ENVIRONMENTAL RISK ASSESSMENT

MILLIPORE

CARRIGTWOHILL,

COUNTY CORK

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Prepared For: -

Millipore,
Carrigtwohill,
County Cork

Prepared By: -

O' Callaghan Moran & Associates,
Granary House,
Rutland Street,
Cork

8th December 2008

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1 INTRODUCTION

A spill of process wastewater (approx 5,600litres), containing a solvent concentration of 4% occurred in July 2008. The solvents were acetone, ethanol and butanol. The occurred from a flexible hose which was feeding wastewater to a temporary storage tanker located north of the IC2 building.

Subsequent investigations identified an overflow from a sump (MW-2 Sump) which collects wastewater from the MW2 process prior to pumping it to the wastewater treatment plant. The sump had been overflowing to ground at various times in the period between April and September 2008. The volume discharged here over the six month period was estimated at 35,000 L at a concentration of 4% solvent.

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Millipore carried out comprehensive investigations to delineate the extent of the contamination and assess the impacts. These included the installation of soil borings, the collection and analysis of soil and groundwater samples in the vicinity of the spill/leak areas and monitoring of the surface water system. Millipore also began daily monitoring in the existing groundwater monitoring wells

The groundwater monitoring indicated that the wastewater had not penetrated the subsoil to a significant degree due to the soils relatively poor permeability and thickness. Monitoring of the stormwater system identified the presence of solvents and Millipore subsequently diverted the contaminated water to the storm water retention pond.

It appeared that much of the spill had either been contained in the spill area, or preferentially discharged to the surface water system. Millipore informed the Environmental Protection Agency (EPA) of the incident and the EPA requested that an environmental risk assessment be undertaken and a remedial action plan be developed to mitigate any impacts. Millipore requested O' Callaghan Moran & Associates (OCM) to complete the risk assessment.

1.1 Scope of Work

OCM initially completed a desk study review of the site investigations undertaken by Millipore in response to incident. OCM then carried out a site inspection to assess the ground conditions and possible migration pathways for contaminant migration and to identify potentially sensitive off-site receptors.

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2 SITE DESCRIPTION

2.1 Site Location and Surrounding Landuse

The Millipore facility is located approximately 12 km east of Cork City (Figure 2.1). It is bounded to the north by the National Road N25, to the east by the R624, to the west and south by local access roads. The lands to the east and south are used for agricultural purposes (grazing).

An unnamed stream flows to the south, approximately 50m from the eastern site boundary and discharges into the estuary (Slatty water) via the Slatty Bridge to the south west of the site.

The closest dwelling to the site is approximately 200meters to the south west, but is currently being renovated and is unoccupied. There is an occupied farm dwelling, Tullagrein House, to the north-west approximately 250meters from the western site boundary.

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2.2 Surface Water Drainage

Surface water run-off from the hard standing paved areas and roof areas is collected in the surface water drainage system, which normally discharges via an oil interceptor to the Cork County Council stormwater sewer. The Council sewer discharges to the Slatty River Estuary at the Slatty Bridge to the south of the site.

Because the surface water drainage pipe lines are situated close to the process wastewater pipe lines where the spill occurred it appears that some of the leaked effluent migrated along the granular material (pea gravel) lining the outside of the surface water drainage pipe lines and entered into the pipe lines along some unsealed joints. OCM understand that leaks were detected in the surface water drainage system which may have provided a pathway for the plume to migrate into the surface water drains. Leaks in surface water drainage pipe line have been identified and have since been repaired.

Because contamination was detected in the drainage system -elevated Chemical Oxygen Demand (COD) and presence of solvents- Millipore diverted all run-off to the stormwater retention ponds, located to the southwest of the facility. The most recent monitoring results indicate that solvents are no longer detectable and COD levels have declined dramatically.

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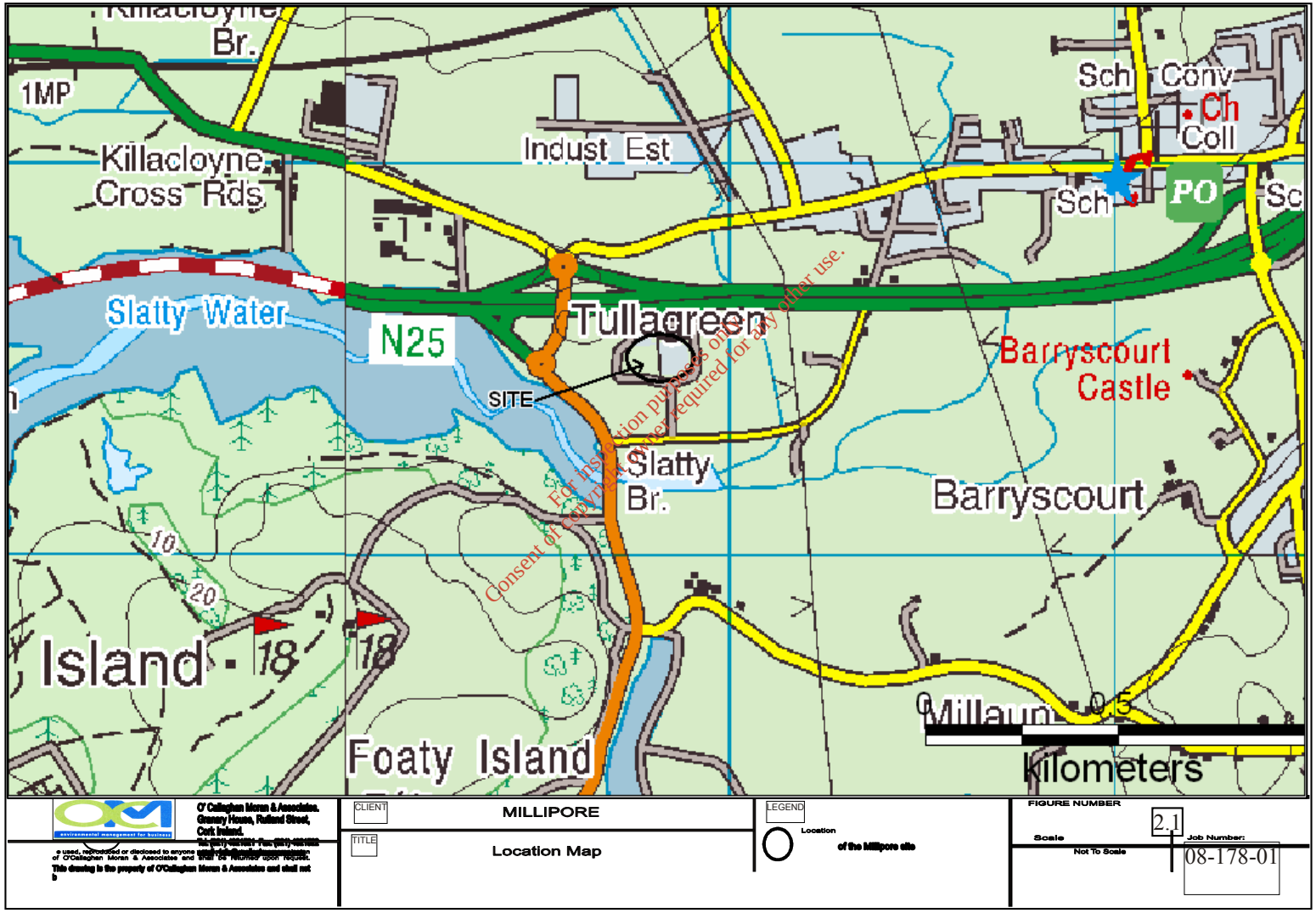
Figure 2.1 location map



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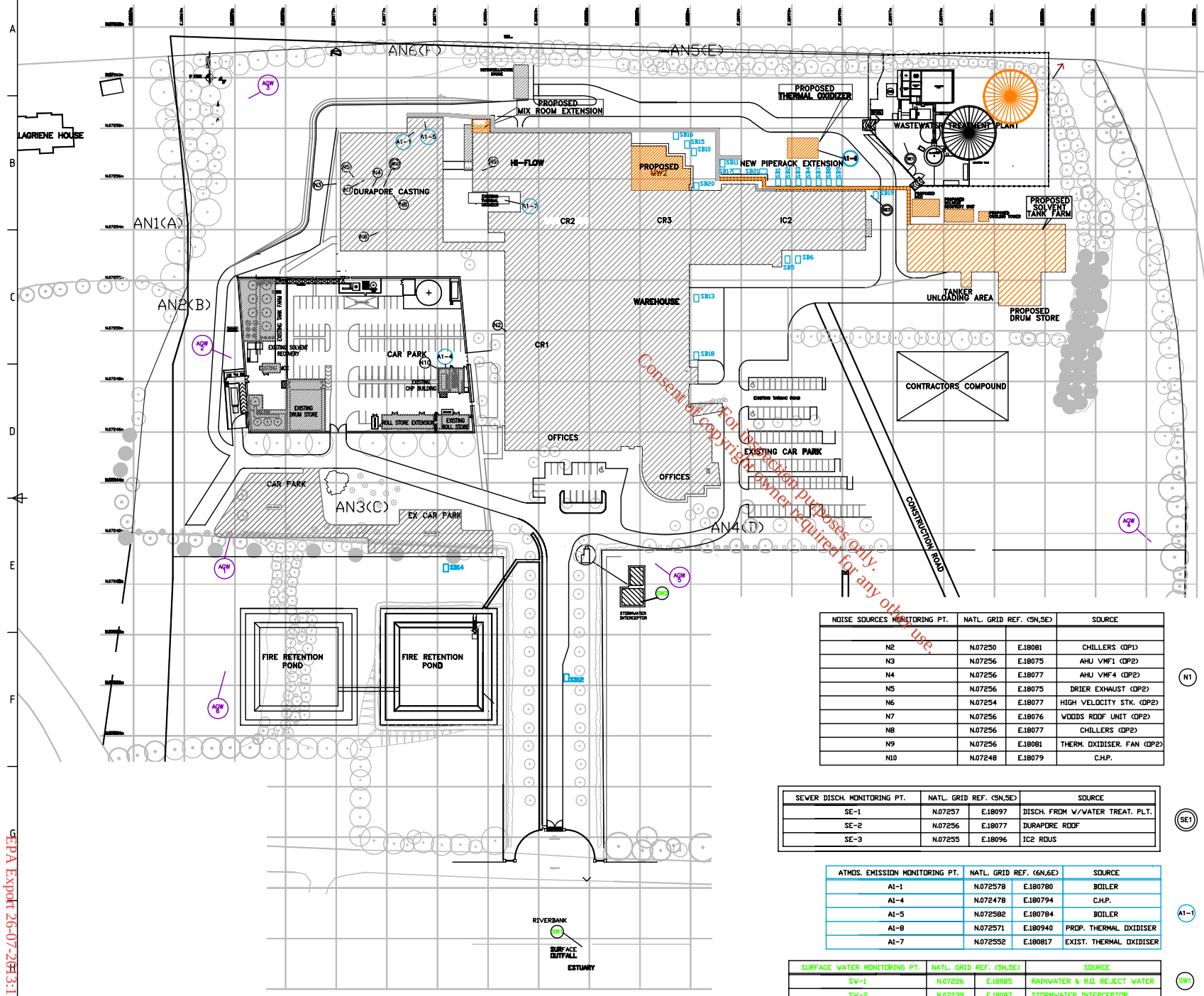

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Rev.	Description	Date	By
0	PRELIM. ISSUED FOR IPPC LICENCE	04 JUL 06	KK
1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 06	BW

LEGEND

- SEWER
- PROCESS WASTEWATER SYSTEM
- SURFACE WATER SYSTEM
- AN1 — AMBIENT NOISE MONITORING POINT
- A1-1 — ATMOS. EMISSION MONITORING POINT
- SW1 — SURFACE WATER DISCH. MONITORING POINT
- SE1 — SEWER DISCH. MONITORING POINT
- PROPOSED EXPANSION

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

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Approved by - date
B.COMYNS-24/07/06

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2.3 Geology and Hydrogeology

Information on the local and regional geology and hydrogeology was derived from a desk study, which included Geological Survey of Ireland (GSI) geology databases; Teagasc Soil Maps for the region; OCM in-house databases; logs of the groundwater monitoring wells and the recent site investigations undertaken by Millipore.

2.3.1 Soils and Subsoil

The subsoil distribution is shown on Figure 2.3. The subsoil is classified as TDSs i.e. Devonian Sandstone Till.

The groundwater well monitoring logs (Appendix 1) confirm the presence of the tills and indicate they range in thickness from 7.5m in the northern section of the site, to approximately 3.5m in the southern section of the site. The tills are underlain by dirty sandstone gravels and occasional sand lenses. The depth to bedrock beneath the site has not been established, but may based on the depth of subsoils recorded for groundwater wells in the IDA industrial estate to the north of the site, be more than 20m.

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2.3.2 Bedrock

The bedrock geology is illustrated on Figure 2.4. The site is underlain by the Waulsortian Limestone Formation, which is a massive unbedded lime-mudstone. The limestone bedrock is known to be karstified and substantial subsidence features and caves have been identified associated with the karstification process to the north and north east of the site in the vicinity of Carrigtwohill.

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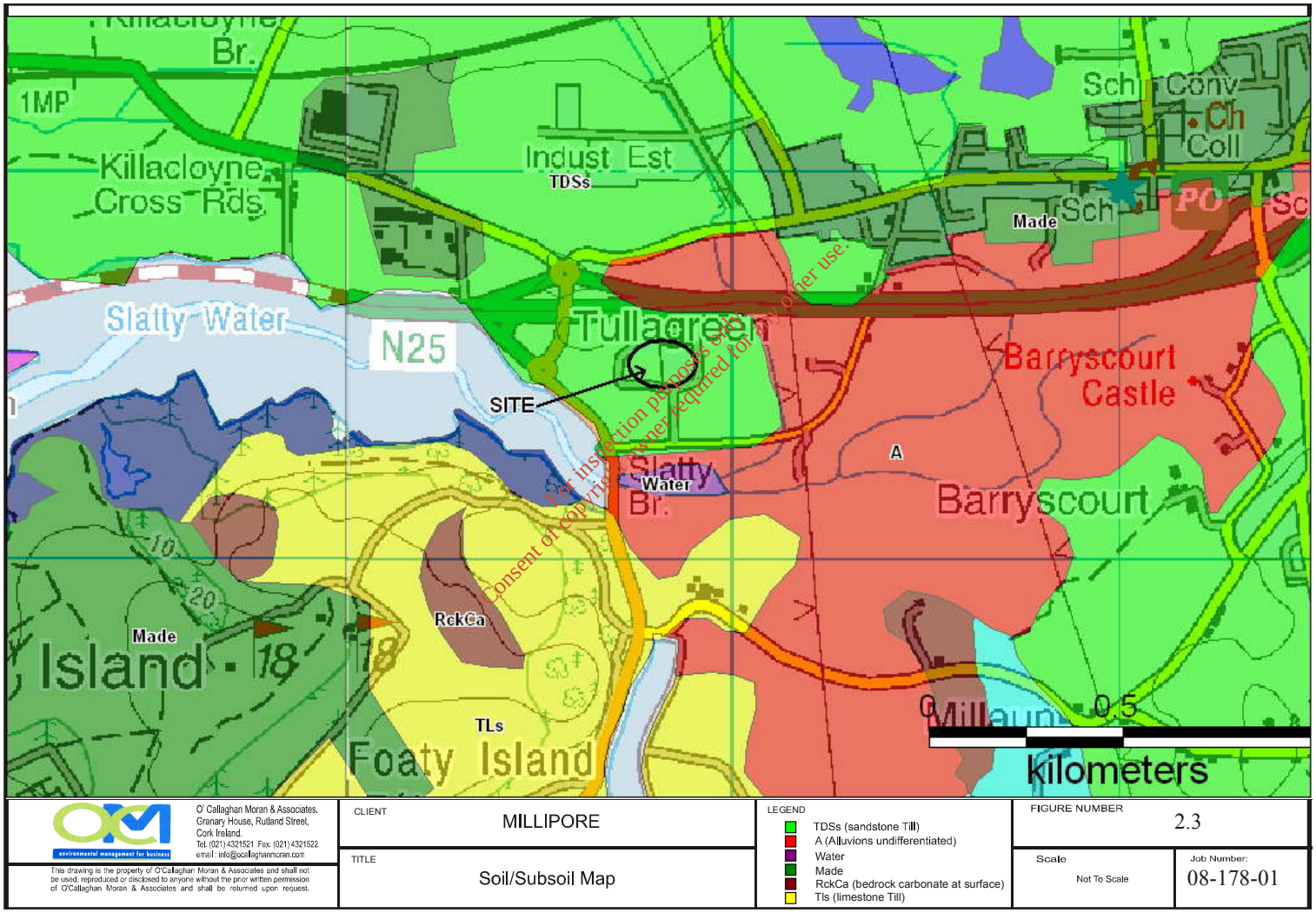
Figure 2.3 subsoils



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CLIENT: MILLIPORE

TITLE: Soil/Subsoil Map

LEGEND
- TDSs (sandstone Till)
- A (Alluvions undifferentiated)
- Water
- Made
- RckCa (bedrock carbonate at surface)
- Tls (limestone Till)

FIGURE NUMBER: 2.3

Scale: Not To Scale

Job Number: 08-178-01

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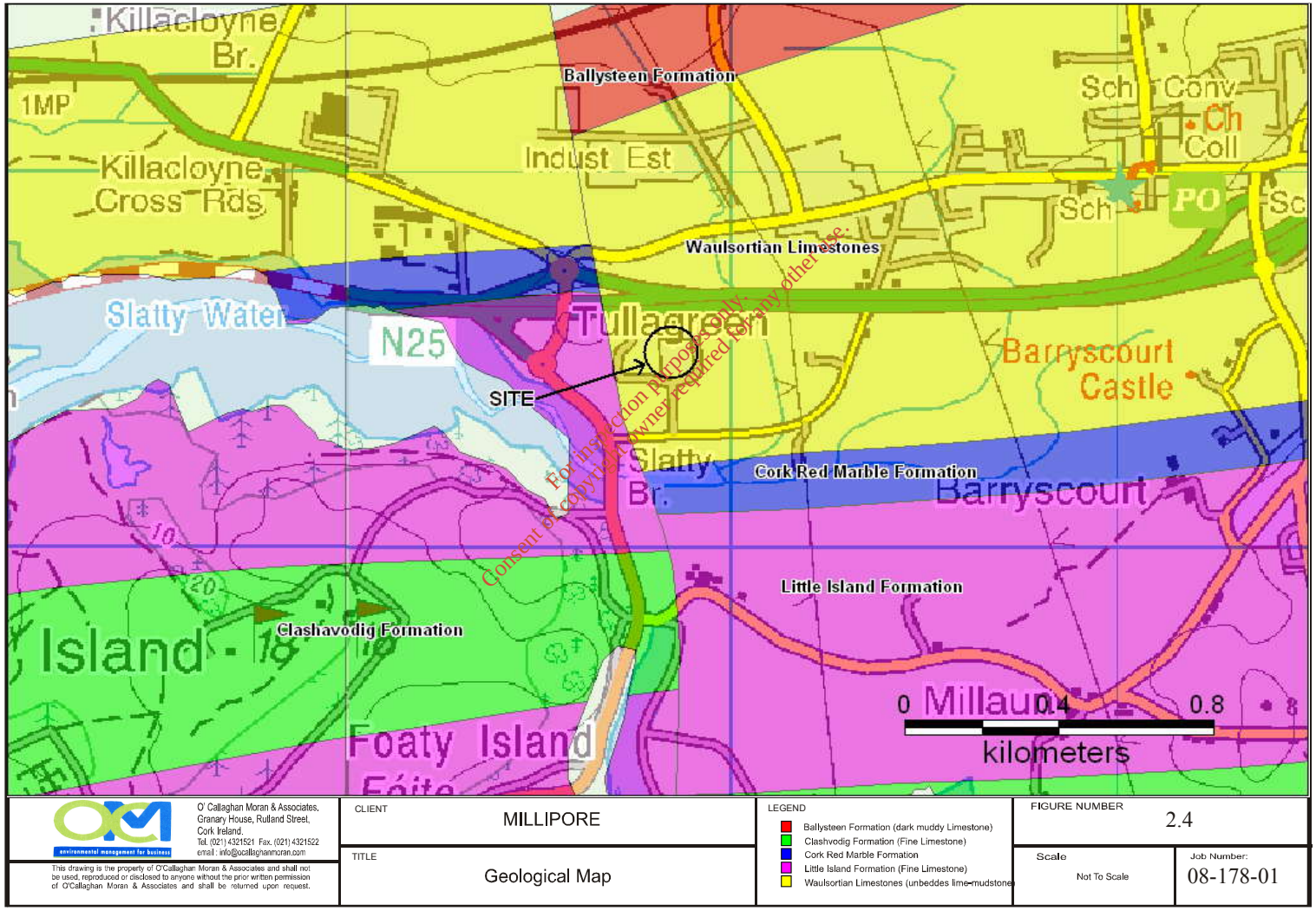
Figure 2.4 Bedrock



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2.4 Hydrogeology

2.4.1 Aquifer Classification

The GSI has developed a classification system for aquifers based on the value of the resource and the hydrogeological characteristics. The subsoils beneath the site are not characterised by the GSI as an aquifer, but where they are gravel dominated may provide additional storage for the underlying bedrock aquifer.

The bedrock aquifer is characterised by the GSI as a Regionally Important karstified Aquifer (Rkd). The aquifer classification is illustrated in Figure 2.5. The permeability of the limestones has developed in response to structural movements and karstification to deeper drainage levels that existed in the past.

The limestones are typically unconfined. Over a significant part of the valleys of South Munster the limestones are overlain by sands and gravels, like in the Millipore site. The potential for saline intrusion in the synclines is a constraint on development of water supply near the coast.

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2.4.2 Aquifer Vulnerability

Vulnerability is defined by the GSI as the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Vulnerability categories range from Extreme (**E**) to High (**H**) to Moderate (**M**) to Low (**L**) and are dependant on the nature and thickness of subsoils above the water table.

The GSI Vulnerability Map indicates that the vulnerability is high (**H-L**). Based on the thickness of the subsoils (possibly greater than 20m thick above the bedrock), OCM considers the aquifer vulnerability to be **Low**. The aquifer vulnerability is illustrated on Figure 2.6.

2.4.3 Groundwater Flow Direction and Hydraulic gradient

There are six (6 No.) permanent monitoring wells (AGW1 to AGW6). The permanent wells which were installed in June 2003 by Glovers Site Investigations (Glovers) are located in the subsoil and are open to the formation between 7 – 10m below ground level.

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As part of the recent investigations carried out by Millipore in response to the incident, 21 temporary boreholes were installed by Glovers. (SB01 to SB 21). These wells are located in the subsoil at an average depth of 3m. All well locations are illustrated on Figure 2.2 and borehole logs are included in Appendix 1.

OCM measured groundwater levels in all the on-site wells on October 8th 2008. Based on the level data groundwater flow in the subsoil is from north-east to south-west across the site. The water table is approximately 1.5m below ground level in the upgradient western portion of the site. The hydraulic gradient across the site is approximately 0.002. The water level data indicate that localised mounding of the water table may be occurring where the glacial till subsoils are thicker, such as in the northern portion of the site.

Monitoring well AGW3 is nominally the up hydraulic gradient monitoring well, while the remaining wells are down hydraulic gradient monitoring wells. OCM considers AGW3 is potentially a side gradient well and that given the orientation of the drainage system (east west) there is potential for preferential flow of shallow groundwater from process areas in the direction of this well. OCM understand that there is an existing groundwater well located further north and east of AGW3. This well was previously used to obtain water for production purposes and assuming it is located in the gravel beneath the site its location would be more representative of up hydraulic gradient water quality.

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2.4.4 Nearby Wells

OCM understand that water supply for the area comes from Cork County Council public supply well, located in the IDA industrial estate 800m to the north west of the site.

There are records of six (6 No.) private groundwater wells located within 0.5km of the site. All of these wells are up hydraulic gradient of the site, as indicated on Figure 2.7 and Table 2.6.3 and are not at risk of impact from the spill/leak.

OCM inspected the only two dwellings located side and down hydraulic gradient of the site. The farm dwelling, Tullagrean House, is side or possibly up hydraulic gradient of the facility. There is an unoccupied dwelling at the Cross Roads at the Slatty Bridge, which is currently being renovated. Neither dwelling has a groundwater supply well.

Table 2.6.3 : Wells located within 1 km

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GSINAME	SRCNAME	TYPE	DEPTH (meters)	DTRCONFID	YIELD_M3D	GENCOMMS
1707SWW117	IDA Industrial Estate, Carrigtwohill	Borehole	44.50	Bedrock Not Met	600.00	Production Well no2
1707SWW125	IDA Industrial Estate, Carrigtwohill	Borehole	23.00	Bedrock Not Met	0.00	Exploration Hole no.1
1707SWW126	IDA Industrial Estate, Carrigtwohill	Borehole	21.00	Bedrock Not Met	0.00	Exploration Hole no.2
1707SWW127	IDA Industrial Estate, Carrigtwohill	Borehole	28.50	Bedrock Not Met	0.00	Exploration Hole no.3
1707SWW128	IDA Industrial Estate, Carrigtwohill	Borehole	41.00	Bedrock Not Met	0.00	Exploration Hole no 4
1707SWW172	IDA Industrial Estate, Carrigtwohill	Borehole	25.00	Bedrock Not Met	0.00	

2.5 Hydrology

The "Slatty Water" is feed by three streams flowing from the north northeast and east. The northern stream, which is the closest to the site, flows south approximately 250m to the east of the site boundary. It turns to the west just south of the site and discharges to the estuary at the Slatty Bridge, approximately 150 m south west of the site. The local surface water drainage system is illustrated in Figure 2.8.

2.6 Ecologically Sensitive Areas

The Slatty Water is designated as:

- special protection area for the Cork Harbour SPA (number 004030),
- proposed natural heritage area and special area of conservation for the Great Island Chanel (number 001058)

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The designated areas are shown on Figure 2.8.

The area surrounding the Slatty Water has not been designated as a Groundwater Dependant Terrestrial Ecosystem under the Water Framework Directive 2000. This is most likely because of its proximity to the sea and tidal nature of the river channel that it is unlikely to have a significant fresh water demand.

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Figure 2.5 The aquifer classification

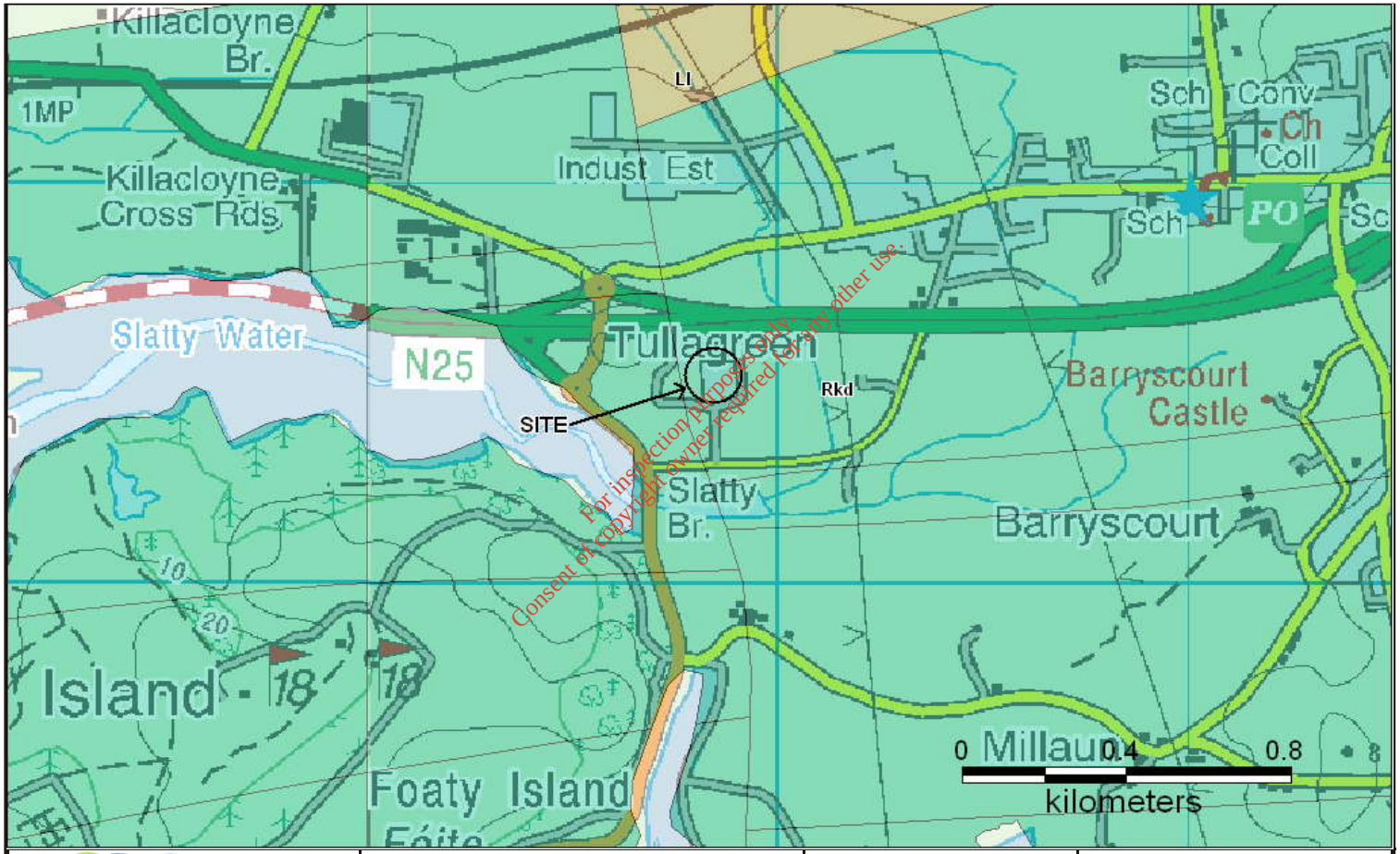

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Figure 2.6 Vulnerability

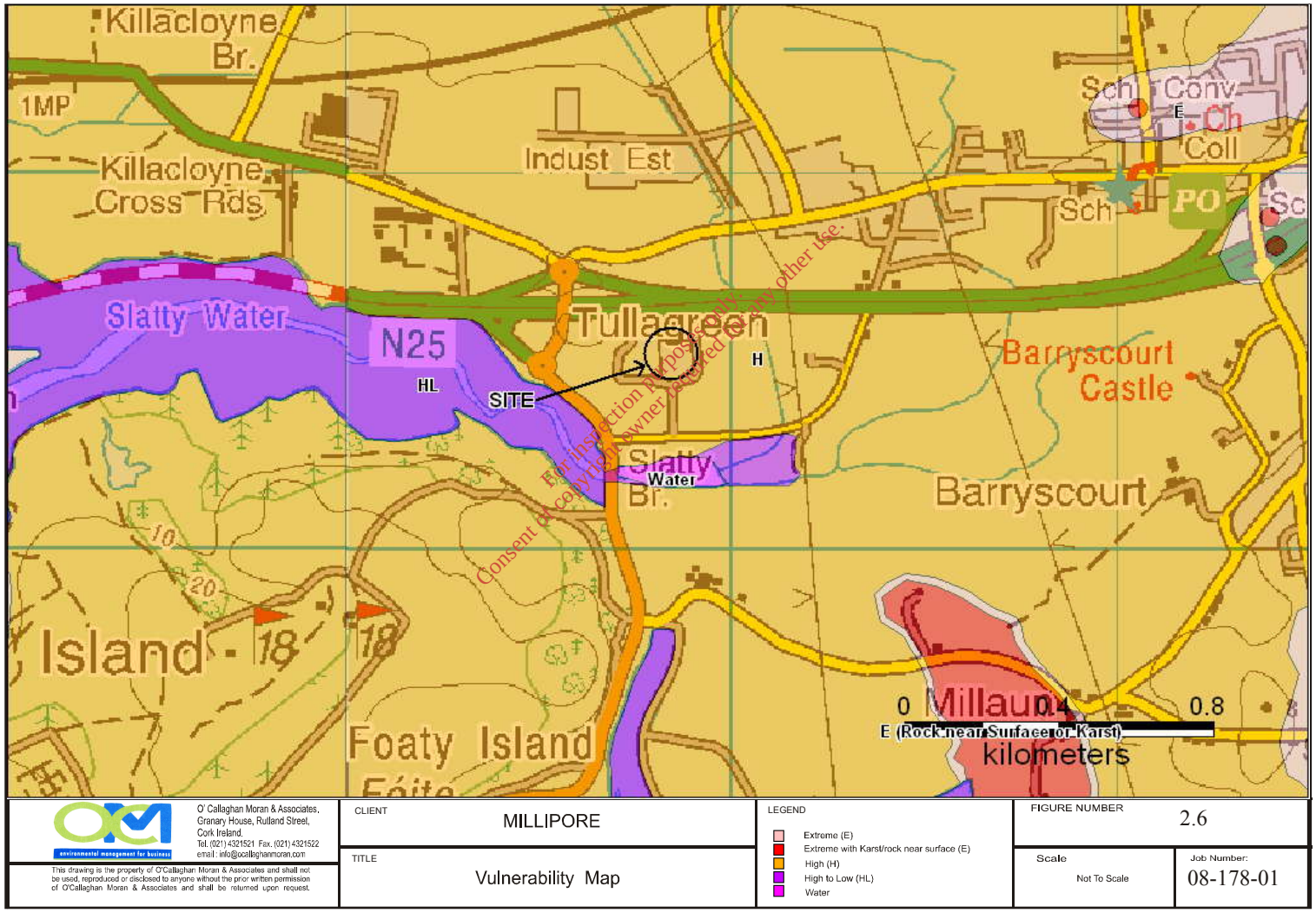

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Figure 2.7 Locations of off-site groundwater wells

