CCE AWARD SUBMISSION

MITIGATION OF RISK TO BIRDS AT AGIP KCO FACILITIES

Golder Associates

PROJECT OUTLINE

Golder was retained by Agip KCO to develop a Bird Risk Mitigation Plan to mitigate the adverse effects of oil and gas operations to birds in the environmentally sensitive North Caspian Sea Region. An innovative risk matrix incorporating 18 risk sources, 10 risk factors and seasonality, was developed to address avian ecology, operational, legal and institutional constraints as part of the comprehensive Risk Mitigation Plan that will aid bird conservation in the Region.

PROJECT HIGHLIGHTS

Social and / or Economic Benefits

Agip Kazakhstan North Caspian Operating Company N.V. (Agip KCO) retained Golder Associates Kazakhstan LLP. (Golder) to develop a Bird Risk Mitigation Plan (Plan) to minimize adverse effects to birds at their facilities during the start-up and commissioning phases of the Kashagan Oil Field Development Project (Project). Discovered in 2000, the oil field is one of the largest in the world, with an estimated recoverable reserve of approximately 30 billion barrels of oil. Successfully developing the field is an important component to economic success in Kazakhstan. Substantial environmental concerns have been raised about the Project, and achieving the social and economic benefits from successful development of the oil field includes identifying potential adverse environmental effects and developing appropriate mitigation.

Within the Republic of Kazakhstan the oil field is located in the environmentally sensitive area of the North Caspian Sea. The North Caspian Sea is the heart of the largest bird migration pathway in Eurasia, with millions of birds crossing the area. It is an important breeding ground for 316 bird species, including several species of conservation concern. Included in the list are the globally endangered Siberian white crane (*Grus leucogeranus*), and other rare and threatened wintering and passage wildfowl such as the lesser white fronted goose (*Anser erythrops*) as seen in Photo 1 below, Bewick's swan (*Cygnus bewickii*) and whooper swans (*Cygnus cygnus*). Mitigating the potential adverse effects of the oil and gas Project to birds found within the Project area is a major conservation focus for Agip KCO and the Republic of Kazakhstan.

Within the Region there is a growing interest in wildlife which is resulting in an increase in economic activity through tourism linked to biodiversity conservation.[1] The tourism industry provides benefits to local people through employment with incomes derived from sectors such as wildlife management, guiding and interpretation, provision of visitor services such as catering and accommodation, and environmental education.

Photo 1 - Flock of migrating White Fronted Geese, species of conservation concern.

[1]Izbassarov, Daulet Laikovich Baideldinov and Aitzhan Omirbekovich, Specifics of the Conservation Area in the Northern Part of the Caspian Sea, Middle-East Journal of Scientific Research 13 (5): 658-664, 2013, 659

Technology Transfer

Golder was able to apply knowledge and technology gained from past projects in the Canadian Oil Sands and International best practice guides to deliver an advanced Bird Risk Mitigation Plan to Agip KCO. Familiarity of deterrents derived from prior work in the Canadian Oil Sands led specialists to include the following technologies within the Plan:

- Propane canons set to fire at varying intervals to emulate gunshots, and thus deter waterfowl from landing on water bodies, as seen in Photo 2 below.
- Acoustic dispersal technology using loud speakers that can be applied to deter birds from contaminated media or habitat traps. High frequency directional acoustics emit loud noises that cause birds to move away.
- Wildlife distress call playback that is designed to disperse prey species by mimicking the distress calls of prey species responding to a predator.
- Calls of predatory species that are often coupled with visual deterrents that look like the predator being mimicked.

Given the large number of integrated risk components present within the Region, and the need to separately calculate risk for each group of species in each of the four seasons, it was necessary to develop risk matrix that incorporated international best practices, in order to prioritize mitigation actions. Recommended mitigation focused on combinations of risk sources, associated risk factors and their potential to adversely affect receptors. By combining practical experience derived in Canada with international conservation guidelines, development of a pragmatic and achievable mitigation plan that meets international conservation expectations was possible.

