NI 43-101 Technical Report
Offshore Continental Shelf Gold & Heavy Mineral Project, Republic of Ghana

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Report Prepared for

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1 Executive Summary

1.1 Introduction

This report was prepared as a Canadian National Instrument 43-101 ("**NI 43-101**") Technical Report (the "**Report**") for GoldCoast GRC Ghana Ltd. ("**GoldCoast**" or "**Company**") by Samuel Torkornoo, a Qualified Person ("**QP**") of Torkornoo and Associates Limited (TAL) based in Accra, Ghana, for the Offshore Continental Shelf Gold & Heavy Mineral Project in the Republic of Ghana. GoldCoast is a Ghanaian-registered mineral development company based in Takoradi, Ghana. The Company's principal asset is this exploration licence (the "**Project**"), located along the offshore of the Republic of Ghana, West Africa, as reported in this Technical Report.

GoldCoast is planning to undertake a reconnaissance mineral survey along much of Ghana's continental shelf area (approximately 10,000 km^2) to assess the potential for concentrations of a variety of heavy minerals such as gold, iron and titanium oxides, zircon, diamonds, and monazite (source of rare earth metals). In addition, the proposed survey will also assess the potential for sand and gravel deposits suitable for aggregate, which is in acute short supply in the major urban centres of southern Ghana, where much of the country's infrastructure and industry are located.

1.2 Property Description and Ownership

The license area (approximately 10,000 km2 – Figure 4.2) covers much of Ghana's continental shelf from Half-Assini at the western end of the coastline to Winneba along the central part of the coast, a straight-line distance of about 250 km. The concession area comprises 10 contiguous blocks, each approximately 1,000 km². The company has reconnaissance licences from the Minerals Commission covering the entire concession area.

1.3 Background

Heavy minerals (HM) are those minerals with a specific gravity greater than 3.0 and are typically associated with marine and terrestrial sediments. Examples include minerals such as gold, diamond, zircon, iron, and titanium oxides. Shallow sea mining is becoming more popular with the increasing demand for heavy minerals that are critical for the development of green energy. Typically, HM only constitutes 3-10% of the host rock. The mining of HM commonly utilizes bucket-line or suction dredges to haul a large volume of material for processing.

Similar operations of this kind are in Namibia, South Africa, for diamonds, Sierra Leone, for rutile, and Senegal, for titanium oxides. Dredging sand and gravel for use as aggregate has also been ongoing for many years. For example, for more than 50 years, sand and gravel have been recovered from the North Sea, and tin in mineral sands has been recovered for over 70 years in South-East Asia.

It is a fact that the aggregate reserves in Ghana cannot satisfy the needs of a swiftly expanding economy, leading to significant environmental damage due to illegal sand extraction. Utilizing offshore sources of high-quality aggregate could greatly reduce the prevalence of illegal sand winning, and the Government of Ghana is likely to fully back this initiative.

GoldCoast is very optimistic about the potential to identify and develop commercial sources of offshore aggregate that can play a significant role in Ghana's construction and infrastructural requirements.

1.4 History

Southwest Ghana is among the most richly mineralized gold terrains in the world. Nowhere else on Earth is such a high concentration of gold mineralization found in such proximity to a coastal seashore. Major rivers (namely, Tano, Ankobra, and Pra rivers) have been draining the area for many millennia, and alluvial gold has been mined from these rivers for centuries. In recent years, Ghana has consistently produced over 3 million ounces annually, securing its place among the top ten gold producers globally. The estimated quantity of alluvial gold found in these drainage systems, which accounted for most of the gold extraction before the 20th century, is disproportionate to the amount of gold that has eroded from many of the current mining regions, where the topographic relief varies from around 50 m to as high as 500 m. If the eroded gold is not located in today's river valleys, it must have been swept offshore.

A similar conclusion can be made for the vast alluvial diamond resources from the Akwatia district and the surrounding Birim River Basin, where many alluvial sources of diamonds are known. Most of the diamonds are small and mainly useful for industrial purposes. Traditionally, grades have been quite high (> 1 carat/m^3), and for many years, Ghana produced 2-3 million carats per year, and cumulative production has certainly exceeded 100 million carats. At its peak, Ghana was among the top few world producers of industrial diamonds, but most of the resources on land have now been depleted. Although in recent years, production has dropped well below 1 million carats per year, nevertheless, major alluvial diamond resources occur within the immediate confines of the Birim River, close to the confluence with the Pra River. This area is not far from the current coastline and, likely, very significant amounts of alluvial diamonds would have also been washed out into the current offshore area.

Towards the end of the last ice age, approximately 10,000 years ago, most of southern Ghana had a relatively dry climate, and sparse savannah vegetation extended to the coastal areas. This was followed by a very wet period during which extensive erosion took place and alluvial deposits of all types were re-worked under extremely high-energy conditions. At that time, the sea level was 100+m below current levels, and the shoreline was some 20 to 80 km south of its present position. This entire low-lying strip, which is now the continental shelf, is underlain by very thick sedimentary units (3-4000m of Paleozoic to Cretaceous marine sequences), and it would have received huge volumes of new sediment from the inland rivers, especially from the ancestral Tano, Ankobra, Pra, and the Volta rivers. Similar periods of intense erosion almost certainly occurred in previous glacial and inter-glacial stages, and much of the sediment along the advancing and retreating coastlines would have formed extensive beach deposits. Vestiges of these unconsolidated beach sands, as well as old river channels, should be present along much of the existing continental shelf area, and they may well contain concentrations of heavy minerals of commercial significance.

Very limited previous work along the coast of Ghana has confirmed the potential for significant accessory gold in river and beach deposits. Sampling in and around the mouths of the Ankobra and Pra Rivers has yielded anomalous to very anomalous background values of gold (0.05-0.50 g/m^3). This is not in the least surprising in view of the fact that there are probably few, if any, areas around the world where there is a larger concentration of several major, world-class gold districts close to a marine coast and drained by mature river systems. Undoubtedly, a substantial amount of alluvial gold has been washed into the offshore area along the SW coast of Ghana. This gold is likely to be hosted in old beach and river sediments along with a suite of other heavy minerals, especially iron and titanium oxides, carried offshore by the ancestral Tano, Ankobra, and Pra rivers.

Offshore dredging operations generally process very large volumes of sand and gravel, and the unit costs for mining and processing are typically very low. Thus, gold could potentially be a primary target in large offshore sand and gravel deposits if the grades are in the order of 0.10-0.20 g/m^3. Gold could also be an important by-product of an iron and titanium oxide dredging operation if the background levels were as low as 0.05 g/m^3. The same could be expected for diamonds transported offshore by the ancestral Pra River.

In 2024, total gold production was a record 5.1 million ounces from both large- and small-scale producers. Buoyed by new contributions from Newmont's Ahafo South Mine and Shandong's Namdini Mine in 2025, gold production is projected to increase further (according to the Ghana Chamber of Mines).

1.5 Geology and Mineralization

Southern Ghana is dominated by a great variety of Early Proterozoic (mostly Birimian units in the age range of 2.2 - 2.0 GA) belts and basins of metamorphosed volcanics and sediments, intruded by extensive intermediate to felsic granitoids, and numerous mafic intrusions. These units are excellent sources for many potentially important 'heavy minerals', especially iron and titanium oxides, zircons, monazite, thorite, etc., all of which may be commercially significant. Some of the higher-grade metamorphic terrain will also be excellent sources of primary industrial minerals such as garnet and resistant aluminum silicates (andalusite, kyanite, and sillimanite) that may be of commercial value if sufficiently concentrated and relatively close to industrial markets.

1.6 Recommendations

It is recommended that a one-year reconnaissance work programme be undertaken, comprising airborne geophysical surveys over the entire concession area; a broad marine geophysical survey scattered at least over 1,000 km^2; mineral sand and gravel sampling at a minimum of 50 plus sites; and integrated interpretation of all results, to test and validate the various theoretical concepts, with a projected minimum budget of US$3.040 million.

1.7 Conclusions

Considering the size of the tenement and the work involved, the reconnaissance licence must be extended for another year for further work. The author is of the view that a diverse range of target areas will be identified and proposed for conversion such identified areas into prospecting licences for further exploration to enhance the definition and characterization of potential resources.

In the case of gold, the intense inland erosion would have resulted in a large amount of gold being washed into the coastal areas and out into the sea. A lot of the gold would be deposited slowly offshore over extended periods, but by far the largest amounts probably got washed out in the major 'wet' period 10,000 years ago, when all the current inland alluvials were being formed and re-worked. The two most important rivers would have been the ancestral Ankobra and Pra systems, but the Tano would also have been draining several significant gold belts. The paleochannels and beach sands of these rivers will be major targets of the exploration programme.

Other traditional accessory minerals that may hold potential value include zircon, monazite, thorite, as well as diamonds and lithium minerals. The latter would be derived largely from the extensive pegmatites that occur right along the seashore for a distance of 80-100 km from the area of Winneba westwards past Cape Coast. The products enhanced in value could find a suitable market not only domestically but also in regional and international markets.

The author has noted earlier that although Ghanaian diamonds are of low quality, it is possible that some offshore occurrences could be relatively high-grade and be well worth recovering. It should be noted that the main source of lithium in Ghana is concentrated in the mineral spodumene that is found in pegmatites, which are widely exposed along the coast between Winneba and Cape Coast. Extensive erosion along the coast could well have washed a considerable amount of spodumene/lithium into the nearby shelf area, where it could be concentrated in sediments that also include diamonds, as they have many similar physical and chemical characteristics.

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2 Introduction

2.1 Terms of Reference

GoldCoast GRC Ghana Limited, a wholly owned subsidiary of GoldCoast Resource Corp., a Toronto-based junior mining startup company, retained the services of Samuel Torkornoo, a Qualified Person (QP) of Torkornoo and Associates Limited, based in Accra, Ghana, as an independent consultant to compile a Technical Report in accordance with the National Instruments NI-43-101 reporting guidelines. In addition, the report will discuss the proposed exploration methodology and a preliminary budget for the initial exploration work.

All currencies are either stated in United States dollars or Canadian dollars or in both denominations, and measurements are in metric units (unless otherwise noted). All report plans and geology maps are plotted in WGS 84 Zone 30N or the WGS 84 geographic coordinate system.

2.2 Purpose of Report

This technical report is intended to provide justification for an offshore mineral sand exploration along the coast of Ghana in West Africa. In addition, this report will make recommendations and a preliminary budget for the initial exploration work.

2.3 Sources of Information

Information utilized in preparing this report includes exploration, geological, and other reports provided by GoldCoast and available in the public domain. References have been provided for all citations that relate to work done or research published by other authors. Complete references are provided in Section 27.

2.4 Qualification of the Consultant

The Author preparing this Technical Report is a specialist in the field of geology and mineral exploration. A qualified Person (QP) certificate of the author is provided at Section 28 of this document. The QP is responsible for all sections of this report.

The Author in the preparation of this report has no beneficial interest in GoldCoast. The author is not an insider, associate, or affiliate of GoldCoast. The result of this Technical Report is not dependent upon any prior agreement concerning the conclusion to be reached, nor are there any undisclosed understandings concerning any future business dealings between GoldCoast and the author. The author is paid a fee for his work in accordance with normal professional consulting practice.

The Author, by virtue of his education, experience, and professional association, is considered a Qualified Person (QP) as defined in the NI 43-101 standard, for this report, and is a member in good standing of appropriate professional institutions.

2.5 Site Inspection

The author of this report visited the western part of the property on the 9th and 10th of August 2025. During the visit, the author conducted a site and infrastructure examination at Axim and Shama, where the Ankobra and the Pra Rivers empty into the sea, respectively (Figure 2-1: and

Figure 2-2:). The author discussed the Takoradi port infrastructure for the project and pertinent aspects of the exploration programme, and reviewed all available literature, inspected a section of the coastline between Takoradi, Cape Coast, and Winneba on his return trip to Accra.

Figure 2-1: The Estuary River Ankobra at Akrumasi Point, Axim, where it enters the Atlantic Ocean. Source: S. Torkornoo

Figure 2-2:Estuary of the River Ankobra at Akrumasi Point, Axim. Source: S. Torkornoo

Figure 2-3: Community Harbour # 1 at Axim: S. Torkornoo

Figure 2-4:Community Harbour # 2 at Axim: S. Torkornoo

Figure 2-5: Aerial View of Axim Harbour #1 and #2

Figure 2-6:Pra emptying into the Atlantic Ocean: S. Torkornoo

Figure 2-7: Pra, facing upstream: S. Torkornoo

2.6 Definitions

km	Kilometre(s)
kg	Kilogram(s)
cm	Centimetre(s)
mm	Millimetre(s)
m	Metre(s)
RL	Reconnaissance Licence
PL	Prospecting Licence
BP	Before Present
WGS	World Geodetic System
Yr	Year
ppb	Parts Per Billion
NI	National Instrument
SW	South West
NE	North East
EPA	Environmental Protection Agency
UTM	Universal Transverse Mercator
USA	United States of America
C$	Canadian Dollar
US$	United States Dollar
%	Percent
SG	Specific Gravity
ASL	Above Sea Level
CI	Cote d'Ivoire
CEO	Chief Executive Officer

MBA	Master of Business Administration
QP	Qualified Person
HM	Heavy Minerals
NNE	North-North East
NNW	North-North West
SE	South East
DRC	Democratic Republic of Congo
JORC	Joint Ore Reserves Committee
ESIA	Environmental and Social Impact Assessment
GNSS	Global Navigation Satellite System
QA	Quality Assurance
QC	Quality Control
TMI	Total Magnetic Intensity
THG	Total Horizontal Gradient

3 Reliance on Other Experts

The authors have made reference to information available in scientific journals and other publications by experts in this field. The report also incorporates insights from D. Horne, a marine architect and pilot, as well as a professional diver, who has been active in Ghana for over 20 years. In addition, other individuals with expertise in the evaluation of offshore mineral deposits have also been consulted.

Much of the unconsolidated offshore minerals along Ghana's Continental Shelf will have come mainly from nearby inland sources, and the author is very familiar with the geology and economic potential of this region, where the author has been involved in a great variety of exploration projects for the past 20+ years

The author has referred to information made available by GoldCoast GRC Ghana Ltd. and what is in the public domain in coming up with this report.

The author has not independently reviewed the ownership of the project and any underlying agreements. And has fully relied upon and disclaims responsibility for information derived from GoldCoast GRC Ghana Ltd. for this report.

The author has, however, not conducted a detailed review of the environmental, tax, and sociopolitical issues related to the project, and therefore, no professional opinion can be expressed on these matters.

The Author relied on the title opinion for Section 4 – Property Location and Description of this report.

4 Property Description and Location

4.1 Location

The Project area in Figure 4-1: consists of ten (10) contiguous offshore Reconnaissance Licenses, approximately 1,000 km^2 each located within the territorial waters of the Republic of Ghana from Half-Assini at the western end of the coastline to Winneba along the central part of the coast, a straight-line distance of about 250 km. The width gradually increases to a maximum in the offshore area between Cape Coast and Sekondi, where it widens to as much as 80 km. It narrows to 30-40 km from about Cape Coast to the Half-Assini area. The total concession area is approximately 10,000 km^2.

The Continental Shelf of the project area is largely defined as the offshore area featuring a relatively shallow, very gently inclined sea-floor (slope of about 1/400+) that varies significantly in width along the coast of Ghana. At depths just beyond 100 m, the slope of the sea-floor steepens significantly (about 1/40) as it descends along the Continental Slope and reaches depths well beyond 1000 m within a relatively short distance.

The Property lies within Ghana's marine jurisdiction under the authority of the Minerals Commission of Ghana.

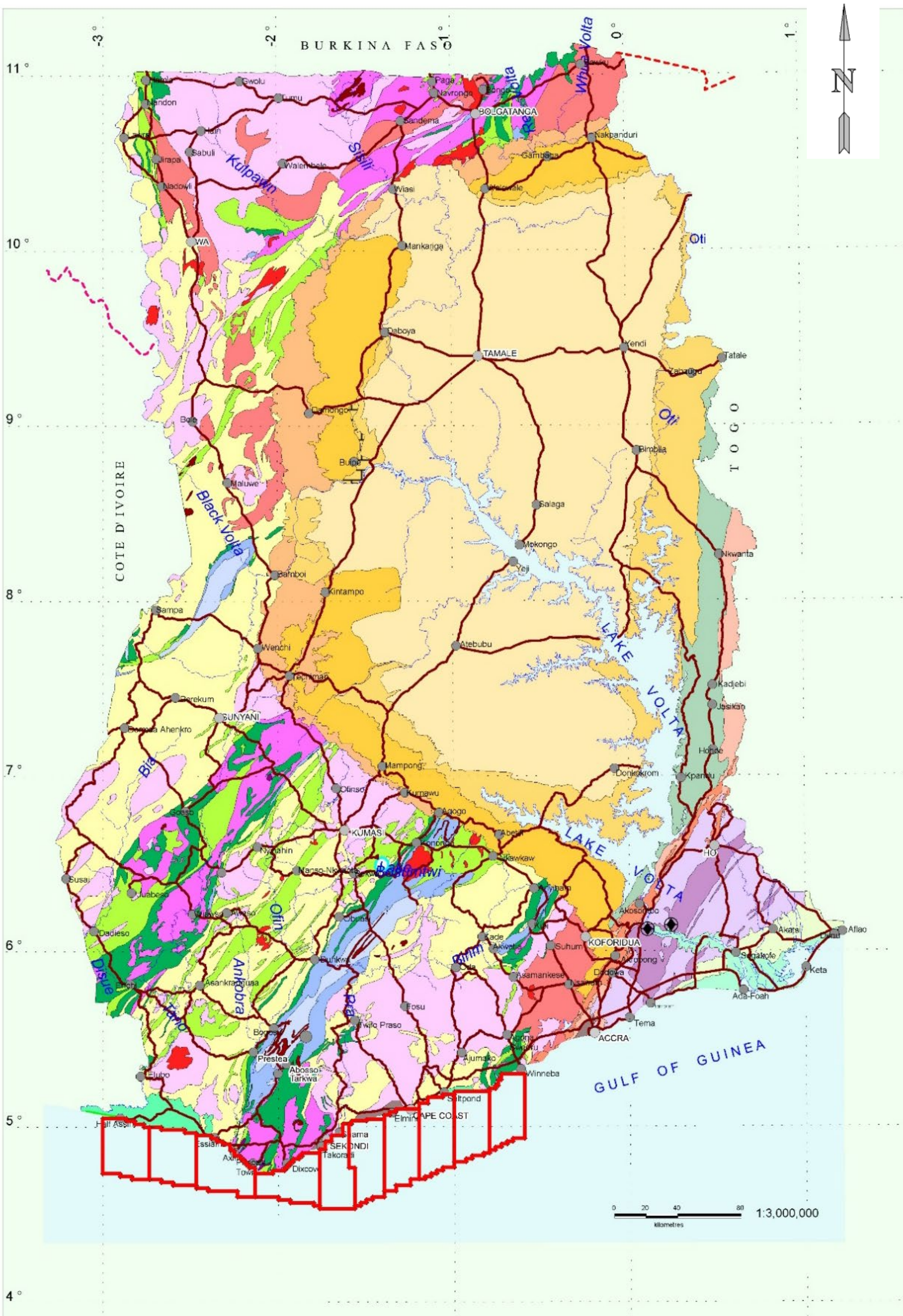


Figure 4-1:Map showing the permit area under application

4.2 Property Description

The reconnaissance permit comprises 10 contiguous blocks of approximately 1,000 km^2 each. The license area in Figure 4-2: is approximately 10,000 km^2.

The site plans for all 10 blocks are found in the appendices at the end of this document.

The approximate centroid of the Property is located at:

- Latitude: [-0°47’60’’]
- Longitude: [5°12’00’’]

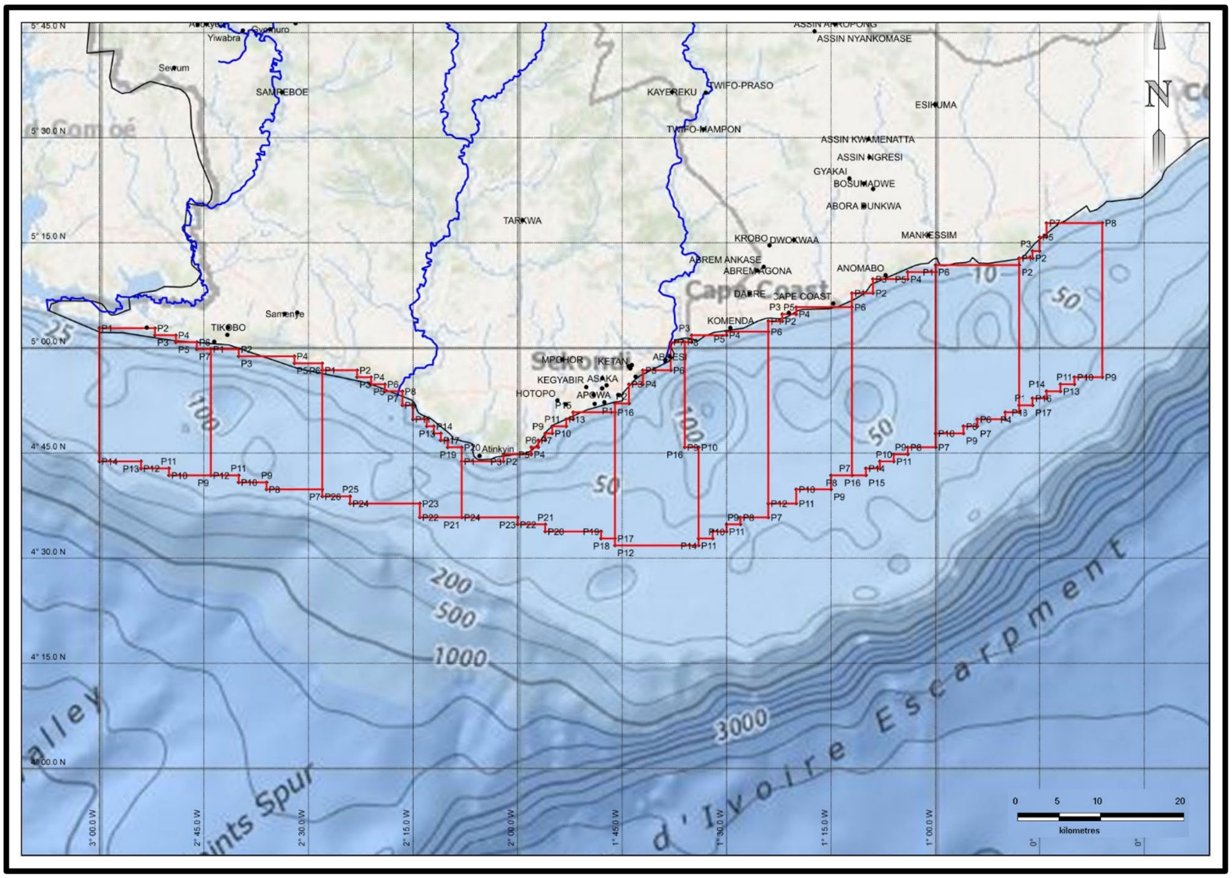


Figure 4-2: Offshore permit area (approximately 10,000 km^2)

4.3 Mineral Tenure

GoldCoast was granted a reconnaissance license on the 9th of February 2026 for a period of one (1) year, expiring on the 8th of February 2027. The concessions granted are listed in Table 4.1 as follows.

