ASBOG® National Association of State Boards of Geology

# TASK ANALYSIS SURVEY 2015:

## A Study of the Practice of Geology in the United States and Canada


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## 1.0 INTRODUCTION

The content or subject matter tested on licensing exams is often determined through formal task analysis research studies that are designed to maximize the relevance of the exams to the practice of the professions. The task analysis studies identify the tasks/activities that are performed by professionals and the underlying knowledge that is necessary to perform these tasks. The task analysis results form the basis for creating test blueprints that define the content and scope of the exams. These studies are conducted on a regular basis to keep abreast of advances and/or changes in the practice of the profession.

ASBOG® conducted the task analysis survey (TAS) 2015 to update the content and scope of the Fundamentals of Geology (FG) and Practice of Geology (PG) Examinations. The TAS 2015 builds on earlier task analysis surveys completed in 1995, 2000, 2005, and 2010. The TAS 2015 results will be implemented with FG and PG Exams in October 2015 (Forms 1510).

## 2.0 PROCEDURES

The TAS 2015 Subcommittee held three meetings during 2014:

Columbia, South Carolina - January 17 - 18, 2014
Buffalo, New York - April 3, 2014
Indianapolis, Indiana – November 11, 2014

TAS 2015 members, serving as Subject Matter Experts (SMEs), accomplished several major objectives during these meetings. The SMEs:

- reviewed the task statements from the TAS completed in 2010,
- updated and refined the TAS 2010 task statements to reflect changes within the geological profession,
- developed the TAS 2015,
- reviewed and evaluated the TAS 2015 results to define the content of the FG and PG Examinations, and
- reclassified the items in the FG and PG Item Banks based on the TAS 2015 task statements.

## 3.0 TAS 2015 FORM

The initial section of the TAS 2015 form included 43 tasks that are performed by professional geologists:

| No. | **A. General and Field Geology** |
|---|---|
| 1 | Plan and conduct geological investigations considering human health, safety, and welfare, the environment, regulations, professionalism and ethics, and Quality Assurance/Quality Control (QA/QC) |
| 2 | Compile and organize available information to plan geological investigations |
| 3 | Collect, describe, and record new geological and geophysical data |
| 4 | Determine positions, scales, distances, and elevations from remote sensing, imagery, surveys, sections, maps, and GIS |
| 5 | Prepare, analyze, and interpret logs, sections, maps, and other graphics derived from field and laboratory investigations |
| | **B. Mineralogy, Petrology, and Geochemistry** |
| 6 | Plan and conduct mineralogic, petrologic, and geochemical investigations, including the use of field, laboratory, and analytical techniques |
| 7 | Identify minerals and rocks and their characteristics |
| 8 | Identify and interpret rock and mineral sequences and associations, and their genesis |
| 9 | Evaluate geochemical and isotopic data and construct geochemical models related to rocks and minerals |
| 10 | Determine type, degree, and effects of rock and mineral alteration |
| | **C. Sedimentology, Stratigraphy, and Paleontology** |
| 11 | Plan and conduct sedimentologic, stratigraphic, or paleontologic investigations, including the use of field, laboratory, and analytical techniques |
| 12 | Select and apply appropriate stratigraphic nomenclature and establish correlations |
| 13 | Identify and interpret sedimentary processes and structures, depositional environments, and sediment provenance |
| 14 | Identify and interpret sediment and/or rock sequences, positions, and ages |
| 15 | Identify fossils and interpret fossil assemblages for age, paleoenvironmental interpretations, and/or stratigraphic correlations |
| | **D. Geomorphology, Surficial Processes, and Quaternary Geology** |
| 16 | Plan and conduct geomorphic investigations, including the use of field, laboratory, and analytical techniques |
| 17 | Identify, classify, and interpret landforms, surficial materials, and processes |
| 18 | Determine absolute or relative age relationships of landforms, sediments, and soils |
| 19 | Evaluate geomorphic processes and development of landforms, sediments, and soils, including watershed functions |
| 20 | Apply remote sensing and GIS techniques to interpret geomorphic conditions and processes |
| | **E. Structure, Tectonics, and Seismology** |
| 21 | Plan and conduct structural, tectonic, or seismic investigations, including the use of field, laboratory, and analytical techniques |
| 22 | Identify and define structural features and relations, including constructing and interpreting structural projections and statistical analyses |
| 23 | Interpret deformational history through structural and tectonic analyses |
| 24 | Develop and apply tectonic models to identify geologic processes and history |
| 25 | Evaluate earthquake mechanisms and paleoseismic history |
| | **F. Hydrogeology** |
| 26 | Plan and conduct hydrogeological, geochemical, and environmental investigations, including the use of field, laboratory, and analytical techniques |
| 27 | Define and characterize hydraulic properties of saturated and vadose zones |
| 28 | Design groundwater monitoring, observation, extraction, production, or injection wells |
| 29 | Evaluate water resources, assess aquifer yield, and determine sustainability |
| 30 | Characterize water quality and assess chemical fate and transport |
| 31 | Manage, develop, protect, or remediate surface water or groundwater resources |
| | **G. Engineering Geology** |
| 32 | Plan and conduct environmental and engineering geological investigations, including the use of field, laboratory, and analytical techniques |
| 33 | Identify and evaluate engineering and physical properties of earth materials |
| 34 | Provide recommendations for engineering design, land use decisions, environmental restoration, and watershed management |
| 35 | Identify, map, and evaluate geologic, geomorphic, and seismic hazards |
| 36 | Interpret land use, landforms, and geological site characteristics using imagery, maps, records, and GIS |
| 37 | Develop plans and recommendations for hazard mitigation, and land and watershed restoration |
| | **H. Economic Geology and Energy Resources** |
| 38 | Plan and conduct mineral or energy resource exploration, evaluation, and environmental programs, including the use of field, laboratory, and analytical techniques |
| 39 | Compile and interpret the data necessary to explore for mineral and energy resources |
| 40 | Estimate the distribution of resources based on surface and subsurface data |
| 41 | Undertake economic evaluation and reserve assessment |
| 42 | Determine quantity and quality of resources |
| 43 | Perform geological studies for design, abandonment, closure, waste management, and reclamation and restoration of energy development or mineral extraction operations |

The TAS 2015 contained one rating scale to assess the importance of each task:

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**JUDGMENT OF IMPORTANCE**

**Based on your knowledge and experience as a professional geologist/geoscientist, how important is this task to the practice of geology as it is applied to the protection of public health, safety, and well-being?**

**0 – Not important 1 – Somewhat important 2 – Very important 3 – Extremely important**

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The Ethics section of the TAS addressed 13 ethical issues that geologists encounter in the practice of the profession. The ethics issues were rated in terms of the frequency of occurrence within the profession, and the seriousness of the ethical issues in terms of influencing the geological/geoscience profession. The final portion of the TAS 2015 included questions about respondents' background characteristics and practice demographics.

The survey was mailed to geologists and academicians in the USA using the United States Postal Service. Each mail packet contained the survey form, a cover letter explaining the rationale of the study, a comment form, and a self-addressed stamped envelope. All recipients in the USA received a follow-up postcard approximately two weeks after the initial mailing that stressed the importance of the study. Geoscientists Canada administered the TAS 2015 on the Internet using SurveyMonkey. All respondents received an e-mail which described the importance of the study and a link to the website for completion of the survey. Geoscientists received a follow-up e-mail two weeks after the initial e-mail that reminded them of the importance of the study. Twenty-nine U.S. States and ten Canadian Provinces participated in the TAS 2015:

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Alabama
Arizona
Arkansas
California
Delaware
Florida
Georgia
Idaho
Illinois
Indiana
Kansas
Kentucky
Maine
Minnesota
Mississippi
Missouri
Nebraska
New Hampshire
North Carolina
Oregon
Pennsylvania
South Carolina
Tennessee
Texas
Utah
Virginia
Washington
Wisconsin
Wyoming

Alberta
British Columbia
Manitoba
New Brunswick
Newfoundland/Labrador
NW Territories/Nunavut
Nova Scotia
Ontario
Quebec
Saskatchewan

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ASBOG® mailed the TAS 2015 to geologists during August and September 2014. Geoscientists Canada contacted geoscientists via e-mail during September and October 2014. The survey was sent to a random sample of 200 licensed/registered geologists/geoscientists in each participating jurisdiction. There were only two jurisdictions having fewer than 200 licensed/registered geologists/geoscientists (New Brunswick = 132; Nova Scotia = 158), and the survey was sent to all registrants in these jurisdictions. A total of 7,690 surveys were sent (USA total = 5,800; Canada = 1,890). Two thousand academicians were also randomly selected from the American Geological Institute (AGI) Directory, provided they met the following criteria:

- Assistant Professor, Associate Professor, Professor, or Chairman/Department Head, and
- teaching or conducting research in a Geoscience Department within the United States.

A total of 2,332 surveys from practicing geologists in the USA were completed and returned (2,332 / 5,800 = 40% return rate). This return rate increases to 42% if the 192 undeliverable surveys are excluded from the analysis (2,332 / 5,608). The high return rate increases the likelihood that the respondents truly represent professional geologists from across the USA. Three hundred and ninety-nine surveys were completed in Canada (399 / 1,890 = 21% return rate), while a total of 194 surveys were completed and returned by academicians (194 / 2,000 =10%).

## 4.0 RESPONDENT BACKGROUND DEMOGRAPHIC DATA

### Practicing Geologists (USA)

- Sixty-eight percent were 51 years or older.
- Fifty-five percent held a graduate degree.
- Ninety-three percent had been practicing for 11 or more years.
- Sixty percent were employed as consultants.
- Eighteen percent worked more than forty hours per week.
- Forty-four percent indicated that Environmental Geology was their primary area of practice.
- Twenty-five percent were registered 10 or fewer years.

The TAS 2015 was sent to random samples of licensed geologists in the 29 ASBOG® states that require licensure. However, respondents were asked to indicate in which one jurisdiction they conduct most of their geological activities, and the data indicate that the TAS 2015 includes practicing geologists from all 50 states.

### Academia (USA)

- Seventy-six percent were 51 years or older.
- One hundred percent held a graduate degree.
- Ninety-three percent had been teaching for 11 or more years.
- Ninety-eight percent of the academicians were employed in an academic setting.
- Fifty percent worked more than 40 hours per week.
- Thirty percent were licensed or registered by a governmental entity.
- Academicians from forty-four states responded to the TAS 2015.

**Practicing Geoscientists (Canada)**

- Fifty-two percent were 51 years or older.
- Fifty percent held graduate degrees.
- Eighty-three percent had been practicing for 11 or more years.
- Forty-four percent indicated that their primary employment was in industry.
- Twenty-six percent worked more than 40 hours per week.
- Twenty-two percent indicated that Economic Geology was their primary area of practice.
- Forty-three percent had been registered 10 or fewer years.

## 5.0 TASK STATEMENT RESULTS - PRACTICING GEOLOGISTS (USA)

The mean values for practicing geologists across the 43 task statements are displayed in Figure 1. There is substantial variation in the mean values across the 43 task statements, with an average mean value of 1.81. Task 1 (Plan and conduct geological investigations considering human health, safety, and welfare, the environment, regulations, professionalism and ethics, and Quality Assurance/Quality Control (QA/QC)) received the highest average rating (mean = 2.71), while Task 15 (Identify and interpret fossils and fossil assemblages for age, paleoenvironmental interpretations, and/or stratigraphic correlations) received the lowest average rating (mean = 0.95).

