

Discussion of Impacts of Solwara 1 and Three Comparison Mines

The following discussion identifies each natural capital accounting category and compares Solwara 1 with the Intag, Prominent Hill, and Bingham Canyon mines. Each ecosystem service is summarized, its presence or lack thereof is described for each mine site and, finally, a more in-depth discussion of the ramifications of impacts to each service is presented.

The level of impact estimates for the Prominent Hill mine were based on documents published by Prominent Hill mine owner OZ Minerals.⁶⁹ The level of impact estimates for the Bingham Canyon mine were based on sources from Rio Tinto (mine owner)⁷⁰ and the EPA.⁷¹ The level of impact estimates for the proposed Intag mine are based on a Japan International Cooperation Agency mine assessment⁷² and an Earth Economics analysis of the Intag Region and mining proposal.⁷³

Provisioning Services

Food

This service is the provisioning of food for human consumption.

Intag: The Intag mine will eliminate agricultural production inside the mine site and may threaten food production downstream, meriting a high impact classification.

Prominent Hill: There is no threat within the mine site, but mine waste may threaten downstream food production in the future. This is, however, a reduced risk due to the desert ecosystem and land access constraints.

Bingham Canyon: There is no threat within the mine site, but mine waste and groundwater contamination present a high and growing threat to downstream food production.

Solwara 1: The mine should have no impact on food provisioning. The Nautilus Environmental Impact Statement⁷⁴ examined the purse seine and long-line fisheries as well as subsistence fisheries. Tuna migrations do not appear to move through the site's area, and tuna does not forage in the deep ocean. The exclusion zone around the mine site, which prohibits fishing activity, is limited to 500 m in any direction of the production support vessel. This is a very small area that is unlikely to impact fishing activities.



▲ Rice varieties

Image credit: IRRI Images

Discussion: Threats to food provisioning generally result in social conflict. Most food is terrestrially produced, although in developing island economies, much protein is sourced from the oceans. Marine systems provide critically important foods from wild marine ecosystems. The Bismarck Sea has important coastal and pelagic fish species; however, the Solwara 1 site is distant from the coast and 1,600 m below the surface where no commercial, recreational or subsistence species exist. The mine is therefore not expected to impact human food production. Regarding the other terrestrial sites, mines in deserts have less impact on food provisioning than mines in areas with good soils and rainfall, though local people relying on desert foods may be severely impacted.



▲ Medicinal plant

Image credit: Köhler Images

Medicinal Resources

This service is the production of medicines and pharmaceuticals useful to people.

Intag: Medicinal resources utilized by local people were identified as impacted at the Intag site.

Prominent Hill: The impact to medicinal resources is low. Some indigenous desert medicinal plants are present, but within a wide geographic range.

Bingham Canyon: The impact to medicinal resources is low. Some indigenous desert medicinal plants are present, but within a wide geographic range.

Solwara 1: Medicinal resources are not discussed in the environmental impact assessment and are not known to be present at this site. There is currently no collection of medicinal resources at the site, although sampling could enable the discovery of medicinal resources. Solwara 1 nevertheless is given a 0 rating as medicinal resources have yet to be discovered.

Discussion: Tropical areas such as the Intag region boast a greater diversity of species and genetics with far more proteins and other organic molecules present than any of the other sites. As a result, there is an increased potential for the loss of medicinal resources due to mining activity at this location. Of slightly less concern, both Prominent Hill and Bingham Canyon do impact known indigenous medicinal resources; however, the landscape housing these known resources is also vast. Finally, regarding Solwara 1, there is little information and few existing investigations concerning medicinal resources from deep seabed environments. However, Nautilus is planning to include a scientific laboratory on the production vessel that could facilitate the discovery of medicinal resources in the deep seabed, if they are indeed present.



▲ Abalone necklace, Miwok
Image credit: By Daderot via
Wikimedia Commons

Ornamental Resources

This service creates aesthetics for clothing, jewelry, handicraft, worship and decoration.