Table 4-1: GoldCoast Offshore Tenements

SN	Licence Name	Licence Type	File Number	Mincom Lin No.	Size (km^2)
1	SL-A: Half-Assini	Reconnaissance	APL-R-183	JS/1377226-26	1038.35
2	SL-B: Twenene	Reconnaissance	APL-R-180	JS/1377222-26	974.62
3	SL-C: Esiama	Reconnaissance	APL-R-177	JS/1377228-26	1027.85
4	SL-D: Atwiwa	Reconnaissance	APL-R-176	JS/1377224-26	929.97
5	SL-E: Takoradi	Reconnaissance	APL-R-178	JS/1377229-26	928.38
6	SL-F: Kafodzidzi	Reconnaissance	APL-R-185	JS/1377227-26	1042.87
7	SL-G: Elmina	Reconnaissance	APL-R-181	JS/1377221-26	1049.49
8	SL-H: Moree	Reconnaissance	APL-R-179	JS/1377223-26	1042.69
9	SL-I: Nakwa	Reconnaissance	APL-R-182	JS/1377230-26	927.08
10	SL-J: Apam	Reconnaissance	APL-R-184	JS/1377225-26	913.55

4.4 Mineral Rights

Mineral rights in Ghana are governed by the Minerals and Mining Act, 2006 (Act 703), which is administered by the Minerals Commission under the Ministry of Lands and Natural Resources. The Mining Act sets out the terms and conditions of maintaining a Reconnaissance, Prospecting, and Mining leases in good standing. These conditions include, but are not limited to:

- Payment of rental land rates (refer to Section 4.7.6), royalties (refer to section 4.7.7) and government charges;
- Presentation of regular returns and annual returns;
- Utilization of the mining rights through the exploitation of the minerals; and
- Payment of bonds and maintenance of rehabilitation programmes.

4.5 Permits and Authorization

The Minerals Commission of Ghana ("Mincom") requires that, in addition to a Reconnaissance, Prospecting, and Mining leases, other permits for exploration and exploiting activities include an Operating Permit issued by the Inspectorate Division of the Minerals Commission and an Environmental Permit issued by the office of the Ghana Environmental Protection Authority (EPA) branch responsible for mineral exploration.

EPA permit for the licence area is in process and will be issued upon providing work commencement notification to the EPA. An Operating Permit is renewed every year and is valid from January 1 to December 31 of that year. The operating permit is in process and will be issued upon providing work commencement notification to the Inspectorate Division of the Minerals Commission.

In addition to the EPA and Operating Permits, it is important to establish strong socio-cultural relationships with communities within and around exploration and mining projects. Access rights must be negotiated with the local inhabitants, and it is mandatory to compensate for disturbances caused by surface exploration. This process is crucial to securing the social licence required to operate within affected communities.

4.6 Underlying Agreements

GoldCoast rights in the licence, representing 100% interest in the entire licence, subject to 10% free carried interest by the Republic of Ghana.

4.7 Mineral Rights in Ghana

4.7.1 Reconnaissance Licence

A Reconnaissance Licence confers on the holder the right to search for a specific mineral (or commodity) within the licence area by geochemical and photogeological surveys or other remote sensing techniques. Except as otherwise provided in the licence, it does not permit drilling, excavation, or other sub-surface techniques.

The licence is normally granted for one year and may be renewed by the Minister from time to time for periods up to one year at a time upon application by the holder. The application for renewal must be made at least three months before the expiration of the licence. The size of the area over which a Reconnaissance Licence may be granted is limited to 5,000 contiguous blocks or 1,050 square kilometres. A block is one cadastral unit, which is equal to 0.21 square kilometres.

Note: although the largest block stipulated is 1,050 km², it can be increased at the discretion of the Minister.

4.7.2 Prospecting Licence

A Prospecting Licence gives the holder the exclusive right to search for specific minerals (or commodities) by conducting geological, geophysical, and geochemical investigations to determine the extent and economic value of any deposit within the licence area. Drilling, excavation, or other sub-surface techniques are permitted under the Prospecting Licence. The initial grant of the licence is limited to three years and a maximum area of 750 contiguous blocks or 157.5 square kilometres.

A Prospecting Licence is granted for a period not exceeding three years and may be renewed for a maximum of two terms or for further periods of up to three years each. The holder of a Prospecting Licence shall, prior to or at the expiration of the initial term, surrender no less than half the number of blocks of the prospecting area so long as a minimum of 125 blocks or 26.3 square kilometres remain subject to the licence and the blocks form not more than three discrete areas each consisting of a single block, or a number of blocks each having a side in common with at least one other block in that area.

4.7.3 Mining Lease

The grant of a Mining Lease gives the holder the right to mine, win, or extract specified minerals (or commodities) within the lease area. The lease may be granted to the holder of a Prospecting Licence or any person who establishes to the satisfaction of the Minister that a mineral to which the lease relates exists in commercial quantities within the proposed lease area and can be mined at a profit. The lease is issued initially for a 30-year period, subject to renewal for a further 30-year term. The size of the area in respect of which a lease may be granted is limited to 300 contiguous blocks or 63 km^2 for a single grant.

A person other than the holder of a Reconnaissance or Prospecting Licence may apply for a mining lease in respect of a mineral specified in the application over land that is not the subject of a mineral right for the same mineral applied for.

4.7.4 Restricted Licence or Lease for Industrial Minerals

Mineral rights governing the exploration and exploitation of industrial minerals and building materials are granted through the issuance of a Restricted Licence or Lease. A Restricted Licence may be granted, as in the case of other minerals, for the different stages of mineral operations (that is, reconnaissance, prospecting, and production) in the form of a Restricted Reconnaissance Licence, a Restricted Prospecting Licence, or a Restricted Mining Lease.

The Restricted Reconnaissance Licence is normally granted for up to one year and may be renewed by the Minister from time to time for periods up to one year. The Restricted Prospecting Licence is normally granted for a period not exceeding three years and may be renewed for a maximum of two terms or for further periods of up to three years. The Restricted Mining Lease is normally granted for a period not exceeding 15 years and may be renewed for the same number of years.

Mineral rights for building and industrial minerals are reserved for Ghanaian citizens except where an exemption is made by the Minister, on the advice of the Minerals Commission, as being in the public interest. A local authority, owner, or lawful occupier of any land is permitted to prospect for and mine, on any land owned or occupied by him, any building or industrial mineral for use in building, road making, or agricultural purposes.

A person who is not a Ghanaian may apply for a mineral right in respect of an industrial mineral, provided the proposed investment in the mineral operations is ten (10) million US dollars or above.

4.7.5 Small-scale Mining

The small-scale Mining Licence governs winning, mining, and production of minerals such as gold, diamonds, salt, kaolin, silica, sand, brown clay, aggregates, and crushed rocks by an effective and efficient method, and observe good mining practices, health and safety rules, and pay due regard to the protection of the environment during mining operations.

A licence is granted to a person, a group of persons, a cooperative society, or a company for a period of no more than five years from the date of issue in the first instance and may be renewed on expiry for a further period that the Minister may determine.

The size of the area in respect of which a licence may be granted for small-scale mining shall not exceed 25 acres (10 hectares). Only Ghanaians of at least 18 years can be granted a small-scale Mining Licence.

4.7.6 Licence Fees

Under the Minerals Act 2006, Act 703, there are a number of fees applicable. Annual Mineral Rights Fees are payable depending on the type of licence you hold, the size, and how long you have held the licence.

Annual Mineral Rights fees: For a Reconnaissance Licence, each cadastral unit costs US$16 for the first year, and US$20 from the second year. A Prospecting Licence attracts an annual rate of US$32 for each of the first three years, US$50 from year 4-6, and US$70 from year 7-9.

Approval charges for a transfer, assignment, mortgage, or joint venture of a Reconnaissance Licence are pegged at US$20,000 and US$40,000 for a Prospecting Licence. The option agreement is US$10,000 for both RL and PL.

In addition to the fees shown above, all mineral rights holders pay a “ground rent” to traditional landowners annually through the Ghanaian government. The ground rent fees for a Prospecting Licence are about US$8 per square kilometre.

4.7.7 Mining Royalties

Pursuant to the 2006 Mining Act 703, amended in 2015, the holder of a mining lease is required to pay, quarterly, a royalty of 5%.

4.7.8 Reporting Requirements

In order to maintain a Licence, the owner is required to submit the following reports:

- Quarterly Return Form
- Environmental Report
- Terminal Report

4.8 Environmental Regulations

An environmental permit is required for any exploration activity. These permits are issued for a period of two (2) years, and they are renewable as long as the Licence is valid and requires yearly reporting to the EPA.

The EPA is required to hold a public hearing in respect of an application for an environmental permit where there is a material adverse public reaction to the commencement of the proposed undertaking. In particular, if it involves the dislocation, relocation, or resettlement of communities, or the undertaking could have extensive and far-reaching effects on the environment.

After the approval of the Environmental Impact Statement (EIS), an environmental management plan, in respect of operations, must be submitted within 18 months of commencing operations and every three years thereafter.

Failure to commence operations within the prescribed time period renders the environmental permit invalid, and the applicant is required to resubmit an application to the EPA, together with reasons for the new application.

After commencing mining operations, the applicant is required to apply for an environmental certificate that may be issued subject to terms and conditions. The environmental certificate must be obtained within 24 months of the commencement of operations.

An environmental certificate will not be issued by the EPA until the person responsible for the application has submitted evidence or confirmation of the actual commencement of operations, acquisition of other required permits, and approvals and compliance with mitigation commitments provided for in either the EIS or preliminary environmental report. Mining companies are also required to submit annual environmental reports in respect of mining operations.

4.9 Environmental Liabilities

The project is located offshore of the country with no environmental liabilities at this stage, as it will not involve the dislocation, relocation, or resettlement of communities.

4.10 Other Significant Factors and Risks

To the extent known by the author, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the property.

5 Accessibility, Climate, Local Resources, Infrastructure, and Physiography

5.1 Geography

Physiography, Climate, Access, Infrastructure, and Resources. The geographical features along the coastal area immediately adjacent to the offshore license area are quite pertinent to the understanding of the exploration concept behind the project and to appreciate the logistical requirements of the exploration work. Similarly, the geography of the offshore area itself also needs to be understood and appreciated.

5.2 Physiography and Climate

The coastal and inland area of southern Ghana (Figure 5-1) is a typically tropical, equatorial region with mainly low-lying hills and broad valleys below elevations of 100m above sea-level (ASL). A few NE trending ranges of more rugged terrain are also conspicuous, reaching altitudes up to 700+m (Atewa Range), although most of these are closer to 300m ASL. Just to the west of Accra, a narrow, rugged set of hills and an escarpment extend to the NE all the way to the Togo border. To the east of these hills, the coastal terrain is far more subdued and is dominated by the very broad Volta River valley, the dominant river system in the country.

In many places, low-lying hills (50-100m ASL), which are usually underlain by more resistant older Precambrian bedrock, extend to the coastline and even a little beyond. For example, the approximately 70+km shoreline from Axim eastwards to about Sekondi/Shama is underlain mainly by the Ashanti greenstone belt, which features many prominent hills that come right up to the water's edge.

Some coastal areas, such as the long (80+km) stretch from the mouth of the Ankobra River to the western border with Côte d'Ivoire (CI), are very flat because they are underlain by young, very gently dipping clastic sediments. However, there are a few hills (relief of 50-100 m) a little inland, which are underlain by more resistant carbonates.

Figure 5-1: Map of geographic features of southern Ghana

5.3 Rainfall

Much of this inland region of southern Ghana, as well as the immediate offshore areas, have relatively high annual rainfall (1000-2000+mm/yr), with the highest rainfall (2000+mm/yr) being along a narrow band extending from the Essiama/Axim area northeastwards towards Tarkwa. The lowest rainfall lies right along the coast from about Shama eastwards through the Cape Coast area and well past Accra right over to the Ada area. However, a few kilometers inland, the rainfall increases noticeably in most areas.

5.4 Drainage

As a result of the relatively high rainfall throughout much of southern Ghana, it is not surprising that the area has several major river systems that include, from west to east, the Tano, Ankobra, and Pra. As noted above, much further east is the Volta River, which originates in the countries north of Ghana and is by far the largest in the country, and it has a huge, regional catchment area. This includes Lake Volta, a man-made lake, which is the reservoir for the Akosombo dam, where the country's main hydro-electric power system is located.

The Tano, in its lower course, marks the border between Ghana and CI, but just upstream from the border town of Elubo, it veers into Ghana and follows the large Sefwi greenstone belt northwards; its headwaters are to the immediate east of Sunyani and include virtually the entire length (60+km) of the world-class Ahafo gold district. It also drains the Enchi area and the gold belt that extends from Enchi to the SW into CI as far as Afema, close to the coast.

The north-south flowing Ankobra River extends from its northern headwaters, close to the Bibiani-Chirano gold district, and two of its major tributaries (Mansi and Bonsa rivers) drain the middle portion of the Ashanti greenstone belt. This includes major gold belts/districts in the Ayanfuri/Wassa-Akropong area, Bogosu-Prestea, the prolific Tarkwa- Damang district, and finally the Salman-Nkroful area that appears to be part of yet another N-S gold district that extends right to the coast in the immediate vicinity of Axim. Alluvial deposits have been mined for generations along the Ankobra valley, and to this day, the area remains a substantive alluvial gold producer.

The drainage basin of the Pra River is quite extensive and exceeds the combined areas of the Tano and Ankobra river valley systems. Rather interestingly, the Ofin River, one of the major tributaries of the Pra River, was once part of the Ankobra basin, but one of the tributaries of the Pra captured the Ofin in the not-too-distant past, probably not long before the last ice age. The Ofin drains large areas of the northern part of the Ashanti Belt, as well as the entire gold district in the Manso Nkwanta-Nkran Hill area. Other tributaries of the Pra drain the Konongo - Lake Bosumtwi gold belt and the Akyem - Nkawkaw gold district. Its major eastern tributary, the Birim River, drains the Atewa Range, an area famous for its extensive alluvial gold deposits. As will be noted in a later chapter, the Birim River and several other eastern tributaries of the Pra host a huge inventory of alluvial diamonds, which were mined extensively in the past, but the remaining resources are still very considerable.

5.5 Access and Infrastructure

Southern Ghana has extensive infrastructure and several major cities, especially along the coast. The region is dominated by the Accra-Tema area, the largest urban (5+mill. population) and industrial area within the country by a wide margin, and it is also the seat of the national Government. Along the central part of the coast is Cape Coast-Elmina, another major urban area known mainly for its secondary and tertiary educational facilities, as well as being the capital of the Central Region. Further to the west is another major urban area, Takoradi-Sekondi, the country's second major port and a transportation hub.

Takoradi is now also known as the 'Oil City' because all of the offshore oil producers and service companies have offices and supply depots in the immediate area. The oil and gas come from major fields along Ghana's continental slope, not far from the border with the Ivory Coast. Although virtually all of the oil production is immediately exported from offshore facilities, most of the gas is destined to be piped to the shoreline, where it is intended for the domestic market. The Government has initiated major infrastructural programmes along the western coastline with the hope that it will lead to the development of major new industrial activities based on the availability of low-cost gas supplies.

The Port of Takoradi is in the process of being upgraded and will continue to be the main export harbour in the country. The traditional marine exports have been timber and mining products (bauxite and manganese concentrates), in addition to rubber, coconut, and palm oil products. Takoradi also has major naval, air force, and army bases, and is now playing a more active role in patrolling Ghana's offshore territorial waters. Efforts are now underway to upgrade the largely defunct railway that connects the harbour to the manganese and bauxite operations, as well as to Kumasi, the country's second largest city and the capital of the Ashanti Region. The port and surrounding industrial and urban areas are likely to play an important role in future offshore mining projects as well.

The major towns and cities along the coast are all connected to the major east-west highway that crosses the country, and all the small villages can be accessed along gravel roads. The national power grid has penetrated the area quite extensively, and now, very few towns along the coast are without power. Likewise, the commercial network of mobile telephone companies has effective links throughout the region.

Accra has a major international airport, which provides adequate connections to many European destinations, as well as to major cities in West, Central, and East Africa. The Government is attempting to upgrade regional airports to facilitate further growth in domestic flights, and Takoradi has been a beneficiary of these efforts with several daily flights to the capital.

Like many countries, Ghana is beginning to encourage alternative sources of power, especially in urban and rural communities where solar power is especially practical. The capital costs for such installations have come down steadily in recent years, and the growth of this sector of power generation may become much more widespread in the coming years.

5.6 Other Resources of Ghana

As for most of southern Ghana, outside of the major urban centres, the coastal region of the country is dominated by agriculture, and the majority of the population is engaged in some form of farming. Much of this is on small plots and is largely on a subsistence scale. There is also very considerable farming of cash-crops such as cocoa, palm oil, rubber, and, to a lesser extent, coffee and coconut; these are also done on a small-scale by many local farmers, but in the case of palm oil and rubber, there are also several massive plantations owned by foreign companies.

Offshore fishing is a vitally important industry to the nation, and the entire coast is dotted with mainly small fishing villages and a few larger towns supported largely by offshore fishing. Any offshore oil and gas, as well as potential dredging operations, must recognize the importance of offshore fishing, and the coastal communities need to be sensitized to the impacts of offshore industrial activities.

Mining has played an important role in the economy of the nation for many generations. The country has been known for hundreds of years as a prime source of gold that is traded regionally and internationally; for the past 30+ years, Ghana has been the number two gold producer in Africa, and in recent years, it has been in the top ten (10) of world producers and Africa's largest gold producer. Neighboring countries (Cote d'Ivoire, Burkina Faso, Mali, Senegal, etc.) in West Africa have also reaped the benefits from gold exploration, and new mines have been opening up all over the region, which has become one of the world's most prolific gold producers.

Most of the gold production in recent decades has come from major mines, virtually all of them confined to SW Ghana. However, a very substantial amount of gold, over 1 million ozs./yr in recent times, comes from small-scale producers, mostly on an artisanal basis. These operations provide a huge number of seasonal and permanent means of income in rural areas of the country, where unemployment rates are very high. The downside, especially of illegal small-scale producers (galamsey), has been the wanton destruction of the environment and the extensive pollution of major and minor waterways, which are sources for water supplies to much of the local population. In recent years, small-scale mining has become more mechanized with the extensive use of excavators, which have increased the havoc created along many waterways. It is a major problem that requires urgent attention, which it now seems to be getting from a newly elected Government.

The development of the oil sector in Ghana is a very interesting case study. For several decades following independence in the mid-1950s, oil exploration was carried out along the coastal areas of Ghana, especially in the western Tano Basin, as well as in the eastern Keta Basin. During the 50s and 60s, most of the drilling was done on land, especially in the Half-Assini area at the western extremity of Ghana, where several oil seeps had been known for many years. However, overall results were disappointing, and although thick sequences of potentially productive marine sediments were confirmed, no discoveries of real significance were made.

From the early 1970s onwards, the search for oil was largely along Ghana's continental shelf, where over 3 dozen holes were completed through to the mid-1980s. Much of this activity was spurred on by major discoveries in neighboring CI, but the apparent extensions of the same favourable basins in CI did not yield noteworthy results in Ghana. There were some minor offshore discoveries, just south of Saltpond, which eventually yielded modest production. However, this was nothing close to resembling a world-class field of the type identified in CI, and nothing remotely similar to the vast discoveries offshore Nigeria and nearby countries along the Atlantic coast of central Africa.

This all changed in the first decade of the new millennium, by which time offshore oil exploration had developed technology to drill in much deeper offshore areas. A relatively small US oil explorer/producer, Kosmos, had carried out seismic geophysics along Ghana's continental slope, very close to the CI border, and followed up with drilling in waters well over 500m deep. The rest is history, and although the discoveries are not enormous, they certainly are major, and Ghana has since become a substantive oil and gas producer. The build-up of production has been slower than projected, but it is quite respectable at over 100,000 barrels/day, and within a few years, it could well increase to over 250,000 barrels/day and sustain this for several decades.

The impact of the new oil production has the potential to be very significant as long as these resources are developed in a responsible, transparent manner, and that they do not become a 'resource curse' as they have for some African countries. The discoveries in Ghana occur in the SW corner of the country, immediately south of Half-Assini, where GoldCoast plans to explore for mineral sands.