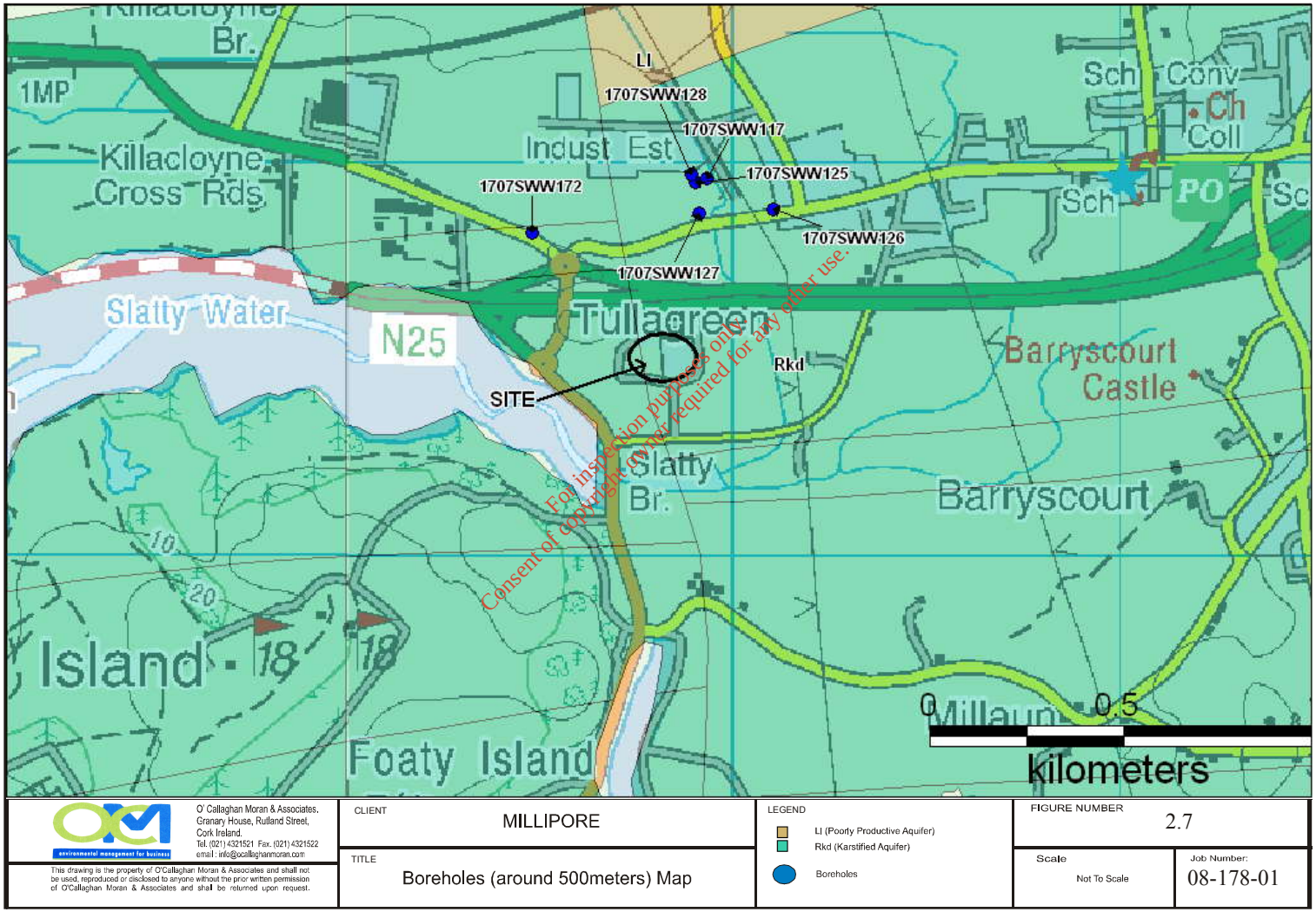

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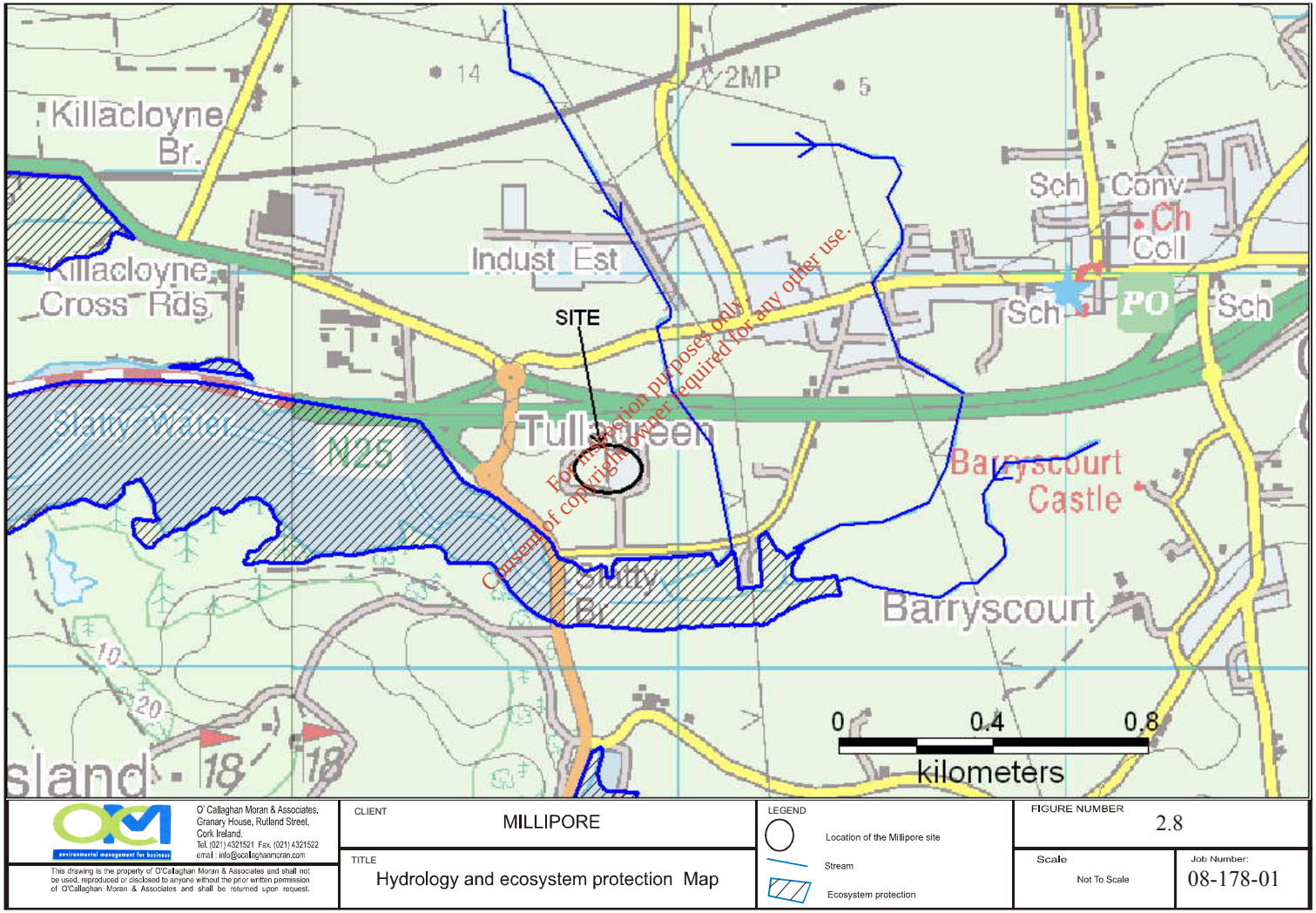
Figure 2.8 : Ecologically Sensitive Areas



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3 RISK ASSESSMENT

3.1 Delineation of Contaminant Plume

The data compiled by Millipore from the investigations undertaken after the incident and the discovery of the leaking sump, was used to delineate the extent of the contamination.

Drawings showing the process waste water and storm water system are included in Appendix 2. The July leak originated from a flexible hose which was being used to transfer wastewater to a storage tanker located to the north of the IC-2 Building and resulted in the discharge of 5,600 L of wastewater. Millipore estimate that the sump spill at MW2 on the process waste water line occurred over a six month period from April to September and resulted in the discharge of approximately 35,000L of wastewater. In both instances the wastewater contained acetone, ethanol, butanol and isopropyl alcohol (IPA) at approximately 4% concentration.

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OCM used the findings of the COD and VOC monitoring carried out by Millipore in the shallow borings over the September to November period to delineate the extent of the contaminant plume downgradient of the source areas. The data is included in Appendix 3 and the COD and VOC levels are shown on Figures 3.1 to 3.16. These figures illustrate changes in the plume concentrations on and Total VOC.

The contaminants migrated in the direction of groundwater movement to the southwest. Figures 3.1 to 3.16 show that the plume is reducing in size and concentration over time. The VOC and COD levels dropped quickly and continued to decline to non–detectable levels well within the site boundary. The changes in concentration of the individual VOC contaminants are also shown on graphs in Appendix 3.

With the exception of GW-5, contamination has not been detected in the deeper permanent groundwater monitoring wells, which indicates that the solvents are either being effectively diluted or that vertical migration is being retarded, by the less permeable till materials in the source area, with subsequent volatilisation.

Because the groundwater migration through the till layer is slow there is some preferential flow laterally in the shallow groundwater toward the surface water system.

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This lateral migration is the source of the solvents and elevated COD detected in the surface water drainage system. Elevated COD and solvents have been recorded in the shallow groundwater in SB-5 and SB-6, which are south of the process wastewater line and in SB-18, which are further south again (Figures 3.1).

The COD concentrations tend to fluctuate in these wells, but the trend is one of declining levels over time. The fluctuations are most likely the result of variations in water through put in response to rainfall.

The data for the shallow borings further south (SB12 and SB-14) indicate that the distal margins of the plume have been reached and that the plume is most likely shrinking.

Elevated COD and solvents have also been detected in the deeper well AGW-5. It is unclear whether this is as a result of migration through the till and into the gravel or whether the contamination migrated initially through the surface water drainage system and then into the well. AGW-5 is close to the surface water drainage line to the stormwater retention pond.

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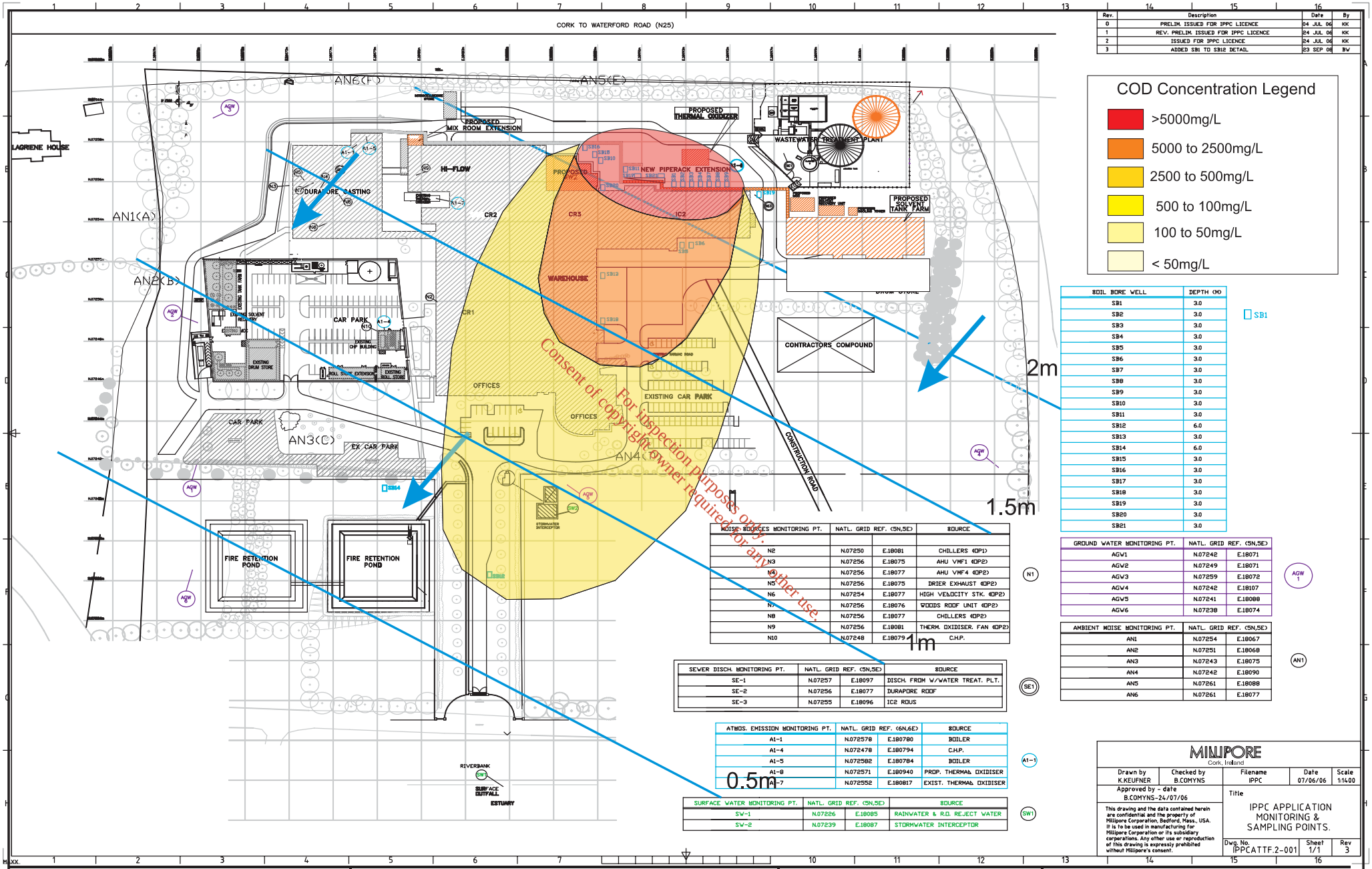

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COD Concentration Legend

- >5000mg/L
- 5000 to 2500mg/L
- 2500 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

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SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
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SB20	3.0
SB21	3.0

SB1

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N9	N.07248	E.18079	C.H.P.
N10			

N1

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SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

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MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

Title
IPPC APPLICATION MONITORING & SAMPLING POINTS.

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Dwg. No.	Sheet	Rev
IPPCATTF.2-001	1/1	3

O' Callaghan Moran & Associates.
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Tel. (021) 4321521 Fax. (021) 4321522
email : info@ocallaghanmoran.com

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CLIENT: MILLIPORE

TITLE: **COD Plume**
WEEK 1 (15th to 21September2008)

LEGEND: Groundwater flow

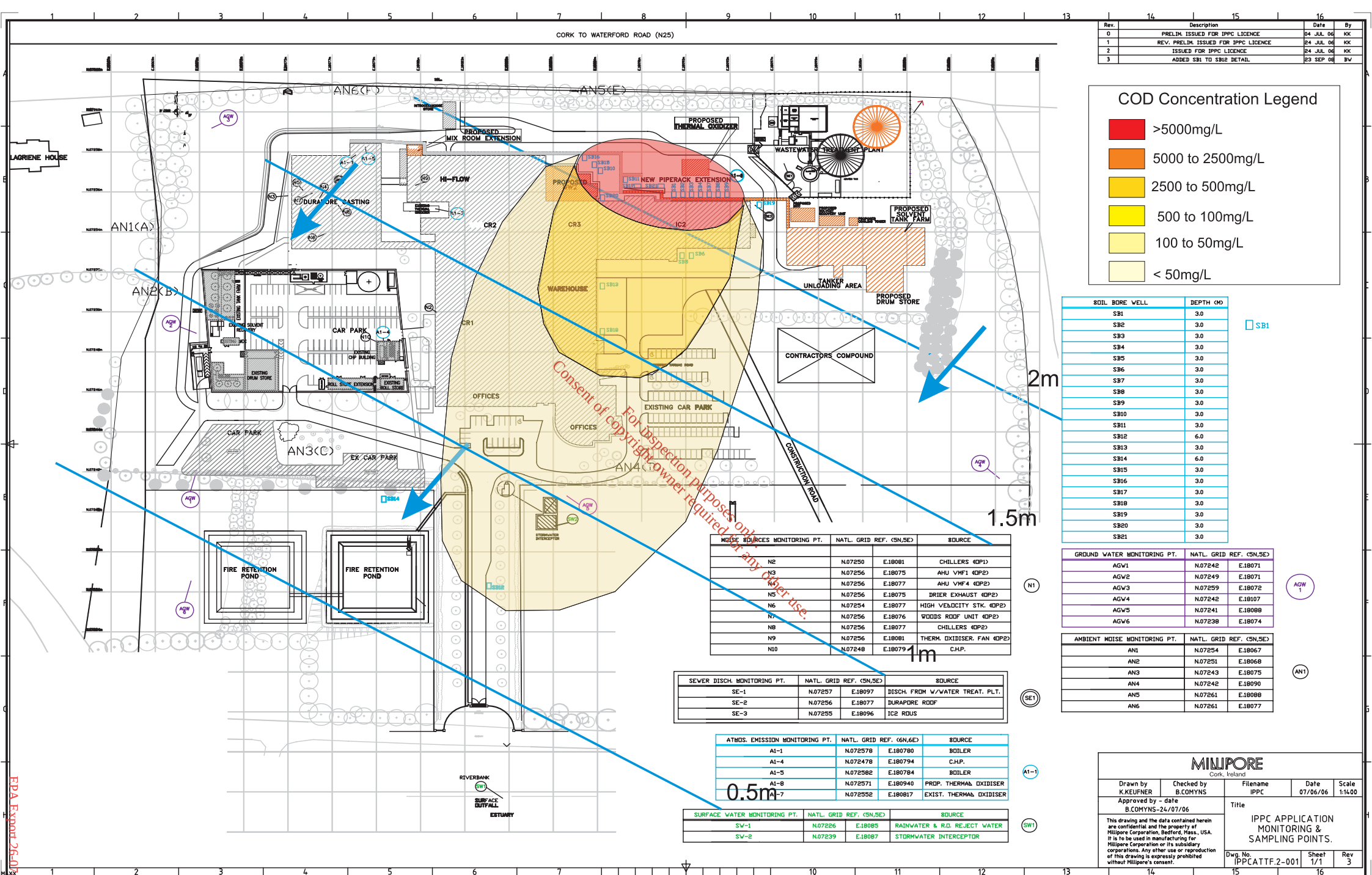
FIGURE NUMBER: 3.1

Scale: Not To Scale

Job Number: 08-178-01

EPA Export 26-07-2013:12:02:52

Rev.	Description	Date	By
0	PRELIM. ISSUED FOR IPPC LICENCE	04 JUL 06	KK
1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW



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For inspection purposes only.

COD Concentration Legend

- >5000mg/L
- 5000 to 2500mg/L
- 2500 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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CLIENT
MILLIPORE

TITLE
COD Plume
WEEK 2 (22nd to 28th september 2008)

LEGEND
Groundwater flow

FIGURE NUMBER
3.2

Scale
Not To Scale

Job Number:
08-178-01

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CORK TO WATERFORD ROAD (N25)

Rev.	Description	Date	By
0	PRELIM. ISSUED FOR IPPC LICENCE	04 JUL 06	KK
1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
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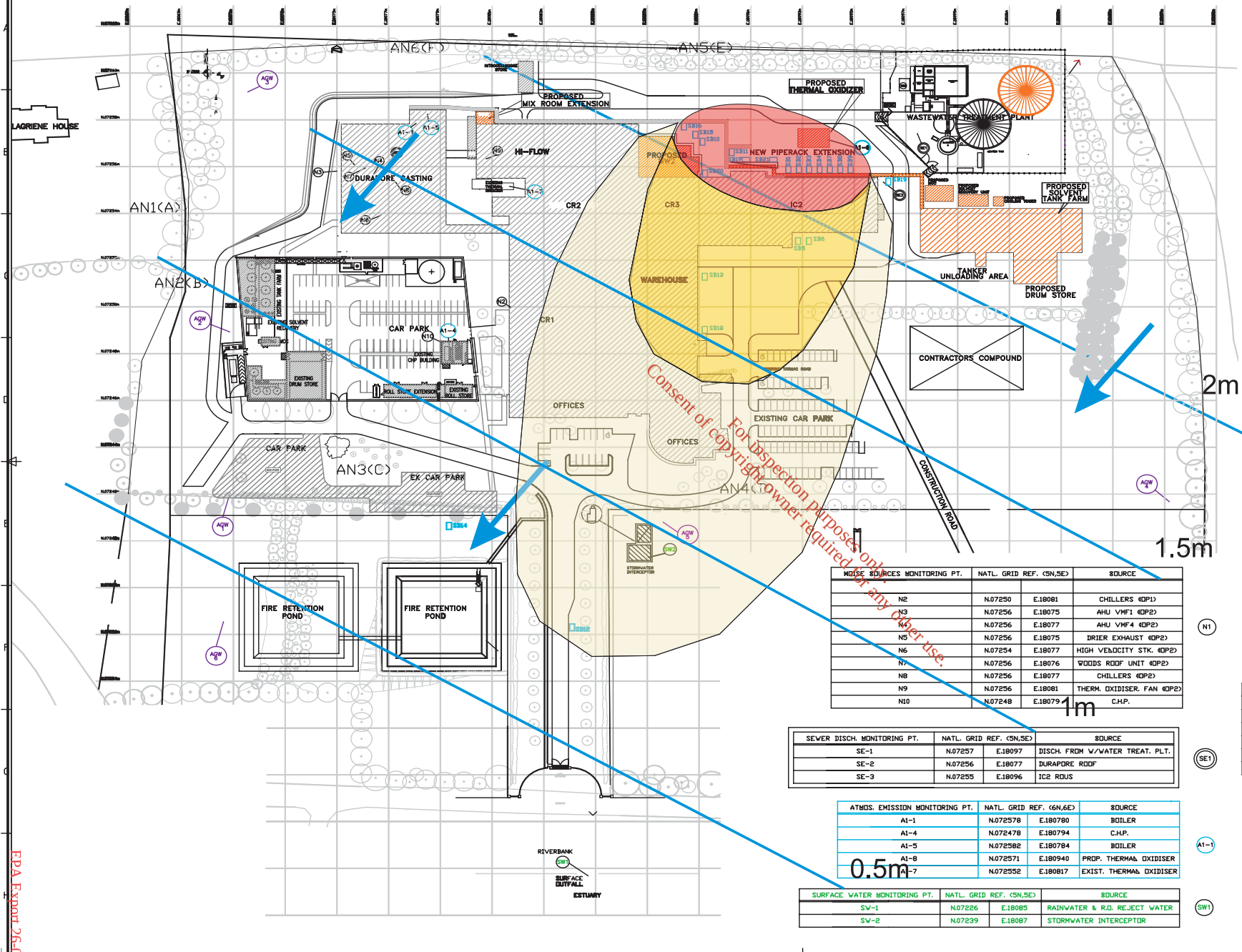
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW



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SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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Dwg. No.	Sheet	Rev
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CLIENT: MILLIPORE

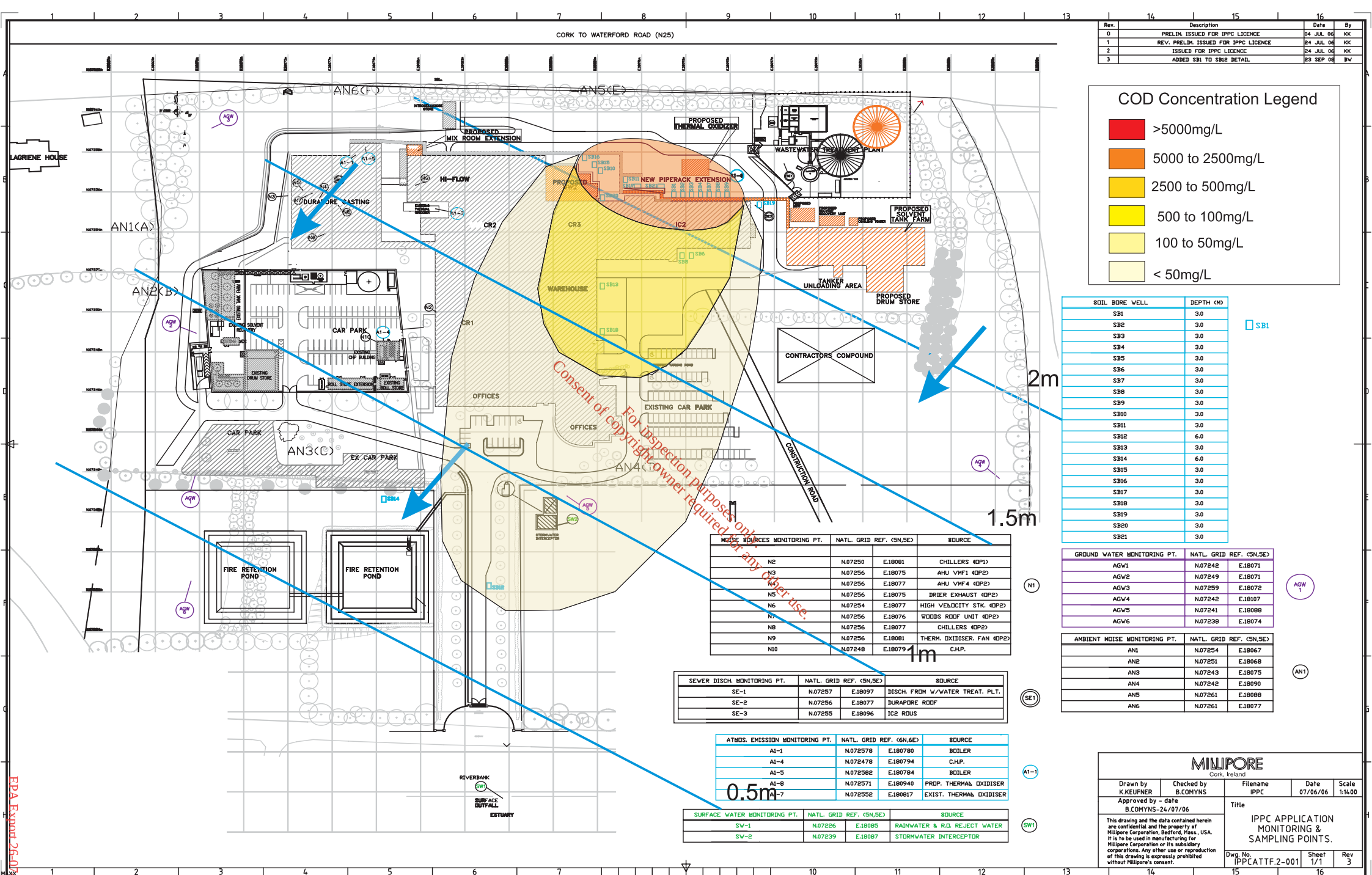
TITLE: COD Plume
WEEK 3 (29th to 5th October 2008)

LEGEND: Groundwater flow

FIGURE NUMBER: 3.3

Scale: Not To Scale

Job Number: 08-178-01



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1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

COD Concentration Legend

- >5000mg/L
- 5000 to 2500mg/L
- 2500 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOF

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
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B.COMYNS-24/07/06

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CLIENT: MILLIPORE

TITLE: COD Plume
WEEK 4 (6th to 12th October 2008)

