NORNICKEL

White paper

ABOUT THIS WHITE PAPER

This white paper has been prepared by Nornickel Group following the incident at HPP-3 of NTEK JSC (part of Nornickel Group), which occurred on 29 May 2020.

It is intended for a wide range of stakeholders and aims to present the official position of the Company on the causes of the incident, the clean-up and compensatory measures taken, as well as organisational changes implemented to prevent similar incidents in the future.

For the purposes of this white paper, Nornickel Group shall refer to MMC Norilsk Nickel and the entirety of operations forming Nornickel Group. Unless otherwise specified or required by the context, the terms "Company", "Group", "Nornickel" or "the Group companies" shall refer to Nornickel Group.

DISCLAIMER

This white paper discloses the Company's short-, medium-, and long-term goals, objectives, and plans. Plans and intentions are provisional and subject to a number of environmental, economic, political, and legal factors beyond the Company's control. As a result, actual future performance may differ from the forward-looking statements contained in this white paper.

Additional information

For more details and video content on the clean-up operation following the incident at HPP-3, see the Company's official website at www.nornickel.ru/sustainability/cleanup/

Nornickel's annual and sustainability reports are available at: www.nornickel.ru/investors/disclosure/annual-reports/

Contact details

for queries related to the content of this white paper:

Svetlana Ivchenko
Head of Sustainable Development Department
Tel: +7 495 797 8250

Inessa Chernova
Line Director, Sustainable Development Department
Tel: +7 495 797 8638

NORNICKEL

WHITE PAPER ON NTEC'S HPP-3 INCIDENT CLEAN-UP AND RESPONSE

CONTENTS

STATEMENT OF THE PRESIDENT AND CHAIRMAN OF THE MANAGEMENT BOARD

Dear colleagues,

At Nornickel, we have a long-standing commitment to environmental and industrial safety, treating it as an absolute priority and seeking to lead the charge in the Russian metals and mining industry in terms of our environmental and sustainable development programmes.

The fuel spill incident that occurred at HPP-3 of NTEK JSC in May 2020, however, made it clear that our previous efforts had not been sufficient. The ageing of our fuel and energy assets coupled with emerging risks including those associated with soil thawing in permafrost areas pose new challenges to Nornickel.
It is no exaggeration to say that the future of the Company now largely depends on how boldly and effectively we respond.

Our first priority following the HPP-3 incident was to clean up the fuel spill, and prevent it from going large-scale, and we did this successfully. I would like to thank our employees and the teams of the Russian Emergencies Ministry and its State Central Airmobile Rescue Team, the Marine Rescue Service, Slavneft, Transneft, LafargeHolcim, Neftetank, Polytechnika, and other companies and government agencies, as well as volunteers, whose commitment, dedication and professionalism during the clean-up operation carried out in harsh physical and climatic conditions on a 24/7 basis helped prevent a major environmental disaster in the Arctic.

Upon completion of the three-stage clean-up campaign, more than 90% of the spilt fuel was collected, all contaminated soil was excavated and removed, and nearly 500,000 sq m of affected area was treated with sorbents. The diesel fuel residues washed away by the rivers from their banks were collected using sorbent booms. Continuous clean-up efforts were in progress until the beginning of the winter season and will resume in 2021 and 2022, if needed. Our ultimate goal is to rehabilitate disturbed soils and water bodies and restore biodiversity in the area affected by the incident.

The second key challenge for us is to prevent similar incidents in the future. Over the recent five years, we have more than doubled our investment in environmental and industrial safety. Our decision now is to double this spending over the next five years. This means that by 2024, we plan to invest around RUB 100 bn in upgrading the energy infrastructure of the Taimyr Peninsula and improving its industrial safety. This money will help modernise heat and power plants, hydroelectric power plants, the energy system, gas pipelines, and fuel storage facilities. In addition, we will continue studying the properties and dynamics of permafrost, and take steps to improve permafrost monitoring by leveraging advanced tools and technologies.

In 2020, we also began reorganising our corporate governance framework and environmental governance processes, developed a holistic environmental strategy, strengthened our process and environmental monitoring expertise, and set up a number of dedicated departments and functions.

In particular, in March 2021, the Company established a single HSE division to ensure safe and environmentally responsible production practices across our operations. Its function is to develop and implement a unified world-class integrated system for safety and environmental management at Nornickel Group's production facilities.

These steps will help us better understand emerging risks and enhance control over the condition of our production assets.

Nornickel assumes full responsibility for countering all effects of the incident. I would like to emphasise that environmental safety has been and remains our priority, and the management team will make every effort to ensure the reliable operation of our facilities by adopting best available technologies, implementing best practices, and leveraging expertise of our employees and partners.

Vladimir Potanin

President
and Chairman of MMC Norilsk Nickel's Management Board

White paper

SUMMARY OF THE DIESEL FUEL SPILL INCIDENT AT NTEC'S HPP-3

On 29 May 2020, a diesel fuel storage tank at HPP-3 of NTEK JSC in the Kayerkan District of Norilsk failed due to unsealing, with 21,200 tonnes of fuel flowing out of the tank, going beyond the bunding, and getting into the pit, on the adjacent area, and into the Bezymyanny Stream. Further through the Bezymyanny Stream and the Daldykan River, the spill reached the Ambarnaya River, where it was contained by protective booms[1], which prevented the diesel fuel from getting into Lake Pyasino.

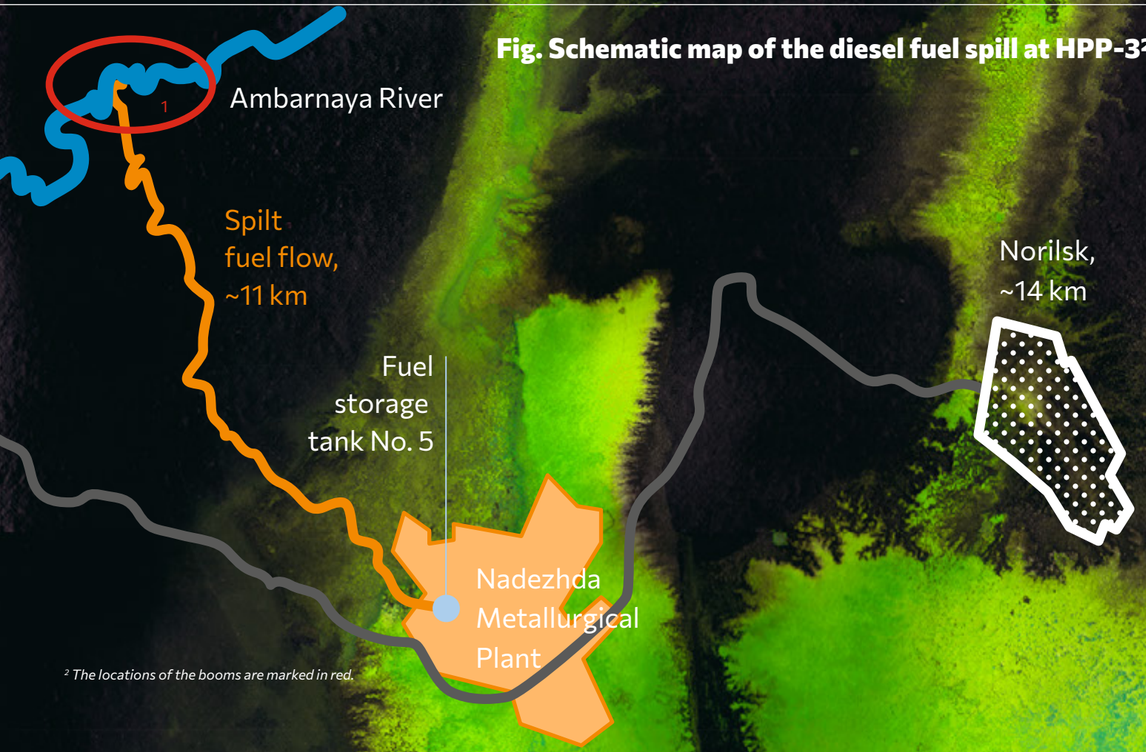
The incident was declared a federal emergency.

Since HPP-3 is located at a distance from Norilsk, the incident did not affect the city and other local settlements, with the key impact being on the soil and water bodies near the tank farm, and human casualties avoided.

According to our estimates, 33% of spilt fuel got into the soil and 67% into the water bodies.

[1] *Floating spill containment systems.*

Fig. Schematic map of the diesel fuel spill at HPP-3[2]



[2] *The locations of the booms are marked in red.*

About HPP-3

- HPP-3 is owned by NTEK JSC (part of Nornickel Group) and mostly serves the municipal facilities of the Norilsk Industrial District and partially the production facilities of Nornickel.
- HPP-3 runs on natural gas as its key fuel source. Diesel fuel is used as a backup (emergency) source and is stored in special fuel tanks.
- The failed tank No. 5 was put into operation in 1985.
- It underwent overhauls in 2017–2018 that were followed by hydraulic tests and industrial safety assessment, with a report issued by Industrial Safety LLC.
- All recommendations for filling the tank with diesel fuel for the first time after the overhaul issued as part of the industrial safety assessment were implemented along with appropriate controls.

TIMELINE OF KEY EVENTS

INCIDENT DATE

29 May 2020

12:45

Local time

Diesel fuel storage tank No. 5 at the tank farm of NTEK JSC's HPP-3 failed due to unsealing, which resulted in a diesel fuel spill.

A car driving outside the storage depot caught fire due to contact with spilt fuel, causing a fire on an area of around 300 sq m

TIMELINE OF THE CLEAN-UP OPERATION[3]

12:55

The dispatcher reported the information about the fuel spill and subsequent fire.

12:57

The reported information was confirmed by HPP-3's team.

12:59

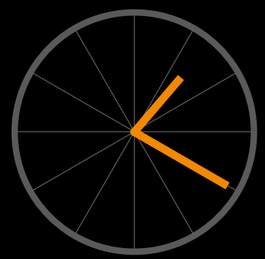
The fire-fighting crew of Nornickel's Polar Division arrived on the site.

13:08

The information about the incident was reported to the Unified Dispatch Department of the Siberian Power System based in Kemerovo.

13:10

The information about the incident was reported to the Single Dispatch Service of the Civil Defence and Emergency Department of the Norilsk administration.

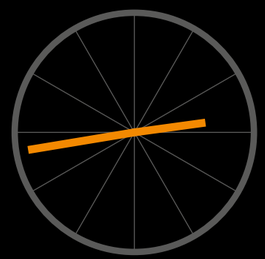


13:20

The information about the incident was reported to the Analysis and Response Centre of the Russian Ministry of Energy in Moscow.

13:49

The information about the incident was reported to the Analysis and Response Centre of the System Operator of the Unified Energy System.



14:43

The fire near the fuel storage facilities was extinguished.

14:59

Emergency Form No. 2[4] was sent to the Single Dispatch Service.

15:00

The teams of NTEC JSC, Nornickel's Polar Division, and third parties launched a clean-up operation.

16:41

Emergency Form No. 3[5] was sent to the Single Dispatch Service.

17:05

Emergency Form No. 4[6] was sent to the Single Dispatch Service.

18:40

NTEC JSC's order declaring a state of emergency was sent to the Single Dispatch Service.

*[3] Interactive content relating to prompt response and clean-up is available at **https://29052020.ru/***

[4] Report on an emergency event and its details

[5] Information (report) on measures to protect local communities and territories as well as on emergency response, rescue and other operations

[6] Information (report) on forces and resources involved in emergency response

CLEAN-UP OPERATION (STAGES 1 AND 2)

CLEAN-UP OPERATION (STAGES 1 AND 2)[7]

MAY 30

By the morning of 30 May, over 100 tonnes of spilt fuel was collected.

The contaminated soil was being removed and the area treated with sorbents[8].

Aerial reconnaissance was conducted to select locations for the booms.

The Murmansk-based team of the Federal Marine Rescue Service was mobilised to carry out a clean-up operation in Norilsk.

MAY 31

Excavation and removal of the contaminated soil continued as well as the collection of fuel from the territory adjacent to the back-up diesel fuel storage facilities at HPP-3.

The installation of spill booms and the collection of fuel from the surface of the Ambarnaya River started at 12:30.

Nornickel's and the Federal Marine Rescue Service's (Murmansk) teams started to set up a tent camp in the Ambarnaya River estuary.

JUNE 01

Four additional lines of spill booms were installed, and the collection of oil products from water bodies continued. More forces and resources were mobilised to join the clean-up operation.

JUNE 02

NTEC, the Federal Marine Rescue Service, and the Russian Emergencies Ministry succeeded in containing the spill in the Ambarnaya River by several cascades of booms. The Federal Marine Rescue Service continued to collect spilt oil products to have them processed later.

JUNE 03

Additional equipment was delivered to the site, including spill booms, oil skimmers[9], sorbents and sorbent pads, inflatable and framed containers for collecting oil products.

JUNE 04

The Russian Emergencies Ministry deployed a 100-people team and delivered about 20,000 tonnes of various equipment and supplies to Norilsk. The Emergencies Minister Evgeniy Zinichev held a working meeting in Norilsk to discuss the oil spill clean-up operation.

A total of 201 tonnes of diesel fuel was collected from the HPP-3 area since the start of the clean-up. In addition, the Marine Rescue Service crew pumped out 137 tonnes of diesel fuel from the Ambarnaya River and installed seven lines of floating booms.

JUNE 05

The clean-up team was expanded to a total of 500 people. Experts from Slavneft and Transneft arrived at the site, carrying special equipment to join the efforts of collecting fuel from the water surface. 6,730 tonnes of contaminated soil was removed from the HPP-3 site and the adjacent area, 400 tonnes of water and fuel mixture was pumped out, and 6,500 sq m of area on the banks of the river were treated with sorbents. Additional 8 tonnes of sorbent were delivered to Norilsk to continue an effective clean-up operation.

JUNE 06

Following a working meeting, Alexander Chupriyan, Russia's First Deputy Minister for Emergency Situations, confirmed that the action taken was sufficient to clean up the fuel spill in Norilsk.

As at 6 June, over 500 people and 126 units of equipment, including 8 aircraft, were taking part in the clean-up operation.

JUNE 07

As at 7 June, over 500 people and more than 200 units of equipment were taking part in the clean-up operation.

About 50,000 tonnes of contaminated soil was removed and 949 cu m of the water and fuel mixture collected from the territory adjacent to HPP-3. 913 cu m of the water and fuel mixture was pumped from the Ambarnaya River surface.

A total of 18 lines of booms were deployed on the Ambarnaya River. On top of that, 2 additional lines of booms were installed at the Bezymyanny Stream influx into the Daldykan River to prevent potential contamination of water bodies with diesel fuel residues from the territory around HPP-3.

JUNE 08

A total of 5,400 cu m of contaminated soil was removed from the HPP-3 area in the past 24 hours. 1,600 cu m of the water and fuel mixture was pumped out of the water bodies. The concentration of pollutants in the water bodies dropped sixteen-fold. The Dudinka Arctic Search and Rescue Unit of the Russian Emergencies Ministry joined the clean-up operation.

[7] Based on the data of the response task force.

[8] Solids or liquids that absorb contaminants from the environment.

[9] Machines for separation (skimming).

CLEAN-UP OPERATION (STAGES 1 AND 2)

JUNE 10

3,700 cu m of the water and fuel mixture was collected over the past 24 hours, including 3,030 cu m pumped from the Ambarnaya River surface. 6,800 tonnes of contaminated soil was removed and hauled to disposal sites.

JUNE 11

Over 3,000 cu m of the water and fuel mixture was pumped from the Ambarnaya River surface and 418 cu m of mixture was pumped out of storage tanks in the HPP area, bringing the total water and fuel mixture collected to 12,500 cu m.

JUNE 12

Over 700 cu m of the water and fuel mixture was pumped from sumps[10] located in the HPP-3 area, bringing the total water and fuel mixture collected to 17,800 cu m.

JUNE 09

As at 9 June, 673 people and 264 units of equipment were taking part in the clean-up operation carried out in shifts on a 24/7 basis.

About 1,500 cu m of the water and fuel mixture was collected from the territory adjacent to HPP-3, including 400 cu m collected in the past 24 hours. A total of 23,000 cu m of contaminated soil was removed and hauled to disposal sites at HPP-3.

5,200 cu m of the water and fuel mixture was pumped from the Ambarnaya River surface, including 2,470 cu m pumped in the past 24 hours. The total number of booms was increased from 18 to 22.

[10] A reservoir serving as a receptacle for water.

JUNE 13

Delivery of 30 additional containers for collecting oil products with a total capacity of 7,500 cu m was planned to support the clean-up effort. As at 13 June 2020, 734 people and 285 units equipment were taking part in the clean-up operation.

