Appendix F

Down Hole Geophysics

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Induction - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH4a
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

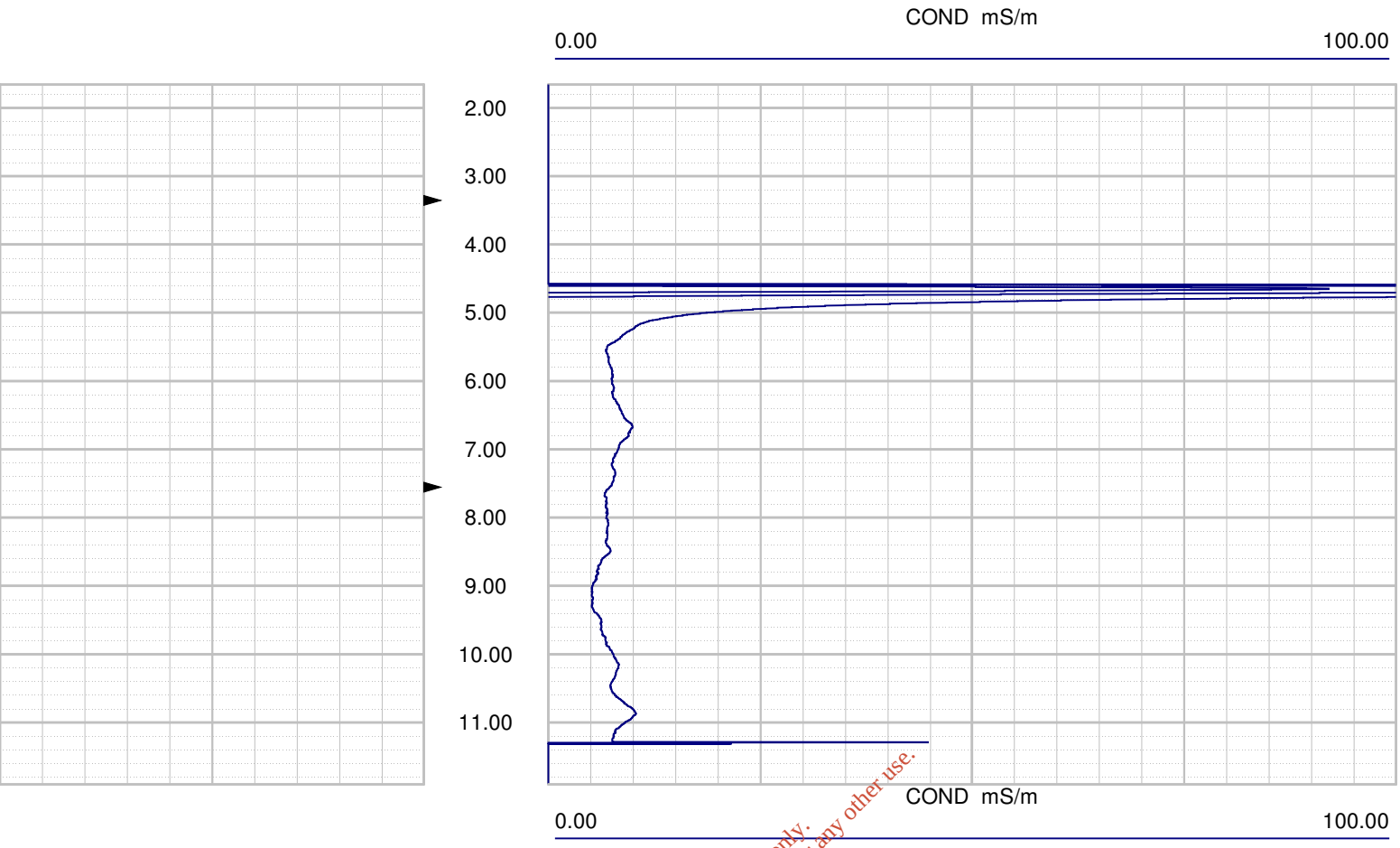
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	12.00	0.00	0.00
DEPTH LOGGER	12.00	0.00	0.00
LOG DEEPEST	12.00	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH4a\BH4a_IND..

INDS 3197



Depth: 1.00 m Date: 21 Nov 2012 Time: 15:24:22 File: "C:\Winlogger\Data\Murphy Environmental\BH4a\BH4a_INDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Temperature & Conductivity - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH4a
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

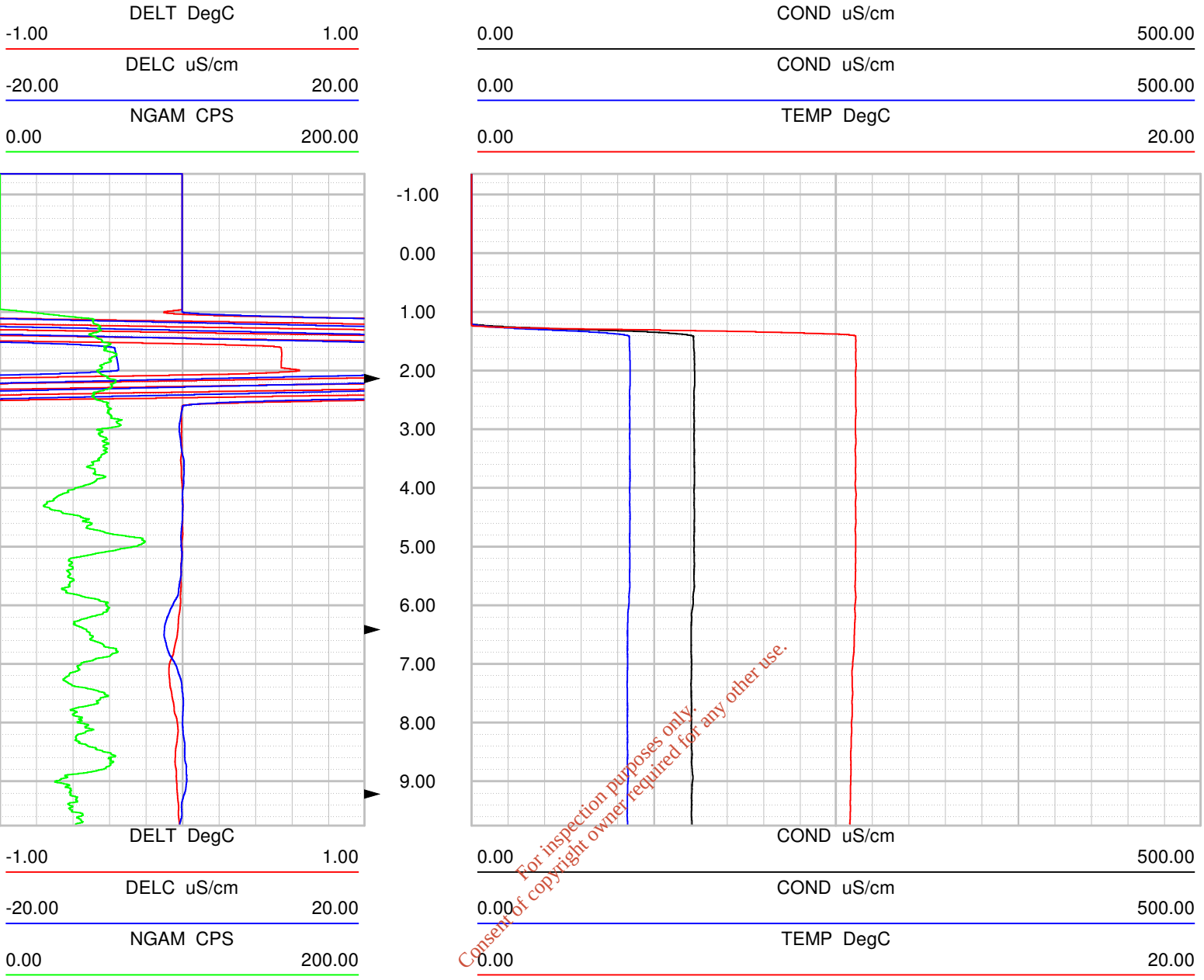
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	12.00	0.00	0.00
DEPTH LOGGER	12.00	0.00	0.00
LOG DEEPEST	12.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH4a\BH4a_TC..