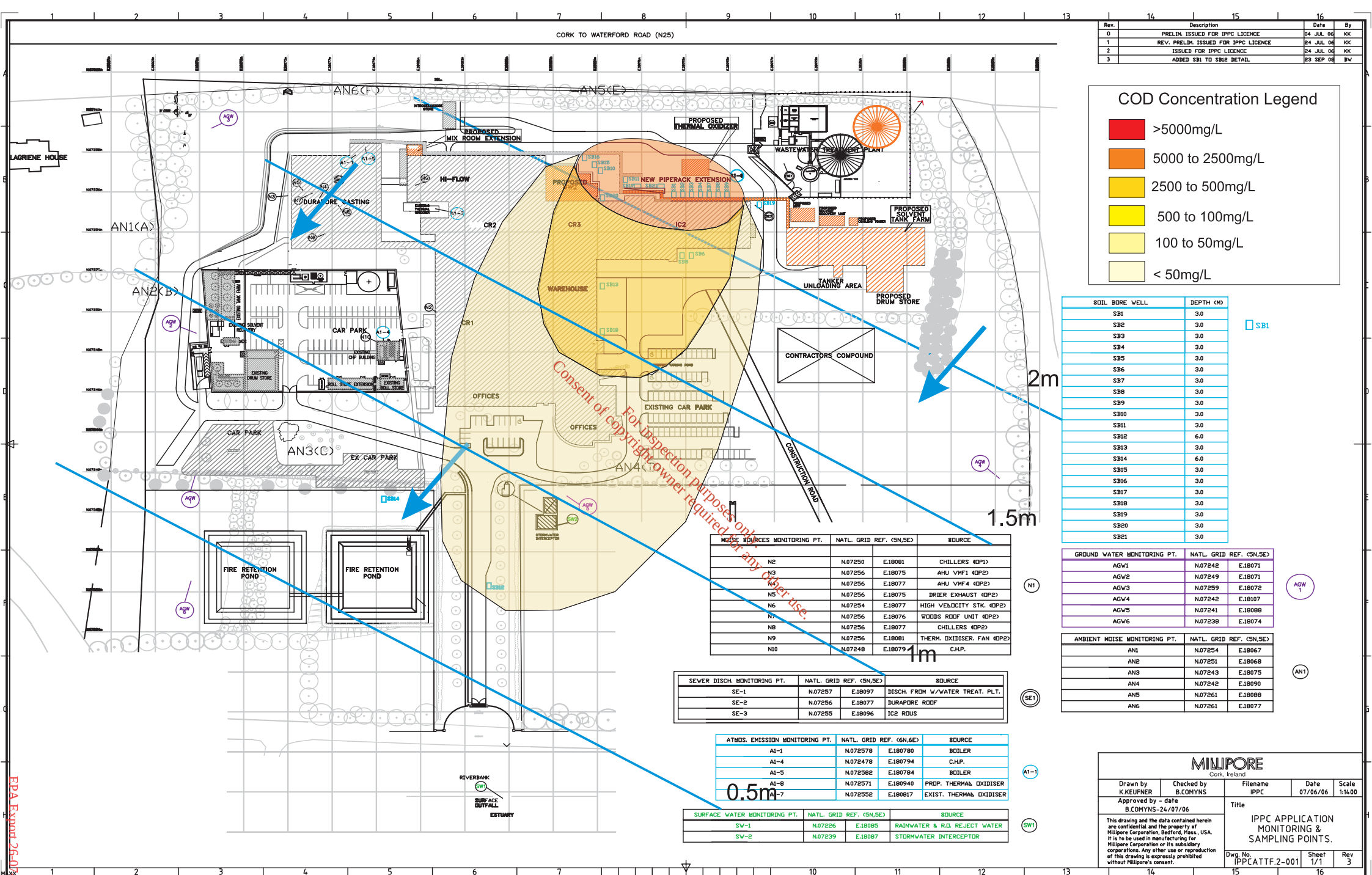
LEGEND: Groundwater flow

FIGURE NUMBER: 3.4

Scale: Not To Scale

Job Number: 08-178-01

EPA Export 26-07-2013:12:02:53



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3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

COD Concentration Legend

- >5000mg/L
- 5000 to 2500mg/L
- 2500 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

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A1-1	N.072578	E.180780	BOILER
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A1-1

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SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
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CLIENT: MILLIPORE

TITLE: COD Plume
WEEK 5 (13th to 19th October 2008)

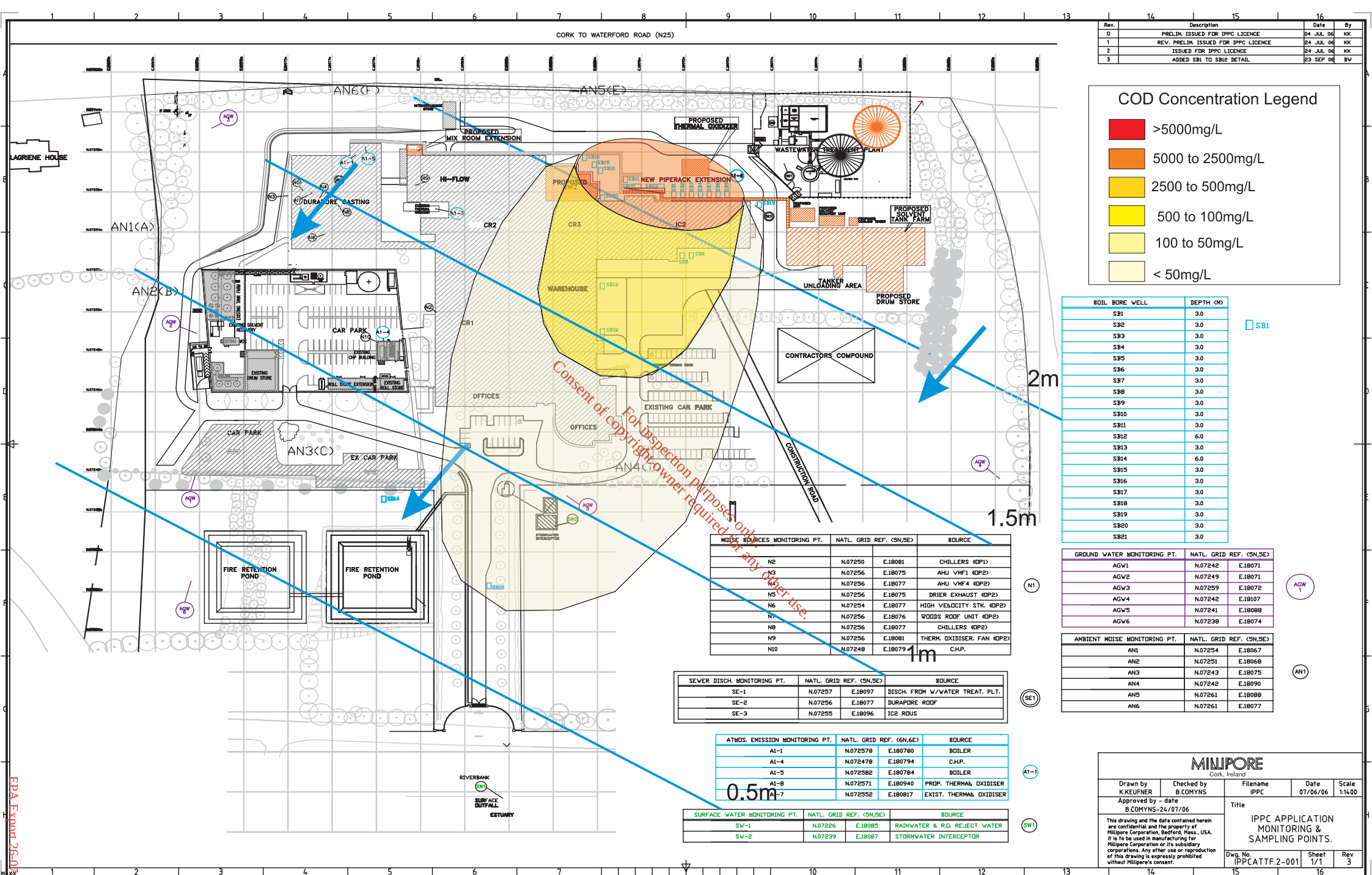
LEGEND: Groundwater flow

FIGURE NUMBER: 3.5

Scale: Not To Scale

Job Number: 08-178-01

EPA Export 26-07-2013:12:02:53



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3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

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SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
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N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOF

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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Title
IPPC APPLICATION MONITORING & SAMPLING POINTS.

Dwg. No.	Sheet	Rev
IPPCATTF.2-001	1/1	3

O' Callaghan Moran & Associates.
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CLIENT
MILLIPORE

TITLE
COD Plume
WEEK 6 (20th to 26th October 2008)

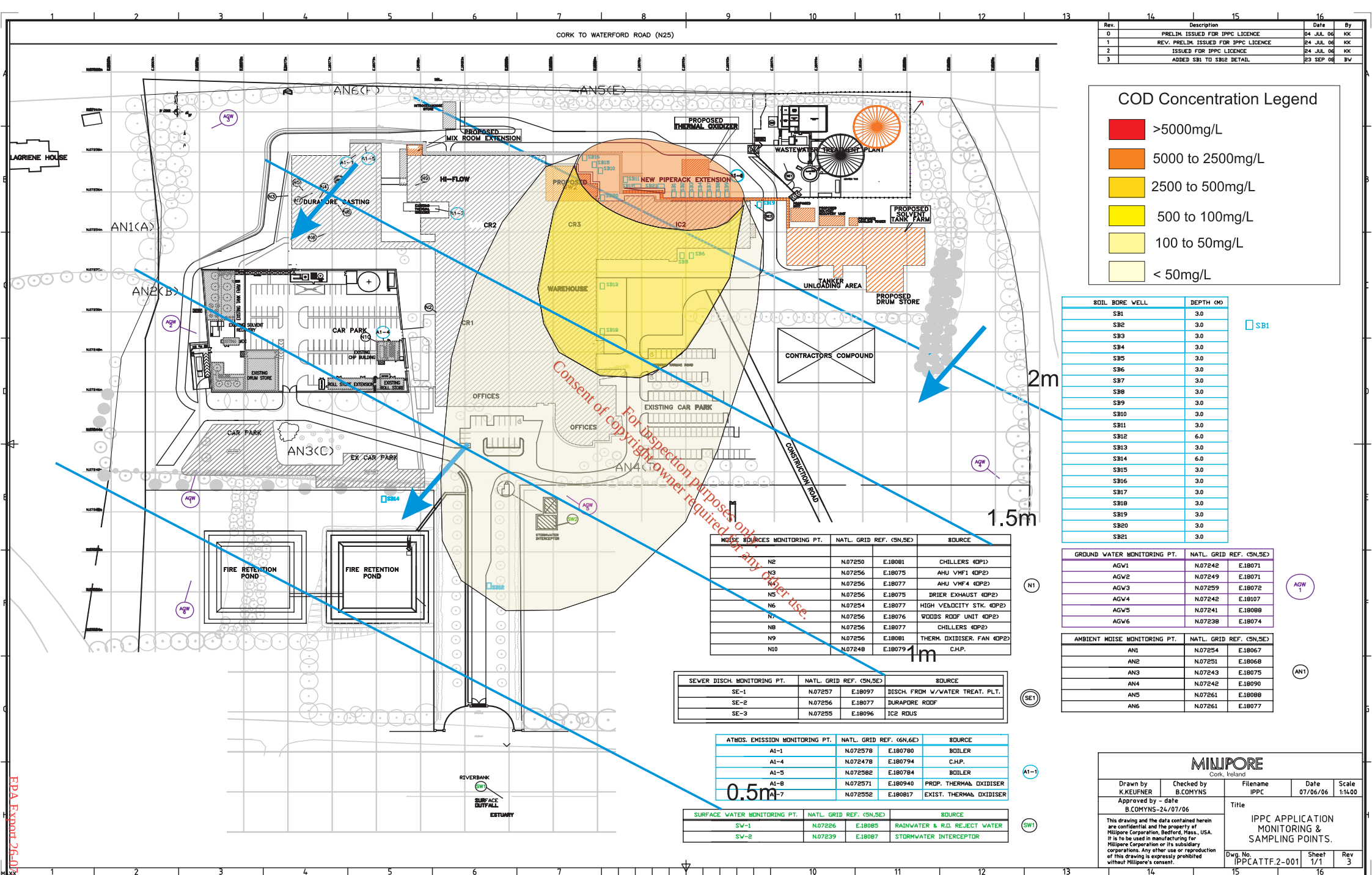
LEGEND
Groundwater flow

FIGURE NUMBER
3.6

Scale
Not To Scale

Job Number:
08-178-01

EPA Export 26-07-2013:12:02:54



Rev.	Description	Date	By
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1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

COD Concentration Legend

- >5000mg/L
- 5000 to 2500mg/L
- 2500 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOF

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

Title
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CLIENT: MILLIPORE

TITLE: COD Plume
WEEK 7 (27th November to 2nd December 2008)

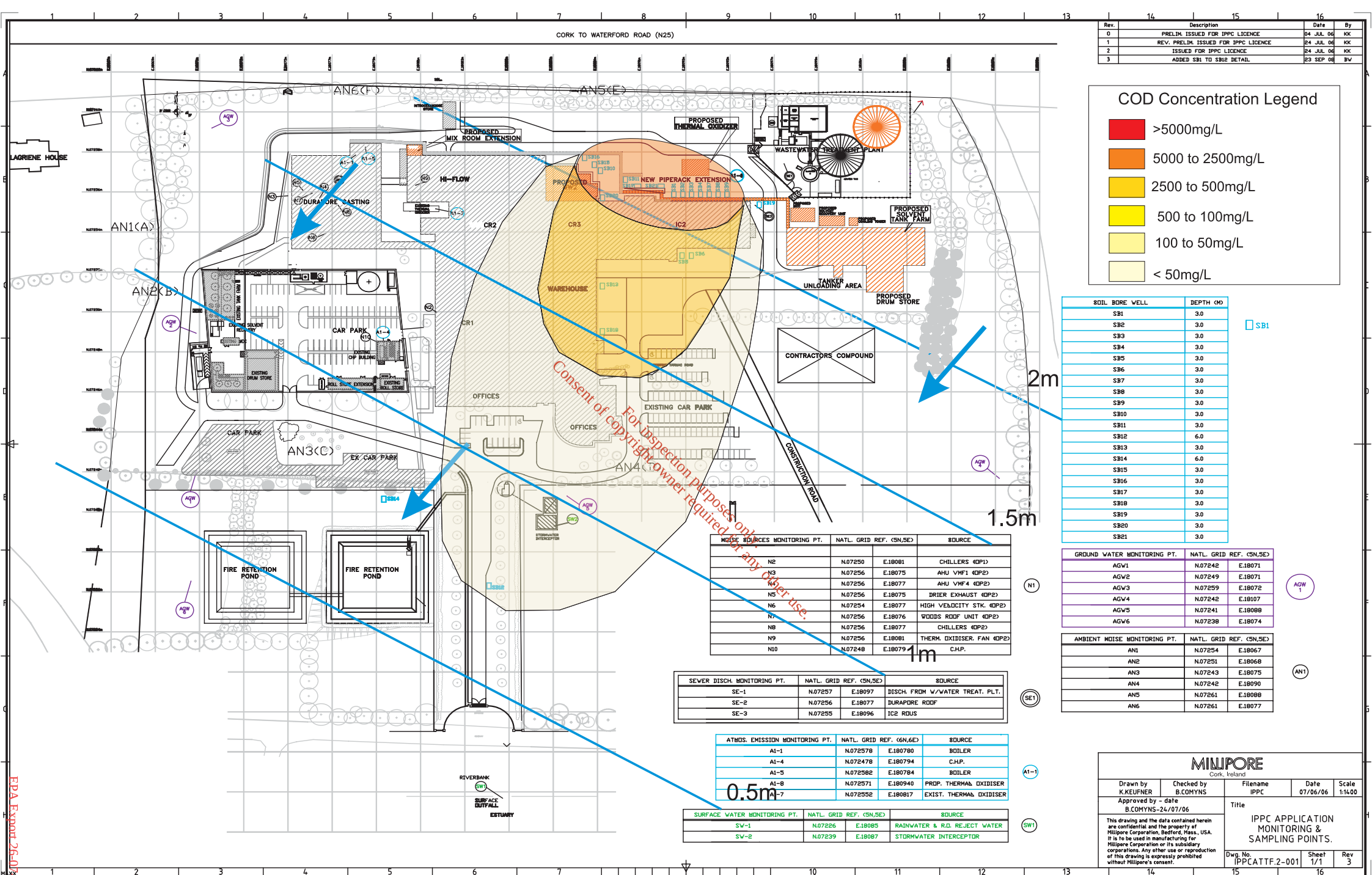
LEGEND: Groundwater flow

FIGURE NUMBER: 3.7

Scale: Not To Scale

Job Number: 08-178-01

EPA Export 26-07-2013:12:02:54



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3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

COD Concentration Legend

- >5000mg/L
- 5000 to 2500mg/L
- 2500 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

Title
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CLIENT: MILLIPORE

TITLE: COD Plume
WEEK 8 (3rd to 9th November 2008)

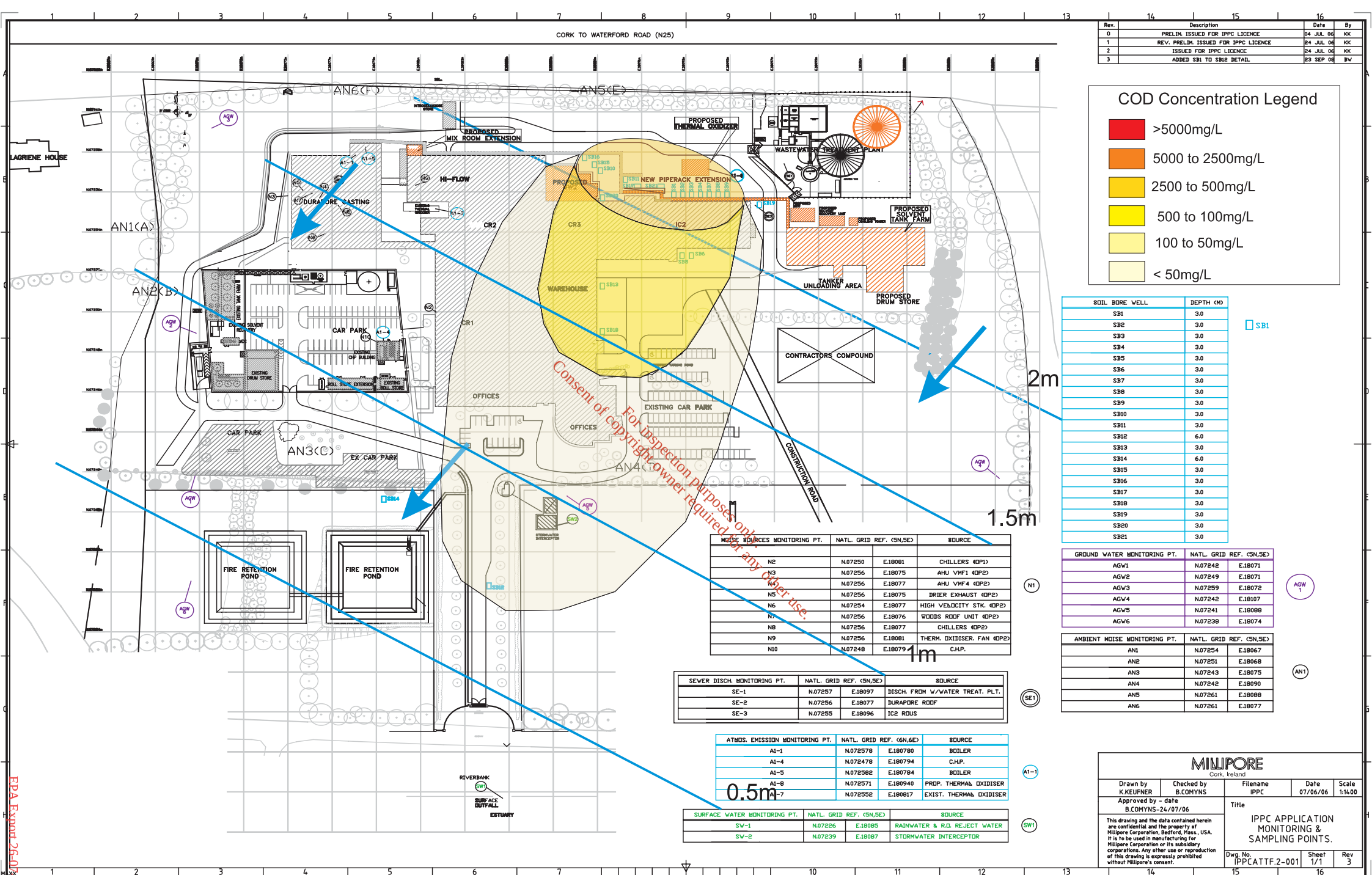
LEGEND: Groundwater flow

FIGURE NUMBER: 3.8

Scale: Not To Scale

Job Number: 08-178-01

EPA Export 26-07-2013:12:02:54



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2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

COD Concentration Legend

- >5000mg/L
- 5000 to 2500mg/L
- 2500 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOF

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE Cork, Ireland				
Drawn by K.KEUFNER	Checked by B.COMYNS	Filename IPPC	Date 07/06/06	Scale 1:1400
Approved by - date B.COMYNS-24/07/06		Title IPPC APPLICATION MONITORING & SAMPLING POINTS.		
Dwg. No. IPPCATTF.2-001		Sheet 1/1	Rev 3	

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CLIENT: MILLIPORE

TITLE: **COD Plume**
WEEK 9 (10th to 16th November 2008)

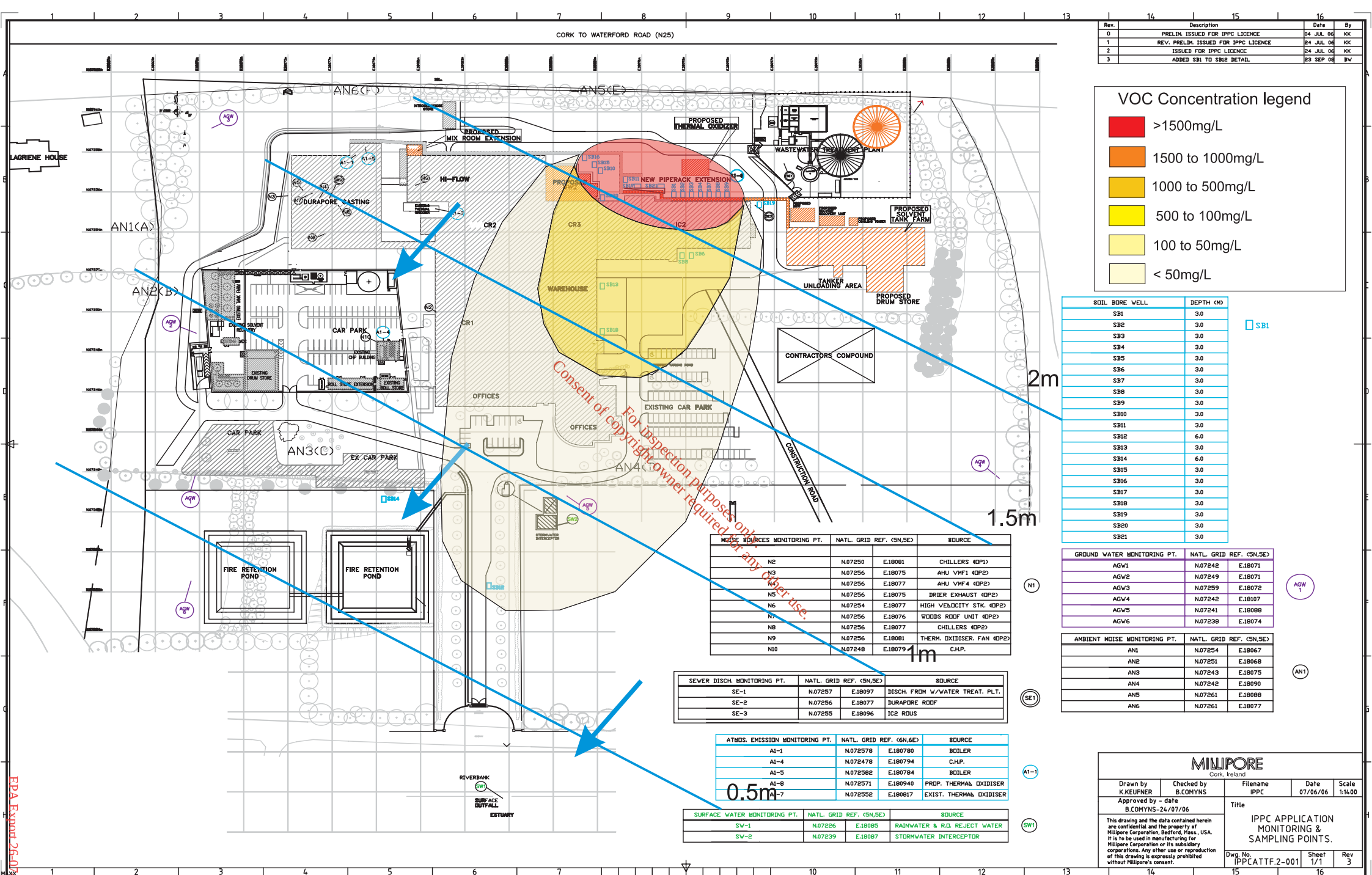
LEGEND: Groundwater flow

FIGURE NUMBER: 3.9

Scale: Not To Scale

Job Number: 08-178-01

EPA Export 26-07-2013:12:02:55



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2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

VOC Concentration legend

- >1500mg/L
- 1500 to 1000mg/L
- 1000 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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CLIENT
MILLIPORE

TITLE
VOC Plume
Week 1 (15th to 21st September 2008)

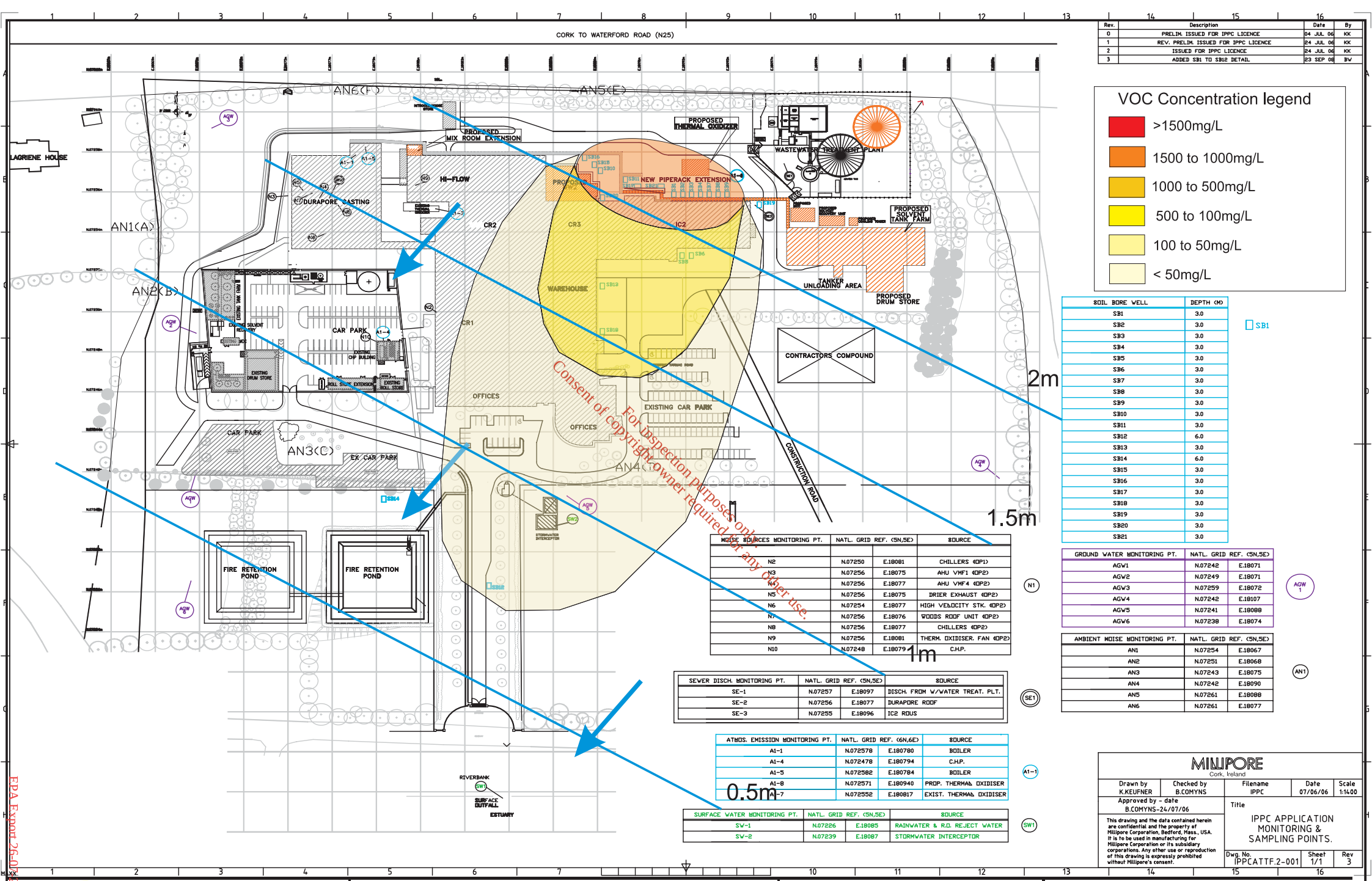
LEGEND
Groundwater flow

FIGURE NUMBER
3.10

Scale
Not To Scale

Job Number:
08-178-01

EPA Export 26-07-2013:12:02:55



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2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

VOC Concentration legend

- >1500mg/L
- 1500 to 1000mg/L
- 1000 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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Dwg. No.	Sheet	Rev
IPPCATTF.2-001	1/1	3

O' Callaghan Moran & Associates.
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Tel. (021) 4321521 Fax. (021) 4321522
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environmental management for business

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CLIENT
MILLIPORE

TITLE
VOC Plume
WEEK 2 (22nd to 28th September 2008)

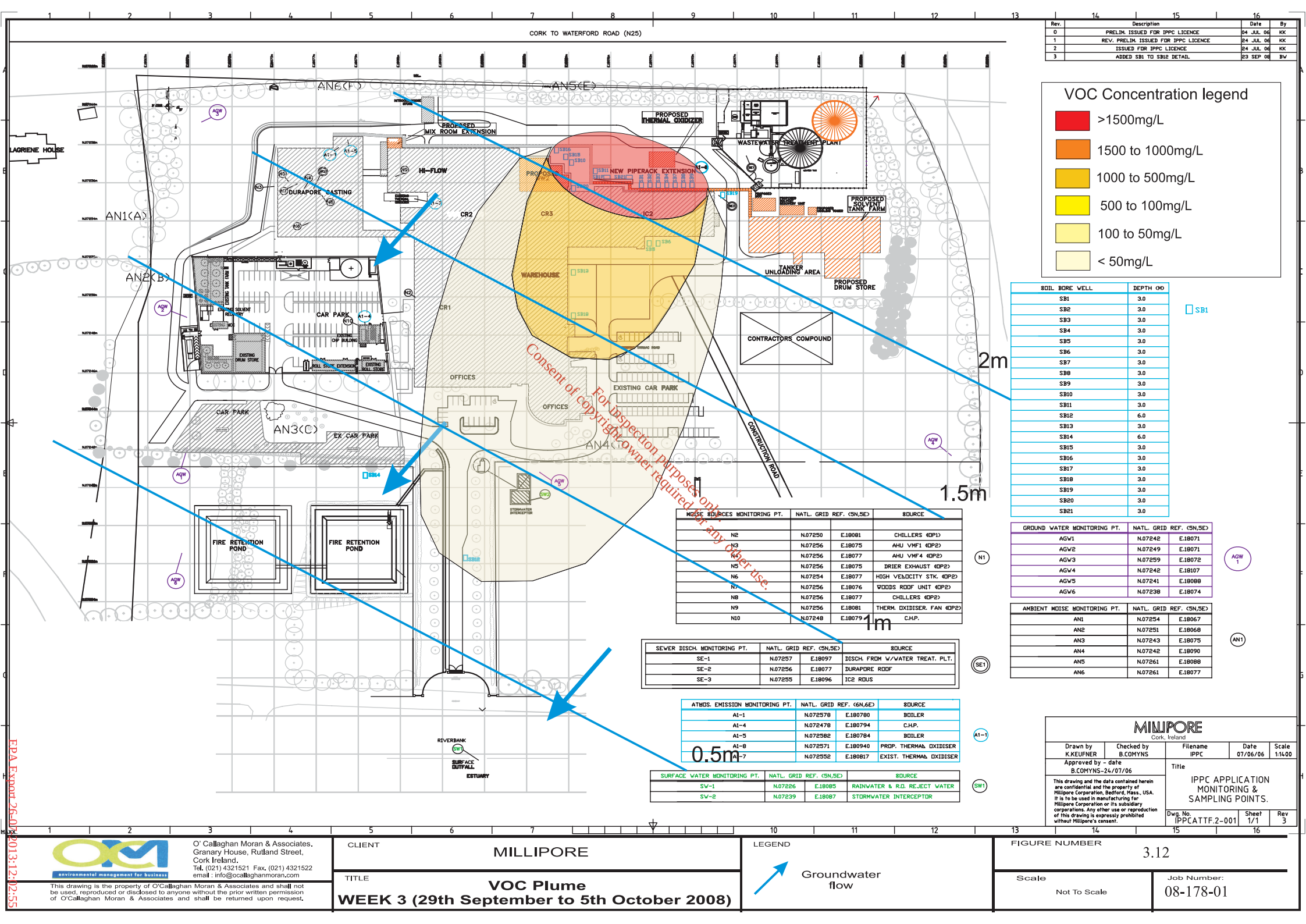
LEGEND
Groundwater flow

FIGURE NUMBER
3.11

Scale
Not To Scale

Job Number:
08-178-01

EPA Export 26-07-2013:12:02:55



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Rev.	Description	Date	By
0	PRELIM. ISSUED FOR IPPC LICENCE	04 JUL 06	KK
1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

