Clean drinking water – always under threat

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About 3.5 million Finns use groundwater as their household water supply. Water gushing from springs is groundwater, created when surface water is absorbed through thick layers of soil.

Clean groundwater needs to be protected

Groundwater is a valuable natural resource: the water contained in soil and bedrock is better protected against contamination than surface water. Groundwater is drinkable without treatment. Groundwater is easiest to utilise in areas with sandy and gravelly soil through which water and contaminants pass easily.

What kind of water would you like to drink?

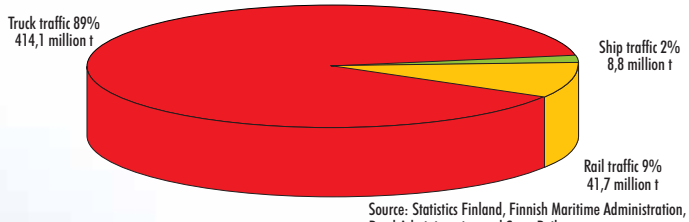
Fuels and petrol are especially dangerous for groundwater: spilled petrol, for example, reaches groundwater in only a few hours in porous ground. In Finland, groundwater occurs at a depth of 2–4 metres. The road and railway transport of hazardous liquids is one of the biggest threats to the cleanliness of groundwater.

The threat of environmental disaster increases due to land transport

Hazardous substances are and will continue to be transported by road and by rail. In 2002, about 10 million tonnes of hazardous substances were transported by road and 6 million tonnes by rail. More than 80% of road transport consisted of fuel transports. The equipment improves, but accidents still happen.

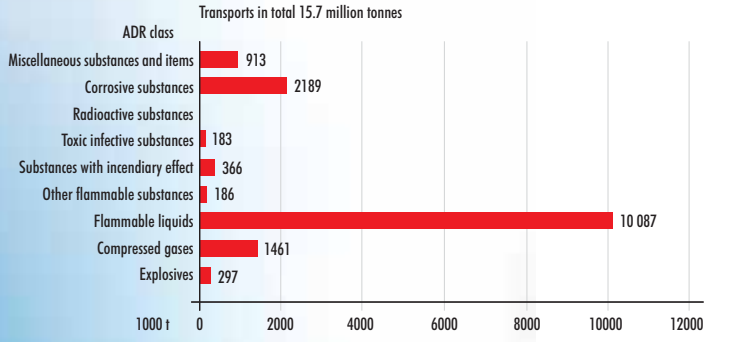
Technical and human errors can not be eliminated by the use of high technology – the risk of accidents is always present.

Domestic freight traffic In 2002 a total of 464.5 million tonnes



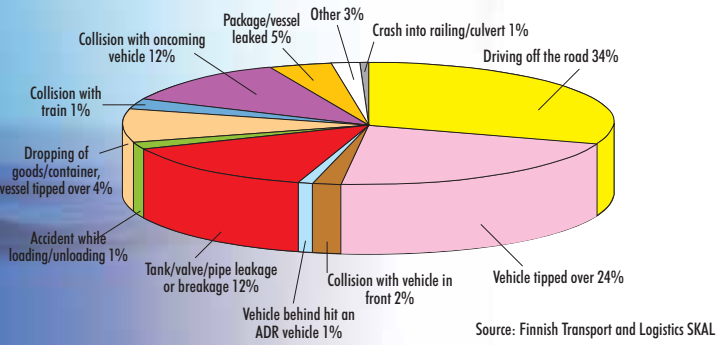
Source: Statistics Finland, Finnish Maritime Administration, Road Administration and State Railways

Transport of hazardous materials in 2002



Source: Statistics Finland, Road transportation of goods in 2002

Accidents in road transport of hazardous substances in Finland 1990-2002



Source: Finnish Transport and Logistics SKAL

Just a drop of petrol will destroy thousands of litres of drinking water

When a tank truck tips over, the earth masses around the leak become toxic waste. Until now, the only option open to the rescue department has been to pump off the fuel remaining on the ground surface. The contaminated soil is then removed with an excavator and transported to a waste processing plant for further treatment.

Rescue departments are in charge of saving the environment

In the event of oil damage on land, the rescue department has the first responsibility for preventing an environmental disaster. With Peltaco Sami Response equipment, the rescue department can prevent the fuel from spreading through the soil and thus save the groundwater from contamination.

An example of a serious oil accident

An environmentally destructive traffic accident took place on 5 January 2004 in Nivala, when a tanker drifted into the oncoming lane while trying to avoid hitting a tractor. A timber truck was not able to steer clear of the tanker, and so the two trucks collided.

