVICES RESPONDENTS ARE MOST SATISFIED WITH

This graph relates to the survey questions: Which products / services are you most satisfied with? (Select top 3). Number of respondents = 32.
 SOURCE: SURVEY OF GSNW'S END USERS.

Overall, industry is most frequently satisfied with products and services that supported their work, such as Drillcore libraries, online services, the Seamless Geology of NSW, GIS web services and company exploration reports. Government stakeholders commented on their satisfaction with only a few products and services and representatives of other geological surveys all indicated their satisfaction with the Seamless Geology of NSW. This reflects the stakeholder interview findings.

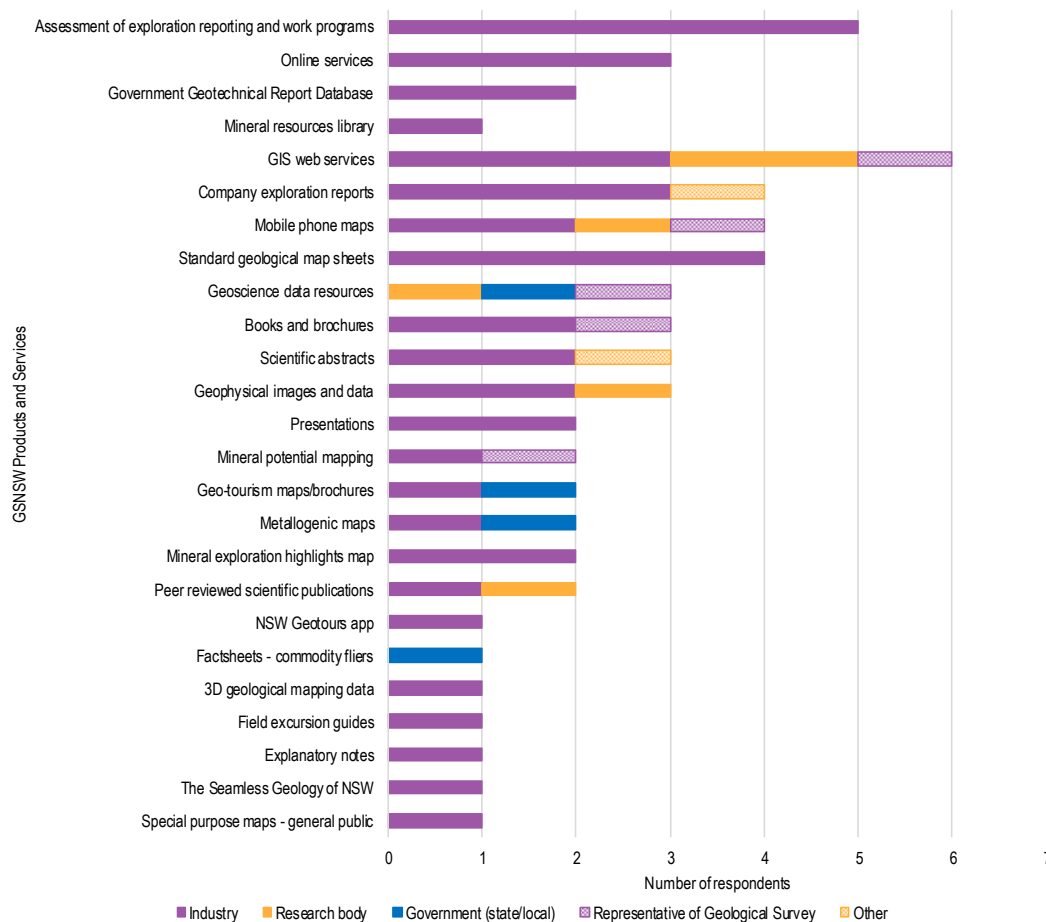
Respondents were least satisfied with (Figure 4.4):

- GIS web services (19 per cent, 6 of 32)
- Assessment of exploration reporting and work programs (16 per cent, 5 of 32)
- Mobile phone maps, company exploration reports and standard geological map sheets (each 9 per cent, 3 of 32).

These results show respondents were generally satisfied with the products and services they use, with fewer respondents indicating they were least satisfied with certain products and services.

Respondents were most satisfied with the products and services they believe deliver the most benefit (Figure 4.2). The survey provided some conflicting results, reflecting a diversity of views among respondents. For example, respondents frequently identified GIS web services as a service they were most and least satisfied with.

There is correlation between the frequency of use (Figure 4.1) and the level of satisfaction (Figure 4.3, Figure 4.4), indicating survey respondents are satisfied with the GSNW products and services that they use, but were unable to comment on the products and services they were not familiar with.

FIGURE 4.4 PRODUCTS OR SERVICES RESPONDENTS ARE LEAST SATISFIED WITH

This graph relates to the survey questions: Which products / services are you least satisfied with? (Select top 3). Number of respondents = 32.
SOURCE: SURVEY OF GSNSW'S END USERS.

4.4 Trust and legitimacy

This aspect of the public value framework focuses on the concepts of trust, transparency, fairness and legitimacy. Trust is essential for an organisation to achieve maximum uptake of its products and services and thus maximum benefit. This was confirmed in the 2018 Fraser Institute Annual survey of mining companies, which showed that 50 per cent or more of survey respondents agreed lack of transparency in NSW is a deterrent to investment.⁷⁷

Most stakeholders interviewed trust GSNSW and its products and services and consider it a legitimate source of information. This is based on their reputation as experts in the geological sciences. There were a few exceptions, where a small number of industry stakeholders interviewed encountered some mapping issues, however, these appear to be isolated issues.

Stakeholders interviewed had conflicting views on GSNSW's transparency. Whilst some stakeholders believe GSNSW is transparent, others disagreed and wanted to know more about how the fees they pay are being used:

- One stakeholder working across multiple states believed that other geological surveys are more transparent.

⁷⁷ Stedman, A. & Green, K.P. (2018). *Fraser Institute Annual survey of mining companies 2018*. Canada: Fraser Institute.

- Industry stakeholders all agreed they do not understand how fees collected from mining companies are allocated and spent, including those that are hypothecated. As such they lack confidence that industry levies and fees are used in an appropriate manner.

“Cost recovery is nonsense. Cost recovery in the geoscience space is counterproductive due to footloose clientele. It puts up a barrier to investment – they will move to another state or country where there are no barriers.” – Member of a geological survey

- Industry stakeholders interviewed all agreed that GSNSW does not engage extensively enough regarding the activities and efforts of GSNSW, particularly pre-competitive data acquisition efforts, incorporate the feedback provided by industry, or communicate the importance of certain actions (which relates to the absence of an overarching strategy).

“There is a frustration of lack of consultation about where funds are expended. There is no concerted effort to listen to the exploration community. Real effort to listen and take on feedback.” – Industry stakeholder

“I disagree with some of their programs however there is little consultation. I think the geological survey wants to do more consulting however their structure doesn’t allow them to do so.” – Industry stakeholder

- Most industry stakeholders interviewed indicated GSNSW’s purpose and objectives were not well articulated. They do not understand why GSNSW performs certain actions and how these actions support GSNSW to meet its strategic objectives. This was identified as a barrier to GSNSW, as a whole, conducting deeper, more meaningful and more efficient collaboration with industry. Stakeholders believe that their expectations and relationships could be better managed through the provision of greater clarity on GSNSW’s roles and financial transparency.

“There doesn’t appear to be an open strategy for the GSNSW. Other states do have this.” – Member of a geological survey

Communication and engagement between GSNSW and its stakeholders occur through weekly newsletters, the MinEx CRC, the Chief Geologists Forum (particularly for communication across geological surveys) and various industry stakeholder committee meetings.

Some industry stakeholders interviewed noted they lack an effective communication avenue through which they can discuss issues with GSNSW staff. They reported difficulties with direct communication due to staff movements. Stakeholders who have limited communication with GSNSW had little knowledge of what GSNSW does or how GSNSW’s role differs from that of the Department.

End users were asked their opinion on whether GSNSW is trustworthy, legitimate and transparent. In general, most survey respondents believe GSNSW is trustworthy, legitimate and transparent (agree or strongly agree). More specifically (Figure 4.5):

- 94 per cent of respondents (30 of 32) believe that GSNSW is a legitimate source of information
- 84 per cent of respondents (27 of 32) trust that GSNSW provides them or their organisation with high-quality product or services
- 75 per cent of respondents (24 of 32) believe GSNSW provides products / services in a transparent way
- 63 per cent of respondents (20 of 32) trust GSNSW as partners in producing products / services that suit their organisation’s needs.

Of those that trusted GSNSW, respondents identified the following factors as contributing to their trust:

- GSNSW staff are technical experts in their fields (eight respondents), for example:

“[GSNSW] Comprises extensive deep domain expertise with a long history of providing fit-for-purpose data, information and advice.” – Government

- Respondents have had positive experiences engaging with GSNSW staff, including information sharing (seven respondents), for example:

“Open communication. Prepared to sit, listen, compromise and discuss.” – Industry

- GSNSW produces high quality data (five respondents), for example:

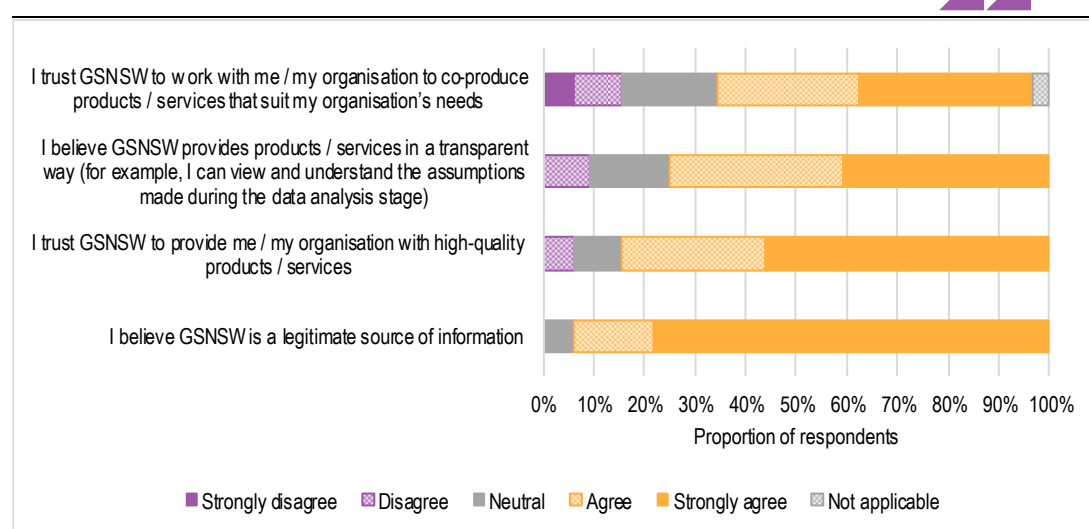
“The quality of GSNSW’s work has always been very high and builds continually on cohesive historic data sets, the non-commercial basis of the work carried out has been essential to the non-biased and very high standard of scientific work.” – Industry

- Repeated use of the information (three respondents) and advice (two respondents) generated by GSNSW, for example:

“Everything I’ve had to do with GSNSW staff and employees has been positive and open to discussion and collaboration.” – Research body

- Other less frequently mentioned comments were the fit-for-purpose nature of the data, information and advice provided to the respondents (two respondents), GSNSW’s focus on service the public (two respondents) and lack of political motives (two respondents).

FIGURE 4.5 TRUST AND LEGITIMACY OF GSNSW



This graph relates to the survey question: Do you agree or disagree with the following statement. Number of respondents = 32.

SOURCE: SURVEY OF GSNSW’S END USERS.

4.5 Service delivery quality

Service delivery quality was assessed in terms of responsiveness, engagement, accessibility and convenience. The service delivery standards were introduced to applications under the *Mining Act 1992* which were lodged from 1 July 2013.⁷⁸ The purpose of the service delivery standards is to allow industry to manage operations and deadlines around the expected waiting times for mineral and coal applications.

Part of DRG’s public reporting to stakeholders involves quarterly performance reporting against the service delivery standards. This is regularly reviewed by NSW Minerals Council and the Association of Mining and Exploration Companies to identify opportunities for improvement.⁷⁹ In 2018 The Fraser Institute ranked NSW as 21st out of 80 jurisdictions around the world in relation to the quality of its geological database, with South Australia ranked 12th, Western Australia 13th and Victoria 38th.⁸⁰ GSNSW staff expressed a strong commitment to the quality of the product delivered, but felt that this is compromised at times due to limited resources.

Most stakeholders interviewed agreed that at a general level, GSNSW’s products and services are high-quality, easily accessible and timely public goods. Two industry stakeholders claimed to have

⁷⁸ Division of Resources and Geoscience (2019). *Service delivery standards*. Accessed 28 September 2019:

<https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/programs-and-initiatives/service-delivery>.

⁷⁹ Division of Resources and Geoscience (2019). *Service delivery standards*. Accessed 28 September 2019:

<https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/programs-and-initiatives/service-delivery>.

⁸⁰ Fraser Institute (2018). *Fraser Institute Annual Survey of Mining Companies 2018*. Accessed 18 September 2019:

<https://www.fraserinstitute.org/sites/default/files/annual-survey-of-mining-companies-2018.pdf>.

encountered data inaccuracies. However, this issue is largely related to data submitted to GSNSW by companies.

4.5.1 Quality

Overall, most respondents agree or strongly agree that GSNSW has good service delivery quality, as the products or services are (Figure 4.6):

- easy to access (84 per cent, 27 of 32)
- provided with support from GSNSW and the products / services meets their needs (each 75 per cent, 24 of 32), whereas 29 per cent of respondents use other sources of NSW geological data because they better meet their needs (Figure 4.12)
- sufficiently detailed and fit-for-purpose (each 72 per cent, 23 of 32), whereas 39 per cent of respondents use other sources of NSW geological data because they are more fit for purpose (Figure 4.12).

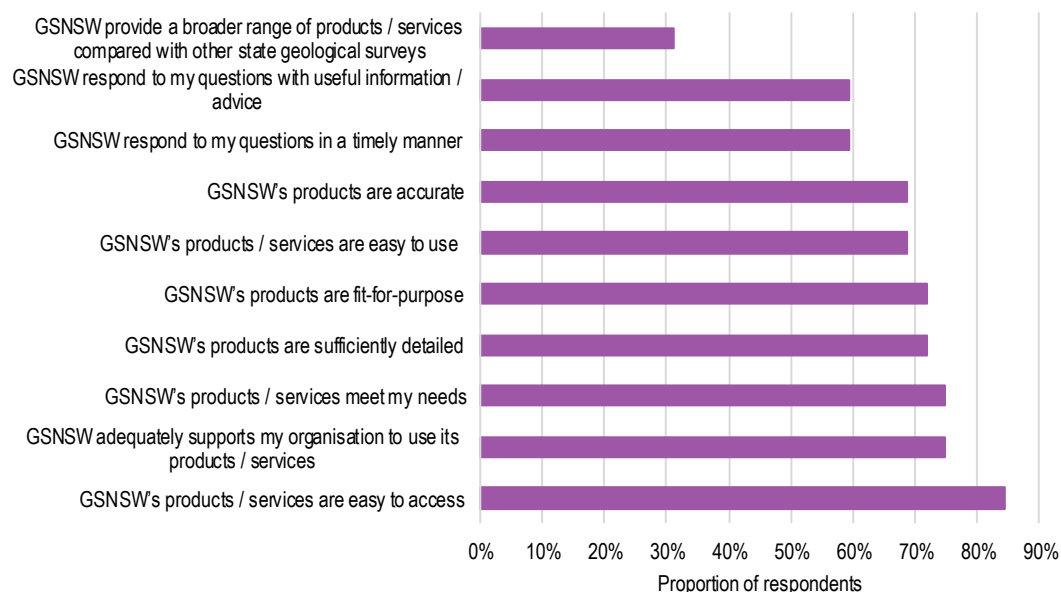
This contrasts with the data provided in Figure 4.1, which suggests that many respondents do not use GSNSW services. This likely reflects the general nature of the survey question, which did not distinguish between products and services.

Respondents were least likely to agree that GSNSW provides a broader range of products and services compared with other Australian geological surveys (19 per cent, 6 of 32).

Respondents noted that GSNSW is indispensable (two respondents), expert and unbiased (two respondents), and cannot be replaced by the private or research sectors (two respondents).

“The GSNSW is a world class geological survey which has provided advice, products and services to all its stakeholders for nearly 150 years. It has immense public value.” – Industry respondent

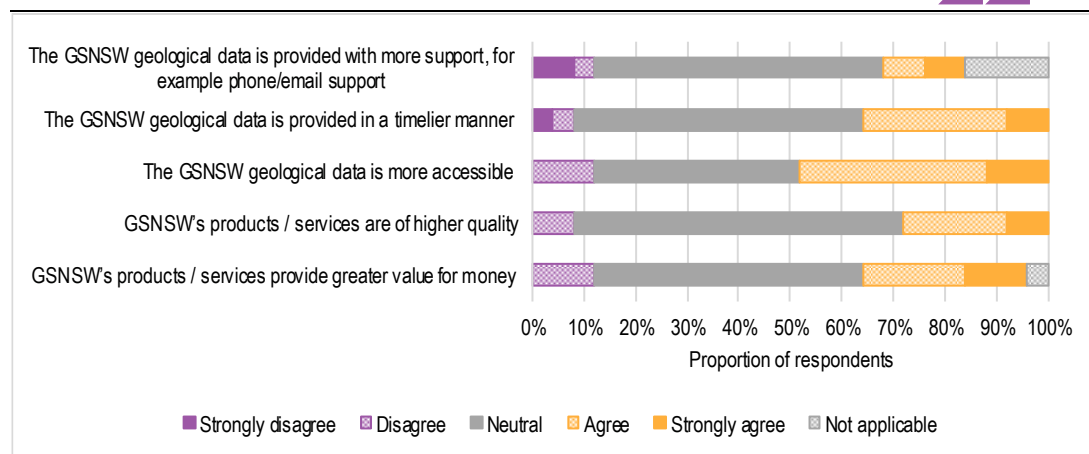
FIGURE 4.6 END USERS VIEWS ON GSNSW'S SERVICE DELIVERY QUALITY



This graph relates to the survey question: In general, to what extent do you agree or disagree with the following statements. Number of respondents = 32.
SOURCE: SURVEY OF GSNSW'S END USERS.

In comparing their experiences of GSNSW with other geological surveys, the majority of respondents were neutral as to whether their experience with GSNSW is better than with other geological surveys (Figure 4.7). Respondents were most positive about the accessibility of GSNSW's geological data (48 per cent, 12 of 25) and most negative about whether GSNSW provides more support (12 per cent, 3 of 25).

FIGURE 4.7 END USERS EXPERIENCE WITH GSNSW COMPARED TO OTHER GEOLOGICAL SURVEYS



This graph relates to the survey question: Compared with your experience with other geological survey(s), please rate your experience with GSNSW in terms of the following statements:

Note: Number of respondents = 25.

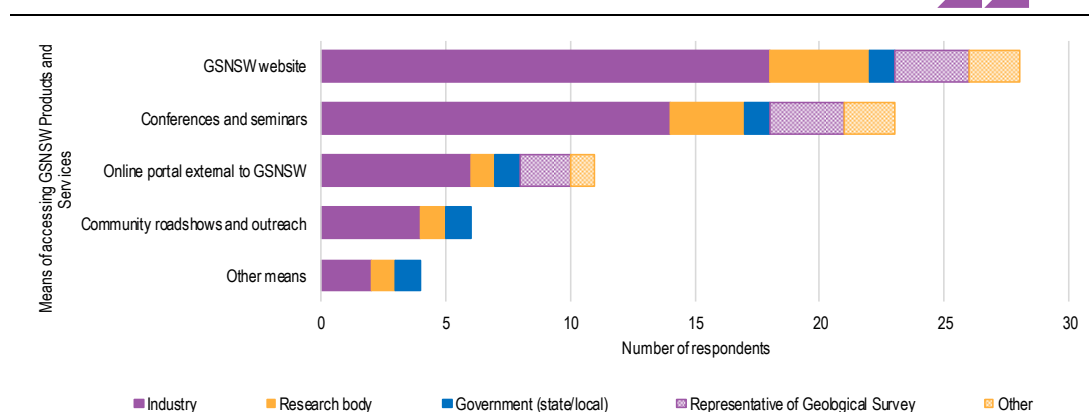
SOURCE: SURVEY OF GSNSW'S END USERS.

4.5.2 Accessibility

The online availability of a number of GSNSW's products and services is seen as central to increasing accessibility. MinView and DIGS were commonly identified examples of online products. Some stakeholders interviewed suggested the general accessibility of GSNSW's resources (including advice) could be improved through relocation to Sydney city. This would bring GSNSW into closer proximity with its stakeholders.

Respondents access GSNSW's products or services through a range of methods (Figure 4.8). The most common methods are through the GSNSW website (88 per cent, 28 of 32) and conferences and seminars (72 per cent, 23 of 32). This highlights the importance of maintaining technology and data infrastructure, as identified by stakeholders (section 0). This is also identified as a priority by GSNSW staff.

FIGURE 4.8 HOW END USERS ACCESS GSNSW PRODUCTS OR SERVICES



This graph relates to the survey question: My organisation accesses GSNSW's products / services through: Tick all that apply. Number of respondents = 32.

SOURCE: SURVEY OF GSNSW'S END USERS.

Other less common methods include online portals external to GSNSW (34 per cent, 11 of 32) and community roadshows (19 per cent, 6 of 32).

Access to products and services is relatively consistent across the stakeholder categories, noting that representatives of geological surveys and other respondents did not access products and services via community roadshows and outreach or other means.

4.5.3 Collaboration, engagement and convenience

GSNSW staff are highly regarded by the stakeholders consulted as experts in their field, collaborative, friendly and responsive to their requests for assistance. Collaboration varies across stakeholder groups. Some stakeholders provide geological data to GSNSW and partner with GSNSW to generate geological data.

All NSW Government agencies and research bodies interviewed claimed to collaborate with GSNSW in some way. This included using GSNSW as a source of advice, knowledge and skills transfer (NSW Government stakeholders), funding (research stakeholders) and research / project partner (research stakeholders). Some Government stakeholders consider GSNSW to be more responsive and collaborative than their counterparts in other states, or other government departments. One example of this is the *Southern Thomson Orogen Project*, which was undertaken to acquire and interpret multi-disciplinary geophysical, geochemical and geological data.⁸¹ This project was jointly delivered by GSNSW, GSQ and Geoscience Australia.