TCDS 1365



Depth: 9.00 m Date: 21 Nov 2012 Time: 15:13:09 File: "C:\Winlogger\Data\Murphy Environmental\BH4a\BH4a_TCDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Temperature & Conductivity - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH11a
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	30.00	0.00	0.00
DEPTH LOGGER	28.00	0.00	0.00
LOG DEEPEST	28.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

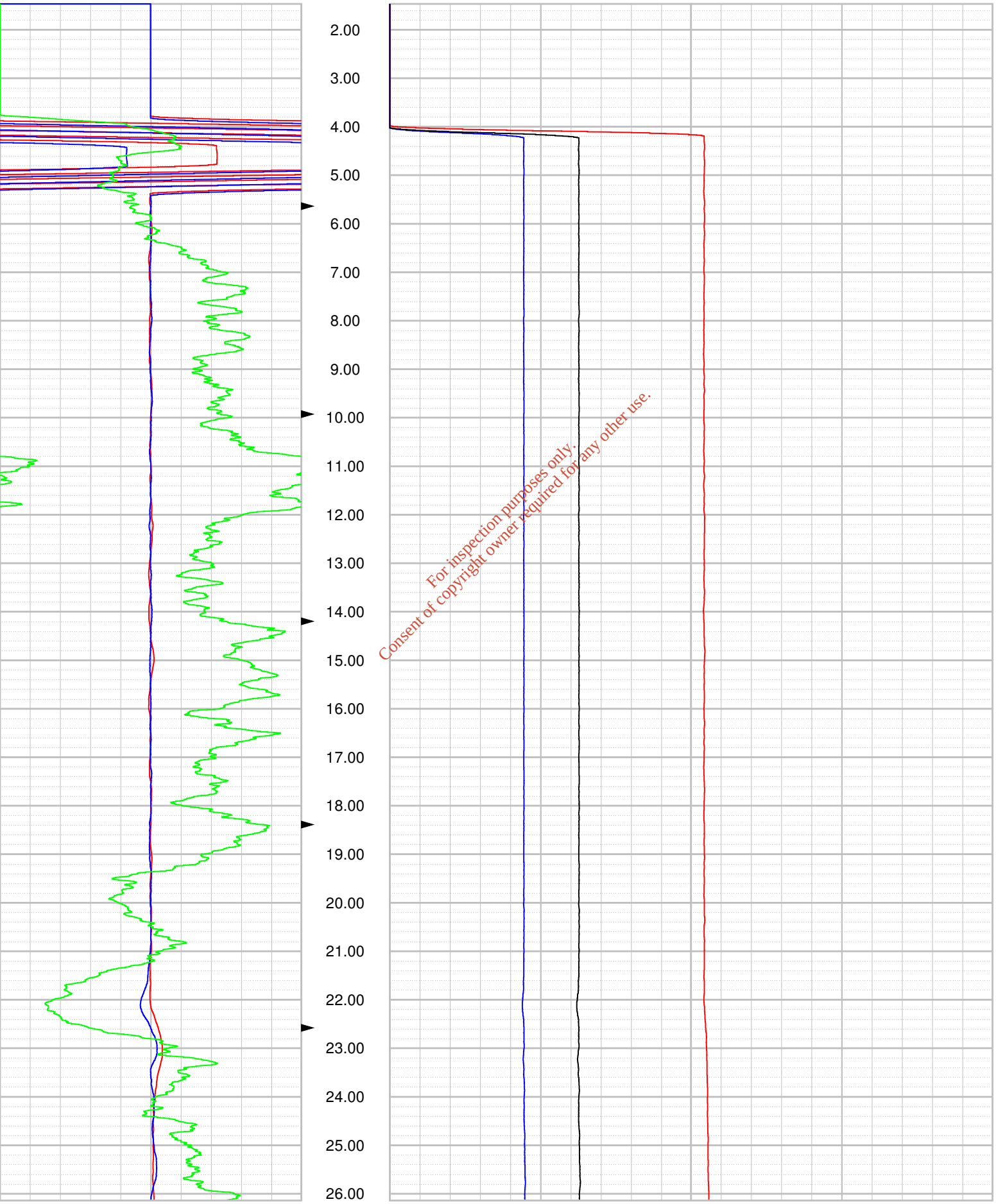
ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH11a\BH11a_T..