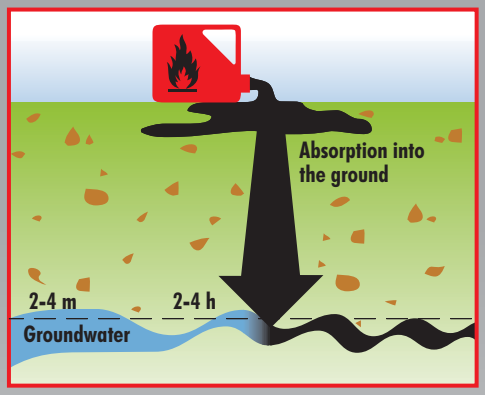
After the collision, both vehicles landed in opposite ditches. The tanker also pushed the tractor and its trailer into the ditch. As a result of the collision, the tank of the fuel truck's tractor unit was ruptured and caught fire.

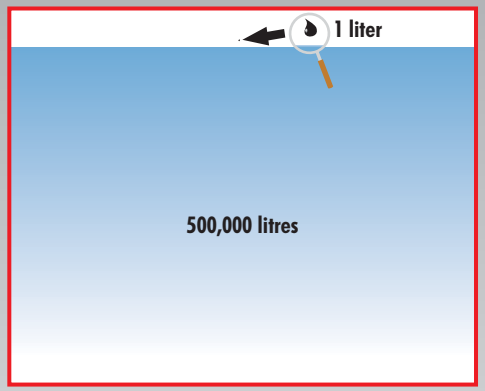
Response measures were started in cooperation with the Environmental Centre. The fuel truck contained about 21,000 litres of fuel, of which about 3,000 litres was petrol and the rest diesel oil. The tractor unit had about 12,700 litres and the trailer about 8,300 litres of fuel (diesel oil). The rescuers were able to recover the fuel from the trailer, but the fuel in the tractor unit burnt or leaked onto the ground. It is very difficult to estimate the exact amount of fuel that leaked onto the ground, as some of the fuel burnt and some soaked into the ground with the fire-fighting water.

Altogether, about 39 tonnes of liquid mixture was removed from the scene. Contaminated snow and soil, totalling about 720 tonnes (about 70 truck loads), was taken in three full trailer combination trucks for further treatment at Jokilaakson jäte Oy in Ylivieska, where the material was treated as lightly contaminated soil. The cost of the soil removal and treatment operation alone was € 24,048.18 (incl. VAT). The excavation of contaminated soil took two days.

Source: Jokilaaksojen pelastuslaitos (Jokilaaksot Rescue Department)

The first few hours after the spill are critical. If the rescue department arrives about 10 to 30 minutes after the accident has occurred, the petrol will have been absorbed to a depth of up to one metre.





There has been no way to protect groundwater from contamination. Modern unleaded petrol contains about 11% of partly water-soluble MTBE which pollutes the groundwater effectively: one litre of petrol renders nearly half a million litres of water undrinkable.

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Peltaco Sami Response to prevent catastrophes

We now have a solution for the controlled recovery of oil spills from land surface and soil, developed at the request of the Finnish environmental authorities. Peltaco Sami Response is a mobile oil spill control system for use on land, developed by the Emergency Services College, Savonia Polytechnic and Peltaco Oy.

There are vessels and equipment on standby in case of oil damage on waters, but on land the preparedness is not as good as it should be. Why not?

Groundwater protection equipment quickly on the scene

When the Peltaco Sami Response equipment has been transported to the scene of the accident, the equipment – including percussion drill with bits, suction tubes, vacuum pump with hoses, low pressure container, combustion equipment, electricity generator, and collector tank – is ready for use in about 10 minutes. The equipment trailer opens from all sides, which makes it quick to use.

The response equipment is packed in a compact trailer, with everything needed included. The heaviest components are pulled out on sliding beds, and the trailer is equipped with lighting to facilitate work.

The hazard of ignition is eliminated by earthing the equipment and by insulating the leakage with foam.

The low-pressure tank and the other components are easily moved to correct positions, depending on the activity in question and the conditions of the terrain.