**Figure 1 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements for Practicing Geologists (USA)**

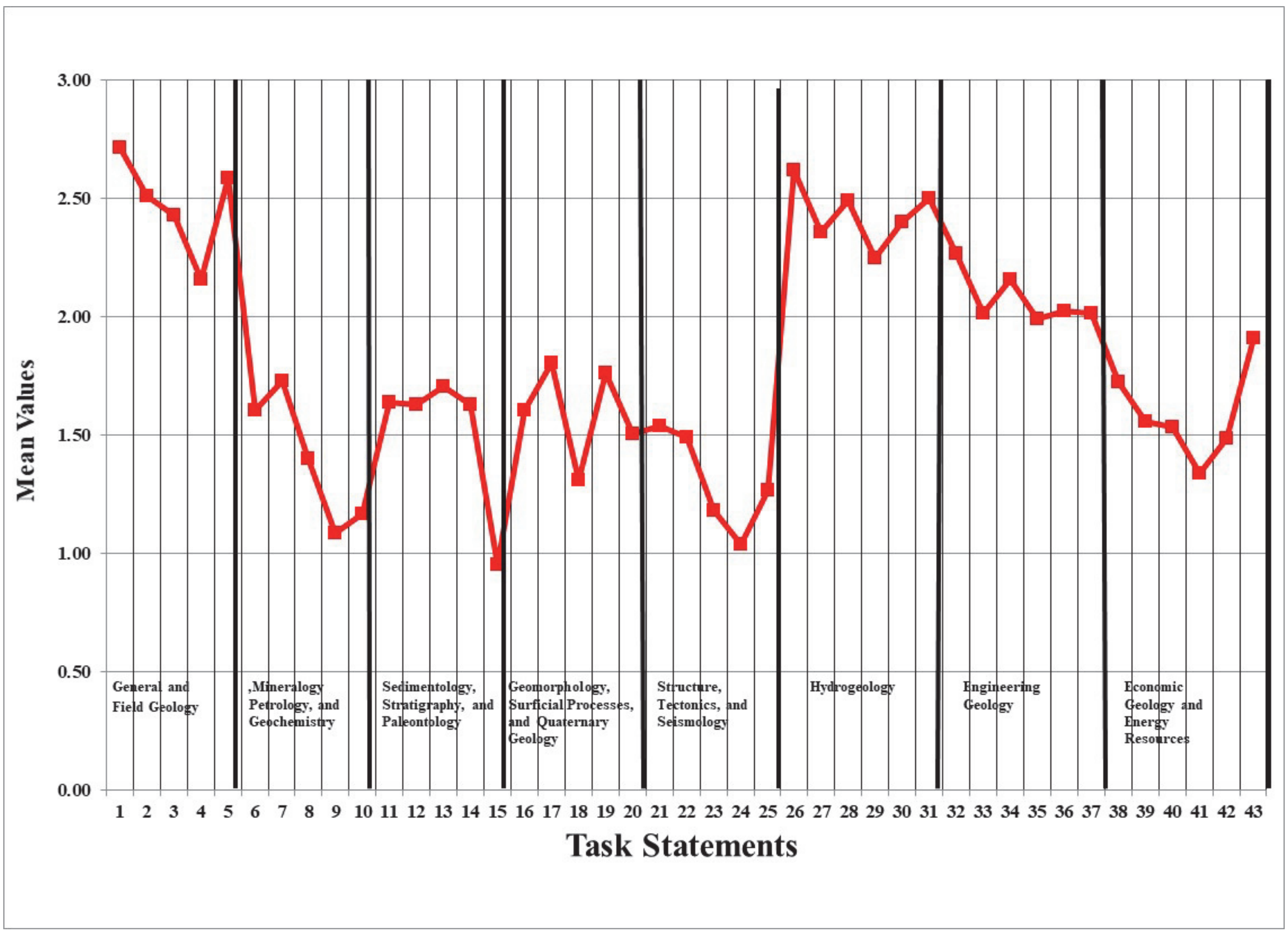
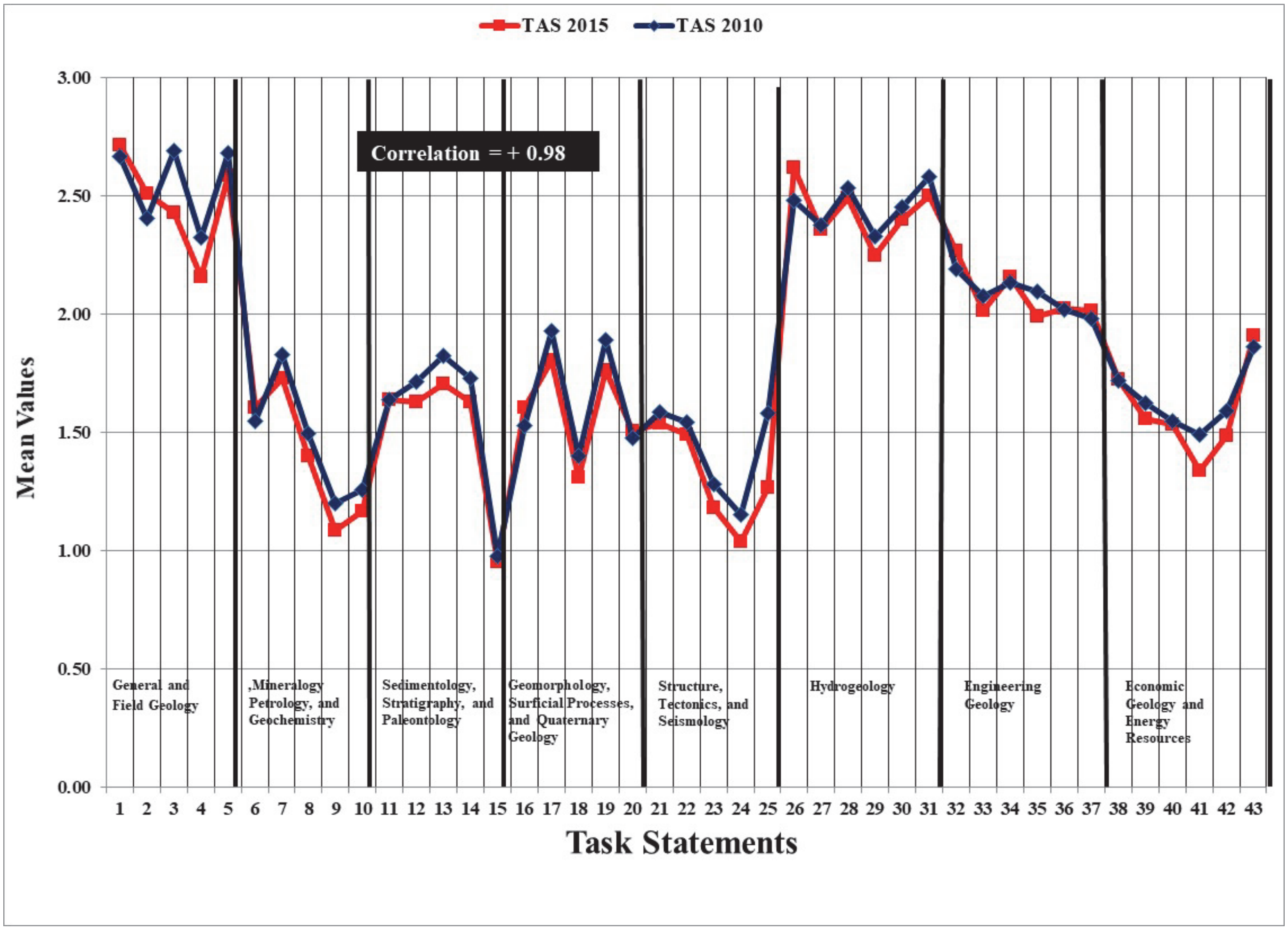


Figure 2 displays the task means for practicing geologists within the USA for the TAS 2015 and TAS 2010. There were minor changes to some of the task statements from 2010 to 2015. However, the correlation between the task means in the two research studies is + 0.98, which indicates an extremely high degree of consistency in the practice of the profession from 2010 to 2015.

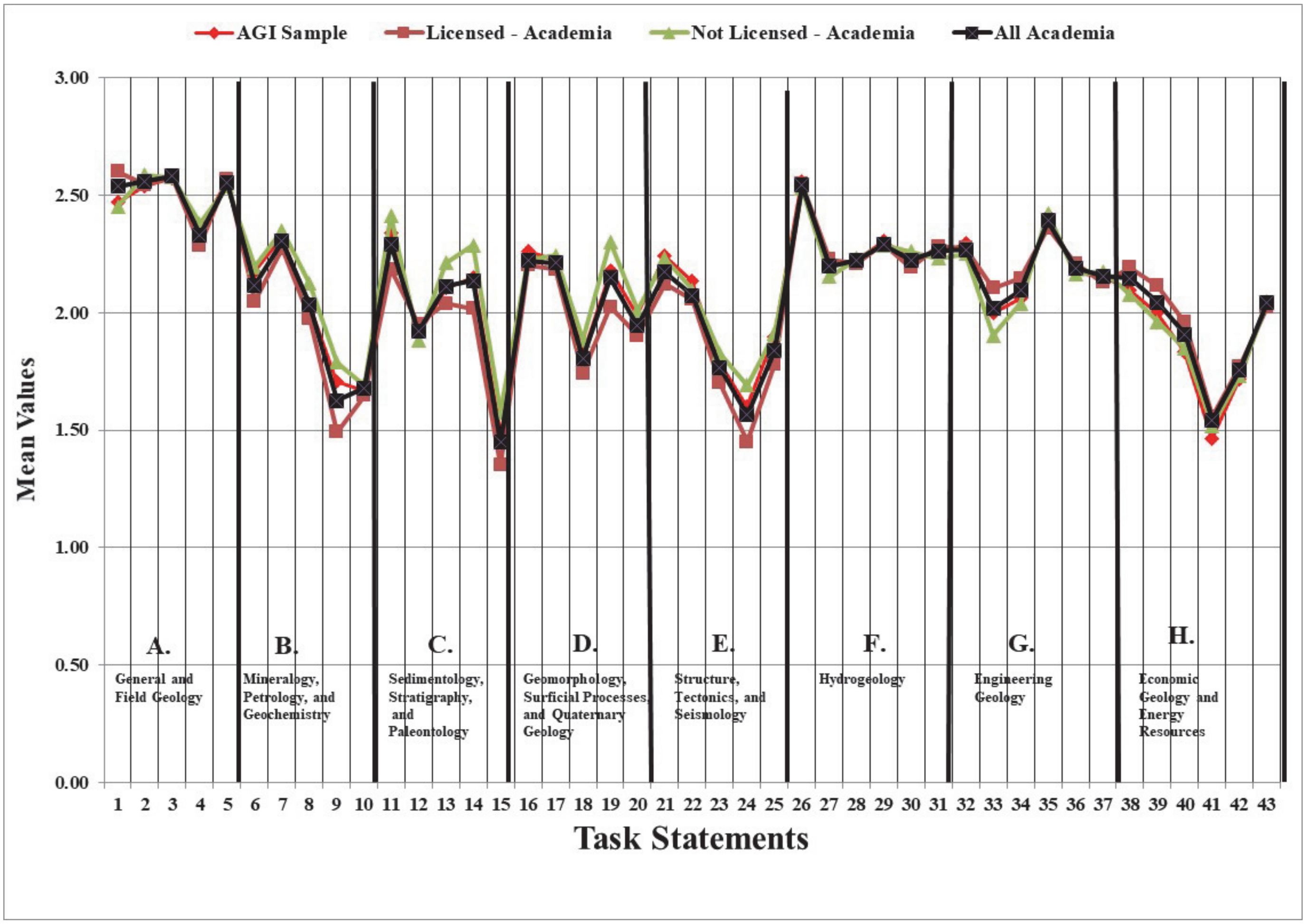
**Figure 2 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements for Practicing Geologists (TAS 2015 vs. TAS 2010)**




## 6.0 TASK STATEMENT RESULTS - ACADEMIA

Two thousand surveys were mailed to academicians who were randomly selected from the AGI Directory. Of these, only 194 surveys were completed and returned. There were an additional 75 surveys from the sample of 5,800 licensed geologists wherein respondents indicated "academia" as their primary place of employment. Figure 3 displays summary data for individual subgroups (i.e., original AGI sample, licensed academia, not licensed academia, and all academia). The correlations between subgroups (ranging from +0.91 to +0.99) indicate an extremely high degree of similarity in responses regardless of licensure status. All subsequent analyses for academia include all respondents, regardless of whether they were selected from the AGI Directory or from Member Board licensure/registration lists.