VOC Concentration legend

- >1500mg/L
- 1500 to 1000mg/L
- 1000 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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O' Callaghan Moran & Associates.
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CLIENT
MILLIPORE

TITLE
VOC Plume
WEEK 3 (29th September to 5th October 2008)

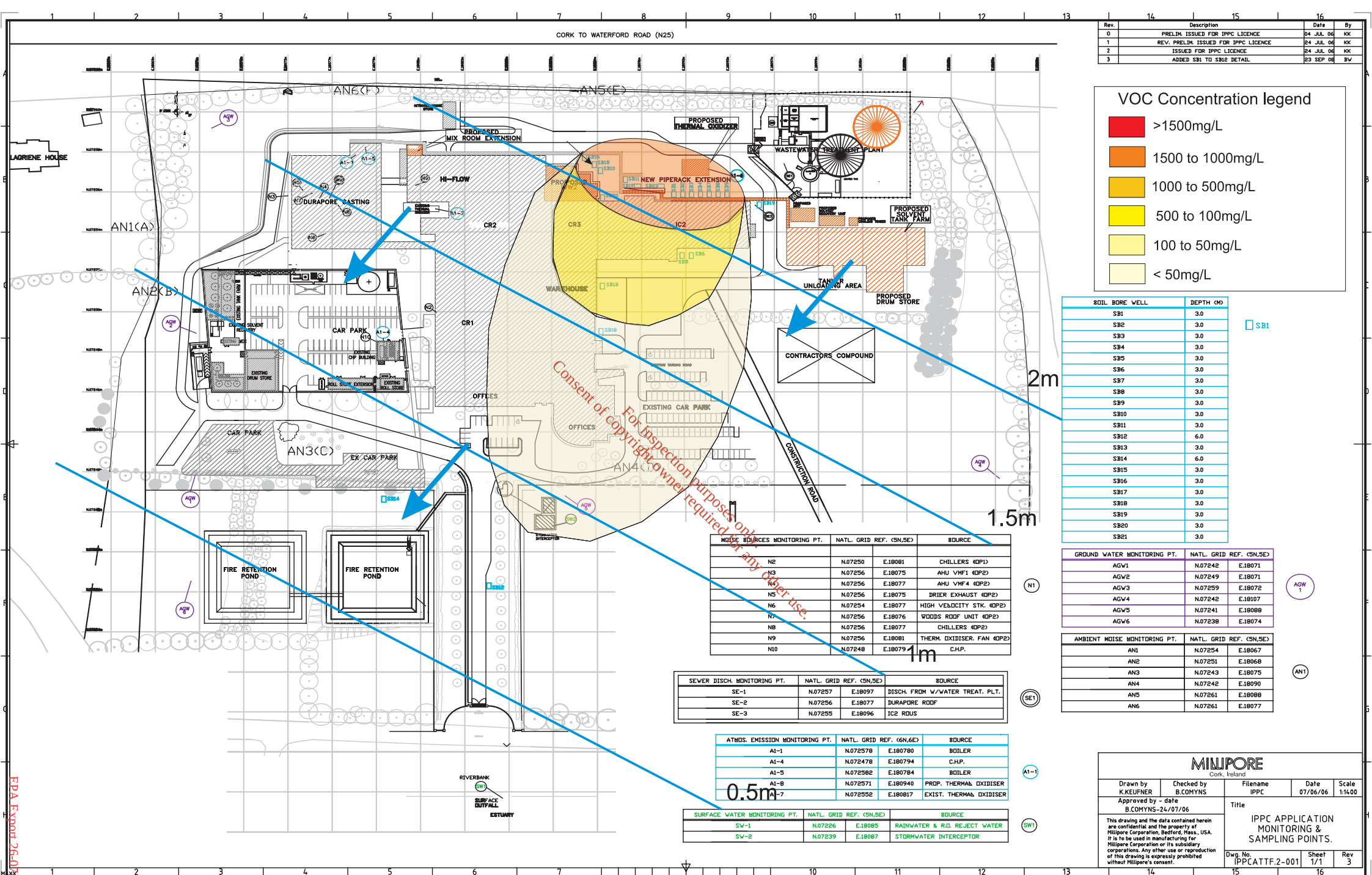
LEGEND
Groundwater flow

FIGURE NUMBER
3.12

Scale
Not To Scale

Job Number:
08-178-01

EPA Export 26-07-2013:12:02:55



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0	PRELIM. ISSUED FOR IPPC LICENCE	04 JUL 06	KK
1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

VOC Concentration legend

- >1500mg/L
- 1500 to 1000mg/L
- 1000 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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CLIENT: MILLIPORE

TITLE: VOC Plume
WEEK 4 (6th to 12th October 2008)

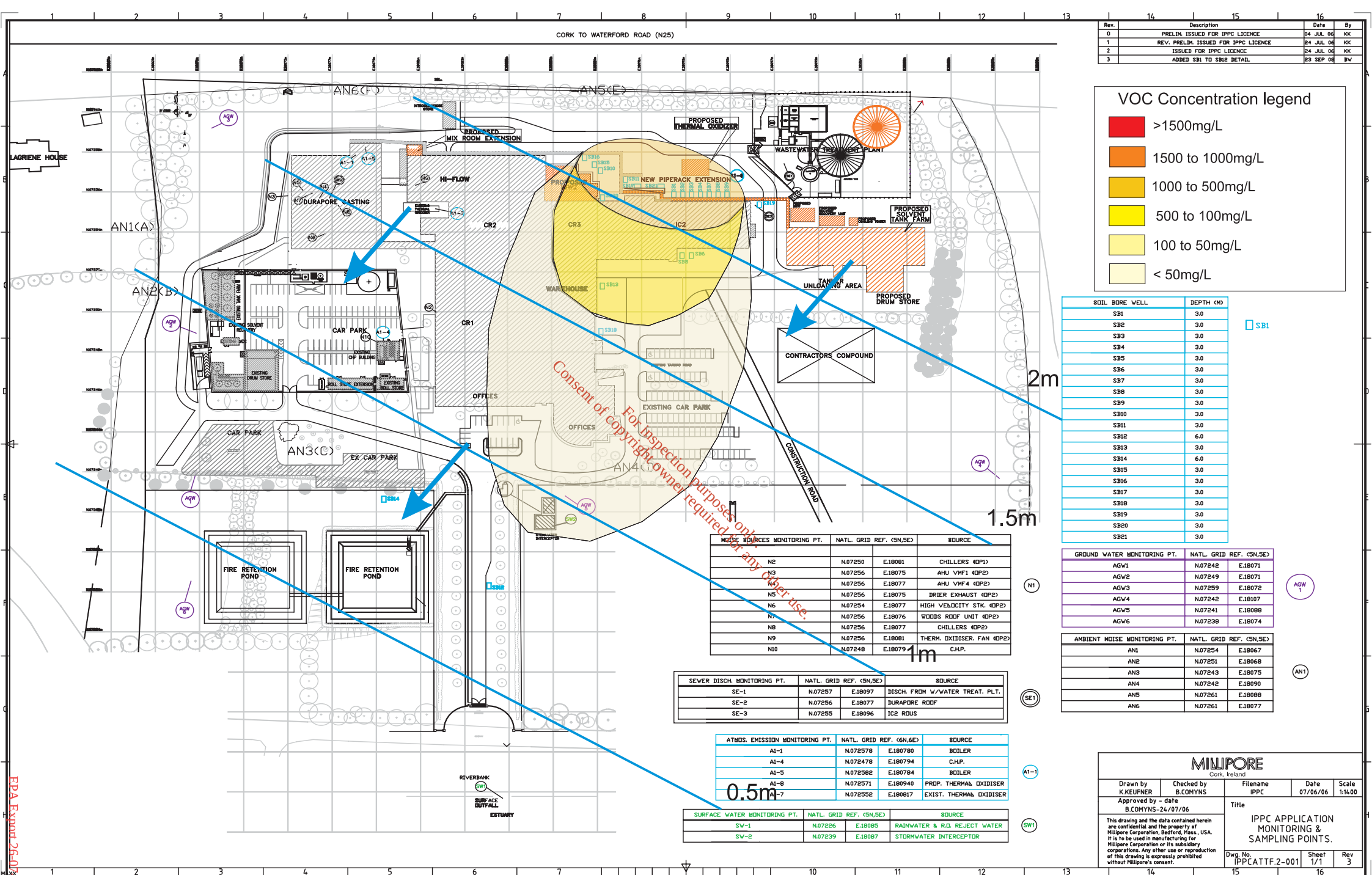
LEGEND: Groundwater flow

FIGURE NUMBER: 3.13

Scale: Not To Scale

Job Number: 08-178-01

EPA Export 26-07-2013:12:02:56



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1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

VOC Concentration legend

- >1500mg/L
- 1500 to 1000mg/L
- 1000 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOS

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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email : info@ocallaghanmoran.com

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CLIENT: MILLIPORE

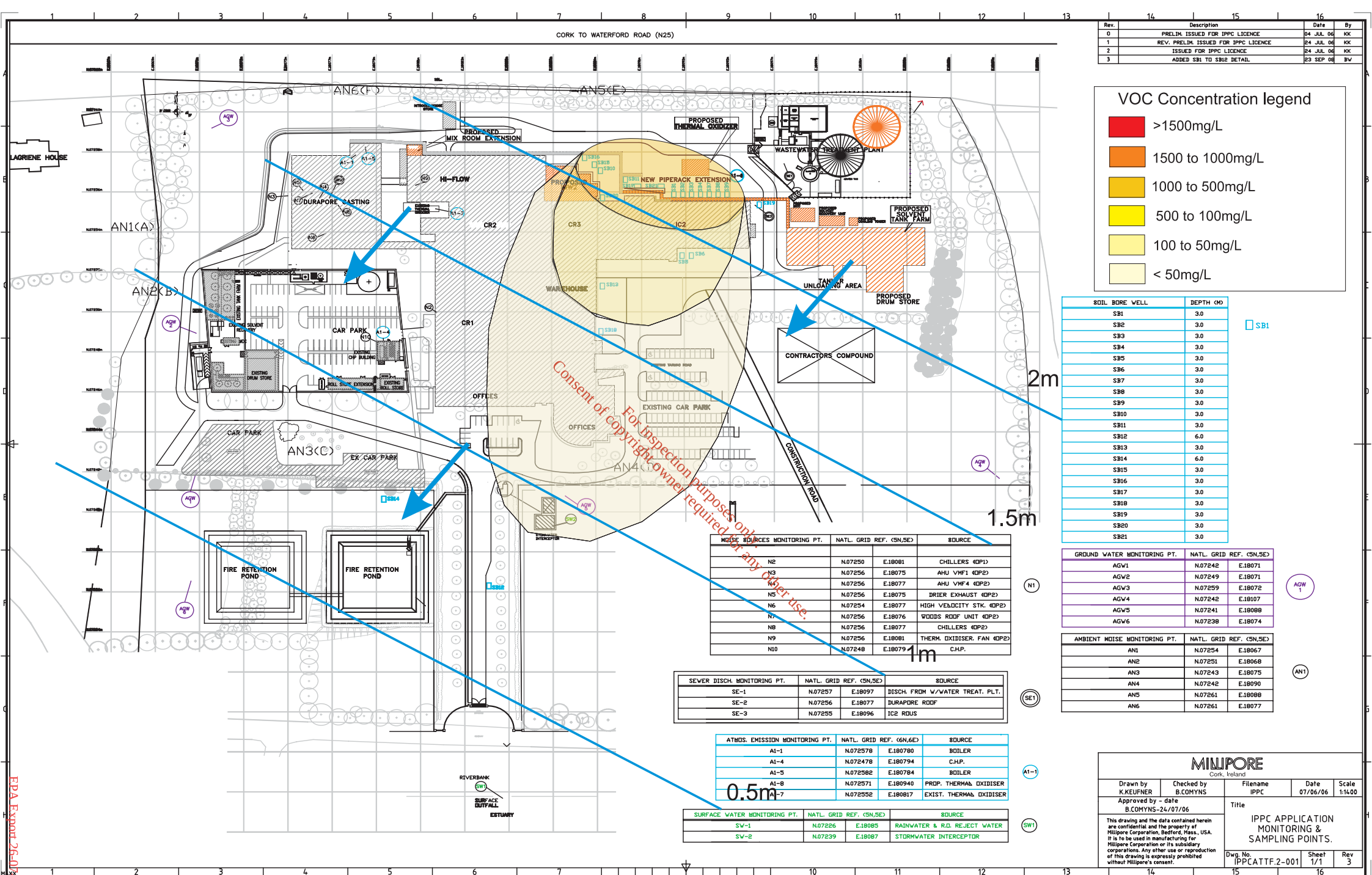
TITLE: VOC Plume
WEEK 5 (13th to 19th October 2008)

LEGEND: Groundwater flow

FIGURE NUMBER: 3.14

Scale: Not To Scale

Job Number: 08-178-01



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1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

VOC Concentration legend

- >1500mg/L
- 1500 to 1000mg/L
- 1000 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOF

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072578	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	07/06/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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CLIENT: MILLIPORE

TITLE: VOC Plume
WEEK 6 (20th to 26th October 2008)

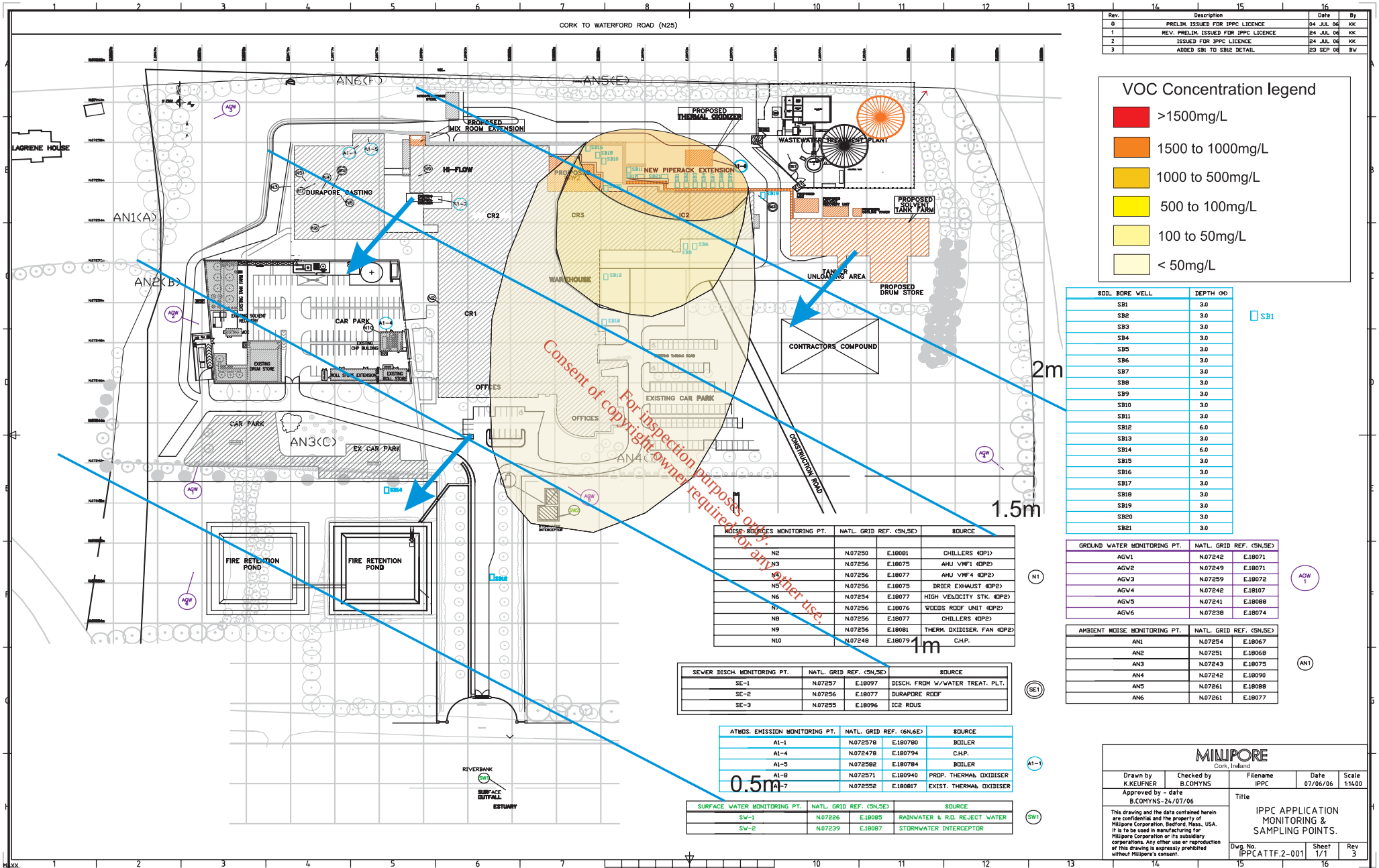
LEGEND: Groundwater flow

FIGURE NUMBER: 3.15

Scale: Not To Scale

Job Number: 08-178-01

EPA Export 26-07-2013:12:02:57



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2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK
3	ADDED SB1 TO SB12 DETAIL	23 SEP 08	BW

VOC Concentration legend

- >1500mg/L
- 1500 to 1000mg/L
- 1000 to 500mg/L
- 500 to 100mg/L
- 100 to 50mg/L
- < 50mg/L

SOIL BORE WELL	DEPTH (M)
SB1	3.0
SB2	3.0
SB3	3.0
SB4	3.0
SB5	3.0
SB6	3.0
SB7	3.0
SB8	3.0
SB9	3.0
SB10	3.0
SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (DP1)
N3	N.07256	E.18075	AHU VMF1 (DP2)
N4	N.07256	E.18077	AHU VMF4 (DP2)
N5	N.07256	E.18075	DRIER EXHAUST (DP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
AN2	N.07251	E.18068
AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOF

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
A1-1	N.072576	E.180780	BOILER
A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.D. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

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Dwg. No. IPPCATTF.2-001 | Sheet 1/1 | Rev 3

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CLIENT: MILLIPORE

TITLE: **VOC Plume**
WEEK 7 (27th October to 2nd November 2008)

LEGEND: Groundwater flow

FIGURE NUMBER: 3.16

Scale: Not To Scale

Job Number: 08-178-01

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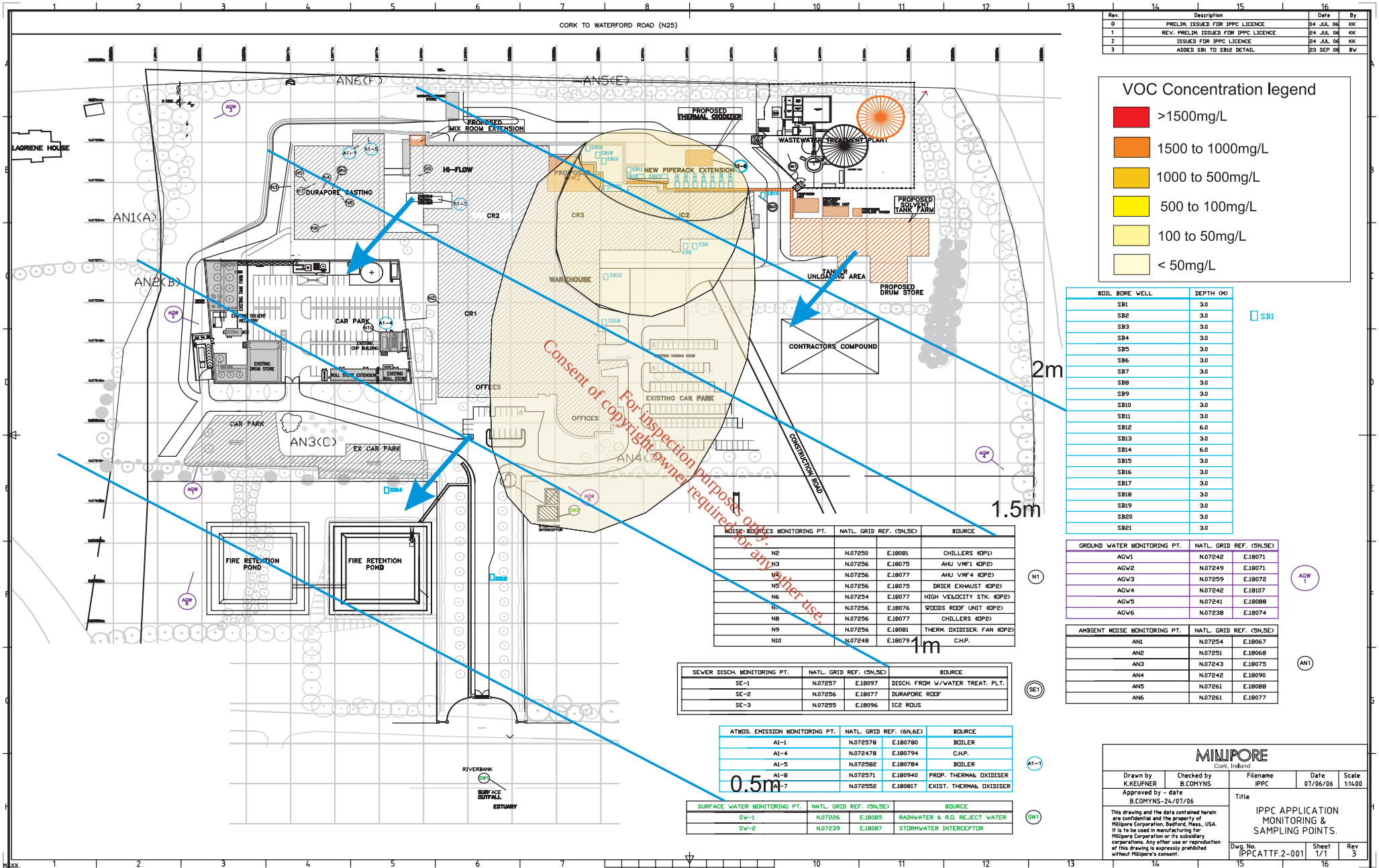

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VOC Concentration legend

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SB7	3.0
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SB11	3.0
SB12	6.0
SB13	3.0
SB14	6.0
SB15	3.0
SB16	3.0
SB17	3.0
SB18	3.0
SB19	3.0
SB20	3.0
SB21	3.0

SB1

NOISE SOURCES MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
N2	N.07250	E.18081	CHILLERS (OP1)
N3	N.07256	E.18075	AHU VMF1 (OP2)
N4	N.07256	E.18077	AHU VMF4 (OP2)
N5	N.07256	E.18075	DRIER EXHAUST (OP2)
N6	N.07254	E.18077	HIGH VELOCITY STK. (OP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (OP2)
N8	N.07256	E.18077	CHILLERS (OP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (OP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

AMBIENT NOISE MONITORING PT.	NATL. GRID REF. (5N,5E)	
AN1	N.07254	E.18067
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AN3	N.07243	E.18075
AN4	N.07242	E.18090
AN5	N.07261	E.18088
AN6	N.07261	E.18077

AN1

SEWER DISCH. MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SE-1	N.07257	E.18097	DISCH. FROM W/WATER TREAT. PLT.
SE-2	N.07256	E.18077	DURAPORE ROOF
SE-3	N.07255	E.18096	IC2 ROOF

SE1

ATMOS. EMISSION MONITORING PT.	NATL. GRID REF. (6N,6E)		SOURCE
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A1-4	N.072478	E.180794	C.H.P.
A1-5	N.072582	E.180784	BOILER
A1-8	N.072571	E.180940	PROP. THERMAL OXIDISER
A1-7	N.072552	E.180817	EXIST. THERMAL OXIDISER

A1-1

SURFACE WATER MONITORING PT.	NATL. GRID REF. (5N,5E)		SOURCE
SW-1	N.07226	E.18085	RAINWATER & R.D. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

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Cork, Ireland

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Approved by - date: B.COMYNS-24/07/06

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Title: IPPC APPLICATION MONITORING & SAMPLING POINTS.

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CLIENT: MILLIPORE

TITLE: **VOC Plume**
WEEK 8 (3rd to 9th October 2008)

LEGEND: Groundwater flow

FIGURE NUMBER: 3.17

Scale: Not To Scale

Job Number: 08-178-01

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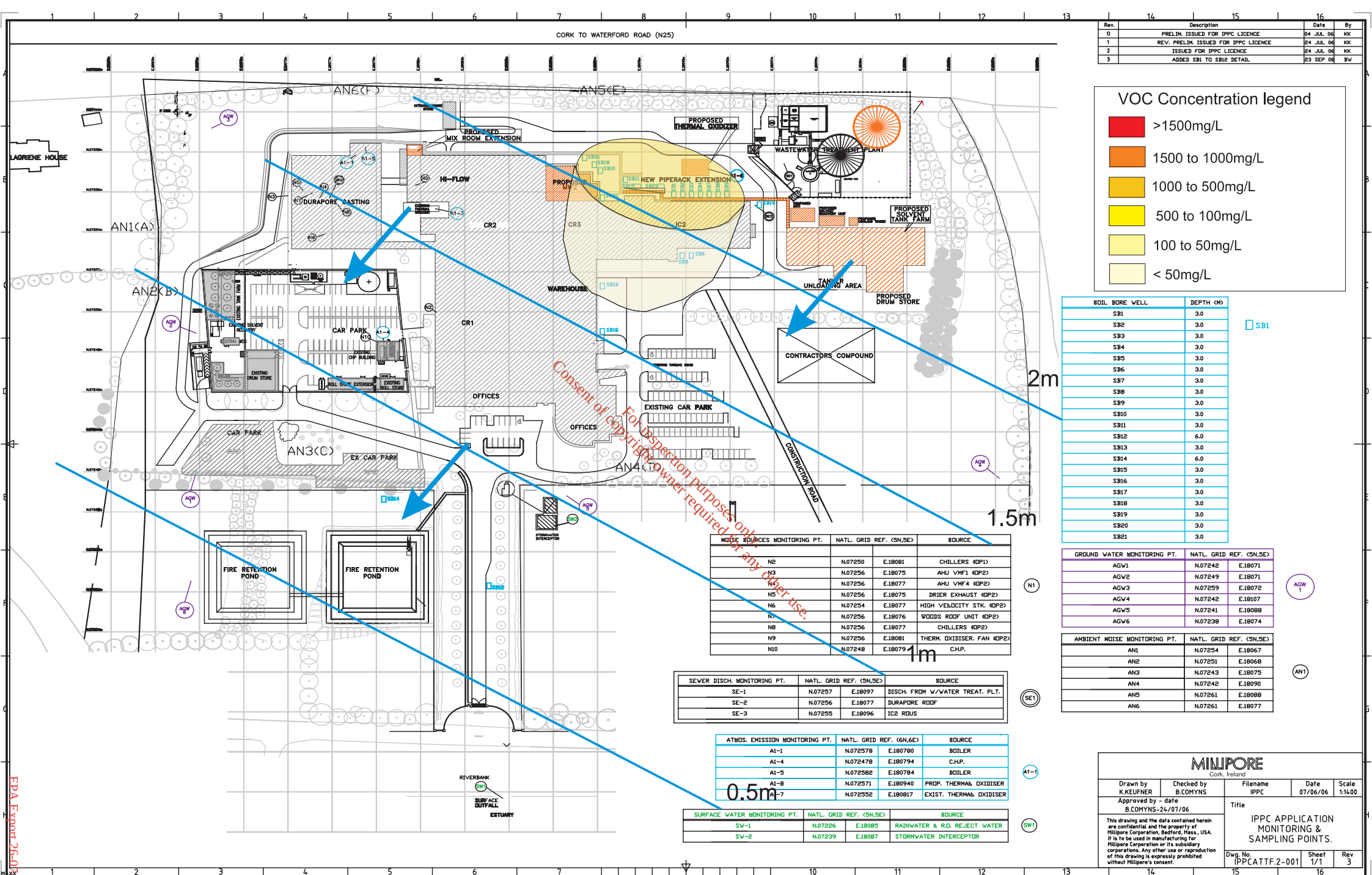

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N6	N.07254	E.18077	HIGH VELOCITY STK. (DP2)
N7	N.07256	E.18076	WOODS ROOF UNIT (DP2)
N8	N.07256	E.18077	CHILLERS (DP2)
N9	N.07256	E.18081	THERM. OXIDISER. FAN (DP2)
N10	N.07248	E.18079	C.H.P.

N1

GROUND WATER MONITORING PT.	NATL. GRID REF. (5N,5E)	
AGW1	N.07242	E.18071
AGW2	N.07249	E.18071
AGW3	N.07259	E.18072
AGW4	N.07242	E.18107
AGW5	N.07241	E.18088
AGW6	N.07238	E.18074

AGW 1

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SE-3	N.07255	E.18096	IC2 ROOS

SE1

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A1-4	N.072478	E.180794	C.H.P.
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SW-1	N.07226	E.18085	RAINWATER & R.O. REJECT WATER
SW-2	N.07239	E.18087	STORMWATER INTERCEPTOR

SW1

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Cork, Ireland

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CLIENT
MILLIPORE

TITLE
VOC Plume
WEEK 9 (10th to 13th November 2008)

LEGEND
Groundwater flow

FIGURE NUMBER
3.18

Scale
Not To Scale

Job Number:
08-178-01

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3.2 Conceptual site model

OCM used the Source-Pathway-Receptor Model to establish if the groundwater contaminant plume presents an unacceptable intrinsic risk to any potential receptor. The assessment followed the guidance set out in the Agency's publication 'Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites'. Although not directly applicable to the Millipore facility, the guidelines present current best practice in environmental risk assessment.