Intag: Ornamental resources, such as orchids, are present and utilized by local people.

Prominent Hill: No threat to ornamental resources has been identified.

Bingham Canyon: No threat to ornamental resources has been identified.

Solwara 1: Ornamental resources are not known to be present.

Discussion: Of the comparison sites, only Intag has identified ornamental resources. Prominent Hill and Bingham Canyon did not contain any identified ornamental resources. If any ornamental resources do exist in the Solwara 1 site, they would be virtually impossible for a local community to collect as the site is 1 mile below the ocean.



▲ Fiber extraction
Image credit: Ecuador Living

Energy and Raw Materials

This service is the provision of fuel, fiber, minerals and energy.

Intag: Copper minerals are present at a 0.7 % grade. Energy resources are not present. Mine operation will require the construction of a dam to provide sufficient electrical power for large-scale earth moving equipment such as draglines, but the impact of this dam was not examined.

Prominent Hill: Copper minerals are present, ore grade is approximately at 1.1%, and solar power could potentially be utilized.

Bingham Canyon: Copper minerals are present, ore grade is less than 1%, but no significant energy resources are present.

Solwara 1: Copper minerals are present at a 7% grade.⁷⁵ Geothermal energy is also present at the mine site and could potentially be utilized, but only at an extremely high cost.

Discussion: The material at Solwara 1 has by far the highest concentration of copper of all comparison sites. Prominent Hill and Bingham Canyon have already mined out their highest-concentration ore, as have most terrestrial mines.



▲ Intag River Valley
Image credit: Ecuador Living

Solwara 1 is expected to have no impact on terrestrial freshwater supply or water quality (surface waters or aquifers). In this respect, the project may be completely unique in the history of copper mining

Water Supply/Quality

This service is the provision of water quantity (a good) and water quality (a service).

Intag: The mine site is located in an elevated position in a large, populated catchment. Population density rises with proximity to the coastal plain. The mine will have significant potential impacts on water supply and water quantity in surface and groundwater resources. This catchment provides fresh water for human consumption, agricultural production, and manufacturing.

Prominent Hill: This site poses low impacts to surface water and groundwater quality, and there are possible impacts to aquatic fauna and riparian vegetation.⁶³

Bingham Canyon: The impact is high, including impacts on water supply and water quality within the Salt Lake City watershed. The mine has contaminated surface and groundwater supplies with acid, metals and sulphates (the contaminated groundwater plume is currently 70 square miles) that threaten water community supplies.⁷⁶

Solwara 1: The mine is expected to have no impact on terrestrial freshwater supply or water quality (surface waters or aquifers). In this respect, the project may be completely unique in the history of copper mining. The TNFM smelting facility will also use wastewater, not freshwater, to process the Solwara 1 mineralized material.⁷⁷

Discussion: Impacts to freshwater supplies from mining are one of the greatest sources of environmental damage and social conflict. All three terrestrial mines have significant impacts. Intag, due to its location on a steep sloped, high rainfall area with a large downstream population, has the potential for severe water supply and water quality impacts.

Deep seabed mining, on the other hand, cannot damage freshwater supplies or quality at the mine site, and Nautilus has stated that it is committed to monitoring saltwater quality. The mine plan has been amended to remove the requirement to stockpile mineralized material at a terrestrial location in PNG, and, as a result, the mine should not affect PNG fresh water quality or supplies.

There are currently no water quality standards for copper mining in marine systems, and this is a gap in existing management approaches that will need to be addressed. Solwara 1 is located near an erupting underwater volcano and vent system with a high background level of what would be considered contaminants in a terrestrial freshwater system or non-volcanic coastal marine system. Nautilus has also examined impacts to fresh water from the concentration and smelting processes, even though this goes beyond their custody of the mineralized material. This topic is discussed further in the smelting section of this report.

Regulating Services



▲ Bat

Image credit: LonghornDave

Biological Control

This service affords pest and disease control.