**Figure 3 - ASBOG® Task Analysis 2015**
**Mean Values for Different Academic Groups**




The average mean value for all tasks was 2.10, which is higher than the average of 1.81 for practicing geologists in the USA. Task 3 (Collect, describe, and record new geological and geophysical data) received the highest mean value (2.58) and Task 15 (Identify and interpret fossils and fossil assemblages for age, paleoenvironmental interpretations, and/or stratigraphic correlations) received the lowest mean value (1.45).

Figure 4 displays the task means for academicians for the TAS 2015 and TAS 2010. The correlation between the TAS 2015 and TAS 2010 task means is + 0.91, which indicates a high degree of consistency in the viewpoints of academicians from 2010 to 2015.

## 7.0 TASK STATEMENT RESULTS - PRACTICING GEOLOGISTS VS. ACADEMIA

Figure 5 shows mean values across the 43 task statements for practicing geologists and academia. The correlation between practicing geologists and academia is very high (r = + 0.86). Figure 5 illustrates the high degree of consistency between the two groups. In general, the ratings made by practicing geologists (average = 1.81) are lower than ratings made by academicians (average = 2.10). Hydrogeology is the only content domain that received higher ratings from practicing geologists. In general, the present study demonstrates that practicing geologists and academia view the practice of the profession similarly.

**Figure 4 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements for Academia (TAS 2015 vs. TAS 2010)**

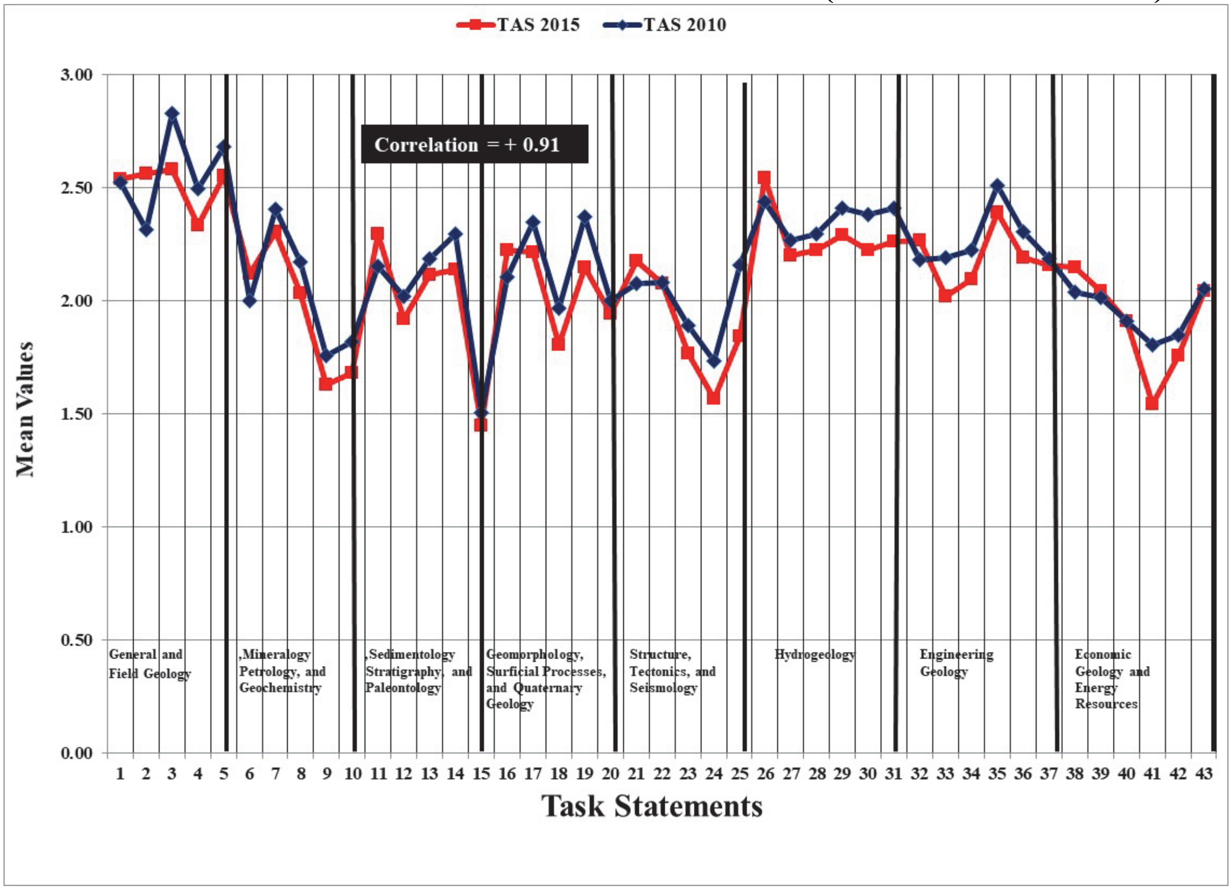
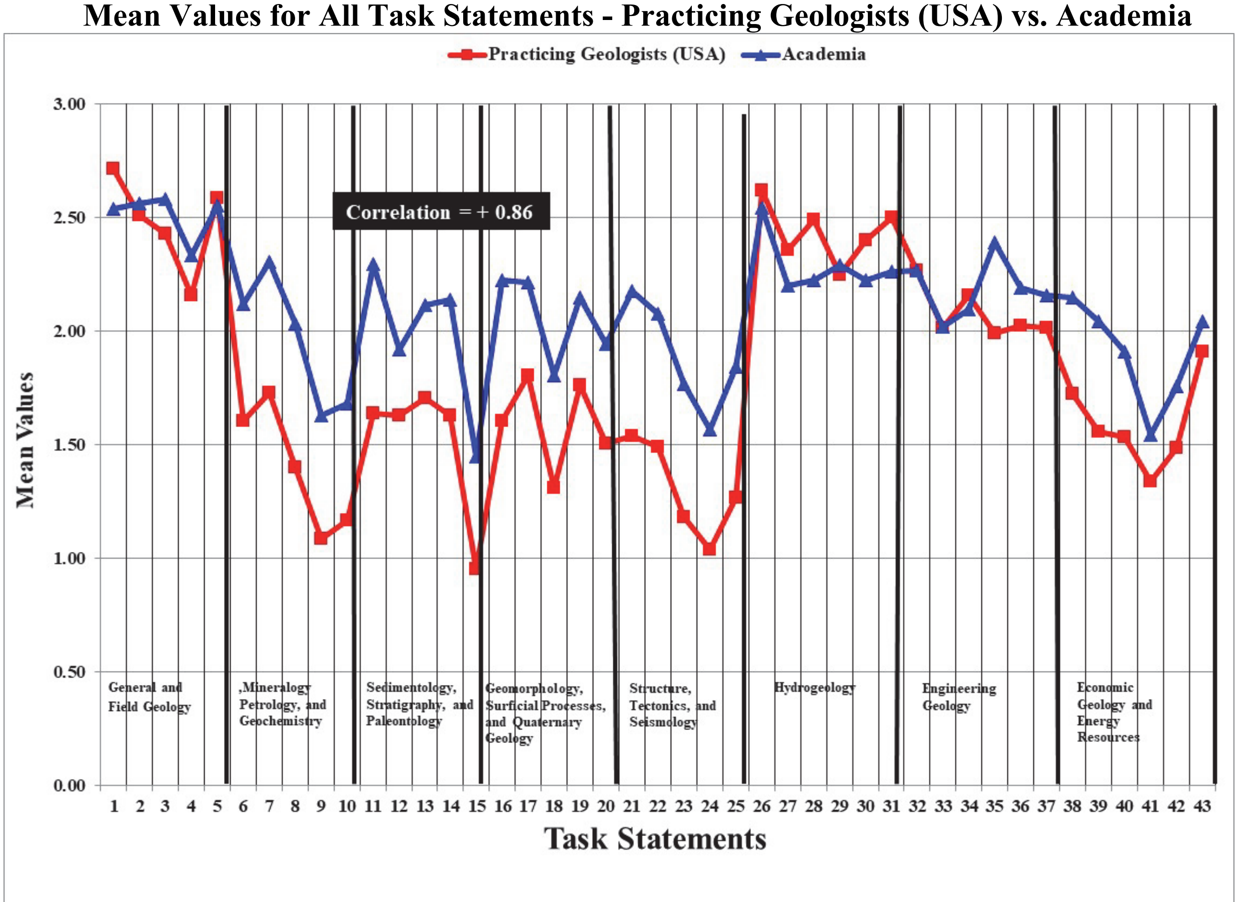


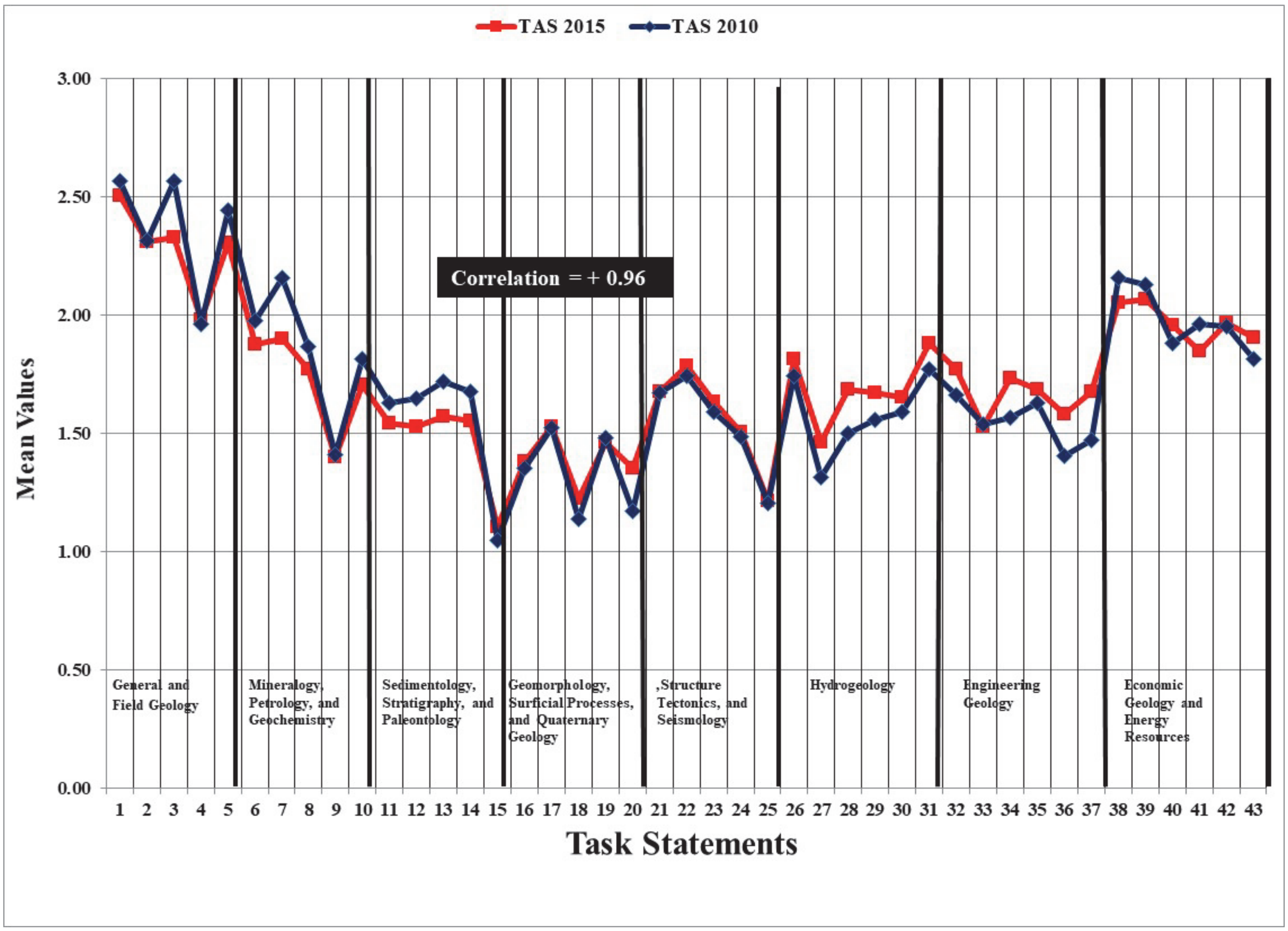

**Figure 5 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements - Practicing Geologists (USA) vs. Academia**



## 8.0 TASK STATEMENT RESULTS - PRACTICING GEOSCIENTISTS (CANADA)

Figure 6 shows the task means for the practicing geoscientists in Canada from the TAS 2015 (red line) and TAS 2010 (blue line). The correlation between the TAS 2015 and TAS 2010 task means is + 0.96, which indicates a high degree of consistency in the viewpoints of practicing geoscientists in Canada from 2010 to 2015. The TAS 2015 average rating across all tasks is 1.72, slightly below the average for practicing geologists in the USA (1.81). Consistent with practicing geologists in the USA, Task 1 (Plan and conduct geological investigations considering human health, safety, and welfare, the environment, regulations, professionalism and ethics, and Quality Assurance/Quality Control (QA/QC)) received the highest average rating (mean = 2.50), while Task 15 (Identify and interpret fossils and fossil assemblages for age, paleoenvironmental interpretations, and/or stratigraphic correlations) received the lowest average rating (1.10).

