HYDROGEOLOGICAL GROUP

An experimental use of hydrogen peroxide in water well rehabilitation

10th September 2008

Professor Rick Brassington Newcastle University

Introduction

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- **Outline of site procedures**

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- **Example of treatment to restore yield**

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- **Example of treatment to restore yield**
- **Example of treatment to destroy PAH**

Collaborators

Solvay Interox Ltd, Warrington

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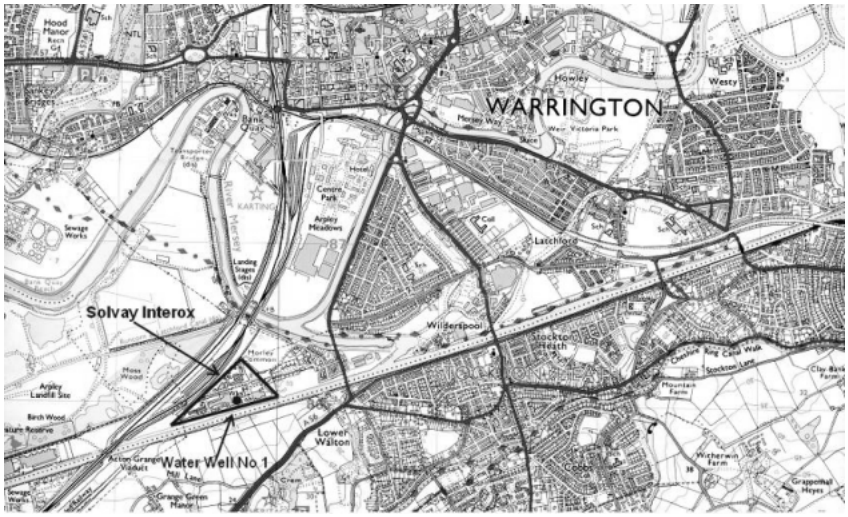
J.P. Whitter (Water Well Engineers) Ltd

Yield restoration

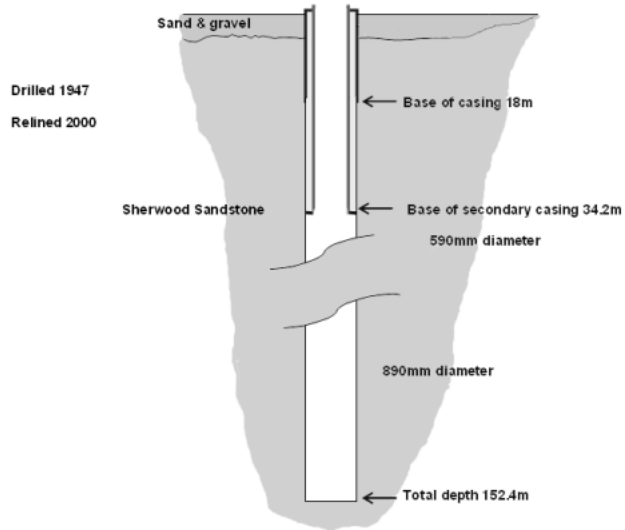
Example of yield restoration

Solvay Interox, Warrington

Site Location



Borehole details



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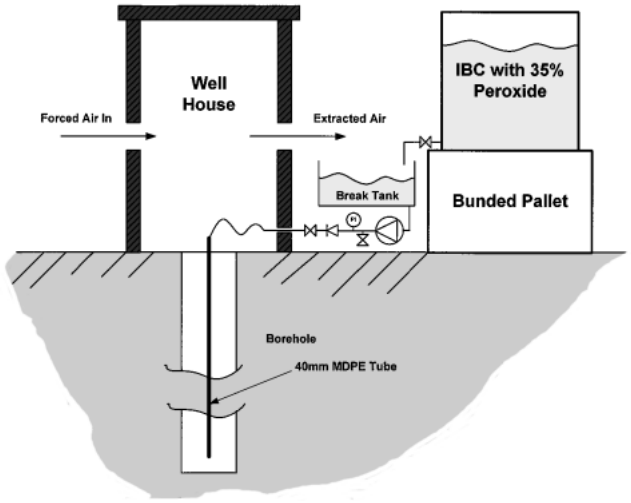
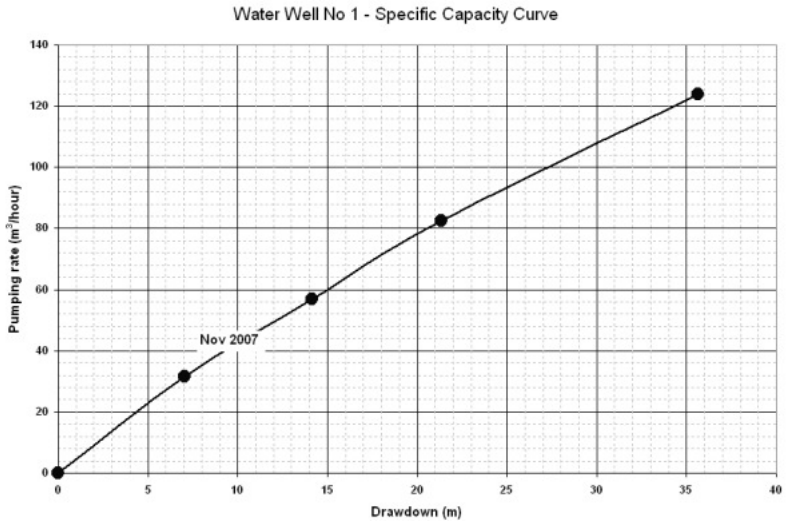
- Borehole returned to service