“The state geological surveys work well together, share initiatives and collaborate where appropriate.” – Research stakeholder

“We have regular collaboration with GSNSW – at least once per month, or more, through project level meetings and strategy discussions.” – Research stakeholder

“We use information sourced from GSNSW to develop status report projects. GSNSW is handy because they are independent and have a regional outlook.” – Government stakeholder

“We find them really good and easy to work with. They try to understand our needs and how they can best meet these. This is especially the case now, perhaps not 30 years ago. The relationships have gotten better over time.” – Government stakeholder

“It is challenging to compare across Departments because the scope of GSNSW’s advice is typically very narrow and is based on leveraging their datasets. In that context, it is the most thorough dataset out of all the states resource datasets – it’s over 100 years old and represents a big investment.” – Government stakeholder

As a whole, GSNSW’s collaboration with industry is significantly lower and could be strengthened. One industry stakeholder interviewed commented that GSNSW’s attempts to involve industry are often too late, and that GSNSW needs to collaborate with industry *before* a product or service is offered.

“GSNSW asks for our input really late – this isn’t enough time to share with members and get their input. The two members in the room can’t speak for all of industry.” – Industry stakeholder

Survey respondents collaborate with GSNSW by providing geological data to GSNSW, partnering with GSNSW to generate geological data, information and advice. Collaboration with GA and GSV is regular, with formal agreements in place. Collaborative efforts with GSWA and GSSA could be improved.

“We help each other where we can, noting that geology does not stop at the borders.” – Member of a geological survey

4.5.4 Responsiveness

Stakeholders interviewed generally regard GSNSW as responsive to change, such as changes in regulation, technology and the environment. When compared with other agencies, one stakeholder regarded GSNSW as ‘very responsive’, and another regarded GSNSW as an early adopter of technology with more technical capability compared to other state geological surveys.

⁸¹ NSW Department of Resources and Geoscience. (2019, August 24). Southern Thomson Orogen Project. Retrieved from <https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/geoscience-information/projects/southern-thomson-orogen-project>

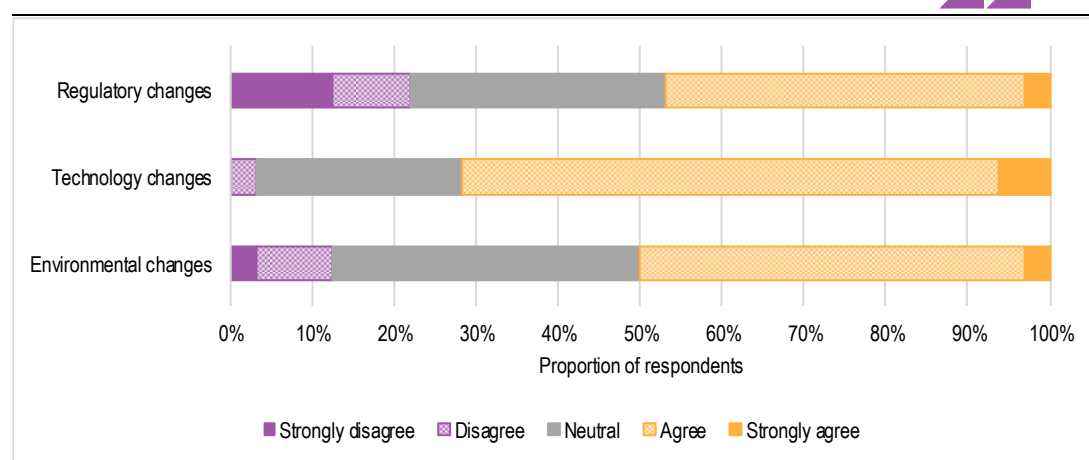
“Yes, they are responsive to technology changes specifically. This is a big ask given the changes in technology – but they have moved pace with the changing information.” – Industry stakeholder

“Yes, as best they can - all geological surveys suffer from this – they are not large organisations but need to continually do more. They need to be agile, which requires resources.” – Research stakeholder

“I think they are responsive because they are proactively working with our teams where it is relevant to do so.” – Government stakeholder

Survey respondents were asked whether they agree or disagree that GSNSW and its products or services are responsive to changes in regulation, technology and the environment. Most respondents believe that GSNSW and its products or services are responsive to changes in technology (72 per cent, 23 of 32). Fewer respondents agree that GSNSW and its products or services are responsive to environmental (50 per cent, 16 of 32) or regulatory (47 per cent, 15 of 32) changes (Figure 4.9).

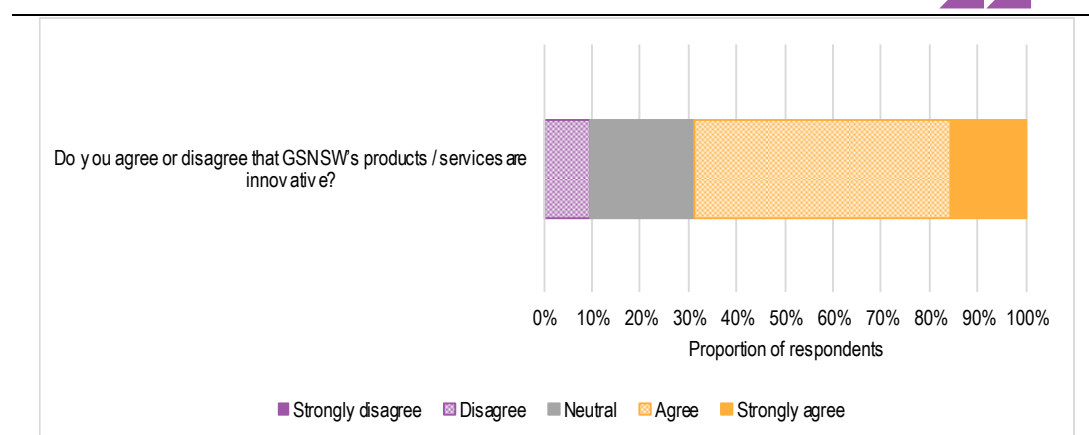
FIGURE 4.9 END USERS VIEWS ON GSNSW RESPONSIVENESS TO REGULATORY, TECHNOLOGY AND ENVIRONMENTAL CHANGES



This graph relates to the survey question: Do you agree or disagree that GSNSW and its products / services respond to. Number of respondents = 32.
 SOURCE: SURVEY OF GSNSW'S END USERS.

Most respondents also agreed that GSNSW's products or services are innovative (69 per cent, 22 of 32, Figure 4.10).

FIGURE 4.10 END USERS VIEWS ON WHETHER GSNSW'S PRODUCTS / SERVICES ARE INNOVATIVE



This graph relates to the survey question: Do you agree or disagree that GSNSW's products / services are innovative? Number of respondents = 32.
 SOURCE: SURVEY OF GSNSW'S END USERS.

SUMMARY OF PRODUCTS AND SERVICES

- The main users of GSNSW's products and services include Government, industry and research organisations. The broader NSW community is perceived to be an end user by some interviewed stakeholders.
- Stakeholders most commonly access GSNSW products and services online through the GSNSW website, which is central to promoting and facilitating user access.
- GSNSW collaborates with numerous partners from a range of sectors and organisations who use GSNSW's expertise, experience and resources. As a whole, GSNSW's collaboration with research organisations, industry and some other geological surveys could be improved.
- GSNSW has built a reputation of expertise and is consequently trusted and seen as legitimate. GSNSW staff are recognised as experts in their field, collaborative, friendly and responsive to their requests for assistance.
- GSNSW is not as transparent as stakeholders believe it should be, particularly around articulating their allocation and spending of fees and their purpose and objectives. Trust could be improved if industry felt they were heard and engaged more collaboratively.
- Stakeholders identified that GSNSW delivers a range of outcomes by providing products and services to a range of stakeholders, including economic, commercial, social and environmental outcomes. Primarily, these outcomes are economic, and GSNSW should primarily focus on delivering economic outcomes.
- The majority of products and services delivered by GSNSW are, at a high level:
 - also delivered by comparator geological surveys
 - broadly valued by stakeholders
 - considered appropriate for GSNSW to produce and would not be better produced by private or research sectors
 - considered high-quality, easily accessible and timely public goods.
- Some gains in efficiency could be achieved by ceasing production of printed products. Geotourism maps / brochures and the NSW Geotours app could be given lower priority, in line with comparators.

4.5.5 Areas for improvement

The suggestions for improvements received from survey respondents is presented below. In their view, GSNSW should:

- Engage and align with industry: lack of industry collaboration / consultation was consistently raised in interviews and across a number of questions in the survey. GSNSW needs to engage more with industry and align with their priorities, boost the promotion of GSNSW's activities, conduct more community outreach and education and be more responsive to change.

“Although the level of exploration expenditure for minerals in NSW has started to increase again, this rate would be accelerated if GSNSW listened more to industry and responded by implementing collaboratively-designed programs. This would significantly reduce the inherent exploration risk and would also fast-track the rate of new discoveries.” – Industry

“GSNSW needs to listen to the suggestions of the NSW exploration industry more thoroughly, and implement programs recommended by industry which will actually assist in the discovery of new mineral deposits in the minimum timeframe, which can be developed into the State's next generation of mines.” – Industry

“More community outreach and education on minerals and geology.” – Industry stakeholder

“GSNSW needs to engage with high schools and teach the principals of economic / environment with regard to geology.” – Industry
- Receive more funding and support from government (that is, shared services, such as legal services).
- Increase coordination with bordering states, collaborative drilling projects, innovation, mapping and compiling of company exploration data.

“More co-ordination with bordering states to ensure geological products and data are seamless across administrative boundaries.” – Representative of a geological survey
- Redevelop products and services, including DIGS, MinView and the GSNSW website.

“There is an abundance of really good information that should be made more accessible and may require a specialised team to create the portal and promote it.” – Industry

— Review GSNSW’s strategic direction.

“The issue is not the products that the GSNSW is delivering, the issue is the extremely poor prioritization and design of the programs of work that are going to generate new products in the future and how such programs are poorly considered and unaligned with the needs of industry and the long-term interests of NSW.” – Industry

4.6 Efficiency

In considering efficiency, this Review has been limited to a high-level assessment of effort distributed across GSNSW business units, resource distribution analysis across the other geological surveys, and resource distribution analysis across GSNSW business units.

4.6.1 Assessment of duplicative effort

Almost all activities and products and services delivered by GSNSW are also delivered by other state geological surveys. Because these are regionally focused, there is no duplication of effort. Similarly, GA undertakes some activities that are similar to GSNSW. However, the focus of these products and services is national, rather than state-based. GA plays a large role in coordinating the work of individual state surveys.

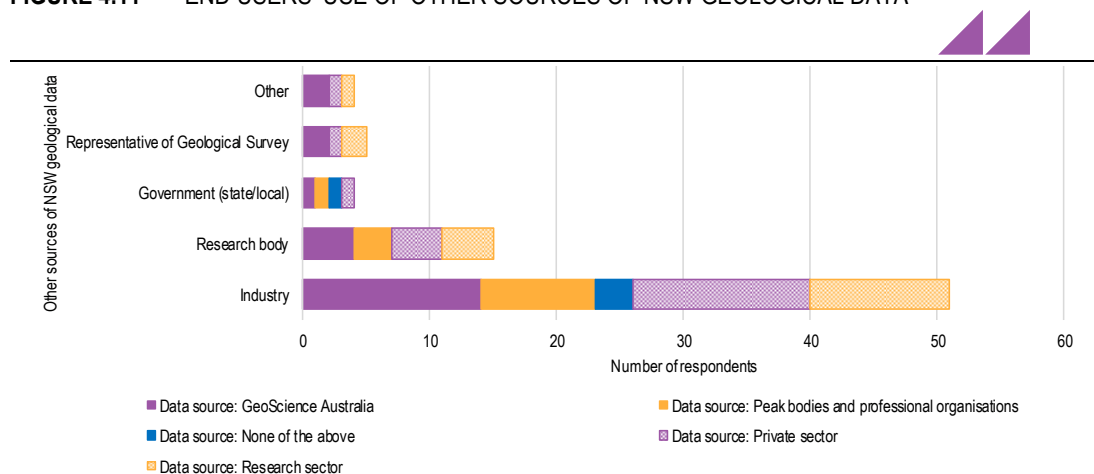
“No one’s duplicating anything, everything is additive.” – Government stakeholder

As previously discussed, NSW agency and research and geological surveys identified a number of areas where GSNSW collaborates. This is supported by GSNSW’s involvement in a number of collaborative projects and programs (Appendix E). Collaborative efforts are described as beneficial for all parties involved, due to the provision of special inputs, skills, and expertise by participating parties. The sharing of resources may result in cost savings, lead to efficiencies and reduce the risk of duplication of effort.

GSNSW’s collaboration is facilitated by sharing agreements, for example, agreements with industry to share, data or with universities to share equipment.

Survey respondents were asked about their use of other sources of NSW geological data (Figure 4.11). All respondents reported using NSW geological information from a range of sources, commonly Geoscience Australia and the private and research sectors. The type and nature of geological data sourced from non-GSNSW providers is not known. Other sources of geological data used by survey respondents include the research sector and peak bodies / professional organisations.

FIGURE 4.11 END USERS’ USE OF OTHER SOURCES OF NSW GEOLOGICAL DATA



This graph relates to the survey question: Which other sources of NSW geological data does your organisation obtain information from?

Note: Number of respondents = 32.

SOURCE: SURVEY OF GSNSW’S END USERS.

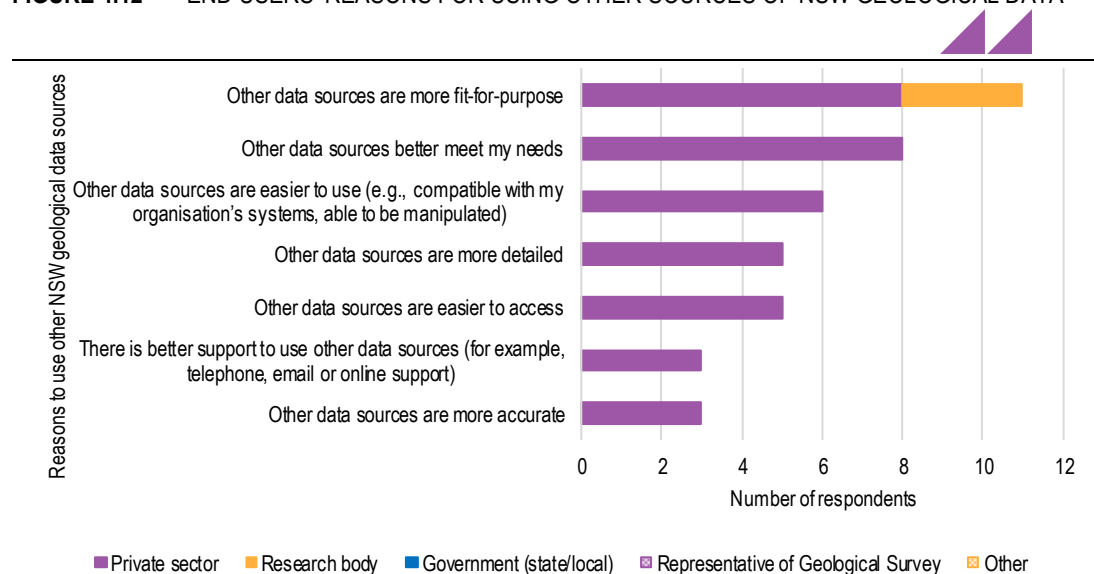
Survey respondents use other sources of NSW geological data because they (Figure 4.12):

- are more fit-for-purpose (39 per cent).
- better meet the respondents' needs (29 per cent)
- are easier to use (21 per cent)
- are more detailed and easier to access (both 18 per cent)
- are more accurate and have better support (both 11 per cent).

Fit-for-purpose data sources are particularly important for research organisation respondents. Only industry respondents provided an answer to the remaining reasons.

This appears to conflict with the survey responses provided in Figure 4.6, which shows that 72 per cent of respondents agree that GSNSW's products and services are sufficiently detailed and fit-for-purpose. This may result from respondents commenting on different aspects of the range of products and services they use.

FIGURE 4.12 END USERS' REASONS FOR USING OTHER SOURCES OF NSW GEOLOGICAL DATA



This graph relates to the survey question: Why do you use other NSW geological data sources instead of GSNSW sources?

Note: Number of respondents = 28.

SOURCE: SURVEY OF GSNSW'S END USERS.

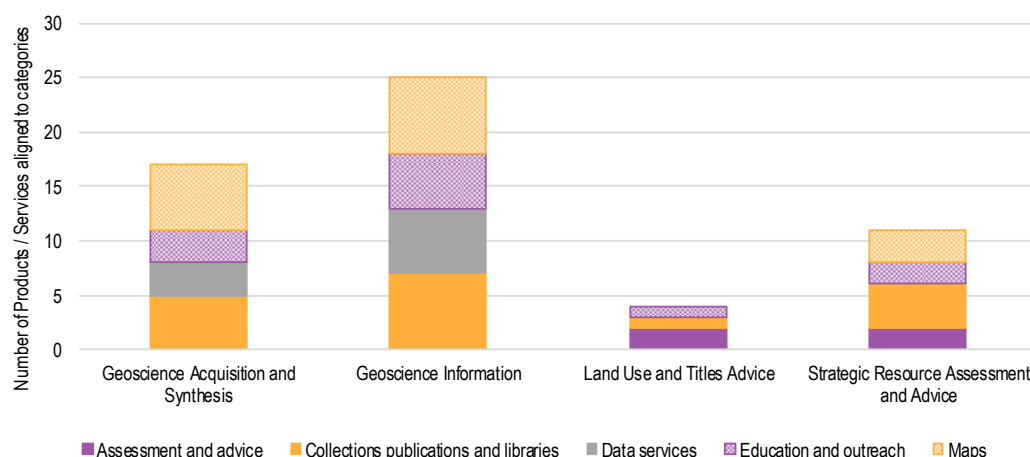
In summary, most respondents do not think that GSNSW duplicates geological information from other sources. A large portion of respondents access NSW geological data from other sources, such as Geoscience Australia, because the information is more fit-for-purpose and better meets their needs. They also access information from geological surveys of other states. Most respondents believe that their experiences with GSNSW are comparable to those with other geological surveys.

End users were asked whether GSNSW's products and services duplicate geological information from other sources. The largest proportion of respondents believe there is no duplication (59 per cent, 19 of 32).

4.6.2 Effort distribution analysis across GSNSW business units

Delivery of products and services across GSNSW business units

GSNSW's products and services have been mapped to business units (see Appendix I). Figure 4.13 presents the number of products and services aligned to each of GSNSW's business units. Given that the effort required to deliver different products and services varies, these findings do not indicate the workload of each business unit.

FIGURE 4.13 PRODUCTS AND SERVICES DELIVERED BY GSNSW BUSINESS UNITS

NOTE: MULTIPLE PRODUCTS AND SERVICES ALIGN TO EACH CATEGORY..

SOURCE: GSNSW DATA, PRESENTED BY ACIL ALLEN

Activities undertaken across business units

A number of GSNSW activities are undertaken by more than one business unit (see Appendix I). There is a notable degree of crossover between the GAS, LUTA and SRAA business units. This does not necessarily signal a duplication of effort, but rather, that multiple business units are involved in the delivery of an activity, or, business units are performing the same activity for different purposes. For activities that are not shared, the GI unit is predominantly the responsible business unit.

There is no information available on the effort distribution across comparator geological surveys. However, an analysis of the structure of GSNSW compared with the comparator geological surveys is provided in Appendix Section D.2. This shows that across the four geological surveys, GSNSW, GSSA and GSV have separate business units focused on geoscientific information management. GSWA has a more consolidated structure with only two business units. Similarly, the advisory services are a separate business unit for GSNSW, GSSA and GSV. Details of the sub-structures under GSWA's two business units were not available. There is no evidence from comparator geological surveys to suggest that the existing functional separation of GI and GAS should be changed.

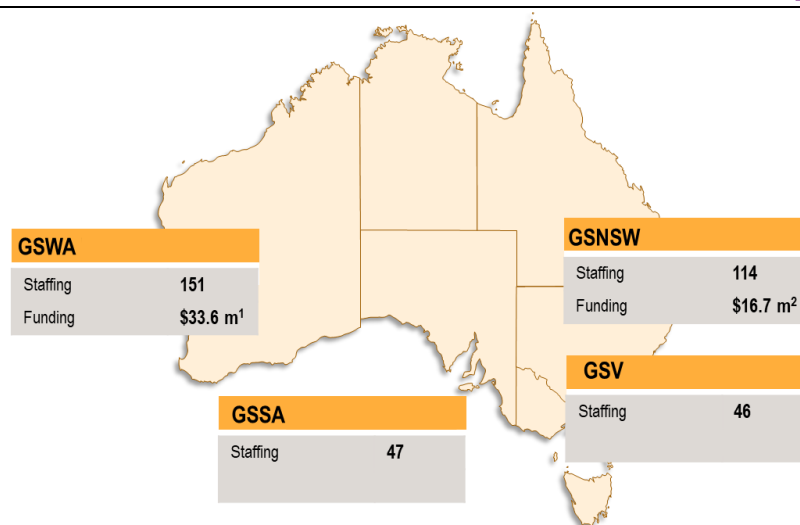
4.6.3 Resource distribution analysis across the geological surveys

Figure 4.14 provides the staff and funding figures of GSNSW, GSWA, GSSA, and GSV. Staff and funding figures provide an indicator of the relative size of the comparator surveys and provide, at a high-level, each survey's staff to funding ratio.

In comparison across the four surveys, by funding, GSNSW ranks as the third largest state geological survey, receiving \$16.7 million in funds in 2017-18. GSWA is the largest state geological survey, receiving almost double the amount of GSNSW's funding. In regard to staffing numbers, GSWA is again the largest survey, with 151 employees in 2017-18. Followed by GSNSW (141), GSSA (47), and GSV (46), respectively.

Resource distribution analysis across GSNSW business units

GSNSW staff highlighted the importance of maintaining data management and delivery to ensure high data quality prior to the release of company data reports in June 2021. This included adequately developing and managing data infrastructure. Further, staff also identified the need for an external outreach and education agenda. Staff identified that outreach and education are currently ad-hoc activities.

FIGURE 4.14 STAFF AND FUNDING OF AUSTRALIAN GEOLOGICAL SURVEYS 2017-18

¹ This figure excludes \$1.0 million of one-off, special funding.

² This figure excludes \$7.6 million of one-off, special funding. This relates to funding from the Coal Innovation Fund which is no longer part of GSNSW.