**Figure 6 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements for Canada (TAS 2015 vs. TAS 2010)**



## 9.0 TASK STATEMENT RESULTS - USA VS. CANADA

Figure 7 reveals a moderate degree of similarity in the practice of geology in the USA and Canada (r = + 0.55). There is a high degree of consistency (r = + 0.85) in the ratings made by these groups for Tasks 1 through 25 (Domains A – E):

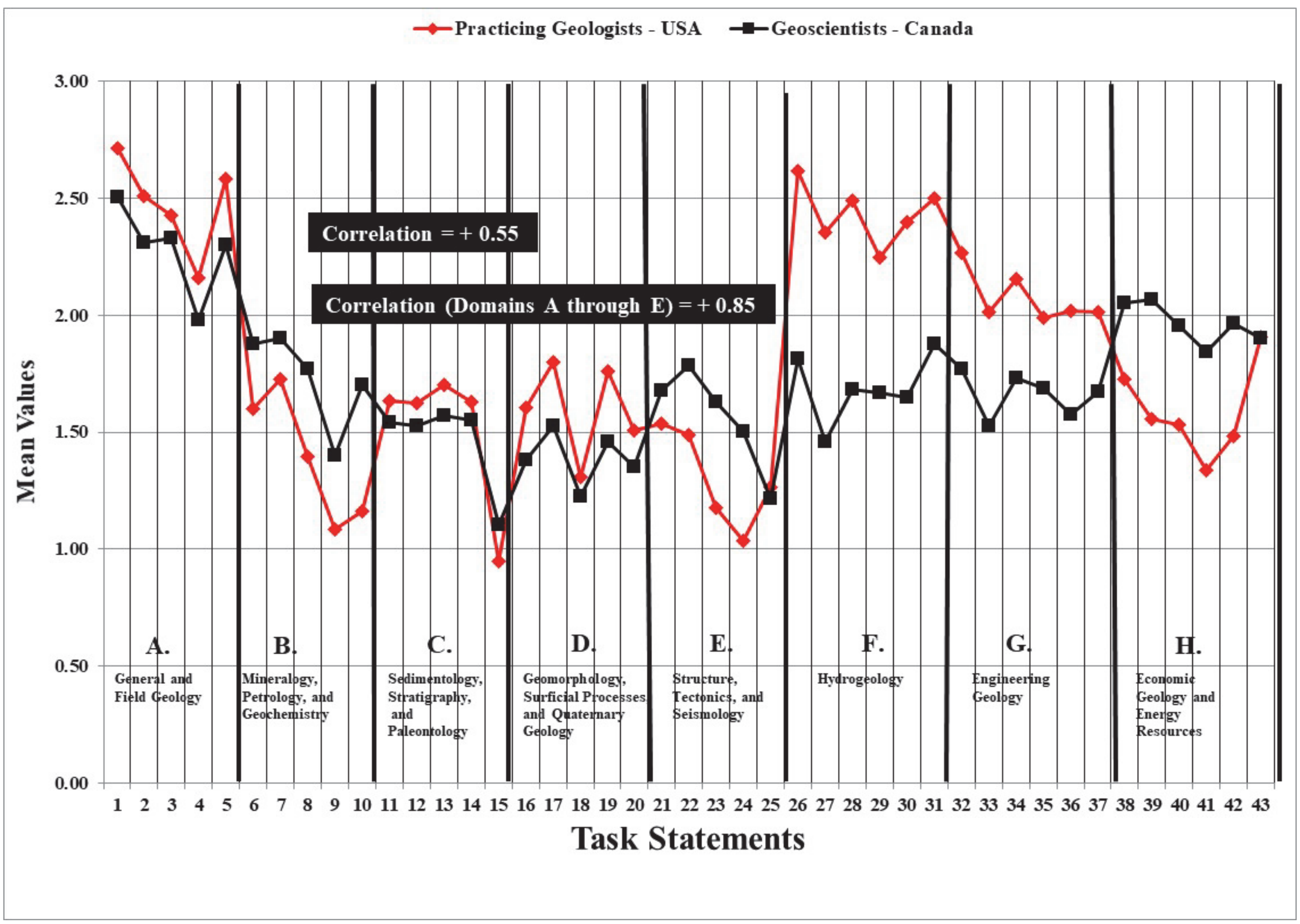
A. General and Field Geology
B. Mineralogy, Petrology, and Geochemistry
C. Sedimentology, Stratigraphy, and Paleontology
D. Geomorphology, Surficial Processes, and Quaternary Geology
E. Structure, Tectonics, and Seismology

However, the consistency between the USA and Canada is diminished for the tasks in the last three domains:

F. Hydrogeology
G. Engineering Geology
H. Economic Geology and Energy Resources

Practicing geologists in the USA rated the Hydrogeology and Engineering Geology task statements higher than the geoscientists in Canada. This pattern is reversed for Economic Geology and Energy Resources tasks, which received higher average ratings in Canada.

**Figure 7 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements**
**Practicing Geologists (USA) vs. Practicing Geoscientists (Canada)**



## 10.0 ETHICS RESULTS

Geologists and geoscientists rated the frequency and seriousness of 13 ethical issues encountered in the practice of the profession. Respondents were asked two questions regarding each of the 13 ethics issues:

1. How frequently have you encountered breaches of ethical behavior in these areas of the geological/geoscience profession?

   0 = Never; 1 = Seldom; 2 = Occasionally; 3 = Often

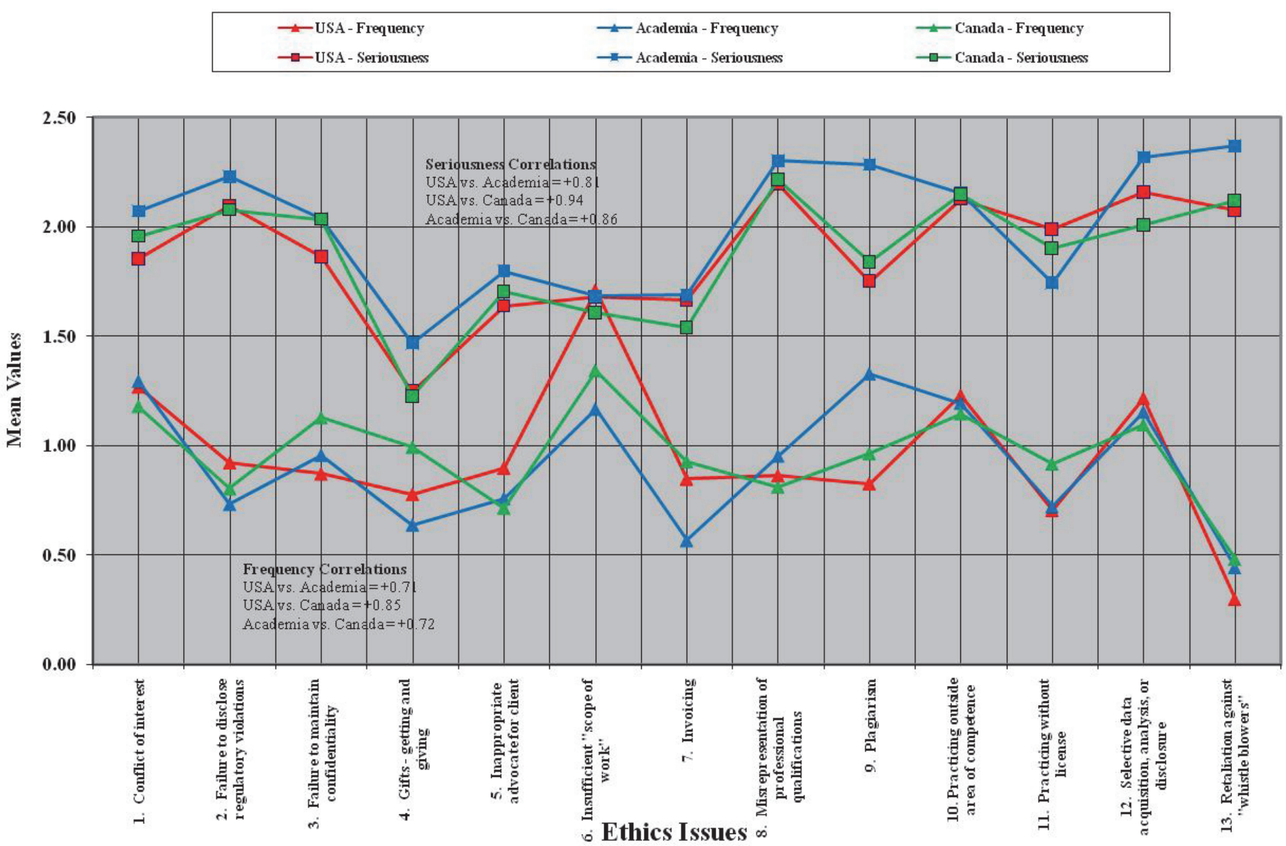
2. How serious do you believe a breach of ethical behavior is in each situation in terms of influencing the geological/geoscience profession?

   0 = Not serious; 1 = Somewhat serious; 2 = Very serious; 3 = Extremely serious

Figure 8 displays summary data for practicing geologists in the USA, academia, and practicing geoscientists in Canada for the Frequency and Seriousness rating scales. The correlations indicate moderate to high degrees of similarity between groups with respect to the frequency and seriousness of these issues (USA vs. Academia – Frequency r = + 0.71, Seriousness r = + 0.81; USA vs. Canada – Frequency r = + 0.85, Seriousness r = + 0.94; Academia vs. Canada – Frequency r = + 0.72, Seriousness r = + 0.86).

The most frequent ethical offense for practicing geologists in the USA was "Insufficient scope of work," whereas the least frequent ethical issue was "Retaliation against whistle blowers." The most serious ethical issue was "Misrepresentation of professional qualifications" while the least serious was "Gifts – getting and giving."