3.3 Source

The sources are the spill of process wastewater (approx 5,400 litres) in July 2008 and a leak from wastewater pipe line between April and September 2008 (approximately 35,000 litres). The source area is located at the rear of the IC2 building. The wastewater contained acetone, ethanol, butanol and isopropyl alcohol (IPA) at approximately 4% concentration. All of these solvents are highly volatile and miscible in water. It is estimated that the leak from the MW-2 sump occurred approximately 0.5m below ground level while the temporary tanker spill occurred at ground level.

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3.4 Pathway

The pathways include the unsaturated and saturated subsoil beneath and down hydraulic gradient of the spill areas, surface water and groundwater.

The borehole logs indicate that the subsoils in the source area comprises a c.7.5 metre thick layer of glacial tills overlying a layer of saturated clayey gravels that are at least 20m thick. Permeability testing of the tills indicates a range from $3.7x10^{-6}$m/s in the source area (SB-4) to $1.4x10^{-4}$m/s at GW-6 down hydraulic gradient of the site (Ref Table 4.1.

Table 3.1: Subsoil Probabilities

Well	Permeability (m/s)	Depth (meters)
BH04	$3.7.10^{-6}$	1.5 to 3
GW7	$1.4.10^{-4}$	4.9 to 7.8
GW5	1.10^{-4}	3.5 to 6.5

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3.4.1 Unsaturated (Vadose Zone)

The low permeability of the subsoil indicates that vertical migration through the unsaturated zone will be slow and will result in increased rates of volatilisation and subsequently lower concentrations of volatile organic compound concentrations reaching the water table.

Given the potential for high rates of volatilisation in the source area, it is likely that some VOCs will migrate through the unsaturated zone beneath the building to the south of the spill area.

OCM understand that a comprehensive indoor air monitoring programme has been undertaken by Millipore, and that this did not detect any VOCs inside the building. Given the granular nature of the fill material beneath the building floor slab it is more likely that the VOCs disperse through this layer, thereby rather than accumulate beneath the floor slab.

3.4.2 Surface Water Pathway

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The low permeability of the subsoil in the source area resulted in some discharge to the surface water drainage system. This pathway was identified at an early stage by Millipore, who subsequently diverted stormwater from this portion of the site to the stormwater retention ponds and stored pending removal for off-site disposal. The contaminated water was diverted to the Cork County Council foul sewer following receipt of permission from the Council and review and approval by the EPA.

OCM consider that any residual contamination that may not have been collected would have been substantially diluted through rainfall run-off before reaching the Slatty Water. Monitoring of the tributary of the Slatty Water, which runs along the east site boundary, has not detected any contaminants down hydraulic gradient of the site.

Given the actions taken by Millipore to divert, contain and remove contaminated surface water and the non detection of pollutants in the closest surface water receptor OCM considers that the surface water pathway is not significant.

3.4.3 Groundwater Pathway

The groundwater flow is to the south-west. With the exception of AGW-5 VOCs have not been detected in the down hydraulic gradient wells. The wells have been monitored on a weekly basis during September and October.

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Given the thickness of the glacial till in the source areas it is considered that the rate of vertical migration of VOCs is slow which is likely to result in increased volatilisation in the unsaturated zone. Based on the permeability test results for BH-4 (also identified as SB4) the vertical migration rate is approximately 0.3m per day. This means that with a 7m thickness of glacial till, break through into the underlying gravels would be expected in approximately 24 days.

However, the water table in the till is approximately 1.5m below ground level which means that some dilution of the solvents is occurring even within this zone. The elevated COD and higher solvent concentrations detected in the till indicate that oxygen levels in the shallow groundwater in the till are being depleted by the process wastewater and as a result of the slow rate of groundwater movement though this material.

The gravels underlying the till have a much higher permeability, which means that once the contaminants reaches the gravel, they would be subject to greater dilution. Elevated COD and solvents were detected in only one deep well- AGW-5. The recent monitoring in mid October did not pick up any significant contamination in this well. The absence of contamination in the majority of the deep wells and the improvement in water quality in AGW-5 indicates that the groundwater in the gravels has not been significantly impacted. .

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The hydraulic gradient across the site is shallow-0.002-which means that the rate of contaminant migration laterally is slow. To date there is no evidence that contamination has reached the down hydraulic gradient site boundary. Because the source is not active i.e. has been removed through sump repair the contaminant plume is now most likely receding and will not migrate off-site. While some remedial action may be required to reduce the COD levels in the source area OCM considers that groundwater is not a significant pathway for off-site migration.

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3.5 Receptor

Potential Receptors include the surface water tributary of the Slatty Water, the Slatty Water and the Estuary which are designated ecological sensitive areas. Other potential receptors are the bedrock aquifer and users of groundwater if present down hydraulic gradient of the site.

3.5.1 Surface Water

As indicated above the surface water is not a significant pathway and monitoring has shown that no off-site surface water receptors have been impacted. The pathway to the off-site receptor while present has not resulted in an off-site impact on a receptor. An assessment of the risk posed to the Estuary was undertaken by URS Consultants which concluded that there was no significant risk of impact from the spill incident. Therefore OCM considers that the tributary stream or the Slatty Water and the Estuary are not at risk.

3.5.2 Groundwater

With the exception of AGW-5 no contamination has been detected in the down hydraulic gradient monitoring wells. This indicates that the plume has not migrated beyond the site boundary. In addition the bedrock aquifer beneath the site is overlain by possibly more than 20 metres of gravels.

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There are no groundwater abstractions down hydraulic gradient of the site. OCM considers based on the aquifer vulnerability and the lack of significant detection of contamination in the groundwater in the gravels that the groundwater down hydraulic gradient of the site is not at risk from the plume. OCM considers that there is no longer a need to remove contaminated groundwater from the source area. However, some remedial measures may be required to reduce the elevated contamination levels in the short to medium term within the source area.

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4 MITIGATION MEASURES

4.1 Mitigation Measures Undertaken by Millipore

In order to minimise the risk of impact on the receiving environment, Millipore implemented a series of mitigation measures that contributed to reducing the risk posed by the incidents.

4.1.1 Removal of Contaminated Soils

Millipore excavated a trench around and beneath the leaking sewer line to allow repairs to the line and also to remove the impacted subsoils immediately around and beneath the leak point. Approximately 25 tonnes of contaminated soils were excavated and removed for appropriate disposal by Lehane Environmental Ltd.

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4.1.2 Removal of Contaminated Groundwater

Millipore are continuing to remove contaminated groundwater from the shallow wells installed in the plume. The groundwater is pumped out on a daily basis and collected in polyethylene 105L capacity drums. To date approximately 73,280 L of contaminated groundwater has been removed from the plume area which has significantly reduced the volume of contaminated water that would otherwise have migrated downgradient. The water was sent to the on-site wastewater treatment plant following authorisation to do so from the EPA.

4.1.3 Removal of Contaminated Surface Water

Contaminated surface water was also diverted to the storm water retention pond and ultimately to the Council foul sewer. Recent monitoring of water quality in the retention pond indicates that the water is uncontaminated and is therefore suitable for discharge to the Council storm water and ultimately the Slatty Water rather than the foul sewer. The stormwater monitoring data collected from the manhole prior to entry to the pond is included in Appendix 4.

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4.2 Monitored Natural Attenuation (MNA)

The United States Environmental Protection Agency (USEPA) defines monitored natural attenuation (MNA) as the "reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods".

The 'natural attenuation processes' that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favourable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization, radioactive decay, and chemical or biological stabilization, transformation, or destruction of contaminants" (USEPA, OSWER Directive 9200.4-17P).

The decision making process for MNA applicability involves the following parameters: -

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4.2.1 No Active Source(s) Present

The "source" as used in MNA is defined as "any inventory of contaminant in the environment that is being released to the groundwater plume at a rate greater than that which it can be attenuated". The source is considered active if it produces more mobile phase contaminant then it is attenuated, resulting in a growing plume with increasing concentrations of contaminants in the source and downgradient from the source. The source is considered in equilibrium if its size and contaminant concentration remain relatively stable. If the inventory of contaminants is significantly reduced such that fluxes to the mobile phase are less than the removal rate, the source is considered a diminishing source.

The USEPA recommends that source control actions should use treatment to address "principle threat" wastes wherever practicable. If treatment is not practicable, then the source should be contained with engineering controls. If natural attenuation is selected, it should only be selected after remedial options remove, treat, or contain the contaminant source.

The "sources" of contamination at the site have been identified and eliminated through repairs to the wastewater treatment line.

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4.2.2 Advancing, Static, or Retreating Plume

All plumes eventually become static by virtue of dilution and dispersion over time. With the possible occurrence of other natural attenuation mechanism (i.e. biodegradation, adsorption), plume can reach stasis more rapidly. However, the time required to reach stasis depends on many factors, including the size of the plume, aquifer conditions and contaminant concentrations.

MNA is an acceptable remedial alternative for those plumes that are static or retreating. MNA may also be applicable for a plume which has not yet become static provided that the plume is expected to reach stasis in the near future and that there is no potential exposure at areas where it is expected to migrate. The best test to evaluate whether a plume is static or retreating is to examine trend analysis on temporal data gathered from the entire plume.

The analytical data presented in Appendix3 illustrates the temporal trend analysis gathered from the plume. The data suggest that the plume has retreated and that the contaminant concentrations have been reduced significantly throughout the original impacted area. .

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4.2.3 Imminent Exposure

MNA is not a desirable remedial alternative where contamination poses an imminent risk to people or the environment, or where a large groundwater plume shows no signs of stabilizing.

The USEPA suggests that where practicable, groundwater should be brought to background concentrations or similar standards within a reasonable time frame to eliminate potential exposure. Where restoration to background quality is not possible for technical and/or economical reasons, further plume migration should be controlled and exposure pathways should be interrupted. In such a case, active remedial responses may be adopted as back-ups if MNA proves inadequate. As a remedy, MNA may prove possible in conjunction with more active responses in the following situations: -

- Outer portions of contaminant plumes where contaminant concentrations are very low might be left to natural attenuation while the rest of the plume is subjected to treatment;

- If active remedies are no longer bringing significant or even measurable improvements, then natural attenuation might be relied upon to finish the job.

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The plume has diminished substantially both in size and in contaminant concentrations and appears to be a retreating plume. Furthermore, there is no imminent exposure risk to site workers, utility/construction workers or downgradient properties. Groundwater quality down hydraulic gradient of the site has not been impacted. Based upon the foregoing, MNA appears to be a feasible remedial alternative for the Millipore site.

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5 CONCLUSIONS

5.1 Conclusions

There is no evidence that the incidents have significantly impacted on either groundwater quality in the gravel aquifer beneath the site, or on the surface water system downstream of the facility.

The subsoil in the spill areas comprises glacial tills that are more than 7m thick, which have greatly retarded the vertical migration of contamination to the groundwater. The presence of the till has resulted in volatilisation of the solvents in the unsaturated zone above the water table and some preferential migration of contamination along the shallow groundwater and surface water drainage system within the site.

The measures taken by Millipore to mitigate the impacts on the subsurface have substantially reduced the size and extent of the shallow groundwater contaminant plume beneath the site and also minimised the risk to surface waters.

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OCM considers that the plume beneath the site is reducing in size and concentration. OCM also considers that a Source Pathway Receptor linkage has not been completed for the plume and therefore there is no significant risk to an off-site sensitive receptor.

Based on the most recent groundwater monitoring results for October there is no longer a need to remove groundwater from the source area. However, some remedial measures may be required to reduce the elevated COD and solvent levels in the source areas.

Monitored Natural Attenuation (MNA) is considered to be the most effective remedial solution.

OCM considers that an existing well located to the northeast of AGW3, which is not part of the monitoring network, would be more representative of up hydraulic gradient water quality.

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5.2 Recommendations

OCM recommend that the shallow groundwater in the plume area be injected with a chemical oxidant. This can be achieved by injection though the trench excavation in the vicinity of the repaired surface water pipeline by excavation of a trench up hydraulic gradient of the July spill area and by injection into selected soil borings within the plume.

Following completion of the injection programme OCM recommend that routine monitoring be carried out to confirm that the plume is shrinking and that no impacts are occurring in the surface water or groundwater system beneath and down hydraulic gradient of the facility.

OCM recommend that an up hydraulic gradient monitoring well be installed in the northeast corner of the site to allow a comparison with the downgradient wells.

OCM recommend that monitoring of groundwater quality be undertaken on a quarterly basis in the IPPC licensed wells and in the following shallow groundwater wells. (SB-20, SB-4,) in the core of the plume, SB-5 and SB-18 in the mid plume and SB- 14 in the down gradient distal end).

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If the monitoring programme demonstrates a reduction in COD and VOCs after 1 year the monitoring frequency for the groundwater and surface water should revert to that specified in the IPPC licence conditions.

Based on the lack of detection of any contaminants in the surface water discharing to the retention pond OCM recommend that the surface water diversion valve be reopened on the stormwater retention pond to allow the discharge of surface water to the Slatty Water.

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APPENDIX 1

Boreholes logs

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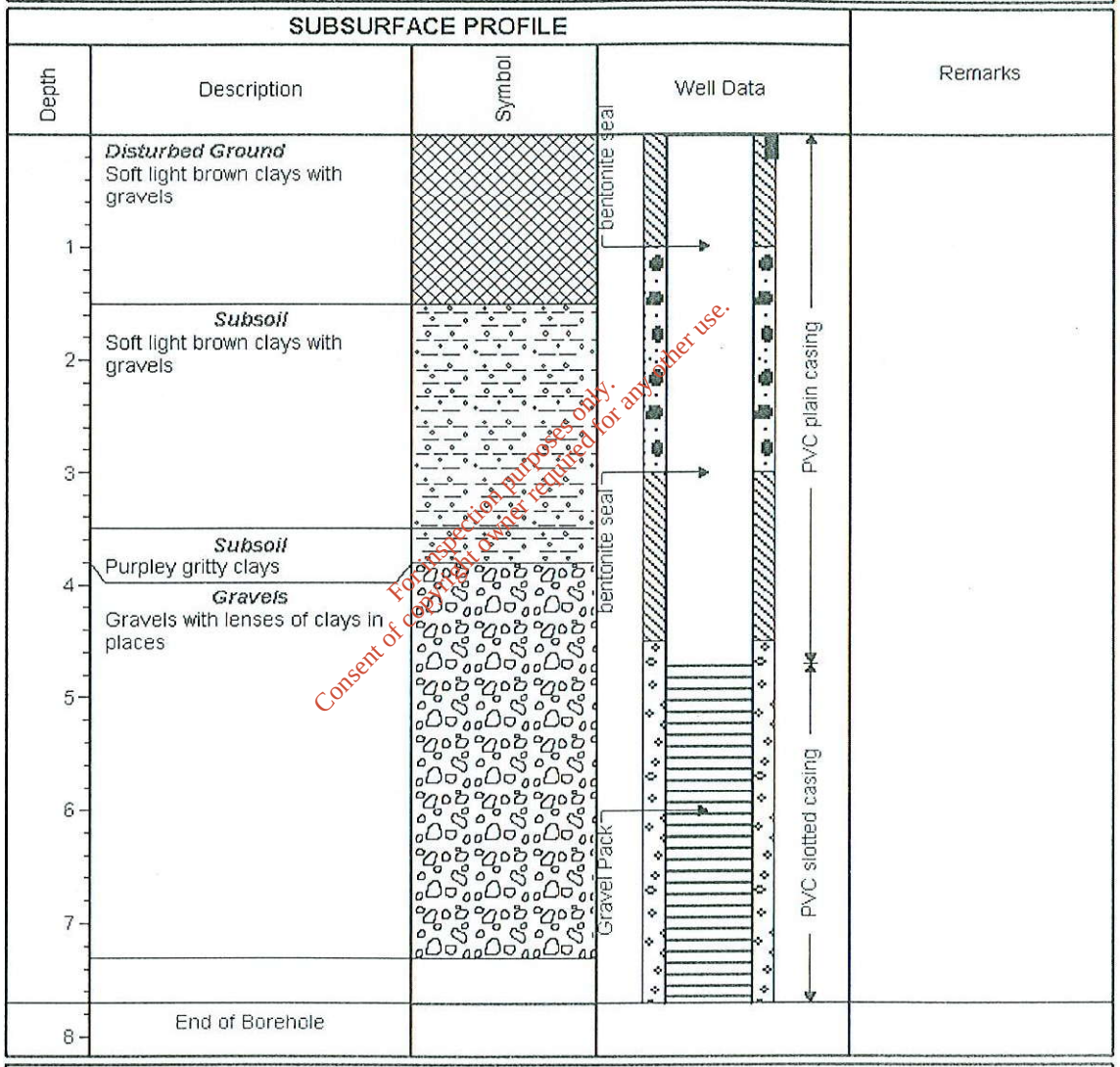
Log of Borehole: MW07-01

Project No: ECS2471 ***Client:*** Millipore

Site: Carricktwohill, Cork ***Date:*** April 2007

Location: By Firewater Pond ***Logged by:*** S. Casey



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Bord na Móna Environmental Limited Main Street Newbridge

Drilled By: Glover Site Investigations ***Hole Size (mm):*** 6-inch

Drill Method: Shell & Auger ***Datum (m AOD):***

Drill Date: 16th April 2007 ***Sheet:*** 1 of 1

EPA Export 26-07-2013:12:03:00

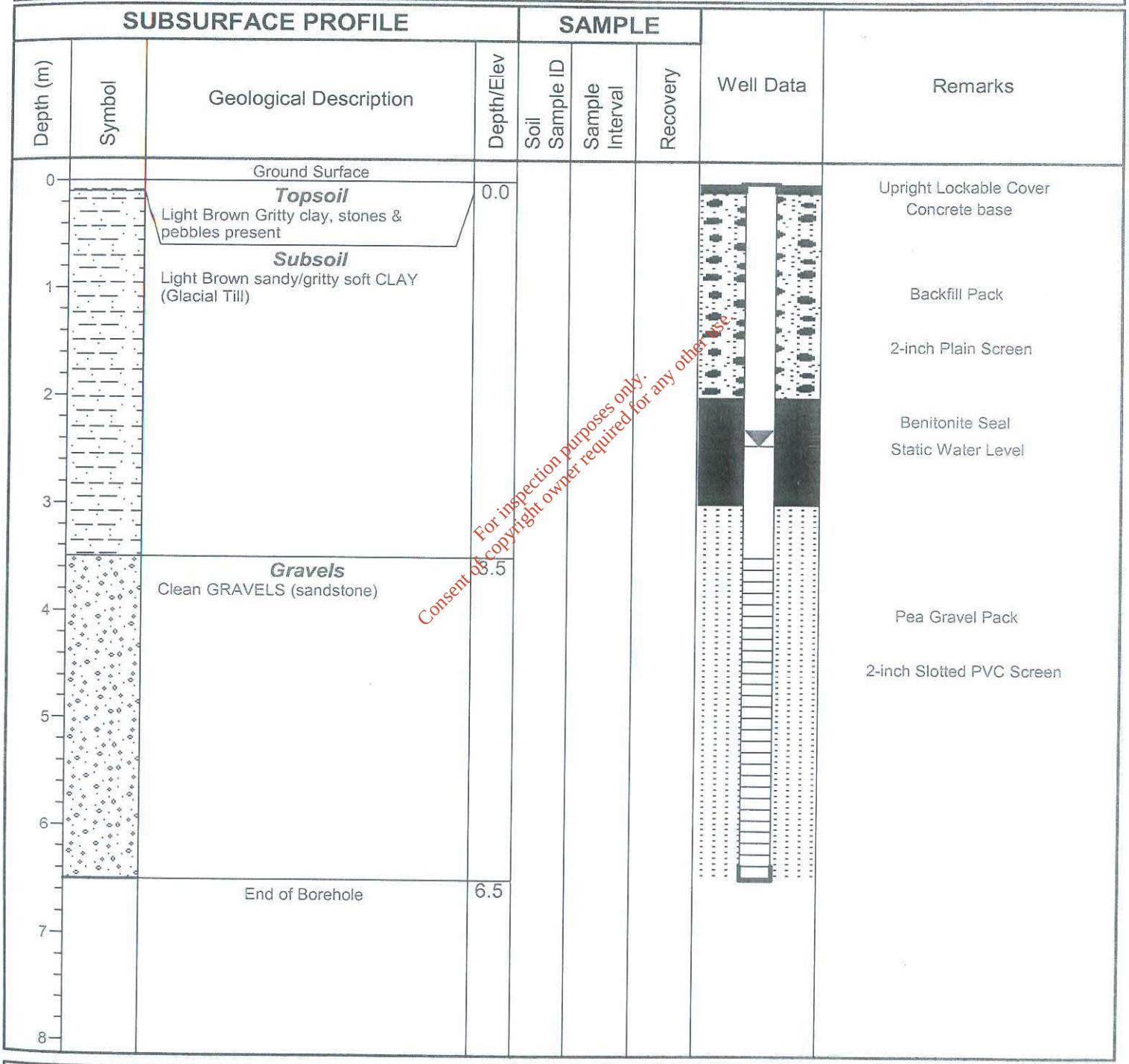
Log of Borehole: GW1

BORD NA MÓNA
BORD NA MÓNA ENVIRONMENTAL LIMITED
Environmental Consultancy Services
Main Street, Newbridge, Co. Kildare

Project No: ECS0157 ***Site Location:*** Carricktwohill

Project: Hydrogeological Investigation ***Date:*** June 2003

Client: Millipore ***Logged by:*** Sarah Casey



For inspection purposes only.
Consent of copyright owner required for any other use.

Drilled By: Glovers Site Investigations

Drill Method: ODEX

Drill Date: 5th June 2003

Hole Size: 4-inch

Datum:

Sheet:

EPA Export 26-07-2013:12:03:00

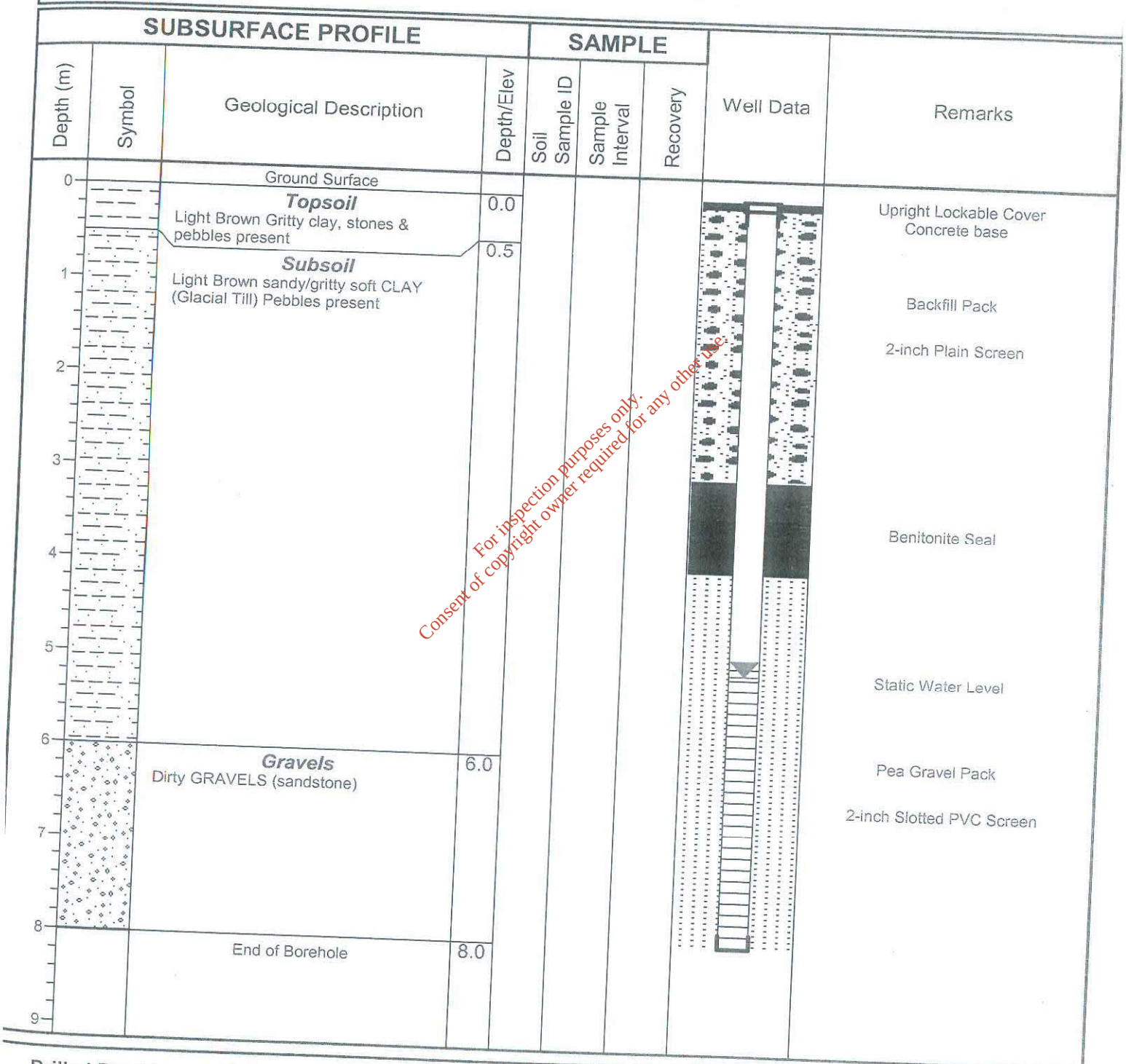
Log of Borehole: GW2

Project No: ECS0157 **Site Location:** Carricktwohill

Project: Hydrogeological Investigation **Date:** June 2003

Client: Millipore **Logged by:** Sarah Casey

BORD NA MÓNA
BORD NA MÓNA ENVIRONMENTAL LIMITED
Environmental Consultancy Services
Main Street, Newbridge, Co. Kildare



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Drilled By: Glovers Site Investigations

Drill Method: ODEX

Drill Date: 5th June 2003

Hole Size: 4-inch

Datum:

Sheet:

EPA Export 26-07-2013:12:03:00

Log of Borehole: GW3

BORD NA MÓNA
BORD NA MÓNA ENVIRONMENTAL LIMITED
Environmental Consultancy Services
Main Street, Newbridge, Co. Kildare

Project No: ECS0157 **Site Location:** Carricktwohill

Project: Hydrogeological Investigation **Date:** June 2003

Client: Millipore **Logged by:** Sarah Casey

SUBSURFACE PROFILE				SAMPLE				
Depth (m)	Symbol	Geological Description	Depth/Elev	Soil Sample ID	Sample Interval	Recovery	Well Data	Remarks
0		Ground Surface						
		Topsoil Light Brown Gritty clay, stones & pebbles present	0.0					Upright Lockable Cover Concrete base
			0.5					
1		***Subsoil*** Light Brown sandy/gritty soft CLAY (Glacial Till) Pebbles present some water present						Backfill Pack
								2-inch Plain Screen
2								
3								Benitonite Seal
4								Pea Gravel Pack
5								
6								Static Water Level
7								
		GRAVELS Dirty Gravels	7.5					2-inch Slotted PVC Screen
8								
9								
		End of Borehole	9.5					
10								

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Drilled By: Glovers Site Investigations

Drill Method: ODEX

Drill Date: 5th June 2003

Hole Size: 4-inch

Datum:

Sheet:

EPA Export 26-07-2013:12:03:01

Log of Borehole: GW5

BORD NA MÓNA
BORD NA MÓNA ENVIRONMENTAL LIMITED
Environmental Consultancy Services
Main Street, Newbridge, Co. Kildare

Project No: ECS0157 ***Site Location:*** Carricktwohill

Project: Hydrogeological Investigation ***Date:*** June 2003

Client: Millipore ***Logged by:*** Sarah Casey

SUBSURFACE PROFILE				SAMPLE				
Depth (m)	Symbol	Geological Description	Depth/Elev	Soil Sample ID	Sample Interval	Recovery	Well Data	Remarks
0		Ground Surface						
		Topsoil Light Brown Gritty clay, stones & pebbles present	0.0					Upright Lockable Cover Concrete base
		Subsoil Light Brown sandy/gritty soft CLAY (Glacial Till) Pebbles present some water present	0.5					Backfill Pack 2-inch Plain Screen
1								
2								Benitonite Seal
3		***GRAVELS*** Dirty Gravels	3.5					
4								Pea Gravel Pack 2-inch Slotted PVC Screen
5								
6								
		Sands Clean SANDS	6.4					
		End of Borehole	6.5					
7								
8								

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Drilled By: Glovers Site Investigations
Drill Method: ODEX
Drill Date: 5th June 2003

Hole Size: 4-inch
Datum:
Sheet:

EPA Export 26-07-2013:12:03:01

Glover Site Investigations Ltd

Site	Borehole Number
Millipore Ireland BV, Manufacturing Plant, Cork	BH01

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando Terrier	150mm cased to 3.00m		Millipore Ireland BV	08-0583

Location	Dates	Engineer	Sheet
	14/08/2008		1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	MADE GROUND: Stone Fill		
						0.30	Firm brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
						(1.30)			
						1.60	Soft brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
				Water Strike(1) at 2.50m.		(1.40)			▽1
				14/08/2008:		3.00	Complete at 3.00m		

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Remarks
Standpipe installed.

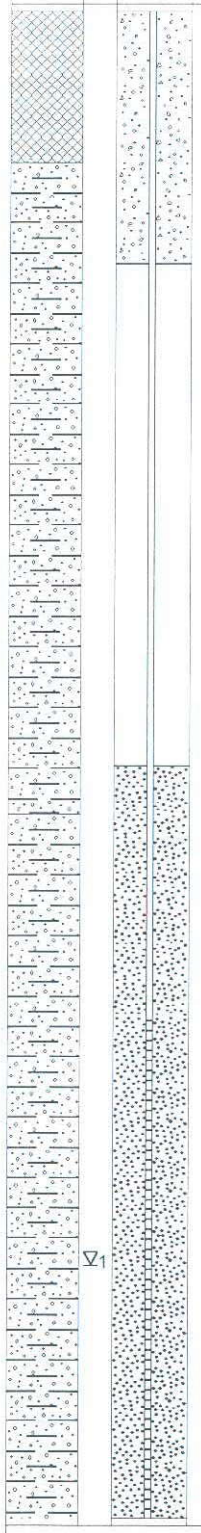
Scale (approx)	Logged By
1:25	DC/HH

Figure No. 08-0583.BH01

EPA Export 26-07-2013:12:03:01

Glover Site Investigations Ltd

Site: Millipore Ireland BV, Manufacturing Plant, Cork			Borehole Number: BH01
Installation Type: Standpipe	Dimensions: Internal Diameter of Tube [A] = 50 mm; Diameter of Filter Zone = 150 mm	Client: Millipore Ireland BV	Job Number: 08-0583
Location	Ground Level (mOD)	Engineer	Sheet: 1/1



Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)
		2.50		Water Strike					

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)
14/08/08							3.00			

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks

For inspection purposes only.
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Remarks
Flush cover fitted.

EPA Export 26-07-2013:12:03:01

Glover Site Investigations Ltd

Site: Millipore Ireland BV. Manufacturing Plant. Cork				Borehole Number: BH02
Boring Method: Dando Terrier	Casing Diameter: 150mm cased to 3.00m	Ground Level (mOD)	Client: Millipore Ireland BV	Job Number: 08-0583
	Location	Dates: 14/08/2008	Engineer	Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	MADE GROUND: Stone Fill		
						0.30	Firm brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
						(1.30)			
						1.60	Soft brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
				Water Strike(1) at 2.50m.		(1.40)			▽1
				14/08/2008:		3.00	Complete at 3.00m		

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Remarks
Standpipe installed.

