Hazardous Waste Landfill Site Kölliken
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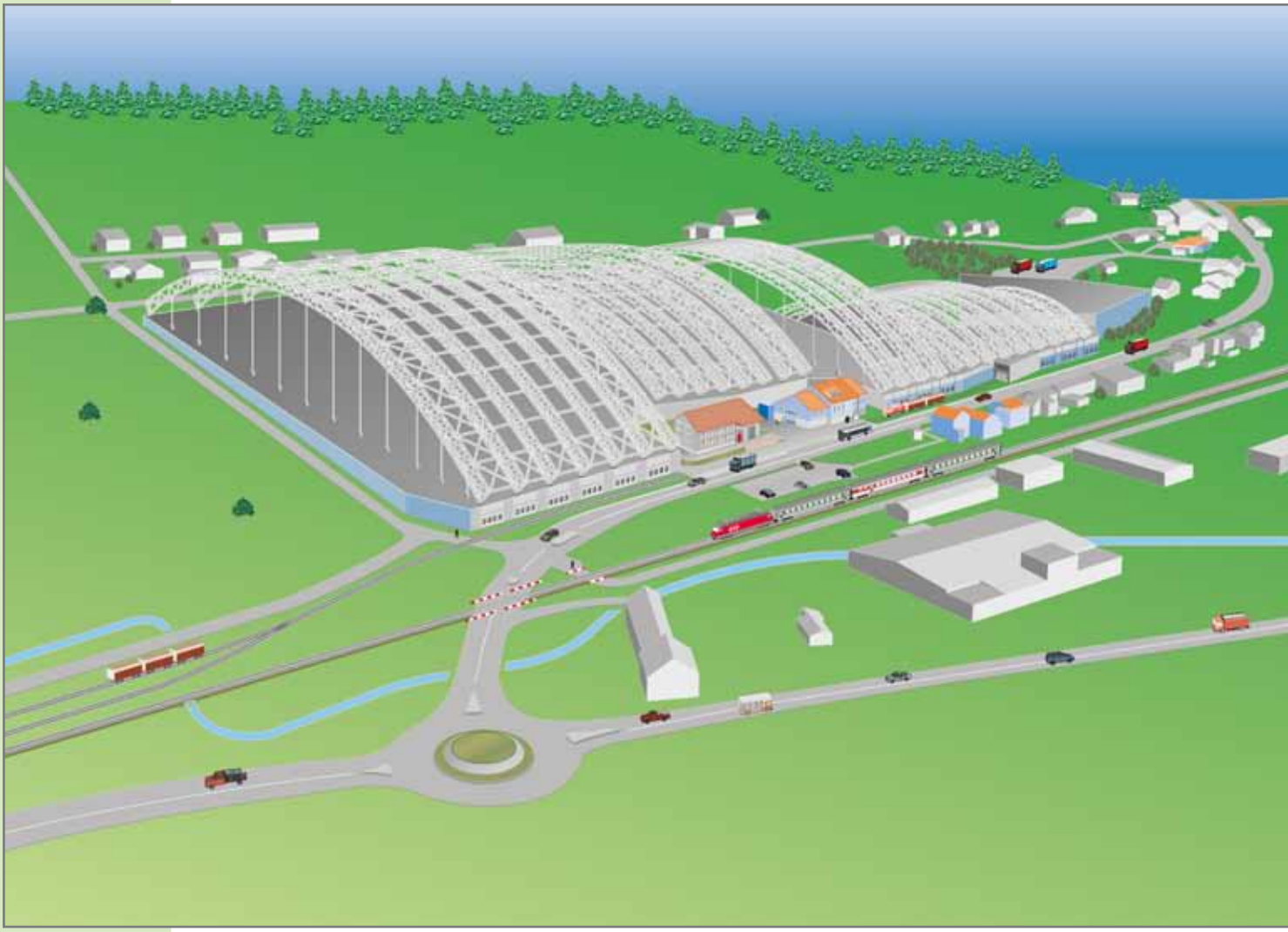
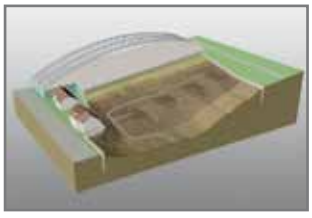
Total Remediation

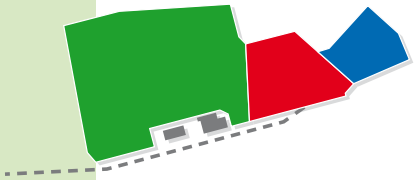
of the Kölliken Hazardous Waste Landfill Site



In July 2003 the Department of Construction, Transport and Environment of the Swiss Canton of Aargau directed that the Kölliken Hazardous Waste Site Consortium be required to remediate completely the hazardous waste landfill site by the end of 2015.