4,100 cu m of the water and fuel mixture was collected over the past 24 hours (or a total of 21,900 cu m since the start of the clean-up).

9,578 tonnes of contaminated soil was removed from the HPP-3 area (or a total of 55,700 tonnes since the start of the clean-up).

3,400 sq m of the contaminated area was treated with sorbents over the past 24 hours (or a total of 55,700 sq m since the start of the clean-up).

JUNE 15

Nearly 3,000 cu m of the water and fuel mixture was collected over the past 24 hours (or a total of 28,700 cu m since the start of the clean-up).

2,500 sq m of the contaminated area was treated with sorbents over the past 24 hours (or a total of 61,600 sq m since the start of the clean-up).

JUNE 14

As at 14 June 2020, 743 people and 301 units equipment were taking part in the clean-up operation.

3,900 cu m of the water and fuel mixture was collected over the past 24 hours despite harsh weather (or a total of 25,800 sq m since the start of the clean-up).

9,900 tonnes of contaminated soil was removed from the HPP-3 site (or a total of 65,600 tonnes since the start of the clean-up).

3,400 sq m of the contaminated area was treated with sorbents over the past 24 hours (or a total of 59,100 sq m since the start of the clean-up).

JUNE 16

The first stage of the clean-up was completed. Over 90% of the spilt fuel and around 70% of the contaminated soil were collected.

A total of 30,500 cu m of the water and fuel mixture was collected from the HPP-3 area and the Ambarnaya River since the start of the clean-up. A total of 63,100 sq m of area on the banks of the Daldykan river was treated with sorbents. A total of 84,000 tonnes of contaminated soil was removed.

As at 16 June, over 700 people with more than 300 units of equipment were working round the clock to clean up the spill.

CLEAN-UP OPERATION (STAGES 1 AND 2)

JUNE 17

31,300 cu m of the water and fuel mixture was collected since the start of the clean-up, including 25,000 cu m of mixture pumped from the Ambarnaya River.

8,400 tonnes of contaminated soil was removed and hauled to disposal sites at HPP-3 over the past 24 hours (or a total of 92,000 tonnes since the start of the clean-up).

700 sq m of the contaminated area was treated with sorbents over the past 24 hours (or a total of 63,800 sq m since the start of the clean-up).

As at 17 June 2020, 688 people and 301 units equipment were taking part in the clean-up operation.

JUNE 18

6,700 cu m of the water and fuel mixture was collected from the HPP-3 area over the past 24 hours.

A total of 32,000 cu m of the water and fuel mixture was collected and a total of 99,600 tonnes of the contaminated soil was removed since the start of the clean-up.

An area of 65,000 sq m was treated with sorbents.

A total of 45 lines of booms were installed.

JUNE 19

The second stage of the clean-up at HPP-3 in Norilsk was completed, as was announced at a meeting with President Vladimir Putin. Most of the spilt fuel was cleaned up.

"You have done a truly monumental amount of work. It is good to know that the worst of the crisis is behind us," Vladimir Putin said at the outset of the meeting.

The joint clean-up team collected 32,000 cu m of the water and fuel mixture and 103,000 tonnes of the contaminated soil. The mixture was placed into 103 watertight containers.

Jointly with the supervisory authorities, Nornickel is conducting an ad-hoc technical audit of all its production buildings and facilities.

KEY MEASURES AS PART OF STAGE 3 OF THE HPP-3 SPILL CLEAN-UP, INVESTIGATION OF THE INCIDENT CAUSES, AND ASSESSMENT OF ENVIRONMENTAL DAMAGE

JUNE'20

- Nornickel commenced work to develop a land rehabilitation programme to restore the areas contaminated as a result of the diesel fuel spill.
- Nornickel launched regular surface water quality monitoring in the Daldykan and Ambarnaya rivers.
- Nornickel developed a programme of quick-impact initiatives for 2020–2021 to boost industrial safety and strengthen protective structures of its hazardous facilities.
- The Arctic Development Project Office and the Association of Indigenous Peoples of the North, Siberia and Far East of the Russian Federation launched an ethnological expert review to assess the damage caused to indigenous northern minorities.
- By the end of June, the first and second stages of the clean-up operation were completed. Over 90% of the spilt fuel and over 70% of the contaminated soil were collected. The water and fuel mixture was placed in 103 watertight containers while the soil was taken to sealed-off hangars to prevent any risk of affecting the environment.
- At the peak of the clean-up, over 700 people and more than 300 units of equipment were taking part in the operation, with 100 booms installed.

JULY'20

- Work commenced to pump the collected water and fuel mixture from the site located on the bank the Ambarnaya River into a temporary tank farm near the Lebyazhye tailing dam. Nornickel engaged Neftetank and Polytechnika to lay down a pipeline for pumping the water and fuel mixture. Separation of the water and fuel mixture was running in parallel.
- The excavation of the contaminated soil was completed.
- The condition of the contaminated areas was being assessed.
- Nornickel developed a detailed action plan to improve industrial safety at the Company's facilities and submitted it to Russia's nuclear and environmental watchdog Rostechnadzor (Federal Environmental, Industrial and Nuclear Supervision Service).
- The Environmental Task Team of Nornickel's Board of Directors led by the Board Chairman Gareth Penny that was set up after the incident, held the first meeting.
- MMC Norilsk Nickel established a new role of Senior Vice President for Sustainable Development.
- Nornickel's Polar Division established a new role of Deputy CEO' for industrial safety and environment protection.
- Nornickel engaged ERM, a global consultancy firm, to conduct an independent assessment of the causes of the fuel spill incident.
- Works to dismantle fuel storage tank No. 5 commenced.
- The Great Norilsk Expedition organised by the Company jointly with the Siberian Branch of the Russian Academy of Sciences moved on to fieldwork.

AUGUST'20

- The Great Norilsk Expedition went on to do fieldwork.
  For more details, see the Great Norilsk Expedition section.
- Nornickel continued regular surface water quality monitoring in the Daldykan and Ambarnaya rivers.
- The condition of the contaminated areas was being assessed.
- The ethnological expedition launched by the Arctic Development Project Office and the Association of Indigenous Peoples of the North, Siberia and Russia's Far East released its report.
  For more details, see the Ethnological Expedition section.

SEPTEMBER'20

- The pumping of 25,000 cu m of the water and fuel mixture for subsequent separation was completed using over 40 km of newly built flexible piping.
- The Great Norilsk Expedition had fieldwork completed and moved on to lab tests of samples and data analysis.
- Nornickel and the Siberian Branch of the Russian Academy of Sciences signed a cooperation agreement for a comprehensive study of the Arctic.
- Nornickel signed cooperation agreements with three organisations representing the interests of indigenous northern minorities, and decided to pay compensation to the affected indigenous communities in the amount of RUB 175 mln.
  For more details, see the Ethnological Expedition section.

OCTOBER'20

- The third stage of the clean-up was completed.
- According to the latest data, about 35,000 cu m of the water and fuel mixture and fuel residues was collected from the surface of water bodies and from the soil, respectively.
- The separation of the water and fuel mixture was completed.

CLEAN-UP EFFORTS AT HPP-3

CLEAN-UP EFFORTS AT HPP-3

Main stages of the clean-up and environmental reclamation programme

2020

29 May — 19 June 2020

Stages 1 and 2:
Fuel spill clean-up

- Over 90% of the spilled fuel was collected, with contaminated soil removed (completed in July);
- The contaminated soil was placed into hangars to avoid further risk to the environment;
- The water and fuel mixture was being collected and pumped from the Ambarnaya River into temporary bladder tanks;
- Over 700 people and more than 300 units of equipment were taking part in the clean-up operation.

June—October 2020

Stage 3:
Residues collection, transportation, and disposal

- As at the end of October, about 35,000 cu m of the water and fuel mixture and fuel residues was collected from the surface of water bodies and from the soil, respectively;
- River banks were washed and treated with sorbents;
- The collected water and fuel mixture was delivered to a temporary tank farm near the Lebyazhye tailing dam for further separation;
- The separation of the water and fuel mixture was completed.

2020—2023

Stage 4:
Recovery

2020–2021:

- Programmes for monitoring natural environment (soil and natural water bodies) and projects for rehabilitation of the contaminated land were developed;
- Works commenced to replace contaminated soil near HPP-3 and sow perennial grasses in the affected area.

2021 – until the disturbed and contaminated land is completely restored

- Disposal or treatment of the sorbents and collected soil contaminated with oil products;
- Reproduction of aquatic bio-resources.

Prompt response. Stages 1 and 2 of the clean-up

Fig. Booms on the Ambarnaya River

Fig. Contaminated soil collected and removed from the spillage area

On 29 May at 12:55 p.m. local time, tank unsealing and a fire were reported. In the first 10 minutes, the Company's rescue unit arrived at the incident site and took action to extinguish the fire. In the next hour, the information about the incident was reported to the Single Dispatch Service, the regional EMERCOM office, Federal Ministry of Emergency and Disaster Response in the region, the Unified Dispatch Department of the Siberian Power System (a division of the Analysis and Response Centre of the System Operator of the Unified Energy System based in Kemerovo), the Analysis and Response Centre of the Russian Ministry of Energy in Moscow, and the Analysis and Response Centre of the System Operator of the Unified Energy System.

At the same time as the authorities and the key government agencies were informed, Nornickel immediately responded to the fuel spill with a series of clean-up actions. An emergency response task force was set up in Norilsk and included representatives of local and regional authorities, Nornickel's senior management, law enforcement , regulatory and other government agencies.

The clean-up was conducted in and around HPP-3, in the adjacent areas and waterways.

About 9,000 cu m of the water and fuel mixture was pumped out of drain sumps installed on the HPP-3 site. The sorbents available on site were used on the contaminated bank line immediately to prevent further contamination.

On 31 May, the installation of spill booms, as well the collection of fuel from the water surface of the Ambarnaya River, started. The Federal Marine Rescue Service joined the efforts to eliminate the consequences of the incident. The Murmansk-based team consisted of 15 professionals with a track record of over 50 successful clean-up operations all over the world.

On 3 June, the Russian Emergencies Ministry declared a federal emergency. To contribute to the clean-up, it deployed a 100-people team and brought various equipment and consumables to Norilsk.

On 5 June, experts from Slavneft-Megionneftegaz PJSC and Transneft Siberia JSC arrived at the emergency site, carrying special equipment to join the efforts of collecting fuel from the water surface. Additionally, the Company engaged the Swiss-French LafargeHolcim and Norwegian experts.

The teams worked around the clock in two shifts. The progress rate of treatment of the contaminated land and collection of the water and fuel mixture nearly doubled every day.

On 12 June, aircraft monitoring identified that birds (swans, seagulls, ducks) were getting back closer to the incident scene, suggesting that the local fauna was gradually recovering.

By 19 June, Stages 1 and 2 of the clean-up were completed: over 90% of the water and fuel mixture and 70% of the contaminated soil were collected.

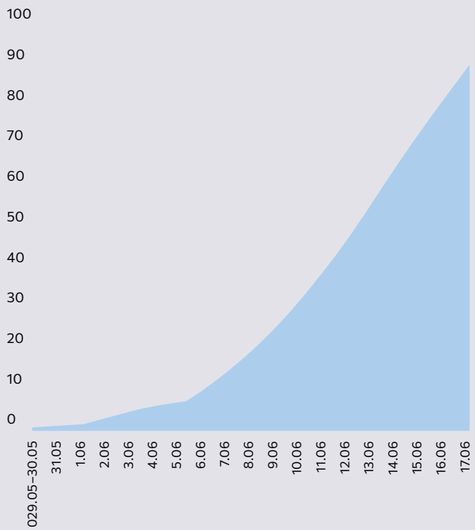
A total of over 700 people and more than 300 units of equipment took part in the clean-up operation.

CLEAN-UP EFFORTS AT HPP-3

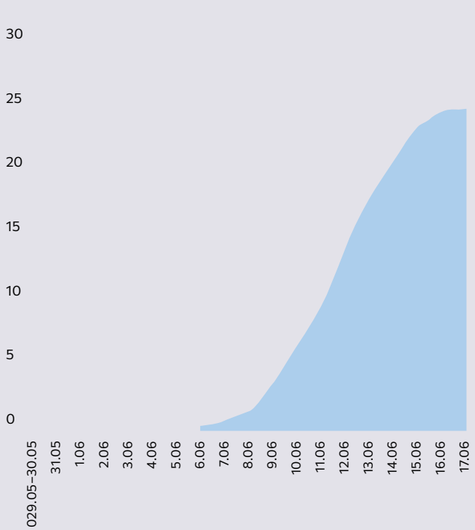
By the end of Stage 2:

- 55 booms were deployed, including 16 lines of sorbent booms to prevent further spill into Lake Pyasino and the Kara Sea;
- over 100,000 tonnes of the contaminated soil was removed from the HPP-3 site;
- over 32,000 cu m of the water and fuel mixture was collected from the area adjacent to HPP-3 and the Ambarnaya River;
- over 70,000 sq m of the land was treated with sorbents;
- NTEC's team launched an inspection of the back-up diesel fuel storages with special attention paid to the assessment of risks associated with the subsidence of soil under hazardous facilities.

Contaminated soil collected. Volume accumulated, '000 tonnes



Water and fuel mixture collected from the Ambarnaya River Volume accumulated, k cu m



Stage 3. Disposal of the water and fuel mixture and contaminated soil

Neftetank and Polytechnika supplied 245 bladder tanks, 41 km long flexible piping, 20 motor pumps, and 95 km of booms.

"For the clean-up, we have been using the world's best pumping and separation technologies. I can say that this is the first time ever that the water and fuel mixture has to be pumped over such a long distance. We pioneered this, and to good results."

Igor Korobkin,

Head of NTEC's Emergency Response Directorate

In July, the next stage of the clean-up was launched: transportation and pumping of the water and fuel mixture. The excavation of the contaminated soil was completed. The Company engaged professionals from Neftetank and Polytechnika to leverage their experience and technologies for pumping out the mixture collected from the surface of the Ambarnaya River.

Around 25,000 cu m of the water and fuel mixture had to be pumped. The water and fuel mixture was pumped into a temporary tank farm near the Lebyazhye tailing dam.

Flexible piping connecting the separation site at the Lebyazhye tailing dam and the work site near the Ambarnaya River was delivered to Norilsk by Neftetank. To install a reinforced flexible pipeline, the Company delivered 18 km flexible pipes, relevant accessories, and four high-capacity pump units to the emergency area. The installation involved a 40-people specialist team working for two weeks. Additionally, Neftetank manufactured and delivered a total of 173 Model MR-NT-250-N tanks to the emergency area.

Polytechnika laid down 21.8 km of the field trunk hose-type pipeline for pumping the water and fuel mixture. Polytechnika is also a supplier of elastic tanks for the clean-up operations. The water and fuel mixture collected over the two weeks of the clean-up efforts was stored in elastic tanks of the PER-250-N series.

On 21 July, the mixture pumping from the site on the Ambarnaya River bank to the separation area was launched. The clean-up teams worked around the clock in three shifts, with an average pipeline throughput rate at 30–40 cu m per hour.

In parallel with the pumping out of the water and fuel mixture, tanks were dismantled and installed: as they were emptied, the filled tanks at the Ambarnaya River were dismantled and transported by helicopter to a temporary tank farm near the Lebyazhye tailing dam, where the separation was carried out.

To separate the water and fuel mixture, Nornickel procured special equipment — a high-capacity separator supplied by the Norway marine rescue service, eight pumping units, and three filtration units. Diesel fuel was treated and is planned to be re-used for heating after its chemical analysis and further assessment. After the treatment, the separated water was pumped into the Company's water circulation system and re-used within a closed-loop water supply system as process water.

The contaminated soil was temporarily placed into hangars with a total capacity of 100,000 tonnes built on a concrete platform and having a roof to ensure protection from precipitation. At the same time, the bank line of the Ambarnaya River was washed in a reduced-impact way. The clean-up efforts were carried out by SPASF Priroda LLC and continued until the beginning of the winter season.

CLEAN-UP EFFORTS AT HPP-3

Volunteer engagement in the clean-up

> **“We are monitoring the response to the federal-level emergency, including its progress in Norilsk, on a daily basis. You are working together to tackle the incident as a single team, and we greatly appreciate your contribution. We are positive that you will maintain the momentum until the end of your shift and pass it on to the next shift.”**
>
> Colonel General
> **Alexander Chupriyan,**
>
> Deputy Minister of the Russian Emergencies Ministry

The All-Russia People's Front youth team and volunteers began the clean-up on 12 August. On that day, the first team of 40, including volunteers from all over the country, began collecting pollutant residues, used booms and sorbent in the Ambarnaya River area. The efforts were coordinated by the Russian Emergencies Ministry, NTEC and the Marine Rescue Service. A special tent camp was set up at the Ambarnaya River to accommodate the group.