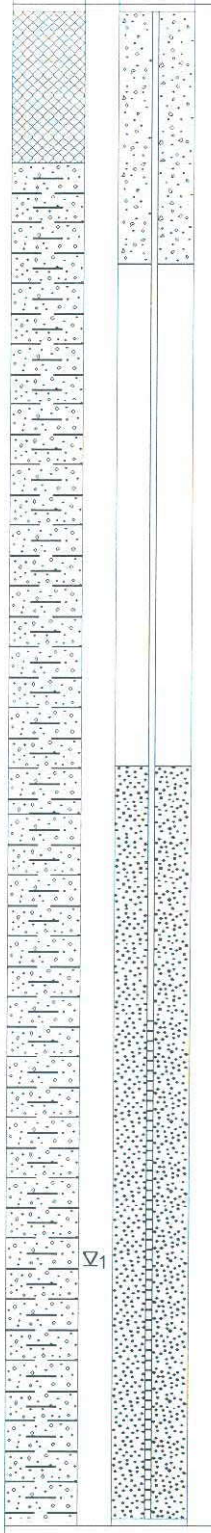
Scale (approx)	Logged By
1:25	DC/HH

Figure No. 08-0583.BH02

EPA Export 26-07-2013:12:03:02

Glover Site Investigations Ltd

Site: Millipore Ireland BV, Manufacturing Plant, Cork			Borehole Number: BH02
Installation Type: Standpipe	Dimensions: Internal Diameter of Tube [A] = 50 mm; Diameter of Filter Zone = 150 mm	Client: Millipore Ireland BV	Job Number: 08-0583
Location	Ground Level (mOD)	Engineer	Sheet: 1/1



Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)
		2.50		Water Strike					

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)
14/08/08							3.00			

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks

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Remarks
Flush cover fitted.

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Glover Site Investigations Ltd

Site: Millipore Ireland BV, Manufacturing Plant, Cork			Borehole Number: BH03
Boring Method: Dando Terrier	Casing Diameter: 150mm cased to 3.00m	Ground Level (mOD):	Client: Millipore Ireland BV
	Location:	Dates: 14/08/2008	Engineer:
			Job Number: 08-0583
			Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	MADE GROUND: Stone Fill		
						0.30	Firm brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
						(1.30)			
						1.60	Soft brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
				Water Strike(1) at 2.50m.		(1.40)			▽1
				14/08/2008:		3.00	Complete at 3.00m		

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Remarks
Standpipe installed.

Scale (approx)	Logged By
1:25	DC/HH

Figure No.
08-0583.BH03

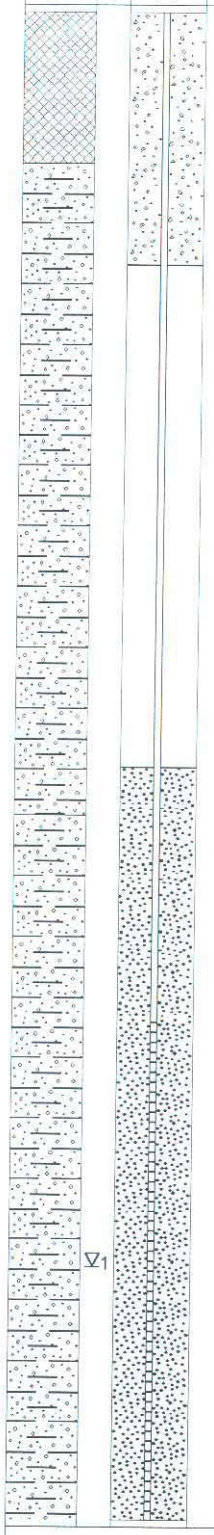
EPA Export 26-07-2013:12:03:02

Glover Site Investigations Ltd

Site	Borehole Number
Millipore Ireland BV, Manufacturing Plant, Cork	BH03

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	Millipore Ireland BV	08-0583

Location	Ground Level (mOD)	Engineer	Sheet
			1/1



Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)
		2.50		Water Strike					

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)
14/08/08							3.00			

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks

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Remarks
Flush cover fitted.

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Glover Site Investigations Ltd

Site: Millipore Ireland BV. Manufacturing Plant. Cork				Borehole Number: BH04
Boring Method: Dando Terrier	Casing Diameter: 150mm cased to 3.00m	Ground Level (mOD)	Client: Millipore Ireland BV	Job Number: 08-0583
	Location	Dates: 14/08/2008	Engineer	Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	MADE GROUND: Stone Fill		
						0.30	Firm brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
						(1.30)			
						1.60	Soft brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
				Water Strike(1) at 2.50m.		(1.40)			▽1
				14/08/2008:		3.00	Complete at 3.00m		

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Remarks
Standpipe installed.

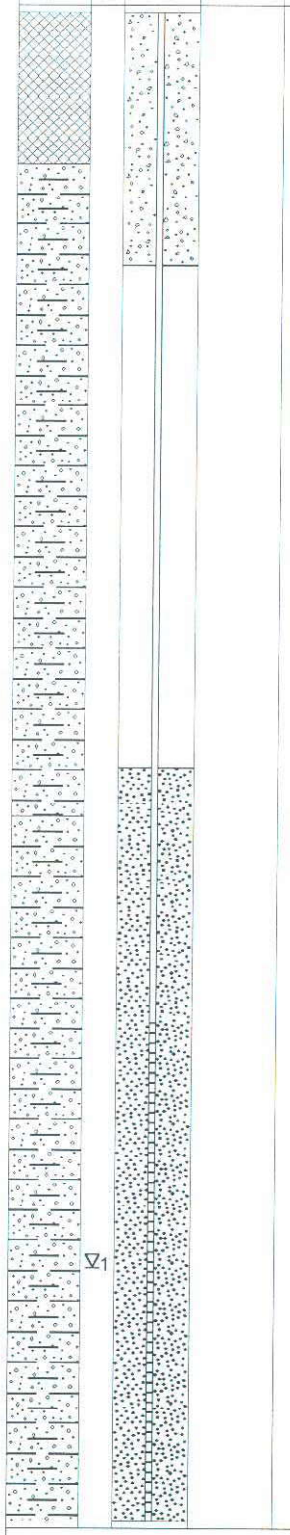
Scale (approx)	Logged By
1:25	DC/HH

Figure No.
08-0583.BH04

EPA Export 26-07-2013:12:03:03

Glover Site Investigations Ltd

Site: Millipore Ireland BV. Manufacturing Plant, Cork			Borehole Number: BH04
Installation Type: Standpipe	Dimensions: Internal Diameter of Tube [A] = 50 mm; Diameter of Filter Zone = 150 mm	Client: Millipore Ireland BV	Job Number: 08-0583
	Location	Ground Level (mOD)	Engineer	Sheet: 1/1



Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)
		2.50		Water Strike					

Groundwater Observations During Drilling

Date	Start of Shift: Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	End of Shift: Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)
14/08/08							3.00			

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A] Time	Depth (m)	Level (mOD)	Remarks

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Remarks
Flush cover fitted.

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VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

CONTRACT: 08-0583 Cork BOREHOLE No.: BH04 TEST No.: 1
DATE: 15-Aug-08

TYPE OF TEST: ***Falling*** HEAD

Diameter of standpipe (d):	*50*	(mm)
Height of TOP of standpipe above ground leve	*0.00*	(m) (use -ve values if BELOW g.l.)
Depth to centre of piezo. tip below ground level (m):		(m)
Depth to top of filter below ground level (m):	*1.50*	(m)
Depth to bottom of filter below ground level (m	*3.00*	(m)
Diameter of filter (D):	*150*	(mm)
Standing ground water level SWL (m below top of standpipe)	*2*	(m) on: 15-Aug-08

DATUM: All depths to water level measured from top of standpipe.

TIME ELAPSED (mins)	WATER LEVEL* (m)	HEAD H (m)	HEAD RATIO H/Ho
0	0.7	1.3	1
0.5	0.8	1.2	0.92308
1	1.25	0.75	0.5769
1.5	1.31	0.69	0.5308
2	1.42	0.58	0.4462
2.5	1.53	0.47	0.3615
3	1.64	0.36	0.2769
3.5	1.7	0.3	0.2308
4	1.76	0.24	0.1846
4.5	1.79	0.21	0.1615
5	1.81	0.19	0.1462
6	1.84	0.16	0.1231
7	1.86	0.14	0.1077
8	1.88	0.12	0.0923
9	1.9	0.1	0.0769
10	1.92	0.08	0.0615
12	1.96	0.04	0.0308
14	2	0	0.0000
16	2	0	0.0000

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CALCULATION OF PERMEABILITY OF SOIL:

Employing Hvorslev formula: k = A/FT
where:
k is the permeability of soil
A is the cross-section area of standpipe
F is the intake factor (see below)
T is the basic time lag factor as defined in Figure 8 of BS 5930:1999 (page 52)

Values of intake factors (F/D) for various cylindrical intake zones of length to diameter ratio (L/D) are given in Figure 7 of BS 5930:1999 (p51); also Dunn and Razouki formula:
F/D = 2.32*PI*(L/D)/loge[1.1*(L/D)+{1+1.1*(L/D)^2}^0.5]

L/D ratio = 10.00 thus F/D= 23.74
i.e. F = 3.56 (m)
and A = 0.00196 (m^2)
and T = 2.5 mins
(see graph of log H/Ho v Time.)

hence **3.7E-06 m/s**

i.e., k = 3.7×10^{-6} m/s

EPA Export 26-07-2013:12:03:03

VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

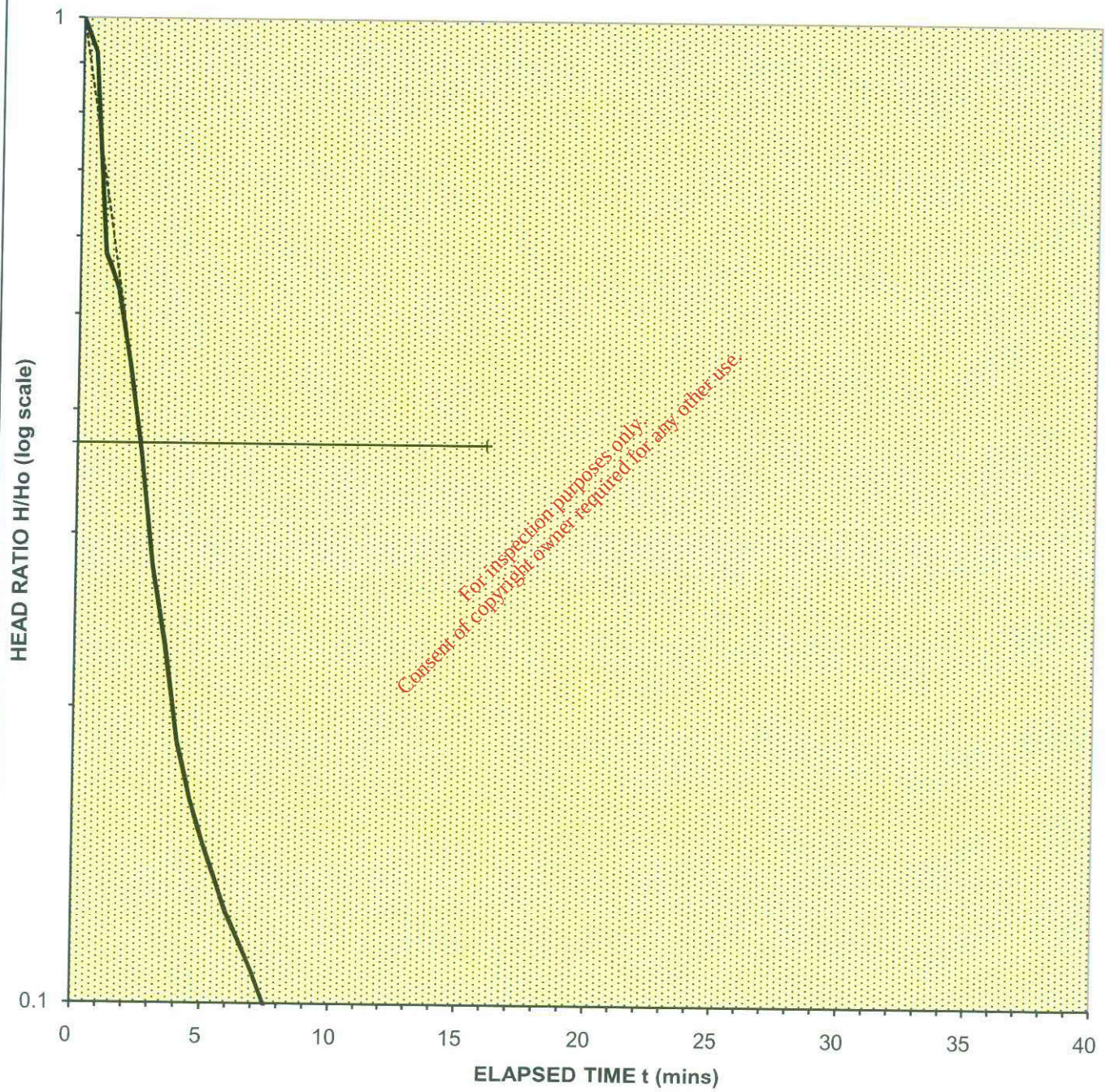
TYPE OF TEST: ***Falling*** **HEAD**

CONTRACT: 08-0583 Cork

BOREHOLE No.: BH04 **TEST #:** 1

DATE: 15-Aug-08

HEAD RATIO (log scale) v. ELAPSED TIME



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Basic Time Lag Factor T = 2.5 minutes

wt99

GSI

EPA Export 26-07-2013:12:03:03

Glover Site Investigations Ltd

Site: Millipore Ireland BV. Manufacturing Plant. Cork			Borehole Number: BH05
Boring Method: Dando Terrier	Casing Diameter: 150mm cased to 4.00m	Ground Level (mOD):	Client: Millipore Ireland BV
	Location:	Dates: 15/08/2008	Engineer:

Job Number: 08-0583

Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(2.70)	Brown clayey subangular to subrounded fine to coarse GRAVEL		
						2.70	Firm brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
						(1.30)			
						4.00	Complete at 4.00m		

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Remarks
Standpipe installed.

Scale (approx)	Logged By
1:25	DC/HH

Figure No.
08-0583.BH05

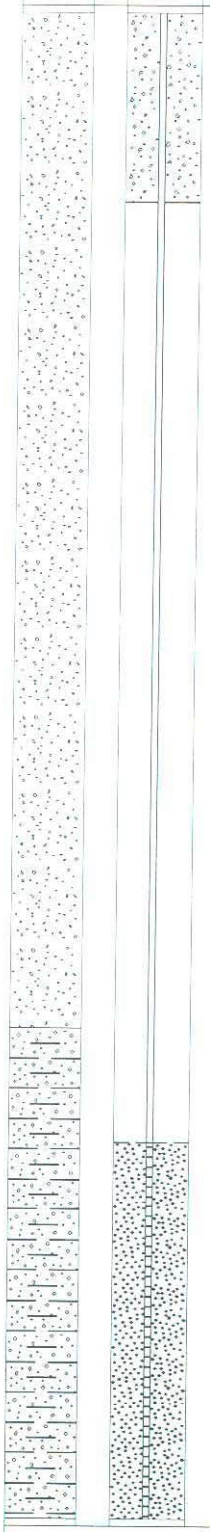
EPA Export 26-07-2013:12:03:04

Glover Site Investigations Ltd

Site	Borehole Number
Millipore Ireland BV, Manufacturing Plant, Cork	BH05

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	Millipore Ireland BV	08-0583

Location	Ground Level (mOD)	Engineer	Sheet
			1/1



Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	End of Shift Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A] Time	Depth (m)	Level (mOD)	Remarks

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Remarks
Flush cover fitted.

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Glover Site Investigations Ltd

Site: Millipore Ireland BV, Manufacturing Plant, Cork				Borehole Number: BH06B
Boring Method: Dando Terrier	Casing Diameter: 150mm cased to 3.00m	Ground Level (mOD)	Client: Millipore Ireland BV	Job Number: 08-0583
	Location	Dates: 15/08/2008	Engineer	Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	MADE GROUND: Stone Fill		
						0.30	Firm brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subrounded to subangular fine to coarse		
						(2.70)			
				15/08/2008:		3.00	Complete at 3.00m		

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Remarks
BH06 refused at 0.70m
BH06A refused at 1.20m.
Standpipe installed.

Scale (approx)	Logged By
1:25	DC/HH

Figure No. 08-0583.BH06B

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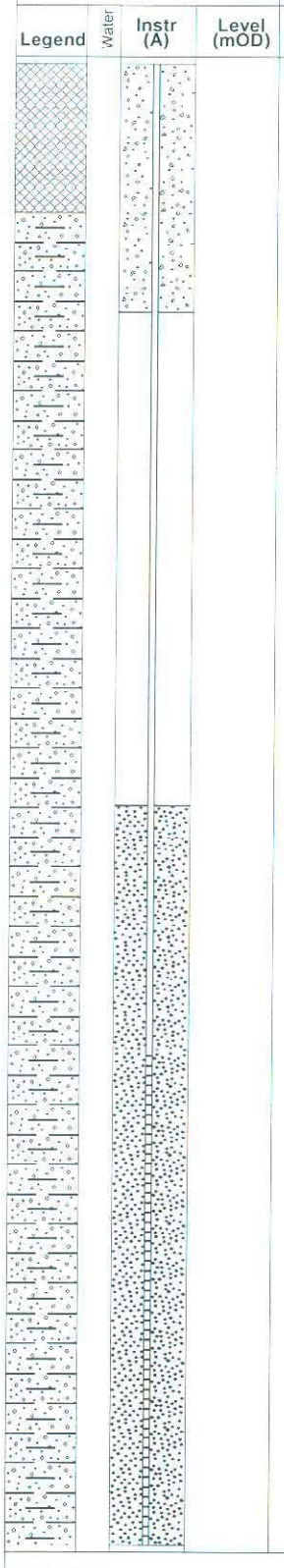
Glover Site Investigations Ltd

	Site: Millipore Ireland BV, Manufacturing Plant, Cork		Borehole Number: BH06B
Installation Type: Standpipe	Dimensions: Internal Diameter of Tube [A] = 50 mm; Diameter of Filter Zone = 150 mm	Client: Millipore Ireland BV	Job Number: 08-0583
	Location	Ground Level (mOD)	Engineer	Sheet: 1/1



Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift: Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	End of Shift: Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)
15/08/08							3.00			

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A] Time	Depth (m)	Level (mOD)	Remarks

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Remarks
Flush cover fitted.

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VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

CONTRACT: 08-0583 Cork BOREHOLE No.: GW7 TEST No.: 1
DATE: 15-Aug-08

TYPE OF TEST: ***Falling*** HEAD

Diameter of standpipe (d):	*50*	(mm)
Height of TOP of standpipe above ground leve	*0.00*	(m) (use -ve values if BELOW g.l.)
Depth to centre of piezo. tip below ground level (m):		(m)
Depth to top of filter below ground level (m):	*4.90*	(m)
Depth to bottom of filter below ground level (m	*7.80*	(m)
Diameter of filter (D):	*150*	(mm)
Standing ground water level SWL (m below top of standpipe)	*1.61*	(m) on: 15-Aug-08

DATUM: All depths to water level measured from top of standpipe.

TIME ELAPSED (mins)	WATER LEVEL* (m)	HEAD H (m)	HEAD RATIO H/Ho
0	0.44	1.17	1
0.1	1.53	0.08	0.06838
0.2	1.6	0.01	0.0085
0.3	1.61	0	0.0000
0.4	1.61	0	0.0000
0.5	1.61	0	0.0000

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CALCULATION OF PERMEABILITY OF SOIL:

Employing Hvorslev formula: k = A/FT
where:
k is the permeability of soil
A is the cross-section area of standpipe
F is the intake factor (see below)
T is the basic time lag factor as defined in Figure 8 of BS 5930:1999 (page 52)

Values of intake factors (F/D) for various cylindrical intake zones of length to diameter ratio (L/D) are given in Figure 7 of BS 5930:1999 (p51); also Dunn and Razouki formula:
F/D = 2.32*PI*(L/D)/loge[1.1*(L/D)+{1+1.1*(L/D)^2}^0.5]

L/D ratio = 19.33 thus F/D= 37.80
i.e. F = 5.67 (m)
and A = 0.00196 (m^2)
and T = 0.04 mins
(see graph of log H/Ho v Time.)

hence **1.4E-04 m/s**

i.e., k = 1.4×10^{-4} m/s

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VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

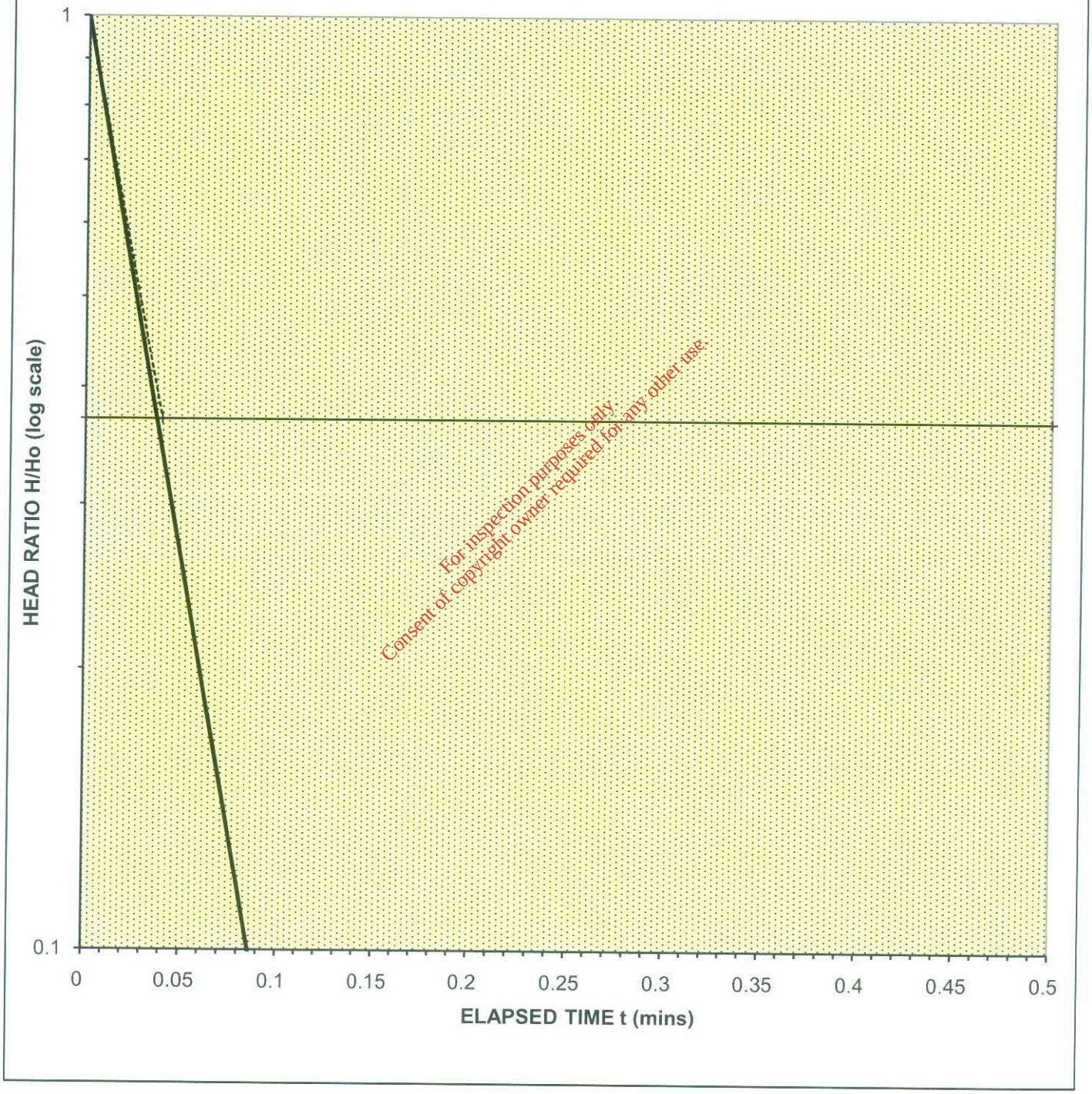
TYPE OF TEST: *Falling* **HEAD**

CONTRACT: 08-0583 Cork

BOREHOLE No.: GW7 **TEST #:** 1

DATE: 15-Aug-08

HEAD RATIO (log scale) v. ELAPSED TIME



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Basic Time Lag Factor T = 0.04 minutes

wt99

GSI

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VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

CONTRACT: 08-0583 Cork BOREHOLE No.: GW5 TEST No.: 1

DATE: 15-Aug-08

TYPE OF TEST: ***Falling*** HEAD

Diameter of standpipe (d):	*50*	(mm)
Height of TOP of standpipe above ground leve	*0.00*	(m) (use -ve values if BELOW g.l.)
Depth to centre of piezo. tip below ground level (m):		(m)
Depth to top of filter below ground level (m):	*3.50*	(m)
Depth to bottom of filter below ground level (m	*6.50*	(m)
Diameter of filter (D):	*100*	(mm)
Standing ground water level SWL (m below top of standpipe)	*4.02*	(m) on: 15-Aug-08

DATUM: All depths to water level measured from top of standpipe.

TIME ELAPSED (mins)	WATER LEVEL* (m)	HEAD H (m)	HEAD RATIO H/Ho
0	1.78	2.24	1
0.1	3.64	0.38	0.16964
0.2	3.97	0.05	0.0223
0.3	4.01	0.01	0.0045
0.4	4.02	0	0.0000
0.5	4.02	0	0.0000

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CALCULATION OF PERMEABILITY OF SOIL:

Employing Hvorslev formula: k = A/FT

where:

k is the permeability of soil

A is the cross-section area of standpipe

F is the intake factor (see below)

T is the basic time lag factor as defined in Figure 8 of BS 5930:1999 (page 52)

Values of intake factors (F/D) for various cylindrical intake zones of length to diameter ratio (L/D) are given in Figure 7 of BS 5930:1999 (p51); also Dunn and Razouki formula:

F/D = 2.32*PI*(L/D)/loge[1.1*(L/D)+{1+1.1*(L/D)^2}^0.5]

L/D ratio =	30.00	thus F/D= 52.48
i.e. F =	5.25	(m)
and A =	0.00196	(m^2)
and T =	0.06	mins

(see graph of log H/Ho v Time.)

hence **1.0E-04 m/s**

i.e., k = 1.0×10^{-4} m/s

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH07

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando Terrier	150mm cased to 3.00m			08-0658
	Location	**Dates**	**Engineer**	**Sheet**
		16/09/2008	Millipore Ireland BV	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30) 0.30	MADE GROUND: Angular fine to medium GRAVEL		
						(2.00)	Firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		
				Water Strike (1) at 2.80m. 16/09/2008:		2.30 (0.70) 3.00	Soft brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		▽1
							Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No.
08-0658.BH07

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH08

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando terrier	150mm cased to 3.00m			08-0658
	Location	**Dates**	**Engineer**	**Sheet**
		16/09/2008	Millipore Ireland BV	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.05) 0.05	BITMAC		
						(0.35) 0.40	MADE GROUND: Red angular fine to medium GRAVEL		
						(2.00) 2.40	Firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		
				Water strike (1) at 2.90m. 16/09/2008:		(0.60) 3.00	Soft to firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		▽1
							Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No.
08-0658.BH08

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH09

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando terrier	150mm cased to 3.00m			08-0658
	Location	**Dates** 16/09/2008	**Engineer** Millipore Ireland BV	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.15) 0.15	BITMAC		
						(0.25) 0.40	MADE GROUND: Angular fine to medium FILL		
						(1.60) 2.00	Firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		
				Water strike (1) at 2.80m. 16/09/2008:		(1.00) 3.00	Soft brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		▽1
							Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No. 08-0658.BH09

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH10

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando Terrier	150mm cased to 3.00m			08-0658
	Location	**Dates**	**Engineer**	**Sheet**
		16/09/2008	Millipore Ireland BV	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.50) 0.50	MADE GROUND: Heterogeneous angular fine to medium GRAVEL and firm brown silty clay		
						(0.70) 1.20	Firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		
				Water strike (1) at 2.00m.		(1.80) 3.00	Soft brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to coarse		▽1
				16/09/2008:			Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No.
08-0658.BH10

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Glover Site Investigations Ltd

Site Tullagreen, Carrigtwohill, Co. Cork			**Borehole Number** BH11
Boring Method Dando terrier	**Casing Diameter** 150mm cased to 3.00m	**Ground Level (mOD)**	**Client**	**Job Number** 08-0658
	Location	**Dates** 16/09/2008	**Engineer** Millipore Ireland BV	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.40) 0.40	MADE GROUND: Heterogeneous angular fine to medium GRAVEL and soft brown silty CLAY		
						(1.60) 2.00	Firm brown slightly sandy gravelly clayey SILT. Gravel is sub angular to sub rounded fine to coarse		
				water strike (1) at 2.00m.		(1.00) 3.00	Angular fine to coarse GRAVEL		▽1
				16/09/2008:			Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No. 08-0658.BH11

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH13

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando Terrier	150mm cased to 4.00m			08-0658
	Location	**Dates**	**Engineer**	**Sheet**
		20/09/2008	Millipore Ireland BV	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.20) 0.20	MADE GROUND: Angular fine to medium GRAVEL		
						(1.10) 1.30	Brown slightly gravelly fine to medium SAND. Gravel is sub rounded fine to medium		
						(2.70) 4.00	Soft to firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium. Moist		
				20/09/2008:DRY			Complete at 4.00m		

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Remarks
Standpipe installed to 4.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No.
08-0658.BH13

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH14

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando Terrier	150mm cased to 5.70m			08-0658
	Location	**Dates** 22/09/2008	**Engineer** Millipore Ireland BV	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.20) 0.20	Peaty clayey TOPSOIL with roots and rootlets		
						(0.90) 1.10	Brown fine SAND		
						(3.90)	Firm brown slightly sandy slightly gravelly CLAY clayey SILT. Gravel is sub angular to sub rounded fine to coarse. Becoming moister and softer from 3.0m BGL		
				Water Strike (1) at 5.00m. 22/09/2008:		5.00 (0.70) 5.70	Very sandy sub rounded fine to medium GRAVEL		▽1
							Borehole terminated on refusal at 5.7m Complete at 5.70m		

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Remarks
Standpipe installed to 5.7m

Scale (approx)	Logged By
1:50	AM/KL

Figure No. 08-0658.BH14

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH15

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando terrier	150mm cased to 3.00m			08-0658
	Location	**Dates** 22/09/2008	**Engineer** Millipore Ireland BV	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.20) 0.20	MADE GROUND: Angular fine to medium GRAVEL		
						(1.30)	Firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		
						1.50			
						(1.50)	Soft brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium. Moist		
				22/09/2008:DRY		3.00			
							Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	Am/KL