**Figure 8 - ASBOG® Task Analysis 2015**
**Ethics Issues - Mean Values for Frequency and Seriousness Rating Scales**
**Practicing Geologists (USA), Academia, & Geoscientists (Canada)**



The 13 ethics issues included in the TAS 2015 are identical to those from the TAS 2010, which allows for a direct comparison of views across time (i.e., 2010 and 2015). The results from both studies are depicted for practicing geologists in the USA (Figure 9), academia (Figure 10), and practicing geoscientists in Canada (Figure 11). The results obtained in both studies are virtually identical from 2010 to 2015 for each of the three groups:

- **Practicing Geologists (USA) - TAS 2015 vs. TAS 2010 (Figure 9)**

  Frequency Correlation = + 0.99
  Seriousness Correlation = + 0.99

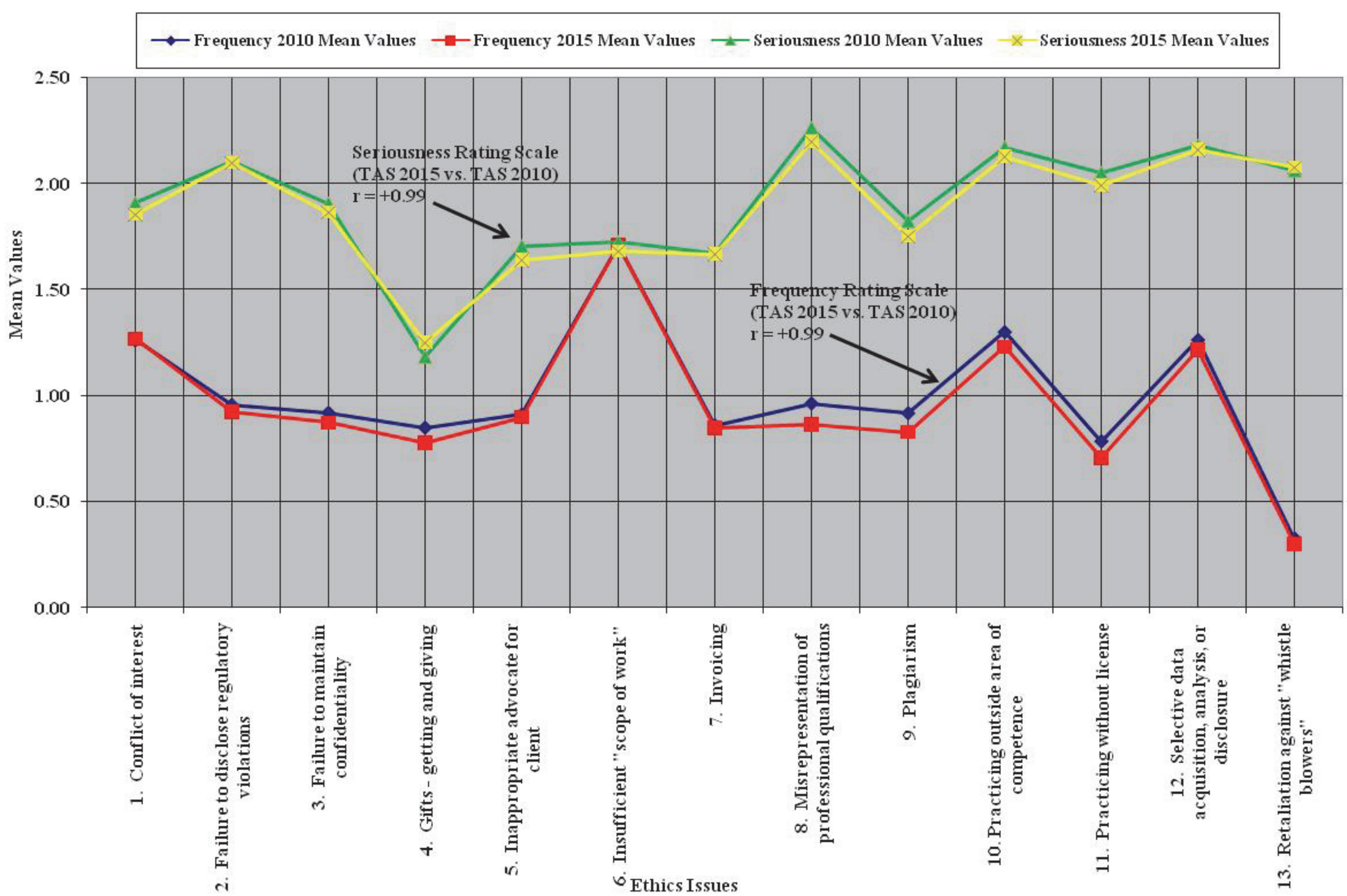
- **Academia - TAS 2015 vs. TAS 2010 (Figure 10)**

  Frequency Correlation = + 0.99
  Seriousness Correlation = + 0.98

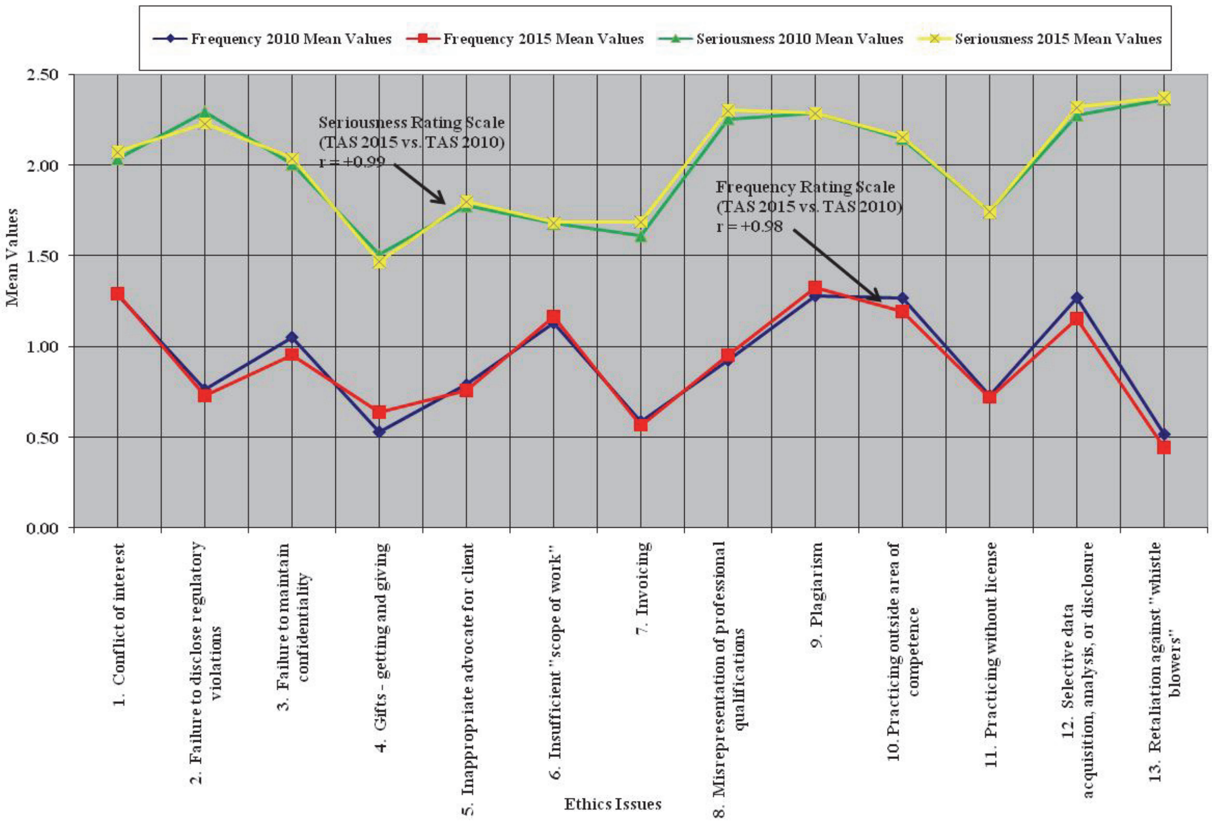
- **Practicing Geoscientists (Canada) - TAS 2015 vs. TAS 2010 (Figure 11)**

  Frequency Correlation = + 0.98
  Seriousness Correlation = + 0.98

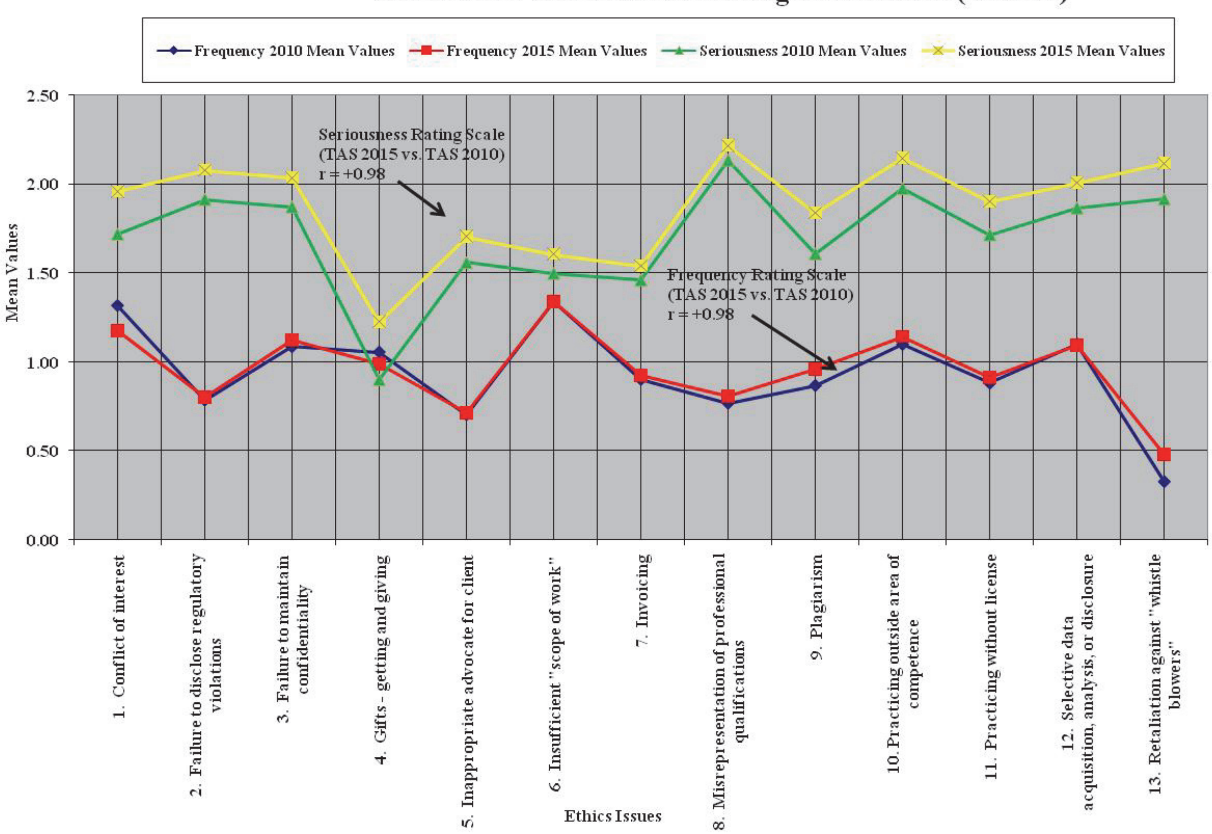
**Figure 9 - ASBOG® Task Analysis 2015**
**Ethics Issues - Mean Values for Frequency and Seriousness Rating Scales**
**TAS 2015 vs. TAS 2010 - Practicing Geologists (USA)**



## Figure 10 - ASBOG® Task Analysis 2015
## Ethics Issues - Mean Values for Frequency and Seriousness Rating Scales
## TAS 2015 vs. TAS 2010 - Academia