The Project



Structures

For the remediation of the site, an excavation hall (**1**), a material handling hall (manipulation hall) (**2**) and a storage building (**3**) have been constructed. As planned in 2005 the construction of the material handling and excavation halls consists of column-free design with an outside arch framework from which the hall roofs are suspended.

Protection of Community Health and Environment

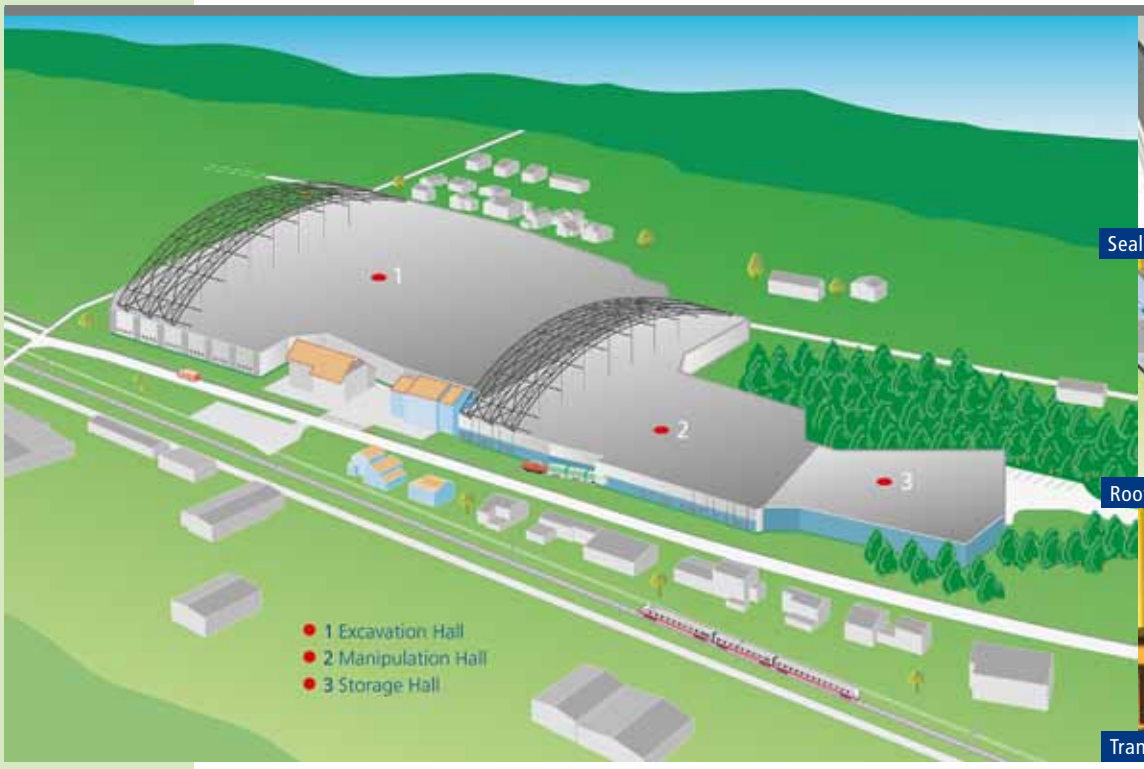
SMDK has high technical and organizational requirements for the protection of health both inside and outside the halls, and for the protection of the environment. The walls and roofs are designed to prevent the escape of air. Furthermore, all work in the halls are performed at below atmospheric pressure, which additionally prevents the escape of gases, odours and dust. All exhaust air is purified by a three-stage air treatment plant using dust as well as two-stage activated carbon filters.

Safety Concepts

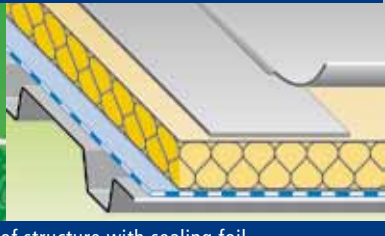
A comprehensive safety concept has been developed. To reduce the risk of fires and to prevent them from spreading, all-embracing precautions have been taken: storage areas and rooms have been partitioned into fire-resistant sectors, and sprinklers installed in the storage rooms. The excavation area is monitored with infrared cameras and a considerable quantity of water for fire fighting is kept in reserve on site. Emergency and operational schedules have been prepared for the fire brigade. In the event of fire, smoke will be routed to the outside via the waste air purification plant; and fire fighting water collected and disposed of separately.