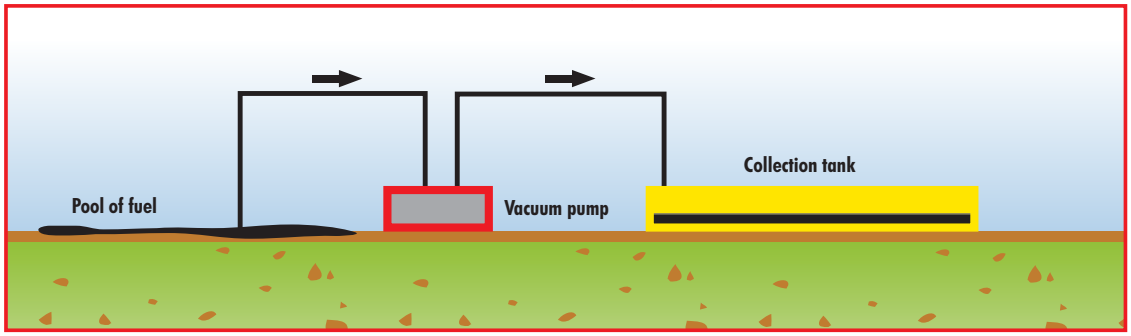
Peltaco Sami Response – Reliable operation in all circumstances

The operation of the Peltaco Sami Response equipment is based on strong vacuum suction, by means of which volatile hydrocarbons, such as petrol, can be recovered from the ground both as liquid and as vapour by means of suction tubes inserted into the ground.

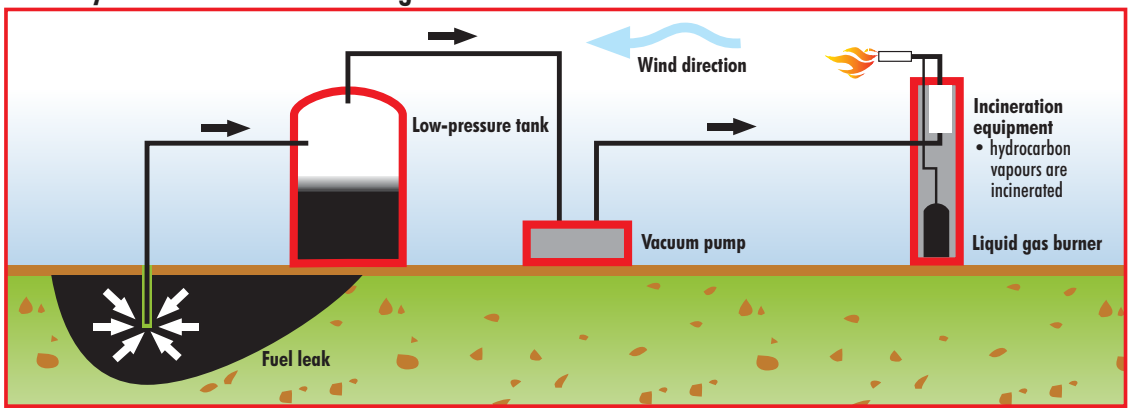
Speed is of essence

The Peltaco Sami Response equipment has been tested in both winter and summer conditions. The suction tubes can be placed in the ground even through thick snow, ice and frost. In tests conducted by the Geological Research Centre, about 50–80% of spilled petrol was removed from the soil immediately after a leak. The response measures can take a couple of hours depending on the extent of the leak.

Surface suction



Recovery of fuel absorbed into the ground



Liquid and vapour efficiently separated

The process is based on powerful vacuum suction, by means of which volatile hydrocarbons - such as petrol - can be recovered from the ground as both liquid and vapour by means of suction tubes inserted into the ground.

Holes up to about 0,5-1,5 metres in depth are drilled into the ground either with a combustion engine drill or an electric drill depending on the type of soil and the season. Suction tubes are then inserted into these holes.

Petrol, diesel or fuel oil in a pool (surface suction) on the ground is sucked with a vacuum pump directly into the collector tank.

The combustible liquid and the hydrocarbon vapours are separated from each other in a low-pressure separation container and harmful petrol vapours are disposed of by means of controlled incineration. Such incineration is assured by means of a liquid gas burner.