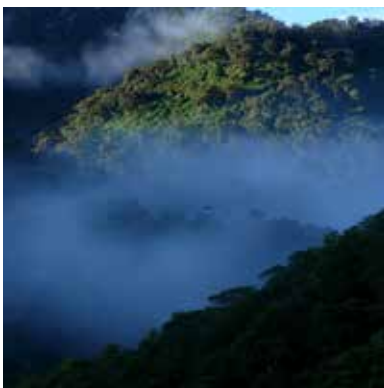
Intag: The disturbance associated with the mine may result in the loss of biological control values identified as present in five land cover types at the Intag site.

Prominent Hill: The disturbance associated with the mine may result in the loss of biological control, but few people reside around the mine.

Bingham Canyon: The disturbance associated with the mine may result in the loss of biological control values. The mine is close to a highly populated area and therefore has a greater potential impact.

Solwara 1: Biological controls within the vent communities exist; however, biological controls that benefit humans are unknown and may not be present. There is also the potential for introduced species as a result of the movement of vessels in and out of the mine site.

Discussion: Mining often disrupts natural systems that provide for the biological control of disease, insect populations, and other potential pests. Where no habitat for invasive species or disease exists prior to mining, or where naturally occurring diseases and pests may be under control, mining activities may disrupt these biological control processes and cause a greater incidence of disease, pests and ensuing damage. Compared with impacts at the terrestrial mining sites, biological control impacts to humans at Solwara 1 are less likely because no human communities live near the site.



▲ Cloud forest

Image credit: Carlos Zorrilla

Climate Stability

This service contributes to climate stabilization. Ecosystems help to regulate atmospheric chemistry, air quality, and climate. This process is facilitated by the capture and long-term storage of carbon as a part of the global carbon cycle.

Intag: Climate stability impacts would occur in the form of carbon emissions and in the loss of carbon-sequestering forests. The total carbon emissions of the project have not been carefully calculated, but were broadly estimated and monetized. Carbon emissions are likely to be substantial given the proposed size of the mine. Extensive forests would also be cleared. In addition, carbon offset projects are housed within the Intag area and could be detrimentally affected by the mining operation.

Prominent Hill: The mine has significant carbon emissions, but the area was not heavily forested and thus suffered less damage from clearing than in the Intag case. The low copper concentration in the ore requires significant processing activity, which further contributes to total emissions.

Bingham Canyon: The mine has significant carbon emissions, and forest areas were lost with the mine establishment. The low copper concentration in the ore requires significant processing activity, which further contributes to total emissions.

Solwara 1: Carbon impacts in the form of emissions are present, although on a smaller scale than the previous studies due to the high grade of the mineralized material.⁷⁸ The expected carbon footprint of the project has been calculated and is expected to be far less than a terrestrial mine due to the lack of overburden removal required and the reduced processing requirements due to the higher copper grade (See Analysis III).

Discussion: The general reduction in mined ore grades over time has resulted in rising CO₂ emissions/metric ton of copper ore produced globally. Solwara 1 is likely to be an exception to this trend due to its high grade and low overburden. Without a global increase in ore grades or major changes in energy use, carbon emissions per ton of copper produced will continue to rise.



▲ Sunny blue skies
Image credit: Zac Christian

Air Quality

This service relates to the provision of clean, breathable air.

Intag: The loss of cloud forest at the mine site will reduce the provisioning of clean air as the forest is removed. Air pollution in a previously undisturbed area will take place and may degrade air quality for communities in the valley and around the mine site.

Prominent Hill: Impact to air quality likely occurs locally at the mine site due to dust generation and processing emissions.

Bingham Canyon: Impact to air quality likely occurs locally at the mine site due to dust generation and processing emissions.

Solwara 1: The site is 30 km offshore and thus will have no measureable air quality impacts on communities in New Ireland and New Britain. Power generation on the support ship may reduce air quality for crew on the ship.