Waste Transport

It is SMDK's aim to transport a maximum amount of the waste material by rail. For that purpose, a separate rail connection was built.



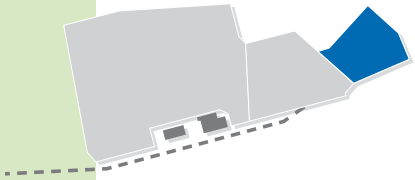
Sealing profiles protect the environment

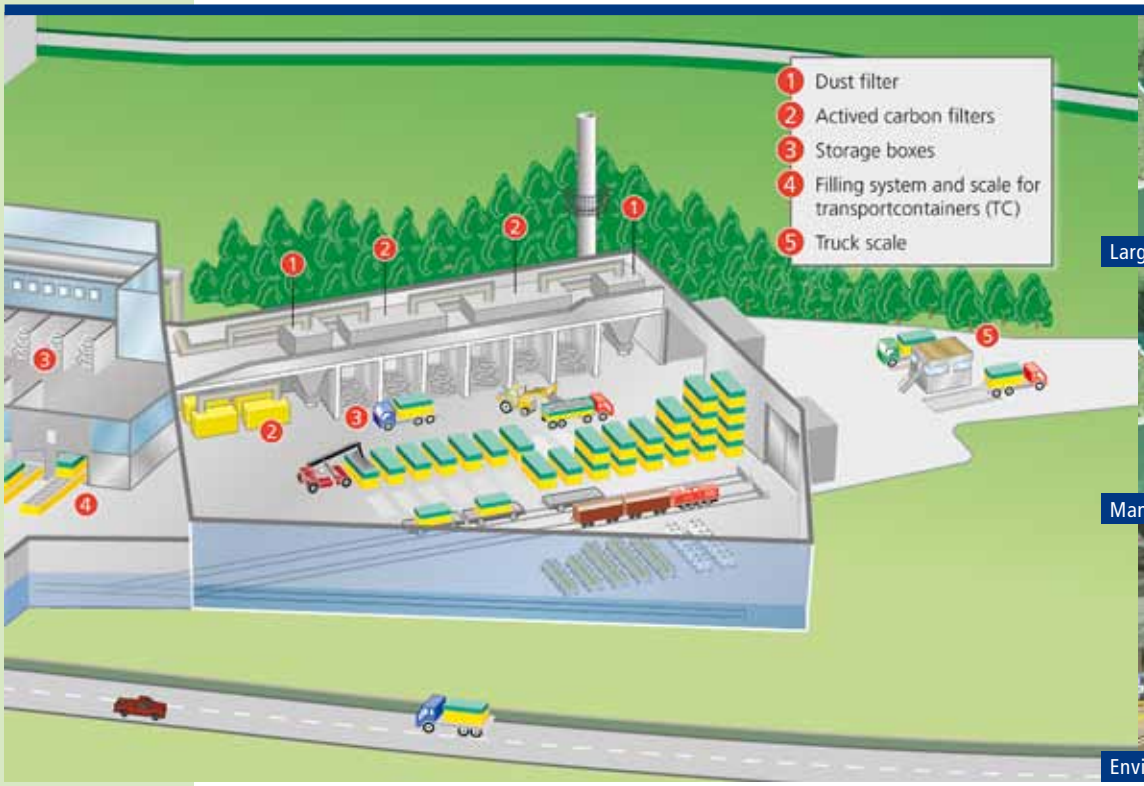


Roof structure with sealing foil

Transport by rail from the site

The Storage Hall






Large fire fighting water reserves


Manipulation hall structure in steel


Environmental protection by underpressure

Construction Start

Construction began to the east of the landfill site where the area was clear of any waste material. The eastern access road, a forecourt, the link road to the cantonal road, the construction site installations, the infrastructural buildings, and the information pavilion have all been built.

Structure stabilization

The infrastructural buildings as well as the storage building are situated outside the landfill site perimeter on uncontaminated ground. Bored piles were drilled around the landfill site perimeter and secured by a circumferential girder. The piles not only stabilize the slope but also serve as the hall foundations.

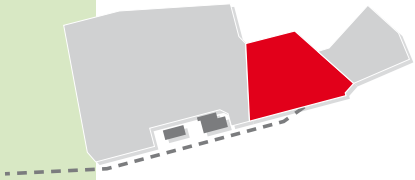
Walls

The walls of the storage hall were constructed partly in a modular design, comprising sound- and heat-insulating elements. The outer walls of the material handling and excavation halls were built with reinforced concrete. The arch framework of the roof structures rest on these walls.