Site set-up



Well performance



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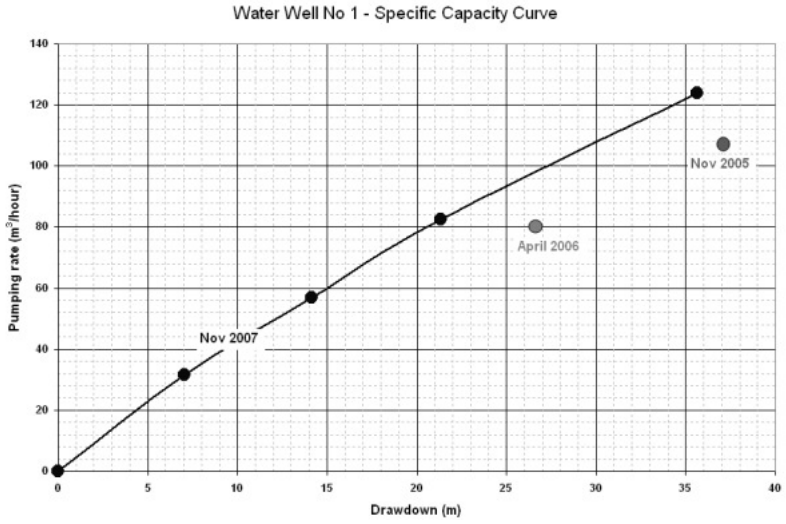

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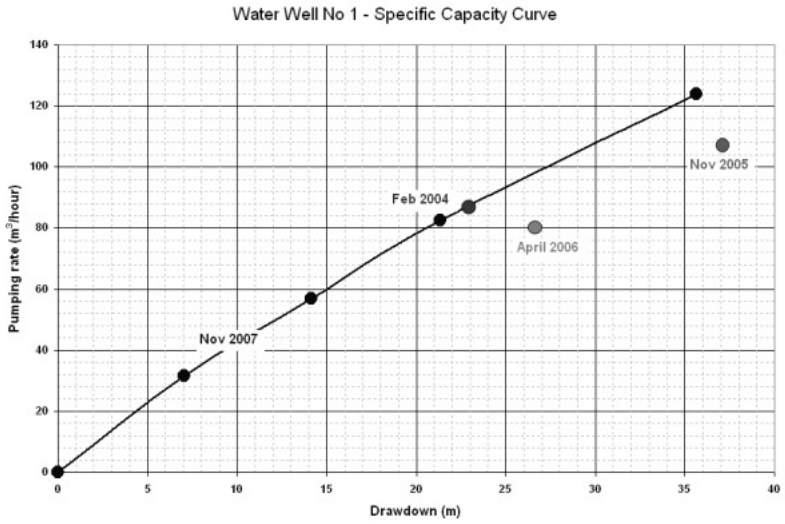