During the first two weeks, the first group of volunteers covered the area of 2,900 sq m, collecting 84 tonnes of used sorbent and 15,761 m of sorbent booms, recovering 1,500 m of permanent floatation booms, and transporting them to the camp for storage.

The first shift of volunteers included members of the All-Russia People's Front youth team from the Amur Region, Trans-Baikal Territory, Kaluga Region, Kamchatka Territory, Krasnoyarsk Territory, Leningrad Region, Nenets Autonomous Area, Nizhny Novgorod and Novgorod regions, republics of Adygeya, Buryatia, Ingushetia, Crimea and Tuva, as well as the Rostov, Tula and Saratov regions and the Stavropol Territory. They worked together with ten students of the Norilsk State Industrial Institute.

The second shift (26 August to 9 September) comprised of volunteers from the Krasnoyarsk Territory, Krasnodar Territory, Orenburg Region, Pskov Region, Republic of Tatarstan, Saratov Region, Moscow, Amur Region, Republic of Dagestan, Rostov-on-Don, Kamchatka Territory, Republic of Komi, as well as students of the Norilsk State Industrial Institute.

They worked side by side with members of Nornickel's Leader movement for young professionals, namely employees of Medvezhy Ruchey, Polar Construction Company, Centralised Storage Facilities, Mayak Mine, and NTEC[11].

[11] Photos and videos from the clean-up are available at:
https://yadi.sk/d/C6FM6h6_PxARkg

Disassembly of damaged tank

> **The tank was first dismantled into large fragments and then cut into smaller pieces. All metal (a total of ca. 450 tonnes) was disposed of. On 10 September 2020, the emergency tank was fully dismantled.**

On 25 July, NTEC began disassembly of damaged HPP-3 tank following extensive preparation, which included the drafting of a storage tank No. 5 disassembly project by Norilsknickelremont Maintenance and Construction and two specialist organisations.

As part of the preliminary works, the sloping bunds were disassembled, and gravel was brought in and formed to enable machinery transportation and installation. The experts made access holes and fed wire ropes through them to stabilise the damaged roof.

NTEC commissioned the services of the specialised company Hydrotechnologies Siberia (Irkutsk) to clean and degas the tank.

Works completed in 2020

Fig. Disassembly of damaged tank No. 5

By the end of October, before the snow cover settled, Nornickel experts completed the Stage 3 of the clean-up programme.

Upon excavation, all contaminated soil was collected and transported to roofed hangars with concrete foundations for temporary storage. Lands affected by the excavation were subsequently reclaimed to prepare them for the intended use.

To prevent further spread of the spill and water pollution, 110 lines of containment and sorbent booms were installed on the Ambarnaya River by the end of September 2020. Since the beginning of the clean-up, 34,500 tonnes of the water and fuel mixture were collected, 423,000 sq m of surface in the Ambarnaya River area were treated with sorbents, and ca. 190,000 tonnes of contaminated soil were collected and placed in special hangars.

The works to collect residual oil products and wash and treat river banks with sorbents continued until the temperature went below zero. Once 2021 spring floods are over, the lands will be examined to assess the scope of technical and biological reclamation required to restore the environment.

In June–September 2020, the Company also monitored the condition of soil and water. Nornickel experts and Federal Service for Supervision of Natural Resources (Rosprirodnadzor) team carried out regular aerovisual inspections of water bodies of the Norilo-Pyasinskaya water system in search for contaminated areas. The Russian Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor) checked the quality of the drinking water sources of the city of Norilsk and detected no violation of maximum permissible concentration levels of harmful substances.

The Company also set up areas for control and monitoring of river flora and fauna and water quality on the Ambarnaya River up to Lake Pyasino.

CLEAN-UP EFFORTS AT HPP-3

Incident and clean-up coverage

By the end of Stage 3:

- the spill was fully contained;
- the collection of the water and fuel mixture was completed;
- over 25,000 cu m of the water and fuel mixture was pumped through newly installed pipelines from the work site located on the Ambarnaya River bank into a temporary tank farm near the Lebyazhye tailing dam;
- the separation of the water and fuel mixture was completed;
- all scheduled clean-up activities were completed on time.

The Company disclosed the incident to the public and all stakeholders immediately, on 29 May. A Fuel Spill Clean-Up[12] section was created on the Company's website to post regular updates.

Interactive maps, figures and charts are used to deliver information in an easily digestible way.

The information is provided both by Company managers and clean-up participants working on the site.

Despite the state of emergency and pandemic-related restrictions, the Company organised six press tours to the spill site and regular journalist visits. It also promptly set up an ad hoc conference call between the management, investors, and the media. All interested media representatives immediately received complete and reliable information.

The Company promptly informed all stakeholders about the progress of clean-up and reclamation efforts. The civic chambers of Russia and Norilsk organised dedicated round tables, which served to provide information on the clean-up progress and stage discussions with the Company's top managers.

Nornickel also provided comprehensive information on the lessons learned and steps taken as a result of the incident investigation, including organisational and structural changes.

[12] *The section is available at:*
https://www.nornickel.ru/sustainability/cleanup/

Land rehabilitation programme to restore the areas contaminated as a result of the diesel fuel spill, and biodiversity restoration programme

In 2020:

- **489,000 sq m was cleared of contaminants using 121 tonnes of sorbent;**
- **almost 1,000 sq m of the Ambarnaya River banks and 21,000 sq m of the Bezymyanny Stream and the Daldykan River banks were washed;**
- **the fuel residues washed out from the river banks were collected using more than 110 sorbent booms;**
- **pits from soil excavation near HPP-3 were filled;**
- **works commenced to replace contaminated soil near HPP-3 and sow perennial grasses in the affected area.**

Since all assessments were performed visually during the clean-up, NTEC carried out a series of subsequent clarifying assessments:

- **geodetic measurements at temporary storage facilities for oil products. The assessments revealed a total of 14,071.4 cu m of separated diesel fuel in the temporary tank farm at the Lebyazhye tailing dam and 1,265.6 cu m at the back-up diesel fuel storage at HPP-3;**
- **geodetic measurements of oil-contaminated soil. The collected contaminated soil amounted to 127,476 tonnes.**

In parallel with the clean-up operation at HPP-3, Nornickel engaged ECOTERRA to develop a comprehensive programme to rehabilitate the land impacted by the fuel spill. The draft document was submitted to the Norilsk Administration and Interagency Commission created by the Russian Ministry of Natural Resources for approval.

The key approach proposed by ECOTERRA experts suggests using the best available technologies with a limited impact when selecting suitable initiatives and technical solutions.

In 2020, in line with the land rehabilitation programme, a system of oil traps was installed, while the drain systems installed during the clean-up were removed. The programme also provides for the installation of booms in the spring of 2021 and the use of sorbents during snow melt and ice drift to eliminate pollution residues.

In 2021–2022, the Company will carry out technical and biological initiatives to rehabilitate disturbed and contaminated land, including steps to restore its economic and environmental value: sowing mixed seeds, applying mineral and organic fertilizers for faster fertility recovery.

The rehabilitation will make the lands suitable for the intended purpose and permitted use.

In 2021–2023, Nornickel plans to implement additional programmes to restore biological resources, which will include the study of the aquatic biological resources of the Daldykan and Ambarnaya rivers, release of fry into water bodies to maintain the population of rare fish species, and the construction of three fish breeding facilities.

The Company is also developing new programmes to monitor the environment (soil, surface water, vegetation, fauna) within the area polluted as a result of the diesel fuel spill. The Company undertook to finance the clean-up and environment restoration in full.

REPORT ON INVESTIGATION OF HPP-3 INCIDENT CAUSES


НОРНИКЕЛЬ
МЧС
РОССИИ

REPORT ON INVESTIGATION OF HPP-3 INCIDENT CAUSES

Immediately after the incident at HPP-3, Nornickel and Rostechnadzor initiated a technical investigation into the causes of the fuel spill focusing on:

- examination of metal samples from the tank shell;
- examination of welded joints;
- examination of concrete samples from the pile foundation;
- examination of steel samples from steel supports;
- drilling of holes along the piles to verify the bedrock location;
- geological exploration of the area to study underground waters which may have triggered the permafrost thawing.

Official investigation results

Based on the review of design and technical documents, site inspection, interviews of witnesses and officers, and the expert group's opinion, Rostechnadzor's commission established the following causes of the incident *http://en.gosnadzor.gov.ru/news/443/*

Technical causes:

- the loss of containment at RVS-30000 vertical welded steel tank (No. 5) resulting in 25,324.567 cu m (21,163.300 tonnes assuming a density of 812.5 kg/cu m) of diesel fuel spilt was caused by overloading and insufficient bearing capacity of the raft foundation and reinforced concrete piles with the subsequent progressive destruction of 33 piles located around and inside the pile space, as well as the destruction of the cast reinforced concrete foundation and its subsidence by up to 1.5 m under the tank floor.

Organisational causes:

- flaws in the design of the reinforced concrete pile foundation due to the low quality of design work[13];
- construction defects: eccentricity of load distribution from the raft foundation to the piles not in line with design parameters, no traverse reinforcement in the monolithic casing of pile heads, dry waste at the well bottom beneath the pile end and up to 30% of the pile not resting on rock significantly increased the stress and strain on the reinforced concrete pile foundation. Loose soils underneath the piles caused redistribution of load in the pile foundation, with load on some of the piles exceeding their bearing capacity[14].

Other causes:

- poor control over the reliable and safe operation of the structures (the pile foundation at tank No. 5) by the responsible persons: failure to assess the actual state of the pile foundation to verify its compliance with design documents and applicable regulations, and failure to conduct an examination of its strength, stability and operational reliability, taking into account the specific operating conditions;
- failure to observe the requirements when conducting an industrial safety assessment, specifically when conducting industrial safety assessment No. 1495/2018-EPB in 2018, where the expert organisation (Industrial Safety LLC) failed to assess the actual state of the pile foundation at RVS-30000 tank No. 5 to verify its compliance with design documents and applicable regulations.

Following the investigation of the HPP-3 incident, the Yenisey Department of Rostechnadzor imposed a maximum fine on Nornickel for industrial safety violations[15].

On 10 March 2021, the Company fully paid the fine imposed by court over the diesel fuel spill at NTEC's HPP-3 in the amount of RUB 146.2 bn. Of this amount, RUB 145.5 mln was paid to Russia's federal budget and RUB 685 mln went into the budget of Norilsk.

[13] *Designed in 1981.*

[14] *Constructed in 1984.*

[15] *www.gosnadzor.ru/news/65/3454/*

Independent assessment of the incident causes

ERM's review focused investigating the incident and its causes, assessing the Company's clean-up efforts, and making recommendations to mitigate risks at the Company's production facilities.

Fig. Failure of some of the reinforced concrete piles which supported the tank.

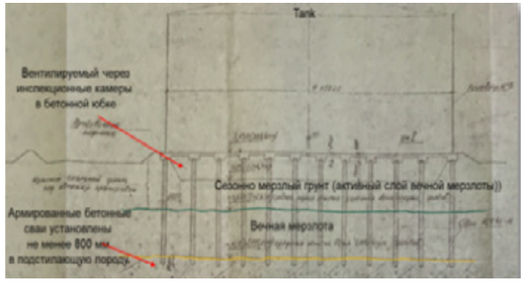


Fig. Tank No. 5 original design drawing dated 1981.

The incident mainly stems from flaws in the design (1981) and construction (1984) of tank No. 5 leading to overloading and the subsequent destruction of 33 reinforced concrete piles and the foundation which subsided by up to 1.5 m under the tank floor.

On top of that, Environmental Resources Management Limited (ERM), a world-class environmental advisory company, was retained by Nornickel's Board of Directors to carry out an independent assessment. ERM is a leading global sustainability consulting firm providing environmental, health, safety, and risk advisory services to businesses.

ERM was commissioned in July 2020 but due to COVID-19 restrictions was unable to gain access to the site until 15 September 2020. By this time, the tank had been fully dismantled. As a result, ERM's assessment of the root causes of the incident was based on available documents, photos and interviews only. ERM specialists identified possible causes of the incident, analysed the Company's response and made their recommendations going forward.

Based on their review, ERM identified a number of the most likely causes of the incident.

The root cause of the tank failure was differential subsidence of its foundation following the destruction of several reinforced concrete piles which supported the tank. This subsidence resulted in a rupture of the tank shell where the wall was welded to the tank floor.

Following its investigation, the regulator reported that some of the piles were found to be shorter than their design length, failing to be installed 800 mm into the bedrock during construction in 1984 as required by design documents and applicable regulations.

Climate changes tend to affect the permafrost and the bearing capacity of soils, which renders such piles susceptible to potentially rapid settlement and creep.

ERM specialists also identified a number of flaws in the management of diesel fuel storage tanks. This is highlighted by a series of missed signals and lack of specific monitoring which in combination could have been taken as warning signs of the subsidence and could potentially help avoid the failure, including:

- **loss of verticality and a 80 mm gap between the foundation and the tank floor identified during an industrial safety assessment in 2018;**
- **lack of focus on the foundation during tank inspections;**
- **lack of permafrost monitoring, which is not a statutory requirement for such tanks.**

Because of the above factors, the tank safety management was inferior to what would have been expected from tanks of that size. However, ERM emphasises that if the piles had been installed as designed into the bedrock, this failure would have never happened.

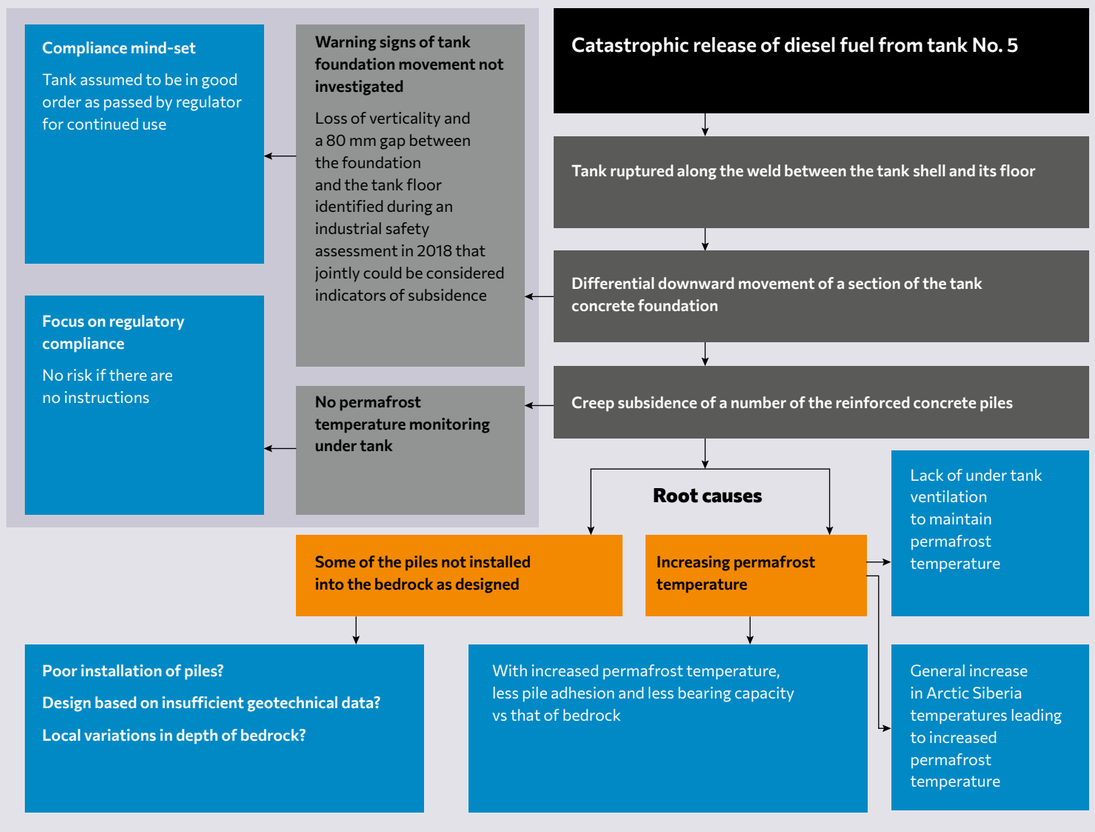
REPORT ON INVESTIGATION OF HPP-3 INCIDENT CAUSES

Following their investigation, ERM made a number of recommendations to enhance risk assessment, improve emergency response and reduce a possible negative impact on the environment.