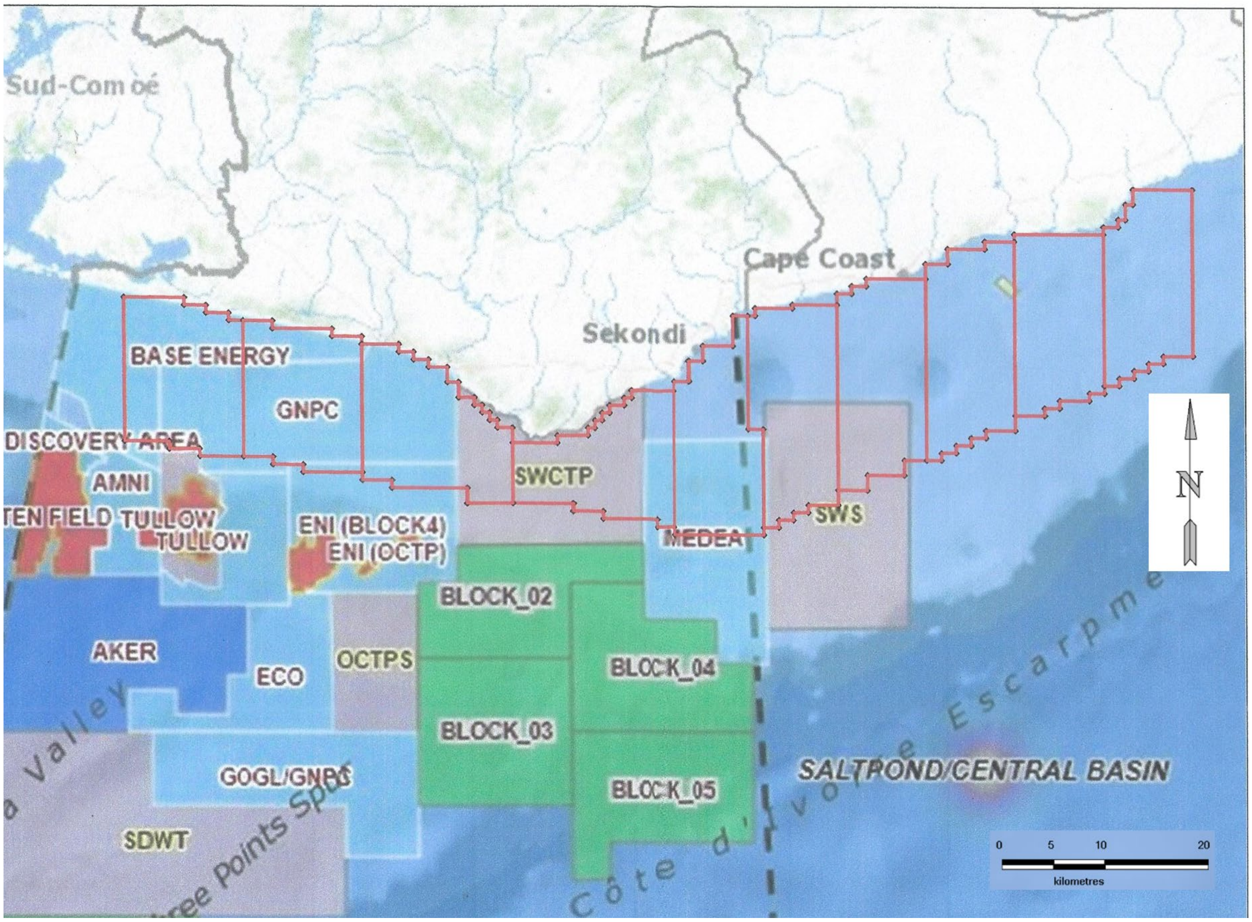


Figure 5-2: Oil & Gas Blocks in relation to permit area

6 History

There has been no systematic exploration along the continental shelf of Ghana for anything other than oil and gas. However, for a number of years, a Canadian junior mining company, Marine Mining Corp., held exploration rights to a very large licence area extending offshore from about Winneba westwards about 200 km to Essiama, just west of the mouth of the Ankobra River. Marine Mining's initial interest was in the offshore mineral sands, especially in areas where the sand could be expected to contain gold. The Marine Mining Concession was virtually identical to the current area being applied for by GoldCoast.

Marine Mining's focus was on the alluvial debris carried to the coast by the Ankobra and Pra river systems, which drain mainly the Ashanti greenstone belt, which hosts several world-class gold deposits and a myriad of lesser-known gold deposits. Both these river systems have extensive current alluvial gold inventories, and obviously, they must have deposited a very substantial amount of alluvial gold in coastline deltas, many of which would have been re-worked as beach sand and gravels and transported along the coast by long-shore currents.

Marine Mining did sample areas right around the mouths of the Ankobra and Pra rivers and certainly identified anomalous gold values in numerous samples. There were a variety of types of gold grains discovered that were interpreted to have come from different sources and environments, some quite nearby, some more distal. They also took a few small grab samples of sand out much further to sea and again got some noticeably anomalous values. The offshore sampling was very limited, but it at least confirmed the potential for substantive accessory gold in offshore sediments.

For a considerable period of time, when the gold price was depressed and funds for gold exploration were unavailable, Marine Mining adopted a different approach and decided to look at the potential for aggregate in offshore sediments. This was very timely because the Ghanaian economy for the past 20+yrs had been growing at a very considerable rate, and there was a rapidly growing demand for sand and gravel in the housing and infrastructure sectors. Much of the growth in the economy was concentrated in southern Ghana, where easily accessible sources of sand and gravel were limited, and there were very few stone quarry operations.

Unfortunately, Marine Mining's efforts to promote the potential for offshore aggregate were limited by a lack of funding, and no real progress has been achieved in this regard. Nevertheless, the demand for sand and gravel in southern Ghana has continued unabated, and there has been a major ongoing shortfall between supply and demand. This has resulted in the unfortunate situation where construction companies have been stripping sand and gravel from thin surface sources all over southern Ghana, seriously degraded widespread areas. This degradation of the land has, in fact, become a major problem for the Government, and thus an offshore source of sand and gravel supplies would help alleviate a very serious situation that is already creating a major bottleneck in t he nation's long-term housing and infrastructure plans.

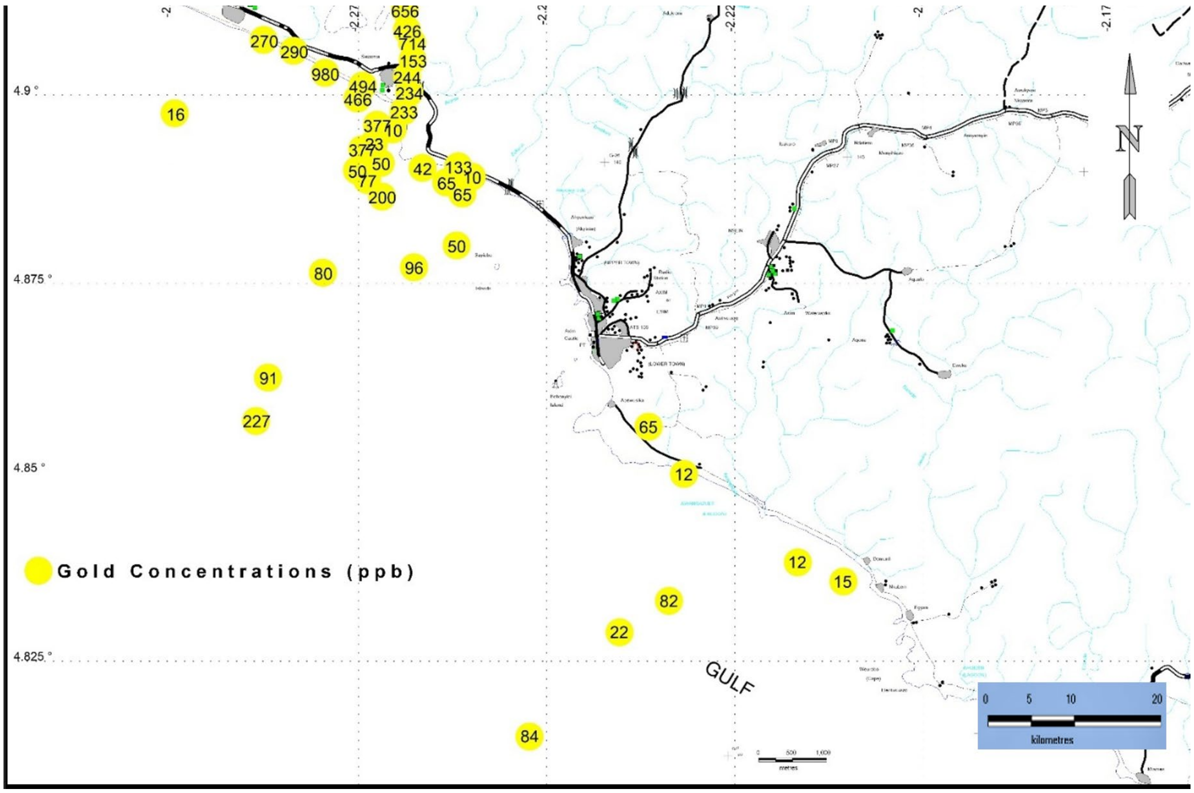


Figure 6-1: Historical sample points from Marine Mining. Source: Gipp, M.R., 2010

GoldCoast has every intention to systematically identify potential sand and gravel sources, especially along the inner continental shelf of Ghana, and promote their use in the national economy.

7 Geology and Mineral Deposits

7.1 Regional Geology

This chapter provides a brief description of the geology of the onshore and offshore areas of southern Ghana, as well as the main types of mineral deposits known in the area that may have been eroded and carried into the offshore environment. Substantial amounts of gold have almost certainly been carried into the offshore areas and could be a valuable accessory mineral in some heavy mineral sands. Therefore, a little background on the history and nature of the inland gold deposits is discussed in modest detail.

The most abundant heavy minerals expected to be found in offshore mineral sands will be combinations of iron and titanium oxides, which often occur together, and there are abundant sources of these minerals in many nearby inland rocks, so they will certainly be an important component of many offshore mineral sand deposits. In addition, the southern part of the Ashanti Belt hosts many manganese carbonate and oxide deposits, some located very close to the coast, and eroded debris from these deposits could be concentrated in some offshore beach deposits.

Other less common heavy minerals, such as zircons and monazite, are minor to trace constituents of many granites and pegmatites, which are found in abundance within the massive Cape Coast granitic complex that is exposed over wide areas along the coast, east of the Pra River. Under suitable conditions, zircons and monazite grains can become significantly concentrated in beach sands and are relatively easy to recover by physical means. Concentrates of these minerals are quite valuable sources of zirconium metal and rare-earth elements (REEs), which are becoming increasingly valuable in an age of highly specialized metals. Some of the same sands with these minerals could also include minor amounts of tin and tantalum, as well as a few more exotic semi-precious minerals such as various varieties of beryl and coloured tourmalines, possibly even a few emeralds, which are a highly valuable variety of beryl.

The Birim River drainage basin has been the source of very large amounts (over 100 million carats- Kesse,1985) of industrial diamonds that have been mined since the early 1920s, and at one time (1950s), Ghana was one of the world's most important sources of industrial diamonds. The Birim River valley still contains a vast resource of alluvial diamonds, and it is almost certain that a significant amount of diamonds have been transported down the Pra River and into the offshore environment. This probably occurred during the massive flooding that took place about 10,000 years BP, when all the inland alluvial gold and diamond deposits were being reworked under very high energy conditions. The offshore diamonds could eventually be concentrated in old beach sands along ancient coastlines, along with a variety of other heavy minerals. Diamonds are not very dense (S.G. of 3.5), but they are very hard and will likely be concentrated in sands that may contain considerable heavy minerals, and the diamonds could be a potential by-product.

Unconsolidated sediments along Ghana's continental shelf will certainly include extensive deposits of sand and gravel that are suitable for a wide range of uses in the aggregate industry. Considering the chronic shortages of sand and gravel in many highly populated parts of southern Ghana, as well as the rampant degradation of lands in southern Ghana by illegal sand winning, the Government of Ghana must make a concerted effort to source aggregate from offshore deposits. This has been done very successfully in many countries, and there is little reason to think that it cannot be done in Ghana as well. It is also very possible that significant deposits of heavy minerals will occur in sand and gravel deposits, and aggregate could be an important by-product in an operation to recover a variety of heavy minerals. Conversely, a sand and gravel operation would include the recovery of other heavy minerals as by-products.

7.2 Geological Background of Southern Ghana

The geology of Ghana, in very simplified terms, is dominated by 3 geological ‘domains’. Half (50%) of the country is underlain by Early Proterozoic (mostly around 2- 2.2 billion years old) metamorphosed Birimian sediments, volcanics, and intrusions. The other half is dominated by the large (about 35%), central Volta Basin of mainly flat-lying, highly indurated but unmetamorphosed sediments and a narrow, eastern belt (approximately 15%) of highly tectonized and metamorphosed Pan-African sedimentary and volcanic units, along with a smattering of intrusives.

The Volta Basin sediments are mainly Late Proterozoic in age (about 1 billion years to around 550 million years BP), although in the central part of the basin, some of the youngest units are lower to middle Paleozoic in age (about 350 mill. yrs. BP). Much of the Volta Basin appears to be underlain by Early Proterozoic/Birimian units.

The Pan-African units appear to have been thrust westwards onto the margins of the Volta Basin and occur along a rugged NNE trending belt that extends from the coastal area immediately west of the capital Accra up towards and beyond the border with Togo. The ‘Pan-African event’ (approximately 600 million yrs. BP) is manifest along the border between Ghana and Togo; it represents a classical mountain-building period within a ‘eugeosynclinal’ marine sedimentary/volcanic environment, and that the Volta Basin represents the ‘miogeosynclinal’ basin, which features thick sequences of clastic sediments derived directly from the denudation of the adjacent mountain chain.

The geological map of southern Ghana () illustrates many of the features outlined above and gives an idea of the complexity of the geological history of the region.

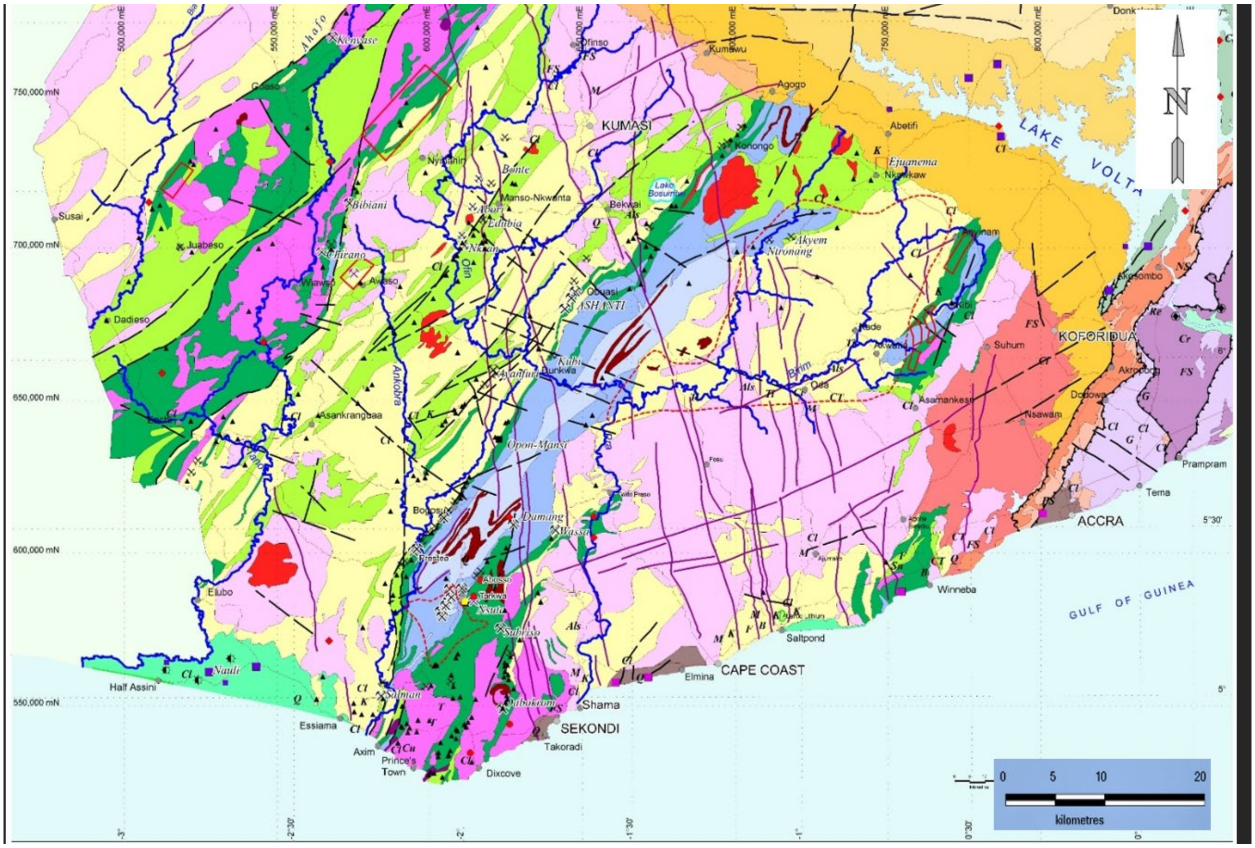


Figure 7-1: Map of geological features of southern Ghana

7.3 Geology along the Continental Shelf of Ghana

Looking at the geological map of Ghana, one could immediately speculate that much of the continental shelf all along the offshore coast of Ghana consists of the same mainly Proterozoic units that are exposed in many areas right up to the coastline. In fact, the Proterozoic age units stop abruptly at the coastline, and only in rare instances do they extend any distance onto the continental shelf. If they do occur along the continental shelf, they do so beneath great thicknesses of much younger sediments, which dominate the offshore areas of SW Ghana.

In fact, along the shores of Ghana's coastline, there are exposures of a wide variety of mainly marine sediments. For example, in and around Takoradi and Sekondi, thick Devonian sedimentary units (Sekondian Series) are well exposed in many road-cuts, and similar-aged units are also exposed in and around Accra (Accraian Series). Immediately east of the mouth of the Pra River, towards Elmina, a narrow band of Devonian clastics is exposed, and further along the coast to Saltpond and Winneba, sequences of Jurassic clastic units (Amisian Formation) are exposed along the coast.

At the far western end of the country, fairly widespread Upper Cretaceous to Early Tertiary marine clastics (Apollonian Formation) are exposed in many of the hills close to the coastline. These units include a very distinctive, highly fossiliferous carbonate that is now being used in the manufacturing of cement. It has long been known that many oil seeps are known within the Apollonian Formation, and this was the area where some of the early oil exploration was focused.

Early drilling for oil on land in the SW corner (Half-Assini) of the country clearly confirmed the existence of very thick sequences of sediments that projected out onto the continental shelf, but results were generally disappointing. Nevertheless, the presence of very thick sequences of marine sediments in the offshore areas along the coast of Ghana provided a large target area, and many were hopeful of duplicating the types of discoveries made along the coast of Nigeria, especially in the offshore Niger River delta area.

By the late 1960s, systematic oil exploration along Ghana's continental shelf gained considerable momentum, and some early results were encouraging in the area south of Saltpond where drill holes to depths of about 3000 m were completed. The sediments spanned a time range from about the Devonian (Middle Paleozoic – approximately 300 mill. yrs. BP) through to the Cretaceous (approximately 60 mill. yrs. BP). Eventually, some very modest production was achieved in this area, and more widespread drilling all along the shelf area revealed similar very thick sequences of sediments right across the continental shelf. By the 1970s, the concept of continental drift and plate tectonics became universally accepted, and this had important implications for sedimentary and tectonic modeling of this region.

The Atlantic coast of West Africa represents a passive continental margin created by the separation of Africa and South America. This slow and lengthy process looks to have been initiated as early as the Middle Paleozoic and has continued ever since. As the massive, old Gondwanaland supercontinent began to break up, thick sequences of sediments began to accumulate along the passive margin of the new African continental block. These included mainly marine clastics that accumulated in very thick sequences, some of which appear favourable for substantive oil and gas accumulations. Unfortunately, considerable drilling along much of Ghana's continental shelf area has yet to yield any major new discoveries.

As oil exploration methods advanced in order to carry out surveys in increasingly deeper offshore basin areas, new discoveries were made in many areas well beyond the continental shelf, especially along the continental slope. This opened many new frontiers for oil exploration, and very significant discoveries were made along the coastal areas of Africa and South America. As noted earlier in this report, the small American oil company, Kosmos, carried out seismic studies well off the continental shelf in waters over 500m deep, in Ghana's territorial waters, very close to the western border with Côte d'Ivoire (CI). It had long been known that major oil deposits off the coast of CI occurred in deeper basins that apparently extended into Ghana's continental slope area. By 2008, Kosmos' efforts were rewarded by the discovery of major oil and gas accumulations in thick Early Tertiary sediments well out into the continental slope. Since then, several other discoveries have been made in the same vicinity, and Ghana has now become a modest but expanding oil producer.

To the immediate east of Shama, where the Pra River enters the ocean, the shoreline is moderately subdued as it is also underlain by younger sediments, but the coast becomes more rugged and hilly again towards Elmina/Cape Coast/Saltpond. This area features more resistant and much older granitoids, pegmatite dykes, and large swaths of Birimian metasediments. Further east towards Winneba, a variety of resistant Birimian volcanics and metasediments are exposed along the coast, as well as extensive granitoids. Around the coast of Accra, highly sheared, low-grade Neoproterozoic metasediments extend to the shoreline, and further east towards Prampram, extensive metasediments and intrusions are widespread. The 100+km long eastern end of the shoreline is mainly dominated by low-lying sand bars and extensive lagoons related to the complex Volta River delta system.

7.4 Mineralogy

The most common constituents of alluvial deposits are those found in nearby bedrock sources and they include very common minerals such as quartz, feldspar, mica, amphibole, pyroxene, along with a variety of clay and carbonate minerals; they also include rock particles from nearby sources, especially the more durable rocks such as granites, some volcanics, and many sedimentary and metamorphic units with high quartz content. These typically make up 90-98% of the sand deposits, and most of them are relatively light, usually with a specific gravity (SG) less than 3.

The remaining balance of the alluvial deposits (approximately 2-10%) is usually heavy and more durable minerals. The most common of these are the iron and titanium oxides, which include the likes of hematite (Fe_2O_3) and magnetite (Fe_3O_4) as well as ilmenite (Fe, Ti_2O_3) and rutile (TiO_2). They include a host of other minerals that are typically quite heavy, with a specific gravity close to or greater than 4. They also tend to be chemically and/or physically durable minerals. For example, gold and platinum are ideal metals to be concentrated in beach sands by physical means because they are so heavy (SG of 19-20), chemically inert, and malleable. On the other hand, many sulphide minerals are heavy, but they are often very brittle and chemically active, so they do not survive long or far in the alluvial environment. At the other end of the spectrum, some quite light minerals, such as diamonds, which have a modest SG of 3.5, are extremely hard and chemically resistant, so they are commonly concentrated and preserved along with other heavy minerals.

As noted above, the planned offshore exploration programme is very interested in high-value heavy minerals and low-value bulk commodities such as aggregate (sand and gravel). It is anticipated that the two will be fairly closely linked in many high-energy beach deposits where finer-grained heavy minerals will be hosted in coarse sands and gravels with clasts that are hard and durable, such as quartz, granitoids, and some mafic volcanics and intrusives.

7.5 Economic Potential

The potential economic importance of offshore mineral sands is quite considerable, and the exploration programme to identify and assess such sands is really two-fold. The primary interest has been in the potential for a concentration of minerals in the ‘sands’ that could be valuable sources of a variety of metals and minerals, such as gold, iron and titanium oxide. Beach sands in many places around the world are being mined extensively for such commodities, usually on land close to the shoreline, but some operations for the same minerals are being recovered in similar beach-type deposits in offshore locations.

In Ghana, there are numerous areas where onshore beach sands do occur, but for the most part, they are in coastal areas that are vital for agriculture and human habitation. It is expected that remnants of extensive old beach sands will occur along the continental shelf from times when the sea level was much lower than present, and the coastline was well south of its current location.

Beach sands are mostly re-worked alluvial deposits that typically remove the finest and the least durable particles (mostly clay and silt-sized material) and concentrates the larger, more durable particles and the heaviest minerals. The term ‘heavy minerals’ is used informally to refer to the heavy minerals that are typically found in virtually all types of alluvial deposits, including beach sands.

8 Onshore Mineral Deposits

8.1 Gold

For centuries, gold and Ghana have been synonymous. Hundreds of years before the Portuguese sailors first arrived (late 1400s) along the coast of West Africa in search of gold, large quantities of this precious metal had been mined and transported across the Sahara to North Africa. This trade helped to establish and support major trading centers in the Sahel along the course of the Niger River and contributed much to the main trading ports along the southern coast of the Mediterranean Sea.