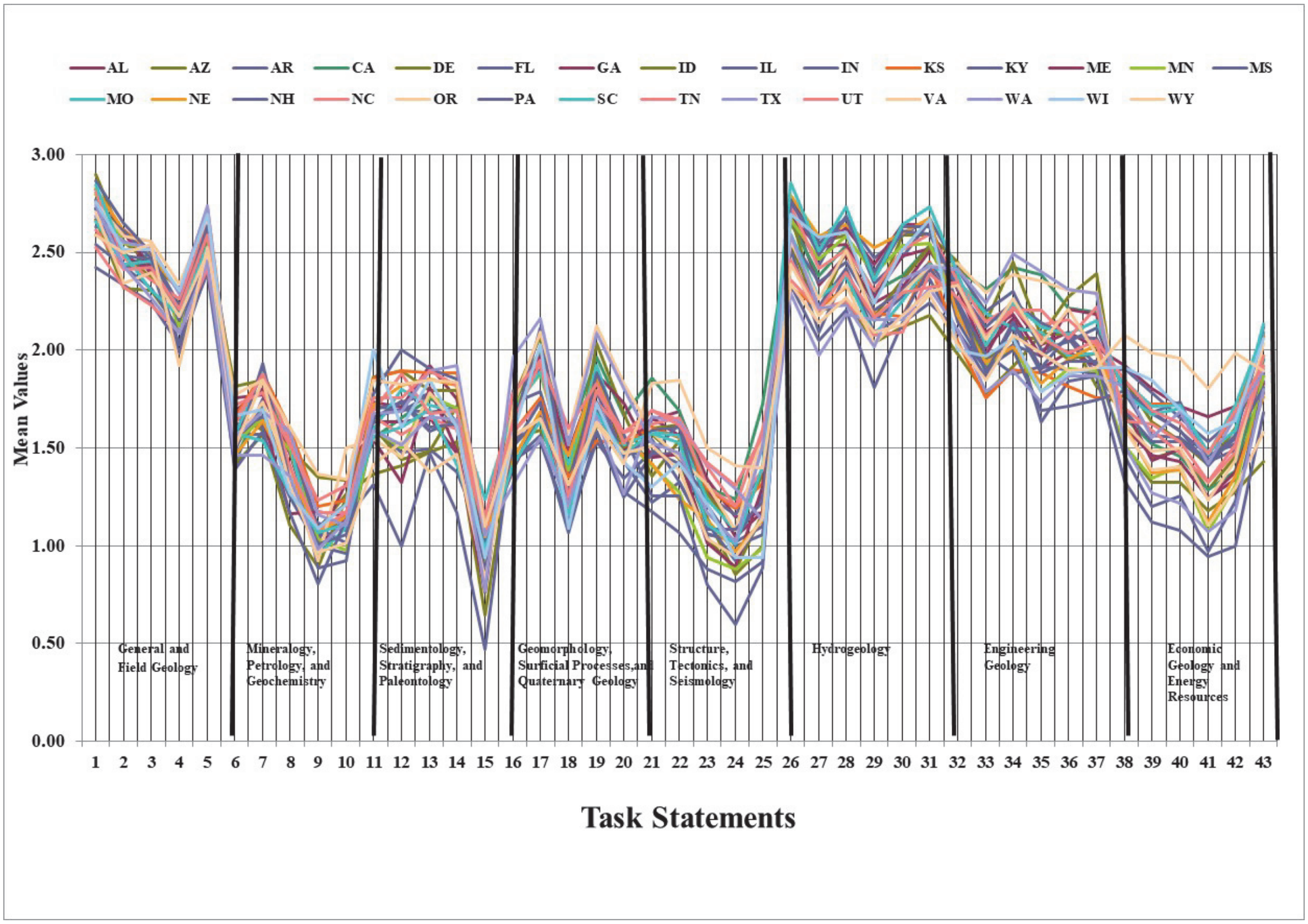

## Figure 11 - ASBOG® Task Analysis 2015
## Ethics Issues - Mean Values for Frequency and Seriousness Rating Scales
## TAS 2015 vs. TAS 2010 - Practicing Geoscientists (Canada)



## 11.0 RELIABILITY ANALYSES

The consistency in the practice of the profession in the USA was evaluated by performing reliability analyses using ratings made by geologists that practice in one of the 29 jurisdictions that participated in the present study. Figure 12 shows the mean values for the 43 task statements for each jurisdiction that participated in the study. There is an extremely high degree of consistency in ratings made across the 29 jurisdictions.

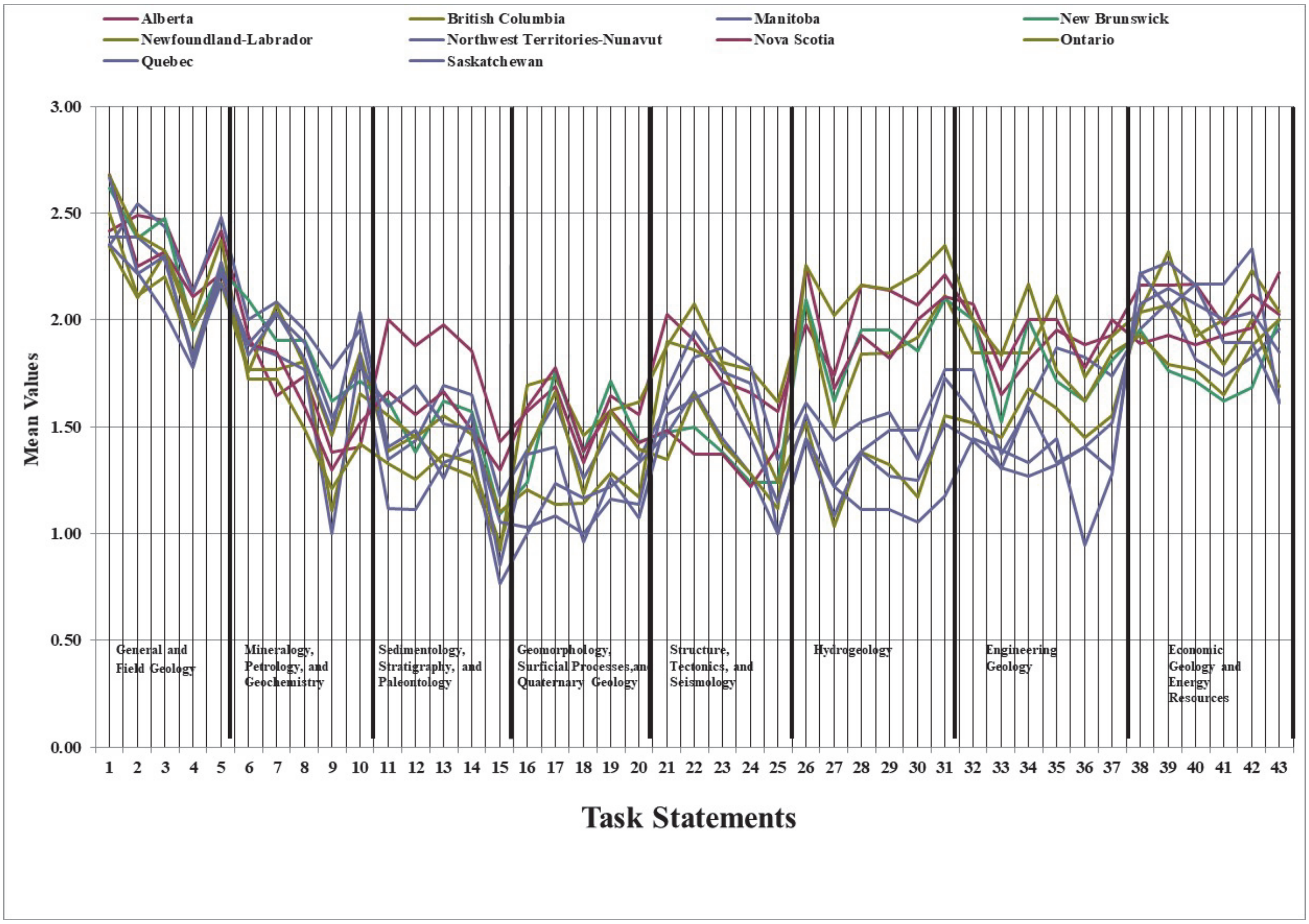
**Figure 12 - ASBOG® Task Analysis 2015**
**Importance Means Values for All Task Statements**
**All ASBOG® States**




The estimated reliability (Coefficient Alpha) is 0.997, where 0 indicates no consistency and 1.00 reveals perfect agreement. These findings are extremely important because they demonstrate that the national exams will be relevant to the practice of the profession in each jurisdiction.

In Canada, the reliability analyses also indicate that geoscientists viewed the tasks similarly across the ten provinces. The task means for Canada are illustrated in Figure 13. The estimated reliability of 0.956 indicates a high level of consistency among the provinces in Canada.

**Figure 13 - ASBOG® Task Analysis 2015**
**Means Values for All Task Statements**
**All Canadian Provinces**




The ratings made by geologists practicing in each of the ASBOG® states (n = 29) were compared to those made by geologists in non-ASBOG® states (Figure 14). A remarkably high degree of consistency was observed between the two groups (r = + 0.99). This finding is very powerful because it demonstrates that the content of the FG and PG Exams, driven by the task analysis results, will be relevant to the practice of geology for those states that join ASBOG® in the coming years.

The ratings made by geologists with different experience and education levels were also examined to see whether these factors influence the views of the profession. The mean values for respondents with 10 or fewer years of experience are virtually identical to the responses made by persons with 11 or more years of experience (r = + 0.99. Figure 15). This high degree of consistency was also observed between respondents with different educational backgrounds (r = + 0.99, Figure 16).