Discussion: Many copper mines are located near inhabited areas and have a substantial impact on local air quality. This loss of air quality often impacts the health of people living in the mine vicinity. Solwara 1 is distant from any human communities, with the exception of the production ship's crew. The Solwara 1 site also does not contribute to dust generation, which can have impacts on human populations and ecosystem health. This is likely to result in a significant, overall air quality benefit in a shift from terrestrial to deep seabed mining.



▲ Flooded farmland
Image credit: Ecuador Living

Terrestrial mines often increase the risk of, or exacerbate, disaster damages. Solwara 1 will not reduce the resilience that natural systems in the area provide to people.



▲ Hummingbird pollinating a flower
Image credit: Angela Arenal

Moderation of Extreme Events

This service buffers against storms, floods, fires, drought and other extreme events.

Wetlands, grasslands, riparian buffers, and forests all provide protection from flooding and other disturbances. For example, these ecosystems are able to slow, absorb, and store large amounts of rainwater and runoff during storms, thus reducing flooding. Changes in land use and the potential for more frequent storm events due to climate change make disturbance regulation one of the most important services to economic development.

Intag: The impact is likely to be high at Intag as the mine will remove vegetation that provides storm and flood mitigation. The planned mine site receives 3,000-4,000 mm of rain annually, often in large rainfall events. Like other copper mines with earthen dam impoundments, there is also a danger of dam failure and catastrophic downstream flood damage. If mine tailings are flushed downriver, extreme event damage can be exacerbated.

Prominent Hill: The impact is low as the mine site is distant from populations in an area of low rainfall.

Bingham Canyon: The impact at this site is significant. Massive landslides occurred at the mine site in 2013, for example.⁷⁹

Solwara 1: This impact is not present. There are no human communities on the downgrade slope from the mine. The Solwara 1 mine will not damage natural capital that provides moderation of extreme events. The mineralized material is also shallow on the ocean floor under tremendous pressure from the water column, and cannot trigger an earthquake or tsunami.⁸⁰

Discussion: Terrestrial mines often increase the risk of, or exacerbate, disaster damages. Solwara 1 will not reduce the resilience that natural systems in the area provide to people.

Pollination

This service provides for the fertilization of plants. Pollination supports wild and cultivated plants and plays a critical role in ecosystem productivity.

Intag: The Intag mine is in an area of cloud forest where pollination for farms within the proposed mine area and outside the mine area occurs. Removal of vegetation for the mine will likely impact pollination services.

Prominent Hill: The impact is likely low. The mine site is distant from agriculture, but pollination of native desert species may occur.

Bingham Canyon: The impact is likely moderate. Nearby forested areas may gain from local pollination, but farms are outside the flight distance of pollinators from the mine.

Solwara 1: Plant pollination is not present at the Solwara 1 deep sea site and no impact is foreseen. Larval recruitment is addressed in the Habitat and Nursery section.

Discussion: Pollination is not only one of the most critical services provided by any ecosystem, but it is also among the most delicate and easily disrupted services. With the exception of Prominent Hill (due to its extremely remote location), our comparison sites negatively impact pollination, which can impact the ecosystem as well as local agricultural productivity. Plant pollination does not occur at the Solwara 1 site, and therefore the proposed mine poses no risk to pollination services.



▲ Eroded bank

Image credit: Wikimedia Commons

Soil Formation and Retention

This service enhances soil fertility and soil retention.

Intag: The mine is likely to accelerate soil erosion and eliminate soil formation at the mine site. The Intag mine will be located on the crest of a very steeply sloped ridge with high and variable rainfall. Communities at lower elevations depend upon the erosion control and could be impacted by uncontrolled erosion, loss of topsoil or a tailings spill.

Prominent Hill: The impact may be significant if topsoil resources are lost. Soil formation is impacted. Downstream areas may be impacted by erosion of rock waste and mine tailings.

Bingham Canyon: The impact is considered high and may extend beyond the mine's life if topsoil resources are lost. Soil formation is impacted. Rock waste and tailings piles overshadow the populated portion of the Salt Lake basin. Downstream areas would be significantly impacted should erosion of rock waste and mine tailings occur.