TCDS 1365

DELT DegC
-1.00 1.00
DELC uS/cm
-20.00 20.00
NGAM CPS
0.00 200.00

TEMP DegC
0.00 20.00
COND uS/cm
0.00 500.00
COND uS/cm
0.00 500.00



DELT DegC		TEMP DegC	
-1.00	1.00	0.00	20.00
DELC uS/cm		COND uS/cm	
-20.00	20.00	0.00	500.00
NGAM CPS		COND uS/cm	
0.00	200.00	0.00	500.00

Depth: 26.00 m Date: 21 Nov 2012 Time: 14:09:51 File: "C:\Winlogger\Data\Murphy Environmental\BH11a\BH11a_TCDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Induction - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH15a
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

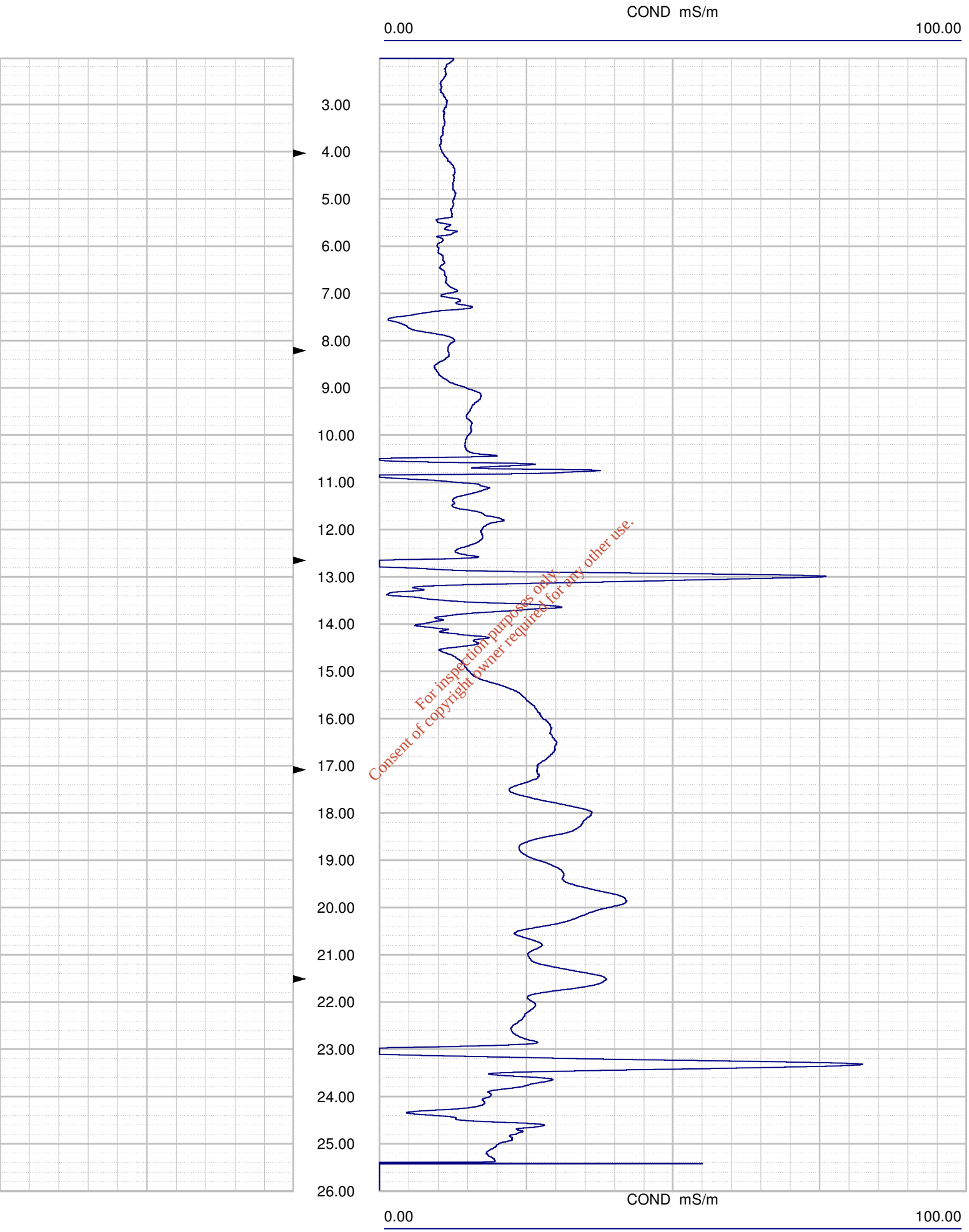
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	30.00	0.00	0.00
DEPTH LOGGER	26.30	0.00	0.00
LOG DEEPEST	26.30	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH15a\BH15a_I..

INDS 3197



Depth: 2.00 m Date: 21 Nov 2012 Time: 11:34:45 File: "C:\Winlogger\Data\Murphy Environmental\BH15a\BH15a_INDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Temperature & Conductivity - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH15a
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