ERM specialists also identified a number of additional factors contributing to the scale of the spill impact:

- the bund was insufficient in size to accommodate the tank volume: the bund wall was not capable of preventing the dynamic forces of a catastrophic tank failure forcing diesel over the bund wall;
- inadequate risk assessment in the Industrial Safety Declaration (ISD). The catastrophic tank failure scenario was assessed as immaterial due to its low probability ($1.5x10^{-5}$ per year) and minor consequences. The ISD did not contain any recommendations to mitigate such scenario;
- inadequate tertiary containment measures (booms, etc.) to reduce the off-site impact of a catastrophic tank failure;
- lack of immediate resources and response planning required to swiftly react to such a major incident;
- no spill modelling was undertaken to inform the Oil Spill Response Plan.

Summary root cause analysis: tank No. 5 failure



Independent analysis based on satellite data

Following their investigation, ERM made a number of recommendations to enhance risk assessment, improve emergency response and reduce a possible negative impact on the environment.

An international team of reputable researchers have analysed the data acquired by the European Space Agency's Sentinel-2 satellite before, during, and after the incident on 29 May 2020, and concluded that the collapse of the diesel fuel tank may have been caused by climatic, permafrost, and weather conditions. In summary, the Sentinel-2 data show the following:

- the disappearance of snow and ice in the ten days between 21 and 31 May 2020 due to unusual warmth before 31 May 2020;
- the change of water state in Lake Pyasino between 21 and 31 May 2020 and the subsequent increase of the water level in the lake after 31 May 2020;
- development of vegetation between 21 and 31 May 2020 and its active growth after 31 May 2020.

According to the research team, these changes and other factors are consistent with the conceptual model suggesting that abnormally high temperature in May 2020 may have contributed to the collapse of the fuel tank and oil spill at HPP-3 in Norilsk.[16]

ERM recommendations:

"I would like to thank ERM for its insightful report and helpful recommendations. This has been produced under difficult and challenging circumstances. It was important that a globally recognised and respected firm such as ERM undertook an independent review of events and the clean-up efforts by the Company. Significant progress has been made, but with much that must still be achieved. Nornickel remains fully committed to making the necessary progress in environmental affairs to ensure its operations adhere to world-class standards."

Gareth Penny,

Chairman the Board of Directors of MMC Norilsk Nickel

- inspect foundations of all tanks with the similar pile design as tank No. 5 to look for evidence of subsidence and confirm all piles are installed as designed. remove 'at risk' tanks or reduce fuel level in them;
- ensure if there is adequate ventilation under the tanks as per the design solutions in order to preserve permafrost;
- extend assessment to all other tanks focused on review of tank foundation stability with respect to permafrost active zone and trend for climate warming reducing bearing capacities of soils — consider the need for any additional permafrost related protection measures;
- design and implement a permafrost monitoring system for all tankage;
- develop a management system to improve the integrity of the primary containment;
- strengthen the management systems supporting tank integrity, including by improved inspection and maintenance, anti-corrosion measures and possibly decommission tanks where it is considered there is a significant risk of catastrophic failure;
- check the bund capacity/design of all tanks as it may be necessary to construct a secondary bund around these tanks, reduce the height of the bund wall between tanks or increase the overall bund capacity;
- undertake modelling to determine where to locate tertiary containment systems and spill clean-up equipment together with emergency warning and response planning;
- look to booming locations and the provision of emergency response access routes;
- update the spill response plan and carry out emergency response exercises.

[16] *More details on the research are available at https://doi.org/10.1038/s41598-021-83260-7*

REPORT ON INVESTIGATION OF HPP-3 INCIDENT CAUSES

The Company immediately started implementing these recommendations, with the following progress achieved in 2020:

- bunding around tank farms inspected at hazardous production facilities operated by NTEC and used for fuel storage to measure their geometry, actual and potential bund capacity (of the largest tank possible);
- industrial safety assessment conducted at pile foundations of fuel storage tanks across NTEC's hazardous production facilities to verify their actual state and compliance with design documents and applicable regulations;
- regular geodetic monitoring is in place at foundations of vertical cylindrical welded steel tanks, with each tank being individually measured for foundation settlement at specific time intervals depending on how the strain speed and intensity at the foundation affects the tank's strength and stability;
- monitoring is in place to control the technical condition of tanks Nos. 2 and 3 at the back-up diesel fuel storage of HPP-3 operated by NTEC, including temperature control at pile foundations;
- internal regulations developed and implemented to govern the scope, frequency, administration and management of maintenance and repair on the equipment, tanks, process pipelines and engineering facilities, taking into account the specific operating conditions at NTEC's hazardous production facilities;
- engineering survey (geological and geophysical research) conducted at tank farms to identify any potential geohazards;
- HPP-1, HPP-2 and HPP-3 operated by NTEC are not allowed to keep more backup fuel than provided for by the Procedure for Creating and Using Fuel Reserves at Thermal Power Plants, including during the Heating Season approved by the Russian Ministry of Energy's Order No. 469 dated 22 August 2013.

The Company will be further improving its predictive risk identification and emergency response systems and is willing to share the lessons learnt from the HPP-3 incident with any and all stakeholders to ensure environmental safety in the Arctic region.

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

Great Norilsk Expedition[17]

With the Arctic zone development being on the list of the national priorities, the region's environmental safety comes to the fore in the face of global climate change.

To work out effective and sustainable ways of addressing environmental challenges and restoring the areas affected by the fuel spill and prepare recommendations on how to minimise the environmental impact of operations in the Arctic, Nornickel invited scientists from the Siberian Branch of the Russian Academy of Sciences to organise the Great Norilsk Expedition.

The expedition began almost a century after the famous geological expedition led by Nikolay Nikolayevich Urvantsev, a renowned scientist and discoverer. Back then, its participants stayed in the first residential house built in Norilsk. Even though the current expedition was organised within short timeframes to look into the HPP-3 accident, its objectives, goals and scope go far beyond establishing the causes and consequences of the accident.

Mission:

To develop recommendations to form new approaches to responsible business practices in the Arctic zone.

Objectives:

- to conduct comprehensive examinations of environmental media such as water, bottom deposits, soils, vegetation cover, fauna, etc. to assess the current environmental condition;
- to establish the actual harm caused by the HPP-3 accident and the cumulative damage over the years;
- to collect new data to mitigate the risk of incidents and other emergencies caused by geocryological factors and processes;
- to work out recommendations including those aimed at early detection and prevention of adverse effects of progressing processes triggered by permafrost degradation.

> **"The findings of the Great Norilsk Expedition will help us get an unbiased picture of the impact the incident had, free from the influence of the current trends, and identify the most effective instruments, methods and techniques to restore the environment to its previous state."**
>
> **Andrey Grachev,**
>
> Vice President
> at MMC Norilsk Nickel

[17] *Key data and findings of this section are based on the report on the results of the Great Norilsk Expedition by the Siberian Branch of the Russian Academy of Sciences* ***www.sbras.ru/files/news/docs/bne_kratkiy_otchet.pdf***

The Great Norilsk Expedition brought together experts from 14 leading institutes and organisations of the Siberian Branch of the Russian Academy of Sciences:

- Trofimuk Institute of Petroleum Geology and Geophysics (Novosibirsk) — geophysical, hydrochemical, geochemical and microbiological surveys;
- V.S. Sobolev Institute of Geology and Mineralogy (Novosibirsk) — geochemical and geochronological study of sediments and soils;
- Institute of Soil Science and Agrochemistry (Novosibirsk) — soil and vegetation studies;
- Central Siberian Botanical Garden (Novosibirsk) — vegetation cover studies;
- Institute of Chemistry and Chemical Technology (Krasnoyarsk) — hydrochemical studies;
- Sukachev Institute of Forest (Krasnoyarsk) — zoological studies;
- Biophysics Institute (Krasnoyarsk) — hydrobiological studies;
- Melnikov Permafrost Institute (Yakutsk) — geocryological studies;
- Institute of Oil and Gas Problems (Yakutsk) — hydrochemical and microbiological studies;
- Scientific-Research Institute of Agriculture and Ecology of the Arctic (Norilsk) — studies of soil, bottom deposits, and vegetation cover;
- Institute of Petroleum Chemistry (Tomsk) — hydrochemical studies;
- Institute for Water and Environmental Problems (Barnaul) — hydrochemical studies;
- Institute of Economics and Industrial Engineering (Novosibirsk) — mathematical modelling;
- Institute of Computational Mathematics and Mathematical Geophysics (Novosibirsk) — mathematical modelling.

The expedition consisted of five groups of experts from the following fields:

- **terrestrial ecosystems (12 experts);**
- **permafrost soils (7 experts);**
- **hydrobiology (4 experts);**
- **geochronological studies (5 experts);**
- **bio- and zoodiversity (3 experts)**

The main points of the Great Norilsk Expedition included the basins of Taimyr rivers Pyasino, Norilka and Ambarnaya, as well as Lake Pyasino and Lama Lake. The fieldwork spanned the period from 25 July to 1 September 2020. The researchers collected nearly 2,000 samples of water, soils, bottom sediments and living organisms and examined the condition of permafrost soils.

The expedition was carried out under the scientific supervision of Valentin Parmon, Academician, Vice President of the Russian Academy of Sciences and Chairman of the Siberian Branch of the Russian Academy of Sciences. The fieldwork was led by Nikolay Yurkevich, Head of the Laboratory of Ecological and Economic Modelling of the Trofimuk Institute of Petroleum Geology and Geophysics of the Siberian Branch of the Russian Academy of Sciences.

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

Routes

Terrestrial ecosystems

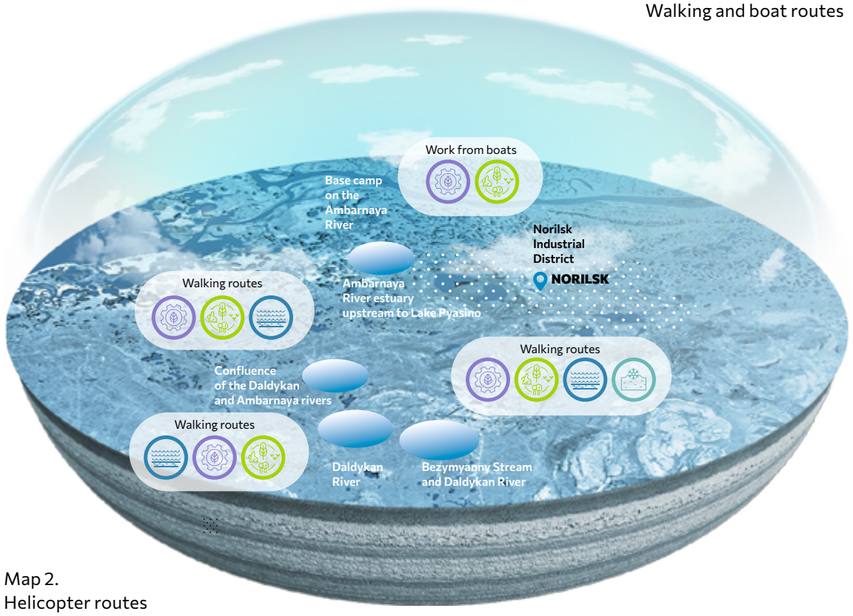
Bio- and zoodiversity

Bottom deposits and soil

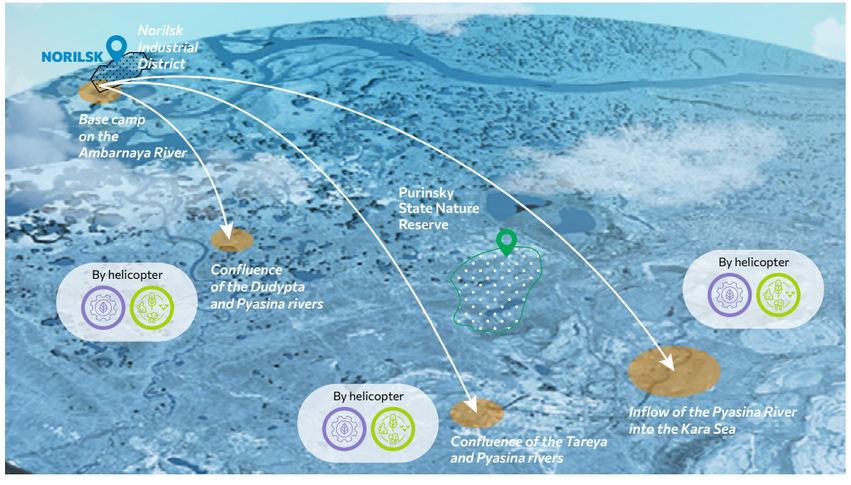
Permafrost soils

Hydrobiology

Map 1.
Walking and boat routes



Map 2.
Helicopter routes



The expedition took in 1,000 km, surveyed dozens of natural sites, collected nearly 2,000 samples with a total weight of around 500 kg.

The routes included six rivers (Pyasina, Daldykan, Ambarnaya, Tareya, Dudypta, Boganida), two lakes (Melkoe and Pyasino) and the coastline of the Kara Sea.

The expedition was covered by a TASS reporter. The latter kept a field diary, recording talks with researchers and sharing his impressions and photos of the Arctic. His diary is available at *https://tass.ru/spec/arcticdiary*

The research then moved to the laboratories of academic institutes in Novosibirsk, Tomsk, Barnaul, Yakutsk, Krasnoyarsk, and Norilsk. The laboratory research aimed to establish the zone affected by the May incident at HPP-3, identify the presence of petroleum products in natural sites, trace back the history of anthropogenic pollutions on the Taimyr Peninsula and track changes in biocoenosis and in permafrost conditions. Field and laboratory research formed the basis of a report describing the current state of the area in question.

Key takeaways from the Great Norilsk Expedition

Geochronology and GIS modelling

Based on the research data, the Norilsk Industrial District is a major geochemical anomaly. Its ecosystems accumulate large amounts of chemicals and elements, which is associated with both mineralisation and ore mining and processing.

It was found that the concentrations of potentially toxic elements in soils developed over natural geochemical anomalies accompanying ore fields exceed their average concentrations in the Earth's crust and the maximum permissible concentrations. From soils, these elements get into plants, moving further up the trophic levels of the food chain.

The comparison of natural geochemical backgrounds shows an uneven natural distribution of chemical elements in the sediments in Melkoye and Pyasino lakes. The average nickel and copper content in the sediments of Lake Melkoye is more than 4 and 2 times higher than their average content in the Earth's crust, respectively, and even more higher — by 6 and 10 times — in the bottom sediments in Lake Pyasino.

The expedition experts used remote sensing and GIS modelling to gauge the scale of pollution caused the fuel spill. The data analysis showed that there were practically no chances of any significant amounts of oil products getting into the central and northern parts of Lake Pyasino, and even more so into the Arctic Ocean. In the first days after the incident, this was physically impossible due the residual ice cover serving as a "plug" in the northern basin of Lake Pyasino, and later – due to specific surface distribution processes, including the impact of wind loads.

Permafrost soils

Geophysical surveying was carried out at the site of the back-up diesel fuel storage at HPP-3 neartanks Nos. 2–4 and outside its territory along the course of a temporary seasonal run-off down to its outfall into the Daldykan River at about 600 m away from the back-up diesel fuel storage.

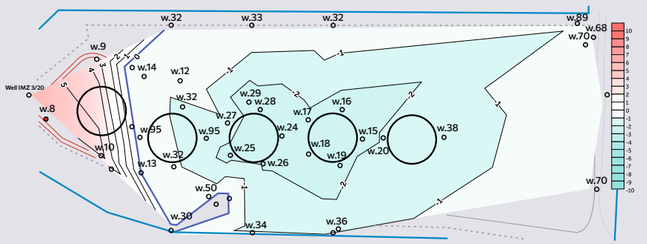
A variety of geophysical surveys were conducted at the site to locate the boundaries of frozen and seasonally frozen rocks and produce their top and cross-sectional views.

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

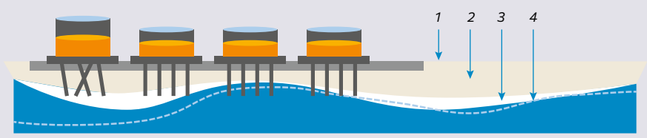
The electrical resistivity imaging survey conducted to identify channels for groundwater filtration, also located an anomaly that was interpreted as an anthropogenic talik, which was subsequently confirmed by verification drilling. The researches assumed that the source of groundwater was a lake located 200 m north of tank No.5. The underground drainage was a most likely cause of the permafrost thawing at the foundation of fuel storage tank No. 5 and the resulting subsidence of the pile foundation and the fuel spill.