**Figure 14 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements - ASBOG® States vs. Non-ASBOG® States**

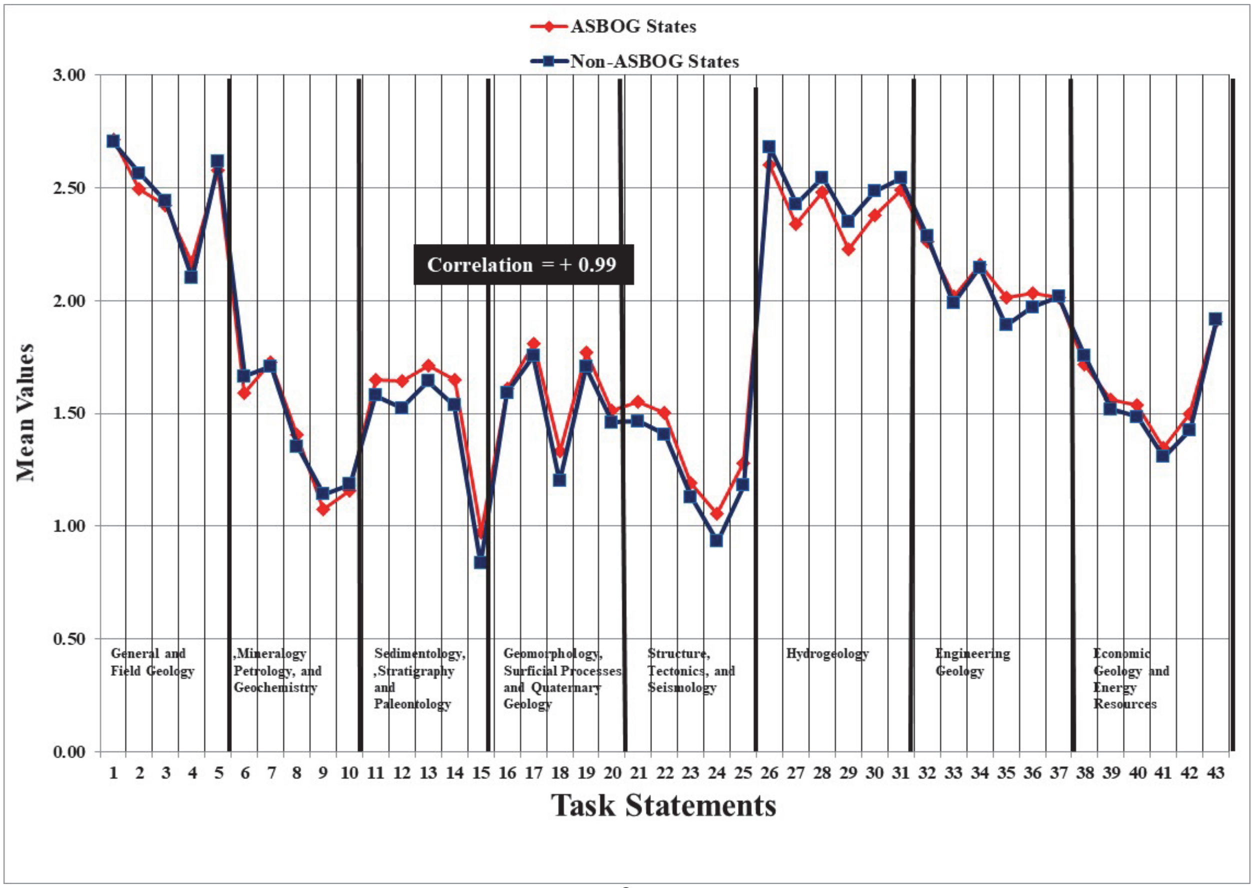



**Figure 15 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements - Ten or Fewer Years vs. Eleven or More Years**

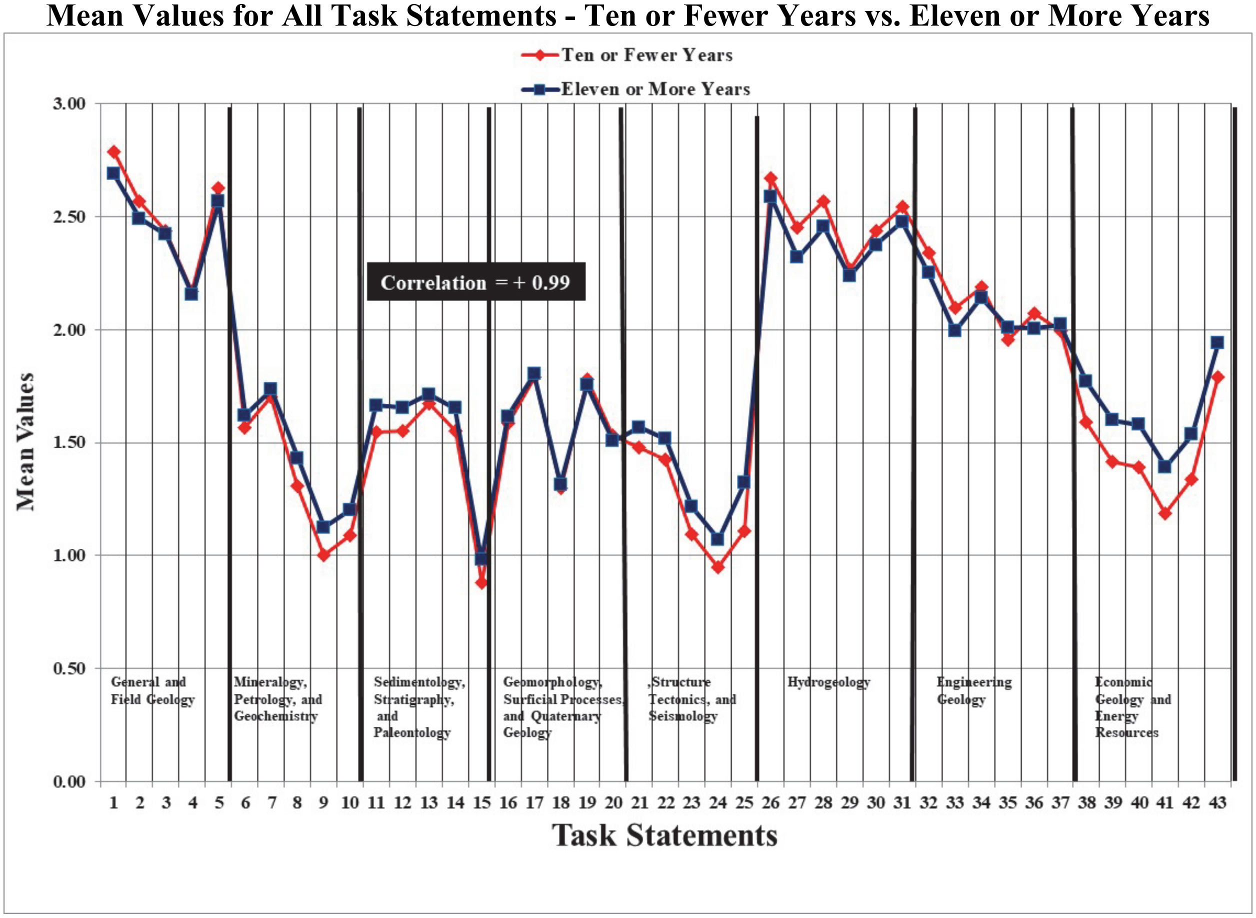
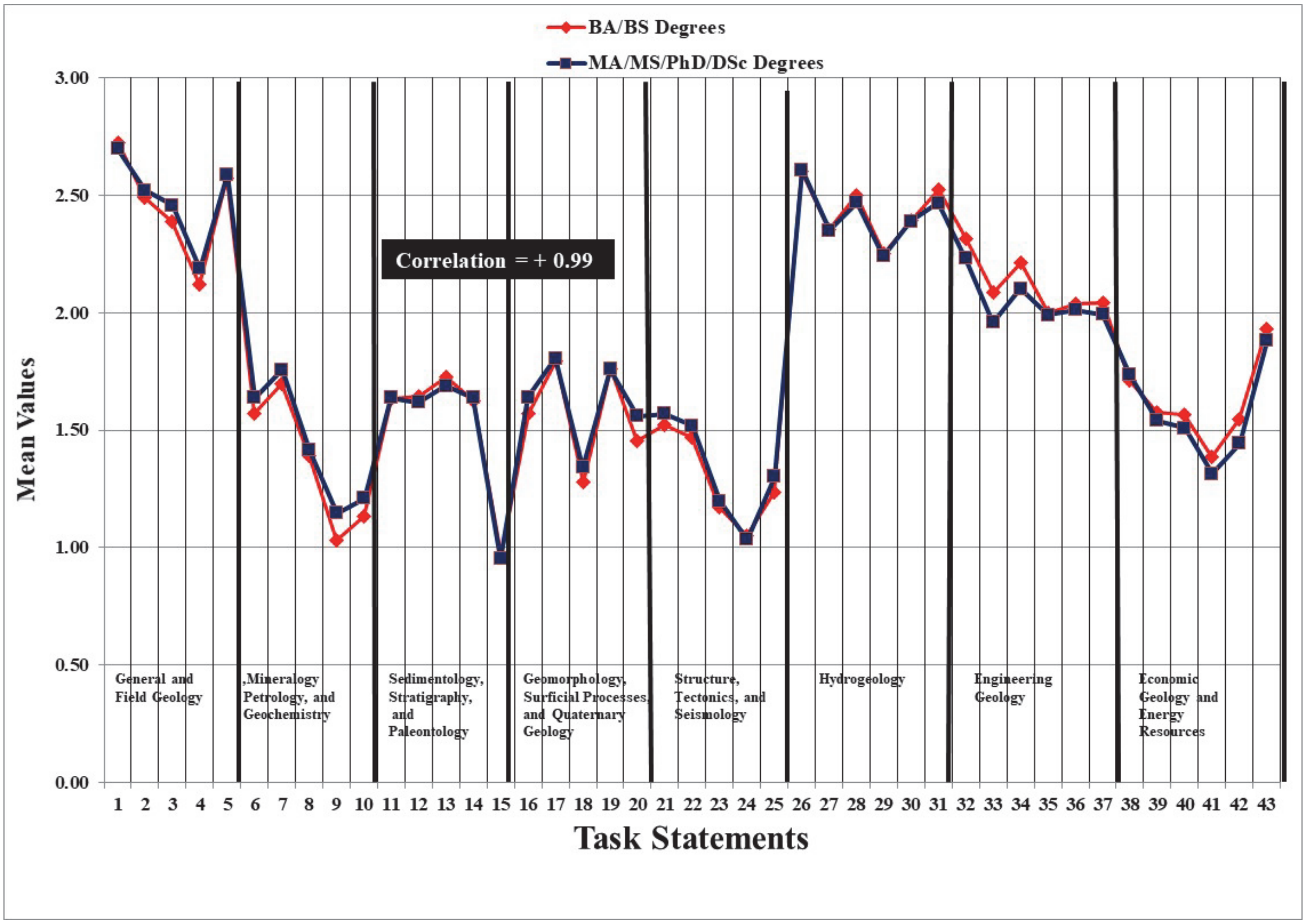


**Figure 16 - ASBOG® Task Analysis 2015**
**Mean Values for All Task Statements**
**BA/BS vs. MA/MS/PhD/DSc**




## 12.0 FG AND PG TEST BLUEPRINTS

The TAS 2015 members reviewed and discussed the survey results during a workshop in Indianapolis, Indiana during November 2014. The primary goal of the workshop was to develop the FG and PG Test Blueprints. The content and scope of the FG and PG Exams will be based exclusively on the ratings made by respondents practicing in the USA. The task means for all 43 task statements were sufficiently high to justify the continued testing of all tasks in either the FG or PG Exams.

SMEs assigned each of the task statements to the FG and/or PG Exam based on whether the tasks were most accurately tested at the FG level (no requisite experience), the PG level (minimum of four years experience requirement), or both. The FG Exam will test 30 (70%) of the 43 tasks included in the TAS 2015. The PG Exam will focus on 33 (77%) of the 43 tasks. Twenty of the 43 tasks (47%) will be included in both the FG and PG Test Blueprints.

To determine the relative weight and, therefore, the number of questions necessary for each task in the examinations, the following formula was used:

**Task Weight = Importance Mean**

This formula places more emphasis on those tasks that are most important to public health, safety, and well-being. On the FG Exam, task weights were determined using the ratings made by practicing geologists <u>and</u> academia, giving equal weight to both groups. By contrast, the PG task weights were calculated using <u>only</u> those ratings made by practicing geologists.

The relative percent of items devoted to each task was determined by dividing each task weight by the sum of all task weights and then multiplying by 100:

**Task Percent = (Task Weight/Sum of Task Weights) x 100**

Effective with the October 2015 administration of the exams (Forms 1510), the FG Test Blueprint will be based on 140 questions (Figure 17) while the PG Test Blueprint will contain 110 questions (Figure 18).

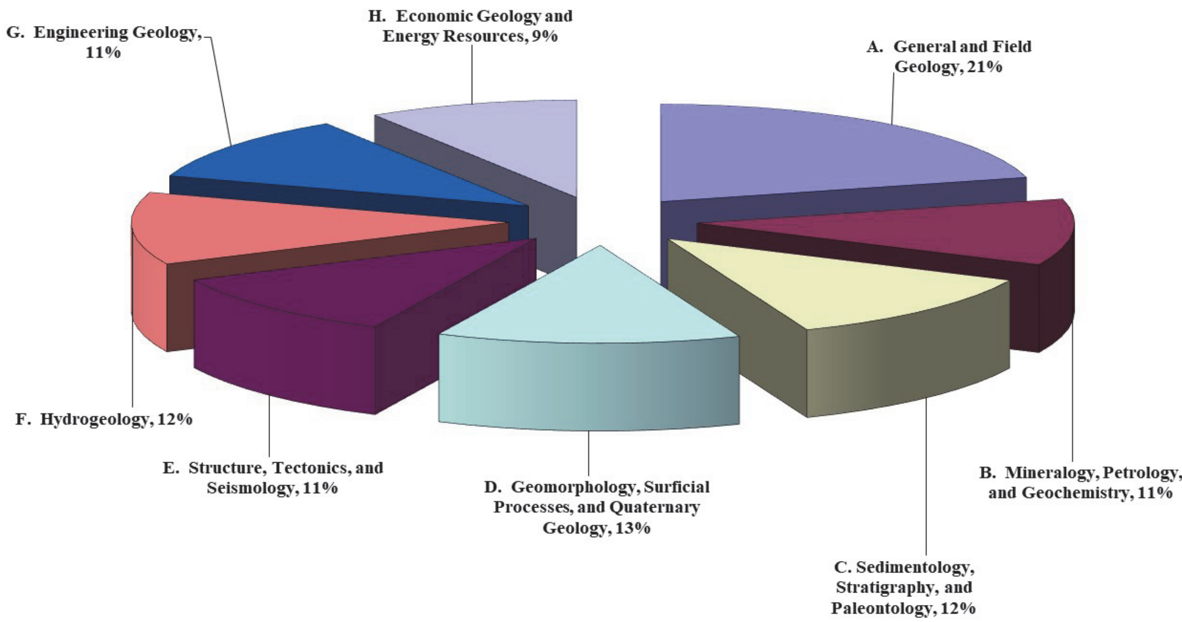
## 13.0 CONCLUSION

ASBOG® conducted the TAS 2015 to update the content and scope of the FG and PG Exams. The TAS 2015 results reveal an extremely high degree of consistency in the practice of geology throughout the USA. Practicing geologists in different states view the importance of the geologic tasks very similarly. These findings provide a sound basis for developing FG and PG Test Blueprints that are relevant to the practice of the profession in all regions of the country.