Photo 2 - Propane cannon. These cannons can be set to fire at varying intervals emulating gunshots, thus deterring waterfowl from landing on water bodies.

Environmental Benefits

The Republic of Kazakhstan has obligations to protect bird species according to International Conventions (e.g., International Convention for the Protection of Birds) and national legislation. In particular the 2012 revision of Kazakhstan's Nature Protection legislation has resulted in the inclusion of the term "Important Bird Area" (IBA) in the law on Specially Protected Nature Areas in Kazakhstan. There are 121 IBAs that are recognized in Kazakhstan.

The study area comprises the North Caspian Sea State Nature Reserve, Tasuprinskiy State Nature Reserve, Mountains of East and West Karatau State Nature Reserve and Kyzylsaysky State Nature Reserve. Moreover, the Ural and Volga Deltas are internationally recognized as Ramsar sites and the study area contains eight distinct IBAs, some of which overlap with other protected areas.

A variety of Project facilities and activities exist that may pose a risk to birds. Because of the importance of the North Caspian Sea, as seen in Photo 3 below, as both a breeding ground and migratory route for hundreds of bird species, mitigating potential adverse effects of the Project to birds is a major conservation focus both for the Republic of Kazakhstan and Agip KCO. Developing and implementing a risk mitigation plan for the Project is an important component of Agip KCO's due diligence (defined as the implementation of actions that achieve compliance with regulatory requirements and demonstrate appropriate effort to minimize risk of environmental impacts) with regard to minimizing adverse impacts to birds and maintaining ecological value in the North Caspian Sea Region.