Structure

Storage basins for rain, site run-off and water for fire fighting were built below the storage building. The basins ceilings are also the floor of the storage building itself. In order to ensure an optimum process and safe operations a free interior height of 10 metres is necessary in the storage hall.

Manipulation Hall



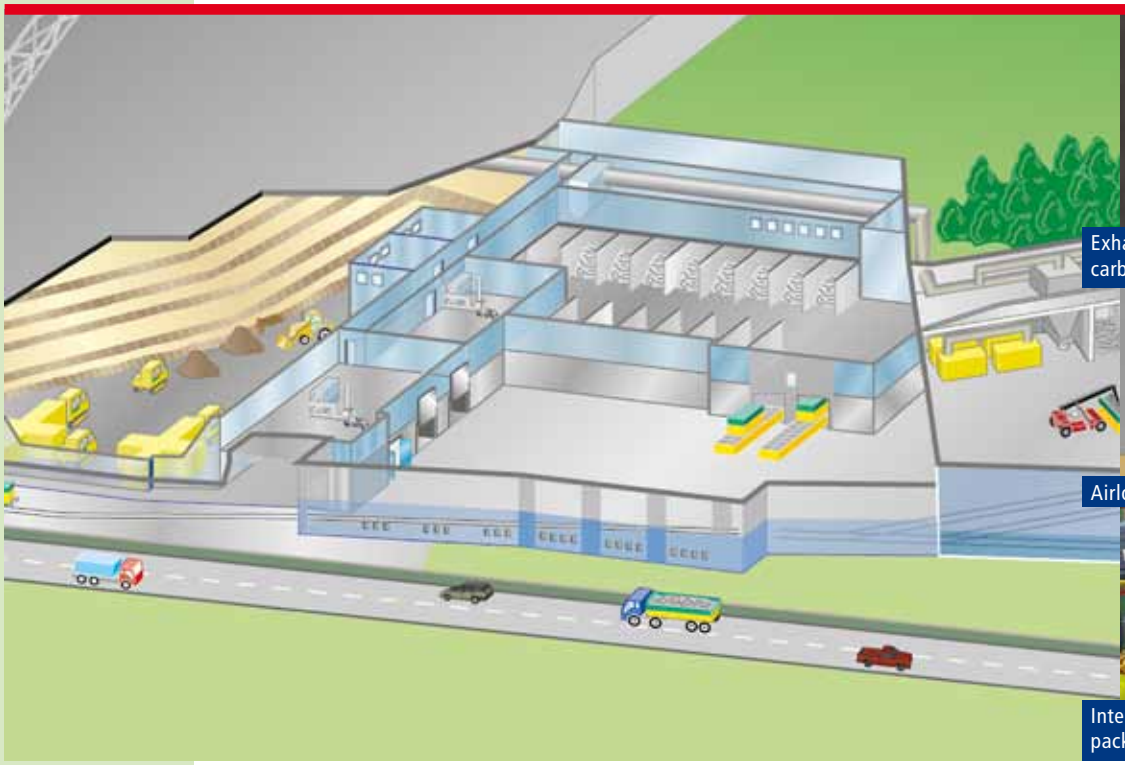
Double function of the Manipulation Hall

The manipulation, storage and excavation halls are built as one. As the manipulation hall area forms part of the perimeter of the landfill, it was used in the first remedial phase as an excavation hall and the western sector of the real excavation hall was initially partitioned off.

During a pilot phase of about one year the waste material was excavated, packed in special containers and removed by lorry.

After complete removal of the waste material from the manipulation hall a concrete base slab was laid. The pile wall exposed by the remediation serves also as slope stabilisation. The material handling and excavation halls are now separated to the storage hall by a wall and linked by air-locks.

After construction work was completed in the manipulation hall, the technical facilities for interim storage, sampling, sorting (triage) and re-packing of the waste material were installed and the railway connection into the manipulation and storage hall laid. Three tracks in the storage hall will ensure optimal rail operations. From then on removal will mainly be by rail.

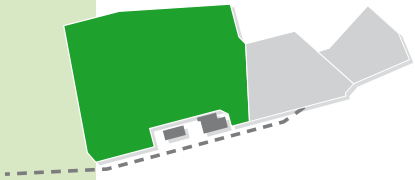


Exhaust air purification by filter and activated carbonfilter

Airlocks prevent emissions

Intermediate storage facilities and new packing

Excavation Hall



Excavation Hall

Upon completion of the first remediation phase the temporary partition wall built in the excavation hall has been removed. The excavation hall now covers the entire area of the landfill site.