The arrival of the European traders led to increased gold production within the forest areas of southern Ghana, and the area became known as the Gold Coast. It soon became one of the most important gold-producing areas in the world and eclipsed other major producing areas in present-day western Mali and northern Guinea.

In the late 1800s, when the emerging European powers were carving up their respective interests in Africa, Great Britain emerged as the dominant European power along the Gold Coast and claimed it as a British colony in the mid-1870s. This marked the beginning of a new era in gold mining in the region as foreign companies were able to gain gold concessions in very prospective areas in the interior of the country for the first time. By the beginning of the 20th century, modern gold operations began to emerge in many districts of southwest Ghana.

As will be seen below, during the colonial period, gold exploration and production waxed and waned according to economic conditions in the world economy. There was a huge but very brief gold rush at the very beginning of the 20th century and a much more sustained one throughout the 1930s, when gold production reached historical highs and world-class operations developed at the famous Ashanti mine at Obuasi and in the Tarkwa, Prestea, and Bibiani districts.

After World War II and leading up to Ghana's independence in 1957, the gold production remained substantial, and the mines were critical to the economy of the new nation. However, the rising costs of production at a time of a fixed gold price made many of the existing operations marginally profitable, except for the Ashanti mine, whose very high grades kept it amongst the premier gold producers in the world. In the early 1960s, the Government of Ghana bought out several of the marginal producers and formed the State Gold Mining Corporation. This parastatal achieved very good results in the 1960s and early 1970s, but a sustained lack of capital investment in the existing operations led to a downward spiral in production throughout the remainder of the 1970s and early 1980s.

It was not until the mid-1980s that the downward trend was reversed as a result of the implementation of a broad Economic Recovery Programme, which included a significant focus on the mining sector. New laws and regulations, as well as fiscal incentives, were established to attract foreign capital to carry out exploration and development of new producers or the upgrading of existing gold operations. As will be seen in the statistics below, these new policies were extremely successful and created the necessary economic 'enabling environment' that resulted in huge capital expenditures on exploration and development projects.

Dramatic increases in production were achieved and have been sustained for the past 20+ years. Ghana has emerged as the largest gold producer in Africa, and the country has been consistently in the top ten world gold producers. Ghana's success has become a case history for many developing nations, especially with respect to stimulating exploration and mining.

During the latest exploration boom, much of the early interest naturally focused on previous producers and the implications of new treatment schemes to more effectively mine lower-grade deposits at mines that had closed down. In addition, many of the older mines now had more reason to re-evaluate known resources on their extensive concessions and to bring in new ideas and ways to increase production. This was especially true at Obuasi, where a new and enlightened management team undertook huge development schemes that greatly increased gold production from about 250,000 ozs in the mid-1980s to almost 1 million ounces in the mid-1990s.

In addition, the Government's efforts to privatize the exploration and mining assets of the State Gold Mining Corporation were finally successful in the early 1990s, and subsequent developments have seen very impressive production increases. For example, in Tarkwa, the old underground operations were producing a very modest 20-40,000 ozs/yr in the late 1980s through the mid-1990s but a very large low-grade open-pit operation that got started in the late 1990s saw production shoot up to over 300,000 ozs by the end of the decade and for the past several years it has been the #1 producer in the country at about 600,000 ozs per year (Figure 8-1).

Ghana plans to maintain a favourable 'enabling environment' for investment in the mining sector. This starts with a full commitment to good governance and the strengthening of democratic institutions that have gained the nation much favourable attention in recent times. It also includes modifying laws and regulations to improve the oversight and administering exploration and mining activities, as well as establishing a fair and equitable distribution of the profits from mining in the country.

As can be observed in the accompanying tables and illustrations, gold production in Ghana has been very significant over the ages and has kept Ghana as the pre-eminent producer in the region. It is especially noteworthy that over the past 20+ years, Ghana has seen a steady increase in production to the present historically high levels that have allowed the country to achieve the status of number 1 gold producer in Africa and have allowed it to consistently break into the top 10 world producers. In 2024, total gold production was a record 5.1 million ounces from both large- and small-scale producers. Buoyed by new contributions from Newmont's Ahafo South Mine and Shandong's Namdini Mine in 2025, gold production is projected to increase further (according to the Ghana Chamber of Mines).

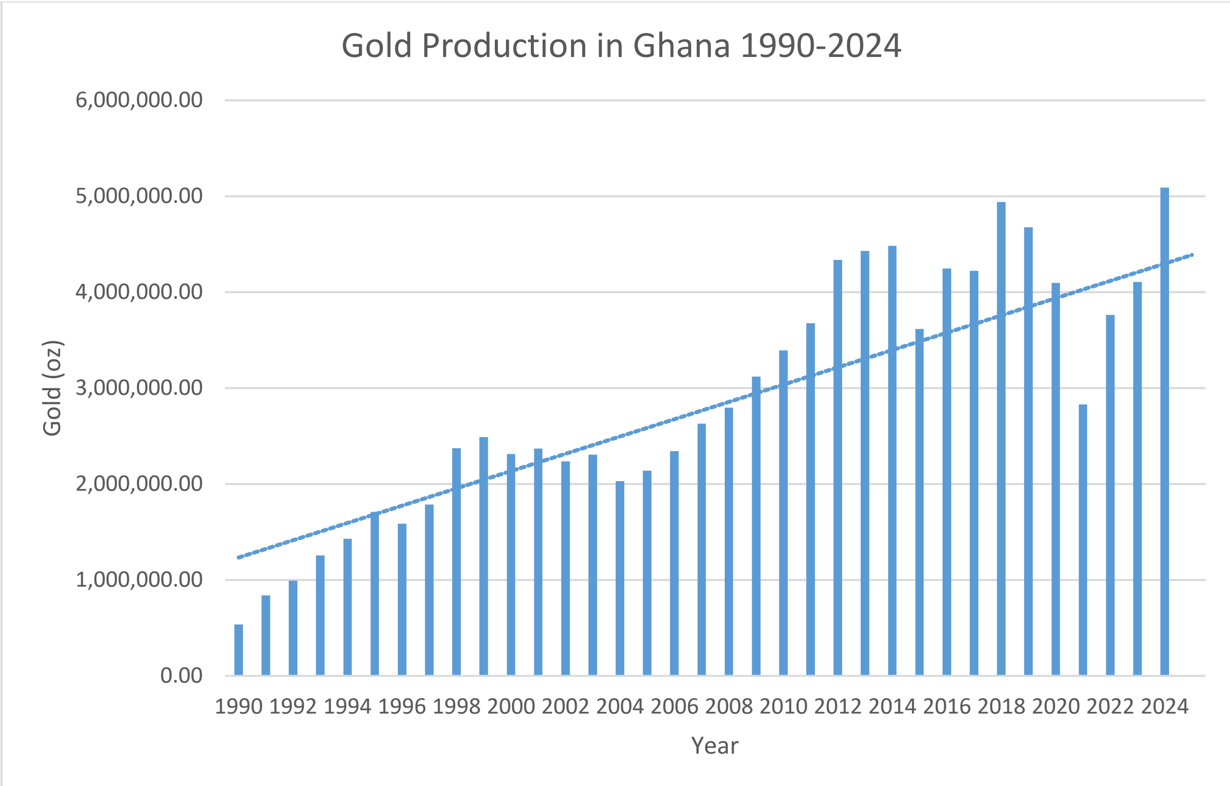


Figure 8-1: Gold production since 1990

8.2 Types of Gold Deposits

The vast gold endowment of the country is mainly confined to the Early Proterozoic units and the modern rivers and valleys that drain these areas. The Early Proterozoic is dominated by broad basins of marine sediments along the margins of comparatively narrow, NE-trending 'greenstone' belts, which contain a great variety of sediments, volcanics, and intrusions. The broad sedimentary basins feature a variety of very thick, marine clastic sediments, which were later intruded by massive granitoid batholiths, probably of anatectic origin. The primary gold deposits are mainly confined to the 'greenstone' belts, especially along the margins of these belts and the adjacent basin sediments**.**

The map of the gold occurrences in southern Ghana illustrates (Figure 7-1) how widespread these occurrences are, and the following section describes key features of the dominant types of gold deposits. Much of the information in this section comes from the "Gold Deposits of Ghana" published by the Minerals Commission (Griffis and others, 2002) as well as from brochures on gold deposits prepared by the Minerals Commission in more recent years.

8.3 Birimian-Hosted Deposits

In the early 1900s, it was really the opening up of the high-grade quartz vein systems at Obuasi in the Ashanti Region that spurred on future generations of explorers. The 'Ashanti-type' of vein systems produced some of the richest gold deposits; they are now generally referred to as 'an orogenic gold deposit' and are amongst the most prolific producers in the world.

These gold occurrences usually feature complicated quartz vein systems commonly associated with extensive disseminated sulphides. The vein systems usually appear to be related to regional NNE to NE trending regional structures (tectonic corridors), which are typically concentrated along the margins of various Birimian 'greenstone' belts and adjacent metasedimentary basins. The most favoured host rocks are usually interbedded argillites, greywackes, and volcaniclastic units. Frequently, these deposits also feature a variety of fine-grained chemical sediments (siliceous, graphitic, manganese, carbonate, fine-grained sulphides, etc.). It is also quite clear that in some areas, intermediate intrusions and mafic volcanics in the transitional zones between the belts and basins also host important gold occurrences.

Orogenic gold deposits often consist of steeply dipping vein systems, usually with multiple stages of mineralization and veining. In some cases, the veins are relatively narrow (1-2 m) and discreet, and there may be several parallel sets within broad structural zones. Not all vein systems are created equal; some are relatively barren in gold, whereas others can be extremely high-grade. Individual vein systems can be traced for long distances along strike (1000+m) and are up to 10+m wide (Obuasi, Bibiani), although most are narrower. The individual vein systems can also extend to considerable depth (500+m). One individual set of veins can pinch out rapidly, but a separate one can be discovered along strike, down dip, or anywhere within the confines of a broader, favourable structural zone.

The mineralized veins often feature medium to fairly dark grey quartz and commonly contain visible gold along with relatively abundant granular pyrite and arsenopyrite, usually in relatively fine-grained, acicular form. However, in many of the mineralized vein systems, visible gold is quite uncommon.

It has long been recognized that on a local and regional scale, structure is probably the key factor in controlling lode gold deposits in southwest Ghana. The term 'structural corridor' for many of the regional structural zones along the margins of the belts and basins is appropriate because they certainly feature a variety of structures of considerable complexity over extensive areas. They form an excellent plumbing system for vast quantities of mineralizing fluids, provided by hot, connate waters from the nearby basin sediments and from metamorphism of deeply buried sediments and volcanics within the greenstone belt.

8.4 Tarkwaian-Hosted Deposits

The conglomerates of the Tarkwa district have now produced about 20+ million ounces of gold over the past 100+ years, and although the last remaining underground mine closed in 1999, the district now has very substantial open-pit gold production, and the regional resource potential is excellent. To date, virtually all of the gold mined from Tarkwaian Paleo-placers, traditionally known as 'banket' deposits, have come from the immediate vicinity of the Tarkwa district. Similar Early Proterozoic sedimentary sequences are known in many of the other belts in Ghana and neighbouring Paleoproterozoic belts of West Africa, where there are some minor gold occurrences. However, as yet, none of these have been developed into major mines.

In the Tarkwa district, the 'basal' conglomerate in the Banket series usually contains the best gold values, but the overlying conglomerates also contain substantial gold, and the intervening cross-bedded quartzites frequently contain low values. On the eastern margin of the Tarkwa Syncline, where most of the underground mining has been concentrated, the banket conglomerates are comparatively thin (often less than 1 m), whereas they thicken to the west. The high-grade zones (15-45g/t) are largely confined to the thin conglomerate beds that contain a high proportion of well-rounded, coarse quartz pebbles. The gold is virtually restricted to the matrix of the conglomerates where it occurs as quite fine (10-15 microns) grains or clusters, often in zones with abundant hematite. Tarkwaian gold is typically very pure, with a fineness commonly exceeding 950.

Although a few geologists have speculated on an epigenetic origin for the Tarkwaian gold occurrences, the vast majority of opinions by those most familiar with the area are essentially unanimous that these deposits are true paleoplacers (Junner, 1935). They bear striking resemblances to the huge paleoplacers of the Witwatersrand Basin of South Africa.

Quartz veins are very common in the Tarkwaian Group, but historically, these have been of no commercial interest. This all changed in the late 1980s when a large mineralized stockwork system was discovered and developed at Damang, just to the NNE of Tarkwa (Griffis and others, 2002). The Damang quartz stockwork system is hosted in the Banket Formation units on the east limb of a tight anticlinal structure with a NNE trend. The fracture system has been traced for several kilometres along strike and features two dominant, generally N-S trending vein systems; one dips shallow (20-35°) to the east, whereas the second set dips more steeply (60-75°) to the east.

Since the discovery of the Damang deposit, this type of occurrence has been the target of considerable exploration effort. In reality, these occurrences are just another type or style of orogenic gold deposits that probably formed fairly late in the Eburnean tectonic cycle, and the gold could have originated either from nearby Tarkwaian conglomerates or from nearby existing Birimian occurrences.

8.5 Oxide and Laterite Occurrences

Virtually all of the primary (and paleoplacer) gold deposits in Ghana have been intensely weathered to produce oxide and lateritic caps. The oxide cappings (also called saprolite) have been a major target for exploration over the past two decades because they are usually amenable to inexpensive surface mining and treatment schemes, thus allowing very low-grade deposits to be mined economically. In some areas, the lateritic crust on top of the oxide zone can also contain residual gold, but in most of the current gold districts, mineralized lateritic cappings have been eroded away.

The effects of oxidation have had a particularly beneficial effect on deposits with extensive disseminated sulphides in the primary zone, and where a high proportion of the gold was originally contained within sulphide grains. The liberation of gold from the sulphides has rendered many of the oxide caps suitable for mining, whereas the underlying primary zones may be too low grade to justify more expensive refractory recovery systems. The physical effects resulting from the weathering have also resulted in many benefits, such as softer ores that require minimum blasting as well as substantially increasing the permeability of the host rock, which may permit very low-cost heap-leach methods to recover the gold. Oxidized and lateritic gold accumulations have also been the principal source for gold in the current and past inland river systems for many millions of years.

8.6 Late Quaternary Alluvial Deposits

The vast majority of historical gold production from Ghana before the 20th century came from a myriad of small streams and rivers draining areas with underlying oxide and primary gold deposits. In addition, several of the major rivers have been dredged starting in the early 1900s, and in the Dunkwa area, dredging along the Ofin River lasted up into the early 1990s.

The much-improved gold price of the late 1980s resulted in a major resurgence of alluvial mining, including large alluvial operations that were started up on rivers in several districts. With the increase in the gold price over the past several years, the amount of small-scale gold mining, primarily of alluvial deposits, has increased dramatically throughout Ghana. Currently, the historical high price of gold will almost certainly guarantee significant ongoing gold production from artisanal miners. However, the rampant destruction of the environment in many gold districts poses a major problem for the government and the mining industry, which eventually has to be addressed.

There is very little detailed information on the ages of the alluvial terraces and river sediments observed in the present inland river system, but most appear to be relatively young and are probably of Late Quaternary age. During the last major ice age, the sea level was about 100-120 m below the current level, and at the end of that ice age, perhaps around 10,000 years BP, much of southern Ghana had a savannah climate characterized by low rainfall and fairly sparse vegetation (Hall and others, 1985; Petters, 1991). This was followed by a very rapid increase in rainfall that resulted in enormous erosion and down-cutting of most of the main river valleys throughout southern Ghana. A great deal of gold was eroded from all the near-surface deposits in the region and added to the alluvial gold already in the existing rivers.

Furthermore, it should be noted that back in the 1920s to 1930s, dredging took place along portions of the Tano, Ankobra, Ofin, and the Prah rivers and continued on the Ofin until the late 1980s. Kesse (1985) noted the presence of a significant gold deposit on the Tano River to the immediate south of Enchi. Kesse’s text on the mineral resources of Ghana noted the following alluvial resources: “Tano River between Insu-Enchi motor road and Yiraboi, Western Region; 39,520,000 cubic metres of gravel averaging 318 mg of gold per cubic metre. This indicates a total amount of about 14,000,000 grams of gold here” (p. 580). This is equivalent to about 450,000 ozs. This occurrence is located in close proximity to the Atlantic coast and is the type of alluvial gold deposit we hope to locate within the concession area. It is also exactly the kind of deposit we may be able to identify along the continental shelf.

While there remains a substantial amount of alluvial gold in the river systems of southern Ghana today, there is also little doubt that a huge amount of gold was discharged along the coastal region where the major rivers enter the Gulf of Guinea. Since the sea level at that time was considerably lower than today, it would seem reasonable to conclude that a very substantial amount of gold was deposited in the current offshore region.

8.7 Iron, Titanium, and Manganese

Iron, titanium, and manganese minerals are very widespread in the bedrocks of southern Ghana and occur in a great variety of host rocks, mostly as accessory minerals. In some cases, they occur in primary and secondary concentrations and are potentially of economic significance.

Iron occurs mainly in the form of very common iron oxides such as magnetite (Fe_3O_4) and hematite (Fe_2O_3); magnetite is highly magnetic and usually of primary origin, whereas hematite is non-magnetic and can be formed as a primary mineral but also can be of a secondary origin. Other very common iron oxide minerals in Ghana include goethite [FeO (OH)] and limonite, which is a complex hydrated iron oxide; these are invariably secondary minerals formed by the weathering of primary bedrock that is rich in iron.

In southern Ghana, concentrations of secondary iron oxides are mainly observed in the widespread iron laterite deposits that cap most of the high hills throughout the region. In the past, most of these laterites were far more widespread than currently observed, and they have been eroded extensively and will almost certainly be the most common heavy mineral (particularly hematite and goethite) in offshore beach and river sands.

Although primary iron oxides in Ghana are rarely observed in significant concentrations in older bedrock deposits, they are very abundant accessory minerals in a great variety of volcanic and igneous rocks, as well as in many medium-to-high-grade metamorphic rocks ('greenstones') throughout southern Ghana. These include mainly magnetite and hematite, which are commonly found as heavy minerals in most alluvial deposits in southern Ghana, and it would be expected that an abundance of these same minerals will have been transported offshore.

Titanium and iron commonly occur together due to their similar geochemical characteristics. In many cases, they substitute for one another in some minerals, the most common one being ilmenite [$(FeTi)_3O_4$], which, like magnetite, is very magnetic. When the titanium content of magnetite is quite high, it is usually referred to as titaniferous magnetite. It would appear that much of the accessory iron found in mafic volcanics and intrusives in southern Ghana is actually quite titanium-rich, and some large mafic complexes observed in the southern part of the Ashanti belt contain coarse grains of ilmenite.

Some of these mafic (and ultramafic) complexes (for example, at Mpohor) look to be layered intrusions, and some of the layers are rich in ilmenite. There have also been a few reports (Kesse, 1985) of copper and nickel sulphides, along with anomalous platinum values, in mafic intrusions around Axim and Cape Three Points (Ashanti Belt). A similar occurrence was reported to be associated with a hornblendite further to the east along the coast at Winneba.

Rutile (TiO_2) is a minor but very common accessory mineral in many igneous and metamorphic rocks, such as true granites, pegmatites, mica schists, and gneisses, which are widespread throughout southern Ghana. Typically, rutile occurs as very fine-grained needles and gets concentrated in alluvial deposits along with other heavy minerals, although it is often so fine-grained that it will be difficult to identify. Rutile and ilmenite are commonly observed in the heavy mineral concentrates from many rivers and streams in the Birim River Basin, where diamonds are abundant, especially in the Akwatia area, but also in the vicinity of Tarkwa. Rutile is also apparently quite abundant as a major accessory mineral in the high-grade metamorphic gneisses and schists (Pan-African) that are widespread (Kesse, 1985) in the SE corner of the country and almost certainly will be present in many of the sands transported via the Volta River system into the current offshore environment.

The Birimian-age sediments throughout West Africa and certainly in southern Ghana are characterized by quite widespread manganese-rich metasediments. The primary sources of manganese are mainly manganese carbonates and oxides, which, in some localities, were later metamorphosed into manganese-rich garnets. When exposed to extensive tropical weathering, these primary, bedrock deposits are transformed into laterites very rich in manganese, mainly in the form of pyrolusite (MnO_2) and manganite [$MnO(OH)$]. Pyrolusite is fairly heavy but very soft and will not likely be concentrated in offshore deposits, but manganite is much harder and could be a significant constituent in some offshore beach sands derived from the nearby deposits on land.

One of the inland sources for manganese is located at Nsuta, just to the south of Tarkwa. This has probably been the longest-standing continuous manganese operation in the world; first discovered in 1914 (Kesse,1976), it has now been in production for over 100 years, and it is still going very strong (Figure 8-2). At the very southern end of the Ashanti Belt, there are several similar but much smaller manganese oxide deposits on several of the flat-topped hills around Busua and Butre, very close to the present shoreline. This is a high-rainfall area, and rivers originating in the nearby hills could have carried alluvial manganese debris into the offshore area, where it could be re-worked.