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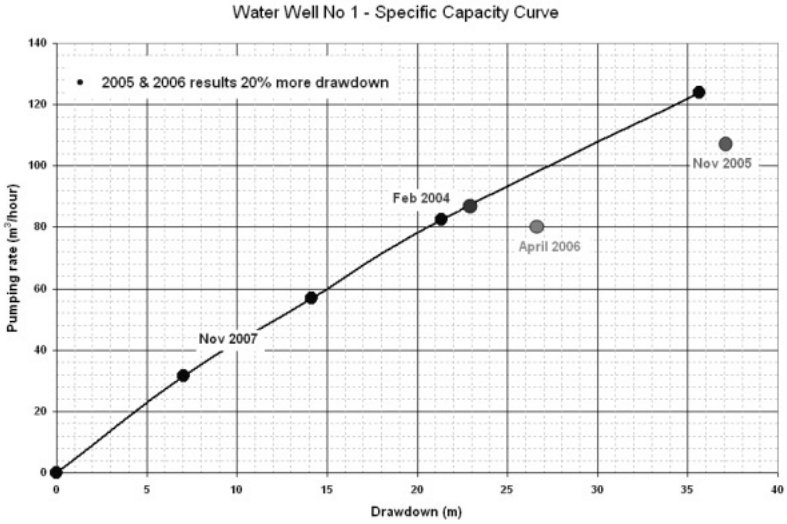

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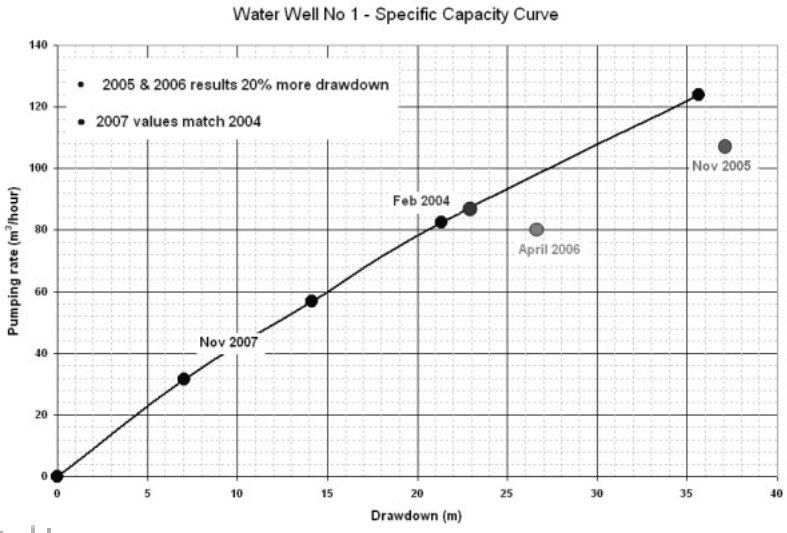

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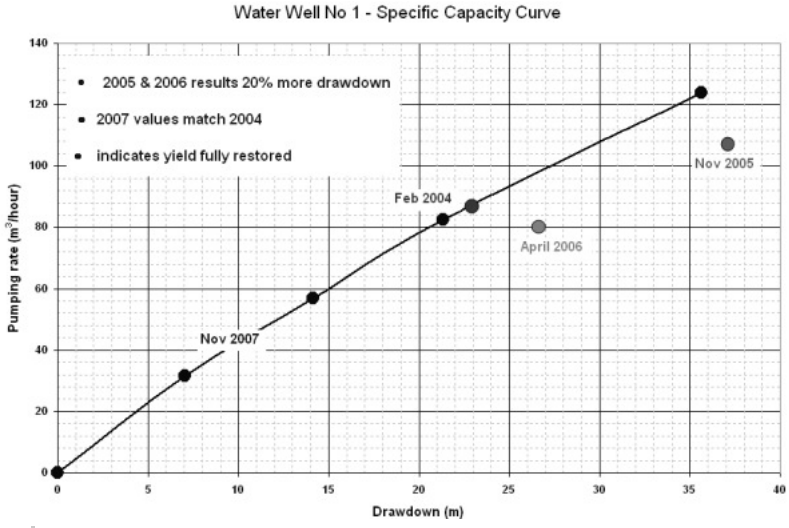
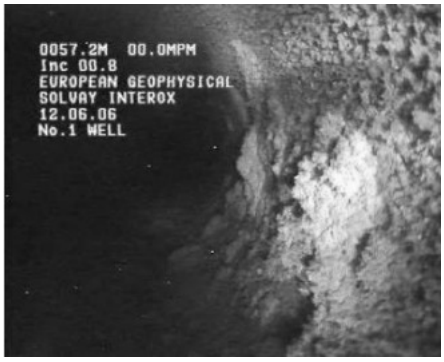
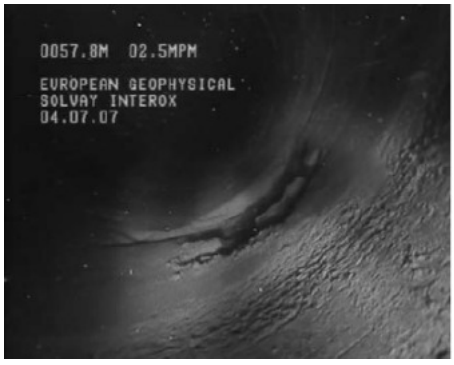