Beginning of the Remediation

When precautions for the protection of on-site staff, community and environment are complete the remedial phase 2 will begin. This phase includes the main portion (75%) of the land fill. Where the landfill perimeter or its base is contaminated those areas will also be removed and accordingly disposed of.

Remediation Process

The waste materials will be removed completely by several excavation teams working in parallel, using special vehicles and under strict safety measures. To excavate the teams will use diggers fitted with backhoes, drum grippers, big-bag grippers, forks and front-end loaders. The machine operators work in airtight and dustproof cabins in a clean atmosphere. They are protected from contact with the waste material and from the contaminated air within the excavation hall.

In the immediate proximity of the landfill an on-site laboratory was built. The excavated waste materials are checked, analysed and, based on the analytical results assigned for appropriate disposal.
Thereafter the landfill materials will be sorted accordingly to their level of contamination and stored in storage boxes. Loose landfill material, is transported directly from the excavation hall into interim storage boxes in the manipulation hall by dumpers. Landfill waste in intact barrels or big-bags is put into handling containers which are then transported into the manipulation hall for interim storage.

Non or low contaminated waste materials are placed on a conveyer belt and transported into assigned interim storage boxes within the storage hall.

Excavation by several teams

Work under protection of airtight cabins

Separation in accordance with rigorous measures

Repacking in new Containers

The waste materials in the interim storage areas will then be packed. Depending on the situation barrels, big-bags or special hermetically sealed containers will be employed. Each individual container will be numbered, registered and marked with details of its contents.

Interim Storage

Until transportation from the site, the waste material will be stored in containers or hoppers within the storage building. A stacker will be used to prepare the containers for transport in a precisely defined sequence so that railway wagons and lorries can be loaded with the correct materials.

Overall the SMDK has got roughly 30 working days of interim storage capacity for the excavated waste materials. This either in the storage boxes (contaminated area) within the manipulation hall or already packed in air-tight barrels, big bags respectively sealed containers in the storage hall.

Transportation to disposal site

The waste materials will either be transported by train, by road or ship to the site of disposal. With the landfill management system (DMS) the SMDK has a tool to control all waste movements, knowing at anytime where the materials and what their allocated disposal processes are.

Removal of the Halls

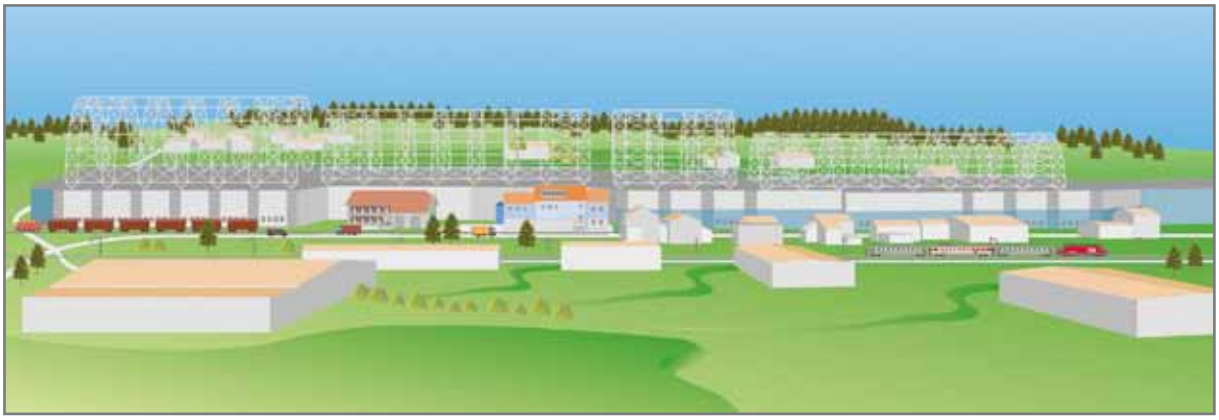
After the removal of the landfill site, which is expected to be in 2016, the excavation, manipulation and storage halls themselves will be dismantled.

Restoration

After the removal of the all infrastructure there will be an interim recultivation of the site. The excavated pit will be filled with a clean layer of gravel and sand and then replanted. The results of the remediation will be observed for another three to four years, an important indication being the quality of the groundwater. If the results are acceptable and after consultation with the local authorities, the landfill will be finally restored and redeveloped appropriately.

Responsibility for the Future

The aim of the total remediation is to restore the former Kölliken Hazardous Waste Landfill Site in a state that will allow us to pass on the area to future generations and this with a clear conscience.



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