PACIFIC

Passive seismic techniques for environmentally friendly and cost efficient mineral exploration

The environmental impact of PACIFIC report 1

Grant agreement number	776622	**Authors**
Start date of the project	01/06/2018	Nicholas Arndt, UGA
Duration	36 months	

Description
PACIFIC will assess the risks for the environment of technologies and models developed and tested during the project. The results will be presented in regular reports which will be communicated to the public at large (including NGOs and other concerned stakeholders). The consortium will also have a specific section on the project public website reserved for providing information about the environmental footprint and other consequences of PACIFIC activities.

Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Introduction

This document is an assessment of the impact on the environment of the technologies and models developed during the PACIFIC project and of all related activities of the project.

One of the main objectives of the project is to develop new techniques to explore for mineral deposits, with minimal harm to the environment. PACIFIC uses the passive seismic technique in which ambient seismic noise is used to produce valuable information about the geological and structural setting of mineralised regions.

Although the environmental impact of the passive seismic technique is limited, the PACIFIC project still has a significant environmental footprint, mainly because of the plane travel linked to transnational meetings.

1 PACIFIC techniques and environmental risks

During the test of the passive seismic technologies at the Marathon site, over 1000 nodes (compact cable-less seismometers, see Figure 1) were deployed in a ca. 2 x 3 km array of region of forest and scrubland in northern Ontario (Figure 2). No-one lives in this area, the closest centre of population being the town of Marathon (population about 3000) located about 8 km from the edge of the array. The area is cut by a few gravel roads and tracks used occasionally by hunters or loggers, and also by Stillwater Inc. during their exploration and drilling.

Figure 1: A seismic node.

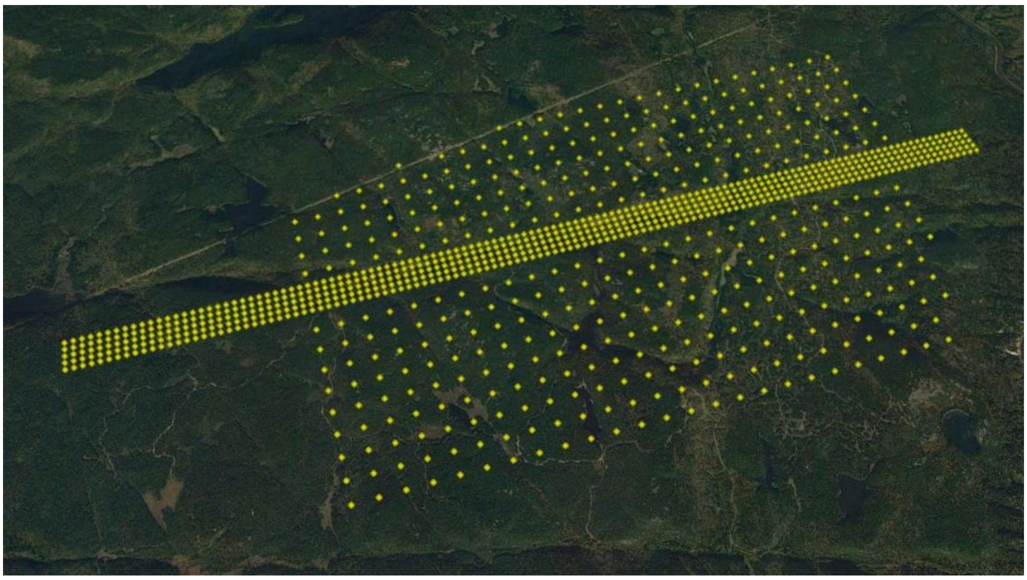

Figure 2: Design of the 1200-node array in Marathon, ON, Canada.

The deployment of the nodes was accomplished using SUVs, all-terrain vehicles and a helicopter, which transported the nodes to accessible sites; from these sites the nodes were transported in backpacks. Each node was buried in a small hole, activated, then left in place for about 30 days before being recovered.

Figure 3 shows a node in place after deployment. During deployment, all participants were fully briefed by Stillwater staff about safety and environmental issues following the CIM Mineral Exploration Best Practice Guidelines, from the Canadian Institute of Mining which allowed them to conduct consistently high-quality work in planning, supervising, and executing exploration.

Figure 3: Node placed in a small hole in the ground at Marathon test site.

The total impact on the environment during the surveys was limited to some traffic over pre-existing roads and the digging of small holes; this impact was far less than that of habitual visitors to the region (hunters driving in SUVs; loggers and drillers making new roads, driving in big trucks, cutting down trees, etc).

Similar practices will be used during the deployment of nodes in the Kallak region of Sweden, the second test site of the PACIFIC project. Also sparsely populated, with similar topography and geography to that at Marathon, the environmental risks of the deployment will be limited.

2 PACIFIC environmental footprint

As described above, the environmental footprint associated with the deployment of nodes at the two test sites is very low. No additional roads or paths were constructed and the main environmental impact at the site was related to the use of the vehicles.

At a broader scale, the main contribution to the environmental footprint and consequences of PACIFIC activities is probably the plane flights taken to go to the test sites and also the air travel related to the workshops and other meetings of the consortium.

Table 1 lists the flights made during the first 18 months of PACIFIC activities, as well as the CO_2 emissions for each of these flights. Recent research has shown that air travel accounts for 60-85% of the carbon footprint of active research scientists.

Table 1: Environmental footprint of the flights made during the 18 first months of PACIFIC activities.

Transnational meetings	Number of European flights (0.5t CO_2/flight)	Number of Canadian flights (0.5t CO_2/flight)	Number of transatlantic flights (2.5t CO_2/flight)	Total flights CO_2 emission
Kick-Off Meeting **6-7 June 2018**	22		2	**16 t**
Joint test at Las Cruces, Spain **27-29 March 2019** **29-30 April 2019**	10			**5 t**
PACIFIC General Assembly 14-15 May 2019	34		6	**32 t**
Marathon Workshop 12-14 June 2019		6	14	**38 t**
TOTAL	66	6	22	**91 t**

PACIFIC will attempt to reduce this impact by a) systematically paying an extra fee to offset flight emissions; and b) limiting the total number of flights taken by PACIFIC participants.

Other measures taken are to reduce the number of unnecessary emails. According to the Carbon Literacy Project, CO_2 emissions associated with the emails sent each year by a typical office worker is about the same as that of a European air flight.

Conclusion

The new techniques to explore for mineral deposits developed in the PACIFIC project have minimal harm to the environment. However, the plane travel linked to transnational meetings has a significant environmental footprint.