Note: this figure only includes GSNSW and the selected comparator state geological surveys (GSW, GSSA, and GSV). GSV and GSSA's funding information was provided on a confidential basis.

SOURCE: GSNSW 2017-18 BENCHMARKING TABLE, PRESENTED BY ACIL ALLEN

Some staff consider that the less important areas include coal and 3D models (companies are primarily concerned with raw data and therefore have less need for interpretive models). Some staff consider that external outreach activities are less important.

In 2018-19 GSNSW spent \$16.2 million. GAS expended the largest portion of the total budget (\$4.5 million), followed by GI (\$3.7 million), and then SRAA (\$3 million) and LUTA (\$2.8 million). The Executive Management Unit budget was \$2.1 million. With 26 employees, the GAS unit also has the largest portion of GSNSW's workforce (99 in total). Closely followed by GI (25 staff), and then SRAA (21 staff) and LUTA (20 staff). As GAS and GI receive the largest amount of funding and have the largest number of staff, it is essential that these business units in particular, and GSNSW overall, have strategic objectives to guide the purposeful acquisition, management and delivery of data.

4.6.4 Economic efficiency

In 2018-19, GSNSW received \$15.9 million in operating and labour expense budget, and spent \$16.2 million.⁸² A breakdown of funding sources and their contribution to GSNSW's 2018-19 expenditure⁸³ is presented below:

- NSW Consolidated Revenue - funding provided by NSW Treasury accounted for approximately 60 per cent of GSNSW's total expenditure and represents a cost to the state government. In 2018-19 the majority of these funds was invested in New Frontiers Initiative projects, and the remainder funded other GSNSW geoscience information, assessment and advisory activities.
- Minerals and Petroleum Investment Fund - revenue from annual rental fees accounted for approximately 30 per cent of GSNSW's total expenditure and represents a cost to industry. As is required under the Mining Act 1992, these funds were fully expended on the New Frontiers Initiative.
- Minerals and Petroleum Administrative Fund - revenue from the annual administrative levy accounted for approximately 7 per cent of GSNSW's total expenditure and represents a cost to industry. In 2018-19 these funds were expended on GSNSW's mineral and exploration assessment activities as well as maintenance of the Common Ground website.

⁸² The variance is predominantly due to GSNSW's contribution to professional fees and services, minor building repairs and maintenance costs, and contingent labour costs.

⁸³ Based on advice provided by the DRG.

- Coal Resource Identification Fund - cost recovery from industry of assessment costs prior to the grant of a new coal exploration authorisation. This revenue accounted for approximately 3 per cent of GSNSW's total expenditure. In 2018-19 these funds were expended on GSNSW's Coal Resource Assessment activities.

The distribution of effort could be made more efficient by fostering better collaboration with the private and research sectors. This could support leveraging of resources and reduced costs.⁸⁴ This would likely improve GSNSW's effectiveness, as stakeholder engagement would support design of products and services to be fit-for-purpose. An example of this is the South Australian PACE Initiative, which leveraged significant private investment (\$700 million, leveraging at a ratio of 20:1) and identified significant deposits, boosting the reputation of South Australia as a location for minerals exploration and investment and returning \$2.4 billion in State mining revenues (44-fold return on public expenditure).⁸⁵ GSNSW is well placed to undertake collaborative efforts. GSNSW's collaborative projects and programs are shown in Appendix E.

SUMMARY OF EFFICIENCY

Assessment of duplicative effort

- Given the timing and evidence constraints, this Review found no evidence of duplication between GSNSW and other organisations.
- Collaboration may increase GSNSW's efficiency.
- Most GSNSW end users also access materials from comparator geological sources, as other products and services are, for example, more fit-for-purpose or better respond to the user's needs. However, most end users do not believe GSNSW duplicates information from other sources.

Effort distribution analysis across GSNSW business units

- Data limitations prevented an accurate assessment of the distribution of effort across GSNSW business units.
- There is no evidence from comparator geological surveys to suggest that the existing functional separation of GI and GIS should be changed.
- Within GSNSW most activities are undertaken by GI and GAS, and most activities, products and services are delivered across more than one business unit.
- GI predominantly produces information, whilst other business units commonly provide information.
- Potential streamlining opportunities appear to exist for business units that jointly deliver products and services, where this could be undertaken by one unit.

Resource distribution analysis across the comparator geological surveys

- The four-comparator state geological surveys receive different amounts of funding and support different sized workforces. By funding, GSWA is the largest, followed by GSV, GSNSW, then GSSA. By staffing, GSWA is the largest, followed by GSNSW. Comparing survey funding to workforce size, GSV has the highest ratio of budget per staff member (as a result of a current short-term initiative), followed by GSWA, GSNSW, and then GSSA.

Resource distribution analysis across GSNSW business units

- GAS is GSNSW's largest business unit, by funding and staff.
- Resources could be reduced (coal division, 3D models, and outreach development effort) or strengthened (data management, delivery and infrastructure, outreach and education) across different areas.

Economic efficiency

- GSNSW cost \$16.2 million in 2018-19, which includes industry contributions (through annual rental fees as well as other levies) and the State government funding (from consolidated revenue and other funding).

⁸⁴ Economics Consulting Services (2014). *The Evaluation of the Plan for Accelerating Exploration (PACE) Prospectivity, Programs, Promotion and People*. Report to: Department of Manufacturing, Innovation, Trade, Resources and Energy. Perth: Economics Consulting Services.

⁸⁵ Economics Consulting Services (2014). *The Evaluation of the Plan for Accelerating Exploration (PACE) Prospectivity, Programs, Promotion and People*. Report to: Department of Manufacturing, Innovation, Trade, Resources and Energy. Perth: Economics Consulting Services.

4.7 Summary of public value delivered by GSNSW's products and services

Table 4.2 summarises the findings of this chapter and prioritises GSNSW's products and services based on the evidence presented to this Review.

TABLE 4.2 PRIORITISATION OF GSNSW'S PRODUCTS AND SERVICES

Type of product or service	Product or service	Priority	Rationale
Assessment and advice	Geoscientific advice to other agencies, Assessment of exploration reporting and work programs	Higher	These services are delivered by comparator jurisdictions, were identified as delivering the most economic and environmental benefit by GSNSW staff and are a responsibility under legislation.
Maps	Metallogenic maps, Standard geological map sheets, Special purpose maps - general public, Special purpose maps - technical audience, Mineral potential mapping, Mineral exploration highlights map, Mobile phone maps	Higher	These services are delivered by comparator jurisdictions and deliver the most benefit.
	3D geological mapping data	Medium	This service is delivered by comparator jurisdictions but is less important as industry is primarily concerned with raw data (not value-add).
Data services	Geophysical images and data, GIS web services, Geoscience data resources, Company exploration reports, The Seamless Geology of NSW, Online services, Drillcore scanning services	Higher	These services are delivered by comparator jurisdictions, used most frequently and deliver the most benefit (particularly economic benefit) as identified by survey respondents.
Education and outreach	Geotourism maps / brochures, Books and brochures, Field excursion guides, Factsheets - commodity fliers, NSW Geotours app	Lower	These services are not delivered by two comparator jurisdictions, are used least frequently, are resource intensive, deliver lower economic and commercial benefit and higher social benefit.
Collections, publications and libraries	Explanatory notes, Presentations, Peer reviewed scientific publications, Scientific abstracts, Reference collections, Mineral resources library	Medium	These services are delivered by comparator jurisdictions but are used least frequently and deliver lower benefit.
	Government Geotechnical Report Database, Drillcore libraries	Higher	These services are delivered by comparator jurisdictions and deliver economic and social benefit

SOURCE: ACIL ALLEN CONSULTING 2019



5.1 Appropriate roles of GSNSW

Recommendation 1: To provide greater clarity and reduce duplication, streamline GSNSW's current roles into three core roles and four enabling functions.

GSNSW should perform three core roles. These core roles have been identified as important to the development of NSW's resources and economy. They are also important in fulfilling GSNSW and government's responsibility under legislation (see Chapter 3). The core roles should drive the multi-year strategic planning activities, products and services of GSNSW, as well as the annual operating budgets / plans of GSNSW. The roles should be used to shape the discussions GSNSW has with government and external stakeholders during the planning process. The core roles should provide a strategic and operational framework for future activities of GSNSW.

These core roles are:

1. **Providing expert advice and information to government to support the sustainable management of NSW mineral and petroleum resources.** This helps government to effectively manage its responsibilities and obligations under the Mining and Petroleum Acts. GSNSW should be the expert source of up-to-date geoscience knowledge. This helps government to meet its legal obligations as well as make informed and strategic policy decisions about the State's resources.
2. **Collecting and making available data to de-risk and attract exploration investment into NSW.** This recognises the Geological Survey's critical role in providing information (that attracts and facilitates investment in resource development) which would not otherwise be provided by the private market due to the risks associated with exploration. This role delivers economic benefits to NSW because it addresses a key market failure associated with exploration of the State's resources.
3. **Providing advice and information to government to support non resources-related decision-making.** This reflects GSNSW's advisory and assessment responsibilities under land use planning, environmental and natural resources legislation. It also reflects GSNSW's advice to inform decision-making on regional development and other NSW priorities. GSNSW provides expert knowledge to inform whole-of-government consideration. This role delivers economic, environmental and social benefits to NSW.

This Review has identified four enabling functions which are secondary to, and support the achievement of GSNSW's core roles (Table 5.1).

TABLE 5.1 GSNSW'S ENABLING FUNCTIONS

Enabling function	Priority	GSNSW responsibility	Other parties
<p>1. Provides custodianship of NSW's geoscientific data and reference collections (drillcores, economic rocks and minerals and paleontological specimens).</p> <p>Custodianship is essential for developing and delivering knowledge and advice. This is intimately linked with GSNSW's core roles of collecting and making available geoscientific data and providing advice.</p>	Medium	Lead	Industry, research, NSW government
<p>2. Supports government to manage the appropriate use of NSW's geological resources by undertaking geological assessment of resource industry activity.</p> <p>This supports government to manage efficient resource use. Conducting and advising government on mining exploration assessment is a responsibility under legislation.</p>	High	Lead	NSW Government
<p>3. Supports promotion of resource prospectivity and exploration investment in NSW.</p> <p>GSNSW supports the NSW Department of Planning, Industry & Environment to perform this role, and performs general awareness raising efforts.</p>	Medium	Assist	NSW Department of Planning, Industry & Environment
<p>4. Supports community engagement with, and education in, geological sciences.</p> <p>GSNSW is considered an objective and trusted expert and should play a supporting role in this area, particularly in community outreach and education of school children.</p>	Medium	Assist	Peak bodies, higher education sector, NSW Government

SOURCE: ACIL ALLEN CONSULTING 2019

5.2 An overarching strategy

Recommendation 2: To provide strategic direction for GSNSW, an overarching strategy should be developed that outlines its roles, priorities and objectives and articulates GSNSW's relationship with its primary stakeholders: industry, government, the research sector and the public. This should be co-developed with stakeholders and communicated effectively to improve the line of sight between GSNSW's funding and outcomes, and to support more meaningful and effective collaboration with industry.

The strategy could incorporate an assessment of the current state of GSNSW's technological capability and the planning and investment required to prepare for future technology and data changes. This would position GSNSW to better deliver core role 2 (collecting and making available data).

5.3 Current and future GSNSW products, services and investments

5.3.1 Short term considerations

Recommendation 3: Immediately revise GSNSW's current products and services to discontinue or amend lower priority products and services and move towards the digital delivery of all information.

The high-level evidence assembled in this Report shows that GSNSW should continue to deliver most of its current products and services in order to maximise public value and fulfil its roles. However, some lower priority products and services were identified. These deliver lower public value and it is recommended that GSNSW discontinue or reduce them. These products and services are:

- NSW Geotours app, Geo-tourism maps / brochures and Field excursion guides. Although stakeholders identified that these deliver high social outcomes, they identified that they achieve fewer economic outcomes.
- 3D models are less valuable to industry, who are primarily concerned with obtaining raw data.
- Printed maps, which are expensive and resource intensive to produce and are 'out of date' once printed.

Online services are the primary means for engaging stakeholders and are highly valued and used. However, they need redesigning (an action in the 2019 NSW Minerals Strategy). GSNSW should move towards the digital delivery of all information, requiring increased short-term investment in information technology infrastructure and development, for longer-term cost savings.

Table 5.2 shows how the delivery of the products and services could be prioritised. Products and services classified as higher priority should be the focus of shorter-term efforts. Products and services classified as lower priority may still be important but could be the focus of investment in future years. Future work should focus on collecting sufficient information to enable the more detailed prioritisation of individual products and services (see Section 5.3.2).

TABLE 5.2 PRIORITISATION OF GSNSW'S PRODUCTS AND SERVICES

Type of product or service	Product or service	Priority
Assessment and advice	Geoscientific advice to other agencies, Assessment of exploration reporting and work programs	Higher
Maps	Metallogenic maps, Standard geological map sheets, Special purpose maps - general public, Special purpose maps - technical audience, Mineral potential mapping, Mineral exploration highlights map, Mobile phone maps	Higher
	3D geological mapping data	Medium
Data services	Geophysical images and data, GIS web services, Geoscience data resources, Company exploration reports, The Seamless Geology of NSW, Online services, Drillcore scanning services	Higher
Education and outreach	Geotourism maps / brochures, Books and brochures, Field excursion guides, Factsheets - commodity fliers, NSW Geotours app	Lower
Collections, publications and libraries	Explanatory notes, Presentations, Peer reviewed scientific publications, Scientific abstracts, Reference collections, Mineral resources library	Medium
	Government Geotechnical Report Database, Drillcore libraries	Higher

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW

5.3.2 Medium to longer term considerations

GSNSW's efforts should be guided by a prioritisation process which allows GSNSW to undertake effective planning and internal resourcing over the coming financial years. Medium term efforts (6-12 months) should focus on planning, which provides each business unit (see below) with the certainty and clarity required to effectively use the resources GSNSW has at its disposal. This prioritisation should inform the annual operating activities of GSNSW.

Process for prioritising current products and services

Recommendation 4: In the medium-term, prioritise current GSNSW products and services using a multi-criteria analysis approach.

There was insufficient information available for this Review to provide detailed and systematic prioritisation of all products and services. Some recommendations for removal or amendment of low value products and services have been identified. Prioritisation of the other products and services could focus GSNSW's efforts, improve alignment of products and services with stakeholder needs and create efficiencies. Business units need to use their finite resources (including financial, expertise and time-based resources) strategically, and an annual process of prioritisation could help each unit to effectively deliver against annual budgets. This prioritisation process could be extended, over time, to more clearly support DRG's priorities and the quantum of budget applied to GSNSW relative to other functions of the Division.

Prioritisation should be guided by multi-criteria analysis (MCA) or an MCA-based tool. MCA is an evaluation approach used to structure and solve decision-making problems involving multiple criteria.

MCA differentiates and evaluates options based on a series of weighted assessment criteria. Options are scored against the criteria, which are weighted to reflect their relative importance. A total weighted score is calculated. Assessment against the criteria should be largely qualitative and based on the informed judgement of the individual / persons making the assessment. MCA could be used to filter and prioritise products and services to a more focused set.⁸⁶

MCA criteria should include:

- Alignment with core roles, enabling functions, priorities and strategies:
 - Product or service alignment with one of the three core roles
 - Product or service alignment with one of the four enabling functions
 - Product or service alignment with state and national priorities and strategic plans
- End user satisfaction:
 - Stakeholder use of the product or service
 - Stakeholder satisfaction with the product or service
- Benefit or return on investment:
 - Value delivered by the product or service
 - Cost to deliver the product or service
 - Cost effectiveness of delivering the product or service

The criteria should be assessed using an intensity scale, for example:

- 0 – N / A: Not applicable or does not meet any aspects of the criterion
- 1 – Low: Providing the product or service meets few aspects of the criterion, or meets all aspects of the criterion to a low level
- 2 – Medium: Providing the product or service meets most but not all aspect of the criterion, or meets all aspects of the criterion to a medium level
- 3 – High: Providing the product or service meets all aspects of the criterion to a high-level

Principles to drive future potentially longer-term strategic investments

Recommendation 5: In the longer-term, apply principles to support strategic investments in the future, including ongoing data acquisition, management and delivery.

GSNSW's future strategic investment should be guided by a series of principles. These principles should be underpinned by engagement with GSNSW's stakeholders (industry, government, the research sector and the public) and informed by legislated and strategic priorities in NSW and nationally. They should be part of GSNSW's overarching strategy as well as its operational decision-making / planning activities.

The principles should be used to filter investment priorities and drive decision-making to ensure that GSNSW's efforts are aligned with end users' needs and deliver maximum value to NSW. These principles are designed to address industry and government priorities:

- **Principle 1:** investment should support delivery of at least one of the three core roles. These core roles define the purpose of GSNSW.
- **Principle 2:** investment should seek to address stakeholders' needs, as identified through a stakeholder engagement process. The stakeholders and their needs include; but are not limited to, industry stakeholders (focused on pre-competitive data to de-risk investment), government stakeholders (focused on expert knowledge and advice required to meet GSNSW's responsibilities under legislation), the research sector (focused on data, innovation and new technologies) and the general public (focused on understanding geological sciences, how resources are used and generation of public benefits).
- **Principle 3:** investment should align with the policies and strategies set by government. This includes a focus on the NSW Minerals Strategy (growing mining and mineral exploration in the State) and relevant water and regional plans. This includes supporting investment that aligns with the priorities of these policies and strategies, for example the NSW Minerals Strategy prioritises participation in the

⁸⁶ A useful practical guide can be found at http://eprints.lse.ac.uk/12761/1/Multi-criteria_Analysis.pdf

MinEx CRC, making available historical exploration data, high-tech metal resources mapping and release of a 'future of minerals' report.

- **Principle 4:** *investment should be collaborative, where appropriate, to leverage additional resources, create efficiencies and reduce duplication.* GSNSW should collaborate with stakeholders where appropriate to improve GSNSW's effectiveness and efficiency. These stakeholders include the research sector.
- **Principle 5:** *GSNSW should only provide products or services to industry where industry is not able to or unwilling to provide them, but where the products or services will deliver significant benefit to the citizens of NSW.* Public benefit may include, for example, environmental (understanding the location and characteristics of ground and surface water resources), social (improving public awareness of and engagement in geological sciences) or economic benefit (understanding the location and characteristics of mineral and extractive resources and de-risking exploration and investment).

Strategic investment should be reviewed through a monitoring and evaluation process. This should be embedded from the start of the investment to ensure appropriate data collection and effective monitoring and evaluation. Metrics for success should be leveraged from previous reviews of geological surveys and initiatives (see Section 2.4.1). This would support improved public value and return on investment.

5.4 The most appropriate organisational structure to deliver GSNSW in the future

Recommendation 6: *Revise GSNSW's four business unit structure into a more streamlined three business unit structure that focuses on supporting its three core roles, i.e. acquiring geoscience data, managing and organising geoscience data, and providing expert advisory services.*

In order to maximise its efficiency, GSNSW could be restructured to reflect its core roles. These all relate to geoscience data and follow the logical sequence: acquire data, manage data and use data. This implies an efficient organisation of activities into three groups:

- Acquiring geoscience data.
- Managing and organising geoscience data.
- Leveraging geoscience data to provide expert advice to government, industry participants, including inbound investors, and public stakeholders.

GSNSW could be efficiently organised into three branches reflecting these core roles (Figure 5.1):

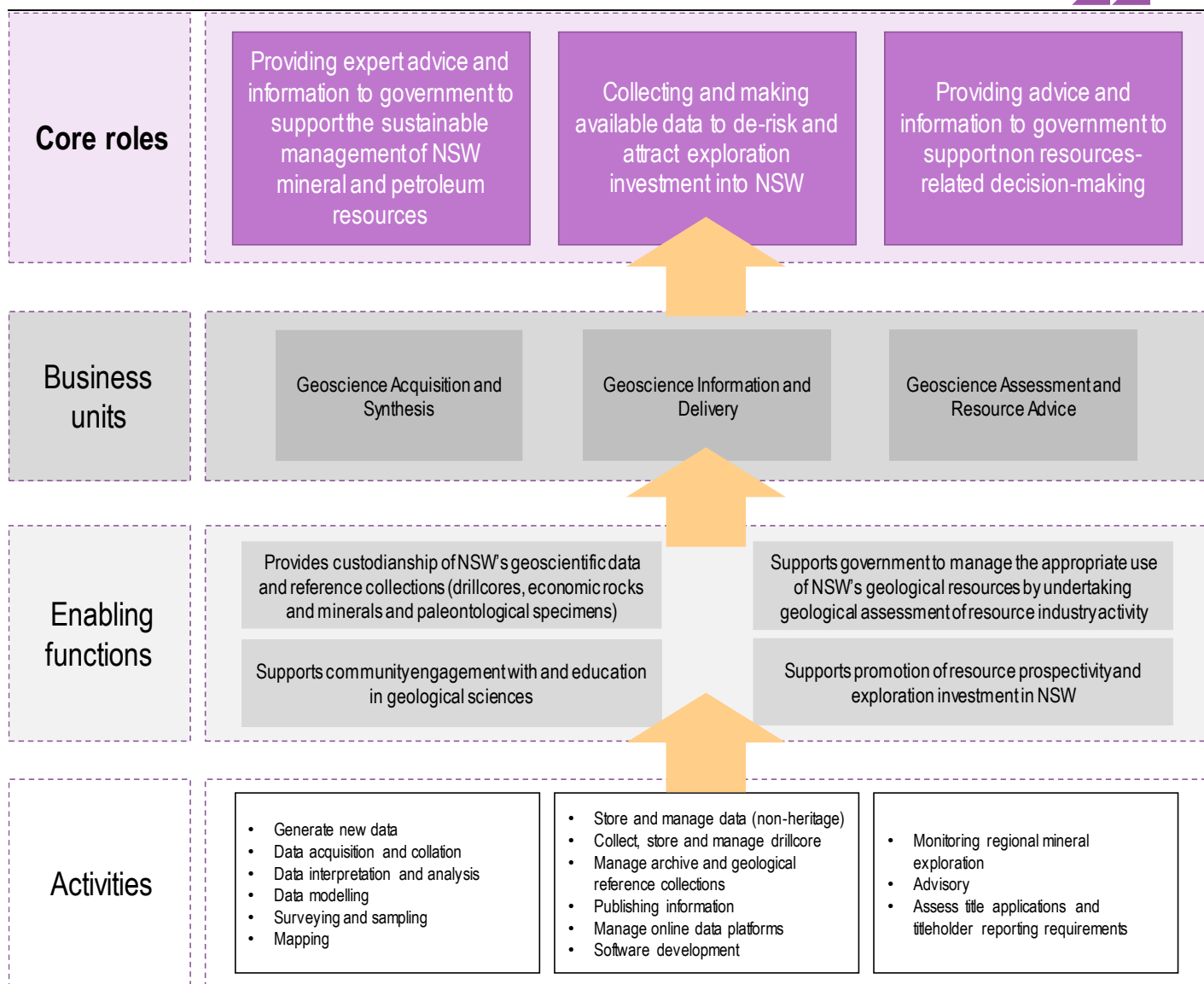
1. Geoscience Acquisition and Synthesis (GAS) (corresponding to current GAS)
2. Geoscience Information and Delivery (GID) (corresponding to current GI)
3. Geoscience Assessment and Resource Advice (GARA) (corresponding to current LUTA and SSRA).