New thermometric wells were drilled and existing thermometric wells surveyed, with temperature measurements taken in all of them. The storage site, despite its small size, showed a very wide range of soil temperatures. The lowest temperatures (-4.2° C) were recorded near tank No. 2. Decreased temperatures were also observed at the foundation of tank No. 3. Higher temperatures were recorded in the wells located near tank No. 4 and the highest ones – in the supra-permafrost talik located in proximity to tank No.5.

Scheme of intra-permafrost waters formation and their influence on the back-up diesel fuel storage's foundation bed:

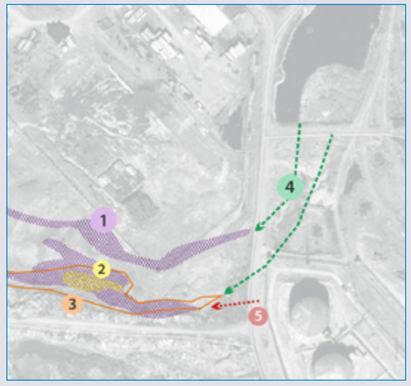


Temperature field at a depth of 4 m.



1. Land surface;
2. Soil fill;
3. Area of the groundwater filtration formation along the bedrock;
4. Estimated permafrost table.

Scheme of filtration channels identified by geophysical surveying and assumed from geomorphological analysis:



1. ways of groundwater filtration at a depth of 5 m;
2. areas of groundwater accumulations contaminated with oil products;
3. contours of polarisation anomalies at a depth of 5 m;
4. assumed filtration paths for the surface waters from the lake;
5. filtration paths for the surface waters contaminated with oil products.

Hydrobiology

The research in this area has identified a strong self-purification ability of the studied waters' microbial system with respect to organic pollution. The researchers found that the microbial flora of the studied waters was adapted to oil products and capable of participating in their degradation; however, the waters of the Ambarnaya River, due to the high content of oil products, showed both decreased levels oil-degrading bacteria and their reduced ability to oxidise volatile compounds of oil, benzene, toluene, and naphthalene.

In terms of hydrophysical and biological indicators, the water quality turned out to be low in the Bezymyanny Stream, the Daldykan River (downstream of the confluence of the Bezymyanny Stream) and the Ambarnaya River (downstream of the confluence of the Daldykan River), i. e. in the watercourses close to the incident site. The waters of the northern part of Lake Pyasino and in the Pyasina River were deemed to be clean.

Thus, in the areas downstream of the surface watercourses coming from the fuel spill site, the plant communities of the Daldykan and Ambarnaya rives were showing classic signs of being affected by oil pollution. The ecosystems of Pyasino Lake and the Pyasina River, on the contrary, had not been affected by the fuel spill.

Surface waters

The researchers confirmed that the content of oil products in the most polluted sections of watercourses (Bezymyanny Stream, Daldykan River, Ambarnaya River) were significantly higher than the background values.

In Lake Pyasino, the concentrations of oil products were within the background values and below the established maximum permissible concentrations for water bodies used for fishery, which may be a result of the effective use of booms deployed to contain the fuel spill.

Soil and vegetation cover

As part of the field research, the expedition team studied terrestrial floodplain ecosystems, the condition of the soil cover of the floodplains of the Bezymyanny Stream, the Daldykan, Ambarnaya, Pyasina, Dudypta, and Tareya rivers, as well as the southern and northern shores of Lake Pyasino and select areas along the banks of the Pyasina River up to the Kara Sea.

The maximum concentrations of oil products were often found in the underlying soil layer rather than on the surface. No contamination of the soil layers deeper than 30–40 cm was identified anywhere.

The researchers believe that the shallow depth of the oil products' penetration into soils is due to the physical and climatic profile of the region, with permafrost serving as a natural aquiclude, which prevented oil products from penetrating below the seasonal thawing zone (in most areas — up to 60 cm).

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

Based on the level of pollution and the resulting alteration of terrestrial ecosystems, the researchers divided the surveyed territory into fours zones:

1. the areas near Norilsk up to the Ambarnaya River delta (the most polluted area) – **unsatisfactory condition**;
2. the area from the Ambarnaya River delta to the headwaters of the Pyasino River (medium level of pollution) — **satisfactory condition**;
3. the slightly affected area from the middle reaches of the Pyasino (Kresty) River to the Tareya point — **good condition**;
4. the areas not affected by the technogenic impact associated with the Norilsk Industrial District and stretching from the Tareya River to the Kara Sea — **excellent soil and overall environmental condition**.

Biological and zoological diversity

Based on the research findings, the identified effects of plant community disturbance are not long-term. These effects emerged simultaneously as a result of the fuel spill, and the disturbed plant communities differ from undisturbed ones in that some of their species died. Judging by the chemical burns caused by the diesel fuel to the plants in the lower reaches of the Ambarnaya River, the vegetation partially flooded with river waters was affected most. Aquatic plants and communities that were underwater were not affected or affected to a lesser extent. Greatly impacted were floodplain communities , including sparse willow populations, mixed sedge and grass bogs, and sedge bogs.

Disturbed plant communities were also identified upstream of the Ambarnaya River, which is associated with a much larger area of its floodplain and a wider variety of its plant communities that were affected by oil products to one degree or another.

The researchers identified just once stage of plant disturbance in the Daldykan River, which may be due to the fact that at the time of the fuel spill the river was full-flowing (due to the spring flood) and most of the plant communities were underwater. In the Bezymyanny Stream's floodplain located in the proximity to the fuel tank of HPP-3, three stages of plant disturbance by oil products were identified.

In the direction from the Bezymyanny Stream to the Ambarnaya River mouth decreased phytodiversity of disturbed vegetation was recorded. The lowest decrease in diversity was observed near the upper and middle reaches of the Pyasina River.

Expedition highlights

> **"The goals of the Great Norilsk Expedition were not just to investigate the causes and consequences of the incident at HPP-3 in Norilsk but to commence a large-scale comprehensive study of Taimyr's ecosystems and climate change that has taken place over the recent decades. The Company will carefully study the report presented by the Russian Academy of Sciences and will continue collaboration with the academia to introduce new approaches to doing business in the Arctic amid tougher environmental requirements and stronger public demand for cleaner industries. It is perfectly possible that one of the results of the expedition will be the development of new regulations, including nation-wide statutory documents, which will define the framework for operating in the Arctic."**
>
> **Andrey Bougrov,**
>
> Senior Vice President for Sustainable Development at MMC Norilsk Nickel

Based on the researchers' overall assessment, the diversity of plant communities has not altered significantly as a result of the fuel spill, and the recorded changes were associated with other types of anthropogenic pollution.

The comparison of mammal populations by species type, sex and age in 2020 versus the 2017 data shows that their total number decreased in 2020 insignificantly (by 9 animals). The examination of the internal organs of all captured animals revealed no infectious or pathological metabolic processes. No typical external changes in the form of chronic visceral lesions attributable to technogenic impacts or the fuel spill were identified.

Key takeaways

The expedition results were presented to a meeting at the Russian Academy of Sciences attended by Nornickel's top executives and the leading scientists and researchers.

Following the results of the expedition, its members ruled out the possibility that any significant amount of oil products spilt as a result of the incident at HPP-3 might have reached the Arctic Ocean and even the central and northern parts of Lake Pyasino. The investigations also proved that the spill had no negative impact on the ecosystems of Lake Pyasino and the Pyasina River.

The current state of land ecosystems near Norilsk up until the Ambarnaya River delta was deemed unsatisfactory in terms of pollution levels and their transformation. At the same time, as the researchers moved away from the fuel spill site, the ecosystem demonstrated a consistently better state: from satisfactory (from the Ambarnaya River to the sources of the Pyasina River) to excellent (from the mouth of the Tareya River to the Kara Sea).

An analysis of soils at the site of the back-up diesel fuel storage at HPP-3 and beyond shows that confirmed permafrost thawing at the foundation of fuel storage tank No. 5 and the subsidence of the pile foundation might have been caused by an underground talik originating in a lake located in the vicinity of the destroyed facility.

The report also describes deterioration in the state of plants present in the area, with considerable damage caused to the floodplains of Daldykan and Ambarnaya rivers. However, mammals covered by the studies demonstrated no changes caused by the fuel spill.

The studies are to resume in April 2021 when the snow cover is thickest, which should provide a clearer picture of pollutions by type and their accumulation. In future, the local environment will be constantly monitored to evaluate the effects of recommended measures, prevent any disruptive events, and proactively identify any qualitative or quantitative changes in natural environment components.

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

“The Great Norilsk Expedition was a milestone for the Siberian branch. It brought us back to doing the job that the Academy was meant for, and that is addressing issues of federal importance. This time, it was the environmental impact. At Nornickel's request, we conducted our first comprehensive expedition in 30 years, with results beyond the company’s own needs. But it is what we are here for, to study the environment as it is today across Russia.”

Valentin Parmon,

Chairman of the Siberian Branch of the Russian Academy of Sciences

These findings of the Great Norilsk Expedition point to the spill's stressful environmental impact. At the same time, the researchers believe that no major disaster happened, owing to the following:

- the spill was localised within the Norilsk Industrial District (the Bezymyanny Stream, Daldykan and Ambarnaya rivers, and the southern border of Lake Pyasino);
- over summer and autumn, the water and fuel mixture and the topsoil filled with diesel fuel were collected and removed;
- ecosystems demonstrate a strong regenerative capacity whenever there is no stressful man-made impact;
- the incident did not cause a cascade effect whereby the extinction of one species in an ecosystem leads to the extinction of others;
- further actions to remediate the disrupted area will ramp up the recovery of the ecosystem.

“This will require us to analyse the expedition results and use proven scientific approaches to devise a continuous monitoring technique available to all prospective customers, not just Nornickel. We know that issues related to the strength and stiffness of engineering systems and dilapidation of buildings are pressing in Yakutia and other northern regions.”

Nikolay Yurkevich,

Head of the Ecology Scientific and Research Centre

The Great Norilsk Expedition also prompted the Siberian branch of the RAS to establish a scientific and research centre. Ecology, as the centre was named, is headed by Nikolay Yurkevich, who supervised the fieldwork during the expedition. Its main focus is creating a “one-stop shop” to facilitate cooperation between scientists and industrialists and design marketable products based on scientific developments that have not yet gained traction with businesses.

One of the first assignments for the centre’s team is to develop a methodology for identifying geocryological hazards to industrial, infrastructure, and other facilities in the Norilsk Industrial District.

While studying the ecosystems of Taimyr and the Norilsk Industrial District, the Siberian branch of the RAS and Nornickel signed an agreement to implement a long-term spill response programme and develop rules for sustainable industrial activities in the Russian Arctic. No one in the country's metals and mining industry had previously committed themselves to such extensive cooperation with the Academy.

Ethnological expedition[18]

On 25 June, the Arctic Development Project Office and the Association of Indigenous Peoples of the North, Siberia and Far East of the Russian Federation launched an ethnological expert review on Taimyr to assess the damage caused to indigenous northern minorities by the incident at HPP-3. The invited experts included representatives of the Federal Agency for Ethnic Affairs and academicians from Moscow State University and Northern (Arctic) Federal University as well as those from Miklukho-Maklai Institute of Ethnology and Anthropology (with the latter joining the expedition in winter and spring 2021). The goal was to assess the impact of the fuel spill on the lifestyle and traditional industries of indigenous peoples.

Objectives	Results	Highlights
▸ To assess the spill's impact on the lifestyle and traditional industries of indigenous minorities in the region ▸ To assess the damage and provide recommendations on the compensation package ▸ To list the communities and individuals who seem eligible for compensation	▸ Water and soil samples taken from the Ambarnaya and Pyasina rivers and Lake Pyasino and analysed ▸ 670 local residents covered by the review (including the five main indigenous minorities fishing near Lake Pyasino) ▸ 100 interviews with locals taken ▸ 10 community leaders with the best knowledge of local fishers identified	▸ The permanent indigenous settlements are far from the spill site and have not been affected ▸ A situational ethnographic map has been drawn to show changes in the geography of traditional industries following the incident ▸ Community leaders helped compile a list of nearly 700 locals that were later offered compensation

The group of scientists carried out a large-scale review that included a field stage (collecting samples and data, conducting sociological surveys on the potentially affected territories) and an analytical stage that involved ethnographers and anthropologists. Current and future influences of the incident on hunting and fishing, reindeer herding and preservation of cultural traditions were studied.

The scientists also drafted an ethnological map of all economic entities within the local indigenous communities. The review was the first one of its kind in the modern history of Russia.

[18] *Key data and findings of this section are from the report of an ethnological expedition organised by the Arctic Development Project Office, Association of Indigenous Peoples of the North, Siberia and Far East of the Russian Federation, and Federal Agency for Ethnic Affairs with support from Nornickel. The full report (in Russian) is available at www.etnoexpert.ru*

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

Fig. Situational ethnographic map showing changes in the geography of traditional industries following the incident

Indigenous peoples survey

"The full-scale ethnographic expedition has already become a huge step forward in the right direction paving the way for further projects of this type. The results of this expedition will help develop initiatives of paramount importance for indigenous peoples. We are confident that the agreement will help us find new joint approaches to sustainable living and working in the North and resolve other pressing issues facing local communities. Each and every item of the comprehensive support programme was closely coordinated with Taimyr residents, including indigenous peoples and local organisations. What they said and what they focused on was most accurately reflected in the programme."

Grigory Ledkov,

President of the Association of Indigenous Minorities of the North, Siberia, and the Far East of the Russian Federation

The survey spanned 670 people from five main ethnic groups inhabiting the region (Dolgans, Nenets, Evenks, Enets, and Nganasans), with 100 interviews taken and opinions of the community leaders studied.

In the interviews, the representatives of indigenous minorities had an opportunity to propose preferred compensatory measures, as well as general initiatives to improve their traditional way of life.

Another important outcome of the expert review was the amount of compensation agreed with indigenous northern minorities for the fuel spill (RUB 175 mln to be paid to almost 700 members of indigenous northern communities). In 2020, NTEC paid RUB 94 mln out of the agreed amount. The calculation methodology is based on the assessment of the impact of economic activities on traditional lifestyles. It was the first time in Russia this approach had been used to determine the compensation for actual damage.

It also involved using a mathematical model that assesses the maximum possible contamination areas and damage to fish stocks in money terms and distributes the resulting value proportionally between the indigenous people subsisting on the resources in the affected areas. Notably, indigenous northern minorities bear no burden of proof in this case. The compensation received by a community may be distributed both among its individual members or used to meet community needs.

Interviewees

Nationality

Dolgans	50%
Nganasans	34%
Evenks	7%
Nenets	7%
Enets	2%

Age

18–24 years	11%
25–29 years	22%
30–39 years	27%
40–49 years	29%
50–59 years	8%
60+ years	3%

Gender

Male	46%
Female	54%

Measures expected from Nornickel by indigenous northern minorities[19]

Seasonal jobs related to traditional lifestyles	74%
Expert-approved measures to restock fish in the Pyasina River	72%
Establishment of seasonal training shops for craftswomen. Making traditional outfits for tundra work and selling them at cost to indigenous nothern minorities	29%
Expert-approved measures to restore the wild reindeer population	27%
Seasonal jobs at the plant for the years needed to restore fish resources	18%

[19] *The diagram shows the percentage of respondents supporting the measure.*

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

A comprehensive programme to support the indigenous northern minorities to 2024

On 25 September 2020, Nornickel signed a 5-year cooperation agreement with three organisations representing over 90% of the indigenous northern minorities inhabiting the Taimyr Peninsula: the Association of Indigenous Minorities of the North, Siberia, and the Far East of the Russian Federation, the Regional Association of Indigenous Peoples of the Krasnoyarsk Territory, and the local Association of Indigenous Minorities of Taimyr.

“We have jointly determined new systemic measures to support indigenous peoples living on the Taimyr Peninsula and consolidated them in the form of an agreement. This is a RUB 2 bn programme comprising over 40 initiatives for the next five years. Firstly, it is aimed at stimulating the economic activity of indigenous minorities and facilitating the recovery of renewable resources, which form the basis of their traditional lifestyle and trades. Nornickel has a long history of close cooperation with organisations representing the interests of indigenous communities in the regions of our operation, ensuring transparency in decision-making and maximum efficiency in the implementation of joint projects.”

Andrey Grachev,

Vice-President,
Federal and Regional Programmes

Based on the proposals received during the ethnological expedition, a set of priority measures was defined, including seasonal jobs in tourism, reindeer herding, fishing and hunting. The Company has made plans to construct fish and reindeer meat processing facilities, purchase refrigeration chambers, build ethnic shops to manufacture fur apparel, subsidise helicopter flights, organise training in professions required by Norilsk Nickel, publish learning aids in native languages, and take many other specific and integrated measures.