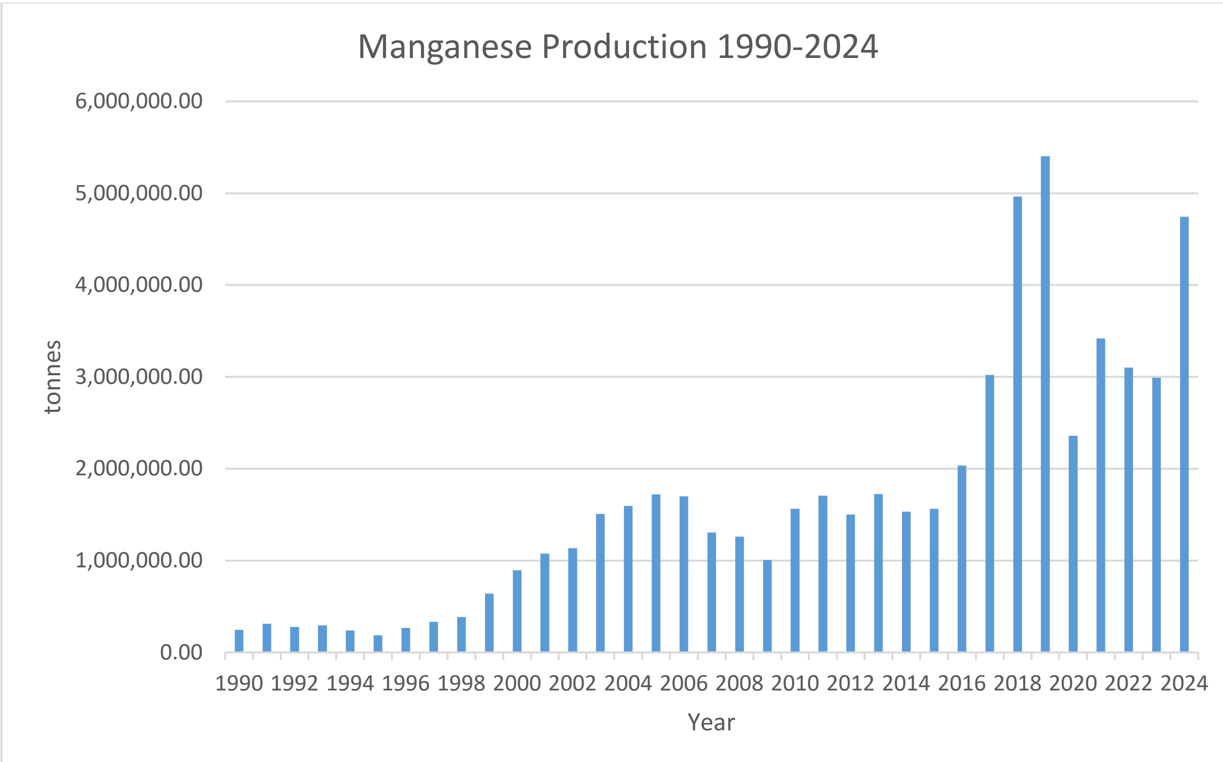


Figure 8-2: Manganese production since 1990

8.8 Diamonds

Although Ghana is not currently well known for its production of diamonds, in the early 1930s through to the early 1980s, Ghana was amongst the top few world producers; from the mid-60s to the mid-70s, the annual production was close to 2.5 million carats (Kesse, 1985). Unfortunately, virtually all of the Ghana production has been for relatively low-value industrial purposes, but in recent years, much of the reduced production (Figure 8-3) appears to cater to the jewelry business in India.

The vast majority of Ghana's diamond production has come from the immediate vicinity of Akwatia, which is part of the Birim River Basin, a very large area of thick Birimian sediments of Paleoproterozoic age (2.1-2.2 billion years BP). The primary (bedrock) sources for the diamonds have been elusive; there are some potential ultramafic intrusives identified as possible 'conveyors' of diamonds from greater depths, and also some diamonds have been recovered from Birimian-age metasediments. However, the vast majority of diamonds have come from a large number of Quaternary alluvial deposits in secondary and tertiary stream channels within the Birim River valley, as well as from the Birim River itself, which is a major tributary of the Pra River.

A much smaller diamond 'field' occurs in tributaries of the Bonsa River, a major tributary of the Ankobra River, immediately south of Tarkwa. The diamonds from this area are very similar to those from Akwatia but cover a much smaller area.

The diamonds from offshore beach sands along the coast of Namibia and South Africa are amongst the highest quality in the world, and they have apparently travelled a very considerable distance down the ancestral Orange River from their distant inland sources. Although the Ghana diamonds are mainly quite low-quality, they are extensively distributed in areas close to the coast, and it is almost certain that a considerable quantity of alluvial diamonds has been carried down both the Pra and Ankobra rivers. In the right circumstances, these could have been re-concentrated in offshore beach and river sands.

Although important accessory minerals such as zircon, monazite, thorite, and rutile occur in a wide range of igneous and metamorphic rocks, their overall content in these primary sources is rarely above 1%, and it is only the result of considerable concentration by weathering and transportation in rivers and re-working along coastlines that allows them to be recovered economically from beach sands. Most beach sands will probably average less than 5% total heavy minerals, although some may contain as much as 5-10%; quite rarely, and usually in quite isolated situations, the total amount of the heavy minerals in beach sands will reach 15+%. As noted above, the heavy minerals in beach and river sands are usually dominated by iron and titanium oxides, which are usually the primary economic minerals, and other constituents, such as zircon and monazite, are important by-products even though they may only comprise 1-2% of the beach sands.

There are several accessory minerals, which are resistant to chemical and physical weathering, and they are frequently concentrated in alluvial deposits on land and in offshore sediments. The most common and economically significant of these include rutile, zircon ($ZrSiO_2$), monazite [$(Ce,La,Nd,Th)PO_4$], and to a lesser degree, thorite [$(Th,U)SiO_4$]. Zircon is the primary source for zirconium metal, which is an important, high-end niche market; monazite is a very important source for rare earth metals, which, in recent years, has seen much growth in modern technological applications and often has been in short supply. Thorite is a significant source of thorium, which is weakly radioactive and used in certain types of nuclear reactors, especially in India. These minerals are usually recovered as a by-product of other heavy mineral production (ilmenite and/or rutile) from beach sands.

Many of these are associated with granitic rocks, and in some cases, with closely related pegmatites. In some localities with high-grade metamorphic rocks, similar accessory minerals are quite common and can be found concentrated in residual weathered deposits, as well as in nearby alluvial stream deposits. Those stream deposits eventually make their way to the ocean, where they accumulate and become re-concentrated as a result of heavy wave action and long-shore currents. The result is extensive beach deposits, some re-worked into nearby dunes. Most of the world's production of these heavy minerals comes from beach or dune deposits in countries such as Australia, India, Sri Lanka, Vietnam, Brazil, southern and eastern Africa. Many of these deposits are from older beaches when the sea level was considerably higher than today, and they are mined by traditional open-pit methods as well as by dredging in ponds.

Some granites and associated pegmatites are known to host a variety of important metals, often in accessory amounts but sometimes in significant concentrations. The most common of these would be 'tin granites' from which most of the world's tin resources have originated. Many of these primary resources have been weathered and eroded in a manner that has produced important alluvial resources that have been mined in many localities.

The famous tin fields of Nigeria are mainly alluvial deposits that were worked for decades. In recent years, the eastern DRC has seen many very similar alluvial tin mining operations on quite a massive scale. Even more significant alluvial tin deposits are mined extensively in SE Asia. This includes many areas along the coast of Malaysia where offshore tin dredging of old river channels and beach deposits has been ongoing for several decades, and this remains an important source of current tin production.

Many ‘tin granite’ systems also feature associated metals rich in tantalum and niobium, which in the past were never recovered as they had little value. Then it was discovered that tantalum metal has many vital industrial and medical applications, so it has become much much-valued commodity. Tantalum is almost always found in close association with niobium, usually in the minerals tantalite and columbite [$(Fe,Mn)(Nb,Ta)_2O_6$], and is commonly hosted in pegmatites. The informal term ‘coltan’ is now popularly used in reference to these occurrences.

Unfortunately, the increased value of tantalum has stoked the ethnic violence in the Great Lakes region of East Africa, especially in the DRC, which is rich in tin, tungsten, and tantalum, most of which is recovered by hordes of artisanal miners, sometimes with the support of well-armed militia and rebel groups.

Ghana does not appear to host major ‘tin granite’ complexes, although some of the massive granites and associated swarms of pegmatites in the Cape Coast-Saltpond- Mankessim-Winneba area (Hughes and Farrant, 1963) have a few known columbite-tantalum occurrences. One occurrence in the Akim-Oda area (Birim River Basin) was heavily prospected for tantalum (Kesse, 1985). Streams in these areas will certainly contain some concentrations, and lagoon deposits close to Winneba apparently have anomalous levels of tantalum, along with tin and tungsten. Although it is unlikely that major offshore concentrations of tin or tantalum will be discovered along Ghana’s continental shelf, there certainly could be some significant localized concentrations, especially of tantalite, which could be a possible by-product if other valuable heavy minerals are exploited.

The vast majority of pegmatites, especially in the coastal areas of Winneba and Mankwadze, have a relatively simple mineralogy that is dominated by coarse-grained quartz, feldspars, and mica (muscovite). However, some of the pegmatites have a more complex and exotic mixture of additional minerals that may include spodumene ($LiAlSi_2O_6$), beryl ($Be_3Al_2Si_6O_{18}$), and chrysoberyl ($BeAl_2O_4$); a number of coloured varieties of beryl are highly valued gemstones, including emerald, aquamarine, heliodor, and morganite. The different colours are due to the presence of minor metals such as Cr and Mn. Some of the pegmatites also contain coarse, elongate crystals of tourmaline, a very hard, complex hydrous silicate that usually contains a host of elements that give it a range of colours, some of which are prized as semi-precious gemstones. All of the above highlighted minerals are quite hard, and some are relatively heavy, and they should certainly be concentrated in nearby streams and along the beaches. One could reasonably expect to find concentrations of many of these minerals in older beach sands further offshore.

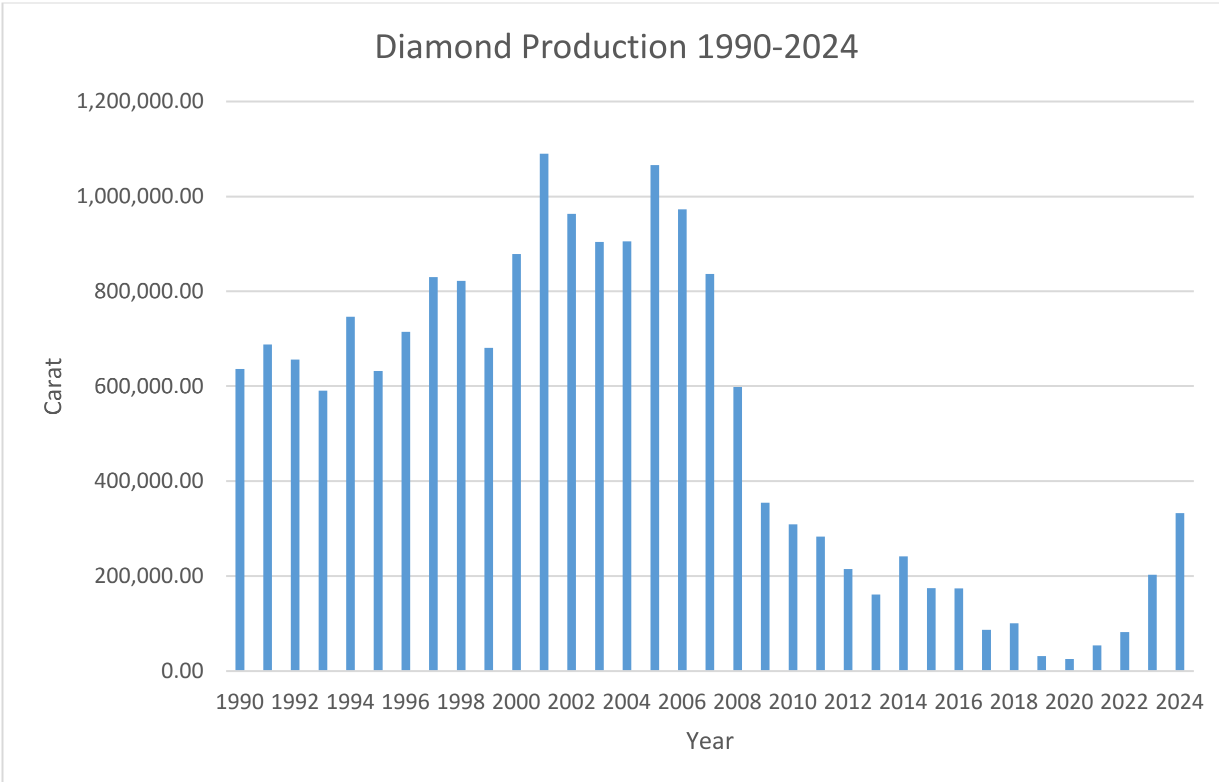


Figure 8-3: Diamond production since 1990

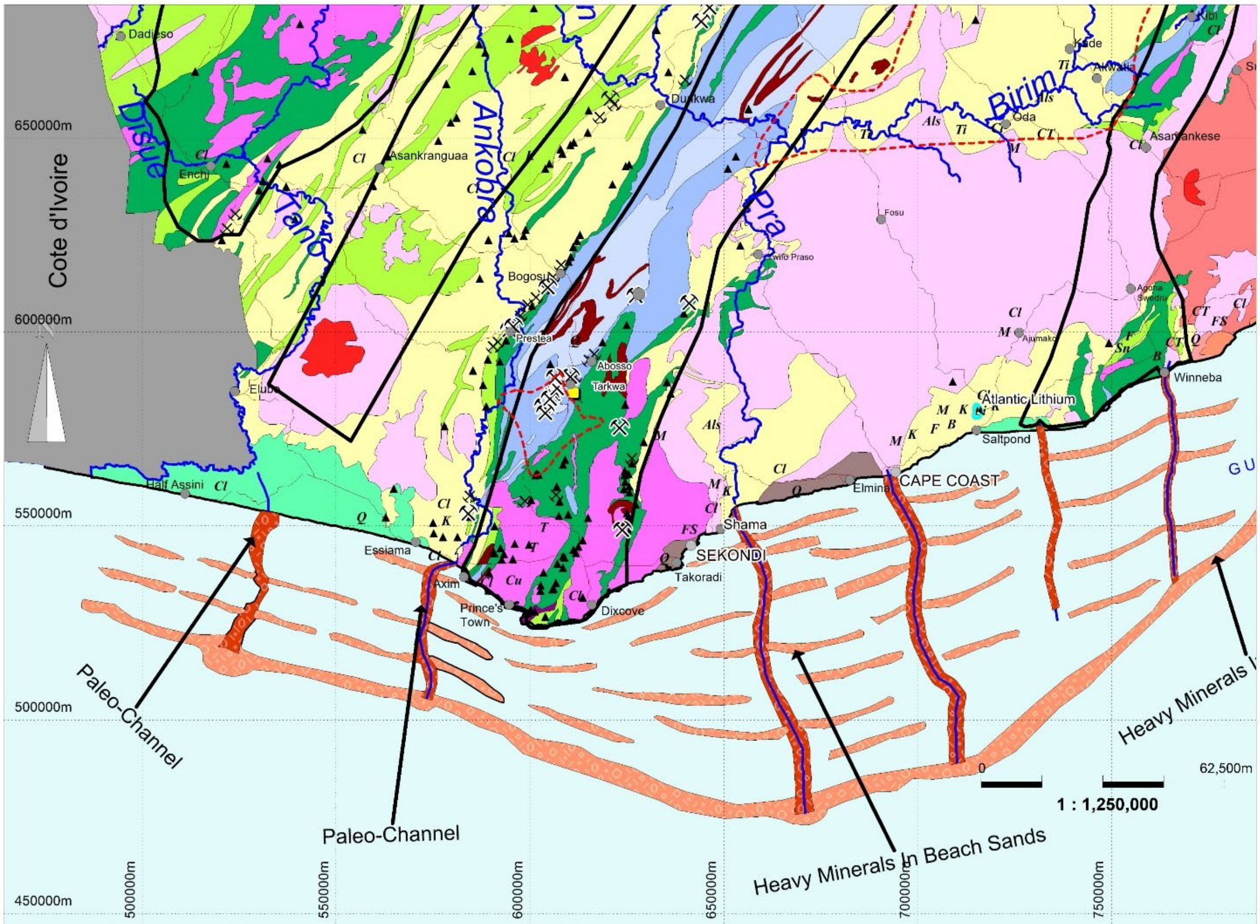


Figure 8-4: Potential targets for offshore minerals

8.9 Lithium

In recent years, lithium has become a very sought-after metal because of its use in newly designed batteries suitable for electric vehicles. The growth in the demand for lithium has been meteoric, and lithium deposits have garnered intense attention all over the world. One important source of lithium is closely related to the development of granite pegmatite, and it turns out that the massive Cape Coast granite complex that is widely exposed in the central coastal area of Ghana includes a large adjacent area with lithium-bearing pegmatite. This includes a widespread lithium resource located very close to the coast, immediately north of Saltpond. Australian junior mining company, Atlantic Lithium, has reported substantive lithium resources of about 36.8 million tonnes with an average grade of 1.24% LiO_2 (JORC) that are to be mined in the very near future.

It should be noted that the lithium resources in the Saltpond pegmatites are contained in the mineral spodumene ($LiAlSi_2O_3$), which contains about 8% lithium and is a hard mineral (6.5 to 7 on Moh's hardness scale) with an SG of about 3.2, very close to that of diamond. The considerable hardness of spodumene would likely result in it being concentrated once it is liberated from its host rock. The pegmatite occurrences between Winneba and Cape Coast cover a stretch of about 80 km right along the coast, and over time, a considerable amount of spodumene could well be contained in the nearby offshore sands and gravels.

8.10 Alluvial Sand and Gravel (Aggregate)

Sand and gravel deposits are critically important to modern societies because they are a primary building block in virtually all infrastructure projects, especially in the building of homes, highways, railways, airports, and anything else that needs concrete. Traditionally, sand and gravel come from active or paleo-alluvial deposits, but in their absence, they can be obtained by crushing bedrock mined from quarries. As noted earlier, in many countries, especially in densely populated countries like northern Europe, an increasing amount of aggregate is recovered from offshore sources along the perimeter of the North Sea. These sources are mainly old beach and river deposits from quite recent glacial periods, especially during the last Ice Age, which ended a mere 10,000 years ago when the sea level was as much as 100+m below current levels.

In recent years, the increased population and the continued urbanization of most countries have put immense pressure on traditional sources of aggregate, and in this regard, rapidly growing countries such as Ghana have struggled to provide adequate aggregate to meet their domestic needs (Adinkrah-Appiah et al, 2016). The result has been quite rampant degradation of surficial soil, sand, and gravel deposits, and widespread illegal 'sand winning' that devastates large areas of land close to the major urban areas. Offshore sand and gravel deposits along the coast of Ghana could be a convenient, economical, and environmentally sound source of aggregate for future growth in the country.

The presence of vast supplies of sand and gravel on a worldwide basis is largely taken for granted, much as some forest areas in the not-too-distant past were considered to be 'inexhaustible'. Much to our surprise, our vast forest reserves have dwindled dramatically and proven to be quite exhaustible! Such also seems to be the case for many types of sands as has been highlighted in an article by David Owen (May issue 2017) in the popular US magazine "The New Yorker"; Owen points out that common sands suitable for a variety of uses are in surprisingly short supply in places such as parts of the Middle East, Europe and North America where ones assume sand supplies are inexhaustible. Despite being a low-value bulk commodity, sand is indispensable to modern societies and will become even more valuable in the future.

It has long been known that some of the beach sands along the far western shoreline of Ghana (Nzima/Half-Assini districts) are very rich in silica and were evaluated over 40 years ago as part of an effort to establish an iron and steel foundry in Ghana. Silica sand is one of the critical raw materials needed to produce steel, and samples of sand from the Eikwe area (Kesse, 1985) on the coast indicated the sands were close to 99% pure silica (SiO_2). This region has large resources of quite pure quartz sands that no doubt extends well into the offshore region.

These silica sands could be suitable for numerous industrial purposes (refractory bricks, foundry molds, floor tiles, and Portland cement), although they are a little distant from major existing markets in Ghana. This could change quickly if the Ghana offshore gas supplies can be used to establish a variety of new industries that can utilize local raw materials, such as silica sands, to produce value-added products for the local market and for export from the nearby port in Takoradi. It is also very possible that some of the silica-rich sands along the far western coastline of Ghana could contain a small but economically significant amount of heavy minerals, and these areas should be tested systematically.

There can be little doubt that the offshore areas of Ghana will certainly host a variety of sand and gravel deposits. These will mainly be associated with many of the major current rivers (Tano, Ankobra, Pra, and Volta) that would have dumped massive amounts of sediments on old shorelines, which would be re-worked into beach sands along the coast. In addition, many of the much smaller rivers would have had sufficient energy to carry their bedload material well out into the current offshore areas. Although most of this material would have been fine clay, silt, and sand, it is also likely that pebbles and cobbles of durable bedrock (granites, volcanics, quartz veins, quartzites, siliceous sandstones, etc.) would be included as well, perhaps in close association with a variety of heavy minerals. Such deposits could be quite extensive and have considerable economic value.

It can be noted that virtually all of the inland alluvial gold and diamond deposits share many common features. Most of them occur in basal gravels (clay, silt, sand, pebble, cobble, and sometimes boulder-sized clasts) sitting on highly weathered bedrock, and they were all re-worked at a period that seems to coincide with the ending of the last ice age, approximately 10,000 +/- yrs BP. Evidence from sediments in Lake Bosumtwi suggests that there was a fairly dramatic climate change in the region at this time from mainly relatively dry, savannah to very wet, equatorial conditions (Wright and others, 1985; Petters, 1991).

The rivers in southern Ghana were under very high-energy conditions on a sustained basis for a considerable period of time. Erosion throughout the region was extensive, and it introduced vast amounts of gold and, in some localities (Birim River), diamonds into the river systems, as well as an abundance of other heavy minerals contained in a massive bedload of clay, silt, sand, and gravel. At this time, the shoreline was out towards the edge of the present continental shelf, and all the rivers along the coast must have been depositing large amounts of sediment in marine deltas, which would get re-worked by coastal waves and currents into beach deposits.

As the continental glaciers melted away and the sea level rose, some of the beach sands could migrate towards the retreating shoreline, but much would probably be left behind. Old river channels would be filled with sediment from nearby beach sands; new deltas and beaches would be formed along the shoreline. During monsoon seasons, coarser and heavier fractions of sediment would be flushed down the rivers to the new shorelines, where they would be re-worked into beach deposits along the shore.

In assessing what types of offshore deposits and where they will be found along the coast of Ghana, it is useful to look at other coastal regions and the types of occurrences found elsewhere.

Sierra Leone has had a longstanding marine sand dredging operation that is a huge supplier of rutile for the pigment industry. It occurs in sands within quite shallow marine waters and apparently not far from the inland primary sources of rutile exposed in nearby rivers. The rutile market is very large, and 'standard' rutile concentrates, used primarily as a whitener pigment in the paint, paper, and plastic industries, are valued at around +1500$/tonne.

Ilmenite-rich beach sands are being mined in many near-shore inland and a few offshore localities in Australia, southern and eastern Africa, India, Sri Lanka, Brazil, etc. For the most part, these operations will have an ilmenite content of less than 5% and are generally mined on a very large scale to reduce unit costs. In some exceptional cases, such as at Avannaata, Greenland (https://www.nsenergybusiness.com/projects/dundas-titanium-ilmenite-project/), and Louga in Senegal (https://gco.eramet.com/en), onshore and offshore beach sands contain up to about 10% ilmenite in very substantive amounts, and they will need these high grades because of the challenging environment.

There is also a major existing ilmenite beach sand operation at Grand Cote along the northern coast of Senegal, where huge reserves of mineral sands occur along the coastline over a distance of 160 km. This is an onshore dredging operation that is owned jointly by an Australian mineral resource group and a French company (Eramet) specializing in the production of alloy metals; the dredging operation processes 50Mt/yr of sand from which it extracts about 570,000 tonnes of ilmenite concentrate, 85,000 tonnes of zircon concentrate, and another 15,000 tonnes of rutile. The ilmenite is shipped to Norway, where it is further processed to produce TiO_2 for pigment and pig iron for steel foundries (https://www.eramet.com/en/).