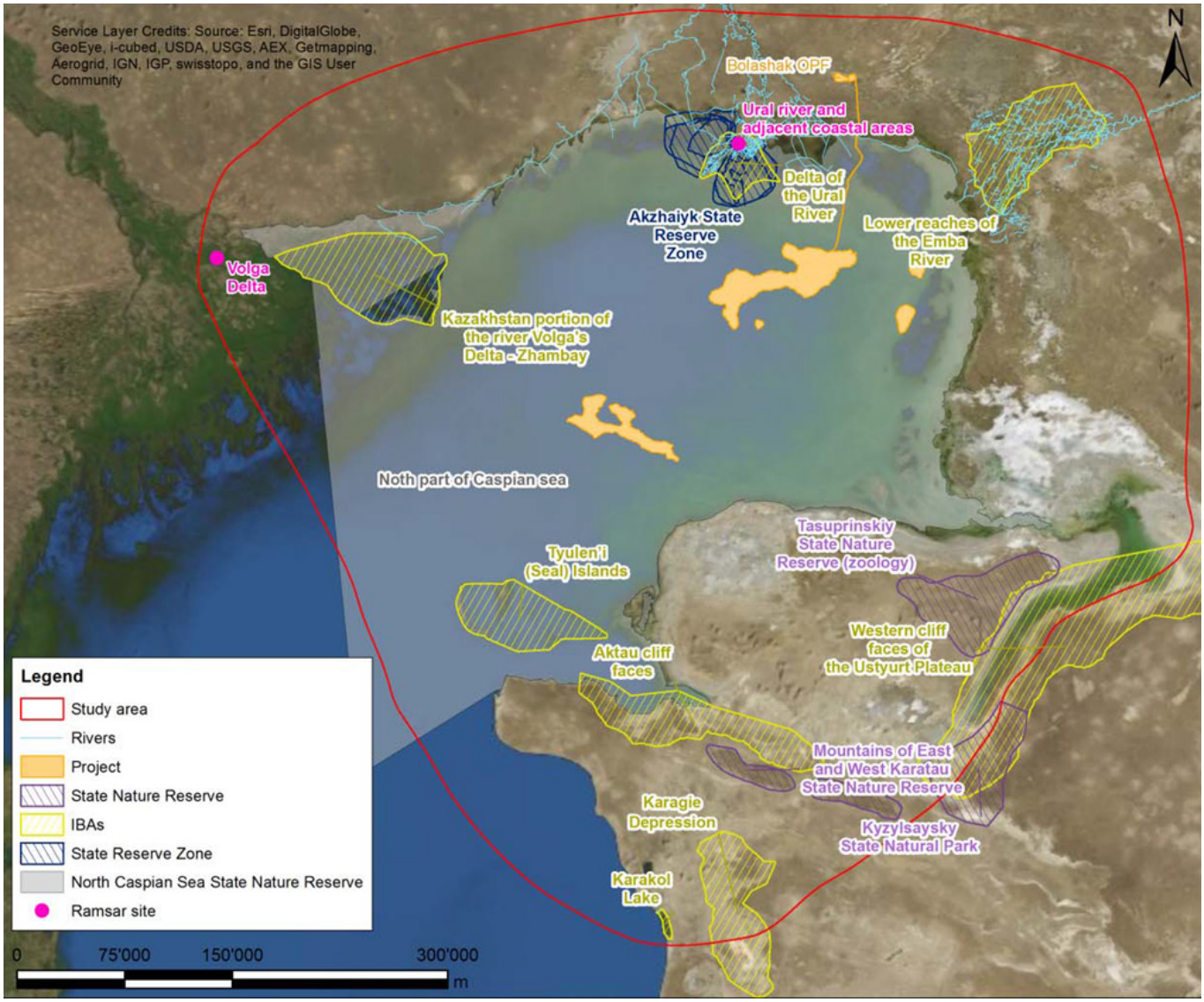

Photo 3 - North Caspian Sea, Republic of Kazakhstan Study Area.

Complexity

The risks to the 316 bird species posed by oil and gas activity were assessed using an innovative risk matrix. Mitigation actions were prioritized by highlighting the Project components that presented the highest risk. Contributing to complexity were:

- Eighteen primary risk sources (onshore and offshore), 15 secondary risk sources, ten risk factors and five risk levels.
- Risk sources included drilling, cutting treatment, onshore and offshore pipelines, production wells and plant, a camp and related evaporation lagoon.
- Risk factors included artificial lighting, gas flaring, operating facilities machinery and vehicles, high voltage electrical lines, contaminated media/creation of artificial habitat/traps, air pollutants, noise, creation of favorable conditions for synanthropic species, releases of oil and gas, and presence and operation of boats and barges.
- Impacts of seasonality: characteristics of birds change during the four seasons.

Statistically, risk is calculated using the product of the likelihood of an adverse event, (both frequency and exposure), and the severity generated by contact between source and receptor.

Sufficient data concerning frequency, exposure, and severity of impacts to birds were unavailable to conduct a canonical quantitative risk assessment. Instead, risks were calculated using a pseudo-quantitative approach based on categories assigned to different risk components describing likelihood and severity. The equation, as seen in Table 1 below, used to determine overall risk level calculates the sum of the risk present for all potential receptors based on the different risk components. Risk level was calculated separately for each risk factor for a given risk source in a given season.

$$RISK_{R_j F_k Q_i} = \sum_{i=1}^{n} M * I * S * H * C$$

where:
i = the bird species being evaluated (of 316)

R_j = the j^{th} risk source

F_k = the k^{th} risk factor

Q_i = the i^{th} season

M = magnitude of the k^{th} risk factor of potential consequences to burds (e.g., probability of mortality it the risk factor is encountered)

I = intensity of the risk factor in terms of the size or amount of risk present at the source (e.g., size of structures)

S = sensitivity of the ith bird species to the k^{th} risk factor

H = suitability of the habitat affected by the k^{th} risk factor for the ith bird species for the j^{th} risk source in the i^{th} season

C = the conservation status of the i^{th} bird species

Table 1 - Risk level equation.

Golder Associates

Meeting Client's Needs

Agip KCO tasked Golder to develop a plan to mitigate adverse effects of oil and gas exploration and production activity associated with the Kashagan Oil Field Project to bird species in the North Caspian Sea Region, as seen in Photo 4 below, to comply with local and international environmental laws and international best practices.