Going forward, the Company is ready to build up a direct meaningful dialogue with all stakeholders as required to ensure environmentally safe and socially responsible Arctic operations.

Key initiatives of the Comprehensive Support Programme until 2024

Projects in support of traditional activities	▸ Building a shop to process wild reindeer carcases ▸ Cooperating with businesses working in the Pyasina River basin and individuals engaged in traditional fishing in the Pyasina River basin ▸ Purchasing two 20 cu m refrigeration chambers (Volochanka) ▸ Building ethnic villages with shops to manufacture fur and leather apparel, horn and ivory products ▸ Subsidising additional helicopter flights to deliver products from local settlements to Dudinka ▸ Supporting indigenous kinship communities in reviving reindeer herding in the Norilsk-Pyasina water basin ▸ Assessing the carrying capacity of reindeer pastures in the Ust-Avam tundra

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

	▸ Arranging for expert assessment of the fishing capacity of Lake Pyasino and its restocking with fish ▸ Accounting fish resources in Lake Pyasino to determine quotas and purchase them at auctions in favour of indigenous communities.
Housing projects	▸ Building 18 dwelling houses over a three-year period (in Volochanka and Ust-Avam) ▸ Building housing for orphaned indigenous children ▸ Providing financial assistance to rent land plots from settlement administrations and providing these free of charge to those wishing to improve their housing conditions
Health projects	▸ Building a new first-aid and obstetric post in Volochanka ▸ Purchasing specialised (crawler) vehicles to hold medical checkups and screening
Tourist projects	▸ Including Volochanka, Ust-Avam, and Khantayskoye Ozero settlements in an ecotourism development project ▸ Establishing a visit centre in one of the settlements; teaching a hospitality course to several communities, and co-funding helicopter flights
Development and support projects	▸ Establishing a foundation to support indigenous minorities of the Taimyr Peninsula ▸ Cooperating with a charity foundation to support indigenous minorities of the North, Siberia, and the Far East ▸ Cooperating with businesses working in the Pyasina River basin and individuals engaged in traditional fishing in the Pyasina River basin
Educational and cultural projects	▸ Training indigenous children in professions required by Norilsk Nickel with a view to eventual employment ▸ Supporting advanced training of teachers at remote settlement schools (in Volochanka and Ust-Avam) ▸ Employing teachers to general education schools in remote settlements, including employment under Norilsk Nickel's grant programmes (Volochanka and Ust-Avam) ▸ Publishing learning aids in native languages ▸ Introducing online education opportunities and, in the long run, providing broadband internet access ▸ Building a community centre by 2024 (Volochanka) ▸ Building community centres in Kheta and Nosok ▸ Publishing a book dedicated to the 90th anniversary of the Taimyr Dolgano-Nenets Municipal District ▸ Shooting a presentation film dedicated to the 90th anniversary of the Taimyr Dolgano-Nenets Municipal District ▸ Installing an outdoor LED screen and related equipment to hold large-scale public events on the river embankment in Dudinka
Sporting and infrastructural projects	▸ Purchasing bathhouse modules (Volochanka and Ust-Avam) ▸ Purchasing two buses branded 'From Norilsk Nickel to the District' for the needs of Dudinka ▸ Purchasing children's playgrounds (Volochanka and Ust-Avam) ▸ Purchasing children's jungle gyms for the villages of Hatanga rural settlement (Kresty, Zhdanikha, Novaya, Kheta, Katyryk, Syndassko, Popigai, and Novorybnoye) ▸ Purchasing children's jungle gyms for Potapovo Secondary School No. 12, Nosok Secondary Boarding School, and Khantayskoye Ozero Base School ▸ Purchasing sports gear and weightlifting equipment (Ust-Avam) ▸ Building northern multisport grounds ▸ Purchasing a sound system for the fitness centre of Dudinka Sports Complex ▸ Organising the Arctic Curling Cup 2020 events in Dudinka ▸ Creating a single news channel in WhatsApp to broadcast news and videos both in Russian and in indigenous languages

ASSESSMENT OF IMPACT OF THE INCIDENT AT HPP-3 ON THE ENVIRONMENT AND THE TRADITIONAL WAY OF LIFE IN THE ADJACENT AREAS

Nornickel strictly complies with its corporate codes and policies[20], including:

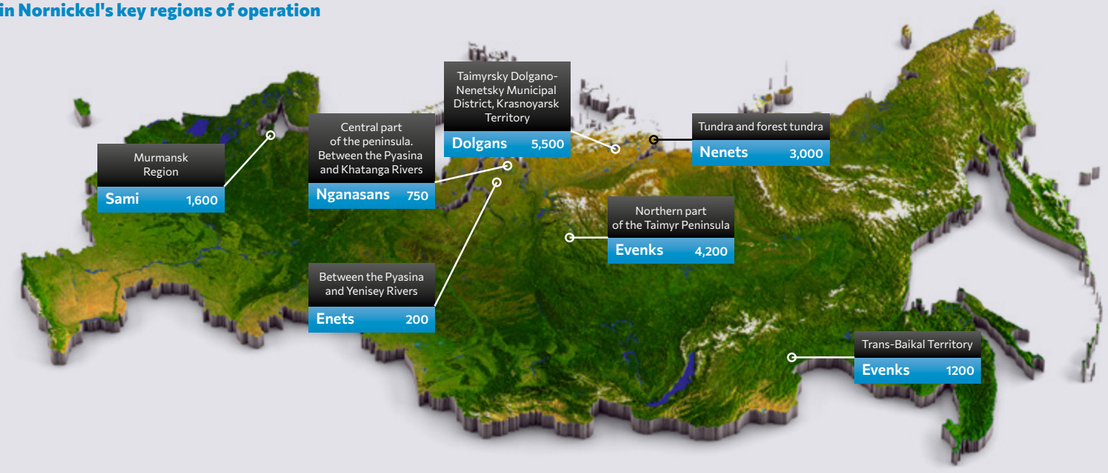
- **Indigenous Rights Policy**
- **Human Rights Policy**
- **Biodiversity Policy**
- **Environmental Policy**
- **Renewable Energy Sources Policy**
- **Environmental Impact Assessment Policy**
- **Local Community Relations Policy**

As a socially responsible company, Nornickel respects the rights, lands, culture, traditions, historical heritage and interests of indigenous peoples inhabiting the Company's regions of operation, and delivers on its commitment to strengthen and develop the mutually beneficial relationship with the local communities.

In recognition of the right of indigenous peoples to preserve their traditional way of life and enjoy decent living conditions of today, over the past decades Nornickel has been implementing projects that meet the needs of local communities and seek to improve living conditions of the indigenous peoples of Taimyr, Kola Peninsula and Trans-Baikal Territory.

The projects aimed at supporting and developing the regions inhabited by the indigenous minorities of the North are implemented without violating the sanctity of indigenous places of worship and holy places.

Location and approximate population of indigenous minorities in Nornickel's key regions of operation



[20] *The key corporate policies and internal documents of the Company are available at www.nornickel.com/investors/disclosure/corporate-documents/#corporate-codes-and-policies*

As it implements these policies, the Company maintains an ongoing dialogue with the local communities to develop and roll out projects aimed at improving the quality of their lives, modernising the local economic practices, and upgrading the social and utilities infrastructure.

The Company's Board of Directors controls compliance with the policies, while the Management Board reports on the same to the General Meeting of Shareholders on an annual basis. Additionally, the Company publishes a Sustainability Report to keep the public informed about the implementation of these policies.

Besides, Nornickel is developing a new Stakeholder Engagement Policy, that will also cover indigenous peoples, based on international standards and best practices[21]. The policy will be drafted in close consultation with the environmental community, ethnology experts, indigenous representatives and other stakeholders.

Specific topics for consultations will be determined in direct dialogue with indigenous representatives, environmental organisations, and scientific community, and could cover public control or public consent of indigenous minorities to the Company's Arctic projects, finding the right grievance mechanisms, and discussion of the Company's decisions that have a direct impact on the indigenous peoples.

[22] *In addition to applicable Russian laws and voluntary national standards, the new policy will rely on OECD Due Diligence Guidance for Meaningful Stakeholder Engagement in the Extractive Sector, IFC Performance Standards, UN Guiding Principles on Business and Human Rights, ICMM's Mining Principles, IRMA Business Integrity Principles, Equator Principles, including recommendations on the assessment of projects that could potentially affect indigenous peoples, etc. The Company also considers reflecting the UN principle of free, prior and informed consent of indigenous peoples to industrial operations on their territory where applicable.*

LESSONS LEARNT AND INTERNAL CHANGES AT NORNICKEL

As Nornickel has progressed from emergency response to rehabilitation, we are now in a position to reflect upon the unique lessons learnt from conducting a large-scale clean-up operation in the harsh Arctic environment.

The Company's absolute priority is to prevent incidents and ensure safe operations by monitoring its production and infrastructure facilities throughout their life cycle from design and construction through to decommissioning and closure. To ensure environmental and industrial safety of operations in the harsh physical and climatic conditions of the Arctic, there is a need for completely new approaches to design, technical and organisational decision-making.

It has been established that the incident resulted from a chain of events in which geocryological factors played a critical role. Therefore, the Company initiated a comprehensive inventory of all facilities where the geocryological hazards may compromise the industrial safety. We also set an ambitious goal to create a multi-level permafrost monitoring system that would include, among other things, satellite remote sensing.

It has been established that the incident resulted from a chain of events in which geocryological factors played a critical role.

Therefore, the Company initiated a comprehensive inventory of all facilities where the geocryological hazards may compromise the industrial safety. We also set an ambitious goal to create a multi-level permafrost monitoring system that would include, among other things, satellite remote sensing.

Yet, the summer events have shown that the Company must be able to react immediately to loss of control over processes, whatever the reason. To that end, we are to enhance our skills and competencies in the following areas:

- containment — one of the major lessons learnt: ensuring availability of qualified personnel, modern equipment and materials to effectively contain a spill in the Arctic, and enabling their swift arrival and delivery to any location, including the remotest areas;
- clean-up — collecting spilt oil products and minimising the environmental impact, including when transporting and processing the collected water and fuel mixture; this requires new innovative approaches to restoring the environment, including new treatment agents and products, dispersants and sorbents that are effective in low temperatures, etc.;
- crisis management — coordinating response operations, implementing organisational steps and procedures to create a quick decision-making framework, and ensuring a reliable information flow.

The 2020 summer incidents gave us an understanding of how to properly manage a response operation engaging all local stakeholders. The Company closely cooperated with the Marine Rescue Service, the Russian Emergencies Ministry, law enforcement agencies and relevant regulatory and government authorities.

During the clean-up and response operations, we developed new ways of interaction with local communities to discuss pressing issues. Having learnt from this experience, we have strengthened our commitment to free and open dialogue and proactive information disclosure, while the Company's employees acquired unique knowledge and hands-on experience.

Nornickel is currently reviewing and summarising its experience of organising and carrying out large-scale response operations in the summer and autumn of 2020. The Company has planned an unprecedented amount of R&D studies, some of which are already being conducted. We have also made substantial organisational changes.

LESSONS LEARNT AND INTERNAL CHANGES AT NORNICKEL

Holistic Environmental Strategy

The events of 2020 clearly indicated to the management that the Company needed to reorganise internal processes related to environmental safety, operational and environmental risks, and sustainable development in general.

As a result, Nornickel developed a draft holistic environmental strategy in December 2020, its approval by the Board of Directors is expected during 2021. The strategy differs fundamentally in its breadth from the Company's earlier environmental programmes and documents. In the past, the Company's environmental efforts were mainly focused on developing and implementing projects and process solutions aimed at reducing sulphur dioxide emissions. The new strategy expands the focus and scope of environmental components and includes six key areas.

The new areas were formulated based on an analysis of the Company's existing environmental initiatives, lessons learned from the incident, and requests from stakeholders — customers, industry associations, investors, creditors, international and national rating agencies. Nornickel was also guided by the broad public call for changes following the incident, continuous public monitoring of the Company's activities, attention to the clean-up operations, and actions aimed at preventing similar incidents in the future.

Under the new environmental programme, the Company's key strategic initiatives include reducing negative environmental impacts and mitigating production risks, cleaning up the spill and fully rehabilitating the affected areas as well as restoring biodiversity. Nornickel plans to transition to advanced clean technology, improve the existing environmental management practices and continuously engage with stakeholders.

For each of the six areas, the Company has assessed its current position in the industry, set specific targets and key performance indicators (KPIs), and laid out CAPEX requirements to implement the plans. A detailed environmental strategy and CAPEX estimates will be tentatively unveiled during 2021.

Key areas of the Holistic Environmental Strategy

Areas	Goals	CAPEX
Climate change	Increase the output of metals to satisfy the demand driven by the global transition to a green economy while keeping GHG emissions at the lowest level achievable in the mining industry **Planned actions:** ▸ Continue to maintain absolute GHG emissions from operations (Scope 1 and 2) at around 10 mt of CO2 equivalent through 2030 while growing production by 30–40% (Ni equivalent vs 2017) ▸ Remain in the first quartile of the global nickel industry in terms of GHG emissions per tonne of Ni equivalent ▸ Contribute to increasing the share of low-carbon energy; ▸ Manage climate-related risks by developing relevant strategies and helping communities in the Norilsk Industrial District and the Murmansk Region embrace energy efficient, low carbon technologies; ▸ Stay on a path of low carbon transition by supporting and scaling up innovative solutions and encouraging inter- and cross-sectoral dialogue on climate change.	To be confirmed in 2021.
Air	Protect the environment and public health from air pollutants while meeting statutory requirements and standards regulating emissions **Planned actions:** ▸ Reduce absolute Kola Division SO2 emissions by 85% in 2021 and Polar Division SO2 emissions by 90% by 2025; ▸ Keep other air emissions (NOx, solids, etc.) at one of the lowest levels in the industry; ▸ Introduce an air quality monitoring system to assess and act upon ambient air quality and dust associated with mining; ▸ Comply with global best practices and standards in air pollution disclosure.	**USD 3,6 bn**
Water	Nornickel prioritises sustainable use of water resources, pollution reduction, and ensuring continuous supply of drinking water to local residents. **Planned actions:** ▸ Nornickel prioritises sustainable use of water resources, pollution reduction, and ensuring continuous supply of drinking water to local residents. ▸ Conduct a comprehensive assessment of water use to understand how much water the Company directly uses in production; ▸ Upgrade water monitoring and control systems to improve safety of hydraulic structures at the Company's facilities and ensure the purification of drinking water that Nornickel supplies to local communities; ▸ Look for green solutions and forge partnerships with the scientific community and organisations to achieve these goals; ▸ Ensure undisrupted operation of water treatment facilities; ▸ Review and implement recommendations of the Great Norilsk Expedition on sustainable water management and rehabilitation after recent ncidents; ▸ Improve water use reporting by keeping a separate record of water used for production and municipal needs in the Norilsk area.	**USD 1,1 bn**

LESSONS LEARNT AND INTERNAL CHANGES AT NORNICKEL

Tailing dams and waste	We are committed to minimising the environmental impact of waste from our operations, ensuring efficient waste management practices, finding alternative uses for the remaining waste, implementing responsible sourcing, and safely operating tailings facilities. **Planned actions:** ▸ Introduce the global industry standard on tailings management; ▸ Apply technically and financially feasible principles and techniques for the efficient use of resources and pollution prevention in order to avoid, or, where impossible, minimise the adverse impact on human health and the environment from waste generated as a result of our operations; ▸ Work with experts and business partners to ensure that waste management strategies minimise the risks to local communities.	**USD 0,6 bn**
Land	Nornickel focuses on the rehabilitation of all land affected by construction, mining and emissions caused by its operations, and carries out regular audits of plant and mine closure plans. **Planned actions:** ▸ Develop a rehabilitation programme for land affected by construction and mining operations; ▸ Audit asset closure plans; ▸ Follow recommendations of the Great Norilsk Expedition on soil recovery; ▸ Continue waste collection and land reclamation in the Norilsk area; ▸ Continue land rehabilitation activities, including outside of our operational sites.	**USD 0,3 bn**
Biodiversity	Nornickel recognises the importance of biodiversity and conservation. The Company's environmental policy seeks to encourage activities aimed at understanding the short- and long-term impacts of our mining operations on biodiversity and develop measures to minimise the Company's environmental footprint. **Planned actions:** ▸ Apply a rigorous scientific approach to establish a biodiversity baseline and understand our impact on ecosystems in the areas of our operations; ▸ Enhance our internal policies and procedures to avoid or minimise any future negative impact on biodiversity and terrestrial ecosystems; ▸ Develop and implement a clear mitigation hierarchy for current and new operations to strengthen our risk management approach towards biodiversity; ▸ Enhance the reporting of quantifiable data on our impact on biodiversity and improve the transparency and efficiency of our collaboration with numerous natural reserves across Russia.	To be confirmed in 2021.