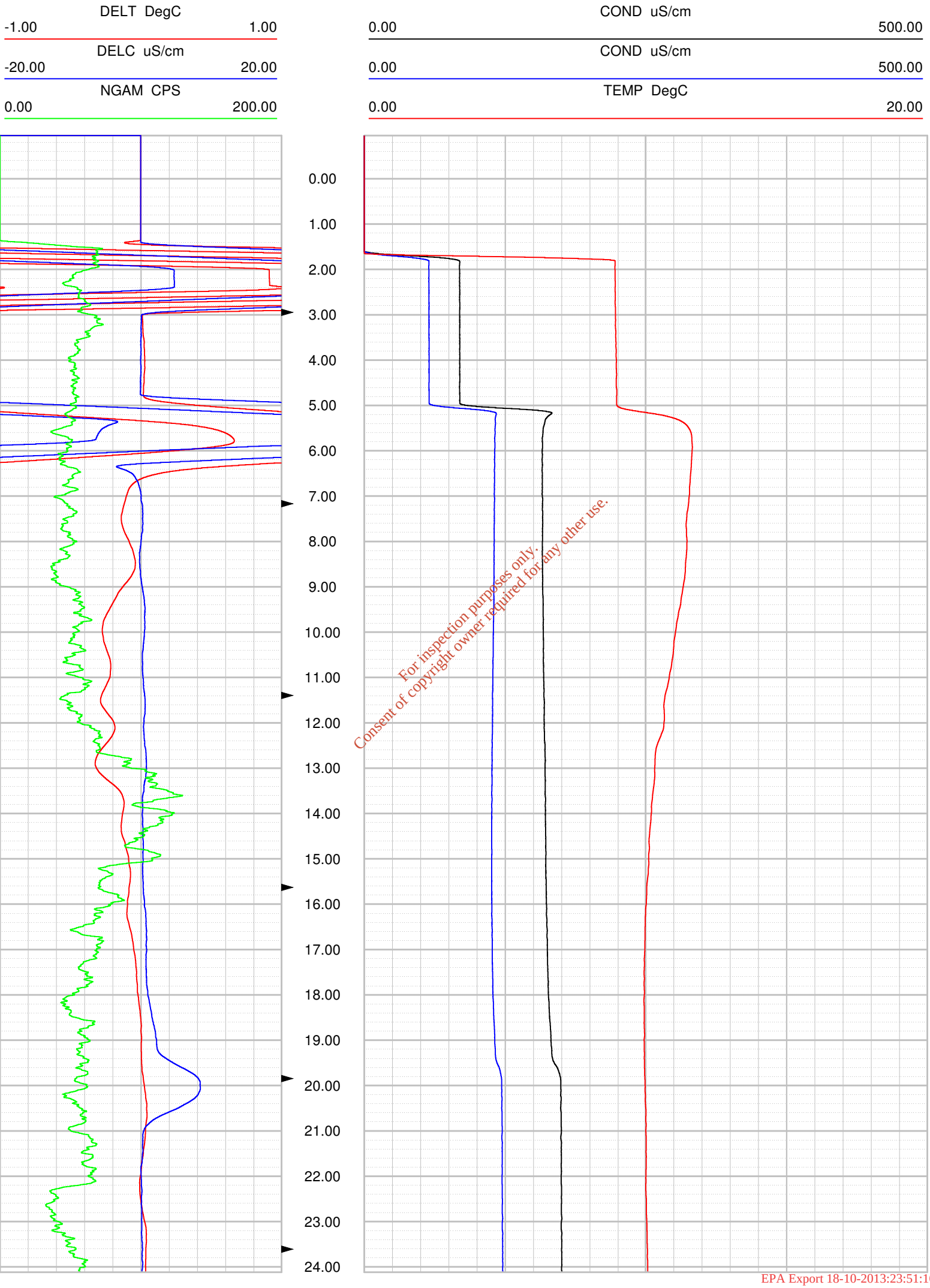
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	30.00	0.00	0.00
DEPTH LOGGER	26.30	0.00	0.00
LOG DEEPEST	26.30	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH15a\BH15a_T..

TCDS 1365



DELT DegC		COND uS/cm	
-1.00	1.00	0.00	500.00
DELC uS/cm		COND uS/cm	
-20.00	20.00	0.00	500.00
NGAM CPS		TEMP DegC	
0.00	200.00	0.00	20.00

Depth: 24.00 m Date: 21 Nov 2012 Time: 11:04:46 File: "C:\Winlogger\Data\Murphy Environmental\BH15a\BH15a_TCDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Induction - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH16
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

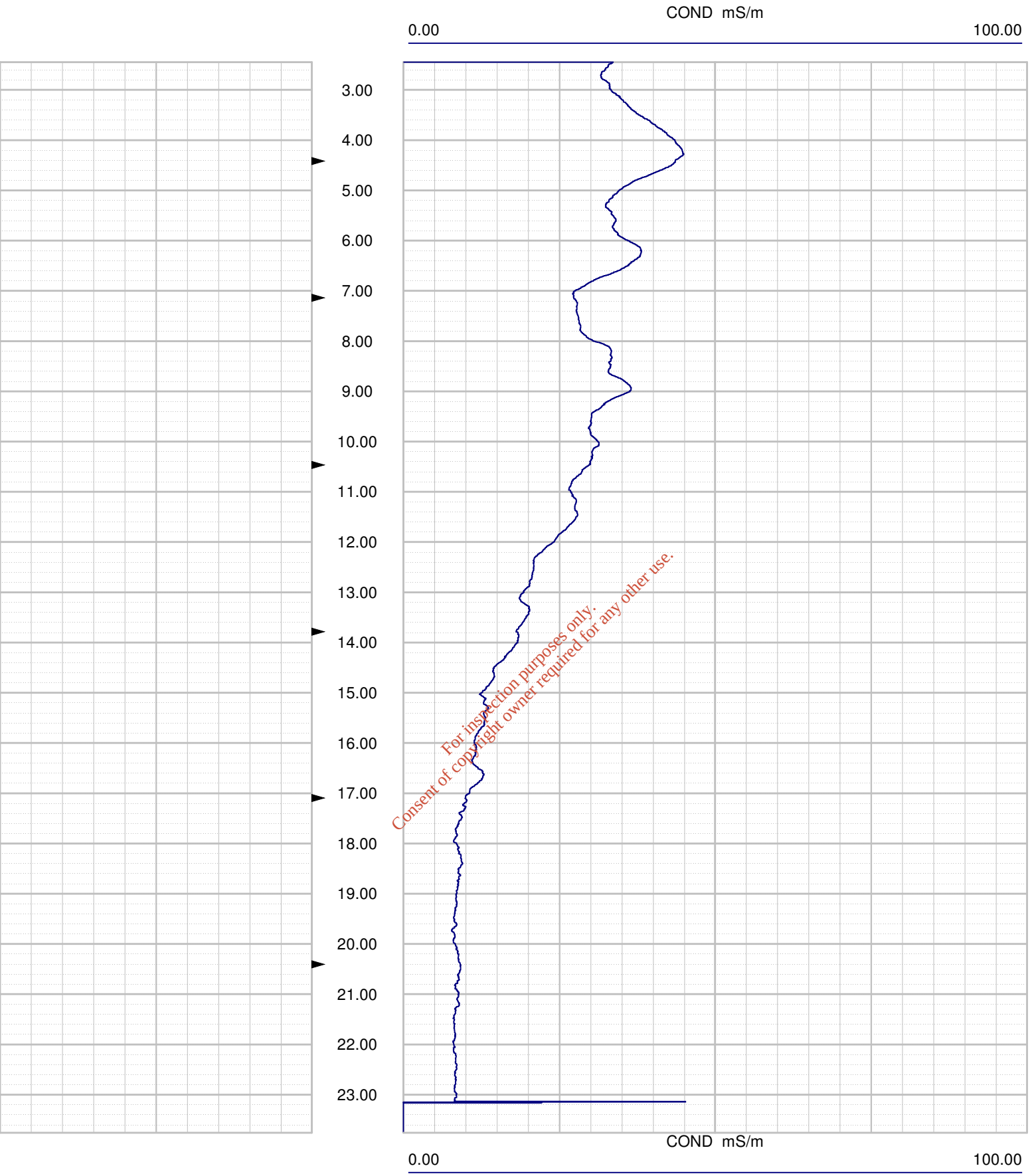
DATE	22 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	24.00	0.00	0.00
DEPTH LOGGER	23.75	0.00	0.00
LOG DEEPEST	23.75	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH16\BH16_IND..