The Grand Cote deposits are exactly the type that one could find offshore Ghana. It would seem the most likely locality for such deposits would be from beach sands derived from rivers draining the Ashanti greenstone belt. This belt includes considerable mafic volcanics and intrusives, along with some ultramafic complexes that are excellent sources of Ti and Fe oxides. The potential for significant by-product zircon and rutile is also possible in the same sands, as there are extensive intermediate and some granitoids in the Ashanti belt, as well as many metasediments, including extensive Tarkwaian clastics with substantive heavy mineral content.

One can also expect to find significant accessory gold in beach sediments derived from the Ashanti belt. As noted previously, this can be inferred by estimating the amount of gold potentially eroded in the major gold districts with what is currently contained within or mined from the river systems in SW Ghana. In fact, there may not be a better-known area in the world with as many world-class gold districts in such a confined area as SW Ghana that is so close to the coastline. As noted earlier, the limited work carried out by Marine Mining (previously from the website www.marinemining.com) at the mouths of the Ankobra and Pra rivers did confirm a variety of types of gold occurrences in beach sands close to the existing shoreline. Some of the values are very anomalous, many in the range 50-500+ppb.

It should be noted that current hydrographic conditions of the rivers and shorelines in SW Ghana will be far more passive than the conditions prevailing approximately 10,000 years ago, when virtually all of the raging inland rivers of SW Ghana were reworking the alluvial gold deposits throughout the region, and the erosion of bedrock at the time was far more severe than at present. Such conditions could be ideal to concentrate gold and, of course, other heavy minerals in beach sands along the ancestral coastline.

Most of the mineral sand projects, on land and offshore, recover heavy mineral concentrates that will be comprised of about 50+% of iron oxides, mainly hematite and magnetite. Very few of these operations recover the iron oxides as they are low-value bulk commodities, and they cannot justify the transportation to iron ore processing facilities. There are very large resources of Fe and Ti-rich mineral sands in several locations around New Zealand (www.tbkcapital.co.nz), and several companies have been trying to develop them on a commercial scale with a view to selling concentrates to steel or titanium oxide producers, mainly in the Asian markets; other groups want to use the Fe-rich offshore sands as feedstock for domestic steel-making.

Some of the New Zealand offshore mineral sands contain significant accessory gold. Back in the 1980s, when the gold price was on a steep upward trajectory, offshore exploration ('Handbook of Marine Mineral Deposits' by D.S. Cronan, 1999) identified a considerable resource that graded about 200ppb/m^3 of gold, but it was not considered economic at the time. At current gold prices, 200ppb/m^3 would be potentially economic on a stand-alone basis if the production rate was sufficiently high and the resource was in excess of 100 million/m^3. It would certainly be a major bonus if it were a by-product of an iron oxide, ilmenite, rutile, or zircon operation.

The potential to utilize both the offshore iron and titanium oxides in Ghana would increase dramatically if further upgrading facilities were available on land nearby. Magnetite and hematite concentrates could be very effectively used in a steel or pig iron production facility, whereas upgrading ilmenite would produce titanium oxide for pigments and pig iron by-product for steel mills. It has long been the hope of successive governments since Ghana's independence in 1957 to establish a major domestic steel industry, and the current plans to maximize offshore gas to stimulate more value-added industrial activity could help make this much more possible.

Although some small-scale steel-making facilities, mainly using scrap metal, are operating in the Tema industrial complex, none are utilizing primary inputs from domestic resources. Certainly, most of the raw material for a steel-making industry is available in Ghana, and offshore iron and titanium sands could become an important feedstock for this industry. Furthermore, even very minor amounts of by-product gold (probably in the range 50-200ppb/m^3) would result in quite significant gold production. As an example, a 31 million cubic meters/yr. dredging operation (about 45 M tonnes/yr.) with an average recovered grade of 100ppb/m^3 Au would yield almost 100,000ozs/yr, with a gross value at current prices of over 100 million USD.

The beach sands derived from sediments deposited on the coast by the Pra River have the potential to concentrate quite a variety of heavy minerals. The catchment area of this river also covers 'greenstone geology', so it may well have considerable iron and titanium oxides, along with some minor accessory gold, as the drainage basin includes several significant gold districts. The huge Cape Coast granitic and pegmatitic intrusive complex is very widespread within the drainage basin and collectively could supply considerable rutile, zircon, and monazite, along with an array of specialized metals (Li,Ta, Sn,W) and even a few precious and semi-precious gemstones.

As noted earlier, the Birim River basin contains a large resource of mainly industrial diamonds, and the very high energy conditions of the Pra/Birim rivers following the end of the last ice-age almost certainly resulted in a very considerable quantity of diamonds being washed offshore. Since diamonds are relatively light (SG of 3.5), they would not necessarily be found with an abundance of heavier minerals but could be concentrated in separate strands or pockets of beach sand. They will probably occur in the offshore area between Shama and Winneba. It is quite possible that within this offshore sector, many small, isolated offshore sand deposits with concentrations of diamonds could be discovered in relatively shallow waters. These could be accessible to smaller suction-dredge operators similar to the 'fleets' of small vessels that currently recover diamonds in shallow waters along the west coast of South Africa, south of the Orange River (Gurney and others, 1991).

In the offshore area just west of Accra, all the way to the Togo border, the mineral sands may well contain a considerable amount of rutile from the metamorphic rocks, but there should also be a wide range of metamorphic minerals, especially garnets that may be in sufficient quantity to be recovered and sold as an abrasive. There may also be some concentrations of other metamorphic aluminum silicates (andalusite, kyanite, and sillimanite) that could be recovered and used for refractory purposes.

At the far western end of Ghana's coastline, the Half-Assini area can certainly be expected to host substantial volumes of very quartz-rich sands. These could be of considerable commercial value (for concrete, tiles, and glass products) if they were close to large urban areas or if they could be used in value-added products from new industries that may take advantage of low-cost gas from nearby offshore production. One can note that the Half-Assini area is only about 100 km from Abidjan, the capital of Côte d'Ivoire, which has a big population, a major port, and a large industrial base.

In the far western corner of the country, the Tano River drainage basin features abundant greenstones and metasediments, a few large granites, as well as two major gold districts. Thus, sediments derived from this terrane could certainly include a wide range of potentially important heavy minerals, which, along with fairly pure quartz sands, could well be of commercial value.

The continental shelf area of Ghana is likely to host a very wide range of sands and gravel containing a great variety of heavy minerals in a wide range of concentrations. It can be reasonably expected that very large volumes of offshore sand and gravel will occur in many deposits right along the entire coast of Ghana. Some of these deposits, especially ones close to the big urban markets, may be significant on a stand-alone basis and may not contain important accessory heavy minerals of commercial interest. At the other end of the spectrum, it is also very possible that substantive concentrations of a variety of heavy minerals of commercial interest will be discovered with little potential for aggregate.

9 Exploration Techniques

9.1 Satellite Imagery and Airborne Magnetic Survey

The initial exploration work will combine a number of different techniques to assist in locating concentrations of heavy minerals along the continental shelf. Multibeam satellite imagery will be first utilized to get an overview of the concession. This will be followed by an airborne magnetic survey on a broad-scale line spacing of 800-1000m and covering the entire 10,000 km^2 concession. It is expected that the magnetic survey will identify magnetic anomalies caused by concentrations of magnetite and ilmenite that are highly magnetic.

The purpose of the airborne magnetic survey is to quickly identify traces of paleo-channels of the three main rivers (Tano, Ankobra, and Pra) across the continental shelf. It is also expected that the magnetic survey will recognize concentrations of heavy minerals in beach sands that have been subjected to powerful longshore currents, which will increase the concentration of valuable heavy minerals (gold) in the beach sands. The magnetic anomalies in paleo channels and beach sands will be reserved for more detailed analysis by closely spaced marine surveys using a number of different techniques.

GoldCoast has retained the services of AI Geointelligence Corporation ("**AiGeo**") of Denver, Colorado, to conduct an airborne passive electromagnetic survey, known as MobileMT, over the entirety of the Project.

Airborne Magnetic Gradiometer Survey

AiGeo was contracted by GoldCoast to complete a high-resolution airborne magnetic gradiometer survey over the Project. The primary objective of the survey was to acquire high-quality magnetic data capable of supporting the interpretation of offshore geological structures, basement architecture, paleo-drainage systems, and potential mineral-bearing depositional environments. Particular emphasis was placed on identifying buried paleo-channels, structural controls, sediment traps, and other geological features that may influence the concentration and preservation of offshore placer gold and associated heavy mineral deposits.

Data acquisition commenced on May 8, 2026 and is scheduled for completion on June 30, 2026. Survey operations were conducted from Takoradi Airport, Ghana utilizing a specially modified Cessna 208B Grand Caravan (N86RF) operated by Revolution Flight LLC. The survey was flown using a high-resolution horizontal magnetic gradiometer configuration consisting of three Scintrex CS-3 cesium vapor magnetometers installed in a tail stinger and wingtip pod configuration. As of June 19, 2026, a total of 70 production sorties have been completed and 43,708 line kilometers have been acquired from a planned total of 45,361 line kilometers, representing approximately 98.6% completion of the overall survey.

Figure 9-1-1: Regional Location Map showing the offshore Ghana survey area relative to Takoradi, Cape Coast, major river systems, and known gold-producing regions.

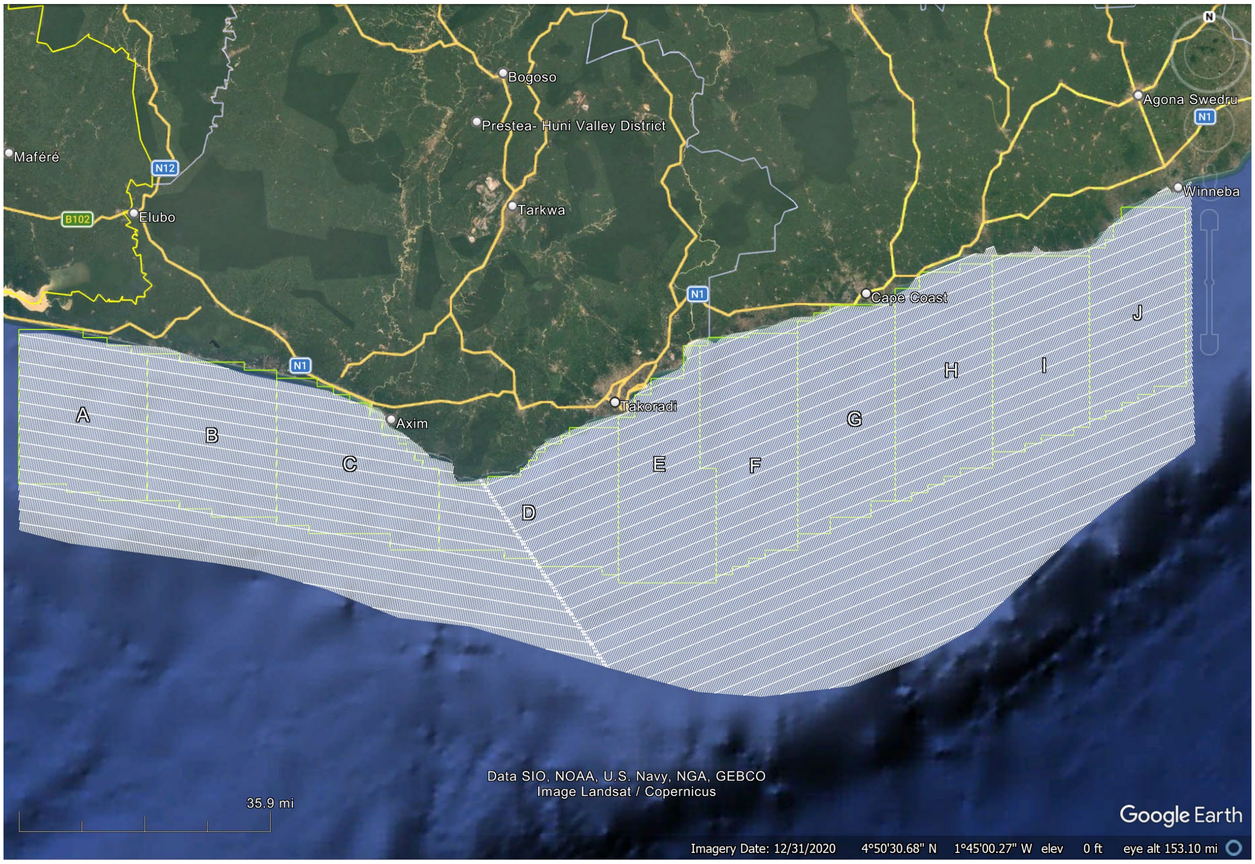


Figure 9-1-2: Survey Block Layout and Flight Line Plan showing Block 1, Block 2, traverse lines, tie lines, and overall survey coverage.

Survey Specifications and Acquisition Parameters

The survey was designed to provide regional-scale magnetic coverage of the offshore Ghana continental shelf while maintaining sufficient spatial resolution to image subtle geological and depositional features. Traverse lines were flown at 400-meter spacing with control tie lines spaced at 3,000 meters. Survey flying was conducted at a nominal terrain clearance of approximately 30 meters above sea level, maximizing signal resolution while maintaining safe operating margins.

The survey area extends along the Ghanaian coastline from west of Axim through Takoradi and eastward toward Cape Coast, encompassing approximately 15,000 km² of offshore prospective ground. The survey design was specifically optimized to intersect interpreted paleo-drainage systems, offshore sediment transport pathways, and structural trends believed to influence heavy mineral deposition.

The acquisition program was completed using a horizontal magnetic gradiometer configuration capable of simultaneously collecting total magnetic field data and measured horizontal magnetic gradient data. This configuration significantly enhances the detection of subtle magnetic boundaries, shallow geological features, and linear structures that may be difficult to resolve using conventional single-sensor magnetic systems.

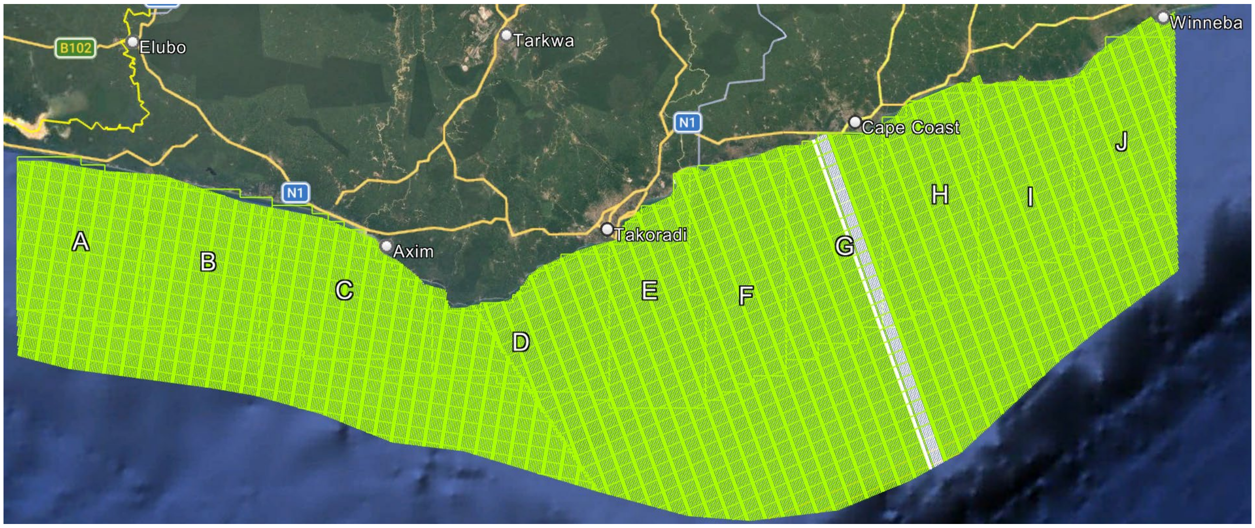


Figure 9-1-3: Detailed Flight Line Map displaying completed survey coverage.

Item	Status
Total Planned Line Kilometers	43,361 km
Total Acquired Line Kilometers[(1)]	43,708 km
Survey Completion [(1)]	98.6%
Total Stories Flown[(1)]	70
Block 1 Acquisition	Complete
Block 2 Acquisition [(1)]	98% Complete
Block 1 Processing	Commenced June 19, 2026
Block 1 Processed Data [(2)]	3 Weeks
Block 1 Interim Interpretation [(2)]	2 Weeks Following Processing
Block 2 Processing [(2)]	6 Weeks Following Acquisition Completion
Block 2 Interpretation Delivery [(2)]	6 Weeks Following Processing Completion

Notes:

(1) As of June 19, 2026

(2) The processing, interpretation, and completion timelines set out above (including those in Table 9-1) are estimates only and are based on information available as of June 19, 2026. Actual timelines may differ materially as a result of factors including, but not limited to, data quality and the extent of reprocessing or re-flying required and weather and operational conditions.

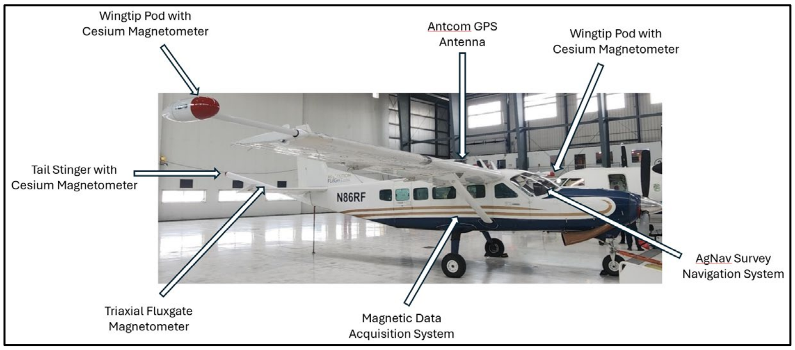
Table 9-1: Survey Acquisition Summary.

Survey Equipment and Methodology

Data acquisition was performed using a modified Cessna 208 Caravan configured specifically for airborne geophysical surveying. The aircraft was equipped with three high-sensitivity Scintrex CS-3 cesium vapor magnetometers installed within wingtip pods and an extended fiberglass tail stinger. This configuration provided simultaneous acquisition of total magnetic intensity and measured horizontal magnetic gradient data while minimizing aircraft magnetic interference.

Aircraft magnetic effects are continuously monitored and compensated using a Billingsley TFM100-LN tri-axial fluxgate magnetometer mounted within the tail stinger assembly. Navigation and positioning are controlled using an AG-NAV LiNav P151 navigation system integrated with differential GPS receivers capable of sub-meter positional accuracy following post-processing. Radar and barometric altimeters provided continuous terrain clearance measurements throughout the survey.

A dedicated magnetic base station equipped with a Scintrex CS-2 cesium vapor magnetometer was operated continuously during survey operations to record temporal variations in the Earth's magnetic field. These measurements form a critical component of the data correction process and ensure all airborne observations are referenced to a consistent magnetic baseline.



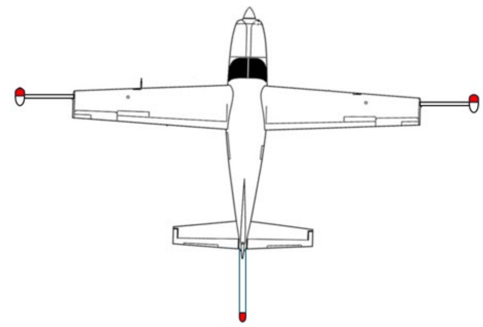
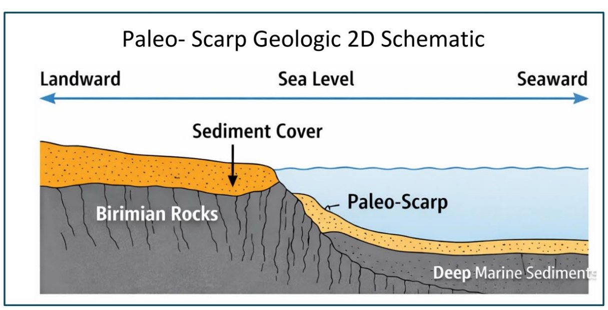


Figure 9-1-4: Survey Aircraft N86RF showing tail stinger and wingtip magnetometer installations.

Survey Objectives

The airborne magnetic gradiometer survey was designed to evaluate the geological framework of the offshore Ghana continental shelf and to identify buried geomorphic features that may represent favorable environments for placer gold accumulation. Prior to survey commencement, AiGeo completed a detailed forward magnetic modeling study to determine whether the anticipated target geometries could be detected using high-resolution airborne magnetic data.

The study evaluated two primary exploration concepts: paleo-shoreline ridge and scarp systems, and paleo-channel systems incised into Birimian basement lithologies. These features are considered highly prospective because they represent natural sediment traps where hydraulic sorting processes may have concentrated gold and associated heavy minerals during periods of lower sea level. The modeling demonstrated that magnetic susceptibility contrasts between Birimian basement rocks and overlying marine sediments should generate detectable TMI and THG responses that can be mapped using airborne magnetic methods.



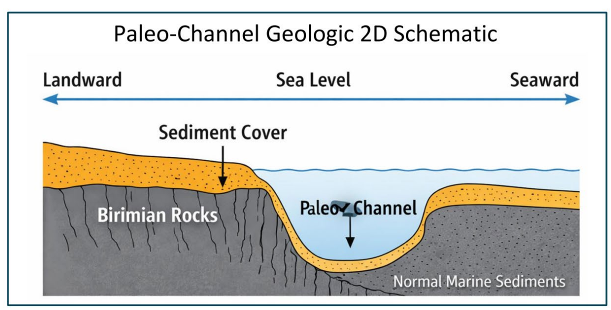


Figure 9-1-5: Regional geological setting showing Birimian source terranes and offshore sediment transport pathways.

The survey was designed as a regional magnetic mapping exercise, and as a targeted exploration program intended to identify buried paleo-landscape features capable of hosting economically significant placer gold accumulations.

Unit	Susceptibility (SI)	Expected TMI anomaly ranges	Expected THG anomaly ranges
Birimian Mafic volcanics, greenstones	0.005-0.05	20-80 nT	.20-.8 nT/m
Birimian Granitoids	.0005-.005	8 to 30 nT	.08 to .3 nT/m
Birimian Metasediments/Felsic rocks	.0001-.001	2-12 nT	.02-.12 nT/m
Placer sands	0.00002-0.0002	1-6 nT * secondary response	.02-.07 nT/m* secondary "tick"
Offshore Sediments (marine sands, silts, clays, non-placer quartz sands)	.00001-.0001	NA	NA

Table 9-1-2: 2D Forward Model Parameters, Susceptibility Values & Expected Magnetic Responses

Interpretation Methodology

Interpretation of the airborne magnetic survey is guided by the exploration model established during the pre-survey forward modeling study. The modeling demonstrated that the primary detection mechanism is not direct detection of gold mineralization itself, but rather identification of the geological and geomorphological traps in which placer gold is likely to accumulate.