CCTV





Removal of bacterial growths for well face

CCTV

Water clear after treatment

Site procedure

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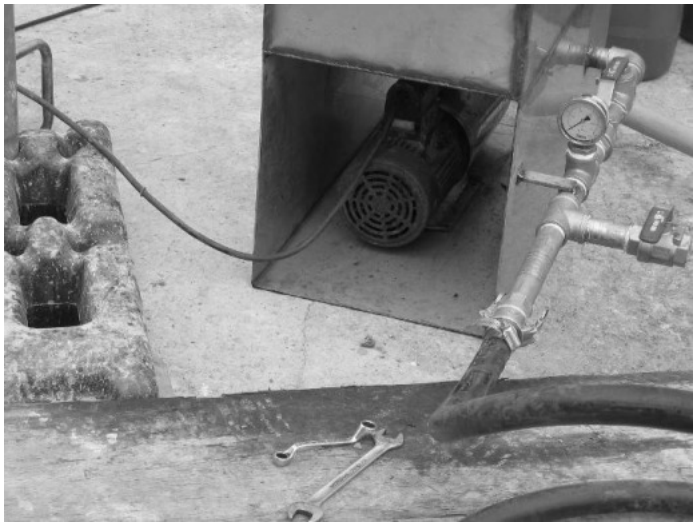

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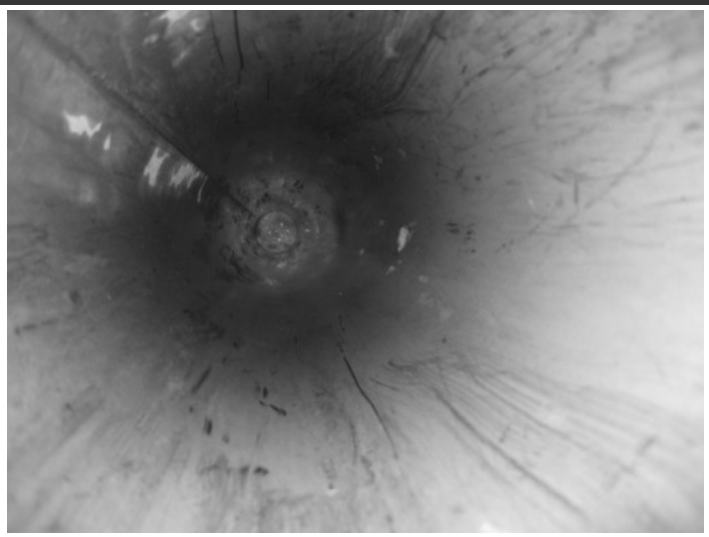
Site practice



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- Exothermic reaction produces heat

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PAH contamination

Example of contaminant removal

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PAH contamination

- **Location confidential**
- **Borehole 92.3m deep & 300mm diameter**
- **PAH contamination from carbon black**
- **Treated with hydrogen peroxide on two occasions**
- **First treatment 1,500 litres used**
- **Second treatment 720 litres used + ferrous sulphate**

Original PAH contamination

Depth		15m	22m	58m	63m	68m	75m	81m	82m
Sample type		P	P	D	P	D	D	D	P
Fluoranthene	ng/l	<0.3	1,020	3,370	2,650	4,730	5,090	2,220	3,450
Benzo 1,12, perylene	ng/l	1.6	106	356	294	520	526	253	374
Benzo 11,12, fluoranthene	ng/l	0.7	94.8	360	283	492	527	230	376
Inendo (1, 2, 3-cd) pyrene	ng/l	<0.1	97.1	281	253	401	391	218	310
Benzo-3, 4-fluorathene	ng/l	1.5	286	1,050	817	1,430	1,520	670	1,070
Benzo-3, 4-pyrene	ng/l	1.0	207	773	618	1,060	1,130	502	801