INDS 3197



Depth: 2.00 m Date: 22 Nov 2012 Time: 11:06:26 File: "C:\Winlogger\Data\Murphy Environmental\BH16\BH16_INDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Temperature & Conductivity - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH16
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

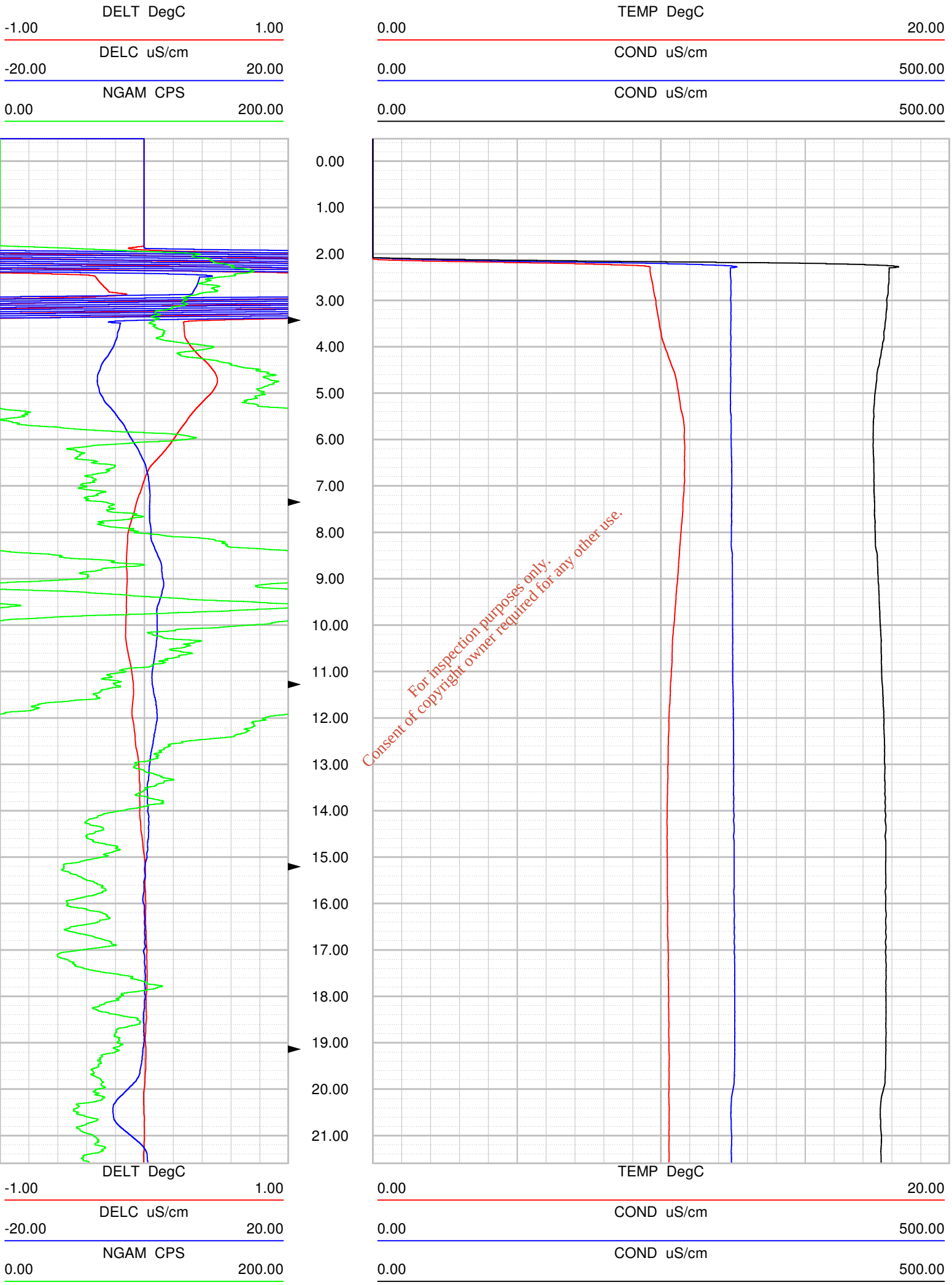
DATE	22 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	24.00	0.00	0.00
DEPTH LOGGER	23.75	0.00	0.00
LOG DEEPEST	23.75	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH16\BH16_TC..

TCDS 1365



Depth: 21.00 m Date: 22 Nov 2012 Time: 10:46:02 File: "C:\Winlogger\Data\Murphy Environmental\BH16\BH16_TCDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Induction - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH17
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

