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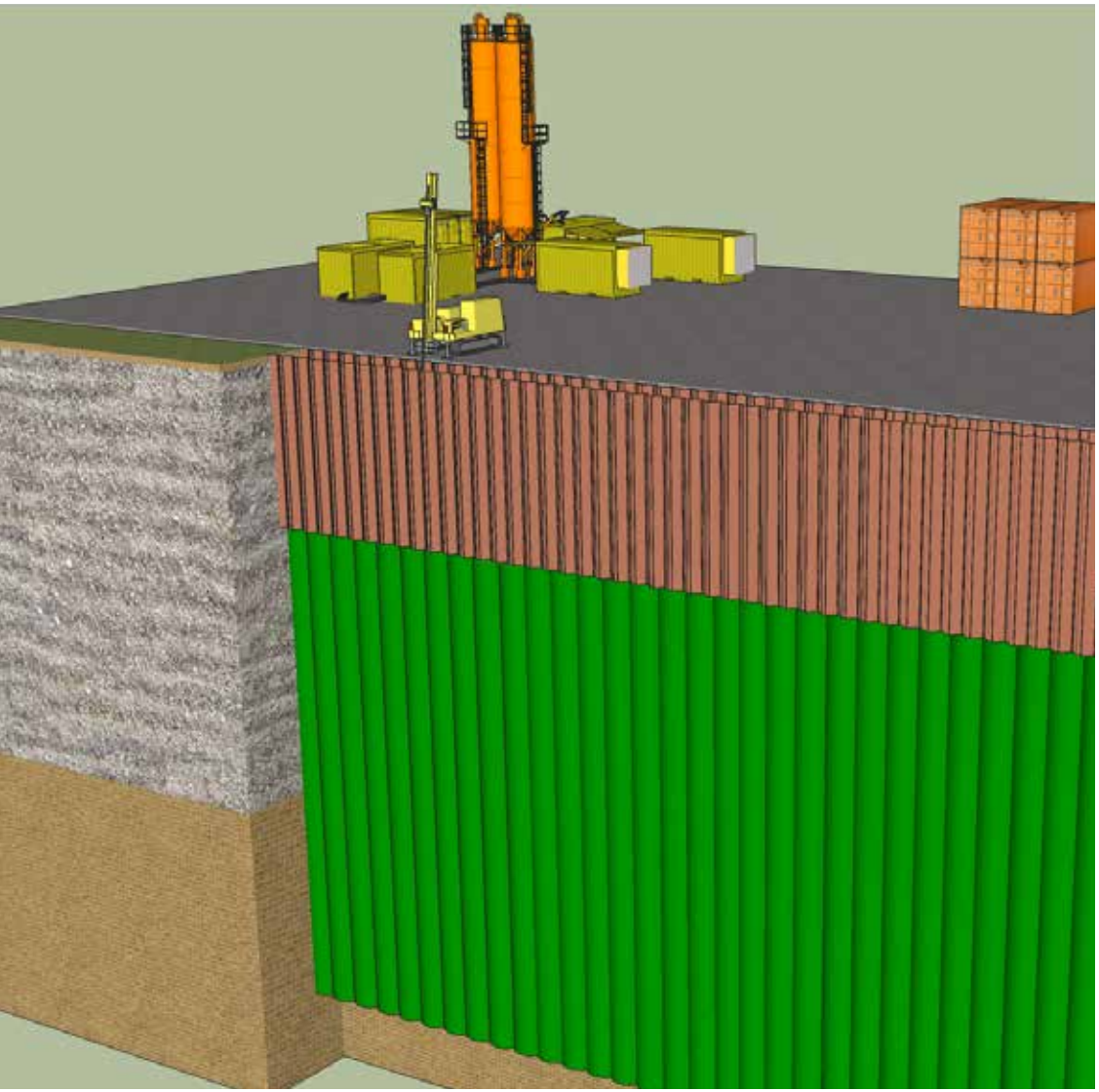
ROCK - SOIL TECHNOLOGY AND EQUIPMENTS

PACCHIOSI DRILL

CONSOLIDAMENTI



REGGIO EMILIA (ITALY)

ROCKAWAY PARK (NEW YORK - U.S.A.)