Figure No. 08-0658.BH15

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH16

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando terrier	150mm cased to 3.00m			08-0658
	Location	**Dates**	**Engineer**	**Sheet**
		22/09/2008	Millipore Ireland BV	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30) 0.30	MADE GROUND: Angular fine to medium GRAVEL		
						(2.70)	Firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium. Becoming moister from 2.0m BGL		
				22/09/2008:DRY		3.00	Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No. 08-0658.BH16

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH17

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando Terrier	150mm cased to 3.00m			08-0658
	Location	**Dates**	**Engineer**	**Sheet**
		22/09/2008	Millipore Ireland BV	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.20)	MADE GROUND: Heterogeneous angular fine to medium GRAVEL and firm brown silty CLAY		
						1.20	Soft brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to medium		
						(1.80)			
				22/09/2008:DRY		3.00	Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No.
08-0658.BH17

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH18

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando terrier	150mm cased to 3.00m			08-0658

Location	Dates	Engineer	Sheet
	26/09/2008	Millipore Ireland BV	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.20) 0.20	CONCRETE		
						(0.25) 0.45	MADE GROUND: Angular fine to medium GRAVEL		
						(1.05) 1.50	Firm brown very clayey slightly sandy slightly gravelly SILT. Gravel is sub angular to sub rounded fine to coarse		
						(1.50) 3.00	Soft brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to coarse. Becoming moister from 2.0m BGL		
				26/09/2008:DRY			Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No.
08-0658.BH18

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Glover Site Investigations Ltd

Site	Borehole Number
Tullagreen, Carrigtwohill, Co. Cork	BH19

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando terrier	150mm cased to 3.00m			08-0658

Location	Dates	Engineer	Sheet
	26/09/2008	Millipore Ireland BV	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.10) 0.10	BITMAC		
						(0.30) 0.40	MADE GROUND: Angular fine to medium GRAVEL		
						(2.60)	Firm brown slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to coarse. Becoming moister and softer from 2.50m BGL		
				26/09/2008:DRY		3.00	Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No. 08-0658.BH19

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Glover Site Investigations Ltd

Site Tullagreen, Carrigtwohill, Co. Cork			**Borehole Number** BH20
Boring Method Dando terrier	**Casing Diameter** 150mm cased to 3.00m	**Ground Level (mOD)**	**Client**	**Job Number** 08-0658
	Location	**Dates** 26/09/2008	**Engineer** Millipore Ireland BV	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.20)	MADE GROUND: Heterogeneous angular fine to medium GRAVEL and soft brown silty clay		
						1.20	Soft brown clayey slightly sandy slightly gravelly clayey SILT. Gravel is sub angular to sub rounded fine to coarse		
						(1.80)			
				26/09/2008:DRY		3.00	Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No. 08-0658.BH20

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Glover Site Investigations Ltd

Site Tullagreen, Carrigtwohill, Co. Cork			**Borehole Number** BH21
Boring Method Dando terrier	**Casing Diameter** 150mm cased to 3.00m	**Ground Level (mOD)**	**Client**	**Job Number** 08-0658
	Location	**Dates** 26/09/2008	**Engineer** Millipore Ireland BV	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				Water strike (1) at 2.00m.		(2.90)	MADE GROUND: Heterogeneous angular fine to medium GRAVEL and soft brown silty clay		▽1
				26/09/2008:		2.90 (0.10) 3.00	Soft brown slightly sandy clayey SILT Complete at 3.00m		

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Remarks
Standpipe installed to 3.0m

Scale (approx)	Logged By
1:50	AM/KL

Figure No. 08-0658.BH21

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APPENDIX 2

Process Wastewater and Surface Water Drainage Drawings

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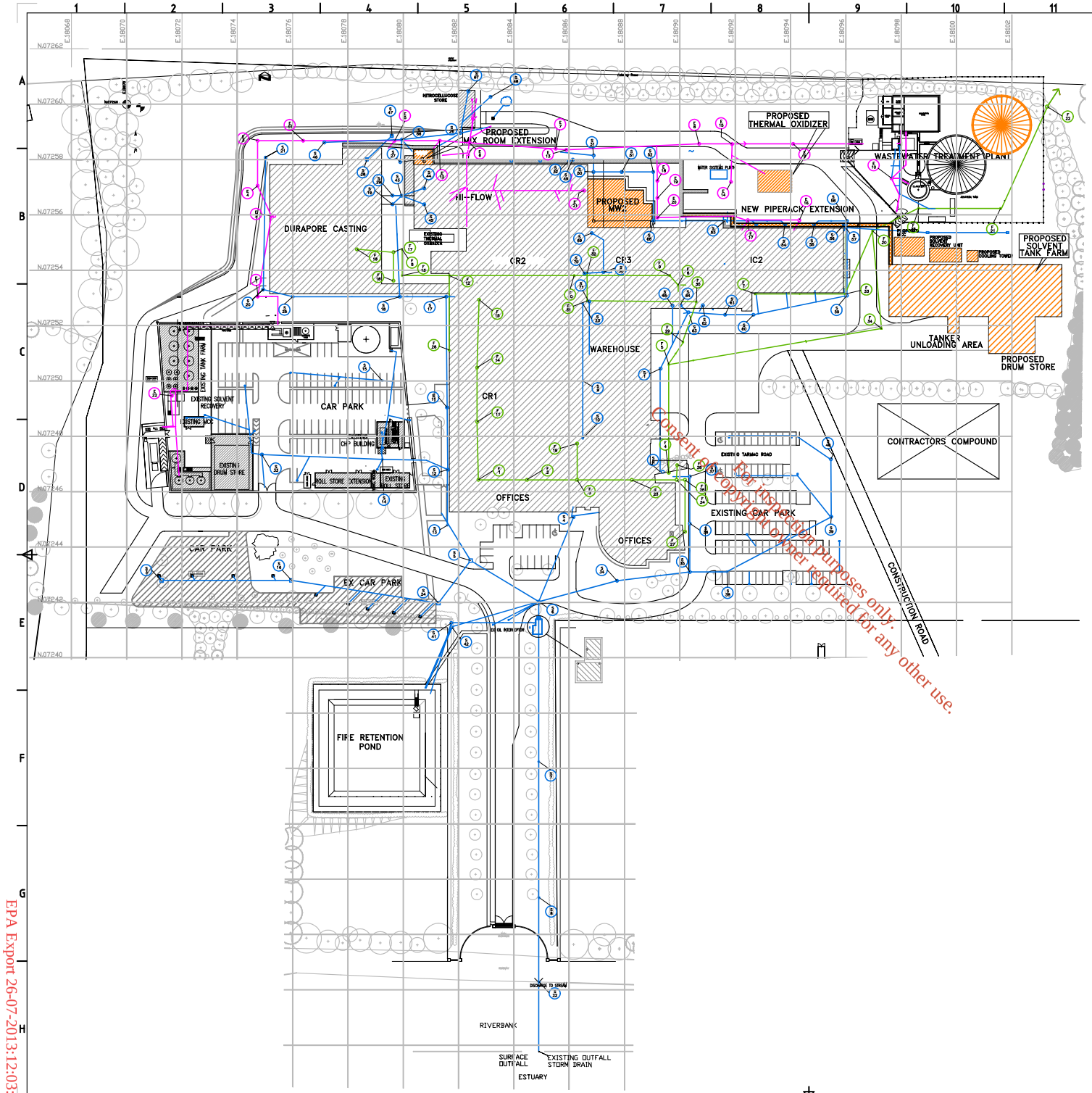

Rev.	Description	Date	By
0	PRELIM. ISSUED FOR IPPC LICENCE	04 JUL 06	KK
1	REV. PRELIM. ISSUED FOR IPPC LICENCE	24 JUL 06	KK
2	ISSUED FOR IPPC LICENCE	24 JUL 06	KK

FOUL SEWER

MANHOLE No.	INVERT LEVEL (m)	COVER LEVEL (m)	PIPE Ø (mm)
F1	6.900	7.500	100ø
F2	6.730	7.500	150ø
F3	6.520	7.500	150ø
F4	6.140	7.200	150ø
F5	5.700	6.200	150ø
F6	4.380	7.300	225ø
F7	4.720	7.600	225ø
F8			150ø
F9	5.720	7.460	150ø
F10	6.060	7.600	150ø
F11	7.115	7.325	100ø
F12	6.235	7.825	150ø
F13			150ø
F14	7.235	7.355	100ø
F15	7.315	7.375	100ø
F16	7.335	8.025	150ø
F17	7.800	8.025	150ø
F18	8.250	8.825	150ø
F19	6.600	7.500	100ø
F20	3.620	7.710	225ø
F21			225ø
F22			225ø
F23			150ø
F24	6.670	7.350	150ø
F25	6.170	7.090	150ø
F26			150ø
F27			150ø
F28			150ø
F29	5.423	6.200	150ø
F30	5.473	7.500	150ø
F31	5.967	7.500	150ø
F32	6.045	7.500	150ø
F33			150ø
F34	4.711	7.000	225ø
F35	3.390	7.346	225ø

PROCESS WASTEWATER COLLECTION SYSTEM

MANHOLE No.	INVERT LEVEL (m)	COVER LEVEL (m)	PIPE Ø (mm)
E1	8.200	8.825	150ø
E2	8.080	8.825	150ø
E3	7.920	8.825	150ø
E4	-	8.825	150ø
E5	-	8.825	150ø
E6	6.220	8.225	150ø
E7	6.020	8.025	150ø
E8	5.520	7.875	150ø
E9	4.720	7.600	150ø
E10	-	-	150ø
E11	-	-	150ø
E12	-	-	150ø
E13	7.691	9.391	150ø
E14	-	-	150ø
E15	-	-	150ø
E16	-	-	150ø
E17	6.730	7.170	150ø
E18	-	-	150ø
E19	-	-	150ø
E20	-	-	150ø
E21	-	-	150ø
E22	-	-	150ø

SURFACE WATER COLLECTION SYSTEM

MANHOLE No.	INVERT LEVEL (m)	COVER LEVEL (m)	PIPE Ø (mm)
S1	5.400	6.200	300ø
S2	5.250	7.200	300ø
S3			XXXø
S4	5.085	7.325	450ø
S5	5.675	7.325	375ø
S6	5.027	7.108	450ø
S7	4.460	5.999	450ø
S8	3.896	5.613	450ø
S9	5.250	7.300	300ø
S10	5.175	7.500	300ø
S11	6.000	7.250	375ø
S12	5.900	7.325	375ø
S13	5.840	7.325	375ø
S14	6.200	8.200	300ø
S15	6.500	8.500	225ø
S16			XXXø
S17	6.670	8.125	225ø
S18	7.370	8.825	225ø
S19	7.695	8.825	225ø
S20	7.600	8.825	225ø
S21	7.825	8.825	225ø
S22	2.321	4.113	450ø
S23	6.670	8.125	300ø
S24			XXXø
S25			225ø
S26	8.125	9.123	150ø
S27	7.825	8.825	150ø
S28	7.625	8.625	150ø
S29			225ø
S30	6.670	8.125	300ø
S31	7.525	8.625	300ø
S32	7.825	8.825	300ø
S33			XXXø
S34			XXXø
S35	5.120	6.860	300ø
S36			XXXø
S37			XXXø
S38			XXXø
S39			XXXø
S40			XXXø
S41			450ø
S42			225ø
S43			225ø
S44			225ø
S45			225ø
S46			225ø
S47			XXXø
S48			150ø
S49			XXXø
S50	6.950	7.550	XXXø
S51			XXXø
S52			XXXø
S53			XXXø
S54			XXXø
S55			XXXø
S56			XXXø
S57			XXXø
S58	6.230	7.180	XXXø
S59	6.000	7.210	150ø
S60	SILTED UP	7.190	150ø
S61			150ø
S62			XXXø
S63	5.680	6.200	XXXø
S64			XXXø
S65			XXXø
S66			225ø
S67			100ø
S68	6.500	7.320	XXXø
S69			XXXø
S70			XXXø
S71			XXXø

LEGEND

- SURFACE WATER SYSTEM
- FOUL SEWER
- PROCESS WASTEWATER
- PROPOSED EXPANSION

MILLIPORE
Cork, Ireland

Drawn by	Checked by	Filename	Date	Scale
K.KEUFNER	B.COMYNS	IPPC	31/05/06	1:1400

Approved by - date
B.COMYNS-24/07/06

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Title
IPPC APPLICATION PROCESS WASTEWATER, STORMWATER & FOUL SEWER SYSTEMS

Dwg. No.	Sheet	Rev
IPPCATTE.3-001	1/1	2

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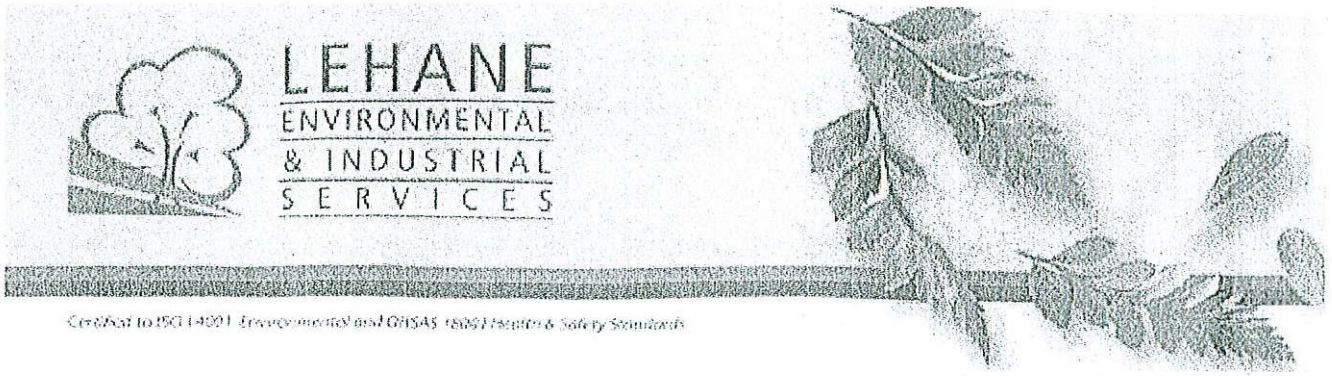

Client Millipore
Location: Carrigtwohill, Co. Cork.

Date	Time	Borehole Ref No.	Operator	Pumping Start Time	Pumping Stop Time
24.9 08	11.00	SB 10	C Stewart	11.00	17.00
24.9.08	11 00	SB 17	C. Stewart	11.00	17.00
25.9 08	7 00	SB 10	C.Stewart	7.25	10.30 7.0 Ltr
25.9 08	7 00	SB 17	C.Stewart	10.30	5.00 60
26.9.08	7 00	SB 10	C.Stewart	1 30	4.50 180
27.9.08	8.30	SB 17	C.Stewart	8.30	1.45 40
29.9 08	7.00	SB 17	C.Stewart	7.30	4.45 70
30.9.08	7.00	SB 10	C.Stewart	7.30	4.00 180
1.10.08	7.00	SB 10	C.Stewart	7.20	4.50 - 220
2.10.08	7.00	SB 10	C.Stewart	7.20	1.00 160
2.10.08	7.00	SBS	C.Stewart	2.10	4.55 100
3.10.08	7.00	SBS	C. Stewart	9.30	4.55 130
4.10.08	8.30	SB 7	C.Stewart	9.00	4.30 - 200
5.10	7.00	SB 3	C.Stewart	7.05	10.00 40
6.10.08		GWS	C.Stewart	10.10	12.10 1000
6.10.08		SB 9	C.Stewart	12.10	4.30 100

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APPENDIX 3

Plume Trend Graphs

Analytical Data

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APPENDIX 3 - UP and SIDE GRADIENT WELLS

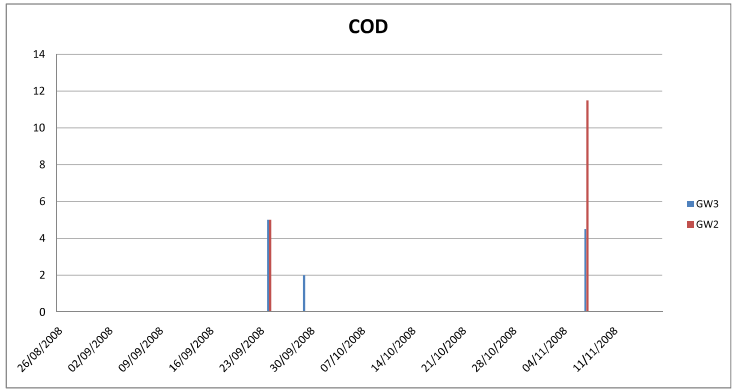
		COD (mg/l)	
		GW3	GW2
26/08/2008			
15/09/2008		<10	<10
16/09/2008	Week1		
17/09/2008			
22/09/2008			
23/09/2008			
24/09/2008	Week 2	5	5
25/09/2008			
26/09/2008			
29/09/2008		2	
30/09/2008			
01/10/2008	Week 3		
02/10/2008			
03/10/2008			
06/10/2008			
07/10/2008			
08/10/2008	Week 4		
09/10/2008			
10/10/2008			
13/10/2008			
14/10/2008			
15/10/2008	Week 5		
16/10/2008			
17/10/2008			
20/10/2008			
21/10/2008			
22/10/2008	Week 6		
23/10/2008			
24/10/2008			
27/10/2008			
28/10/2008			
29/10/2008	Week 7		
30/10/2008			
31/10/2008		n/a	n/a
03/11/2008			
05/11/2008	Week 8		
07/11/2008		4.5	11.5
10/11/2008			
13/11/2008	Week 9		
17/11/2008			

		IPA (mg/l)	
		GW3	GW2
26/08/2008			
15/09/2008		<0.5	<0.5
16/09/2008	Week1		
17/09/2008			
22/09/2008			
23/09/2008			
24/09/2008	Week 2	<1	<1
25/09/2008			
26/09/2008			
29/09/2008		n/a	
30/09/2008			
01/10/2008	Week 3		
02/10/2008			
03/10/2008			
06/10/2008			
07/10/2008			
08/10/2008	Week 4		
09/10/2008			
10/10/2008			
13/10/2008			
14/10/2008			
15/10/2008	Week 5		
16/10/2008			
17/10/2008			
20/10/2008			
21/10/2008			
22/10/2008	Week 6		
23/10/2008			
24/10/2008			
27/10/2008			
28/10/2008			
29/10/2008	Week 7		
30/10/2008			
31/10/2008		<0.5	<0.5
03/11/2008			
05/11/2008	Week 8		
07/11/2008		n/a	n/a
10/11/2008			
13/11/2008	Week 9		
17/11/2008			

		ACETONE (mg/l)	
		GW3	GW2
26/08/2008			
15/09/2008		<0.5	<0.5
16/09/2008	Week1		
17/09/2008			
22/09/2008			
23/09/2008			
24/09/2008	Week 2	<1	<1
25/09/2008			
26/09/2008			
29/09/2008		n/a	
30/09/2008			
01/10/2008	Week 3		
02/10/2008			
03/10/2008			
06/10/2008			
07/10/2008			
08/10/2008	Week 4		
09/10/2008			
10/10/2008			
13/10/2008			
14/10/2008			
15/10/2008	Week 5		
16/10/2008			
17/10/2008			
20/10/2008			
21/10/2008			
22/10/2008	Week 6		
23/10/2008			
24/10/2008			
27/10/2008			
28/10/2008			
29/10/2008	Week 7		
30/10/2008			
31/10/2008		<0.5	<0.5
03/11/2008			
05/11/2008	Week 8		
07/11/2008		n/a	n/a
10/11/2008			
13/11/2008	Week 9		
17/11/2008			

		ETHANOL (mg/l)	
		GW3	GW2
26/08/2008			
15/09/2008		<0.5	<0.5
16/09/2008	Week1		
17/09/2008			
22/09/2008			
23/09/2008			
24/09/2008	Week 2	<1	<1
25/09/2008			
26/09/2008			
29/09/2008		n/a	
30/09/2008			
01/10/2008	Week 3		
02/10/2008			
03/10/2008			
06/10/2008			
07/10/2008			
08/10/2008	Week 4		
09/10/2008			
10/10/2008			
13/10/2008			
14/10/2008			
15/10/2008	Week 5		
16/10/2008			
17/10/2008			
20/10/2008			
21/10/2008			
22/10/2008	Week 6		
23/10/2008			
24/10/2008			
27/10/2008			
28/10/2008			
29/10/2008	Week 7		
30/10/2008			
31/10/2008		<0.5	<0.5
03/11/2008			
05/11/2008	Week 8		
07/11/2008		n/a	n/a
10/11/2008			
13/11/2008	Week 9		
17/11/2008			

		BUTANOL (mg/l)	
		GW3	GW2
26/08/2008			
15/09/2008		<0.5	<0.5
16/09/2008	Week1		
17/09/2008			
22/09/2008			
23/09/2008			
24/09/2008	Week 2	<1	<1
25/09/2008			
26/09/2008			
29/09/2008		n/a	
30/09/2008			
01/10/2008	Week 3		
02/10/2008			
03/10/2008			
06/10/2008			
07/10/2008			
08/10/2008	Week 4		
09/10/2008			
10/10/2008			
13/10/2008			
14/10/2008			
15/10/2008	Week 5		
16/10/2008			
17/10/2008			
20/10/2008			
21/10/2008			
22/10/2008	Week 6		
23/10/2008			
24/10/2008			
27/10/2008			
28/10/2008			
29/10/2008	Week 7		
30/10/2008			
31/10/2008		<0.5	<0.5
03/11/2008			
05/11/2008	Week 8		
07/11/2008		n/a	n/a
10/11/2008			
13/11/2008	Week 9		
17/11/2008			



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APPENDIX 3 - MID PLUME POSITION

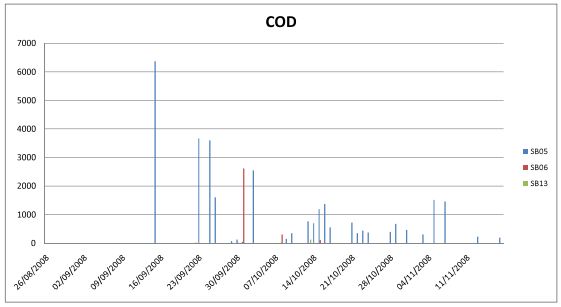
		COD		
		SB05	SB06	SB13
26/08/2008		0	0	
15/09/2008		6375	0	
16/09/2008	Week1			
17/09/2008				
22/09/2008				20
23/09/2008		3670		
24/09/2008	Week 2			
25/09/2008		3605	2	
26/09/2008		1605		
29/09/2008		70		0
30/09/2008		118	8	
01/10/2008	Week 3	50	2610	
02/10/2008		n/a		
03/10/2008		2545		
06/10/2008		0		n/a
07/10/2008		0		
08/10/2008	Week 4	13	300	
09/10/2008		151		
10/10/2008		345		
13/10/2008		761		123
14/10/2008		692		
15/10/2008	Week 5	1185	110	
16/10/2008		1365		
17/10/2008		550		
20/10/2008				2
21/10/2008		720		
22/10/2008	Week 6	350		
23/10/2008		435		
24/10/2008		370		
27/10/2008				
28/10/2008		395,5		
29/10/2008	Week 7	670,5	0	
30/10/2008				
31/10/2008		464		
03/11/2008		300		
05/11/2008	Week 8	1520		
07/11/2008		1463		
10/11/2008				
13/11/2008	Week 9	220,5		
17/11/2008		194		

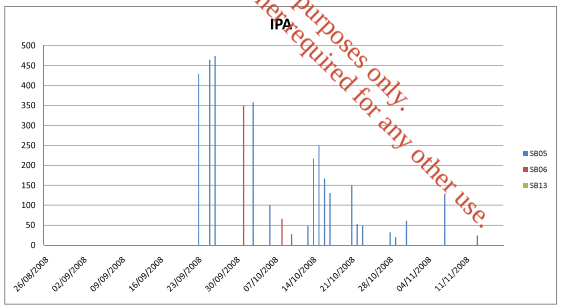
		IPA		
		SB05	SB06	SB13
26/08/2008		n/a	n/a	
15/09/2008		n/a	<0,5	
16/09/2008	Week1			
17/09/2008				
22/09/2008				n/a
23/09/2008		429		
24/09/2008	Week 2			
25/09/2008		465	<1	
26/09/2008		474		
29/09/2008		<1		<1
30/09/2008		n/a	n/a	
01/10/2008	Week 3	<1	349	
02/10/2008		n/a		
03/10/2008		358		
06/10/2008		100		<1
07/10/2008		n/a		
08/10/2008	Week 4	<1	66	
09/10/2008		<1		
10/10/2008		27		
13/10/2008		48		<1
14/10/2008		217		
15/10/2008	Week 5	249	<1	
16/10/2008		167		
17/10/2008		131		
20/10/2008				<1
21/10/2008		150		
22/10/2008	Week 6	53		
23/10/2008		48		
24/10/2008		n/a		
27/10/2008				
28/10/2008		32		
29/10/2008	Week 7	20	<1	
30/10/2008				
31/10/2008		61		
03/11/2008		<1		
05/11/2008	Week 8	n/a		
07/11/2008		129		
10/11/2008				
13/11/2008	Week 9	24		
17/11/2008		n/a		

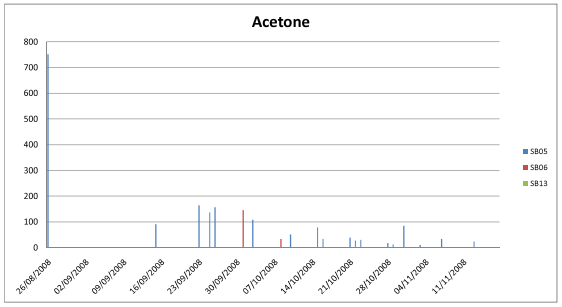
		ACETONE		
		SB05	SB06	SB13
26/08/2008		751,6	<0,5	
15/09/2008		90,8	<0,5	
16/09/2008	Week1			
17/09/2008				
22/09/2008				n/a
23/09/2008		164		
24/09/2008	Week 2			
25/09/2008		136,8	<1	
26/09/2008		157		
29/09/2008		<1		<1
30/09/2008		n/a	n/a	
01/10/2008	Week 3	<1	146	
02/10/2008		n/a		
03/10/2008		108		
06/10/2008		<1		<1
07/10/2008		n/a		
08/10/2008	Week 4	<1	34	
09/10/2008		<1		
10/10/2008		51		
13/10/2008		<20		<1
14/10/2008		<1		
15/10/2008	Week 5	79	<1	
16/10/2008		33		
17/10/2008		<1		
20/10/2008				<1
21/10/2008		38		
22/10/2008	Week 6	27		
23/10/2008		30		
24/10/2008		n/a		
27/10/2008				
28/10/2008		18		
29/10/2008	Week 7	12	<1	
30/10/2008				
31/10/2008		84		
03/11/2008		10		
05/11/2008	Week 8	n/a		
07/11/2008		34		
10/11/2008				
13/11/2008	Week 9	24		
17/11/2008		n/a		

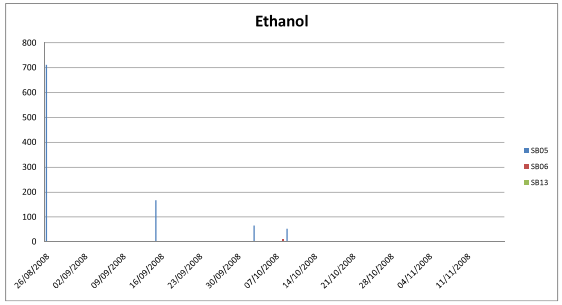
		ETHANOL		
		SB05	SB06	SB13
26/08/2008		711,2	<0,5	
15/09/2008		166,6	<0,5	
16/09/2008	Week1			
17/09/2008				
22/09/2008				n/a
23/09/2008		<1		
24/09/2008	Week 2			
25/09/2008		<1	<1	
26/09/2008		<1		
29/09/2008		<1		<1
30/09/2008		n/a	n/a	
01/10/2008	Week 3	<1	<1	
02/10/2008		n/a		
03/10/2008		66		
06/10/2008		<1		<1
07/10/2008		n/a		
08/10/2008	Week 4	<1	9	
09/10/2008		53		
10/10/2008		<1		
13/10/2008		<1		<1
14/10/2008		<1		
15/10/2008	Week 5	<1	<1	
16/10/2008		<1		
17/10/2008		<1		
20/10/2008				<1
21/10/2008		<1		
22/10/2008	Week 6	<1		
23/10/2008		<1		
24/10/2008		n/a		
27/10/2008				
28/10/2008		<1		
29/10/2008	Week 7	<1	<1	
30/10/2008				
31/10/2008		<1		
03/11/2008		<1		
05/11/2008	Week 8	n/a		
07/11/2008		<1		
10/11/2008				
13/11/2008	Week 9	<1		
17/11/2008		n/a		

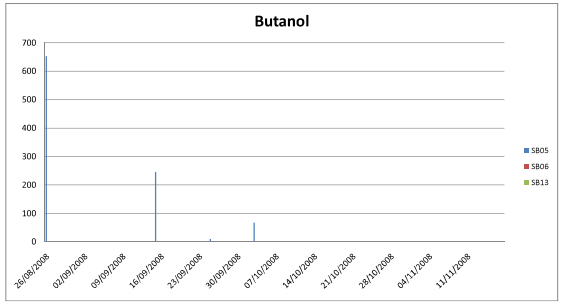
		BUTANOL		
		SB05	SB06	SB13
26/08/2008		652,2	<0,5	
15/09/2008		244,8	<0,5	
16/09/2008	Week1			
17/09/2008				
22/09/2008				n/a
23/09/2008		<1		
24/09/2008	Week 2			
25/09/2008		9,8	<1	
26/09/2008		<1		
29/09/2008		<1		<1
30/09/2008		n/a	n/a	
01/10/2008	Week 3	<1	<1	
02/10/2008		n/a		
03/10/2008		68		
06/10/2008		<1		<1
07/10/2008		n/a		
08/10/2008	Week 4	<1	<1	
09/10/2008		<1		
10/10/2008		<1		
13/10/2008		<1		<1
14/10/2008		2		
15/10/2008	Week 5	<1	<1	
16/10/2008		<1		
17/10/2008		<1		
20/10/2008				<1
21/10/2008		<1		
22/10/2008	Week 6	<1		
23/10/2008		<1		
24/10/2008		n/a		
27/10/2008				
28/10/2008		<1		
29/10/2008	Week 7	<1	<1	
30/10/2008				
31/10/2008		<1		
03/11/2008		<1		
05/11/2008	Week 8	n/a		
07/11/2008		<1		
10/11/2008				
13/11/2008	Week 9	<1		
17/11/2008		n/a		











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APPENDIX 3 - DOWNGRADIENT WELLS