It is proposed that these business units lead the activities detailed in Figure 5.1.

To enable the three-business unit structure to operate more effectively and maximise public value:

- GSNSW should focus on strengthening its position and conducting awareness raising activities, including:
 - Ensuring education and outreach activities are well coordinated. There is some suggestion that these may be poorly coordinated due to lack of dedicated resources. This can create inefficiencies by requiring additional staff to support events and reducing their potential benefit. It is noted that education and outreach is of lower priority (see Chapter 3).
 - Consulting more with industry to identify priority areas for engagement. This would aim to maximise the benefit to industry and the return on investment of the products and services delivered.
 - Redeveloping the GSNSW website, as proposed under the 2019 Minerals Strategy, to improve accessibility and the profile of GSNSW.
 - Engaging more with international forums to assist in raising the profile of industry opportunities in NSW and the support available through GSNSW.
- Collaborating more with stakeholders to leverage additional resources, create efficiencies, improve the alignment of outputs with stakeholder needs and avoid duplication.

FIGURE 5.1 RECOMMENDED ORGANISATIONAL MODEL FOR GSNSW



SOURCE: ACIL ALLEN CONSULTING 2019

5.5 Information collection activities to address data gaps

Recommendation 7: Address information gaps to allow for more detailed future potential analysis of GSNSW's public value.

The analysis presented in this report has been conducted based on the evidence available. Several data limitations and gaps have been identified (see Section 1.3 and Appendix J). To enable more fulsome analysis of GSNSW's public value in the future, and to better support the work of the three business units undertaking the core roles through informed planning, the following data collection activities should be carried out:

- Developing a process for surveying a broader range of end users of GSNSW's products and services to understand the value of the products and services and inform the design of new products and services. This survey would mirror the style of short, online customer satisfaction surveys many public organisations administer after a stakeholder accesses a product or service.
- Interview GSNSW staff and relevant senior staff to understand how GSNSW contributes to relevant state and national agendas.

- Conduct detailed business process mapping to understand how staff within each business unit undertake activities which lead to the development of products and services. This mapping will allow DRG to better understand the relationship between GSNSW's inputs (funding), activities (the efforts of GSNSW staff), outputs (products and services) and outcomes (impact). This mapping will provide information that can be used by GSNSW and DRG to set more informed plans / priorities, to better monitor the efforts and performance of GSNSW's staff and to better demonstrate how the survey is accountable to government and external stakeholders. The mapping will require the collection of information on:
 - labour and capital costs of GSNSW products, services and activities
 - the role of each business unit in delivering products and services
 - personnel funding and budgeted personnel expenditure disaggregated by business unit function.



- ACIL Allen Consulting. (2014). *CSIRO's Impact and Value*. Melbourne: ACIL Allen Consulting.
- ACIL Allen Consulting. (2015). *Economic Impact Case Studies: Establishing the broad economic value of the Defence Science and Technology Program*. Melbourne: ACIL Allen Consulting.
- ACIL Allen Consulting. (2015). *Exploration Incentive Scheme: Economic Impact Study*.
- ACIL Allen Consulting. (2017). *The Value of CSIRO: An estimate of the impact and value of CSIRO's portfolio of activities*. Melbourne: ACIL Allen Consulting.
- ACIL Allen Consulting. (2018). *The Impact and Value of CSIRO research: 2018 Update report*. Melbourne: ACIL Allen Consulting.
- ACIL Tasman. (2010). *New Frontiers program - Financial and Economic Assessment*. Melbourne: ACIL Tasman.
- ACIL Tasman. (2012). *Review of the Geological Survey of Queensland*. Brisbane: ACIL Tasman.
- Adrian, J. (n.d.). *History of the Geological Survey NSW 1875 - 1974*. Retrieved September 3, 2019, from <https://search.geoscience.nsw.gov.au/report/R00019081>
- Allen Consulting Group. (2011). *Review of Victoria's earth resources programs*. Melbourne: Allen Consulting Group.
- Aon. (2019). *Re: DRG Collection Assets Valuation - PROC - 2003590 (DRG Collection Assets Valuation FY 2019) - Scope Deliverable B - Valuation of Collection Assets*. Sydney: Aon.
- Australian Petroleum Production & Exploration Association. (n.d.). Production statistics. Retrieved September 4, 2019, from <https://www.appea.com.au/production-statistics/>
- Bernanke, B. S. (2011). Promoting Research and Development: The Government's Role. *Conference Presentation: New Building Blocks for Jobs and Economic Growth*. Washington, D.C.
- British Geological Survey. (2019). *About the British Geological Survey*. Retrieved August 29, 2019, from <https://www.bgs.ac.uk/about/>
- Bureau of Communications Research. (2016). *Open government data and why it matters A critical review of studies on the economic impact of open government data*. Canberra: Australian Government Department of Communications and the Arts.
- Chief Government Geologists' meeting. (2018). *Geological Survey Benchmarking - Staffing, budgets, salaries and functions: 2017-18*.

- CSIRO. (2000). *Commonwealth Scientific and Industrial Research Organisation (CSIRO) Submission to Productivity Commission Review of Cost Recovery by Commonwealth Agencies*. Canberra: CSIRO.
- Deloitte. (2013). *Market Assessment of Public Sector Information*. London: Department for Business, Innovation and Skills.
- Deloitte Access Economics. (2017). *Mining and METS: engines of economic growth and prosperity for Australians*. Melbourne: Deloitte Access Economics.
- Department of Energy and Mining (2019). *PACE Copper*. Accessed 18 October 2019: http://www.energymining.sa.gov.au/minerals/geoscience/pace_copper.
- Department of Finance and Deregulation. (2011). *Strategic Review of Geoscience Australia*. Commonwealth of Australia: Canberra.
- Department of Industry. (2018). *Greater Hunter regional water strategy—Securing the future water needs of the Hunter, Central Coast and Mid-Coast*. NSW: NSW Department of Industry. Retrieved from https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/196055/greater-hunter-regional-water-strategy.pdf
- Department of Industry, Innovation and Science. (2015). *National Innovation & Science Agenda*. Canberra: Commonwealth of Australia. Retrieved from <https://www.industry.gov.au/sites/g/files/net3906/f/July%202018/document/pdf/national-innovation-and-science-agenda-report.pdf>
- Department of Industry, Innovation and Science. (2019). *Australia's Critical Minerals Strategy*. Canberra: Commonwealth of Australia.
- Department of Planning and Environment. (n.d.). Retrieved September 3, 2019, from History of Geological Survey of NSW: <https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/geoscience-information/geological-survey-of-nsw/history-of-geological-survey-nsw>
- Department of Planning and Environment. (2015). *Illawarra-Shoalhaven Regional Plan*. NSW: State of NSW. Retrieved from <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/illawarra-shoalhaven-regional-plan-2015-11.pdf>
- Department of Planning and Environment. (2016). *Central Coast Regional Plan 2036*. NSW: State of NSW. Retrieved from <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/central-coast-regional-plan-2036-2016-10-18.pdf>
- Department of Planning and Environment. (2016). *Hunter Regional Plan 2036*. NSW: State of NSW. Retrieved from <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/hunter-regional-plan-2036-2016-10-18.pdf>
- Department of Planning and Environment. (2017). *Far West Regional Plan 2036*. NSW: State of NSW. Retrieved from <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/far-west-regional-plan-08-2017.pdf>
- Department of Planning and Environment. (2017). *New England North West Regional Plan 2036*. NSW: State of NSW. Retrieved from <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/new-england-north-west-final-regional-plan-2017-09.pdf>
- Department of Planning and Environment. (2017). *North Coast Regional Plan*. NSW: State of NSW. Retrieved from <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/north-coast-2036-regional-plan-2017.pdf>
- Department of Planning and Environment. (2017). *Riverina Murray Regional Plan 2036*. NSW: State of NSW. Retrieved from <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/riverina-murray-regional-plan-2017.pdf>
- Department of Planning and Environment. (2017). *South East and Tablelands Regional Plan 2036*. NSW: State of NSW. Retrieved from <https://www.planning.nsw.gov.au/~/-/media/Files/DPE/Plans-and-policies/south-east-and-tableland-regional-plan-2017-07.ashx>

- Department of Planning and Environment. (2018). *Division of Resources and Geoscience Business Plan 2018-19*. Sydney: State of NSW.
- Department of Planning and Environment. (2019). *Division of Resources and Geoscience – Welcome and Orientation Pack: Geological Survey of NSW*. NSW: State of NSW.
- Department of Planning and Environment. (2019). *NSW Minerals Strategy*. NSW: State of NSW. Retrieved from <https://www.regional.nsw.gov.au/nsw-minerals-strategy-dpe8828>
- Department of Planning and Environment. (n.d.). *Geological Survey of NSW*. Retrieved July 24, 2019, from Resources and Geoscience: <https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/geoscience-information/geological-survey-of-nsw>
- Department of Planning and Environment. (n.d.). *MinEx CRC*. Retrieved from Resources and Geoscience: <https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/geoscience-information/minexcrc>
- Department of Planning, Industry and Environment. (n.d.). Retrieved from Regional Plans: <https://www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans>
- Department of Planning, Industry and Environment. (n.d.). *Water management strategies*. Retrieved from <https://www.industry.nsw.gov.au/water/plans-programs/water-mgmt-strategies>
- Department of Premier and Cabinet. (2018). *A 20-Year Economic Vision for Regional NSW*. NSW: State of NSW. Retrieved from <https://static.nsw.gov.au/nsw-gov-au/nsw-gov-au/Regional-vision/1532654855/20-Year-Vision-for-RNSW-accessible.pdf>
- Division of Resources and Geoscience (2019). *Service delivery standards*. Accessed 28 September 2019: <https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/programs-and-initiatives/service-delivery>.
- Economics Consulting Services. (2014). *The Evaluation of the Plan for Accelerating Exploration (PACE) Prospectivity, Programs, Promotion and People*. Perth: Economics Consulting Services.
- Faulkner, N., & Kaufman, S. (2017). Avoiding Theoretical Stagnation: A Systematic Review and Framework for Measuring Public Value. *Australian Journal of Public Administration*, 77(1).
- Geosoft. (2017). *Geoscience Data Management Report*. Toronto: Geosoft.
- Greater Sydney Commission. (2018). *Greater Sydney Regional Plan: A Metropolis of Three Cities*. NSW: State of NSW. Retrieved from <https://gsc-public-1.s3-ap-southeast-2.amazonaws.com/greater-sydney-region-plan-0618.pdf>
- Hallett, M., Butt, G., & Watkins, J. (2010). *Business Case for the NSW Government New Frontiers Minerals and Energy Exploration Initiative*. Maitland: State of NSW.
- House of Representatives Standing Committee on Industry and Resources. (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.
- Johnson, J. (2014). The role of government geoscience in the minerals industry. *Geoscience Australia's Deputy Chief Executive Officer keynote presentation: 2014 International Mining and Resources Conference*. Melbourne.
- Lawrence Consulting. (2019). *NSW Mining Industry Expenditure Impact Survey 2017/18, for the NSW Minerals Council*. Sydney: Lawrence Consulting.
- Manyika, J., Chui, M., Groves, P., Farrell, D., Van Kuiken, S., & Doshi, E. A. (2013). *Open data: Unlocking innovation and performance with liquid information*. New York: McKinsey Global Institute.
- McDonald, P. (2019, August 14). Geological Survey of Victoria Consultation.

- MinEx CRC. (2017). *Cooperative Research Centres 19th Selection Round - Stage 2 Application*. Canberra: MinEx CRC.
- MinEx CRC. (2019). *A New Frontier in Mineral Exploration*. WA: MinEx CRC.
- Natural Resources Canada. (2018). *Geological Survey of Canada Strategic Plan 2018–2023*. Canada: Natural Resources Canada.
- National Committee for Earth Sciences. (2018). *Our Planet, Australia's Future: A decadal plan for Australian Geoscience 2018–27*. Australian Academy of Science.
- Nielsen, K. (2010). Economic theory as it applies to Public Sector Information. *Annual Review of Information Science and Technology*, 44(1), 419-489.
- NSW Department of Finance and Services. (2014). *2014 Lower Hunter Water Plan*. NSW: State of NSW. Retrieved from <https://www.hunterwater.com.au/Resources/Documents/Plans--Strategies/Lower-Hunter-Water-Plan.pdf>
- NSW Department of Resources and Geoscience. (2019, August 24). *Paying mining royalties*. Retrieved from <https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/enforcement/royalties>
- NSW Department of Resources and Geoscience. (2019, August 24). *Southern Thomson Orogen Project*. Retrieved from <https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/geoscience-information/projects/southern-thomson-orogen-project>
- O'Neil, B. (1982). *In search of mineral wealth: The South Australian Geological Survey and Department of Mines to 1944*. Adelaide: University of Adelaide Library.
- Parliament of Australia. (n.d.). *Pre-Competitive Geoscience Data Acquisition*. Canberra: Australian Government.
- Pietruszkiewicz, J. (1999). *What are the Appropriate Roles for Government in Technology Deployment? A White Paper with Author's Response to Comments*. U.S.: National Renewable Energy Laboratory.
- Pratt, M. (2019). *Budget Statement 2019-20, Budget Paper No. 1*. Sydney: NSW Treasury.
- Pricewaterhouse Coopers. (2010). *Economic Assessment of Spatial Data Pricing and Access: Stage 1 Report*. Canberra: ANZLIC - Spatial Information Centre.
- PricewaterhouseCoopers Australia. (2014). *Deciding with data How data-driven innovation is fuelling Australia's economic growth*. Australia: Google Australia.
- Productivity Commission. (1995). *Research and Development: Industry Commission inquiry report*. Canberra: Australian Government.
- Productivity Commission. (2000). *Review of Cost Recovery: Australian Geological Survey Organisation*. Canberra: Productivity Commission.
- Productivity Commission. (2017). *Data Availability and Use: Overview & Recommendations*. Canberra: Commonwealth of Australia.
- Productivity Commission. (2017). *Shifting the Dial: 5 Year Productivity Review*. Canberra: Commonwealth of Australia. Retrieved from <https://www.pc.gov.au/inquiries/completed/productivity-review/report/productivity-review.pdf>
- Riganti, A., Farrell, T. R., Ellis, M. J., Irimies, F., Strickland, C. D., Martin, S. K., & Wallace, D. J. (2015). 125 years of legacy data at the Geological Survey of Western Australia: Capture and delivery. *GeoResJ*(6), 175-194.
- SA Department of Energy and Mining. (2019). *About the GSSA*. Retrieved September 16, 2019, from http://www.energymining.sa.gov.au/minerals/geoscience/geological_survey/about_the_gssa
- SA Department of Energy and Mining. (2019). *Mineral Commodities*. Retrieved September 16, 2019, from http://energymining.sa.gov.au/minerals/invest/mineral_commodities

- Scott, M., & Jones, M. (2014). *Management of Public Geoscience Data*. Perth: International Mining for Development Centre.
- Strategic Policy and Economics. (2014). Geological Survey of NSW – Program Evaluation: Cost Benefit Analysis.
- The Resources 2030 Taskforce. (2018). *Australian resources—providing prosperity for future generations*. Australia: Commonwealth of Australia. Retrieved from <https://www.industry.gov.au/sites/g/files/net3906/f/September%202018/document/pdf/resources-2030-taskforce-report.pdf>
- Tyler, I. (2019, August 14). Geological Survey of Western Australia Consultation.
- UNCOVER Australia (n.d.). *UNCOVER*. Accessed 18 October 2019: <https://www.uncoveraustralia.org.au/>.
- USGS. (n.d.). *Mineral Resources Program*. Retrieved August 29, 2019, from <https://www.usgs.gov/energy-and-minerals/mineral-resources-program/about>
- Vic Earth Resources. (2019). *150 Years of the Geological Survey of Victoria*. Retrieved September 16, 2019, from <https://earthresources.vic.gov.au/geology-exploration/victorias-geology/150-years>
- VIC Earth Resources. (2019). *Geological Survey of Victoria*. Retrieved September 16, 2019, from <https://earthresources.vic.gov.au/geology-exploration/geological-survey-victoria>
- Victorian Minerals and Energy Council, Submission No. 63, p. 868. Presented in: House of Representatives Standing Committee on Industry and Resources. (2003). *Exploring: Australia's Future—impediments to increasing investment in minerals and petroleum exploration in Australia*. Canberra: Commonwealth of Australia.
- WA Department of Mines, Industry Regulation and Safety. (2019). *Geology of Western Australia*. Retrieved September 16, 2019, from <http://dmp.wa.gov.au/Geological-Survey/Geology-of-Western-Australia-1389.aspx>



B.1 Stakeholder interview schedule

Two separate group interviews / workshops were held with a total of 17 GSNSW staff. A total of 19 external stakeholders were interviewed for this Review (Table B.1). A presentation on the Review aims and an invitation to participate in the survey was made to the Association of Mining and Energy Related Councils.

TABLE B.1 TYPE AND NUMBER OF STAKEHOLDER INTERVIEWS

Stakeholder	
NSW Government Agencies (5 interviews)	NSW Department of Primary Industries
	NSW Land and Water Commissioner
	NSW Department of Planning, Industry & Environment, Planning Services
	NSW Department of Planning, Industry & Environment, Energy, Environment and Science (formerly Office of Environment and Heritage)
	NSW Chief Scientist and Engineer
Industry (6 interviews)	Association of Mining & Exploration Companies
	NSW Minerals Council
	Australian Petroleum Production & Exploration Association
	Lighting Ridge Miners Association
	Glengarry Grawin Sheepyards Miners Association Hetherington
Research (4 interviews)	AuScope
	MinEx CRC
	University of NSW CSIRO
Geological Surveys (4 interviews)	Geoscience Australia
	Geological Survey of Victoria
	Geological Survey WA
	Geological Survey SA
Total	19 interviews

Note: the NSW Commissioner for Productivity, and Mining Titles Services both declined to be interviewed.

SOURCE: ACIL ALLEN CONSULTING 2019

B.2 Survey distribution and analysis

The survey was designed and hosted using Web Survey Creator. Respondents were advised that the survey was anonymous and that deidentified information would be stored on Australian-based servers. The survey was released on 6 August and closed on 16 August.

The survey was circulated to a total of 26 organisations, comprising: the organisations in Table B1 (except the NSW Land and Water Commissioner) and:

1. Western Lands Council
2. The Association of Mining and Energy Related Councils
3. Mining Titles Services
4. University of Tasmania
5. University of Newcastle
6. Geological Survey of Queensland
7. Geological Survey of Northern Territory
8. Geological Survey of Tasmania.

The total number of individuals to whom the survey was circulated may be higher than 26, as organisations were asked to circulate the survey to their members or staff.

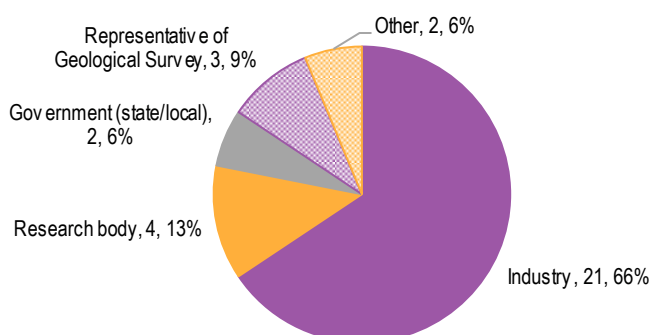
Of the 38 survey questions, 15 were optional questions (9 of which were free-text responses). The remaining 23 questions were mandatory and were answered by all respondents. All survey questions and answers are presented in this Report.

B.2.1 Respondents and demographics

A total of 32 survey responses were recorded. This reflects the number of individual responses, not the number of organisations who responded, as in some cases responses were received from more than one organisation. As shown in Figure B.1, the survey respondents came from a range of organisation types:

- industry (66 per cent, 21 of 32)
- research body (13 per cent, 4 of 32)
- representative of geological survey (9 per cent, 3)
- government (state / local) (6 per cent, 2 of 32)
- other (6 per cent, 2 of 32).

FIGURE B.1 PROPORTION OF RESPONDENTS BY TYPE OF ORGANISATION



This graph relates to the survey question: Which of the following best describes your organisation? Number of respondents = 32.