Solwara 1: The impact is likely to be high, but it is also restricted to a very small area compared with the other studied mines. Sediment and material will be placed downslope from the mine site, impacting only a small area of 3 ha (0.03km²) of deep seabed. Soft sediment will be lost within the mine area, but will also be deposited as a result of mine activities. Biotic communities, but no human communities, will be impacted.

Discussion: Soil serves a vital function in nature. It provides a medium for plant and nutrient growth as well as habitat for millions of micro- and macro-organisms. Healthy soils are able to store water and nutrients, regulate water flow and neutralize pollutants more efficiently than degraded soils. In many areas, vegetation can prevent landslides and harmful erosion. While biotic communities may be impacted at the Solwara 1 site, compared with terrestrial mines, the site will have virtually no impact on human communities.



▲ Mushrooms
Image credit: Carlos Zorilla

Solwara 1 is potentially a unique copper mining project because it has little effect on the waste treatment services of natural systems.



▲ River Mindo, Ecuador
Image credit: Ecuador Living

Waste Treatment

This service refers to the conversion and treatment of wastes.

Intag: This impact is expected to be high. Waste treatment is present in the forests, wetlands, and riparian areas of Intag, and it affects the populations living there.

Prominent Hill: The impact is low. This desert area has low waste treatment value.

Bingham Canyon: The impact is significant. Waste treatment is high in the watershed with greater numbers of people living downstream in an area with snow pack and higher rainfall than Prominent Hill.

Solwara 1: No waste treatment benefits are provided to human communities, but natural waste treatment processes are present. Biological activity declines with distance from the chemotrophic vents, and waste treatment value also declines. Waste generation is limited to the surface vessel and will meet international standards.

Discussion: This service is most valuable when associated with human communities. Solwara 1 is potentially a unique copper mining project because it has little effect on natural systems' waste treatment and because it likely generates far less waste per metric ton of copper mined.

Water Regulation

This service regulates freshwater storage, temperature, flow, quality, and other attributes of water. Traditionally, the focus of this service has been on fresh water.

Intag: The impact to water regulation is likely to be high. The mine is likely to significantly impact surface water resources in terms of storage, temperature, flow, quality and other attributes.

Prominent Hill: The impact is considered low. Low rainfall and the area's topography reduce the impacts.

Bingham Canyon: The site is high in the watershed and impact to surface and groundwater resources impacting storage, temperature, and flow are likely to be significant.

Solwara 1: This mine would have no impact on freshwater regulation.

Discussion: Terrestrial mines such as Bingham Canyon and Intag (excluding Prominent Hill, which is in a desert) can often negatively impact water regulation. Bingham Canyon's location in the mountains above a populated watershed poses a risk to the downstream population. The absence of freshwater in the deep seabed means that Solwara 1 does not have the potential for impacts to this resource.

Supporting Services



▲ Salmon

Image credit: Melissa Doroquez

Solwara 1 will have significant impacts on habitat; however, studies suggest that species in this area have evolved to adapt to regular disturbances, and may recolonize the mined site more quickly than would be the case with a terrestrial mine.



▲ Nurse log

Image credit: Jonny Hannson

Habitat and Nursery

This service refers to the housing of biodiversity, providing habitat for species continuity and the rearing of young.

Intag: The impact is likely to be high as the mine would be located in an area that is globally noted for its biodiversity. The proposed mine site traverses significant ecological regions.

Prominent Hill: The impact is considered significant due to surface disturbance, but may not be as high as in mines located in biodiversity hotspots.

Bingham Canyon: The impact is considered high due to surface disturbance as well as the downstream threat from rock waste and tailings.