The modeling study theorized that buried paleo-shoreline scarps and paleo-channel systems should produce characteristic magnetic signatures resulting from contrasts between magnetic Birimian basement rocks and weakly magnetic marine sediment cover. These signatures are expected to manifest as magnetic lows within TMI datasets accompanied by distinct edge responses visible within THG products. The resulting magnetic response should allow the geometry, lateral extent, and structural setting of buried depositional environments to be mapped with a reasonable degree of confidence.

The interpretation of the collected data will focus on the identification of:

- Buried paleo-shorelines and shoreline scarps;
- Incised paleo-channel systems;
- Basement highs and basement lows;
- Structural corridors controlling sediment transport;
- Accommodation space favorable for sediment accumulation;
- Potential heavy mineral concentration zones;
- Areas where multiple favorable criteria coincide.

Particular emphasis is placed on magnetic edge-detection products including Horizontal Gradient, Analytic Signal, and Tilt Derivative maps. These products are expected to provide an expression of basement topography and the margins of buried geomorphic features.

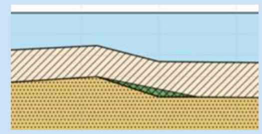
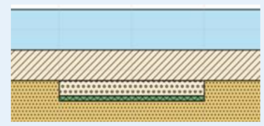
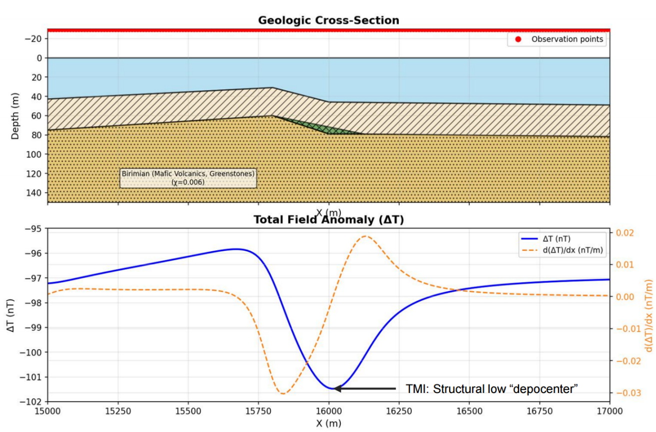
Exploration Target	Geometry	2D Schematic Model
Paleo Shoreline Ridge Scarp Trap	Water Depth 30-60 m Burial depth to top: 15-40 m below seabed **(25 m base value)** Sediment cover: 25 m **(same as base value above)** Total Thickness: 5-20 m (**12 m base value**) Total Width 500-2000m **(1000 m base value)** Length (strike extent) 2-50 km **(5-20 km base va;ie)** Scarp Face Slope **8-15 degrees seaward dip** Placer Concentration zone thickness 2-8 m **(4 m base value)**	
Paleo Channel	Water Depth 30-60 m Burial depth to top: 15-40 m below seabed **(30 m base value)** Channel Depth (incision) 10-40 m **(20 m base value)** Channel Width 200-1000m **(500 m base value)** Channel fill thickness = **(20 m) channel depth (incision)** Placer zone thickness 2- 8 m (**5 m at bottom**)	

Figure 9-1-6: Conceptual Paleo-Shoreline and Paleo-Channel Exploration Model (from feasibility study).

Modeled Target Geometries

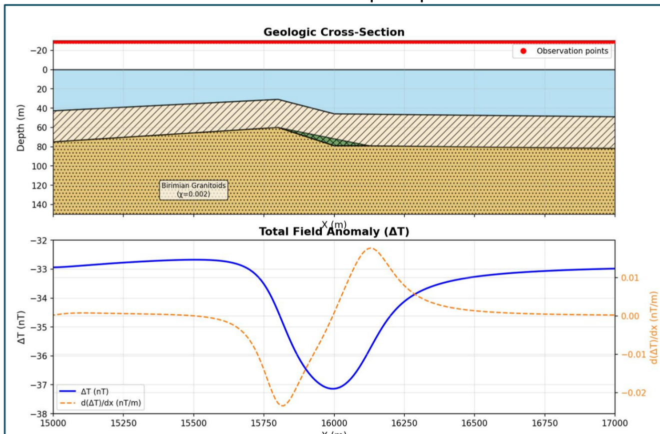
- Results: Paleo Shoreline Scarp Trap High side- Birimian Basement (Mafic volcanics, greenstones)



- The geophysical response is dominated by the high magnetic contrast between the Birimian Mafic volcanics and the overlying non-magnetic sediment cover
- **The Negative Trough (THG- Orange):** This occurs at the Landward Edge (the crest), where the basement transitions from a gentle slope into a steep drop, marking the inflection point where the basement starts to "disappear" from the sensor's perspective
- **The Positive Peak (THG-Orange):** This occurs at the Seaward Edge (the base) of the scarp, where the basement transitions off the "cliff", the magnetic signal begins to stabilize, causing the gradient to swing into a sharp positive peak
- The specific geometry generates two distinct diagnostic signatures for exploration:
  - **Total Magnetic Intensity (TMI-Blue):** Shows a clear **~6 nT** drop (from -96 nT to -102 nT) directly over the scarp. Identifies a magnetic structural low that is the primary indicator for a paleo-shoreline trap with the peak trough **(-102nT)** pinpointing the thickest/highest priority location of placer/heavy mineral sands
  - **Total Horizontal Gradient (THG-Orange)**: Characterized by a **~.045 nT/m** total swing (from -.03 to +.015), serves as the primary diagnostic tool for defining the lateral extent of the target zone by using its steep slopes to map the exact width of paleo-shoreline trap

Modeled Target Geometries

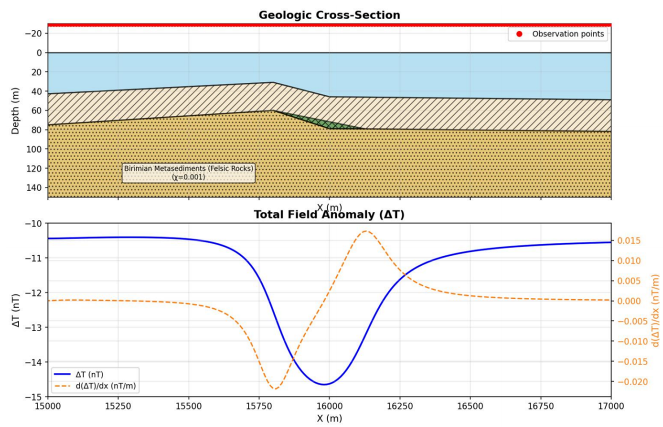
- Results: Paleo Shoreline Scarp Trap Base Case-Mid side- Birimian Granitoids (Intrusives)



- The geophysical response is dominated by the high magnetic contrast between the Birimian Granitoids intrusives and the overlying non-magnetic sediment cover
- **The Negative Trough (THG- Orange):** This occurs at the Landward Edge (the crest), where the basement transitions from a gentle slope into a steep drop, marking the inflection point where the basement starts to "disappear" from the sensor's perspective
- **The Positive Peak (THG-Orange):** This occurs at the Seaward Edge (the base) of the scarp, where the basement transitions off the "cliff", the magnetic signal begins to stabilize, causing the gradient to swing into a sharp positive peak
- The specific geometry generates two distinct diagnostic signatures for exploration:
  - **Total Magnetic Intensity (TMI-Blue):** Shows a **~4 nT** drop (from -33 nT to -37 nT) directly over the scarp. Identifies a magnetic structural low that is the primary indicator for a paleo-shoreline trap with the peak trough **(-37nT)** pinpointing the thickest/highest priority location of placer/heavy mineral sands
  - **Total Horizontal Gradient (THG-Orange):** Characterized by a **~.035 nT/m** total swing (from -.02 to +.015), serves as the primary diagnostic tool for defining the lateral extent of the target zone by using its steep slopes to map the exact width of the paleo-shoreline trap

Modeled Target Geometries

- Results: Paleo Shoreline Scarp Trap Low Side- Birimian Felsic Rocks (Metasediments, Felsic extrusives)

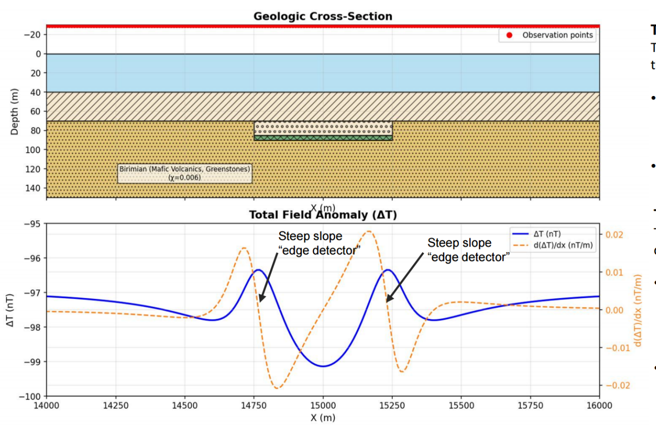


- The geophysical response is dominated by the high magnetic contrast between the Birimian Felsic intrusives and the overlying non-magnetic sediment cover
- **The Negative Trough (THG- Orange):** This occurs at the Landward Edge (the crest), where the basement transitions from a gentle slope into a steep drop, marking the inflection point where the basement starts to "disappear" from the sensor's perspective
- **The Positive Peak (THG-Orange):** This occurs at the Seaward Edge (the base) of the scarp, where the basement transitions off the "cliff", the magnetic signal begins to stabilize, causing the gradient to swing into a sharp positive peak
- The specific geometry generates two distinct diagnostic signatures for exploration:
  - **Total Magnetic Intensity (TMI-Blue):** Shows a **~4 nT** drop (from -10.5 nT to -14.5 nT) directly over the scarp. Identifies a magnetic structural low that is the primary indicator for a paleo-shoreline trap with the peak trough **(-14.5nT)** pinpointing the thickest/highest priority location of placer/heavy mineral sands
  - **Total Horizontal Gradient (THG-Orange):** Characterized a **~.035 nT/m** total swing (from -.02 to +.015), serves as the primary diagnostic tool for defining the lateral extent of the target zone by using its steep slopes to map the exact width of the paleo-shoreline trap

Figure 9-1-7: Paleo-shoreline scarp conceptual magnetic response model.

Modeled Target Geometries

- Results: Paleo Channel Trap High side- Birimian Basement (Mafic Volcanics, greenstones)



Total Magnetic Intensity (TMI / Solid Blue Line)
The TMI shows a **~1.5 nT** structural "dip" (from -97.5 nT to -99 nT) directly over the center of the channel

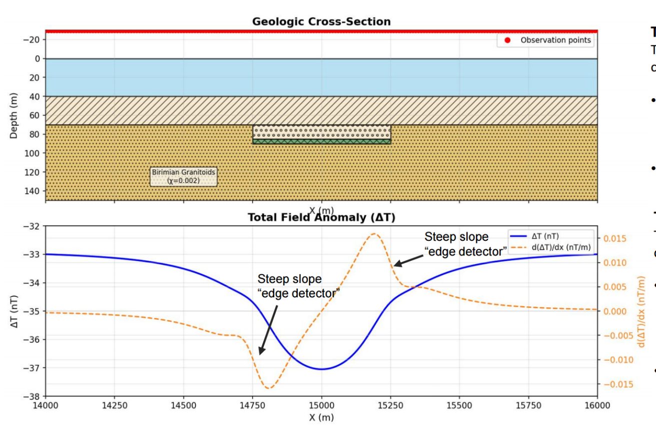
- Structural Low: This dip confirms the presence of a "trough" where magnetic basement has been replaced by non-magnetic sediments, creating the necessary accommodation space for mineral accumulation
- Flank Peaks: The two small peaks at the channel edges mark the "shoulders" of the Birimian basement.

Total Horizontal Gradient (THG / Dashed Orange Line)
The THG acts as an edge detector. The steep slopes (peak to trough) are the primary diagnostic feature for demarcating and mapping the channel edges

- Peak to Trough Slopes: Two steep slopes (**.035 nT/M)** between the THG peak and its adjacent trough reflects the sharpness of the structural contact. A near vertical basement drop off creates the sharpest slope, while a more gradual transition would result in a broader, gentler gradient response
- The area defined between these two slopes represents the paleo-channel trap. By defining the exact lateral boundaries of the channel, you can calculate the potential volume of the (green) mineralized zone: ie. the placer sands located at the base of the structural low

Modeled Target Geometries

- Results: Paleo Channel Trap Base Case Average- Birimian Granitoids (Intrusives)



Total Magnetic Intensity (TMI / Solid Blue Line)
The TMI shows a **~4 nT** structural "dip" (from -33 nT to -37 nT) directly over the center of the channel

- Structural Low: This dip confirms the presence of a "trough" where magnetic basement has been replaced by non-magnetic sediments, creating the necessary accommodation space for mineral accumulation
- Flank Peaks: The two small peaks at the channel edges mark the "shoulders" of the Birimian basement.

Total Horizontal Gradient (THG / Dashed Orange Line)
The THG acts as an edge detector. The steep slopes (peak to trough) are the primary diagnostic feature for demarcating and mapping the channel edges

- Peak to Trough Slopes: Two steep slopes (**.01 nT/M)** between the THG peak and its adjacent trough reflects the sharpness of the structural contact. A near vertical basement drop off creates the sharpest slope, while a more gradual transition would result in a broader, gentler gradient response
- The area defined between these two slopes represents the paleo-channel trap. By defining the exact lateral boundaries of the channel, you can calculate the potential volume of the (green) mineralized zone: ie. the placer sands located at the base of the structural low

Modeled Target Geometries

- Results: Paleo Channel Trap Low side- Birminian Felsic Rocks (Metasediments, Felsic Extrusives)

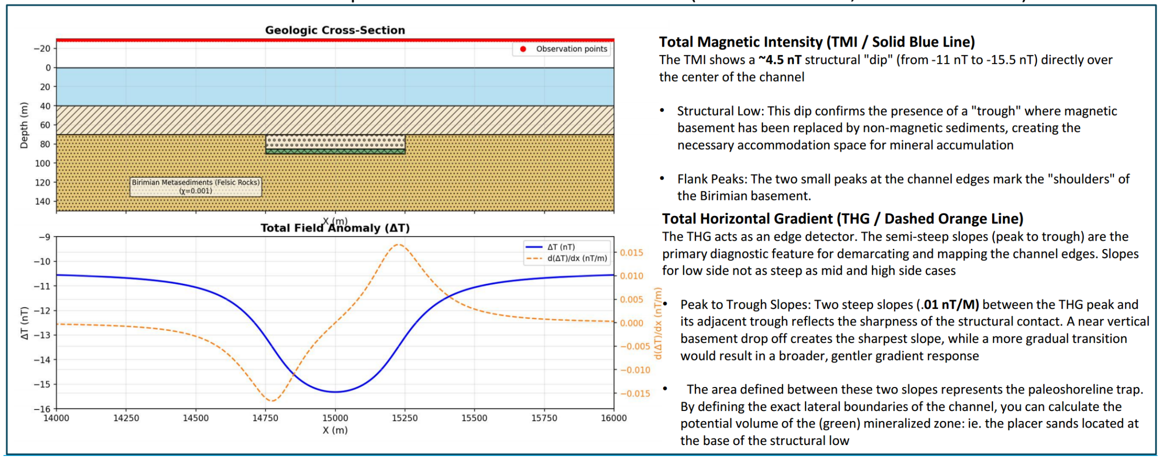


Figure 9-1-8: Paleo-shoreline channel conceptual magnetic response model.

Data Processing Methodology

Raw airborne magnetic measurements contain numerous non-geological signals including aircraft-induced magnetic effects, temporal magnetic field variations, navigation uncertainties, sensor timing offsets, and regional magnetic field contributions. Consequently, extensive processing is required before the underlying geological signal can be isolated and interpreted.

Processing of collected data from Block 1 commenced on June 19, 2026. The processing workflow includes quality control review, spike removal, lag correction, heading correction, aircraft magnetic compensation, diurnal correction, International Geomagnetic Reference Field (IGRF) removal, tie-line leveling, micro-leveling, gridding, and generation of derivative products.

IGRF removal, where the regional magnetic field is separated from the measured data, allows the local geological response to emerge. Subsequent leveling and micro-leveling eliminate line-to-line discrepancies and produce coherent datasets suitable for professional interpretation.

The final processing stage involves the generation of advanced enhancement products including TMI, Residual Magnetic Intensity, Horizontal Magnetic Gradient, First Vertical Derivative, Analytic Signal, Tilt Derivative, and additional structural enhancement products. The data set out above as designed to improve the visibility of geological contacts, faults, basement structures, and sedimentary features.

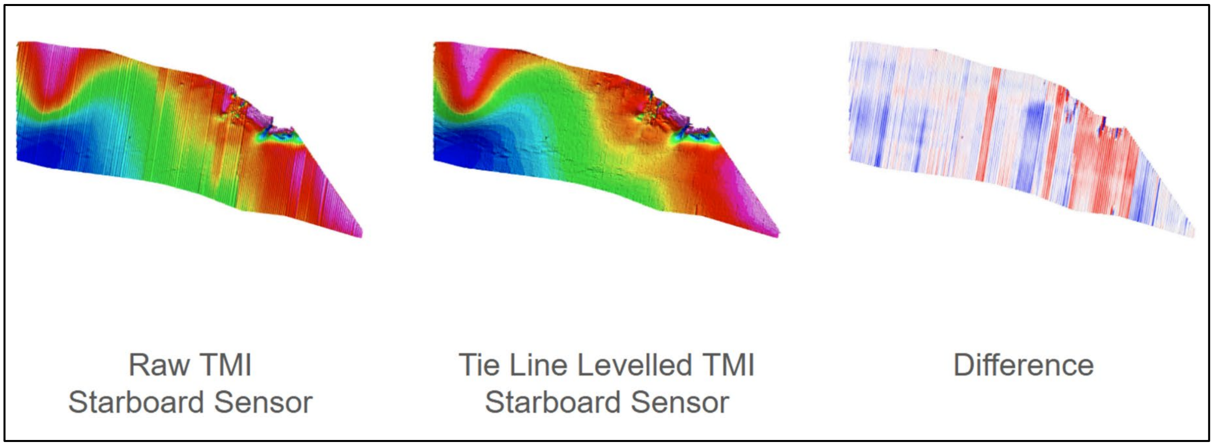


Figure 9-1-9: Example illustrating the progression from Raw Data to Leveled Data.

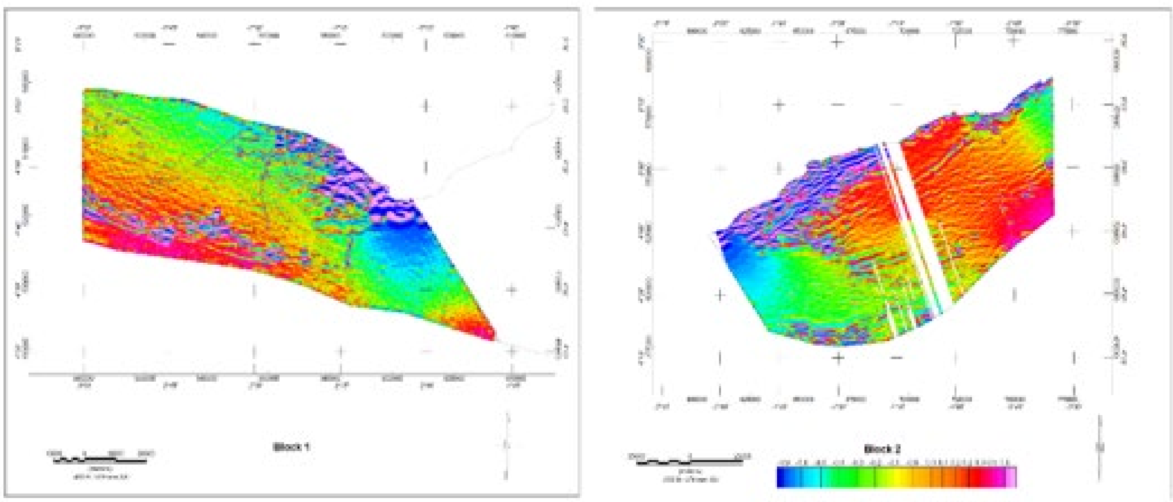


Figure 9-1-10: Residual Magnetic Intensity Map.

Geological Significance and Exploration Implications

Forward modeling completed prior to data acquisition demonstrated that the selected survey parameters are capable of resolving the anticipated placer gold target geometries. The study concluded that maintaining a low survey altitude of approximately 30 metres above sea level was critical for successful detection of buried paleo-shorelines and paleo-channel systems. Modeling indicated that reducing sensor altitude from 100 metres to 30 metres increases anomaly amplitudes by approximately three to five times while improving spatial resolution by more than sixty percent. This improvement substantially increases the probability of detecting narrow placer trap geometries typically ranging from 100 to 300 metres in width.

The modeling survey further demonstrated that paleo-shoreline scarps developed within mafic Birimian basement environments may produce TMI anomalies of up to 12 nT and THG responses exceeding 0.15 nT/m. Similar target geometries hosted within granitoid or felsic basement environments are predicted to produce lower amplitude but still readily detectable responses. These results demonstrate that the survey design is capable of identifying placer gold trap geometries across the range of basement lithologies anticipated within the project area.

A key conclusion of the modeling is that the most prospective exploration targets are expected to exhibit a combination of characteristics, including:

- Distinct magnetic structural lows interpreted as accommodation space;
- Sharp magnetic gradient boundaries corresponding to basement escarpments;
- Linear or curvilinear geomorphological patterns consistent with paleo-shorelines;
- Incised channel geometries visible within derivative products;
- Spatial association with known sediment transport pathways from Birimian source terranes.

The resulting interpretation framework provides a mechanism for ranking exploration targets and prioritizing areas for subsequent Phase II investigations including high-resolution bathymetric surveys, Chirp seismic profiling, vibracore sampling, grab sampling, and detailed geological evaluation. The integration of magnetic data, bathymetry, and sedimentological information is expected to reduce exploration risk by focusing follow-up programs on areas exhibiting the strongest geological evidence for placer gold accumulation.

Processing of Raw Data

As of June 19, 2026, processing of Block 1 data has commenced and preliminary quality assessments indicate that the survey has successfully acquired high-quality magnetic gradiometer data with coverage across the project area. The data currently available remains largely in its raw form. Raw magnetic data contains numerous non-geological effects and does not adequately represent the underlying geological framework until the full processing workflow, quality control procedures, leveling, micro-leveling, and derivative generation have been completed.

Processing of the data acquired from Block 1 is expected to take approximately three weeks with interim interpretation by the Company being completed in approximately two weeks thereafter.