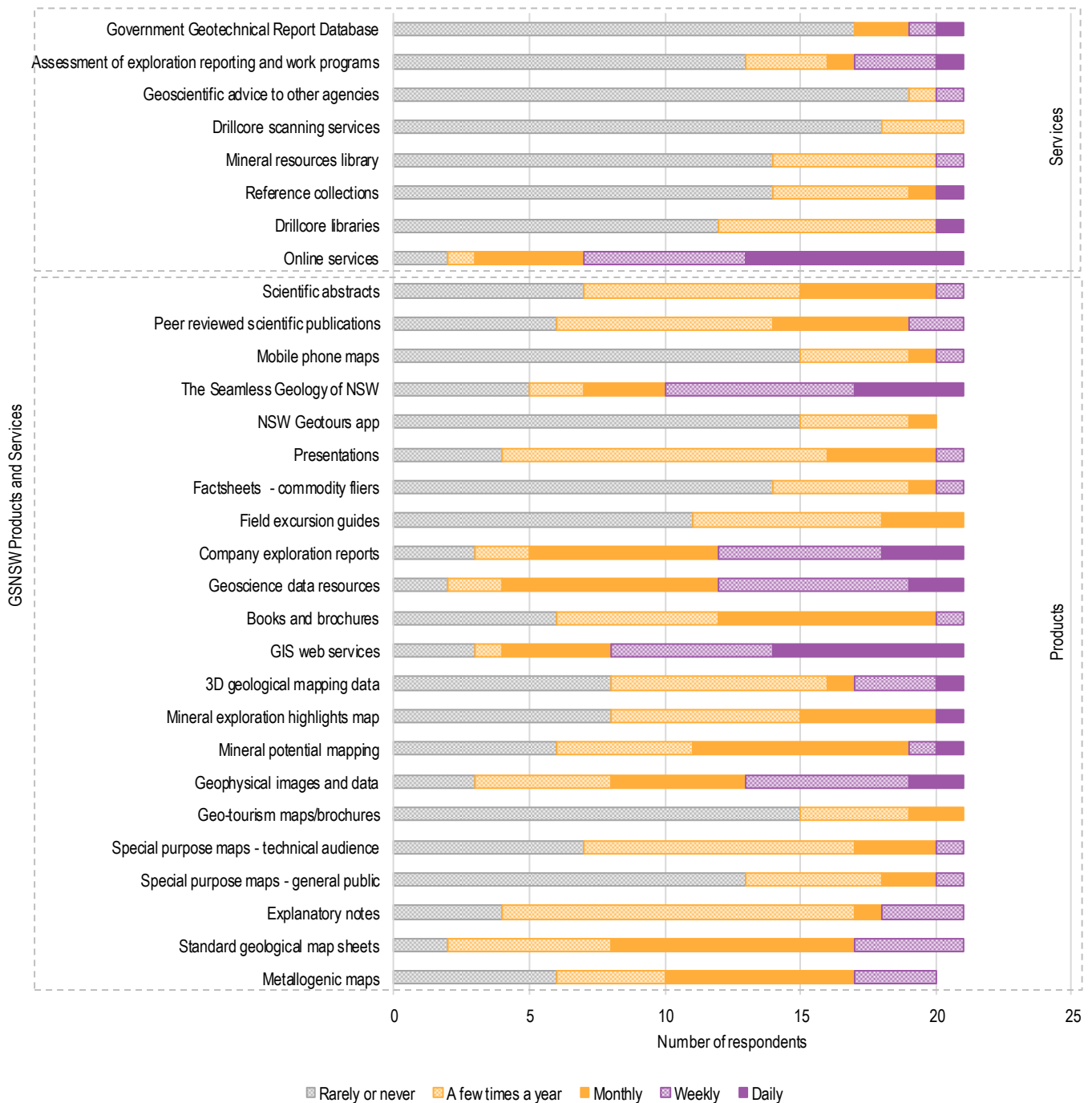
SOURCE: SURVEY OF GNSW'S END USERS.

B.3 Additional survey analysis

B.3.1 Use of GSNSW's products and services

This section provides information on the usage of GSNSW's products and services, by respondent type. Data from research bodies, government, representatives of geological surveys and other respondents should be interpreted with care due to low response numbers. As industry respondents made up the majority of the respondents, the responses from industry were similar to the overall results (Figure 4.1).

FIGURE B.2 FREQUENCY OF PRODUCT AND SERVICE USE BY INDUSTRY RESPONDENTS



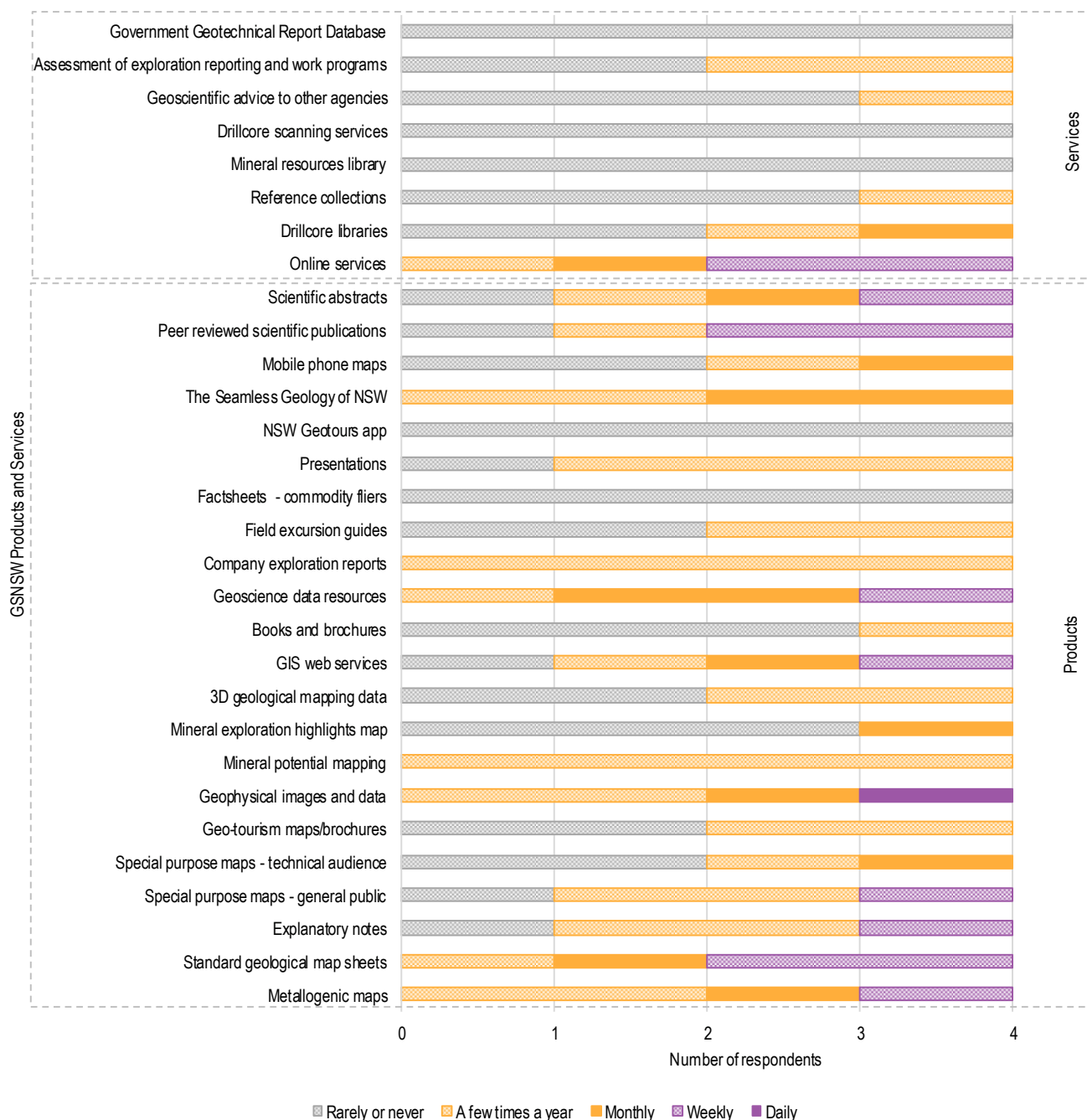
This graph relates to the survey question: How frequently do you use the following GSNSW products? This shows data for use on the basis of daily, weekly, monthly, a few times a year and rarely / never. Number of respondents = 21, except for metallogenic maps and NSW Geotours app where number of respondents = 20.

SOURCE: SURVEY OF GSNSW'S END USERS.

Respondents from research bodies most frequently used geophysical images and data, followed by standard geological map sheets, online services and peer reviewed scientific publications.

Five products or services were rarely or never used, including Government Geotechnical Report Database, drillcore scanning services, mineral resources library, NSW Geotours app and factsheets – commodity fliers.

FIGURE B.3 FREQUENCY OF PRODUCT AND SERVICE USE BY RESEARCH BODY RESPONDENTS

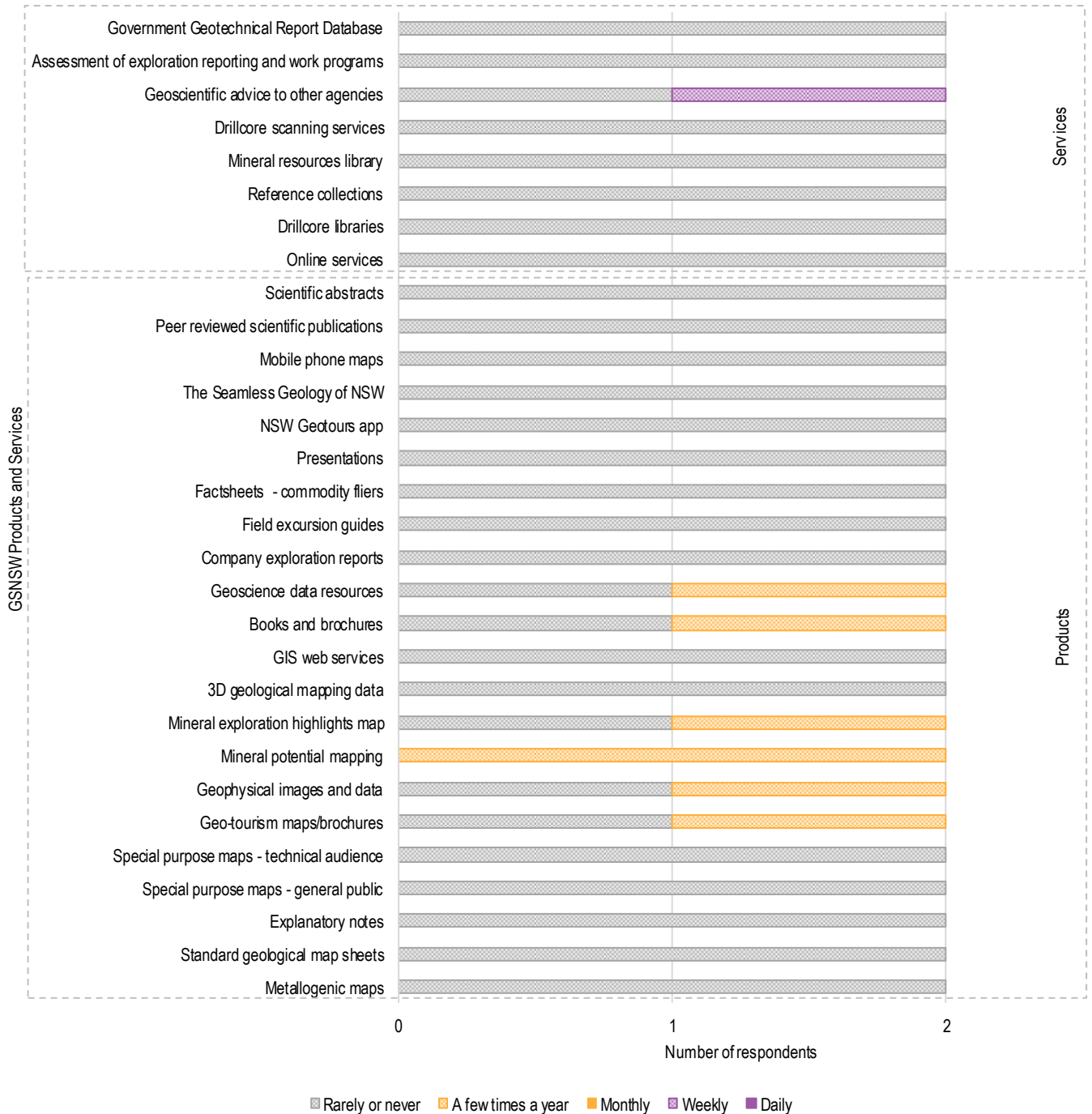


This graph relates to the survey question: How frequently do you use the following GSNW products? This shows data for use on the basis of daily, weekly, monthly, a few times a year and rarely / never. Number of respondents = 4.

SOURCE: SURVEY OF GSNW'S END USERS.

Most government survey respondents rarely or never used most of the products or services (in interviews, some government stakeholders reported use of the products / services). The most frequently used products or services were geoscientific advice to other agencies and mineral potential mapping. No product or service was used daily.

FIGURE B.4 FREQUENCY OF PRODUCT AND SERVICE USE BY GOVERNMENT RESPONDENTS

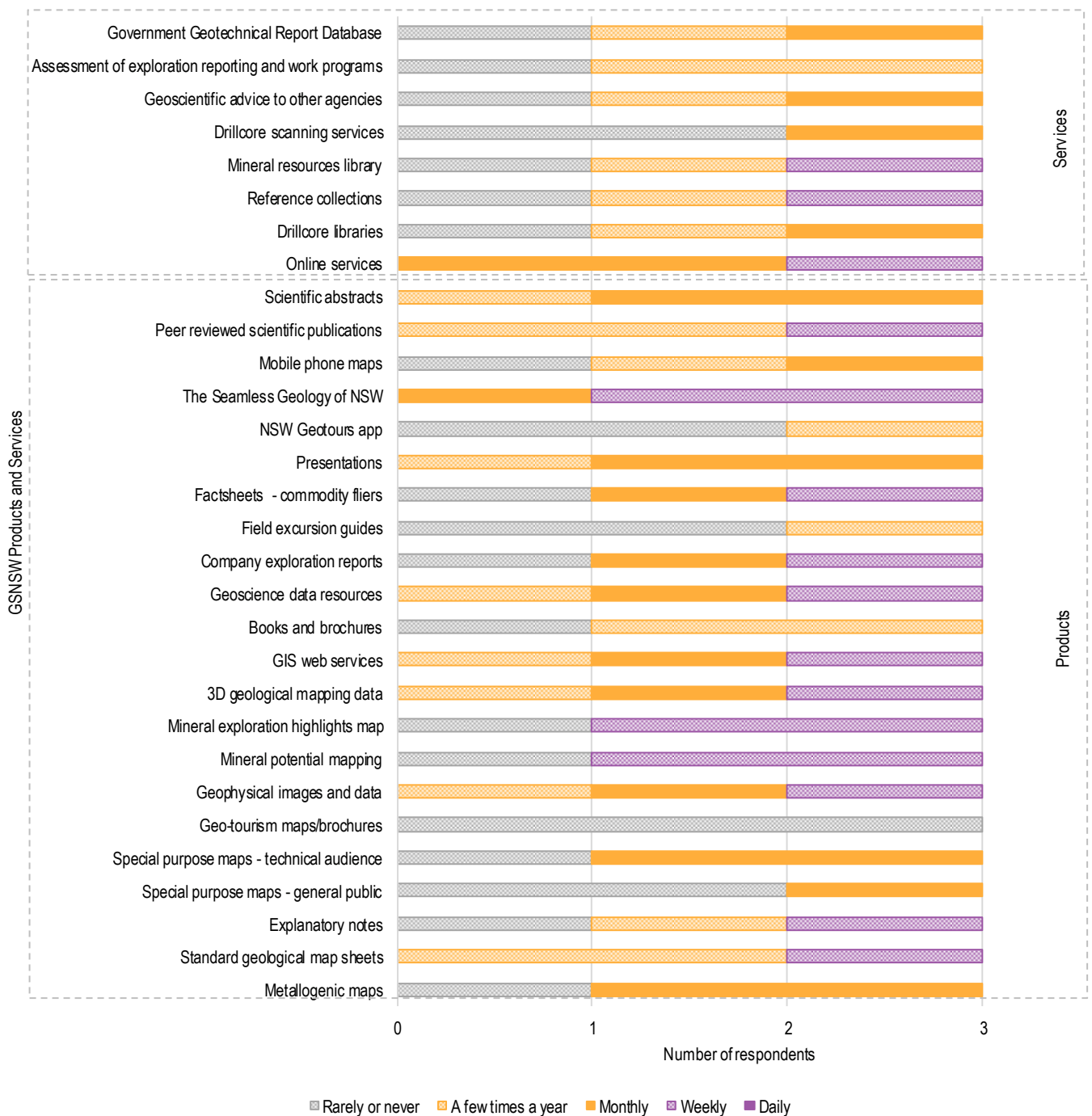


This graph relates to the survey question: How frequently do you use the following GSNSW products? This shows data for use on the basis of daily, weekly, monthly, a few times a year and rarely / never. Number of respondents = 2.

SOURCE: SURVEY OF GSNSW'S END USERS.

The products and services most commonly used by representatives of geological survey respondents were the Seamless Geology of NSW, mineral exploration highlights map and mineral potential mapping. No product or service was used daily.

FIGURE B.5 FREQUENCY OF PRODUCT AND SERVICE USE BY REPRESENTATIVES OF GEOLOGICAL SURVEY RESPONDENTS

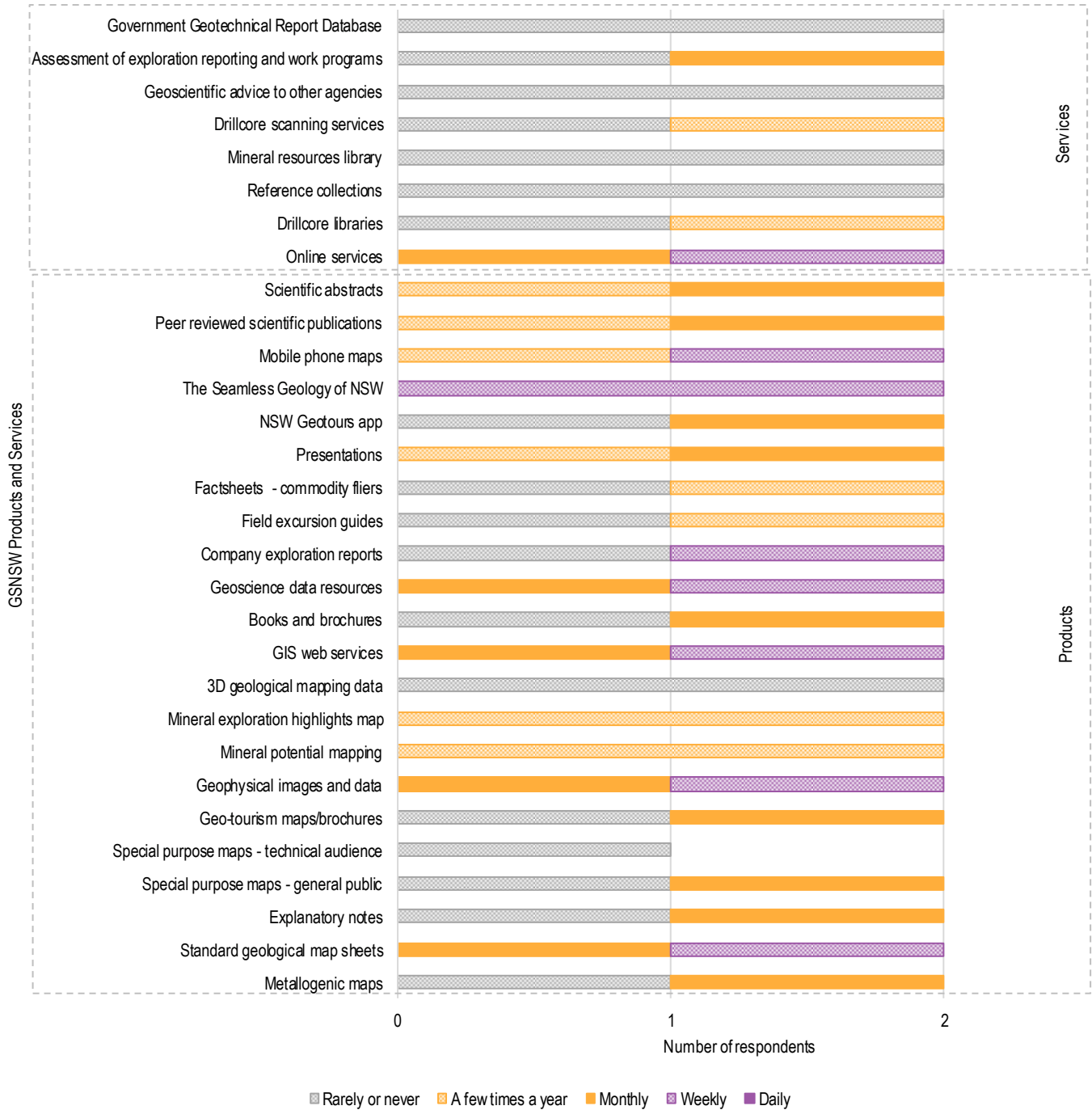


This graph relates to the survey question: How frequently do you use the following GSNSW products? This shows data for use on the basis of daily, weekly, monthly, a few times a year and rarely / never. Number of respondents = 3.

SOURCE: SURVEY OF GSNSW'S END USERS.

The products and services most commonly used by other respondents was the Seamless Geology of NSW. No product or service was used daily. Products or services used weekly-monthly are: online services, geoscience data resources, GIS web services, geophysical images and data and standard geological map sheets.

FIGURE B.6 FREQUENCY OF PRODUCT AND SERVICE USE BY OTHER RESPONDENTS



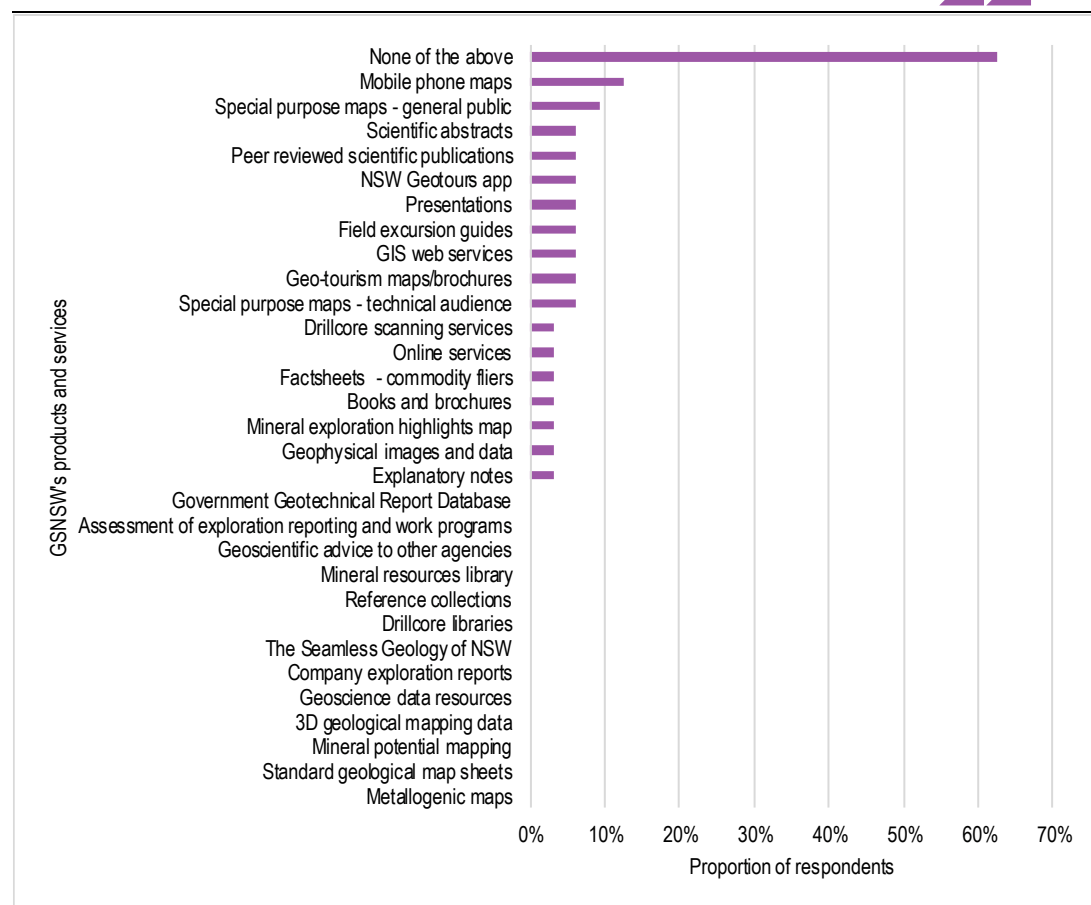
This graph relates to the survey question: How frequently do you use the following GSNW products? This shows data for use on the basis of daily, weekly, monthly, a few times a year and rarely / never. Number of respondents = 2, except for special purpose maps – general public = 1.