PROJECT:

Vertical jet grouting barrier for containment of polluted subsoil.

Making safe a former industrial area used for the manufacture of gas for civilian use; intervention aimed at eliminating the potential risks of migration of highly polluting substances from the subsoil to the adjacent "Jamaica Bay" nature reserve, located on the peninsula of Rockaway Beach in the Southern District of Queens, New York.

EXECUTION PERIOD:

October 2011 – May 2012

CLIENT:

U.S. NATIONAL GRID.

Fig. 1. P1500ECS drill rig positioning

Introduction

The gas production plant "Rockaway Park MGP" (Manufactured Gas Plant) owned by the KeySpan Co. (later purchased by the National Grid in 2008) is located south of the Beach Channel Drive and adjacent to the Bay of New York called "Jamaica Bay", a protected natural reserve communicating with the Atlantic Ocean, near Queens.

Gas production started around 1880 and continued until the mid 1950's, when it finally stopped and the plant was subsequently closed and decommissioned. During its lifetime, the plant was expanded several times to increase its production and storage capacity. In 1998, the site was registered as a protected area with the presence of hazardous wastes designated as class A-2; the description of the class A-2 defines waste which "constitutes a serious threat to public health and the environment; corrective measures are required as well as urgent remediation."

As a result of this classification, KeySpan, in agreement with the NYSDEC (N.Y. STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION), in 1999, carried out a feasibility study on the recovery and remediation of the site.

Fig. 2. View of Rockaway Park MGP plant before disposal (1950)

Type of contamination - Design Solution

The contaminants found in the subsoil and in aquifers are in line with those expected for a former MGP site (primarily the BTEX-group - benzene, toluene, ethylbenzene and xylene - as well as PAHs - polycyclic aromatic hydrocarbons - and cyanide compounds).

The increased risk indicated by the study is that these contaminants present in the subsoil may migrate outside of the same site, more precisely, northwards to the adjacent Jamaica Bay in New York City; They could have a negative impact on wild sea flora and fauna as well as cause significant public health risks.

These contaminants in some zones were found at depths of around 100 feet and more. Based on the results of the investigation and after analysing the various remediation alternatives, the NYSDEC, after a public meeting, announced the design solution for the site. The key element of the project is the formation of a barrier consisting of a jet grouting wall placed inside a double row of metal sheet piling secured into the ground.

Geology.

The area includes three main stratigraphic elements:

- Surface fills - up to 6 metres below ground level, these are composed primarily of sand and coarser materials mainly used for expanding the same area towards the "Jamaica Bay"; the fill material also included varying amounts of coal, clinker, wood cinder, cement, brick, ash, glass and crushed shell fragments.
- Marine deposits called "Barrier Island Deposits" composed mainly of fine, medium and coarse sands, and sea shells. They also contained thin layers of silt and clay; the thickness ranges from 16 metres up to a maximum of 21 meters reaching a depth of 27 meters below ground level; a change of colour from grey to brown can be seen at the base, which identifies the change to the next lithological layer.
- Glacial deposits consisting primarily of compacted brownish fluvial-glacial sands including layers of small quantities of compacted silty sand; these are around 8 metres wide and reach a depth of 35 metres.

Fig. 3. View of Rockaway Park MGP area during works

Aim and description of the interventions

The works included the execution of a row of **three-fluid jet grouting** columns using "**PACCHIOSI SISTEM 3 (PS3)** technology. The aim of the intervention was to allow the formation of a continuous waterproof barrier to prevent the migration of highly toxic substances present in the subsoil to the adjacent Ocean; the columns were made after another company completed the installation of the metal piling.