Solwara 1: The impact is significant, although restricted to a small area. The mine will impact habitat and nursery areas. The site includes vent habitats that are high in biodiversity relative to other deep ocean environments. However, early research by Duke University, Woods Hole Oceanographic Institute and others shows that South Su and nearby vents likely hold the same diversity of life for dominant species as at the mine site, and recolonization of the mine site at the conclusion of mining is expected to reflect the genetic structure of the baseline conditions for all numerically dominant species. This could be achieved if the South Su site provides larvae for the Solwara 1 site.⁸¹

Discussion: Habitat is the biophysical space and process in which wild species meet their needs. A healthy ecosystem provides physical structure, adequate food availability, appropriate chemical and temperature regimes, and protection from predators. Solwara 1 will have significant impacts on habitat; however, studies suggest that species in this area have evolved to adapt to regular disturbances, and may recolonize the mined site more quickly than would be the case with a terrestrial mine (see the earlier chapter entitled “State of Knowledge of the Bismarck Sea Deep Seabed” for more details).

Nutrient Cycling

This service provides local and global cycles for many nutrients including phosphorus, nitrogen, and potassium through living and non-living systems.

Intag: Nutrient flows will likely be significantly impacted. Further analysis would be required to estimate the quantitative impacts on phosphorus and other nutrients.

Prominent Hill: The impact is considered to be moderately low. Desert systems have low nutrient cycling rates.

Bingham Canyon: The impact is considered to be high. Nutrient cycling is relatively high,⁸² and potential downstream impacts from tailings and rock waste are significant.

Solwara 1: The impact is present, but low. Nutrient flows appear to be low for most of the world's deep seabed, although vents are an exception. Vent surveys show that most nutrients remain at the seabed in the deep sea. Chemosynthetic organisms will be impacted by mining. Nutrient flows from the surface will not be impacted by mining. The scale of the mining operation is small.

Discussion: Nutrient cycling is one area of natural capital accounting that can be identified and sometimes quantified, but there are few satisfactory methods for monetization. Values for nutrient cycling are likely to be greater in areas with more vegetation, such as forested environments. Solwara 1 is thus likely to have the lowest impact on nutrient cycling services.



▲ Genetic resources
Image credit: Morley Read
via Shutterstock

Genetic Resources

This service relates to the support of species and varieties that hold different combinations of DNA.

Intag: The impact is likely to be high. The cloud forests of the Intag mining site contain high genetic resources that would likely be damaged. A publicly available survey of the Intag site is not currently available.

Prominent Hill: The impact is unknown, although the surrounding habitat is similar to the mine area, which may reduce the impacts. A publicly available survey of the site is not currently available.

Bingham Canyon: The impact is unknown. A publicly available survey of the site is not currently available.

Solwara 1: The mine would impact genetic resources, but the small size of the mine site would likely keep the impact very low. More is known about the genetic diversity and surrounding areas of the deep seabed than is known about many terrestrial mining areas. Independent research shows genetic alignment between the South Su control site and the project site.⁸³ The project is committed to the establishment of the South Su protected area for the purposes of conserving biological diversity and recolonizing the mine site.

Discussion: Genetic resources will be impacted by the Solwara 1 mine. However, due in part to the proposed deep seabed mining project, the Solwara 1 site is now among the best studied seabed ecosystems on Earth, and genetic resources that may have been unstudied are now better understood (see the earlier chapter entitled “State of Knowledge of the Bismarck Sea Deep Seabed” for more details).

Genetic resources will be impacted by the Solwara 1 mine within the 14 hectare mine site. However, due in part to the proposed deep seabed mining project, the Solwara 1 site is now among the best studied seabed ecosystems on Earth, and genetic resources that may have been unstudied are now better understood.

Cultural Services



▲ Wildflower
Image credit: Isla Chadsey

Natural Beauty

This service provides aesthetic value to people.

Intag: The mine would likely impact the views of Intag Valley residents substantially.

Prominent Hill: The impact is low as the mine is in a very remote area.

Bingham Canyon: The impact is significant. The mine/tailings are within the Salt Lake City catchment.

Solwara 1: The mining activity is likely to have an impact on the natural beauty of vents at the mine site, although no local residents will be impacted.