As of June 19, 2026, acquiring the data for Block 2 data is approximately 98% completed. Once the acquisition of the data is completed, processing of the data acquired from Block 2 is expected to take approximately 6 weeks. Interpretation of the data is expected to be completed approximately six weeks thereafter.

9.2 Marine Surveying

The marine survey (Figure 9-1) will focus on large anomalies, initially on line spacings of over 200 – 400m, and various techniques will be utilized to characterize the image of the sea-floor and the sea-floor sediments. The techniques will include echo sounding, multi-beam sonar, side-scan sonar, and marine magnetometer surveys in selected locations.

The echo sounding will map the surface of the sea-floor, a side-scanning sonar system will penetrate the sediments on the sea-floor, and a very sensitive magnetometer will detect minerals with a high magnetic susceptibility that are expected to be concentrated in some of the old beach deposits and river channels, especially those associated with the ancestral Tano, Ankobra, and Pra rivers. As noted above, at one time, these rivers extended well out into the present continental shelf, as per an earlier schematic cartoon of projected targets

The survey will provide an excellent digital terrain model of the sea-floor and of the location, approximate thickness, and general characteristics of unconsolidated sediments sitting on the older, underlying sediments that will be much more indurated. The magnetic susceptibility of the unconsolidated sediments will also be measured in order to identify anomalous values that should indicate the presence of heavy minerals.

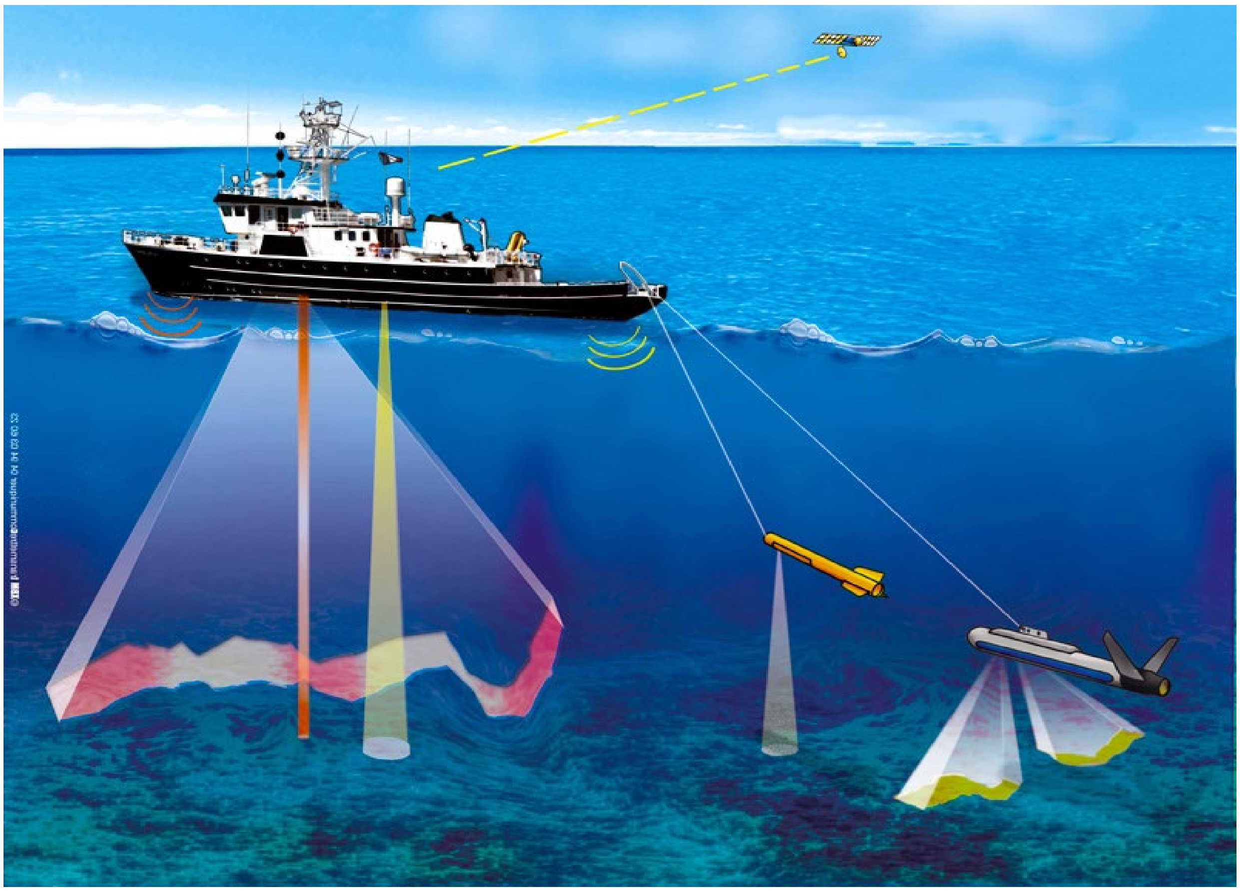


Figure 9-1: Diagrammatic representation of a geophysical sub-sea survey

This information will provide considerable information on potential targets that will hopefully define the course of the major ancestral rivers along the coast and the sediments in the delta where the former rivers have discharged their bed-load. Importantly, it is also expected that old beach sands along the former coastlines will be identified by their surficial profile, elongate form, associated heavy minerals, and sonar profiles. Seismic surveys would also be employed to image subsurface geological structures.

9.3 Initial Sampling

It is anticipated that once old river channels and remnant beach deposits are identified and prioritized, initial sampling of the deposits will be carried out. In shallow waters, up to depths of about 40 m, professional divers will be able to take hand and/or auger samples of sediments on the sea-floor. In deeper waters, mechanical methods will be utilized to obtain samples. This would include dropping a heavily weighted and guided drill rod into the sediment, withdrawing the rod with a winch, and recovering the material from a tube within the drill rod. This type of sampling is not expected to penetrate more than 2-3 m into the sediment, so it is mainly used in early-stage sampling in order to get an initial indication of the nature of the sediments very close to the sea-floor surface and their contained heavy minerals.

Much deeper penetration (10+m) can be achieved with sonic drilling, which involves a vibrating drill rod that displaces loose particles as it descends through unconsolidated material. It contains a plastic inner tube and a core catcher that prevents the loose core from falling out. This method is widely used in offshore sampling and provides a largely unaltered sample of the unconsolidated sediment that will then be studied to determine the mineral content and the sedimentary characteristics, including the amount and nature of the heavy minerals.

9.4 Bulk Sampling

Bulk samples will be required in order to get a more accurate estimate of the heavy mineral content of the sediments, as well as an assessment of the aggregate potential of the sediment. This can be achieved by using clam shells that will take samples of 10+kgs; several such samples can be taken in proximity to provide a good average bulk sample. Larger samples can also be taken by air-lift suction dredges that can manage to take samples from water depths of 100+m through a heavy-duty flexible metal pipe.

Once potential commercial targets are identified, an estimate of the resource potential of each target will be undertaken by more systematic drilling, and more bulk samples of 20+kgs would be carried out in subsequent work.

10 Drilling

This section does not apply to this report.

11 Sample Preparation, Analyses, and Security

No samples have been taken to date by GoldCoast.

The author has provided the company with the material required to implement industry standard sampling and best practice QA/QC for the Project which suits this style of mineralization.

12 Data Verification

Site visit was conducted on the 9th and the 10th of August 2025 by Mr. Torkornoo, a QP and consulting Geologist. During the visit, infrastructural, geological, access, community and logistical issues were assessed and discussed. The details are presented in Section 2.5 of this report.

It is the author's opinion that there has been no significant work completed on the project, hence, there has been no change to the geological understanding of the property. Therefore, no samples were taken during the site visit for verification of mineralization.

The author has reviewed and analyzed data provided by GoldCoast as well as publicly available assessment reports by previous workers on or in the vicinity of the Project. The author has taken reasonable steps to verify the information where possible.

Some relevant information on the Project presented in this Report is based on data derived from reports written by geologists and/or engineers who may or may not have been "qualified persons" (as defined in NI 43-101). The author has made every attempt to accurately evaluate and convey the content of those reports, and it is believed that the reports were written with the objective of presenting the results of the work performed, without any promotional or misleading intent. It is the author's opinion the historic information and other data provided are reasonable and of sufficient quality to support the conclusions and recommendations reached in this Report.

The Qualified Person has reviewed the agreement between GoldCoast and AiGeo, the contractor completing the airborne survey, including the provisions relating to: tests & calibration; quality control program; and data processing. The Qualified Person has determined that the agreement contains provisions that ensure that the data that is collected will be reliable and suitable for geological interpretation and exploration targeting and provisions that enable GoldCoast to remedy any material deficiencies in the quality of the data, including re-flying the airborne survey if necessary.

Upon receipt of the geophysical contractor's report, including the survey specifications, system calibration records, field QC logs, and processing workflow, the Qualified Person will review the data to ensure it is reliable and suitable for geological interpretation and exploration targeting and assess whether there are any material deficiencies in the quality of the data.

13 Mineral Processing and Metallurgical Testing

From the very beginning of any sampling of sands from the sea-floor, systematic mineralogical examination and metallurgical testing will be undertaken. The mineralogical work will be carried out by specialists familiar with a wide range of heavy minerals. Once the valuable minerals are identified and quantified from a variety of targets, metallurgical testing will be carried out to assess the most economical means to effectively extract any minerals of real value. GoldCoast will work with foreign consultants that specialize in identifying and treating heavy minerals, but also with the intent to establish in-house expertise so that much of this can eventually be done in Ghana by GoldCoast personnel.

Based on the regional geology, it is anticipated that the heavy mineral assemblages will likely be very similar to other operations in comparable geological settings. However, in some locations, such as the sediments deposited offshore by the Pra River, there could well be a very wide array of minerals of economic significance if they occur in sufficient quantities to warrant extraction.

Although most mineral sand projects discard the iron oxides because of the lack of a nearby market, this could end up being a valuable by-product if plans for a possible modern steel operation are established close to the port of Takoradi.

The Ghana offshore mineral sand exploration project is at an early stage of exploration, and although mineral processing is not directly relevant in the initial stages, it will become a very important aspect of the project very early on. For the most part, processing of mineral sands is relatively straightforward using well-proven methodologies that focus largely on physical methods to recover the valuable minerals.

The initial step is usually to screen various size fractions, which are then subjected to several additional processes. The heavy minerals are separated using a series of gravitational methods, such as spirals, tables, jigs, or centrifugal bowls, and specialized magnets are used to separate magnetic minerals such as magnetite and ilmenite from non-magnetic fractions. Any gold is likely to be quite fine-grained and would be expected to be recovered with centrifugal bowls, which are able to recover most of the very fine-grained gold.

Screening and initial concentrating of valuable commodities would normally be carried out on the dredge itself, and material of no economic value would be directed back into mined-out areas. Any treatment methods utilized on board the dredge would not utilize any harmful chemicals that potentially could pollute the marine environment. Further processing of concentrates on land would again be largely of a physical nature, although some chemicals, such as heavy media, could be utilized to separate specific minerals such as diamonds. Figure 13-1 is an example of a mining scheme by suction dredging.

Figure 13-1: Diagram of mining scheme by suction dredging. Source: Roya; IHC

14 Mineral Resource Estimates

This section does not apply to this report.

15 Mineral Reserve Estimates

This section does not apply to this report.

16 Mining Methods

This section does not apply to this report.

17 Recovery Methods

This section does not apply to this report.

18 Project Infrastructure

This section does not apply to this report.

19 Market Studies and Contracts

This section does not apply to this report.

20 Environmental Studies, Permitting and Social or Community Impact

The initial survey to assess the potential of Ghana's continental shelf area for mineral sands should have absolutely minimal negative environmental impact. The main focus of the programme is a high-quality marine survey that is very passive and involves no major seismic testing. However, the initial sampling programme, which could involve taking very small samples from the sea-floor, will cause some very minor, localized disturbances.

Once a larger sampling is undertaken, the disturbances will result in increased turbidity in the immediate area, but again, the disturbances will be very short-term and have no lasting effects. None of this sampling should result in the dispersal of any harmful chemicals that could disturb any aquatic life or pollute the immediate area being sampled.

The survey will be carried out by professionals and experts with extensive experience in India, where these surveys are commonplace and where sensitivities to environmental matters are of paramount importance.

From the very beginning of the survey, studies will be undertaken along the entire survey area to assess the existing offshore conditions with respect to all forms of aquatic life and the physical conditions of the ocean and sea-floor environment. This will include measuring water temperatures, currents, turbidity, salinity, etc., in addition to assessing the state of existing aquatic life on a year-round basis. This work will be guided by foreign experts in the field and working with Ghanaian counterparts so that local expertise can be built up and maintained in the future.

From the onset of the exploration programme, GoldCoast will be working with local environmental experts to liaise with Government officials and to sensitize the many coastal communities that depend on the ocean for a living. A very strong case can be made to demonstrate the many potential benefits of offshore mining should economic resources be discovered. However, getting the benefits of developing these resources in an environmentally sound manner will be difficult to achieve without the support of the nearby coastal communities. This simple fact must be realized from the beginning of the exploration work, and an effective campaign to educate and inform local communities and officials will be given a high priority by GoldCoast.

Any mining project on land or offshore will certainly result in lasting environmental effects, and it is the responsibility of mining companies and Government officials to ensure that the effects are minimal and that the benefits of the mining far outweigh the negative impact. A very strong case can be made that offshore mineral sand operations have far less negative impact than comparable operations on land. Thus, the potential to discover significant offshore mineral sand resources along the coast of Ghana should be encouraged, as certainly the benefits to virtually all stakeholders should greatly outweigh any negative factors.

21 Capital and Operating Costs

This section does not apply to this report.

22 Economic Analysis

This section does not apply to this report.

23 Adjacent Properties

This section does not apply to this report

24 Other Relevant Data and Information

This section does not apply to this report

25 Interpretation and Conclusions

The geological, climatic, and marine conditions on land and along Ghana's continental shelf appear to have been favourable for the formation of a variety of types of offshore mineral sand deposits within the past 10,000-20,000 years. During this period, there was extensive erosion in the inland areas of Ghana within the drainage basins of the current major coastal river systems.

This region features a diverse range of volcanic, intrusive, metamorphic, and sedimentary rock types, along with a significant concentration of world-class primary bedrock and secondary alluvial gold deposits, major alluvial diamond deposits, and extensive concentrations of iron- and manganese-rich laterites. These features are very favourable for the development of sand and gravel deposits suitable for aggregate and also for the concentration of a variety of heavy minerals in old beach, river, and delta sediments within and along the outer margin of Ghana's continental shelf.

The most interesting and economical mineral sands will likely include concentrations of heavy minerals dominated by iron and titanium oxides, especially ilmenite and rutile, but there is also good potential for concentrations of zircons and monazite because of the widespread granitic complexes along parts of Ghana's inland coastal areas.

It is also very likely that the Tano, Ankobra, and Pra rivers also deposited very significant amounts of accessory gold derived from numerous nearby world-class gold districts, as did lesser rivers along the coast that drain areas with many known gold deposits. Thus, gold would be expected to be within ancestral channels of these major rivers within the current continental shelf area, and they could also be expected to be disbursed along the coast in old beach sands.

The presence of abundant alluvial diamond resources along the Birim River, right where it joins the Pra River, not far from the coast, strongly suggests that a very substantial amount of diamonds almost certainly got washed out into the offshore environment. This probably occurred during the high rainfall period, approximately. 10,000 yrs. ago, when extremely high-energy conditions prevailed throughout the Pra River basin. Some of the diamonds could be in buried sections of the ancestral Pra River, and very likely a substantial amount would have been re-worked in beach sands along the coast.

Many of the major rivers along the coast originate in areas with extensive metasediments that contain an abundance of common garnets and hard, slightly heavy aluminum silicates (andalusite, kyanite, sillimanite). These and a few other less common metamorphic minerals have potential economic value if in decent concentrations and close to commercial markets. Some of the sands along the continental shelf of Ghana could well be enriched in these minerals and should be carefully evaluated.

Aside from the considerable potential of recovering valuable heavy minerals in old beach sands and gravels, the potential to find commercial resources of aggregate in offshore sediments along the coast of Ghana is very high. If their viability can be confirmed, these resources could help alleviate serious shortages of inland supplies of sand and gravel along the coast. These shortages have led to very serious environmental problems in and around the major urban areas and utilizing offshore aggregate would curtail such activities.

Conditions for mining offshore Ghana are generally very favourable, and should not pose major challenges using well-established methodology. For example, the conditions in the North Sea and along the coasts of Namibia and South Africa are far harsher and more challenging in comparison to the relatively benign conditions along the coast of Ghana.

Like any mining operation, offshore dredging for heavy minerals and/or aggregate will have a significant environmental impact, but for the most part, offshore operations will have less negative impact than comparable mining operations on land. Most of the negative effects are relatively short-term and can be effectively minimized with careful planning.

A reconnaissance marine survey along Ghana's continental shelf area to assess the potential for mineral sand and gravel deposits is highly recommended. If economically viable sources can be discovered and developed in an environmentally acceptable manner, it will increase employment in coastal areas and spur economic development in the region. The potential to discover valuable heavy minerals that potentially can be upgraded on land in new industrial facilities fueled by Ghana's expanding supply of offshore gas should be aggressively pursued and energetically encouraged.

The initial survey will be a broad reconnaissance programme designed to assess the commercial potential of surficial sediments along Ghana's continental shelf. If the results are favourable, more detailed exploration work to better define the commercial potential of specific targets will be justified.

Developing, processing, and marketing industrial mineral commodities, as well as aggregate, can be quite specialized and is best done with existing companies in the industrial mineral and aggregate sectors. Once the potential for offshore industrial mineral commodities is better defined, GoldCoast should develop partnerships with numerous industrial mineral groups that can help to successfully develop the potential of the area.

Much of the initial work in the proposed work programme discussed in the following chapter may require expertise from foreign groups, but every effort must be made to build up local capabilities so that, within a very short period, virtually all of the technical, administrative, and marketing responsibilities will be undertaken by qualified Ghanaians.

26 Recommendations and Budget

It is recommended that a one-year reconnaissance work programme be undertaken, comprising airborne geophysical surveys over the entire concession area. The airborne survey will be carried out on a grid spacing of 800 m oriented more or less NNW-SSE. Approximately 24,000 line-km will be completed. A broad marine geophysical survey scattered at least 1,000 km^2 will also be completed. Mineral sand and gravel sampling will be carried out at a minimum of 50 sites. An integrated interpretation of all results, to test and validate the various theoretical concepts. A broad-scale marine environmental survey and a market study will also be initiated. The duration of this phase of work is estimated to be 12 months. The above activities would be carried out with a projected minimum budget of US$3.040 million.

Should the initial testing programme along the continental shelf prove encouraging, it would be expected that more detailed follow-up work will be justified. The initial, broad-scale survey will be followed by Phase II, which will include a more detailed marine geophysical survey on 400 m-spaced lines covering approximately 50% (approximately 12,000 line-km) of the permit area. This phase is intended to define the sand and gravel deposits better outlined in the initial survey. This phase will attempt to obtain larger sediment samples at least 1000+ sites, and the material will be utilized to identify and quantify suites of heavy minerals, as well as the suitability of the sand and gravel as a source for commercial aggregate. Further environmental studies will be undertaken, and a sensitization programme will be initiated in key fishing communities along the coast. This phase is also estimated to be carried out over an 8–12-month period.

The proposed estimated costs for phase 1 of the reconnaissance survey are presented in Table 26-1 as follows:

Table 26-1: Proposed Budget for Phase 1

Phase 1 (Year 1)	Unit Cost (US$)	Units	Total Cost (US$)
Survey boats	362,261	1	372,000
Airborne Geophysics (for 45,000 line-km)	31	24000	1,026,726
Marine Geophysics(for 1,000 sq km)	320	1000	320,000
Data auditing and interpretation	60,000	1	60,000
Sampling	2,000	60	120,000
Environmental impact studies	100,000	1	100,000
2 Expatriate Geologists	12,000	6	72,000
3 Local Geologists	15,000	8	120,000
Supporting Staff	10,000	8	80,000
Transportation	3,000	6	18,000
Field Supplied and Lab	5,000	12	60,000
Camp Expenses (accommodation/meals, utilities, etc)	6,000	12	72,000
Compensation and Traditional Rates	6,000	12	72,000
Vehicles	60,000	2	120,000
Medical	1,500	12	18,000
Computer Infrastructure and Software	12,500	12	150,000
Permits & Licenses – Reconnaissance	25,000	4	100,000
Market Survey	15,000	1	15,000
Phase I Subtotal(2)			**2,895,726**
Contingency (5%)			144,786
Total Phase I			**3,040,506**

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28 Certificate of Qualified Person

I, Samuel Torkornoo, P. Geo. of Geoscience Professional of Ontario, Canada, do hereby certify that:

1) I am a consulting geologist and the President and the CEO of Torkornoo and Associates Limited, with an office at 200 Westland Boulevard, West Legon, Accra, Ghana. Mobile +233 207967699, email tk@torkornoo.com.

2) I graduated with a B.Sc. in Geological Engineering from Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, in 1996.

3) I graduated with an MBA. in International Resources and Environment from Technische Universitaet Bergakademie Freiberg, Germany, in 2004.

4) I am a registered member of the Professional Geoscientists of Ontario, Registration Number 2340.

5) Since graduating from university in 1996, I have gained relevant experience through active involvement in field programmes exploring for gold in West Africa. In Ghana, I have worked extensively on gold deposits for a number of Canadian Junior Exploration Companies, notable ones are Pelangio Exploration Inc., Xtra-Gold Resources Limited, erstwhile Mutual Ghana Limited, a wholly owned subsidiary of Golden Knight Resources Limited, and St. Jude Resources Limited.

6) I have read the definition of “qualified person” set out in National Instrument 43- 101 (“**NI 43-101**”) and certify that by reason of my education, affiliation with a professional association (as defined by NI 43-101) and past relevant work experience, I fulfil the requirements to be a “qualified person” for the purposes of NI 43-101.

7) I visited the Property on the 9th and 10th of August 2025, and I am familiar with the geology, topography, physical features, access, location, and infrastructure.

8) I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.

9) I am independent of the issuer, GoldCoast GRC Ghana Ltd., applying all tests in Section 1.5 of National Instrument 43-101. I do not hold any securities and/or options on securities of GoldCoast GRC Ghana Ltd.

10) I have read National Instrument 43-101 and Form 43-101F1, and this Technical Report has been prepared in compliance with that instrument and form.

11) I consent to the filing of the Technical Report with any stock exchange and any other regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Effective Date June 19, 2026

Signed Date: July 27, 2026, Accra, Ghana

“signed & sealed”

Samuel Torkornoo, P. Geo., BSc, MBA

(Consulting Geologist)

29 APPENDIX

29.1 Site Plans