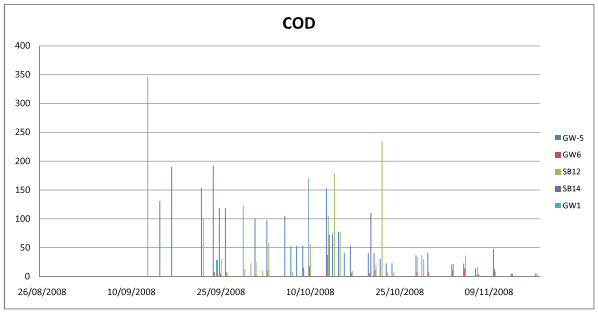
		COD (mg/l)				
		GW5	GW6	SB12	SB14	GW1
26/08/2008						
13/09/2008		347				
15/09/2008		131	<10			<10
16/09/2008	Week1					
17/09/2008		190				
22/09/2008		154		100		
23/09/2008					0	
24/09/2008	Week 2	192	8			29
25/09/2008		119	5	30		
26/09/2008		119	8	8	1	n/a
29/09/2008		123		13	0	
30/09/2008		n/a	n/a	23		
01/10/2008	Week 3	100	2	25		
02/10/2008		0	0	10		
03/10/2008		97	10	58		
06/10/2008		105				
07/10/2008		52	0	8		
08/10/2008	Week 4	53	0	0		
09/10/2008		53	15	n/a		
10/10/2008		171	18	56		
13/10/2008		153	37	105	72	
14/10/2008		74	<8	179		
15/10/2008	Week 5	78	<8	77		
16/10/2008		41				
17/10/2008		54	6.5	9.5		
20/10/2008		40.5	6	6.5	110	
21/10/2008		41	10.5	20		
22/10/2008	Week 6	30.5	1	235.5		
23/10/2008		23	n/a	7.5		
24/10/2008		23	0	7.5		
27/10/2008						
28/10/2008		36.5	8	33.5		
29/10/2008	Week 7	37.5	0	29.5		
30/10/2008		40.5	7.5	n/a		
31/10/2008		n/a	n/a	n/a	n/a	n/a
03/11/2008		21	11	21.5		
05/11/2008	Week 8	22	14	36		
07/11/2008		14	1.5	16.5	4	0
10/11/2008		47	13	8.5		
13/11/2008	Week 9	5	5			
17/11/2008		6	2	6		

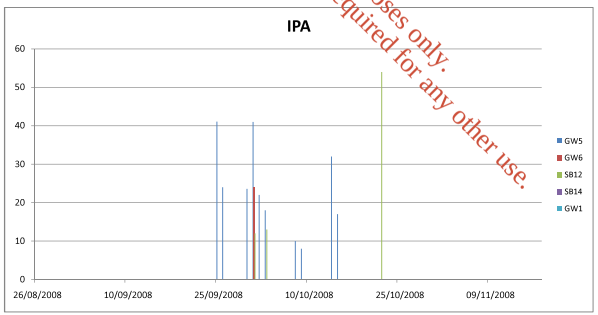
		IPA (mg/l)				
		GW5	GW6	SB12	SB14	GW1
26/08/2008		n/a	n/a			
13/09/2008		n/a				
15/09/2008		<0.5	<0.5			<0.5
16/09/2008	Week1					
17/09/2008		n/a				
22/09/2008		n/a		n/a		
23/09/2008					n/a	
24/09/2008	Week 2	<1	<1			<1
25/09/2008		41.1	<1	<1		
26/09/2008		24	<1	<1	<1	n/a
29/09/2008		n/a		n/a	<1	
30/09/2008		23.6	<1	<1		
01/10/2008	Week 3	41	24	12		
02/10/2008		22	<1	n/a		
03/10/2008		18	n/a	13		
06/10/2008		<1				
07/10/2008		<1	<1	<1		
08/10/2008	Week 4	10	<1	<1		
09/10/2008		8	<1	<1		
10/10/2008		<1	<1	<1		
13/10/2008		<1	<1	<1	<1	
14/10/2008		32	<1	<1		
15/10/2008	Week 5	17	<1	<1		
16/10/2008		<1				
17/10/2008		<1	<1	<1		
20/10/2008		<1	<1	<1	<1	
21/10/2008		<1	<1	<1		
22/10/2008	Week 6	<1	<1	54		
23/10/2008		n/a	n/a	n/a		
24/10/2008		n/a	n/a	n/a		
27/10/2008						
28/10/2008		<1	<1	<1		
29/10/2008	Week 7	<1	<1	<1		
30/10/2008		<1	<1	<1		
31/10/2008		<0.5	<0.5	<0.5	<0.5	<0.5
03/11/2008		<1	<1	<1		
05/11/2008	Week 8	n/a	n/a	n/a		
07/11/2008		<1	<1	<1	n/a	n/a
10/11/2008		<1	<1	<1		
13/11/2008	Week 9	<1	<1			
17/11/2008		n/a	n/a	n/a		

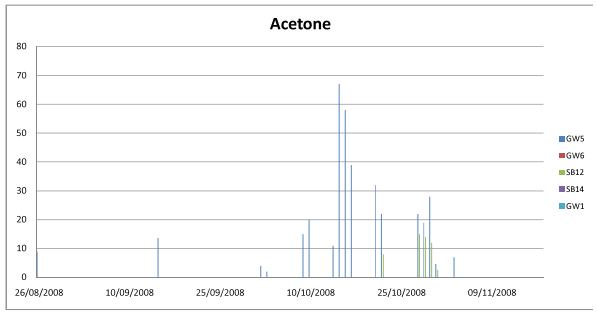
		ACETONE (mg/l)				
		GW5	GW6	SB12	SB14	GW1
26/08/2008		9	<0.5			
13/09/2008		n/a				
15/09/2008		13.6	<0.5			<0.5
16/09/2008	Week1					
17/09/2008		n/a				
22/09/2008		n/a		n/a		
23/09/2008					n/a	
24/09/2008	Week 2	<1	<1			<1
25/09/2008		<1	<1	<1		
26/09/2008		<1	<1	<1	<1	<0.5
29/09/2008		n/a		n/a	<1	
30/09/2008		<1	<1	<1		
01/10/2008	Week 3	<1	<1	<1		
02/10/2008		4	<1	n/a		
03/10/2008		2	n/a	<1		
06/10/2008		<1				
07/10/2008		<1	<1	<1		
08/10/2008	Week 4	<1	<1	<1		
09/10/2008		15	<1	<1		
10/10/2008		20	<1	<1		
13/10/2008		<1	<1	<1	<1	
14/10/2008		11	<1	<1		
15/10/2008	Week 5	67	<1	<1		
16/10/2008		58				
17/10/2008		39	<1	<1		
20/10/2008		<1	<1	<1	<1	
21/10/2008		32	<1	<1		
22/10/2008	Week 6	22	<1	8		
23/10/2008		n/a	n/a	n/a		
24/10/2008		n/a	n/a	n/a		
27/10/2008						
28/10/2008		22	<1	15		
29/10/2008	Week 7	19	<1	14		
30/10/2008		28	<1	12		
31/10/2008		4.7	<0.5	2.7	<0.5	<0.5
03/11/2008		<1	<1	<1		
05/11/2008	Week 8	n/a	n/a	n/a		
07/11/2008		<1	<1	<1	n/a	n/a
10/11/2008		<1	<1	<1		
13/11/2008	Week 9	<1	<1			
17/11/2008		n/a	n/a	n/a		

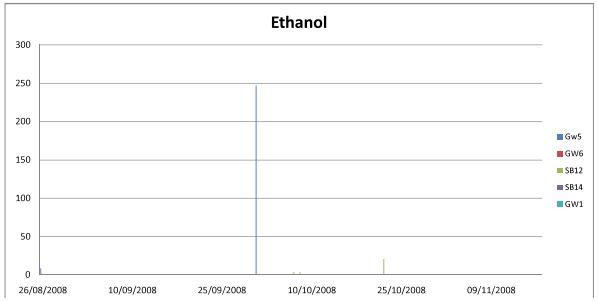
		ETHANOL (mg/l)				
		GW5	GW6	SB12	SB14	GW1
26/08/2008		8.8	<0.5			
13/09/2008		n/a				
15/09/2008		<0.5	<0.5			<0.5
16/09/2008	Week1					
17/09/2008		n/a				
22/09/2008		n/a		n/a		
23/09/2008					n/a	
24/09/2008	Week 2	<1	<1			<1
25/09/2008		<1	<1	<1		
26/09/2008		<1	<1	<1	<1	<0.5
29/09/2008		n/a		n/a	<1	
30/09/2008		<1	<1	<1		
01/10/2008	Week 3	247	<1	<1		
02/10/2008		<1	<1	n/a		
03/10/2008		<1	n/a	<1		
06/10/2008		<1				
07/10/2008		<1	<1	4		
08/10/2008	Week 4	<1	<1	4		
09/10/2008		<1	<1	<1		
10/10/2008		<1	<1	<1		
13/10/2008		<20	<1	<1	<1	
14/10/2008		<1	<1	<1		
15/10/2008	Week 5	<1	<1	<1		
16/10/2008		<1				
17/10/2008		<1	<1	<1		
20/10/2008		<1	<1	<1	<1	
21/10/2008		<1	<1	<1		
22/10/2008	Week 6	<1	<1	21		
23/10/2008		n/a	n/a	n/a		
24/10/2008		n/a	n/a	n/a		
27/10/2008						
28/10/2008		<1	<1	<1		
29/10/2008	Week 7	<1	<1	<1		
30/10/2008		<1	<1	<1		
31/10/2008		<0.5	<0.5	<0.5	<0.5	<0.5
03/11/2008		<1	<1	<1		
05/11/2008	Week 8	n/a	n/a	n/a		
07/11/2008		<1	<1	<1	n/a	n/a
10/11/2008		<1	<1	<1		
13/11/2008	Week 9	<1	<1			
17/11/2008		n/a	n/a	n/a		

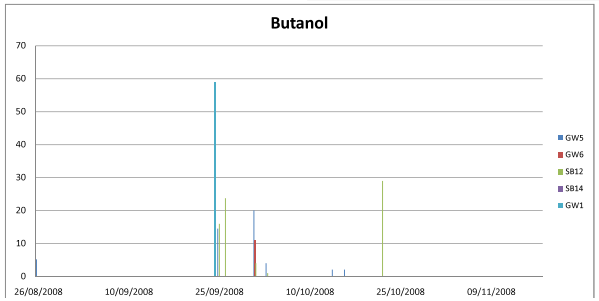
		BUTANOL (mg/l)				
		GW5	GW6	SB12	SB14	GW1
26/08/2008		5.2	<0.5			
13/09/2008		n/a				
15/09/2008		<0.5	<0.5			<0.5
16/09/2008	Week1					
17/09/2008		n/a				
22/09/2008		n/a		n/a		
23/09/2008					n/a	
24/09/2008	Week 2	<1	<1			59
25/09/2008		14.5	<1	15.9		
26/09/2008		<1	<1	23.7	<1	<0.5
29/09/2008		n/a		n/a	<1	
30/09/2008		<1	<1	<1		
01/10/2008	Week 3	20	11	4		
02/10/2008		<1	<1	n/a		
03/10/2008		4	n/a	1		
06/10/2008		<1				
07/10/2008		<1	<1	<1		
08/10/2008	Week 4	<1	<1	<1		
09/10/2008		<1	<1	<1		
10/10/2008		<1	<1	<1		
13/10/2008		<1	<1	<1	<1	
14/10/2008		2	<1	<1		
15/10/2008	Week 5	<1	<1	<1		
16/10/2008		2				
17/10/2008		<1	<1	<1		
20/10/2008		<1	<1	<1	<1	
21/10/2008		<1	<1	<1		
22/10/2008	Week 6	<1	<1	29		
23/10/2008		n/a	n/a	n/a		
24/10/2008		n/a	n/a	n/a		
27/10/2008						
28/10/2008		<1	<1	<1		
29/10/2008	Week 7	<1	<1	<1		
30/10/2008		<1	<1	<1		
31/10/2008		<0.5	<0.5	<0.5	<0.5	<0.5
03/11/2008		<1	<1	<1		
05/11/2008	Week 8	n/a	n/a	n/a		
07/11/2008		<1	<1	<1	n/a	n/a
10/11/2008		<1	<1	<1		
13/11/2008	Week 9	<1	<1			
17/11/2008		n/a	n/a	n/a		











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APPENDIX 3 - SOURCE POSITION

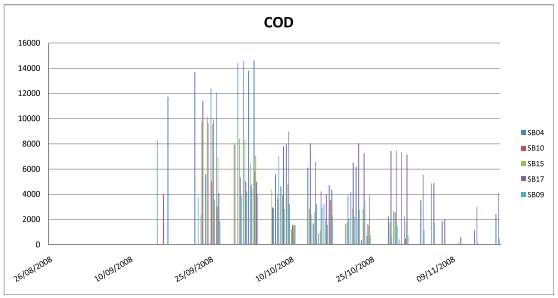
		COD (mg/l)				
		SB04	SB10	SB15	SB17	SB09
26/08/2008		0				
15/09/2008		8310				
16/09/2008	Week1		4025			
17/09/2008		11745				
22/09/2008		13680				3780
23/09/2008			2395	9780	11395	
24/09/2008	Week 2	5595		10130	9650	
25/09/2008		12400	5040	9610	9920	3590
26/09/2008		12065	3030	6975	4090	1860
29/09/2008				8030	7960	
30/09/2008		14415		8415	5345	3880
01/10/2008	Week 3	14570		8365	5025	4210
02/10/2008		13800		6495	4760	4410
03/10/2008		14640	5770	7065	4975	4060
06/10/2008		0		4410	2975	2865
07/10/2008	Week 4	5590		4035	3610	7040
08/10/2008		4645		3900	7790	2850
09/10/2008		7965		4805	8985	3215
10/10/2008		1231	1582	1496	1567	1569
13/10/2008		6115		2832	8028	2378
14/10/2008		1688		2565	6600	3235
15/10/2008	Week 5	889		1145	4232	2950
16/10/2008		3255		1875	3990	1570
17/10/2008		4730	3565	3345	4375	2365
20/10/2008		1645		1755	3910	2075
21/10/2008		4180		2860	6515	2240
22/10/2008	Week 6	6190		2060	8030	2750
23/10/2008		350		2840	7265	3425
24/10/2008		675	1645	1515	3885	750
27/10/2008						
28/10/2008		2225		1745	7445	620
29/10/2008	Week 7	2630		2570	7460	1465
30/10/2008		425			7365	
31/10/2008		2230	480	1855	7165	715
03/11/2008		3520			5565	1170
05/11/2008	Week 8	4870			4910	1710
07/11/2008		1885			2030	
10/11/2008		189			620	63.5
13/11/2008	Week 9	1150			2995	150
17/11/2008		2440			4105	490

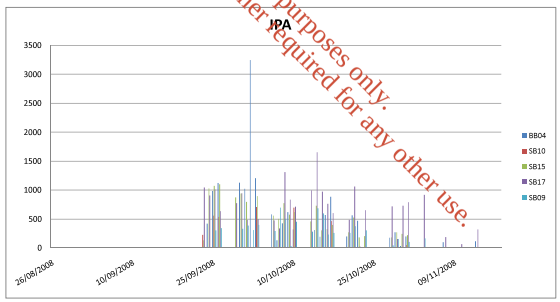
		IPA (mg/l)				
		SB04	SB10	SB15	SB17	SB09
26/08/2008		n/a				
15/09/2008		n/a				
16/09/2008	Week1		n/a			
17/09/2008		n/a				
22/09/2008		n/a				n/a
23/09/2008				225	133	1046
24/09/2008	Week 2	421			1031	909
25/09/2008		984	556.9		1070	1011
26/09/2008		1120	535		1098	637
29/09/2008					875	775
30/09/2008		1129			941.7	943
01/10/2008	Week 3	1022			798	487
02/10/2008		3246			n/a	n/a
03/10/2008		1207	706	894	496	397
06/10/2008		583			560	473
07/10/2008	Week 4	134			504	339
08/10/2008		425			775	1308
09/10/2008		622			574	835
10/10/2008		322	696	619	716	454
13/10/2008		<20			459	995
14/10/2008		309			728	1652
15/10/2008	Week 5	195			306	975
16/10/2008		570			324	762
17/10/2008		884	466	398	604	260
20/10/2008		200			271	484
21/10/2008		562			523	1059
22/10/2008	Week 6	472			181	30
23/10/2008		19			206	654
24/10/2008		n/a	n/a	n/a	n/a	n/a
27/10/2008						
28/10/2008		179			183	718
29/10/2008	Week 7	270			270	153
30/10/2008		34			241	730
31/10/2008		201	49	223	788	103
03/11/2008		<1			920	164
05/11/2008	Week 8	n/a			n/a	n/a
07/11/2008		99			187	
10/11/2008		15			65	4
13/11/2008	Week 9	117			319	10
17/11/2008		n/a			n/a	n/a

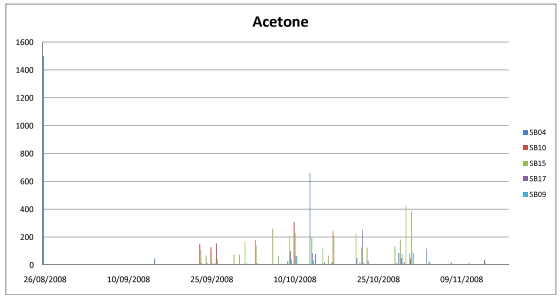
		ACETONE (mg/l)				
		SB04	SB10	SB15	SB17	SB09
26/08/2008		1500				
15/09/2008		46.2				
16/09/2008	Week1		n/a			
17/09/2008		n/a				
22/09/2008		n/a				n/a
23/09/2008			150	111	16	
24/09/2008	Week 2	<1		66	11	
25/09/2008		<1	126.9	79.9	8.8	<1
26/09/2008		11.5	153	44.1	<1	<1
29/09/2008				75.6	<1	
30/09/2008		<1		73.6	<1	<1
01/10/2008	Week 3	<1		170	8	9
02/10/2008		<1		n/a	n/a	<1
03/10/2008		4	176	143	12	8
06/10/2008		<1		260	<1	<1
07/10/2008	Week 4	<1		62	<1	<1
08/10/2008		<1		<1	<1	<1
09/10/2008		28		208	99	39
10/10/2008		<20	309	230	65	61
13/10/2008		659		192	86	32
14/10/2008		78		<1	<1	<1
15/10/2008	Week 5	<1		124	<1	20
16/10/2008		<1		66	<1	<1
17/10/2008		20	241	212	<1	<1
20/10/2008		<1		<1	<1	<1
21/10/2008		8		227	49	<1
22/10/2008	Week 6	15		124	252	17
23/10/2008		<1		125	29	<1
24/10/2008		n/a	n/a	n/a	n/a	n/a
27/10/2008						
28/10/2008		6		130	<1	13
29/10/2008	Week 7	85		181	49	78
30/10/2008		20		425	<1	
31/10/2008		81	47	383	<1	84
03/11/2008		117			25	17
05/11/2008	Week 8	n/a			n/a	n/a
07/11/2008		6			16	
10/11/2008		<1			<1	13
13/11/2008	Week 9	<1			36	11
17/11/2008		n/a			n/a	n/a

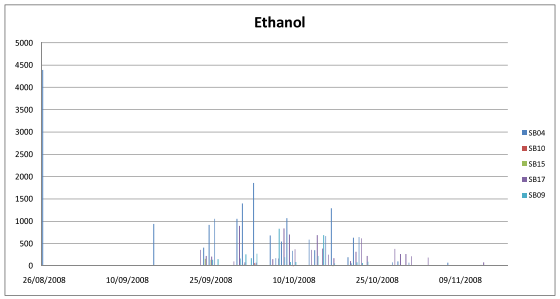
		ETHANOL (mg/l)				
		SB04	SB10	SB15	SB17	SB09
26/08/2008		4392				
15/09/2008		938				
16/09/2008	Week1		n/a			
17/09/2008		n/a				
22/09/2008		n/a				n/a
23/09/2008			<1	<1	356	
24/09/2008	Week 2	407		162	225	
25/09/2008		916	<1	136	210	135
26/09/2008		1056	<1	<1	<1	146
29/09/2008				<1	98.9	
30/09/2008		1056		<1	896	161
01/10/2008	Week 3	1401		36	79	258
02/10/2008		<1		n/a	n/a	171
03/10/2008		1857	66	29	74	269
06/10/2008		685		<1	153	<1
07/10/2008	Week 4	169		<1	166	833
08/10/2008		548		14	839	192
09/10/2008		1068		<1	703	86
10/10/2008		336	3	<1	372	86
13/10/2008		590		<1	359	22
14/10/2008		353		6	686	223
15/10/2008	Week 5	11		<1	386	689
16/10/2008		668		7	252	5
17/10/2008		1288	<1	2	174	52
20/10/2008		192		<1	109	54
21/10/2008		630		<1	318	79
22/10/2008	Week 6	644		<1	615	59
23/10/2008		<1		<1	224	89
24/10/2008		n/a	n/a	n/a	n/a	n/a
27/10/2008						
28/10/2008		80		<1	379	<1
29/10/2008	Week 7	98		<1	265	<1
30/10/2008		10		<1	267	
31/10/2008		73	<1	<1	218	<1
03/11/2008		<1			184	<1
05/11/2008	Week 8	n/a			n/a	n/a
07/11/2008		74			9	
10/11/2008		<1			9	<1
13/11/2008	Week 9	23			82	<1
17/11/2008		n/a			n/a	n/a

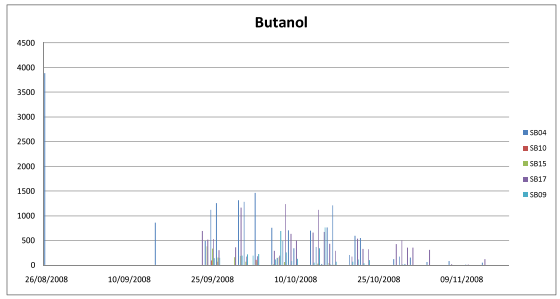
		BUTANOL (mg/l)				
		SB04	SB10	SB15	SB17	SB09
26/08/2008		3882				
15/09/2008		858				
16/09/2008	Week1		n/a			
17/09/2008		n/a				
22/09/2008		n/a				n/a
23/09/2008			<1	<1	696	
24/09/2008	Week 2	489		380	519	
25/09/2008		1117	99.6	333	530.9	141.8
26/09/2008		1252	72.9	155	307	150
29/09/2008				158	360	
30/09/2008		1312		184.7	1165	199
01/10/2008	Week 3	1281		72	174	225
02/10/2008		<1		n/a	n/a	194
03/10/2008		1460	108	74	184	230
06/10/2008		755		15	290	117
07/10/2008	Week 4	148		162	193	695
08/10/2008		491		65	1236	262
09/10/2008		700		5	637	86
10/10/2008		342	<1	5.7	499	131
13/10/2008		697		<1	658	57
14/10/2008		368		30	1123	346
15/10/2008	Week 5	23		<1	671	768
16/10/2008		762		43	434	17
17/10/2008		1210	6	7	290	76
20/10/2008		206		<1	172	72
21/10/2008		593		<1	537	116
22/10/2008	Week 6	548		<1	332	44
23/10/2008		3		<1	324	104
24/10/2008		n/a	n/a	n/a	n/a	n/a
27/10/2008						
28/10/2008		120		<1	425	<1
29/10/2008	Week 7	171		<1	507	15
30/10/2008		21		<1	357	
31/10/2008		149	<1	<1	354	4
03/11/2008		59			308	2
05/11/2008	Week 8	n/a			n/a	n/a
07/11/2008		79			20	
10/11/2008		11			14	<1
13/11/2008	Week 9	50			121	<1
17/11/2008		n/a			n/a	n/a











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VOC		Downgradient wells					Weekly Average	Mid plume Position			Weekly Average	Source Position					Weekly Average	Upgradient wells		Weekly Average
		GW5	GW6	SB12	SB14	GW1	Total	SB04	SB10	SB15	Total	SB04	SB10	SB15	SB17	SB09	Total	GW3	GW2	Total
15/09/2008		13.6	0			0		502.2	0			1842.2						<0.5	<0.5	
16/09/2008	Week1						4.53				251.1						1842.2			0.0
17/09/2008																				
22/09/2008																				
23/09/2008								593					375	244	2114					
24/09/2008	Week 2	0	0			59	16.20				459.4	1317		1639	1664		1387.1	<1	<1	0.0
25/09/2008		55.6	0	15.9				611.6	2			3017	783.4	1618.9	1760.7	580.5				
26/09/2008		24	0	23.7	0	0		631				3439.5	760.9	1297.1	944	638				
29/09/2008					0	0		0		0				1108.6	1233.9			n/a		
30/09/2008		23.6	0	0					8			3497		1200	3004	691				
01/10/2008	Week 3	308	35	16			37.20	0	2959		594.5	3704		1076	748	876	1732.4			
02/10/2008		26	0									3246				673				
03/10/2008		24		14				600				4528	1056	1140	766	904				
06/10/2008		0	0	0				100				2023		835	916	407				
07/10/2008		0	0	4				0		0		451		728	698	2225				
08/10/2008	Week 4	10	0	4			4.06		375		101.0	1464		854	3383	956	1233.6			
09/10/2008		23	0	0				53				2418		787	2274	240				
10/10/2008		20	0	0				78				1000	1008	854.7	1652	732				
13/10/2008		0	0	0	0	0		48		0		1946		651	2098	393				
14/10/2008		45	0	0				219				1108		764	3461	1255				
15/10/2008	Week 5	84	0	0			15.20	328	110		148.0	229		430	2032	2073	1274.9			
16/10/2008		60						200				2000		440	1448	254				
17/10/2008		39	0	0				131				3402	713	619	1068	388				
20/10/2008		0	0	0	0					0		598		271	765	385				
21/10/2008		32	0	0				188				1793		750	1963	567				
22/10/2008	Week 6	22	0	112			16.60	80			86.5	1679		305	1229	120	781.5			
23/10/2008								78				22		331	1231	495				
24/10/2008																				
27/10/2008																				
28/10/2008		22	0	15				50				385		313	1522	57				
29/10/2008	Week 7	19	0	14			8.40	32	0		56.8	624		451	974	245	589.6			0.0
30/10/2008		28	0	12								85		666	1354					
31/10/2008		4.7	0	2.7	0	0		145				504	96	606	1360	191		<0.5	<0.5	
03/11/2008		7	0	0				10				176			1437	183				
05/11/2008	Week 8						1.17				86.5						381.0			
07/11/2008		0	0	0				163				258			232			n/a	n/a	
10/11/2008		0	0	0								26			88	17				
13/11/2008	Week 9	0	0	0			0.00	48			48.0	190			558	21	128.6			
17/11/2008												0								

COD		Downgradient wells					Weekly Average	Mid plume Position			Weekly Average	Source Position					Weekly Average	Upgradient wells		Weekly Average
		GW5	GW6	SB12	SB14	GW1	Total	SB05	SB06	SB13	Total	SB04	SB10	SB15	SB17	SB09	Total	GW3	GW2	Total
15/09/2008		131	<10			<10		6375	0			8310						<10	<10	
16/09/2008	Week1						160.5				3187.5		4025				8026.7			0.0
17/09/2008		190										11745								
22/09/2008		154		100						20		13680				3780				
23/09/2008					0			3670					2395	9780	11395					
24/09/2008	Week 2	192	8			29	69.5				1780.4	5595		10130	9650		7499.2	5	5	5.0
25/09/2008		119	5	30				3605	2			12400	5040	9610	9920	3590				
26/09/2008		119	8	8	1	n/a		1605				12065	3030	6975	4090	1860				
29/09/2008		123		13	0			70		0				8030	7960			2		
30/09/2008		n/a	n/a	23				118	8			14415		8415	5345	3880				
01/10/2008	Week 3	100	2	25			35.5	50	2610		771.6	14570		8365	5025	4210	7694.2			2.0
02/10/2008		0	0	10				n/a				13800		6495	4760	4410				
03/10/2008		97	10	58				2545				14640	5770	7065	4975	4060				
06/10/2008		105						0		n/a		0		4410	2975	2865				
07/10/2008		52	0	8				0				5590		4035	3610	7040				
08/10/2008	Week 4	53	0	0			44.3	13	300		134.8	4645		3900	7790	2850	3910.7			
09/10/2008		53	15	n/a				151				7965		4805	8985	3215				
10/10/2008		171	18	56				345				1231	1582	1496	1567	1569				
13/10/2008		153	37	105	72			761		123		6115		2832	8028	2378				
14/10/2008		74	<8	179				692				1688		2565	6600	3235				
15/10/2008	Week 5	78	<8	77			73.8	1185	110		683.7	889		1145	4232	2950	3415.6			
16/10/2008		41						1365				3255		1875	3990	1570				
17/10/2008		54	6.5	9.5				550				4730	3565	3345	4375	2365				
20/10/2008		40.5	6	6.5	110					2		1645		1755	3910	2075				
21/10/2008		41	10.5	20				720				4180		2860	6515	2240				
22/10/2008	Week 6	30.5	1	235.5			37.5	350			375.4	6190		2060	8030	2750	3169.5			
23/10/2008		23	n/a	7.5				435				350		2840	7265	3425				
24/10/2008		23	0	7.5				370				675	1645	1515	3885	750				
27/10/2008																				
28/10/2008		36.5	8	33.5				395.5				2225		1745	7445	620				
29/10/2008	Week 7	37.5	0	29.5			24.1	670.5	0		382.5	2630		2570	7460	1465	3093.0			0.0
30/10/2008		40.5	7.5	n/a								425			7365					
31/10/2008		n/a	n/a	n/a	n/a	n/a		464				2230	480	1855	7165	715		n/a	n/a	
03/11/2008		21	11	21.5				300				3520			5565	1170				
05/11/2008	Week 8	22	14	36			14.7	1520			1000.0	4870			4910	1710	3207.5			8.0
07/11/2008		14	1.5	16.5	4	0		1463				1885			2030			4.5	11.5	
10/11/2008		47	13	8.5								189			620	63.5				
13/11/2008	Week 9	5	5				11.6	220.5			207.3	1150			2995	150	1355.8			
17/11/2008		6	2	6				194				2440			4105	490				

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APPENDIX 4

Surface Water Monitoring Data (Retention Pond)

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			Internal GC				*Internal GC mg/L*				*GC (external mg/L)*			
Well Type	**Date**	**COD (mg/L)**	**Acetone**	**IPA**	**Ethanol**	**Butanol**	**Acetone (mg/L)**	**IPA (mg/L)**	**Ethanol (mg/L)**	**Butanol (mg/L)**	**Acetone (mg/L)**	**IPA (mg/L)**	**Ethanol (mg/L)**	**Butanol (mg/L)**
Manhole at INT	22/09/2008	39.5	0.005	0.012	0.004	0.005	50	120	40	50	n/a	n/a	n/a	n/a
Manhole at INT	23/09/2008	38	0.011	0.011	0.004	0.005	110	110	40	50	n/a	n/a	n/a	n/a
Manhole at INT	24/09/2008	739	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	25/09/2008	13	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	26/09/2008	0	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	02/10/2008	0	n/a	n/a	n/a	n/a	-	-	-	-	<1	13	<1	<1
Manhole at INT	03/10/2008	0	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	2
Manhole at INT	06/10/2008	0	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	07/10/2008	0	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	08/10/2008	0	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	09/10/2008	n/a	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	10/10/2008	46	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	13/10/2008	17	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	14/10/2008	n/a	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	15/10/2008	<	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	17/10/2008	32.5	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	20/10/2008	17.5	n/a	n/a	n/a	n/a	-	-	-	-	<1	<1	<1	<1
Manhole at INT	22/10/2008	7.5	n/a	n/a	n/a	n/a	-	-	-	-	n/a	n/a	n/a	n/a

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