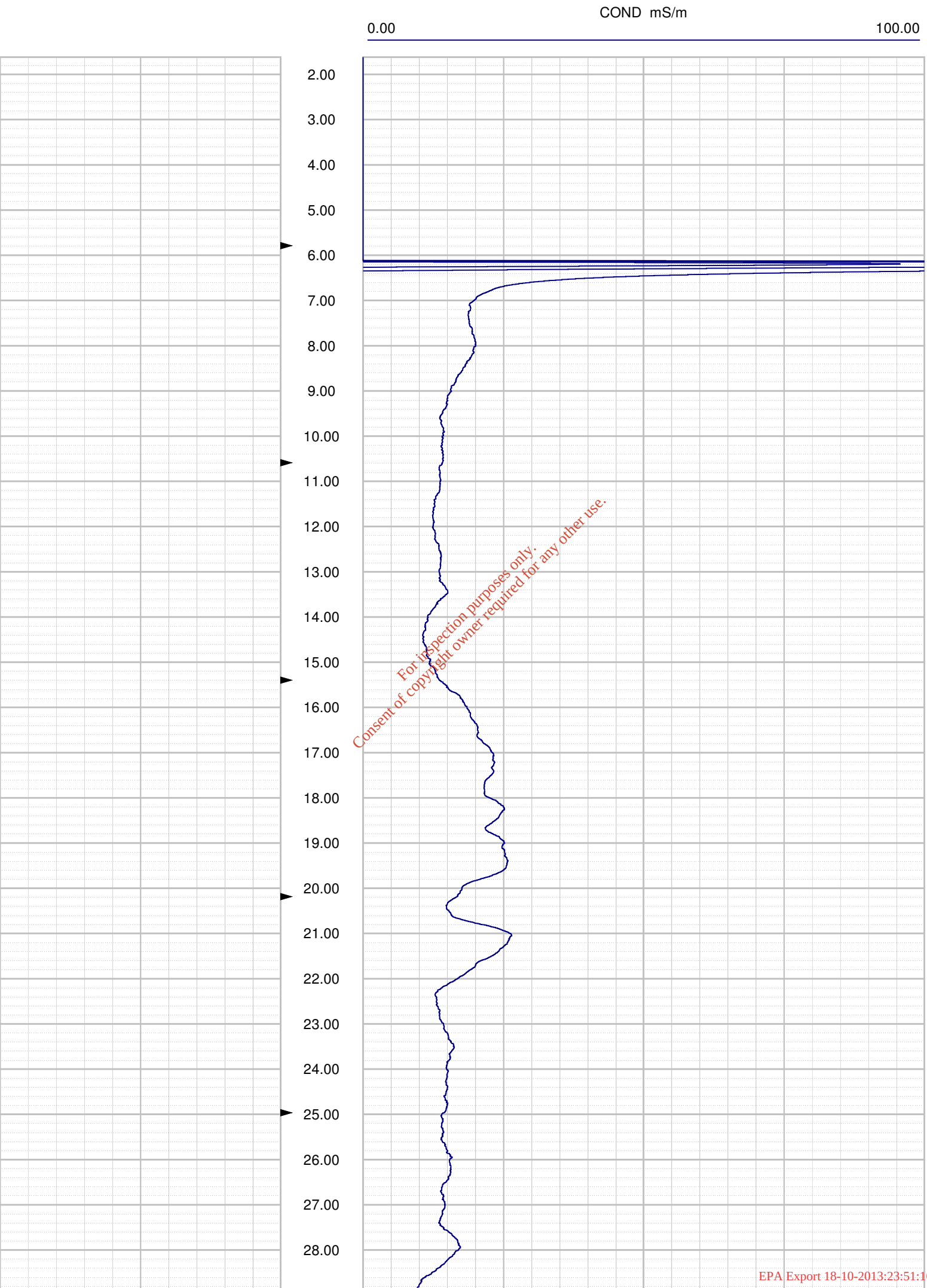
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	54.00	0.00	0.00
DEPTH LOGGER	53.00	0.00	0.00
LOG DEEPEST	53.00	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH17\BH17_IND..

INDS 3197



Depth: 1.00 m Date: 21 Nov 2012 Time: 10:43:39 File: "C:\Winlogger\Data\Murphy Environmental\BH17\BH17_INDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Temperature & Conductivity - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH17
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

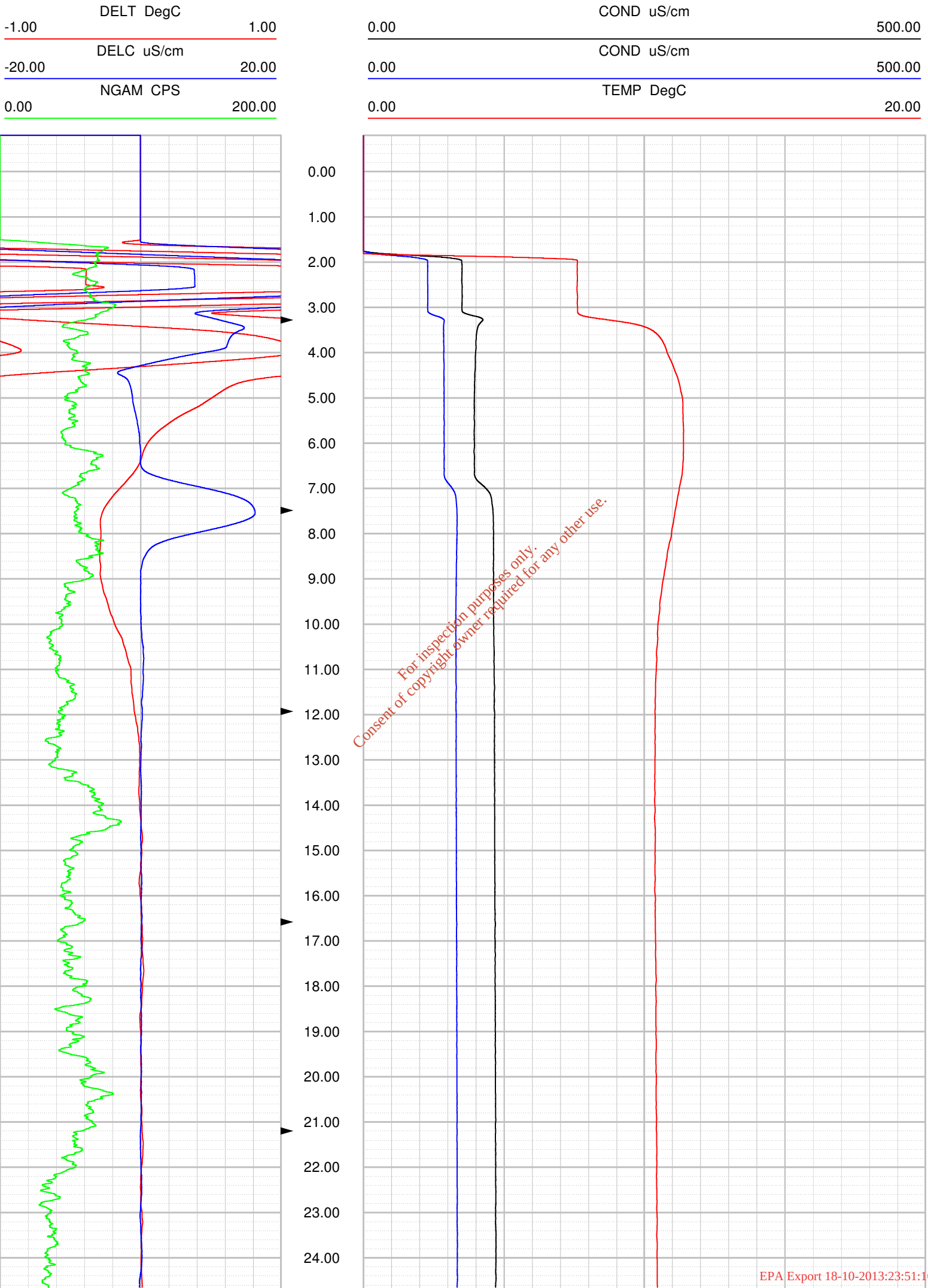
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	54.00	0.00	0.00
DEPTH LOGGER	53.00	0.00	0.00
LOG DEEPEST	53.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