Discussion: Aesthetic value is often highly valued by local populations, so it is no surprise that sites like Intag and Bingham Canyon, which are both located in scenic areas, have impacts on natural beauty. Prominent Hill's remote location and sparse landscape mean that it has less impact on natural beauty. Solwara 1 is one mile below the ocean and therefore exceptionally remote, making its impacts to natural beauty low.



▲ Basketry tray, Chumash
Image credit: Daderot via
Wikimedia Commons

Cultural and Artistic Inspiration

This service provides cultural and artistic value to people.

Intag: Local people currently utilize the proposed mine site for cultural activities which would likely be significantly impacted by the mine.

Prominent Hill: Indigenous cultural values are likely to be present and may be impacted.

Bingham Canyon: Cultural resources were present and impacted.

Solwara 1: No cultural or artistic inspirational values were noted at the site.

Discussion: Cultural and Artistic Inspiration is a value generally associated with the intangible connections between society and nature that permit a society to flourish. Solwara 1's location on the deep seabed means that no indigenous cultures have developed a connection to this area.



▲ River rafting
Image credit: Earth Economics

Recreation and Tourism

This service provides space and ambiance for recreation and tourism.

Intag: Recreational and tourism activities are present in the proposed Intag mine site and would likely be significantly impacted, at least within the mine footprint area and potentially in downstream areas.

Prominent Hill: The impact is low as the mine is in a very remote area, and it is located within the Woomera Prohibited Area (a historic weapons testing area) that is inaccessible to visitors without a permit.

Bingham Canyon: The impact is significant. Nearby forested areas are heavily utilized by people from the Salt Lake area for recreation and tourism.

Solwara 1: No impact to recreation or tourism could be identified.

Discussion: Of all the comparison sites, Bingham Canyon and Intag would most greatly affect recreation and tourism, as the areas disturbed by the other two mines preclude most human activities.



▲ Field trip
Image credit: Metro Parks Tacoma

Science and Education

This service provides learning and information to individuals and humanity.

Intag: There is no scientific agenda associated with the Intag mining plan. As Intag is located in a biodiversity hot spot, the potential for loss of scientific information within the project area is high.

Prominent Hill: Any potential impact is unknown.

Bingham Canyon: The area is relatively well studied, so loss of scientific and educational value is comparatively low as surrounding areas are well utilized.

Solwara 1: Solwara 1: Significant studies have already been carried out on the proposed mine site, and the mine production vessel will house a scientific laboratory to facilitate continued scientific study.

Discussion: Solwara 1 has a unique potential for contributing to a greater scientific understanding of the deep seabed and for examining deep seabed mining impacts and the resiliency of deep sea vent systems.



▲ Petroglyph

Image credit: Martin Padbury

Spiritual and Historic

This service delivers spiritual benefits and historic values to people.

Intag: Spiritual and historic resources are present and expressed by residents of the area, and the impact is likely to be high.

Prominent Hill: The impact is high, as aboriginal cultural sites are present and impacted.

Bingham Canyon: The impact is significant as expressed by indigenous peoples and historic value present.

Solwara 1: No physical links to cultural or spiritual value were found. Local people expressed concern about the project impacting cultural practices such as shark calling, a cultural event in which people attract and harvest sharks in shallow coastal waters. Due to the distance from the shore, the background noise associated with the North Su volcano on the seafloor and fishing vessel activity in the area, it is unlikely that the mining project will impact shark calling or other cultural practices.

Discussion: Cultural and spiritual resources are tremendously important, and they often become a cause of social conflict. Nautilus has planned community projects in New Ireland and New Britain that include discussions with communities about their concerns and needs (health, reef restoration, education, jobs).⁸⁴ Community discussion of shark calling is ongoing and Nautilus plans to review and study this ancient practice in order to further quantify any potential impacts.⁸⁵ The lack of terrestrial disturbance is an important factor in limiting the impact of the mine on cultural values, and this represents a significant benefit compared to the terrestrial mines examined.