After first treatment

Sample depth		25m	60m	72m	76m
Fluoranthene	ng/l	12.4	<2.4	3.4	4.7
Benzo 1,12, perylene	ng/l	<1.3	<1.3	<1.3	<1.3
Benzo 11, 12, fluoranthene	ng/l	<0.6	<0.6	<0.6	<0.6
Inendo (1, 2, 3-cd) pyrene	ng/l	1.9	1.9	2.2	1.6
Benzo-3, 4-fluorathene	ng/l	1.3	1.1	0.9	<0.7
Benzo-3, 4-pyrene	ng/l	0.5	<0.4	0.5	<0.4

After second treatment

Date		26/1/2008	27/1/2008	28/1/2008	25/3/2008
Duration of pumping		90 mins	24 hours	36 hours	53 days
Fluoranthene	ng/l	34.7	<2.4	5.9	<2.4
Benzo 1,12, perylene	ng/l	10.7	<1.3	<1.3	<1.3
Benzo 11, 12, fluoranthene	ng/l	4.6	<0.6	<0.6	<0.6
Inendo (1, 2, 3-cd) pyrene	ng/l	7.9	<0.7	<0.7	0.7
Benzo-3, 4-fluorathene	ng/l	6.4	<0.7	<0.7	<0.7
Benzo-3, 4-pyrene	ng/l	8.0	<0.4	<0.4	<0.4

After second treatment

Date		7/5/2008	20/5/2008	21/5/2008	22/5/2008	23/5/2008
Fluoranthene	ng/l	<2.4	<2.4	<2.4	<2.4	<2.4
Benzo 1,12, perylene	ng/l	<1.3	<1.3	<1.3	<1.3	<1.3
Benzo 11, 12, fluoranthene	ng/l	<0.6	<0.6	<0.6	<0.6	<0.6
Inendo (1, 2, 3-cd) pyrene	ng/l	<0.7	<0.7	<0.7	<0.7	<0.7
Benzo-3, 4-fluorathene	ng/l	<0.7	<0.7	<0.7	<0.7	<0.7
Benzo-3, 4-pyrene	ng/l	<0.4	<0.4	<0.4	<0.4	<0.4

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- Residual materials are oxygen and water
- Further trials are currently underway

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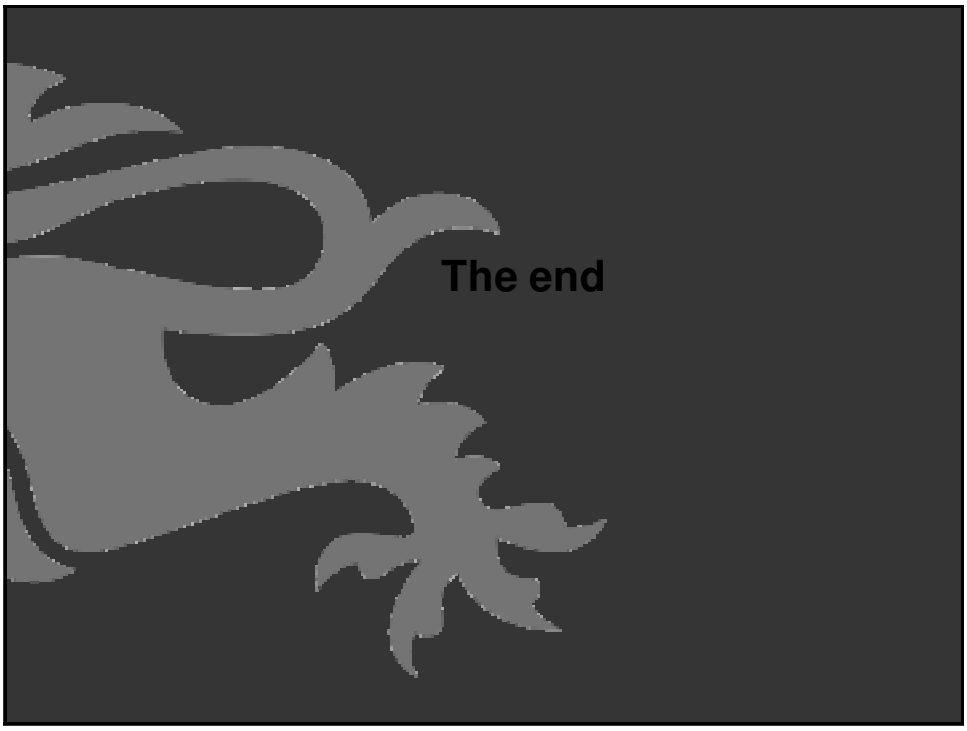
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