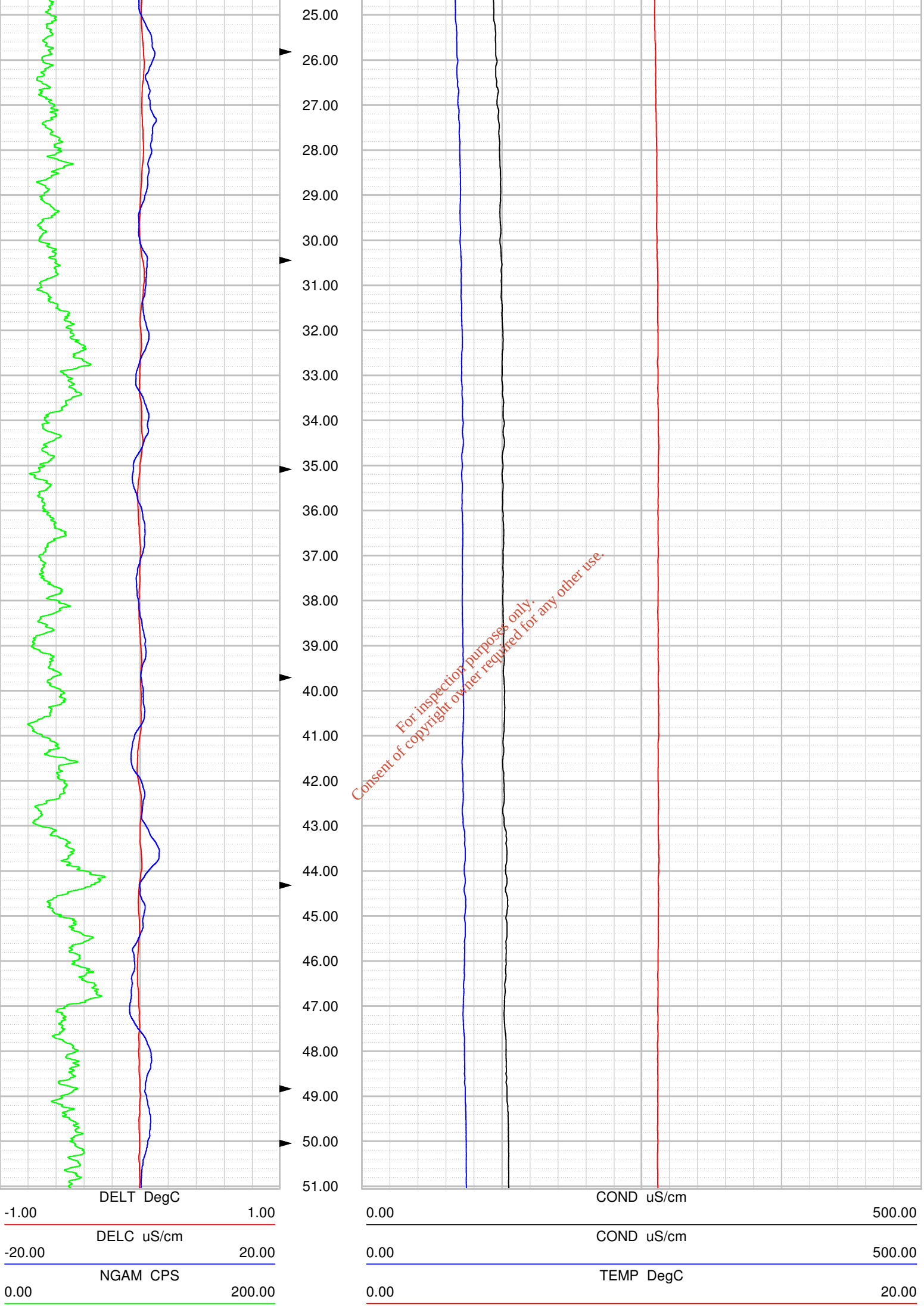
RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH17\BH17_TC..

TCDS 1365





Depth: 51.00 m Date: 21 Nov 2012 Time: 10:21:37 File: "C:\Winlogger\Data\Murphy Environmental\BH17\BH17_TCDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Induction - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH18
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

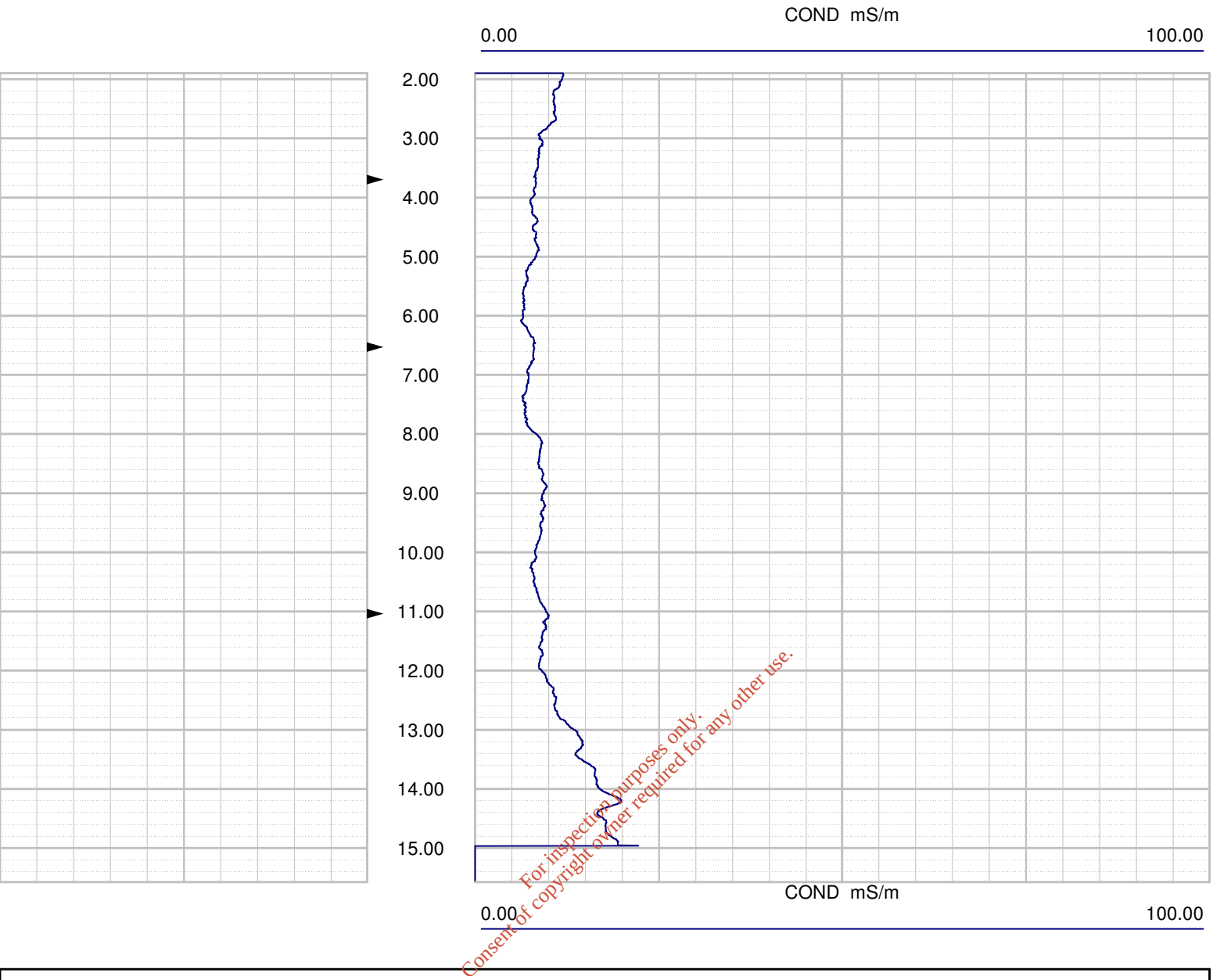
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	21.20	0.00	0.00
DEPTH LOGGER	15.80	0.00	0.00
LOG DEEPEST	15.80	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH18\BH18_IND..