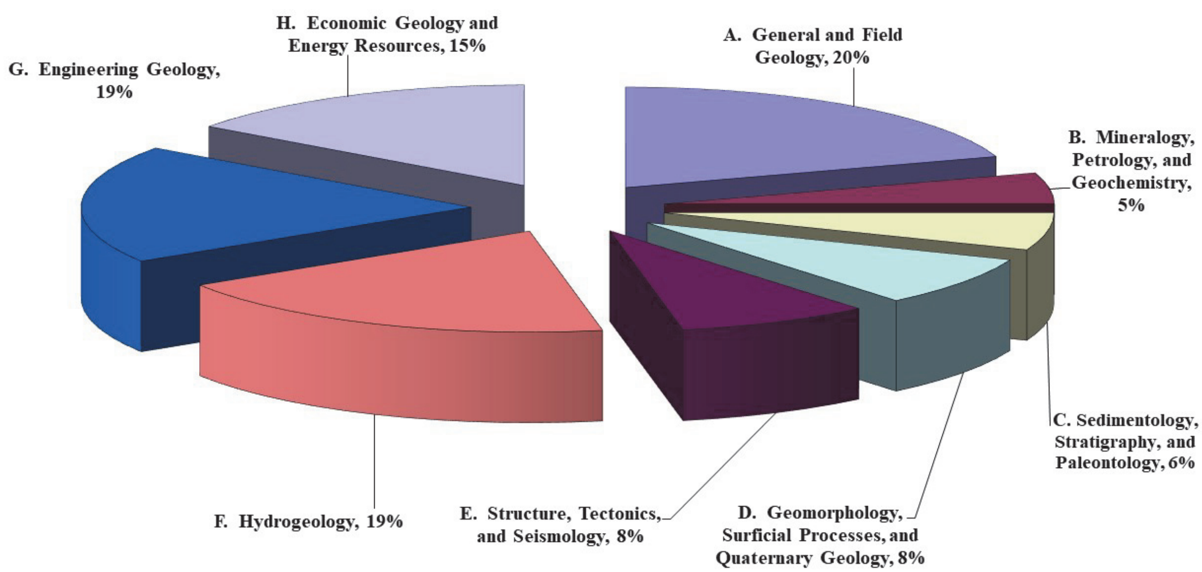
The TAS 2015 results also indicate there is a moderate degree of similarity in the practice of geology in the USA and Canada. The largest differences between the USA and Canada were observed for the Hydrogeology, Engineering Geology, and Economic Geology and Energy Resources task statements.

The consistency in the practice of the profession in the USA from 2010 to 2015 is very striking, as evidenced by the +0.98 correlation in task ratings between the two studies (Figure 2). While ASBOG® has conducted task analysis studies every five years beginning in 1995, the consistent results from 2010 to 2015 suggest the 5-year time period could be expanded to a longer time interval (e.g., every six or seven years).

## Figure 17 - ASBOG® Task Analysis 2015 FG Test Blueprint - Domain Percentages




## Figure 18 - ASBOG® Task Analysis 2015 PG Test Blueprint - Domain Percentages



The FG and PG Test Blueprints, along with the knowledge base for each content domain, are presented below.

| FG and PG Content Domains | FG % | PG % |
|---|---|---|
| **A. General and Field Geology** | **21** | **20** |
| **B. Mineralogy, Petrology, and Geochemistry** | **11** | **5** |
| **C. Sedimentology, Stratigraphy, and Paleontology** | **12** | **6** |
| **D. Geomorphology, Surficial Processes, and Quaternary Geology** | **13** | **8** |
| **E. Structure, Tectonics, and Seismology** | **11** | **8** |
| **F. Hydrogeology** | **12** | **19** |
| **G. Engineering Geology** | **11** | **19** |
| **H. Economic Geology and Energy Resources** | **9** | **15** |
| **TOTALS** | **100** | **100** |

This ASBOG® Fundamentals of Geology (FG) and Practice of Geology (PG) Examination Knowledge Base consists of eight domains which collectively encompass the scientific and practical knowledge needed to become a licensed professional geologist. The Knowledge Base for Domain A encapsulates the general principles and knowledge of geology and field methods which provide the foundation for the other seven domains; i.e., the other seven domains implicitly include the Knowledge Base for Domain A. Within each domain, the order in which the items are listed does not reflect their relative importance.

**A. General and Field Geology**

**Knowledge Base**

*Surface and subsurface exploration techniques and interpretations; Geologic and geophysical tools, application, and interpretation; Earth processes; Surface and subsurface mapping and map applications; Geologic section construction; Photogrammetry, terrain measurement, GPS, and GIS; Remote sensing; Image analysis and interpretation; Scale and scale analysis; Measurement theory, accuracy and precision; Geostatistics; Documentation and record keeping; Modeling concepts; Professionalism and ethics; Project planning, management, organization, and economics; QA/QC (FG/PG)*

1. Plan and conduct geological investigations considering human health, safety, and welfare, the environment, regulations, professionalism and ethics, and Quality Assurance/Quality Control (QA/QC). (FG/PG)
2. Compile and organize available information to plan geological investigations. (FG/PG)
3. Collect, describe, and record new geological and geophysical data. (FG/PG)
4. Determine positions, scales, distances, and elevations from remote sensing, imagery, surveys, sections, maps, and GIS. (FG/PG)
5. Prepare, analyze, and interpret logs, sections, maps, and other graphics derived from field and laboratory investigations. (FG/PG)

**B. Mineralogy, Petrology, and Geochemistry**

**Knowledge Base**

*Rock and mineral identification; Crystal symmetry, systems, and forms; Igneous rocks and processes; Sedimentary rocks and processes; Metamorphic rocks and processes; Geochemical reactions and diagenesis; QA/QC (FG/PG)*

*Project planning, management, organization, and economics (PG)*

6. Plan and conduct mineralogic, petrologic, and geochemical investigations, including the use of field, laboratory, and analytical techniques. (PG)
7. Identify minerals and rocks and their characteristics. (FG)
8. Identify and interpret rock and mineral sequences and associations, and their genesis. (FG)
9. Evaluate geochemical and isotopic data and construct geochemical models related to rocks and minerals. (FG)
10. Determine type, degree, and effects of rock and mineral alteration. (FG/PG)

## C. Sedimentology, Stratigraphy, and Paleontology

**Knowledge Base**

*Stratigraphic principles; Weathering, erosion, transport, and deposition; Depositional environments; Facies analysis; Basin analysis; Sedimentary structures; Diagenesis; Geologic time; Geochronology; Fossil record and evolution; QA/QC (FG/PG)*

*Project planning, management, organization, and economics (PG)*

11. Plan and conduct sedimentologic, stratigraphic, or paleontologic investigations, including the use of field, laboratory, and analytical techniques. (PG)
12. Select and apply appropriate stratigraphic nomenclature and establish correlations. (FG)
13. Identify and interpret sedimentary processes and structures, depositional environments, and sediment provenance. (FG/PG)
14. Identify and interpret sediment and/or rock sequences, positions, and ages. (FG)
15. Identify fossils and interpret fossil assemblages for age, paleoenvironmental interpretations, and/or stratigraphic correlations. (FG)

## D. Geomorphology, Surficial Processes, and Quaternary Geology

**Knowledge Base**

*Geomorphic processes; Landform analysis techniques; Sea and lake level change; Glaciation; Weathering; Sediment transport; Groundwater and surface water; Low temperature geochemistry; Human-land interaction; Soil development and classification; Remote sensing; GIS; QA/QC (FG/PG)*

*Project planning, management, organization, and economics (PG)*

16. Plan and conduct geomorphic investigations, including the use of field, laboratory, and analytical techniques. (PG)
17. Identify, classify, and interpret landforms, surficial materials, and processes. (FG)
18. Determine absolute or relative age relationships of landforms, sediments, and soils. (FG)
19. Evaluate geomorphic processes and development of landforms, sediments, and soils, including watershed functions. (FG/PG)
20. Apply remote sensing and GIS techniques to interpret geomorphic conditions and processes. (FG/PG)

## E. Structure, Tectonics, and Seismology

**Knowledge Base**

*Fractures, faults, and folds; Rock fabric; Rock mechanics; Structural analysis; Plate tectonics; Tectonic regimes; Volcanism; Structural and seismic history; Paleoseismology; Earthquake processes; QA/QC (FG/PG)*

*Project planning, management, organization, and economics (PG)*

21. Plan and conduct structural, tectonic, or seismic investigations, including the use of field, laboratory, and analytical techniques. (PG)
22. Identify and define structural features and relations, including constructing and interpreting structural projections and statistical analyses. (FG)
23. Interpret deformational history through structural and tectonic analyses. (FG/PG)
24. Develop and apply tectonic models to identify geologic processes and history. (FG/PG)
25. Evaluate earthquake mechanisms and paleoseismic history. (FG/PG)

## F. Hydrogeology

**Knowledge Base**

*Groundwater and surface water systems and processes; Aquifer characterization; Hydrogeologic modeling; Low temperature aqueous geochemistry; Contaminant transport and geochemistry; Isotopic and tracer studies; Hydraulic properties of fluids and earth materials; Site investigation methods, tools, and applications; Geophysical techniques; Landform analysis; Weathering; QA/QC (FG/PG)*

*Well drilling; Well design and construction; Soil and water remediation techniques; Water resources management and protection; Project planning, management, organization, and economics (PG)*

26. Plan and conduct hydrogeological, geochemical, and environmental investigations, including the use of field, laboratory, and analytical techniques. (PG)
27. Define and characterize hydraulic properties of saturated and vadose zones. (FG)
28. Design groundwater monitoring, observation, extraction, production, or injection wells. (PG)
29. Evaluate water resources, assess aquifer yield, and determine sustainability. (FG/PG)
30. Characterize water quality and assess chemical fate and transport. (FG/PG)
31. Manage, develop, protect, or remediate surface water or groundwater resources. (PG)

## G. Engineering Geology

**Knowledge Base**

*Landform analysis techniques; Soil and rock weathering; Groundwater and surface water systems and processes; Low temperature geochemistry; Human-land interaction; Soil and rock mechanics; Soil and rock classification and engineering properties; Geologic hazards; Hazard and risk analyses; Cost/benefit analyses; Site investigation methods, tools, and applications; Geophysical techniques; QA/QC (FG/PG)*

*Land restoration and hazard mitigation; Mine closure; Image analysis and interpretation; Remote sensing; GIS; Earth and rock construction methods; In-situ and laboratory testing; Project planning, management, organization, and economics (PG)*

32. Plan and conduct environmental and engineering geological investigations, including the use of field, laboratory, and analytical techniques. (PG)
33. Identify and evaluate engineering and physical properties of earth materials. (FG/PG)
34. Provide recommendations for engineering design, land use decisions, environmental restoration, and watershed management. (PG)
35. Identify, map, and evaluate geologic, geomorphic, and seismic hazards. (FG/PG)
36. Interpret land use, landforms, and geological site characteristics using imagery, maps, records, and GIS. (FG/PG)
37. Develop plans and recommendations for hazard mitigation, and land and watershed restoration. (PG)

## H. Economic Geology and Energy Resources

**Knowledge Base**

*Exploration and development techniques; Geophysical techniques; Petrophysical techniques; Geochemical analysis; Geostatistical analysis; Mineralization processes; Characteristics of mineral deposits; Energy resource systems; Characteristics of hydrocarbon traps; Industrial minerals, coal, and earth materials; Exploration risk and economics; Resource/reserve assessment; Safety hazards and risk analysis; Professionalism and ethics; QA/QC (FG/PG)*

*Exploration drilling techniques; Drill program design and management; Assaying; Land restoration and hazard mitigation; Mine and well decommissioning; Project planning, management, organization, and economics (PG)*

38. Plan and conduct mineral or energy resource exploration, evaluation, and environmental programs, including the use of field, laboratory, and analytical techniques. (PG)
39. Compile and interpret the data necessary to explore for mineral and energy resources. (FG/PG)
40. Estimate the distribution of resources based on surface and subsurface data. (FG/PG)
41. Undertake economic evaluation and reserve assessment. (PG)
42. Determine quantity and quality of resources. (FG/PG)
43. Perform geological studies for design, abandonment, closure, waste management, and reclamation and restoration of energy development or mineral extraction operations. (PG)