SOURCE: SURVEY OF GSNW'S END USERS.

B.3.2 End user perspectives on delivery of GSNSW products and services by other sectors

This provides data relevant to Section 4.1.

FIGURE B.7 PROPORTION OF RESPONDENTS BY GSNSW'S CURRENT PRODUCTS OR SERVICES THAT THEY BELIEVE WOULD BE BETTER DELIVERED BY INDUSTRY OR THE RESEARCH SECTOR



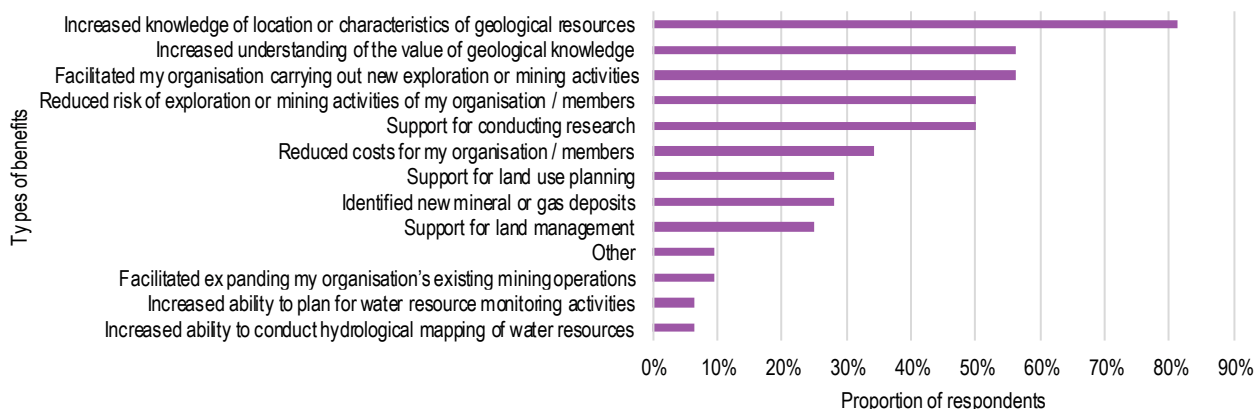
This graph relates to the survey question: If any, which of GSNSW's products / services would be better delivered by the private or research sectors? Tick all that apply. Number of respondents = 32.

SOURCE: SURVEY OF GSNSW'S END USERS.

B.3.3 Benefits derived from GSNSW's products / services

This provides data relevant to Section 4.3.

FIGURE B.8 END USER VIEWS ON THE TYPES OF BENEFITS DERIVED FROM GSNSW'S PRODUCTS / SERVICES

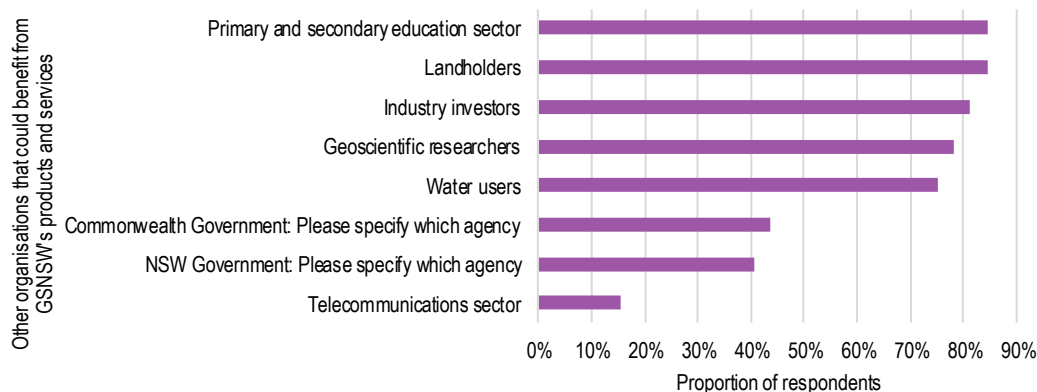


This graph relates to the survey question: What benefits have you received as a result of using GSNSW's products / services? Tick all that apply. Number of respondents = 32.
 SOURCE: SURVEY OF GSNSW'S END USERS.

B.3.4 Organisations that could derive benefits from GSNSW products / services

This provides data relevant to Section 4.3.

FIGURE B.9 END USER VIEWS ON THE ORGANISATIONS THAT COULD DERIVE BENEFITS FROM GSNSW PRODUCTS / SERVICES



This graph relates to the survey question: Apart from your organisation, who else could benefit from GSNSW products / services? Number of respondents = 32.
 SOURCE: SURVEY OF GSNSW'S END USERS.

B.3.5 Accessing data from other geological surveys

More than half of respondents accessed information from comparator surveys. GSQ and Geoscience Australia were the most frequently accessed (Figure B.10). This may suggest that duplication across comparative sources of geological information does not exist. If duplication did exist, there would be less need to use other sources of information, and therefore, cross-use figures would be lower.

FIGURE B.10 END USERS ACCESS OF DATA FROM OTHER GEOLOGICAL SURVEYS

This graph relates to the survey question: From which other geological survey(s) do you access information:

Note: Number of respondents = 25.

SOURCE: SURVEY OF GSNSW'S END USERS.

B.3.6 Cost and value for money of GSNSW's services

The survey found that most respondents access GSNSW products or services free of charge (84 per cent, 27 of 32). Only one respondent paid for access. This respondent indicated that costs are small, however, regardless of size, the cost may reduce demand for products / services.

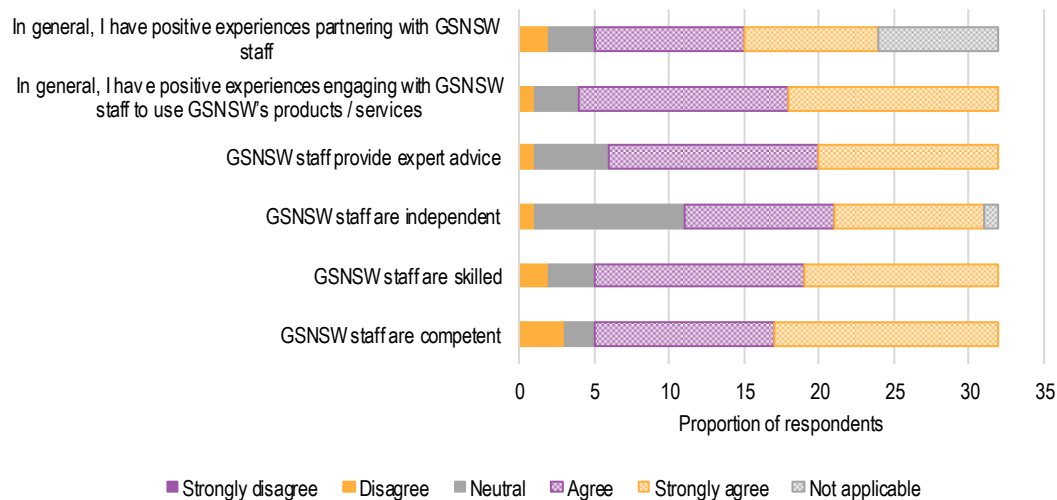
B.3.7 Perspectives of GSNSW staff

End users agree and strongly agree that GSNSW staff:

- are competent and skilled, both 84 per cent
- provide expert advice, 81 per cent
- are independent, 63 per cent.

In general end users have positive experiences using GSNSW's products and services (88 per cent) and partnering with GSNSW staff (59 per cent). Partnering with GSNSW staff was not applicable to 25 per cent of respondents.

FIGURE B.11 END USERS PERSPECTIVES OF GSNSW STAFF

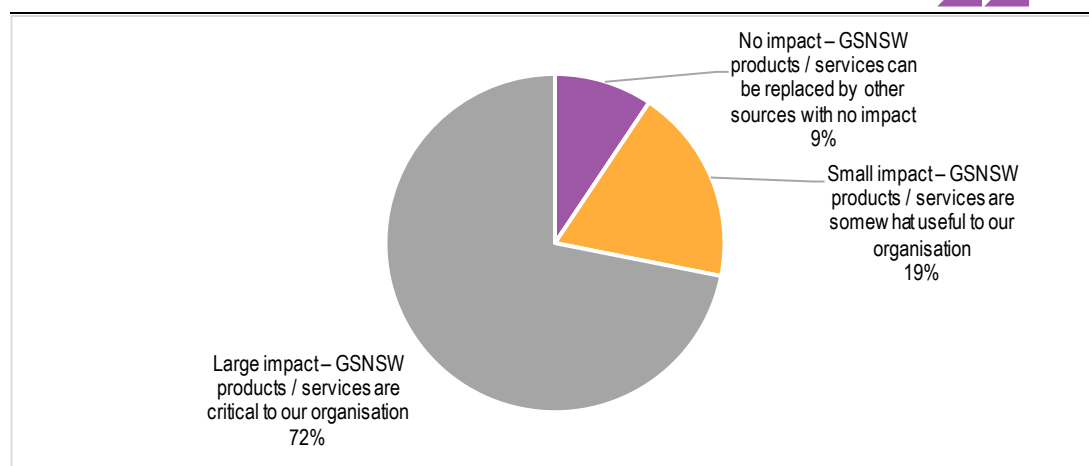


This graph relates to the survey question: From which other geological survey(s) do you access information:
 Note: Number of respondents = 25.
 SOURCE: SURVEY OF GSNSW'S END USERS.

B.3.8 Counterfactual

The counterfactual to GSNSW was discussed in the survey of GSNSW's end users. This question aimed to identify benefits of GSNSW. The majority of survey respondents (72 per cent, 23 of 32) believed that ceasing GSNSW's operations would have a large impact, as GSNSW's products and services are critical to their organisation (Figure B.12).

FIGURE B.12 END USERS VIEW OF THE LEVEL OF IMPACT THAT WOULD BE CAUSED BY THE ABSENCE OF GSNSW



This graph relates to the survey question: If GSNSW stopped delivering the products and services you use, how would you / your organisation be affected?
 Number of respondents = 32.
 SOURCE: SURVEY OF GSNSW'S END USERS.



C.1 Roles performed by industry, research and government geological surveys

Table C.1 summarises the high-level, relative strengths and weaknesses of geological survey organisations, industry participants and research/academic institutions in undertaking GSNSW's current roles. This builds on the information provided in Section 2.4.2.

The table is intended to highlight the value of geological surveys in performing GSNSW's current roles and identify opportunities for industry or research/academia to take on (some parts of) these roles.

TABLE C.1 STRENGTHS AND WEAKNESSES OF SECTORS PERFORMING GSNSW'S CURRENT ROLES

	Government Geological Survey	Industry	Research / academia
1. Data custodian	<p>State-wide remit to gather and curate self-generated and third-party geological data.</p> <p>Legislative support for gathering data from industry participants.</p>	<p>Individual exploration & mining companies focus on and collect data for areas covered by their exploration and production titles, and the commodities they are targeting.</p>	<p>Because of narrow and often “pure” research agendas, researchers are generally not well equipped to maintain consolidated and comprehensive data sets.</p>
2. Geological knowledge expertise	<p>State-wide, all commodities perspective. Objective, driven by public interest rather than commercial self-interest</p>	<p>Individual exploration & mining companies are largely limited to the areas covered by the exploration and production titles that they hold, and the commodities they are targeting. They have a duty to act in the best interests of their shareholders.</p>	<p>Individual expertise tends to be highly specialised, based on areas of research interest. Strong in pure research, less so in applied research. Where involved in applied research in collaboration with industry stakeholders, research is typically bound by commercial confidentiality and intellectual property considerations.</p>
3. Data acquisition	<p>“Pre-competitive” framework building focus. State-wide remit, with opportunities to set and adjust strategic priorities across the State.</p>	<p>As noted above, individual exploration & mining companies acquire data for areas covered by their exploration and production titles, and the commodities they are targeting. There are legislative prohibitions as well as commercial disincentives against operating on land not held under valid title. Companies focus on commercial testing of exploration targets and prospects.</p>	<p>No direct rights of access to land: “by permission” only, or in collaboration with authorised geological survey or industry partner with access rights. Targeted data gathering based on areas of specialist research interest. Data acquired in collaboration with industry stakeholders typically bound by commercial confidentiality and intellectual property considerations.</p>

	Government Geological Survey	Industry	Research / academia
4. Data value-adding	<p>“Packaging” data and using new data analysis techniques to demonstrate prospectivity and to stimulate investment interest.</p> <p>Optimum extent of data acquisition and interpretation aimed at “de-risking” may depend on choice of allocation mechanism for industry transfer. For example, more investment in de-risking may be justified for cash-bid areas in order to maximise bid values by decreasing risk discounts.</p>	<p>Applying new and / or proprietary data analysis to generate specific exploration targets within exploration and production titles.</p> <p>Disincentives to publicly disclose results that convey competitive advantage.</p>	<p>Tend to focus on data interpretation relevant to areas of specialist research interest. These may be pure research with little scope for short-term commercial payback; results typically published in scientific journals. Applied research outputs (for example, new data interpretation methods designed to help industry partners identify new exploration targets) are typically bound by commercial confidentiality and intellectual property considerations.</p>
5. Technical advice to government	<p>State-wide scope of expertise as basis for provision of advice. Objective, driven by public interest rather than commercial self-interest.</p>	<p>Narrower scope of expertise based on exploration / production titles and specific commodity focus. They have a duty to act in the best interests of their shareholders, rather than in the public interest.</p>	<p>May be objective. Expertise tends to be theoretical rather than practical / applied and focussed on narrow areas of research interest.</p>
6. Resource management	<p>Capacity to provide objective technical advice in support of government’s role in ensuring efficient use of resources.</p>	<p>Inappropriate role for exploration and mining companies (“self-policing”). Government could call on an independent third party (for example, a private mining engineering firm) subject to management of potential conflicts of interest.</p>	<p>Government could call on academic advisory services (for example, mining engineering researchers) subject to management of potential conflicts of interest.</p>
7. Investment promotion	<p>Well placed to lead mining investment promotion role, effectively as technical agent for the State government. Able to facilitate technical assessments and data access for prospective investors.</p>	<p>Industry support for investment attraction most likely through service companies (demonstrating local support capabilities) rather than exploration and mining companies who are fundamentally in competition with in-bound investors.</p>	<p>Role in investment attraction mostly limited to demonstration of research / technical / analytical expertise that can support in-bound investment.</p>
8. Geoscience education and outreach	<p>Role principally as “honest broker” to support industry-led communication with stakeholders. May be more trusted because of perceived independence and broader public interest remit. May be better placed to lead on broad (regional) communications programs.</p>	<p>Leads on project-specific communications with public stakeholders. Messages often mistrusted because of perceived self-interest.</p>	<p>Can play a valuable role in researching and analysing public attitudes and concerns regarding exploration and mining activities.</p> <p>Base for formal geoscience education feeding graduates into industry and government.</p>

SOURCE: ACIL ALLEN CONSULTING, BASED ON ANALYSIS UNDERTAKEN FOR THE REPORT

C.2 Benchmarking with comparator geological surveys

This Section provides additional analysis referenced in Chapters 3 and 4.

Table C.2 shows the current Activities of GSNSW compared with GSV, GSSA, and GSWA. This represents the perceptions of the representatives of the three geological surveys.

TABLE C.2 CURRENT ACTIVITIES OF GSNSW ALIGNED WITH COMPARATOR GEOLOGICAL SURVEYS

Activities	GSV	GSSA	GSWA
1. Generate new data	✓	✓	✓
2. Data acquisition and collation (existing and new)	✓	✓	✓
3. Data interpretation and analysis	✓	✓	✓
4. Data modelling	✓	✓	✓
5. Surveying and sampling	✓	✓	✓
6. Mapping	✓	✓	✓
7. Monitoring regional mineral exploration	✓	✓	✓
8. Store and manage data (non-heritage)	✓	✓	✓
9. Collect, store and manage drillcore	✓	✓	✓
10. Carry out resource assessments	✓	✓	✓
11. Advisory	✓	✓	✓
12. Manage archive and geological reference collections	✓	✓	✓
13. Publishing information	✓	✓	✓
14. Manage online data platforms	✓	✓	✓
15. Education and outreach activities	✓	✓	✓
16. Software development	✓	✓	✓
17. Industry investment promotion activities	✓	✓	✓
18. Assess title applications and titleholder reporting requirements	✗	✓	✓
19. Drilling grants program	✓	✗	✓

SOURCE: ACIL ALLEN CONSULTING 2019, VARIOUS

Table C.3 shows the current products and services of GSNSW compared with GSV, GSSA, and GSWA. This represents the perceptions of the representatives of the three geological surveys.

TABLE C.3 CURRENT PRODUCTS AND SERVICES OF GSNSW ALIGNED WITH COMPARATOR GEOLOGICAL SURVEYS

Type of product or service	Product or service	GSV	GSSA	GSWA
Assessment and advice	1. Assessment of exploration reporting and work programs	✓	✓	✓
	2. Geoscientific advice to other agencies	✓	✓	✓
Collections, publications and libraries	3. Drillcore libraries	✓	✓	✓
	4. Explanatory notes	✓	✓	✓
	5. Government Geotechnical Report Database	✓	✗	✓
	6. Mineral resources library	✓	✓	✓
	7. Peer reviewed scientific publications	✓	✓	✓
	8. Presentations	✓	✓	✓
	9. Reference collections	✓	✓	✓
	10. Scientific abstracts	✓	✓	✓

Type of product or service	Product or service	GSV	GSSA	GSWA
Data services	11. Company exploration reports	✓	✓	✓
	12. Drillcore scanning services	✓	✓	✓
	13. Geophysical images and data	✓	✓	✓
	14. Geoscience data resources	✓	✓	✓
	15. GIS web services	✓	✓	✓
	16. Online services	✓	✓	✓
	17. The Seamless Geology of NSW	✓	✗	✓
Education and outreach	18. Books and brochures	✓	✓	✓
	19. Factsheets - commodity fliers	✓	✗	✓
	20. Field excursion guides	✓	✓	✓
	21. Geotourism maps / brochures	✗	✓	✗
	22. NSW Geotours app	✗	✓	✗
Maps	23. 3D geological mapping data	✓	✓	✓
	24. Metallogenic maps	✓	✓	✓
	25. Mineral exploration highlights map	✓	✗	✓
	26. Mineral potential mapping	✓	✓	✓
	27. Mobile phone maps	✓	✗	✓
	28. Special purpose maps - general public	✓	✓	✓
	29. Special purpose maps - technical audience	✓	✓	✓
	30. Standard geological map sheets	✓	✓	✓

SOURCE: ACIL ALLEN CONSULTING 2019, VARIOUS



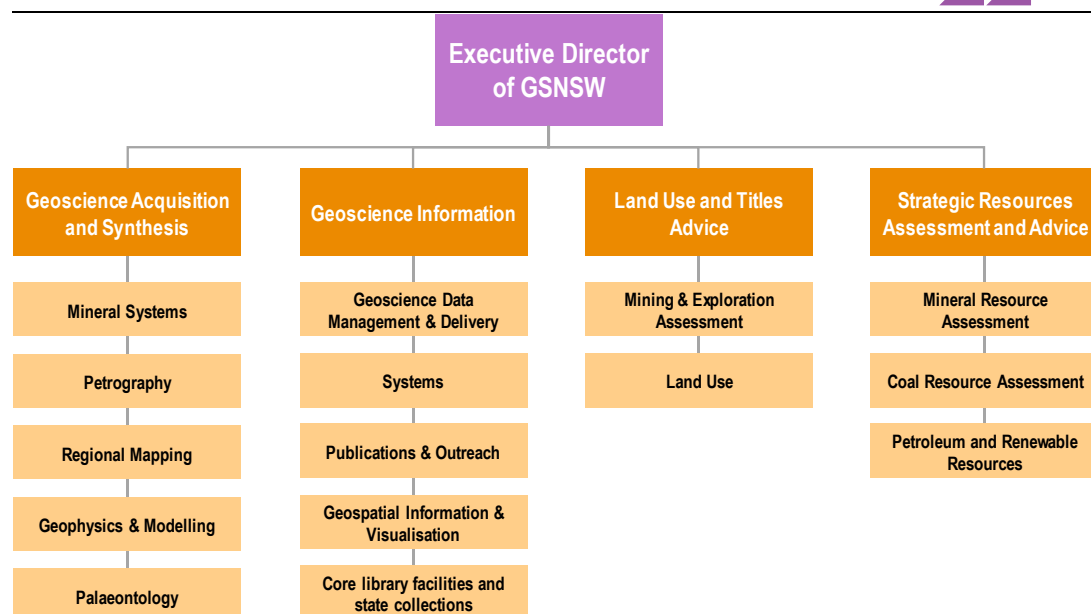
D.1 The structure of GSNSW

In 2018-19 GSNSW employed 99 people across four business units:

- **Geological Acquisition and Synthesis (GAS)**
- **Geoscience Information (GI)**
- **Land Use and Titles Advice (LUTA)**
- **Strategic Resource Assessment and Advice (SRAA).**

Each business unit has multiple specialised functions (Figure D.1) and is led by a Director, who reports to the Executive Director of GSNSW.