Improving the Company's industrial and environmental safety risk monitoring and management framework

Following the fuel spill incident, the Company decided to update its internal environmental risk monitoring and management framework.

Based on the investigation into the causes of the incidents, the Company launched a set of measures aimed at improving industrial safety and mitigating physical risks as well as the odds of environmental incidents going forward.

Comprehensive physical risk mitigation programme

Reassessment of risks inherent in hazardous facilities

Large-scale upgrades of energy infrastructure

Roll-out of a permafrost monitoring system

In June 2020, Nornickel commenced an audit of risks related to its hazardous production facilities. As a result, the Company:

- dismantled fuel storage tanks No. 4 and 5 at HPP-3 and similar tanks at HPP-2;
- upgraded fuel storage tanks No. 2 and 3 at HPP-3: anticorrosion treatment, upgrade of the bunding perimeter, installation of new gas detectors;
- updated the register of industrial facilities and scheduled their ad-hoc audits;
- conducted a comprehensive audit/diagnostics of facilities (more than 600) using our own resources and those of our contractors;
- developed facility upgrade and repair programmes.

As part of the audit, we paid special attention to the risks associated with climate change which may manifest themselves as soil thawing, changes of water levels in water bodies, precipitation volumes, wind loads, and have a material negative impact on the operational safety of the Company's production facilities.

For a qualitative assessment of permafrost and physical risks associated with it, Nornickel plans to establish a regional integrated system aimed at monitoring permafrost and the impact of climate factors thereon. To enable early detection of any possible deformations of industrial buildings and structures resulting from changes in permafrost temperature conditions, it was resolved to roll-out a space monitoring system under an agreement with Sovzond, Russia's leading company in this field. The Company will perform regular interferometric analysis of satellite images to identify both vertical and horizontal changes in building structures. These initiatives were submitted to Rostechnadzor as part of a detailed industrial safety improvement plan.

LESSONS LEARNT AND INTERNAL CHANGES AT NORNICKEL

Our plans also include confirmatory drilling to evaluate the supporting pile deformation, measure soil temperature, and verify the thermometric data obtained during the real-time foundation monitoring. The collected data will enable comparison of historical permafrost / soil temperature data with up-to-date data sets for the earliest possible detection of any changes.

The Company will also use seismoacoustic methods of pile condition analysis to detect potential structural deformations and rusting, and geodesic surveying of buildings structural parts. In the short term, Nornickel will have strain gauges and temperature sensors installed onto the foundations of all buildings and structures. The Polar Division's Diagnostics Centre and permafrost laboratory will be upgraded in order to coordinate these efforts.

The Company has begun drafting a scoring model to assess technical and production risks associated with climate change separately for specific buildings and structures. The model is currently being tested to assess its accuracy.

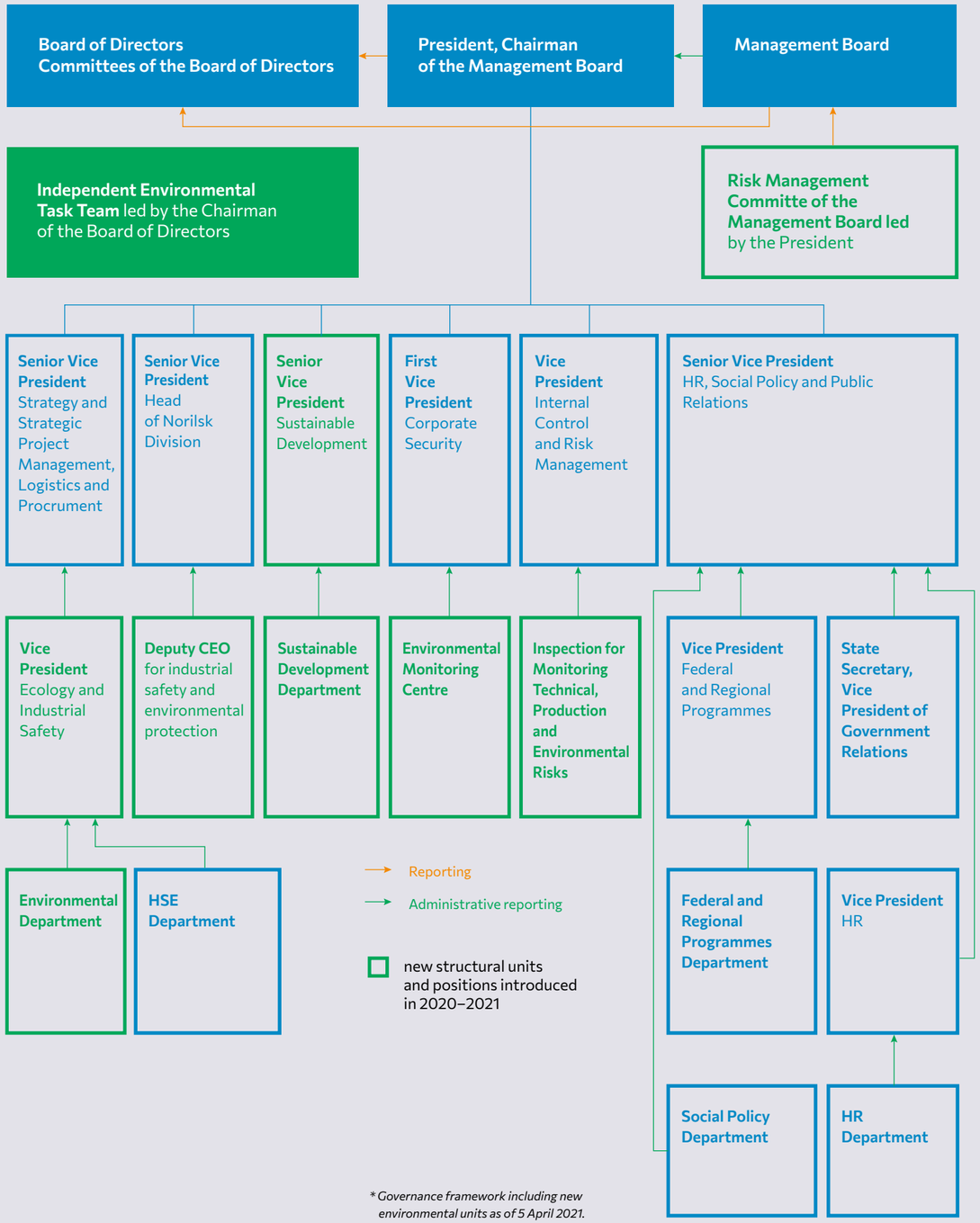
Moreover, we announced additional RUB 100 bn investments over 2021–2024 to upgrade and improve industrial safety at energy infrastructure of the Taimyr Peninsula. The investments will target a broad range of projects to replace equipment at thermal and hydro power plants, upgrade power grid and gas pipeline systems, and modernise fuel storage tanks.

In 2021—2022, we will be working to improve our emergency response mechanisms, while also retrofitting Polar Division's Rescue Service.

New governance structure and staff changes

To make environmental and industrial safety management at Nornickel more efficient, we reorganised our governance framework.

Nornickel's updated sustainability governance framework*



** Governance framework including new environmental units as of 5 April 2021.*

LESSONS LEARNT AND INTERNAL CHANGES AT NORNICKEL

Risk management

In order to raise the efficiency of risk management and complement the existing system of specialised committees, we decided to establish a new Risk Committee under the Management Board, which will be headed by the President of Nornickel. This will mark the completion of a vertical risk management structure, which embraces all levels from production supervisors to the Company's President.

The new committee's responsibilities include:

- developing a risk management strategy;
- scrutinising key areas of risk management, including cross-functional risks;
- conducting a preliminary review of risk management and internal control matters referred to the Company's Management Board;
- preparing recommendations on risk management for the Company's Management Board.

In 2020, the committee held two meetings which addressed supply chain risks, technical and production risks, and risks related to the sales strategy. Following the meetings, a set of measures was developed to strengthen the Company's risk management system, with the implementation timeline set and the amount of required investment planned.

Environmental performance management

To create a full-fledged environmental monitoring system and ensure independent internal control over environmental protection issues, an Environmental Department was separated from the Company's Operating Unit and a new Inspection for Monitoring Technical, Production and Environmental Risks was set up. The Environmental Department will interact with all units of the Company and will be responsible for developing a policy to minimise the environmental impact and restore ecosystems in Nornickel's regions of operation.

The Environmental Department has three divisions: the Environmental Policy Division, the Environmental Regulation Division, and the Environmental Expertise Division. Its key functions include effective management of environmental risks, expert review of investment projects, coordination of environmental regulation, control, and management systems, and obtaining authorisations and permits.

On top of that, Nornickel introduced a position of a Deputy CEO for Industrial Safety and Environment Protection at Norilsk Division, its major production business unit, to strengthen control over its environmental performance.

Environmental oversight at the Board of Directors level

Nornickel has set up an Independent Environmental Task Team of the Board of Directors, consisting of independent directors and chaired by Chairman of the Board of Directors Gareth Penny, to oversee environmental matters concerning the Company. The task team is deployed to assist the Company in solving pressing environmental issues and implementing its long-term environmental programmes. The team comprises: Sergey Bratukhin, an independent director, Sergey Volk, an independent director, Roger Munnings, an independent director, Gareth Penny, an independent director, Evgeny Shvarts, an independent director, and Robert Edwards, an independent director.

Chairman of the Board of Directors since 2013

Member of the Strategy Committee

Born in: 1962

Nationality: UK

Education:
Bishops Diocesan College, Cape Town

Eton College, UK

Oxford, Rhodes Scholar (UK), Master of Arts in Philosophy, Politics and Economics

Gareth Peter Penny

Chairman of the Board of Directors

Experience:

- **2007—2019** — non-executive director at Julius Bär Holding Ltd
- **2012—2016** — Executive Chairman at New World Resources Plc, Executive Director at New World Resources NV
- **2012–2016** — member of the Board of Directors at OKD
- **2016—2018** — Non-Executive Chairman of the Board of Directors at Pangolin Diamonds Corp..
- **2017—2020** — Non-Executive Chairman of the Board of Directors at Edcon Holdings Limited
- **2017—currently:** — Director at Amulet Diamond Corporation
- **2019—currently:** — Non-Executive Chairman of the Board of Directors at Ninety One Plc
- **2019—currently:** — Non-Executive Chairman of the Board of Directors at Ninety One Ltd

LESSONS LEARNT AND INTERNAL CHANGES AT NORNICKEL

Environmental and industrial safety monitoring

To ensure control over environmental compliance, in early October 2020 the Company set up an Environmental Monitoring Centre reporting to First Vice President and Head of Corporate Security Sergey Barbashev.

The centre's key responsibilities include lookahead on-site audits, including those of technical and design documents, overseeing compliance with supervisory instructions, check of the facilities' technical condition, and assessment of resources and capabilities necessary to respond to a potential emergency.

The Environmental Monitoring Centre may issue instructions requiring heads of Nornickel's production enterprises to remedy any identified deficiencies, with the authority to shut down production facilities until such deficiencies are eliminated in cases where critical risks are identified.

By the end of 2020, the Environmental Monitoring Centre's experts had visited all the Company's key production facilities and corporate units, got a view of their operations, and prepared a detailed audit schedule for 2021.

Sustainability and ESG management

As part of the Company's organisational transformation and in line with its commitment to the best global ESG practices, Nornickel established a new role of Senior Vice President for Sustainable Development, to which Andrey Bougrov was appointed.

The Company established a Sustainable Development Department primarily tasked with overseeing compliance of Nornickel's business processes related to environmental and industrial safety and other ESG matters with the best global practices and standards, minimising risks and making use of opportunities related to the sustainability agenda. The department coordinated cross-functional efforts to integrate the standards in all the Company's operations and serves as a corporate methodological and information centre. In addition, its experts interact with external and internal stakeholders on the Company's sustainable development activities.

Member of the Management Board since 2013

Born in: 1952

Nationality: Russian Federation

Education:
Moscow State Institute of International Relations (MGIMO), PhD in Economics

Andrey Bougrov

Senior Vice President for Sustainable Development

- Member of the Bretton Woods Committee's International Council
- Member of the Management Board and Vice President of the Russian Union of Industrialists and Entrepreneurs (RSPP), Chairman of the RSPP Council on Non-Financial Reporting, Deputy Chairman of the RSPP Committee on Corporate Relations, Deputy Chairman of the RSPP Committee on Competition Development, member of the Climate Policy and Carbon Regulation Committee
- Member of the Expert Council on Sustainable Development at the Russian Ministry of Economic Development and Business Union at the Russian Ministry of International Affairs

Experience for the last five years:

- **2002—2020:** member of the Board of Directors at MMC Norilsk Nickel PJSC (MMC Norilsk Nickel OJSC until 1 June 2015)
- **2015—currently:** member of National Council on Corporate Governance non-profit partnership
- **2016—currently:** member of the Expert Council on Corporate Governance at the Bank of Russia
- **2016—currently:** Chairman of the Moscow Exchange Share Issuers Committee
- **2016—2020:** Senior Vice President at MMC Norilsk Nickel
- **2018—2020:** member of the Expert Council on Corporate Governance at the Russian Ministry of Economic Development
- **2018—currently:** member of the Advisory Council at the Russo-British Chamber of Commerce
- **2020—currently:** Senior Vice President for Sustainable Development at MMC Norilsk Nickel

LESSONS LEARNT AND INTERNAL CHANGES AT NORNICKEL

Other personnel and organisational changes as a result of 2020 environmental incidents

Improved environmental awareness and responsibility of all of the Group's employees is a major factor required to implement the Company's environmental strategy and prevent environmental incidents going forward. To build an enabling corporate culture, it is essential for managers to act as role models.

In the medium term, the Company plans to develop and implement new KPIs in the area of sustainability while also introducing fundamental rules of environmental safety similar to health and safety rules.

Incident at Talnakh Concentrator — 28 June 2020

On 28 June 2020, the management team of Talnakh Concentrator decided to pump cleansed used water into an adjacent area to prevent potential emergencies arising from increases in water levels in the tailing dump's process pond. Following an internal investigation, the Company made a decision to reorganise the unit of Deputy Director of Polar Division – Chief Engineer by establishing a new function within Polar Division to be in charge of technical support for the operation of hydraulic structures and instrumental control of their condition.

Importantly, this violation resulted in no major adverse impacts on the environment. Analysis of water samples confirmed that the incident did not have any meaningful impact on the Kharaelakh or Norilskaya rivers. The studies were conducted with the help of the Centre of Laboratory Analysis and Technical Metrology (part of Rosprirodnadzor).

To prevent similar incidents from happening, the Company developed a set of measures to stabilise the water cycle and improve process discipline for hydraulic structures of tailing dams.

Incident at Norilsktransgaz's pipeline near the Tukhard settlement

On 12 July 2020, while pumping aviation fuel near the Tukhard settlement, a pipeline owned by Norilsktransgaz (part of Nornickel Group) suffered a loss of containment. Following stock-taking of the leftover inventories, the exact volume of fuel spilt was found to be 38 t. According to an internal investigation, the potential technical cause of the incident was a rupture of an old pipeline, which lacked some of the supporting structures. It was established that the pumping of aviation fuel from the oil loading terminal to the tank was carried out without necessary authorisations or proper control over the technical condition by the Norilsktransgaz management.

All the spilt fuel was collected and remediation measures were carried out in due time. Water and soil tests detected no excess of permissible concentration limits for pollutants. A new pipeline was constructed to replace the one in disrepair. On 1 August 2020, it was put into pilot operation and is now running in the commissioning mode.

Sustainability best practices and reporting

Nornickel considers social responsibility and commitment to the principles of sustainable development as key operational priorities for business development, community and investor relations, and environmental impact management. The Company has an array of internal corporate documents that govern its activities in the areas of environmental protection, human rights protection, health and safety, environmental impact assessment, and biodiversity preservation[22].

Every year since 2005 (report for 2003–2004), the Company has been preparing sustainability reports in reliance on a wide range of international and national standards: GRI Mining and Metals Sector Supplement, Guidance on Social Responsibility ISO 26000:2010, Reference Performance Indicators of the Russian Union of Industrialists and Entrepreneurs (RSPP), Accountability Standards AA1000SES (2015) and AA1000AP (2018), UNCTAD Guidance on core indicators for entity reporting on contribution towards implementation of the UN Sustainable Development Goals, and recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD).

