



Plate 1 – Completed development

Development:	Combination of residential and commercial usage
Developer:	Barratts
Consultants:	White Young Green

Site Conditions

The Wandle Park Village Site occupies an area of 5.3 hectare bounded to the south by the Purley Way Retail Park, to the north by large retail outlets, to the east by the Croydon Light Railway and to the west by Purley Way and residential properties.

Historical use of the site as part of a coal gasification works had led to the site being heavily contaminated with by-products of the gasification process. Studies identified the main contaminants as being benzene, toluene, ethylbenzene and xylenes (BTEX), poly-aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH).

Ground investigations, determined the ground conditions across the site to consist of Made Ground, overlying River Terrace Deposits, overlying in turn Thanet Sands and White Chalk Formation. Made Ground was determined to comprise of thicknesses of up to 5.0 m consisting of fine to coarse flint gravel with occasional deposits of soft clay with regular fragments of brick, concrete, wood and metal. The River Terrace Deposits consisted of angular to sub-rounded fine to coarse occasional cobble sized flint gravel at thicknesses of up to 5.0 m which exhibited contamination in the shallow groundwater table. The

Thanet Sands were identified at depths between 3.0 m and 4.8 m bgl with proven thickness of up to 12.0 m and consisted of dense silty / clay. The White Chalk Formation was encountered at about 15 m bgl.

The River Terrace Gravels and Thanet Sands are designated by the Environment Agency as a Minor Aquifer; the White Chalk Formation is designated as a Major Aquifer. The Thanet Sands and River Terrace Gravels are considered to be in hydraulic continuity with the White Chalk Formation though the Thanet Sands which has a much lower hydraulic conductivity than the Chalk which were considered to inhibit this hydraulic continuity to some degree.

The site investigation conducted by White Young Green measured groundwater levels between 1.7 m to 4.7 m bgl across the site with groundwater flow within the lower part of the Made Ground, River Terrace Gravels and the Thanet Sands. The site groundwater flow is predominantly to the west in all aquifers. The River Wandle flows east to west across the site and is currently culverted for its entire length within the site.

Three phases of remediation were undertaken by the former site owner which targeted areas of significant contamination and removal of former structures on site.

Objective

Previous remediation operations did not completely remove the contamination source and therefore did not address groundwater contamination, it was proposed that a soil mixed reactive barrier be installed to address these issues. Envirotreat were chosen as preferred contractor to design and undertake this scheme on the basis of cost effectiveness, project experience and technology capability.

Methodology

Envirotreat designed a Soil Mixed Reactive Barrier utilising their proprietary E-Clay® Stabilisation Technology to treat contaminated groundwater as it migrated off-site. The system combined two “passive” sections (130m and 100m in length respectively) and one “reactive” section (65m in length) with the objective of protecting the local culverted section of

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the River Wandle from ongoing pollution arising from the site.



Plate 2 – Installing barrier using Auger piling rig.

An E-Clay® comprising of modified organo-inorgano clay was designed from site investigation data and trailed through extensive in-house laboratory treatability trials. These tests consisted of batch testing followed by detailed column test studies; all of which determined the capability of this particular E-Clay® formulation to address the identified pollutants. A MODFLOW groundwater simulation model was used to demonstrate the minimal effect on the local groundwater regime whilst effectively intercepting and treating the migrating contamination.

The works were conducted in two phases as required by the developer’s programme of works, phase one, the implementation of passive barrier section carried out over a 6 week period and phase two, undertaken a few months later the implementation of the active barrier section over a 3 week period; all works were carried out under the auspices of Envirotreat’s Mobile Treatment Licence (MTL).

Results & Validation

The Treatability Study Report provided the basis for acceptance of the scheme by the Environment Agency. This was further bolstered by the installation of numerous monitoring boreholes, these being located upstream, downstream, and on the line of the barrier itself to verify the installation and operation of the barrier over a prescribed time period. Samples were obtained from each borehole on a monthly basis for year one and bimonthly for year two.

Contaminant	Max Conc. (µg/l)	Target Treatment Criteria (µg/l)
Benzene	40,000	350
Toluene	11,000	580
Ethylbenzene	2,600	230
Xylene	4,200	350
Naphthalene	3,600	120
Phenanthrene	1,200	120
Benzo(a)pyrene	310	5
Ammonia	920,000	700
Cyanide (total)	1,300	580
Arsenic	130	580

Table 1 Maximum observed groundwater contaminant concentrations used for the synthetic groundwater make-up

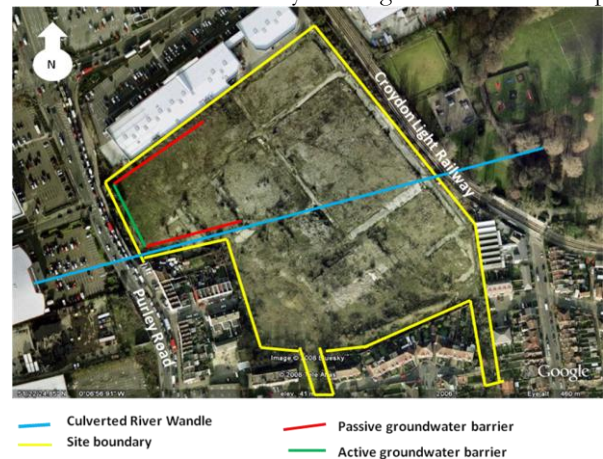


Figure 1 Schematic illustration of the installed Soil Mixed Reactive Barrier.