Golder met the client's needs by:

- Transferring applicable knowledge and technology from past work in the Canadian Oil Sands
- Addressing the 18 on-shore and off-shore risk sources and providing a series of mitigation responses, which when put in place will aid in protecting globally important wildlife during the startup and commissioning phases of the Project
- Applying international best practices regarding risk mitigation to birds
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Golder was proud to work on a project that called for such a high magnitude of technical skill and knowledge that needed to be applied to contribute to environmental due diligence for not only Agip KCO but global biodiversity. We are proud to submit this project to the Association of Consulting Engineering Companies Canada (ACEC) for consideration of an award.

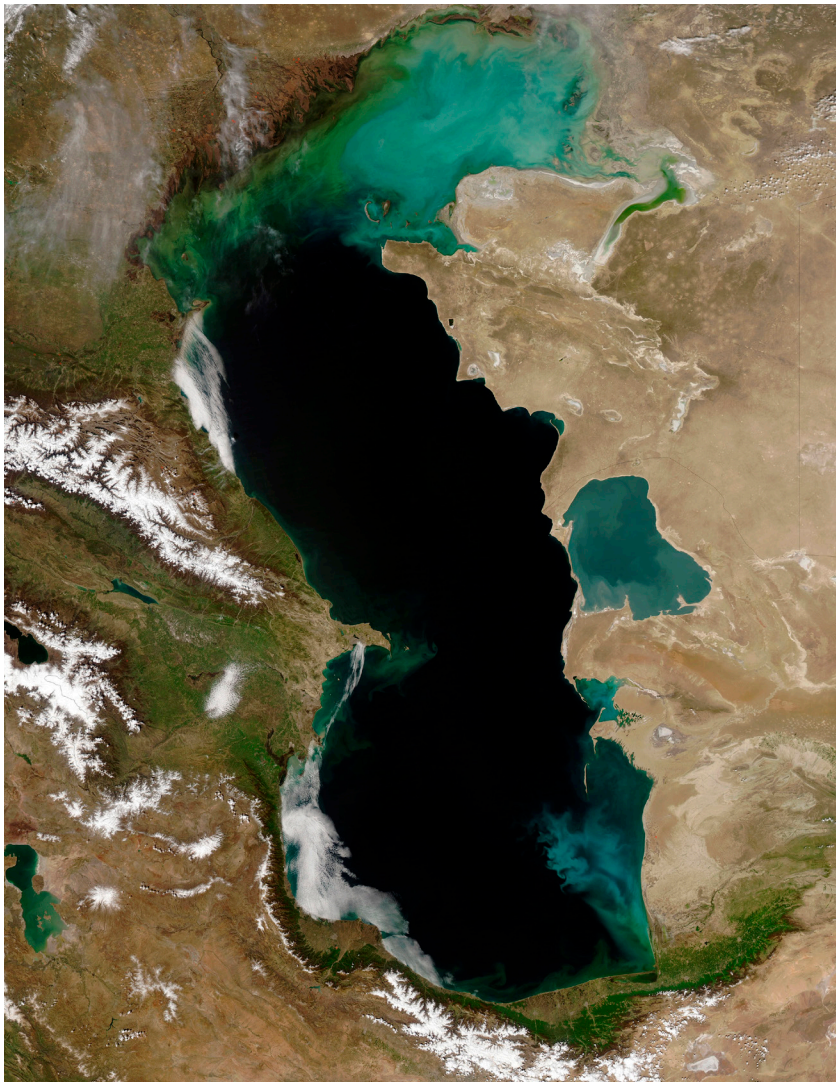
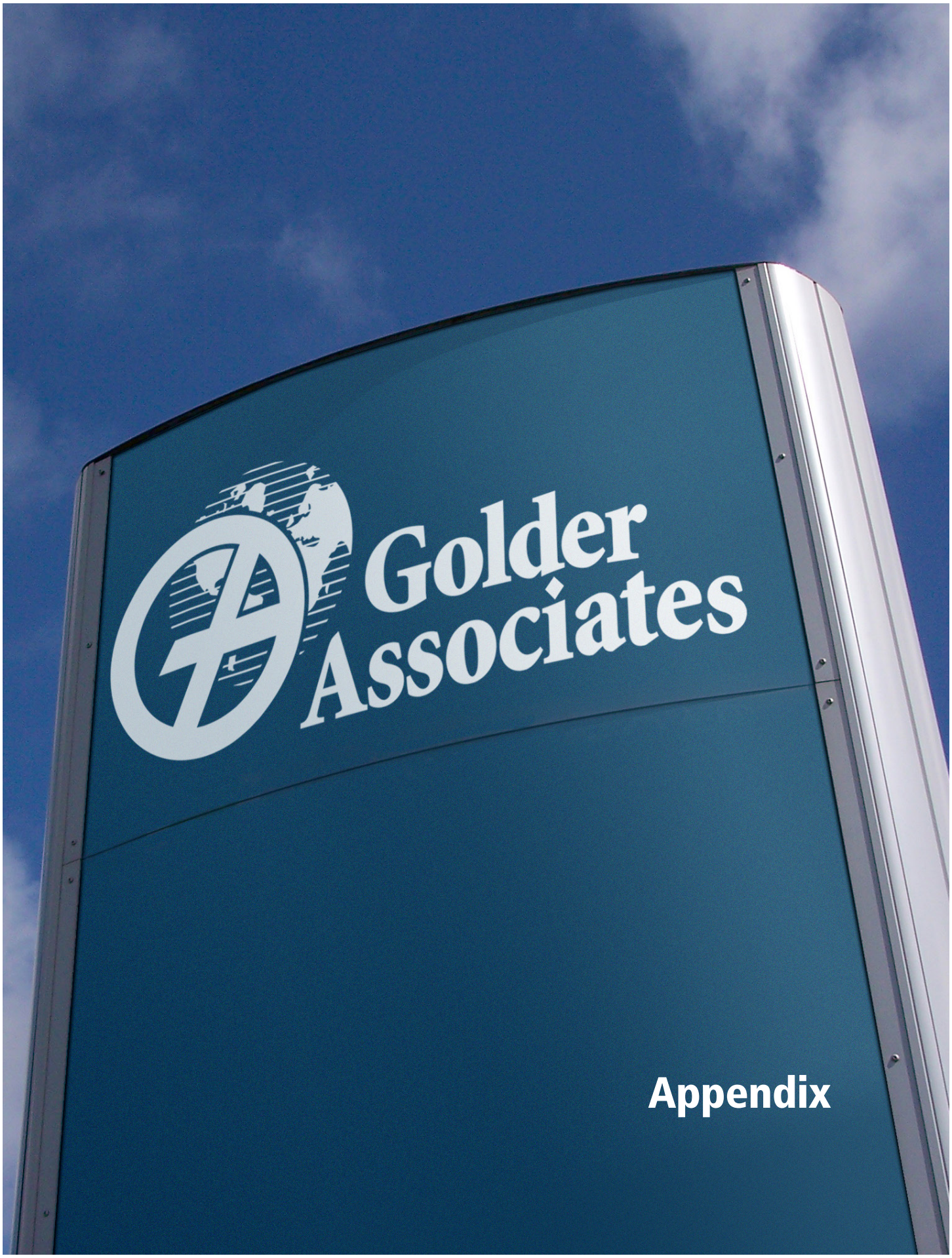


Photo 4 - Satellite view of the Caspian Sea.



Appendix

Summary

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CATEGORIES A-F

Innovation

Complexity

Social & Economic Benefits

Environmental

Client Needs

CATEGORY G - PROJECT MANAGEMENT

Complexity

Meeting Client's Needs

Environmental

Innovation

Social &/or Economic Benefits

CATEGORY H - INTERNATIONAL

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