Nornickel's 2020 sustainability report covers, among other things, the key matters of the Company's response to COVID-19, interaction with indigenous northern minorities, contribution to social and economic development of regions of operation, industrial and environmental safety, innovations and IT, and other material topics. The report is available at ***www.nornickel.com/investors/reports-and-results/#2020***

[22] *Nornickel's policies are available on our website at* ***www.nornickel.com/investors/disclosure/corporate-documents/#corporate-codes-and-policies***

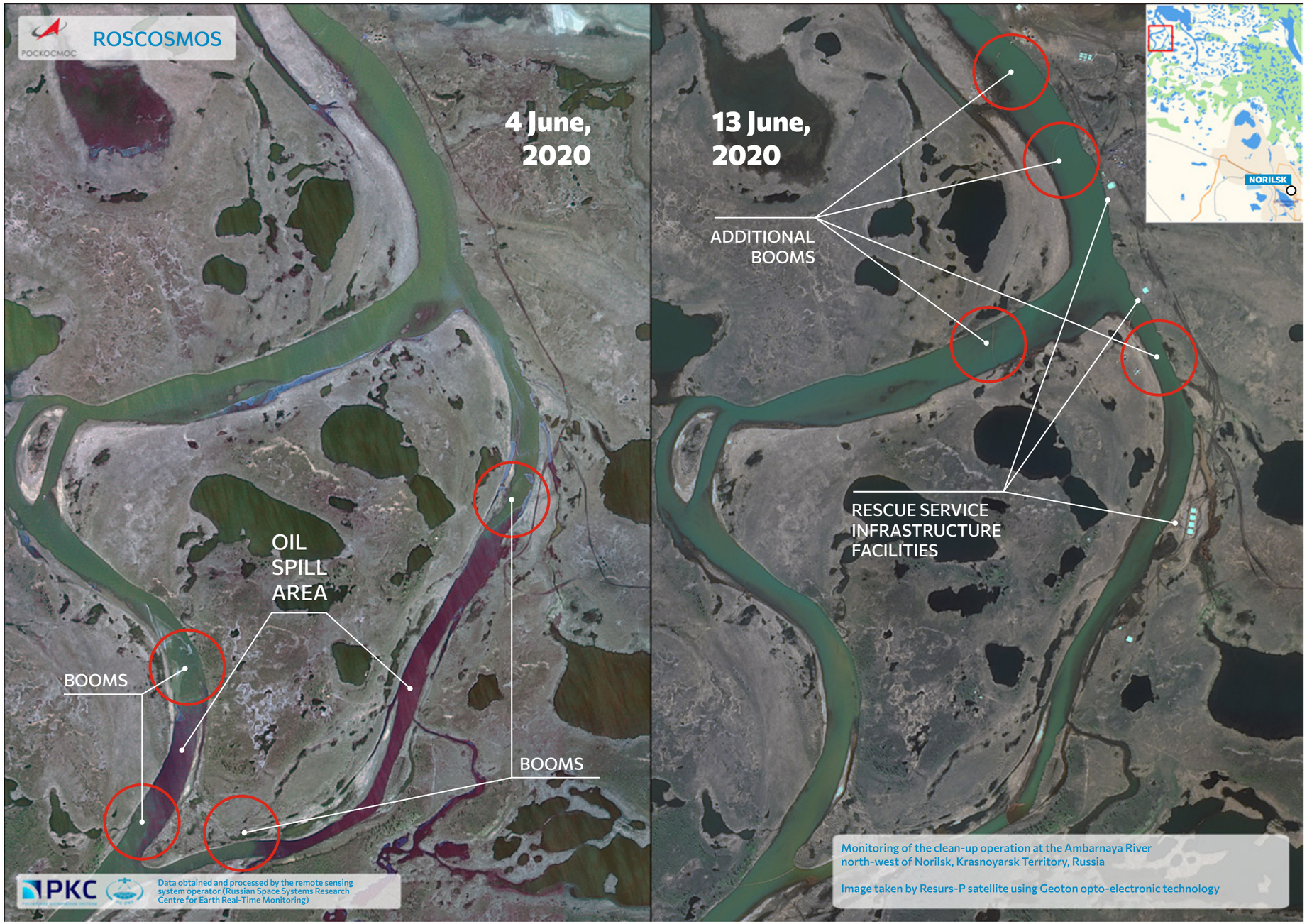
ANNEX

JUNE 24, 2020

APPLYING SPECIAL MEMBRANES FOR BIOMICROGEL FILTERING

WATER BEFORE AND AFTER TREATMENT

ROSCOSMOS SATELLITE IMAGES SHOWING THE INSTALLATION OF SPILL BOOMS AND THE SCALE OF THE CLEAN-UP OPERATION BETWEEN 4 AND 13 JUNE 2020

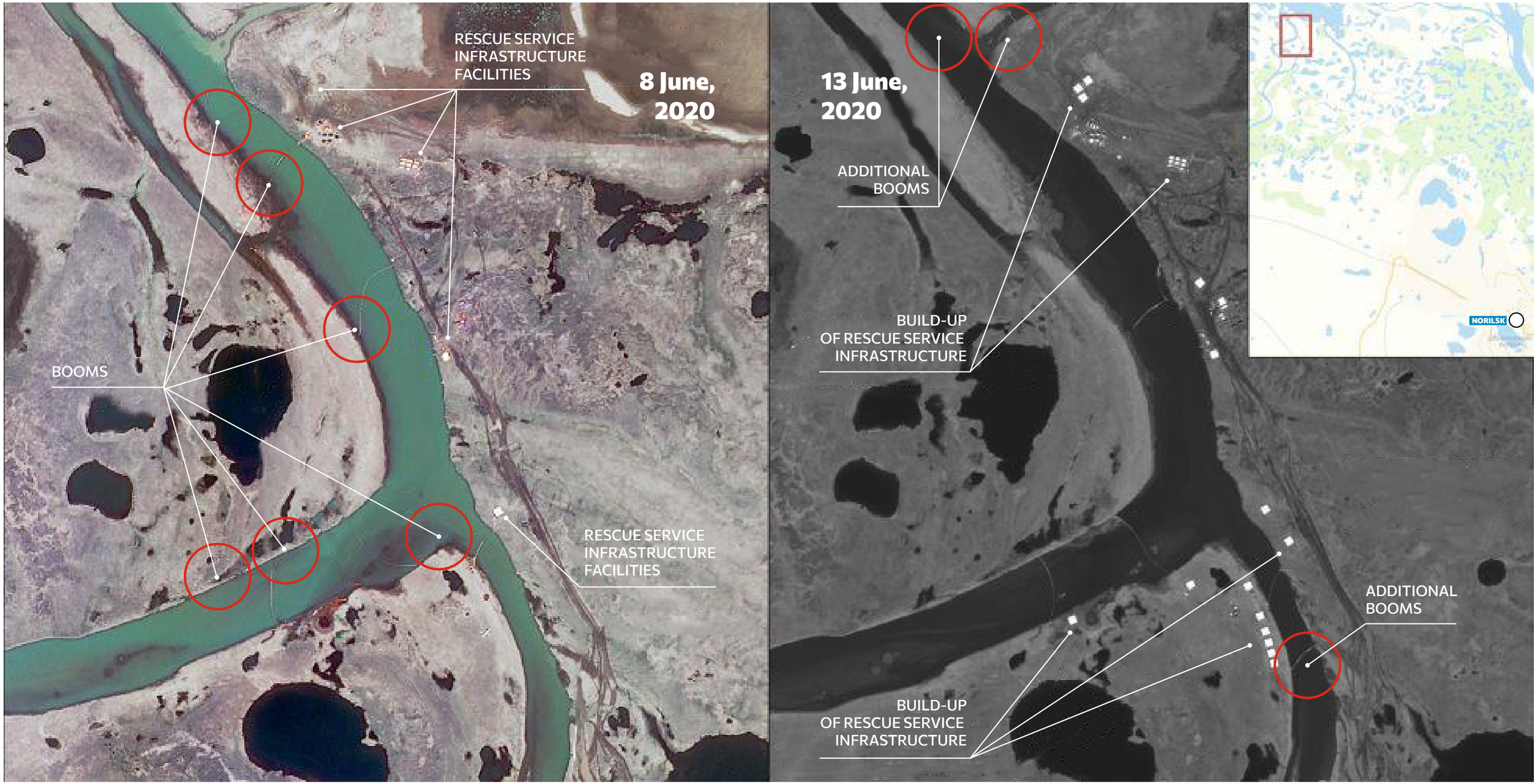


Monitoring of the clean-up operation at the Ambarnaya River north-west of Norilsk, Krasnoyarsk Territory, Russia

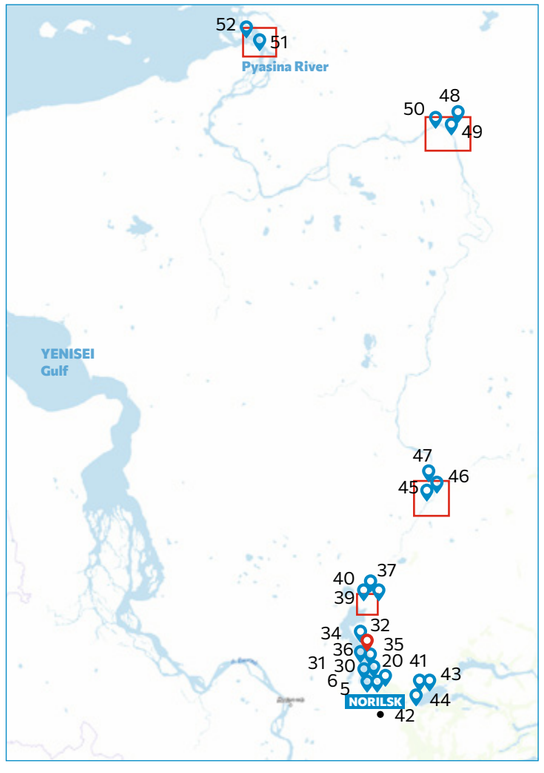
Image taken by Resurs-P satellite using Geoton opto-electronic technology

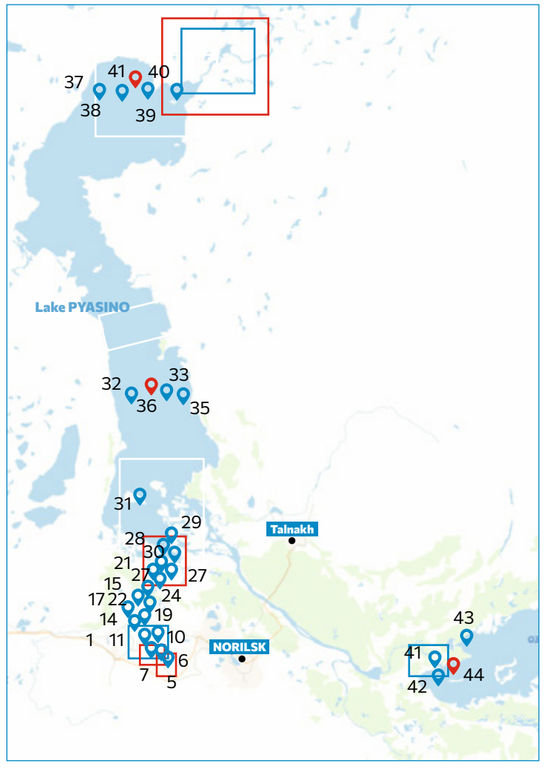

ROSCOSMOS
РОСКОСМОС
Lake PYASINO
Ambarnaya
River
OIL
SPILL
AREA
Data obtained and processed by the remote sensing system operator
(Russian Space Systems Research Centre for Earth Real-Time Monitoring)
All rights reserved. Roscosmos 2020
Lake Pyasino, Ambarnaya River
Image taken by Resurs-P No. 1 satellite
04 June 2020

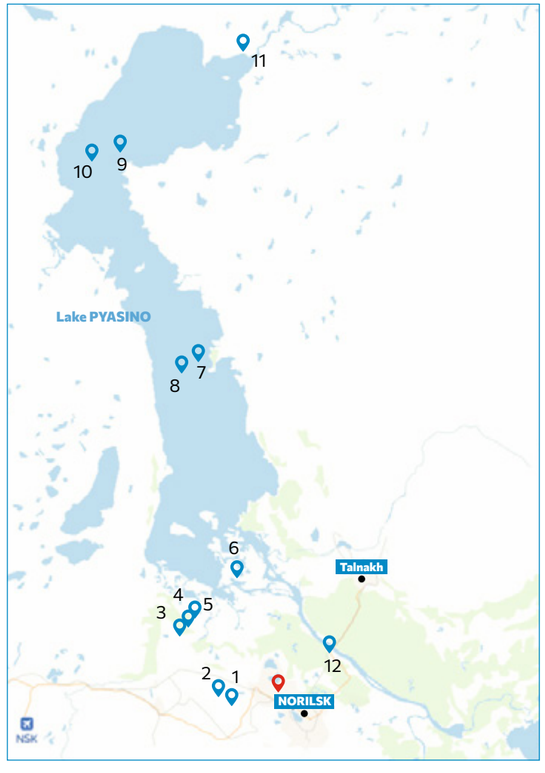

ROSCOSMOS
РОСКОСМОС
HPP-3
EMERGENCY
STORAGE
TANK
EARTHWORKS
РКС
РОССИЙСКИЕ КОСМИЧЕСКИЕ СИСТЕМЫ
НЦ ОМЗ
Data obtained and processed by the remote sensing system operator
(Russian Space Systems Research Centre for Earth Real-Time Monitoring)
All rights reserved. Roscosmos 2020
Monitoring of the fuel spill in Norilsk
Image taken by Resurs-P No. 1 satellite using Geoton opto-electronic technology
04 June 2020


RESCUE SERVICE
INFRASTRUCTURE
FACILITIES
8 June,
2020
BOOMS
RESCUE SERVICE
INFRASTRUCTURE
FACILITIES
13 June,
2020
ADDITIONAL
BOOMS
BUILD-UP
OF RESCUE SERVICE
INFRASTRUCTURE
NORILSK
ADDITIONAL
BOOMS
BUILD-UP
OF RESCUE SERVICE
INFRASTRUCTURE

MAPS OF SAMPLING LOCATIONS OF THE GREAT NORILSK EXPEDITION







General map of sampling locations

Map of sampling locations

1. Hydrochemical and microbiological study **(marks 1–54, Trofimuk Institute of Petroleum Geology and Geophysics, Institute of Oil and Gas Problems)**
2. Hydrobiological study **(white rectangles in fig. 1, Biophysics Institute)**
3. Geochemical and geochronological study of sediments and soils **(marks 31–44 and red marks, Sobolev Institute of Geology and Mineralogy, Institute of Oil and Gas Problems** (Microbiology))
4. Studies of soil, vegetation and animal species **(red rectangles, Science Research Institute of Agriculture and Ecology of the Arctic, Central Siberian Botanical Garden, Sukachev Institute of Forest, Institute of Oil and Gas Problems** (Microbiology))
5. Geophysical and permafrost study **(blue rectangles, Trofimuk Institute of Petroleum Geology and Geophysics, Melnikov Permafrost Institute)**

Map of sampling points

1. Bezymyanny (Nadezhninsky) Stream near HPP-3
2. Daldykan River (north of the Bezymyanny Stream mouth, background sampling)
3. Daldykan River (mouth area)
4. Ambarnaya River (north of the Daldykan River mouth, background sampling)
5. Ambarnaya River (south of the Daldykan River mouth)
6. Ambarnaya River (mouth area)
7. Lake Pyasino (Cape Tonkiy area, near the shore)
8. Lake Pyasino (Cape Tonkiy area, in the middle)
9. Lake Pyasino (Cape Goly area, near the shore)
10. Lake Pyasino (Cape Goly area, in the middle)
11. Pyasina River (source area)
12. Norilskaya River (background sampling)

Head Office
Address: 15, 1st Krasnogvardeysky Drive,
Moscow, 123100, Russia
Telephone: +7 495 787 7667
Email: gmk@nornik.ru

Sustainable Development Department:

Svetlana Ivchenko
Head of Department
Telephone: +7 495 786 8390

Inessa Chernova
Line Director,
Sustainable Development Department
Telephone: +7 495 797 8638

Nornickel on social media
facebook.com/NornickelRU
twitter.com/NornikOfficial
vk.com/nornickel_official
youtube.com/user/NornikOfficial
instagram.com/nornickel_official

Corporate website
www.nornik.ru