FIGURE D.1 STRUCTURE OF GSNSW



SOURCE: ACIL ALLEN CONSULTING 2019

D.1.1 Geoscience Acquisition and Synthesis

GAS is responsible for acquiring geoscientific information, synthesising new data and creating new concepts to enable better understanding of the NSW geological landscape. The following key functions support the operation of GAS:

- **Mineral Systems.** This function collates geoscientific data (including the National Virtual Core Library) on the distribution and origin of known and potential metallic minerals to inform land use planning and exploration.
- **Petrography.** This function creates and makes available geological specimens to enable the characterisation of ore minerals.
- **Regional Mapping.** This function conducts geological mapping at or near the Earth's surface to record the distribution and relationships of different rock types.
- **Geophysics and Modelling.** This function is the custodian of a large collection geophysical data across the state and performs acquisition, processing, modelling, interpretation, compilation and archiving.
- **Palaeontology.** This function manages NSW's Palaeontological Reference Collection, maintains high-level knowledge of palaeontological research, provides specialist services to support regional mapping and other GSNSW programs, and promotes palaeontology as an exploration tool among industry stakeholders.

D.1.2 Geoscience Information

GI is responsible for data management, product delivery services, community outreach and education, management of the WB Clarke Geoscience Centre and core storage facilities. Additionally, GI oversees the quality control, storage and delivery of NSW's pre-competitive geoscientific information. The following key functions support the operation of GI:

- **Geoscientific Data Management and Delivery.** This function delivers geoscientific data through the Geoscientific Data Warehouse, DIGS document management system and MinView web mapping application.
- **Systems.** This function administers and supports the MinView, DIGS and GDW applications, databases and infrastructure, and provides technical solutions and support.
- **Publications and Outreach.** This function produces, promotes and supports the use of a wide range of geoscience publications.
- **Geospatial Information and Visualisation.** This function is the custodian of geological mapping spatial data (including The Seamless Geology of NSW) and facilitates visualisation of geoscience data for a range of audiences and purposes.
- **Core Library Facilities and State Collections.** This function is the Londonderry Drillcore Library (WB Clarke Geoscience Centre).

D.1.3 Land Use and Titles Advice

LUTA conducts geoscientific assessments to provide advice to statutory referrals, applications and concurrences. LUTA supports the development of policy and strategy through DRG and the broader Government. The following key functions support the operation of LUTA:

- **Mining and Exploration Assessment.** This function monitors NSW mineral exploration, including assessment of title applications, for all resources, to provide advice to the decision-maker, and assessment of annual exploration reports, to monitor industry performance.
- **Land Use.** This function conducts assessments to provide advice on land use planning and decision-making regarding geology and mineral resources to local and state government agencies.

GSNSW's responsibilities under legislation are primarily delivered by the LUTA business unit. In some instances, SRAA responds on legislative matters, however, this is almost always coordinated through LUTA.

D.1.4 Strategic Resource Assessment and Advice

SRAA's responsibilities mainly relate to mineral resources. SRAA collects, stores and delivers information on the quantities and locations of known mineral, coal, petroleum and renewable energy resources in NSW. Furthermore, it acquires and analyses data to inform the *Strategic Release Framework* on the nature of coal and petroleum resources. The following key functions support the operation of SRAA:

- **Mineral Resources Assessment.** This function collects, validates and provides data, information and advice on minerals and construction resources to government, industry and the community. This includes mining of geological and resource information from company exploration and mining reports among other sources.
- **Coal Resource Assessment and Petroleum.** This function plans, manages and supervises resource assessment projects to inform on the nature and extent of the state's coal resources (for example, through drilling programs).
- **Renewable Resources.** This function generates pre-competitive data acquisition programs for petroleum and renewable energy resources. This involves modelling, producing prospectivity reports, releasing data packages and providing advice.

D.1.5 GSNSW funding

In 2018-19, GSNSW spent \$16.2 million on operational costs. The GAS business unit expended the largest portion of the total budget (\$4.5 million), followed by GI (\$3.7 million), and then SRAA (\$3 million), LUTA (\$2.8 million), and the Executive management unit (\$2.1 million).

Regarding workforce size, GAS is again the largest business unit, employing 26 staff members. GI follows with 25, and then SRAA (21), LUTA (20), and the Executive management unit (7). In total, GSNSW employed 99 people in 2018-19.

These figures differ from the benchmarking data in Section 4.6.3 which is for 2017-18.

D.2 Comparison of GSNSW with other geological surveys

For this Review, the Geological Surveys of South Australia, Victoria and Western Australia were selected as comparator state geological surveys to which the structure and work program of GSNSW would be compared. An outline of each comparator survey is provided below.

The benchmarking of the comparator geological surveys forms part of the analysis undertaken in Chapter 4. This includes comparison of roles, activities and products and services.

Across the four geological surveys, GSNSW, GSSA and GSV have business units focused on geoscientific information management. GSWA has a more consolidated structure with only two business units, within which the geoscientific information management resides.

Similarly, the advisory services are a separate business unit for GSNSW, GSSA and GSV. The advisory roles are likely performed by one or both of GSWA's two business units. Detail of the sub-structures under GSWA's two business units were not available.

D.2.1 Geological Survey South Australia

Following a restructure in 2016, GSSA was organised into five business units,^{87, 88} comprising:

- Regional geology and mapping – responsible for the definition, interpretation and preparation of geological data and maps.
- Mineral systems – responsible for the development of state's mineral systems and assisting the development and promotion of ore deposits exploration strategies.
- Geophysics and prospectivity – responsible for the acquisition, maintenance, interpretation, modelling and delivery of geophysical and remotely sensed data.

⁸⁷ SA Department for Energy and Mining (2019). *About the GSSA*. Accessed 16 September 2019: http://www.energymining.sa.gov.au/minerals/geoscience/geological_survey/about_the_gssa.

⁸⁸ GSSA refer to these as 'work programs'. In this report, they have been named 'business units' for consistency with GSNSW's structure.

- Resource evaluation and planning – responsible for the provision of assessments, advice and reviews of metallic minerals, construction materials, dimension stone, industrial minerals and gemstones on both the deposit and regional scale.
- Geoscientific information management – responsible for the assembly, maintenance and delivery of geoscientific information.

In 2017-18, GSSA had 47 employees.⁸⁹ In comparison across the four surveys, by funding, GSSA is the smallest state geological survey.⁹⁰ GSSA receive some of their funding from MinEx CRC and the South Australian Economic Growth Fund.

Broadly, GSNSW's business units align to that of GSSA. GSSA has separate business units for information management and advisory services. GSNSW's structure appears more streamlined than that of GSSA, with GAS likely performing similar roles to the minerals systems and geophysics and prospectivity business units.

D.2.2 Geological Survey Victoria

GSV's work program includes basin studies, geophysical interpretation, structural geology, geochemistry, geochronology, seismic and gravity surveys, petrology and mineralisation studies and regolith studies.⁹¹

GSV operates on a 'market failure' model where its purpose is to provide geological information that the free market could not be relied on to provide.

In 2017-18, GSV had a workforce of 46 people.⁹² GSV is fully funded by the Victorian Government.⁹³

GSV has five business units:

- Regional geological investigations
- Geoscience information management
- Prospectivity assessments
- Mineral and energy resources
- Geophysics and prospectivity.

These broadly align to GSNSW's business units, with a separate business unit for information management and advisory services. GSNSW's four business unit structure appears more streamlined than that of GSV. GSV does not undertake geological assessment of resource industry activity, that is, a function equivalent to GSNSW's Mining & Exploration Assessment group. This function is located outside the geological survey.

D.2.3 Geological Survey Western Australia

GSWA has several areas of focus, including crust imaging, geophysics acquisition, mapping, interpretation of geochemistry, interpretation of history, database maintenance, geochronology and geochemistry, minerals and petroleum resources, mineral systems, statutory information (WOMEX), land use, resources strategy (policy), and investment promotion.⁹⁴

In comparison across the four surveys, GSWA is the largest state survey, by staff and funding. In 2017-18, GSWA had a workforce of 151 employees and a \$33.6 million budget.⁹⁵ GSWA is fully funded by the Western Australian Government.⁹⁶

GSWA has two business units:

⁸⁹ 2018 Chief Government Geologists' meeting (2018). *Geological Survey Benchmarking - Staffing, budgets, salaries and functions: 2017-18*.

⁹⁰ GSSA's funding information was provided on a confidential basis.

⁹¹ VIC Earth Resources (2019, September 16). *Geological Survey of Victoria*. Accessed 16 September 2019: <https://earthresources.vic.gov.au/geology-exploration/geological-survey-victoria>.

⁹² 2018 Chief Government Geologists' meeting (2018). *Geological Survey Benchmarking - Staffing, budgets, salaries and functions: 2017-18*.

⁹³ GSV's funding information was provided on a confidential basis.

⁹⁴ Tyler, I. (2019). Geological Survey of Western Australia Consultation. Telephone consultation, 14 August 2019.

⁹⁵ 2018 Chief Government Geologists' meeting (2018). *Geological Survey Benchmarking - Staffing, budgets, salaries and functions: 2017-18*.

⁹⁶ Tyler, I. (2019). Geological Survey of Western Australia Consultation. Telephone consultation, 14 August 2019.

- Geoscience and resource information and maps
- Exploration incentive scheme.

These appear to combine the majority of GSNSW's roles into the Geoscience and resource information and maps business unit, with support for external exploration undertaken by the second business unit. There are likely additional lower level structures to support the delivery of GSWA's work program, however these were not readily available.



Table E.1 provides an overview GSNSW's collaborative projects and programs.

TABLE E.1 GSNSW COLLABORATIVE PROJECTS AND PROGRAMS

Project / program name	Focus	Partners	Timeframe
1 The Australian Lithospheric Architecture Magnetotelluric Project (AusLAMP)	Joint partnership to establish baseline deep crustal conductivity between 11 km and 100 km depth across Australia.	Geoscience Australia	2016 - 2020
2 South East Lachlan Crustal Transect Project	Acquire 600 km of new seismic reflection data over the south-east Lachlan Crustal Transect across north-eastern Victoria and south-eastern NSW.	Geological Survey of Victoria Geoscience Australia AuScope	2018 - 2020
3 MinEx CRC Program	National initiative to enable mineral discovery in Australia's covered terranes by - developing more productive, safer and environmentally friendly drilling methods - developing new technologies for collecting data while drilling - undertaking drilling to collect vital data in under-explored areas of potential mineral wealth in Australia through the National Drilling Initiative.	Geological surveys of all Australian states and the Northern Territory Geological Survey Geoscience Australia Major and mid-tier mining companies ⁹⁷ Mining Equipment Technology and Service provider CSIRO Major Australian universities	2018-2028
4 PALM Paleomagnetic Laboratory	Joint facility (Newcastle Institute for Energy & Resources, University of Newcastle and GSNSW) for analysis of petrophysical samples through the use of palaeomagnetism to help constrain geological models and aid the accuracy of exploration drill targeting.	Newcastle Institute for Energy and Resources	Ongoing
5 The Wandsworth Supervolcano: Catastrophic climate change and critical metals Project	Identify mineral potential within volcanic units and better understand the role of volcanism in driving major climate change events.	Geoscience Australia University of New England and Boise (Idaho)	2019-2022

⁹⁷ Full list of MinEx CRC partners at <https://minexcrc.com.au/about-minex-crc/participants/>.

Project / program name	Focus	Partners	Timeframe
6 CODES Macquarie ARC Linkage Project	Multi-partner research initiative to deliver significant new data on: - the age of rocks and ore deposits - the chemistry of minerals as a vector to mineralisation - geophysical data across key regions of high mineralisation potential in central NSW	Geoscience Australia, Geological Survey of Victoria, Mineral Resources Tasmania University of Tasmania, University of Newcastle, Macquarie University, Australian National University, University of Melbourne Rio Tinto, Alkane Resources, Sandfire Resources, IMEX Consulting, Evolution Mining, Heron Resources	2016-2019
7 Illuminating AusLAMP Project	Multi-partner research initiative to investigate the possible sources of conductivity / resistivity anomalies in the deep crust, which will support informed interpretation of the AusLAMP 3D resistivity models, driving new ideas about tectonic evolution and the location of possible new mineral provinces.	Northern Territory Geological Survey Geological Survey of SA Geoscience Australia CSIRO University of NSW Macquarie University Monash University	2019-2022
8 The Loop consortium Project	Multi-partner research initiative, which aims to find a new Open Source initiative to build the next generation of 3D modelling tools.	Northern Territory Geological Survey Geological Survey of SA Geological Survey of WA Geoscience Australia AuScope MinEx CRC British Geological Survey Canadian Geological Survey University of Western Australia Monash University Aachen University (Germany) BRGM (French geological survey)	2019-2022
9 Government Geotechnical Report Database (GGRD) Project	Secures and provides access to NSW government geotechnical reports and data.	NSW Government Agencies	2019 -2022
10 AuScope National Virtual Core Library Program	Multi-partner research into Australian mineral systems through extensive hyperspectral logging and imaging of archival and newly submitted drillcore. Results will support mineral exploration.	Geological surveys of all Australian states and the Northern Territory Geological Survey CSIRO	2006-ongoing
11 Water monitoring strategy for NSW coal basins project	Expand the groundwater monitoring network in the NSW coal basins.	Lands & Water, Department of Planning, Industry and Environment	2014-2020

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW



To identify NSW and national priorities, a desktop review was undertaken of relevant NSW and national plans and strategies, including regional water management strategies and regional growth plans. Table F.1 provides a summary of the NSW and national priorities related to GSNSW's key areas of interest: minerals, coal or petroleum, environment / land use, water and community.

TABLE F.1 NSW AND NATIONAL PRIORITIES

Plans, strategies and reports	Minerals	Coal or petroleum	Environment / land use	Water	Community
NSW priorities					
NSW Minerals Strategy	Providing data and information to attract investment to NSW by reducing uncertainty and technical risk in mineral exploration				Improving communication and engagement with stakeholders
A 20-year Economic Vision for Regional NSW				Manage vital energy and water resources sustainably to ensure supply will meet long-term regional needs	Draw in more domestic and international tourists Attract more domestic and international students to regional NSW

Plans, strategies and reports	Minerals	Coal or petroleum	Environment / land use	Water	Community
A Metropolis of Three Cities - Greater Sydney region plan	Protect and support agricultural production and mineral resources (in particular construction materials) by preventing inappropriately dispersed urban activities in rural areas		Biodiversity is protected, urban bushland and remnant vegetation is enhanced Scenic and cultural landscapes are protected A low-carbon city contributes to net-zero emissions by 2050 and mitigates climate change	The coast and waterways are protected and healthier Energy and water flows are captured, used and re-used	Services and infrastructure meet communities' changing needs Communities are healthy, resilient and socially connected Greater Sydney's communities are culturally rich with diverse neighbourhoods Greater Sydney celebrates the arts and supports creative industries and innovation
Regional water management strategies⁹⁸					
Lower Hunter Water Plan				Reduce the amount of water required to service the lower Hunter's needs Make better use of existing storages Provide extra supply as a contingency in extreme droughts	
Greater Hunter Water Plan			Review and improve environmental obligations	Document rules for water sharing during extreme events based on probability of supply	
NSW regional growth plans					
Central Coast	Manage the ongoing use of mineral resources and provide access to up-to-date information about these resources through the NSW Government's Common Ground website and its Geoscientific Data Warehouse		Protect the natural environment and manage the use of agricultural and resource lands Develop land use plans that respond to the lifecycle of mineral and energy resources to enable all stakeholders to better understand the long-term productive value of the land and provide greater certainty for adjoining land uses	Sustain water quality and security	Well-connected communities and attractive lifestyles

⁹⁸ The following regions do not have regional water management strategies: Gwydir Region, Macquarie Region, Lachlan Region, Far North Coast Region and the South Coast Region.

Plans, strategies and reports	Minerals	Coal or petroleum	Environment / land use	Water	Community
Central West and Orana Regional Plan 2036	Sustainably manage mineral resources		Plan for greater land use compatibility Increase renewable energy generation Protect and manage environmental assets	Sustainably manage water resources for economic opportunities Manage and conserve water resources for the environment	Promote and diversify regional tourism markets Deliver healthy built environments and better urban design
Far West	Sustainably manage mineral resources		Protect areas of mineral and energy resources potential through local land use strategies and local environmental plans. Protect and manage environmental assets Protect productive agricultural land and plan for greater land use compatibility	Sustainably manage water resources for economic opportunities Manage and conserve water resources for the environment Manage and conserve water resources for communities	Strong and connected communities
Hunter	Manage the ongoing use of mineral resources and provide access to up-to-date information about these resources through the Department of Planning, Industry and Environment Common Ground website and its Geoscientific Data Warehouse	Manage the ongoing use of natural resources (coal, petroleum) Identify the land and infrastructure requirements to develop the Hunter's coal and alternative energy resources	Plan for greater land use compatibility Protect and connect natural areas	Sustain water quality and security	Create healthy built environments through good design Revitalise existing communities Grow tourism in the region
Illawarra-Shoalhaven		Secure the productivity and capacity of resource lands (including coal and petroleum)	Secure the health of coastal landscapes by managing land uses and water quality	Manage and protect the Sydney Drinking Water Catchment Secure the health of coastal landscapes by managing land uses and water quality	Enhance community access to jobs, goods and services by improving connections between centres and growth areas
New England North West	Sustainably manage mineral resources		Protect areas of potential high environmental value Grow New England North West as the renewable energy hub of NSW	Sustainably manage and conserve water resources	Expand tourism and visitor opportunities

Plans, strategies and reports	Minerals	Coal or petroleum	Environment / land use	Water	Community
North Coast	Sustainably manage natural resources (including minerals)	Sustainably manage natural resources (including coal)	Deliver environmentally sustainable growth Promote renewable energy opportunities	Enhance biodiversity, coastal and aquatic habitats, and water catchments	Promote the growth of tourism
Riverina-Murray	Sustainably manage mineral resources		Protect and manage the region's many environmental assets	Manage and conserve water resources for the environment	Promote tourism opportunities Deliver healthy built environments and improved urban design
South East and Tablelands	Manage the ongoing use of mineral resources		Protect important environmental assets Position the region as a hub of renewable energy excellence	Coordinate infrastructure and water supply in a cross-border setting Secure water resources	Grow tourism in the region
National priorities					
Resources 2030 Taskforce Report 2018	Governments should develop strategies to facilitate value-adding for prospective battery and critical minerals domestically		Governments should develop an environmental management economy to further bolster Australia's competitive advantage in this area		Building strong communities
National Science and Innovation Agenda 2015	Innovation and commercialisation in mining are key to future job and economic growth				
MinEx CRC - A New Frontier in Mineral Exploration	Collaborative drilling to explore untapped areas of potential mineral wealth in Australia Developing new technologies for collecting data while drilling		Developing more productive, safer and environmentally friendly drilling methods		
Australia's Critical Minerals Strategy	Attracting investment into Australia's critical minerals sector Spurring innovation in the critical minerals sector Developing geoscience information on critical minerals		Developing a data strategy to improve the discoverability and utilisation of key geological, environment and heritage data sets	Exploring for the Future (2016–2020) initiative (Geoscience Australia) aims to gather new innovative high-resolution geoscience data and information about the potential mineral, energy and groundwater resources	

Plans, strategies and reports	Minerals	Coal or petroleum	Environment / land use	Water	Community
Decadal Plan for Geoscience	<p>Supporting the public-good research agenda of the UNCOVER initiative</p> <p>Improve the openness and accessibility of geoscience data</p> <p>Ensure the existence of high-quality geoscience data as baseline information to inform, track, and predict all impacts of resource development</p> <p>Create, with uniform national standards, a high-resolution national-scale geochemical survey program</p> <p>Support for a National Drilling Initiative, and the creation of a national core repository with uniform national standards</p>		<p>Pursue a deeper understanding of the geomicrobiological controls that have affected the Australian continent</p> <p>Contribute as broadly as possible to the wider Earth Sciences, such as climate change research</p> <p>Provide the research to make informed decisions about competing resource and land use interests</p>	<p>The basic knowledge required for groundwater management includes its geological container, the interconnectedness of different containers, and understanding the pore-space resource. Providing this knowledge is a geoscience responsibility.</p>	<p>Further investigate the origins and evolution of life on Earth</p> <p>Become more adept at integrating new technologies and become better at accessing the enormous advantages from advances in data and computational science</p> <p>Become more adept at accessing relevant knowledge from all available sources, such as from the first Australians</p> <p>Government should invest in and support all levels of geoscience education</p> <p>Professional societies, industry, government agencies, and universities should work together to provide integrated and multi-disciplinary education pathways for the next generation of geoscientists</p> <p>The geoscience community must cultivate a pervasive appreciation and understanding of the importance and relevance of geoscience in the broader community and strengthen the status of the geoscientist as a trusted advisor</p>

SOURCE: ACIL ALLEN CONSULTING 2019, VARIOUS



Table G.1 provides an overview of GSNSW's roles and responsibilities under NSW resources legislation.