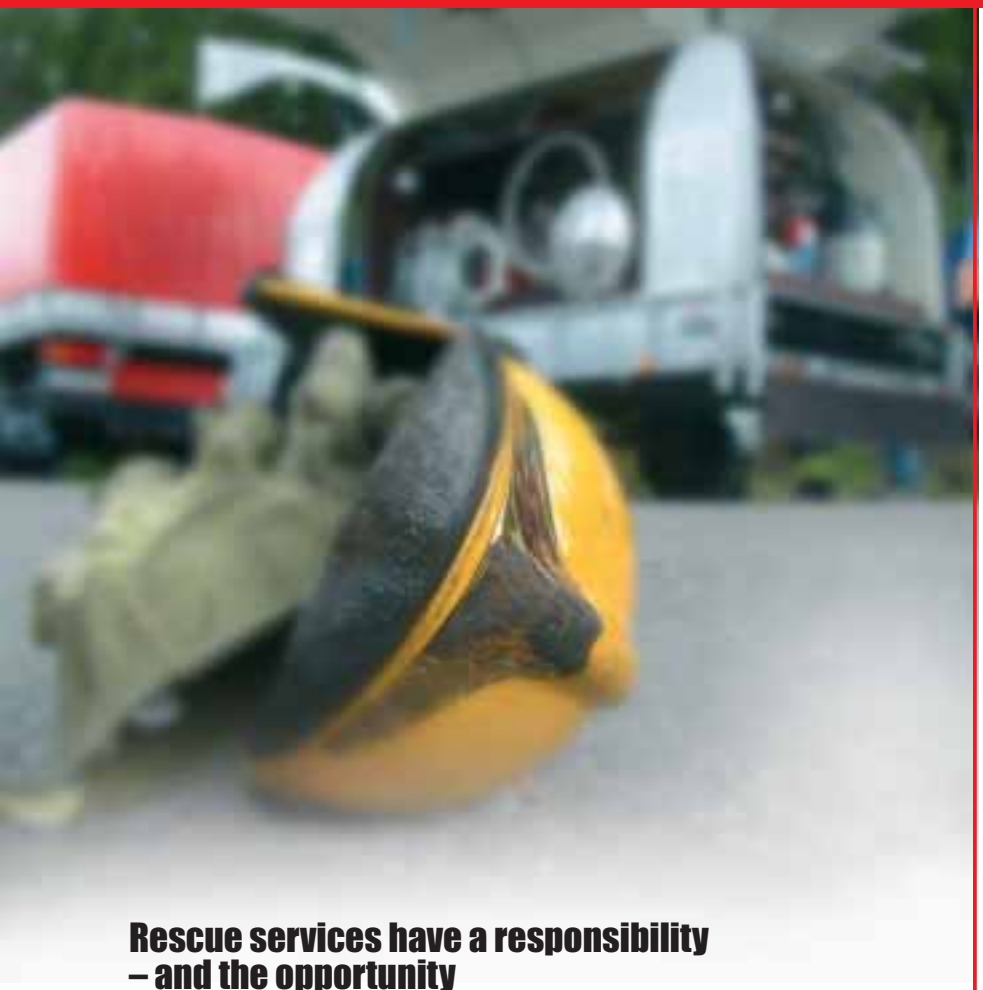
The equipment was awarded with the North Savo Regional Environment Centre's Environmental Award 2003

Immediate response measures can help save up to hundreds of thousands of euros in soil cleansing. Damage to the environment, however, can not be measured in money.

Multifold savings

Soil restoration is expensive. Peltaco Sami Response equipment significantly reduces the need for soil cleansing. The purpose of the response measures is to recover fuel that might otherwise end up in groundwater. Restoration work is still necessary after the response measures, but on a much smaller scale. Groundwater, however, can not be saved retrospectively. One of the duties of rescue departments is to prepare for emergencies.

Rescue teams have great power and responsibility now that a method



Rescue services have a responsibility – and the opportunity

The transport of hazardous substances by road and rail will not significantly decrease in the near future. On the other hand, it will increase, and so will the risk of accidents. Tighter transport schedules, increased traffic, increasingly massive transport equipment and requirements to improve logistics multiply the risk of accidents.

The rescue services now have the ability to prevent disastrous environmental damage, to restrict the spread of fuel in the ground and even to save the threatened groundwater in the event of an accident – the primary objective of the such response measures. This way there is less need for time-consuming and expensive soil cleansing, carried out at a later time.In order to achieve the aims, quick action is required immediately after the leak.

The Emergency Services College provides training in the use of the Peltaco Sami Response equipment. The manufacturer, Peltaco Oy, oversees maintenance and repair. For further information, please contact Peltaco Oy.

For further information on the equipment, also please contact:

Sakari Halmemies, Tampere University of Technology 2003: Development of a Vacuum-Extration Based Emergency Response Method and Equipment for Recovering Fuel Spills from Underground.

Patent pending: PCT/FI 2003 000189

Being prepared is the best insurance

There is a solution to ensuring clean drinking water and to preventing ecological damage. Threats can be prevented by employing the best method available today.

We must leave the land and the environment to our children at least in the same condition in which we found it.

and the equipment for saving the groundwater exist.

Involved in the equipment's development:
- Emergency Services College • Savonia Polytechnic
- Geological Research Centre
- Tampere University of Technology
- Golder Associates Oy
- Technology Development Centre
- IF Teollisuusvakuutus (industrial insurance co)
- VR-Yhtymät Oy (state railways)
- Palonsuojelun edistämissäätiö (fire prevention promotion fund)
- Maa- ja vesitekniikan tuki ry. (support association for soil mechanics and hydraulic engineering)

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