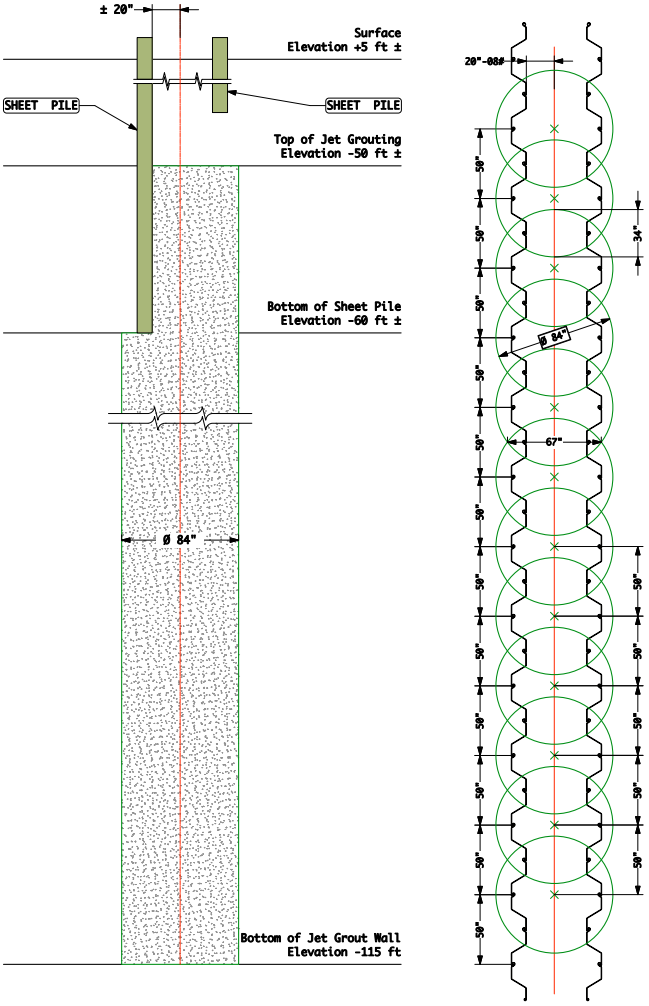


Fig. 4. Typical cross section

On the basis of previous experience in a highly polluted site similar to Rockaway Park MGP (see brochure CLIFTON N.Y.C.), the same equipment and methods were used in relation mainly to the recovery of injection waste water; these were managed through the use of a preventer directly placed on the concrete slab and a watertight tank equipped with a pump to remove the waste water and transfer it to the respective treatment areas.

The waste water collection system, designed and built by PACCHIOSI DRILL allowed the systematic removal of waste water from the work site without the water, which contained highly toxic substances, coming into contact with the personnel working on site.

Fig. 5. PACCHIOSI P1500ECS drill rigs operating with automatic rod loader

Characteristics

Preliminary tests were performed which provided for the execution of four pairs of columns with the aim of identifying the most suitable parameters for the execution of the works.

Fig. 6. Special watertight tank used for Jet Grouting spoils' collection

Controls and Inspections

The following controls were carried out during the execution of the works:

- the deviation from the vertical was checked on each individual bore hole before injection; the deviation was controlled using an inclinometer constructed by Pacchiosi Drill which has the special feature of introducing the inclinometer (equipped with a sensor and a biaxial gyroscope) directly into the drill and injection rods leading to extremely fast execution times compared to traditional measuring devices; the measurement data are processed in real time with immediate display of as-built graphics showing the position of the column along with the relative thickness of the wall under construction.
- The execution of the columns was systematically monitored and recorded using the **PACCHIOSI RECORDING SISTEM PRS3** data acquisition system offering graphic display of the data collected.
- After execution of the columns core sampling is performed to verify their quality and durability; a further check is carried out visually with the aid of a micro camera (located inside the bore hole) that directly checks the quality of the inner walls of the columns.

Fig. 7 e 8. Measuring of the deviation of drilled hole before injection

Fig. 9. Photographs of cored samples

Fig. 10. Extraction of a perfect cored sample

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