TABLE G.1 GSNSW'S ROLES AND RESPONSIBILITIES UNDER NSW RESOURCES LEGISLATION

Legislation / Direction / regulation	Section / clause / part	Subject	GSNSW role / responsibility
<i>Coal Mine Subsidence Compensation Act 2017</i>	General advice	Advice on current and future coal extraction	Provides advice to Subsidence Advisory NSW on current coal mining titles, development consents and future extraction plans and potential.
<i>Coal Mine Subsidence Compensation Regulation 2017</i>	Schedule 3	Mine subsidence districts	Provides advice to Subsidence Advisory NSW on current coal mining titles, development consents and future extraction plans and potential for consideration in declaring or removing districts.
Mining Act 1992	s 6	Ancillary mining activities	Provides geological advice on applications, renewals and activities (mining and non-mining).
	s 11A	Non prospecting / mining	
	s 12	Fossicking	Provides geological advice on fossicking activities and fossicking districts.
	ss 13, 13C, 22, 27, 32	Exploration licence applications	Provides geological advice regarding applications for exploration licences, assessment leases and mining leases and renewals, including transfer of authority and cancellations.
	ss 33, 41, 45, 47	Assessment of lease applications	
	ss 51, 59, 63, 65, 68, 73, 75, 81	Mining lease applications	
	ss 113, 114, 114A, 119	Renewals	Carries out geological assessment of all work programs to determine their validity and suitability for the associated application.
	ss120, 121	Transfers	
	s 125	Cancellations	Provides input to reports on annual activity.
	s 129A	Work programs	
s 163C	Reporting		

Legislation / Direction / regulation	Section / clause / part	Subject	GSNSW role / responsibility
Mining Regulation 2016	s 163G	Sampling of strata	Reviews geological data collected by authority holders ⁹⁹ as part of the authority holder's annual reporting requirements.
	s 367	Mining reserves	Provides advice on where Mining Reserves should be granted, taking account of existing reserves.
	s 368	Allocation areas	Monitors declaration of mineral allocation areas to support future assessment of title applications.
	s 387C	Waivers	Has delegated responsibility to waive minor procedural matters.
	Schedule 1B	Minimum standards	Geological assessment of proposed work programs in applications for an authority.
	cl 7, 11	Ancillary mining activities	Provide geological advice on applications and renewals in relation to Mining Leases for Ancillary Mining Activities.
	cl 12	Fossicking	Provides geological advice on fossicking activities and fossicking districts.
	cl 13	Non prospecting / mining	Provides geological advice on applications for activities not considered to be mining.
	cl 14, 16, 18, 20	Exploration licence applications	
	cl 21, 23	Assessment of lease applications	Provides geological advice in relation to applications for exploration licences, assessment leases and mining leases and renewals, including transfer of authority and cancellations.
	cl 25, 27, 28	Mining lease applications	
	cl 33	Transfers	
	cl 35	Work programs	
	cl 59	Applications	Assessment of annual reports.
	cl 62		Assessment of all reports.
	cl 63		Assesses and provides advice to support assessment of mining lease applications.
	cl 64		Assesses and provides advice to support assessment of mining lease tenders.
	cl 65	Reporting	Collection and disposal of core samples.
	cl 66		Publication of reports.
	cl 67		Assessment of applications for extension to reporting deadlines.
cl 68		Assessment of applications for exemption from reporting.	
Schedule 1 Schedule 2	Minerals and groups	Advises on mineral definitions under the Schedule, including whether activities constitute illegal mining or exploration.	
Petroleum (Onshore) Act 1991	s 8	Applications	Provides expert assessment advice to facilitate decision making for petroleum titles.
	s 14	Work programs	Carries out geological assessment of all work programs to determine their validity and suitability for the associated application.
	s 16	Grants and refusals	Provides advice on the granting or refusal of petroleum titles.
	s 19B	Renewals	Provides advice on renewal of petroleum titles.
	s 20	Continuations	Provides advice on what is a reasonable expectation for work during the continuation.

⁹⁹ An 'Authority' is a defined term under the *Mining Act 1992*.

Legislation / Direction / regulation	Section / clause / part	Subject	GSNSW role / responsibility
	ss 30, 31	Petroleum exploration licences	
	ss 34, 35	Petroleum assessment leases	Provides geological advice in relation to applications for petroleum exploration licences, assessment leases and production leases and renewals, including transfer of authority and cancellations.
	ss 39, 40	Specials	
	ss 42, 44, 45	Petroleum production leases	
	s 67	Development consents	Provides geological advice regarding applications for production leases.
	ss 97A, 97B, 97C, 97G	Reporting	Under 97A, GSNSW keeps geological plans and records. Under S97B GSNSW reviews titleholder statistics and returns Under S97C GSNSW assesses titleholder reports including annual reports Under S97G GSNSW assesses titleholder samples of state, petroleum and water.
Petroleum (Offshore) Act 1982			GSNSW has responsibilities similar to those under the Petroleum (Onshore) Act, shared with the Australian Government.
Offshore Minerals Act 1999	Chapter 2	Regulation of offshore exploration and mining	

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW



GSNSW ROLES AND RESPONSIBILITIES UNDER NSW NON- RESOURCES LEGISLATION

H

Table H.1 provides an overview of GSNSW's roles and responsibilities under NSW non-resources legislation.

TABLE H.1 GSNSW'S RESPONSIBILITIES UNDER OTHER NSW LEGISLATION

Legislation / Direction / Regulation	Section / Clause / Part	Subject	GSNSW role / responsibility
Ministerial Planning Direction 1.3 - Mining, Petroleum Production and Extractive Industries	All	Resource considerations for Local Environmental Plans	Provides advice to the planning authority in response to this statutory consultation requirement regarding planning proposals under the EP&A Act. Provides advice on local government area wide strategic plans (rural / residential land study) to inform amendments to Local Environment Plans, and on Sydney regional plans.
	CI 7	Permissible development under Local Environmental Plans	Provides advice to Relevant Councils on their Local Environmental Plans.
	CI 9A	Coal seam gas exclusion zones	Provides advice to other parts of DRG, Planning Services Division in the Department, other NSW agencies and Councils in relation to areas where CSG development is prohibited.
State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007	CI 10	Exempt development	Provides advice to a wide range of stakeholders, including development applicants, Government and Councils regarding the potential constraints to exploration and mining of proposed changes in land use.
	CI 12	Compatibility of proposed resources development with other Land Uses	Provides advice to consent authorities on compatibility of proposed extractive industry, petroleum production or mine with other existing or potential land uses.
	CI 13	Compatibility of other Developments with existing Resources sector activity	Provides advice to consent authorities on compatibility of proposed developments with existing resources sector activity including existing extractive industry, petroleum production or mine, or mineral, petroleum or extractive resources.
	CI 15	Resource recovery	Provides advice to consent authorities on extractive industry development application.
<i>Environmental Planning &</i>	S 9.1	Ministerial planning directions	Provides input to Ministerial Directions on planning matters. Receives referrals from the Growth, Design & Programs Branch of the Department, or from Councils.

Legislation / Direction / Regulation	Section / Clause / Part	Subject	GSNSW role / responsibility
<i>Assessment Act 1979</i>	s 4.42	Approvals legislation that must be applied consistently	Advise other parts of DRG on the status of development consents to ensure mining leases are not granted without appropriate development consent under the <i>EP&A Act</i> . GSNSW also advises on tenures granted under the <i>Mining Act</i> , which the consent authority must consider when deliberating on a development application.
Sydney Regional Environmental Plan (Central Coast Plateau Areas)	CI 7	Extractive industries	Provides advice to local government on extractive industry development applications. GSNSW also provides advice to the Policy area of the Department on proposed repeals of this instrument.
	CI 18	Consultation	Provides advice in response to this statutory consultation requirement. Consent authorities must consider this advice.
	CI 12	Local Environmental Plan development controls for Richmond Lowlands	Provides advice to the council responsible for the Local Environmental Plan, development proponents, and to the Growth, Design & Programs Branch, of the Department on extraction potential of the area.
	CI 13	Local Environmental Plan development controls for Schedule 1 or 2 land	Provides advice under Ministerial Planning Direction 1.3 - Mining, Petroleum, Production and Extractive Industries. Advice under this clause must be considered in parallel with the <i>EP&A Act</i> , S9.1 Direction 9.3.
	CI 15	Consultation over local environment plans	Provides advice to development proponents seeking rezoning, subdivision or any other change to the standing land use approval. Provides advice to the Growth Design & Programs Branch of the Department and Councils in response to this statutory consultation requirement regarding site specific amendments to Local Environment Plans.
Sydney Regional Environmental Plan - Extractive Industry (No 2-1995)	CI 16	Restrictions on development	Provides advice where development proponents are seeking rezoning, subdivision or any other change to the standing land use approval. Provides advice to the Growth Design & Programs Branch, of the Department and Councils on existing extractive industries.
	CI 20	Extractive industry prohibition areas	Provides advice to Councils and the Growth Design & Programs Branch of the Department on the potential constraints to extractive industries of proposed amendments to a Local Environment Plan.
	Schedule 1	Significant extractive industry sites	Undertakes extractive industry site mapping for development proponents seeking rezoning, subdivision on any other change to the standing land use approval, as well as the Growth Design & Programs Branch of the Department and Councils.
	Schedules 2-5	Planning controls and applicability	Carries out extractive industry site and planning control area mapping by providing advice on the location, significance and priority of relevant resources to a wide range of stakeholders including Council, Growth Design & Programs Branch of the Department.
	s 30D(d)	Ministerial concurrence	Provides advice to support Ministerial concurrence for the reservation of state conservation areas.
<i>National Parks and Wildlife Act 1974</i>	s 39	Existing interests - national parks	Provides advice to the Reserve Establishment Team in the Environment, Energy and Science (EES) Group of the Department on potential constraints to exploration and mining arising from a proposed change in land use.
	s 41	Mining	Provides advice to the Reserve Establishment Team in the EES Group of the Department on the potential constraints to exploration and mining of proposed changes in land use in respect of a national park or historic site.

Legislation / Direction / Regulation	Section / Clause / Part	Subject	GSNSW role / responsibility
	s 47H	Existing interests – State Conservation Areas	Provides advice to the Reserve Establishment Team in the EES Group of the Department on the potential constraints to exploration and mining of proposed changes in land use, including advice on consequences for existing titles, exploration and assessment programs, and mining development.
	s 47J	Provisions relating to mining - State Conservation Areas	Provides advice to the Reserve Establishment Team in the EES Group of the Department, as well as the Minister on the potential constraints to exploration and mining of proposed changes in land use.
	s 47M	State Conservation Area 5-yearly review	Provides input to Ministerial reviews of State Conservation Areas, as well as to the Minister.
	s 47MA	Reservation of State Conservation Area as National Park - ministerial concurrence	Provides advice to support Ministerial concurrence for the reservation of state conservation area as national park.
	s 54	Mining	Provides advice to the Reserve Establishment Team in the EES Group of the Department on the potential constraints to exploration and mining of a proposed change in land use in respect of a Nature Reserve.
	s 58O	Mining	Provides advice to the Reserve Establishment Team in the EES Group of the Department on the potential constraints to exploration and mining of a proposed change in land use in respect of a karst conservation reserve.
	s 61	Declaration of wild rivers - ministerial concurrence	Provides input to Ministerial decisions on the declaration of wild rivers within state conservation areas where the declaration may have an impact on the functions of the <i>Mining Act</i> .
	s 64	Mining	Provides advice to the Reserve Establishment Team in the EES Group of the Department on the potential constraints to exploration and mining of a proposed change in land use in respect of an Aboriginal area.
	s 73A	Consultation on plans of management	Provides advice to the Reserve Establishment Team in the EES Group of the Department in relation to publicly exhibited plans of management for State Conservation Areas.
	Part 11	Acquisition of land for reservation (under part 4)	Undertakes strategic assessments for the purpose of providing advice on the land acquired or land that will potentially be acquired under this part.
<i>Biodiversity Conservation Act 2016</i>	s 3.3	Area of outstanding biodiversity value public authority consultation	Provides advice to the EES Group of the Department on the potential constraints to exploration and mining of a proposed change in land use.
	s 5.5	Biodiversity stewardship agreements - consultation with minister resources	Provides advice in response to this statutory consultation requirement regarding Biodiversity Stewardship Agreement applications.
	s 5.9	Biodiversity stewardship agreement titleholder consultation and consent	Provides advice to the proponent and to potential resources titleholders.
<i>Forestry Act 2012</i>	s 16	Flora reserves	Provides advice to Forestry Corporation, NPWS or other parts of DRG on the potential constraints to exploration and mining of a proposed change in land use.
	s 17	State forest review	Provides advice to Forestry Corporation on the resource potential within state forests.
	Part 3 Division 2	Special management zones	Provides advice to Forestry Corporation on the potential constraints to exploration and mining of proposed changes in land use.

Legislation / Direction / Regulation	Section / Clause / Part	Subject	GSNSW role / responsibility
	Part 3 Division 3	Management plans	Provides advice to Forestry Corporation on the potential constraints to exploration and mining of proposed changes in land use, specifically advice on the potential impacts of a proposed Plan of Management, including impacts on resource access. Advice may guide formation of the Plan of Management or inform changes to proposed forestry zonings to facilitate resource access.
	s 35	Land subject to mining law	Provides advice on the potential constraints to exploration and mining of a proposed change in land use, that is advises: Under 35(1) – Forestry Corporation or NPWS in respect of proposed declarations and conditioning of Flora reserves. Under 35(2) – other parts of DRG on titles permitting matters. Under 35(3) – the Resources portfolio Minister in relation to requests from Forestry Corporation or NPWS for declaration and conditioning of Flora Reserves.
	s 35(3)	Land subject to mining law	Provides advice to support concurrence of the Resources portfolio Minister regarding the exemption of a State forest or flora reserve
	s 38(3)	Unlawful taking of timber	Provides advice in relation to the restriction of quarrying or removal of forest materials under the Mining Act 1992 or Petroleum (Onshore) Act 1991.
<i>Crown Land Management Act 2016</i>	S13.2 (3) & (5)	Land transfers generally	Provides advice to Crown Lands on the resource potential of Crown land.
<i>Roads Act 1993</i>	s 152A(5)	Sell or dispose of crown roads	Provides advice to Crown Lands in response to this statutory consultation requirement regarding potential restrictions to exploration, mining, petroleum production and extractive industry access.
<i>Aboriginal Land Rights Act 1983</i>	s 36(1)(b)	Lawful use and occupation	Provides advice to DRG, the broader Department, Councils, Aboriginal Land Councils on any titles, exploration activities or mining and extractive industry operations that would affect a claim under the definition of <i>claimable Crown land</i> in the section.
<i>Coal Mine Subsidence Compensation Act 2017</i>	General	Advice on current and future coal extraction	Provides advice to Subsidence Advisory NSW on current coal mining titles, development consents and future extraction plans and resource potential.

SOURCE: ACIL ALLEN CONSULTING 2019, GSNSW

GSNSW'S CURRENT, ACTIVITIES AND PRODUCTS AND SERVICES ALIGNED TO BUSINESS UNITS

Figure I.1 shows the activities undertaken across business units (see Section 4.6.2). This information was sourced from GSNSW and considers the alignment of the business units with the activities. It does not reflect the functions of specific business units.

FIGURE I.1 ACTIVITIES UNDERTAKEN ACROSS BUSINESS UNITS

ACTIVITIES	UNITS			
	Geoscience Acquisition and Synthesis	Geoscience Information	Land Use and Titles Advice	Strategic Resource Assessment and Advice
Generate new data	✓			✓
Data acquisition and collation (existing and new)	✓			✓
Data interpretation and analysis	✓	✓		
Data modelling	✓			✓
Surveying and sampling	✓			
Mapping	✓	✓		
Monitoring mineral exploration in NSW			✓	✓
Store and manage data (non-heritage)		✓		
Collect, store and manage drillcore		✓		✓
Carry out resource assessments				✓
Advisory			✓	✓
Manage archive and geological reference collections	✓	✓		
Publishing information		✓		
Manage online data platforms		✓		
Education and outreach activities	✓	✓	✓	✓
Software development		✓		
Industry investment promotion activities	✓		✓	✓
Assess title applications and titleholder reporting requirements			✓	
Drilling grants program (GSNSW Executive)				

SOURCE: GSNSW DATA, PRESENTED BY ACIL ALLEN

Table I.1 outlines the products and services delivered across GSNSW's business units.

TABLE I.1 PRODUCT AND SERVICE DELIVERY ACROSS GSNSW BUSINESS UNITS

Product / Service	GAS	GI	LUTA	SRAA	Potential Streamlining Opportunity
Products					
1. Metallogenic maps	■	■		■	✓
2. Standard geological map sheets	■	■			
3. Explanatory notes	■	■			
4. Special purpose maps - general public		■		■	✓
5. Special purpose maps - technical audience	■	■			
6. Geotourism maps / brochures	■	■			✓
7. Geophysical images and data	■	■			
8. Mineral potential mapping	■	■			
9. Mineral exploration highlights map		■		■	
10. 3D geological mapping data	■				
11. GIS web services		■			
12. Books and brochures	■	■	■	■	✓
13. Geoscience data resources		■			
14. Company exploration reports		■			
15. Field excursion guides		■			
16. Factsheets - commodity fliers		■		■	
17. Presentations	■	■	■	■	
18. NSW Geotours app	■	■			✓
19. The Seamless Geology of NSW	■	■			✓
20. Mobile phone maps	■	■			✓
21. Peer reviewed scientific publications	■	■		■	
22. Scientific abstracts	■	■		■	
Services					
1. Online services		■			
2. Drillcore libraries		■		■	
3. Reference collections	■	■			
4. Mineral resources library		■			
5. Drillcore scanning services	■				
6. Geoscientific advice to other agencies			■	■	
7. Assessment of exploration reporting and work programs			■	■	
8. Government Geotechnical Report Database		■			

Note: Purple tiles indicate where a business unit provides information, yellow tiles indicate a where a business unit produces information, multi-coloured tiles indicate both, and grey tiles indicate where a role is undefined.

SOURCE: GSNSW DATA, PRESENTED BY ACIL ALLEN



DATA GAPS AND OPPORTUNITIES IN RELATION TO GSNSW'S ACTIVITIES, PRODUCTS AND SERVICES



Table J.1 outlines the data gaps and opportunities in relation to GSNSW's activities, products and services.

TABLE J.1 DATA COLLECTION REQUIRED TO ADDRESS EXISTING DATA GAPS

Data gaps	Opportunity to address gap	Purpose
<p>Stakeholders were asked to reflect on their experiences with and public value of the products and services. The stakeholders interviewed (largely senior, high-level NSW government agency representatives or industry representatives) often lacked exposure to the individual products and services. As such, stakeholders tended to reflect on the public value delivered by GSNSW as a whole.</p> <p>Due to the short timeframes for this project, the release of the stakeholder survey occurred prior to the finalisation of the list of GSNSW's products and services. Subsequently added products and services do not have associated stakeholder survey data.</p>	<p>Surveying a broader range of end users would develop more detailed information on use / purpose and experience with using the full spectrum of GSNSW's products and services.</p>	<p>Regularly survey end users to understand their ongoing product and service needs. End users should include, for example, users of the website, map downloads and recipients of advice.</p>
<p>The survey of end users targeted a selection of known end users. The usage and satisfaction with GSNSW and its products and services from a broader range of end users is not well understood.</p>	<p>Surveying a broader range of end users would develop more detailed information on use / purpose and experience with using GSNSW's products and services. For example, the general public could be included to better understand how GSNSW engages and delivers public value to the general public.</p>	<p>A survey of a broader range of end users could be conducted to inform utilisation of and public value generated by GSNSW's products and services.</p>

Data gaps	Opportunity to address gap	Purpose
<p>There was limited information on the specific role GSNSW may play in contributing to the achievement of relevant state and national agendas and priorities. The exception to this is:</p> <ul style="list-style-type: none"> – the NSW Minerals Strategy, where GSNSW plays a clear role in participating in the MinEx CRC, making available historical exploration data, conducting high-tech metal resources mapping and contributing to a 'future of minerals' report – the Decadal Plan for Geoscience, where GSNSW, GA and other state geological surveys will play a role in creating strategically targeted public good data sets. 	<p>Interviewing GSNSW staff and senior staff would enable a more detailed understanding of how GSNSW is already contributing to relevant state and national agendas, and how this could be further improved.</p>	<p>Understanding how GSNSW could contribute more effectively to these agendas would be important for prioritising investment and the delivery of products and services.</p> <p>Given the range of GSNSW's activities and products and services, and GSNSW's involvement in collaboration with a range of stakeholders there is an opportunity for GSNSW to develop further collaboration to support fulfilment of appropriate state and national agendas and priorities. For example, there is scope for GSNSW to expand its contribution to knowledge of the characteristics and location of ground and surface water, and to more directly contribute to regional water management strategies. Further, inputting information on the use of mineral resources and providing access to up-to-date information about resources through Common Ground and the Geoscientific Data Warehouse would support the NSW regional growth plans.</p>
<p>The 'first-pass' alignment of activities, products and services with GSNSW's role and public value was limited due to information gaps.</p>	<p>An opportunity exists for detailed business process mapping through interviews with GSNSW staff. This would foster a deeper understanding of the impact of GSNSW's efforts.</p>	<p>Business process mapping would enable a deeper and more fulsome understanding of the purpose and use of GSNSW's activities, products and services, and the impact of these efforts. This could support streamlining of GSNSW's business units and enhance productivity. This would identify the causal link between input (time and financial resources), outputs and outcomes.</p>
<p>Production costs of GSNSW products, services and activities is not available.</p>	<p>Collecting information on labour and capital costs of GSNSW products, services and activities</p>	<p>Labour cost information would provide an indication of the effort required to deliver GSNSW's activities and support GSNSW's products and services, and thus the distribution of effort across GSNSW's business units. This information could be collected through time-sheets, whereby GSNSW staff logged the time spent conducting certain activities and producing certain products and services.</p> <p>By collecting capital costs (non-labour costs) required to conduct certain activities and produce certain products and services, and combining this with labour costs, the total cost of each product, service, and activity could be determined. This would enable comparison of the most and least resource intensive activities conducted and products and services produced. This information would also enable the identification of potential cost savings if any products, services, or activities were to be discontinued.</p>
<p>In the delivery of products and services, a business unit may assume a production role, a provides information role, or a combination of both roles. Role identification was provided for an incomplete list of products and services (33 out of 57 products and services). The remaining products and services were undefined.</p>	<p>Collecting information on the role of each business unit in delivering products and services.</p>	<p>Given that the crossover between production and provides information roles has been used to identify potential streamlining opportunities, this information could be used to analyse GSNSW's whole work program to identify further opportunities for streamlining.</p>
<p>No breakdown was provided for personnel funding and budgeted personnel expenditure. ACIL Allen made assumptions during data manipulation to distribute these amounts to business units. If true personnel allocations differ, the results could vary.</p>	<p>Collecting information on personnel funding and budgeted personnel expenditure disaggregated by business unit function.</p>	<p>Accurate personnel funding and expenditure according to business units (and function), would enhance the accuracy and completeness of the financial performance analysis. This would strengthen decision-making around funding reallocations and potential cost savings.</p>

SOURCE: ACIL ALLEN CONSULTING 2019

ACIL ALLEN CONSULTING PTY LTD
ABN 68 102 652 148
ACILALLEN.COM.AU

ABOUT ACIL ALLEN CONSULTING

ACIL ALLEN CONSULTING IS THE LARGEST
INDEPENDENT, AUSTRALIAN OWNED
ECONOMIC AND PUBLIC POLICY
CONSULTANCY.

WE SPECIALISE IN THE USE OF APPLIED
ECONOMICS AND ECONOMETRICS WITH
EMPHASIS ON THE ANALYSIS,
DEVELOPMENT AND EVALUATION OF
POLICY, STRATEGY AND PROGRAMS.

OUR REPUTATION FOR QUALITY
RESEARCH, CREDIBLE ANALYSIS AND
INNOVATIVE ADVICE HAS BEEN
DEVELOPED OVER A PERIOD OF MORE
THAN THIRTY YEARS.