INDS 3197



Depth: 1.00 m Date: 21 Nov 2012 Time: 12:01:57 File: "C:\Winlogger\Data\Murphy Environmental\BH18\BH18_INDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Temperature & Conductivity - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH18
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	21.20	0.00	0.00
DEPTH LOGGER	12.00	0.00	0.00
LOG DEEPEST	12.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

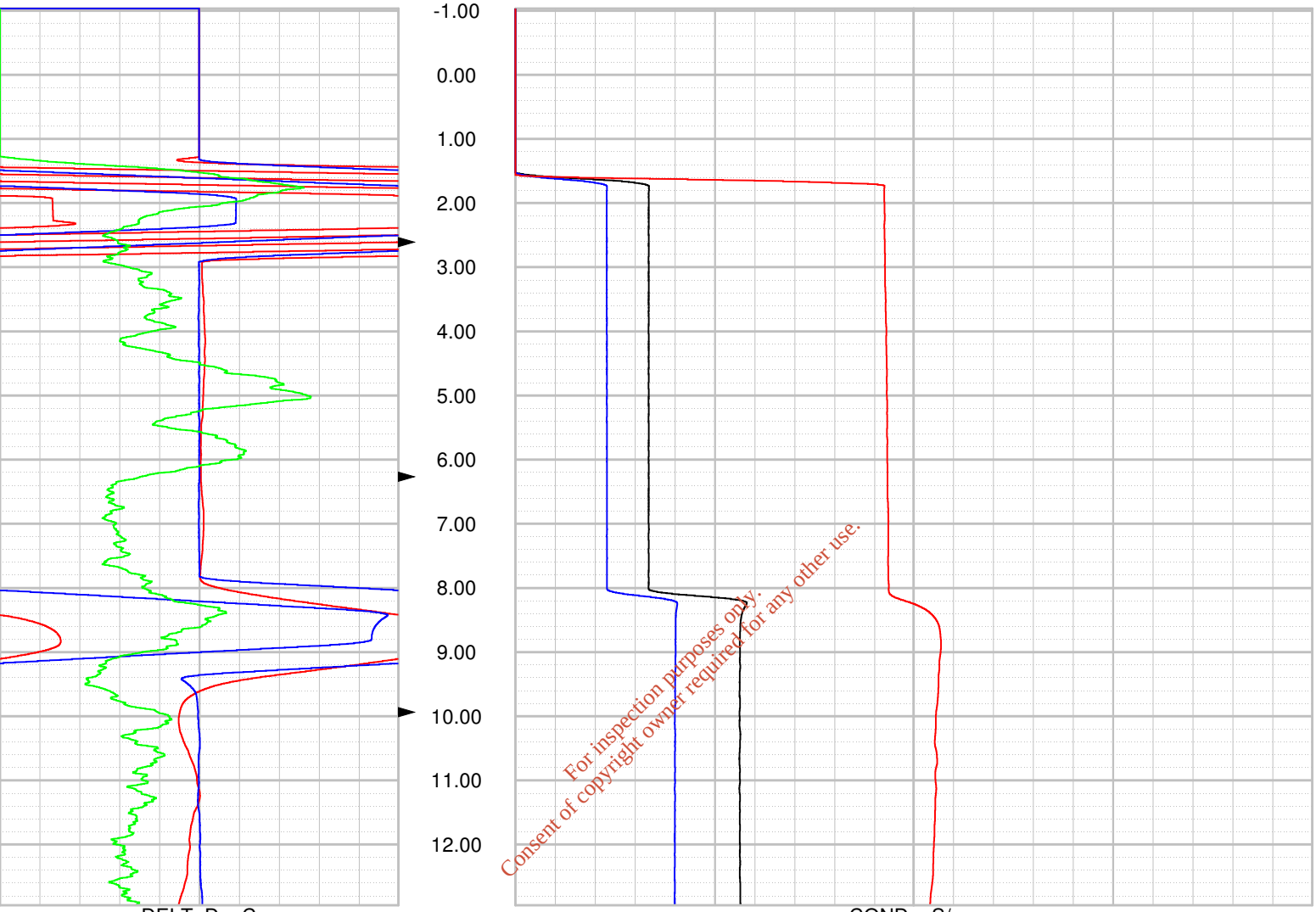
ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH18\BH18_TC..

TCDS 1365

DELT DegC
-1.00 1.00
DELC uS/cm
-20.00 20.00
NGAM CPS
0.00 200.00

COND uS/cm
0.00 500.00
COND uS/cm
0.00 500.00
TEMP DegC
0.00 20.00



DELT DegC
-1.00 1.00
DELC uS/cm
-20.00 20.00
NGAM CPS
0.00 200.00

COND uS/cm
0.00 500.00
COND uS/cm
0.00 500.00
TEMP DegC
0.00 20.00

Depth: 12.00 m Date: 21 Nov 2012 Time: 11:52:30 File: "C:\Winlogger\Data\Murphy Environmental\BH18\BH18_TCDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Induction - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH19
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

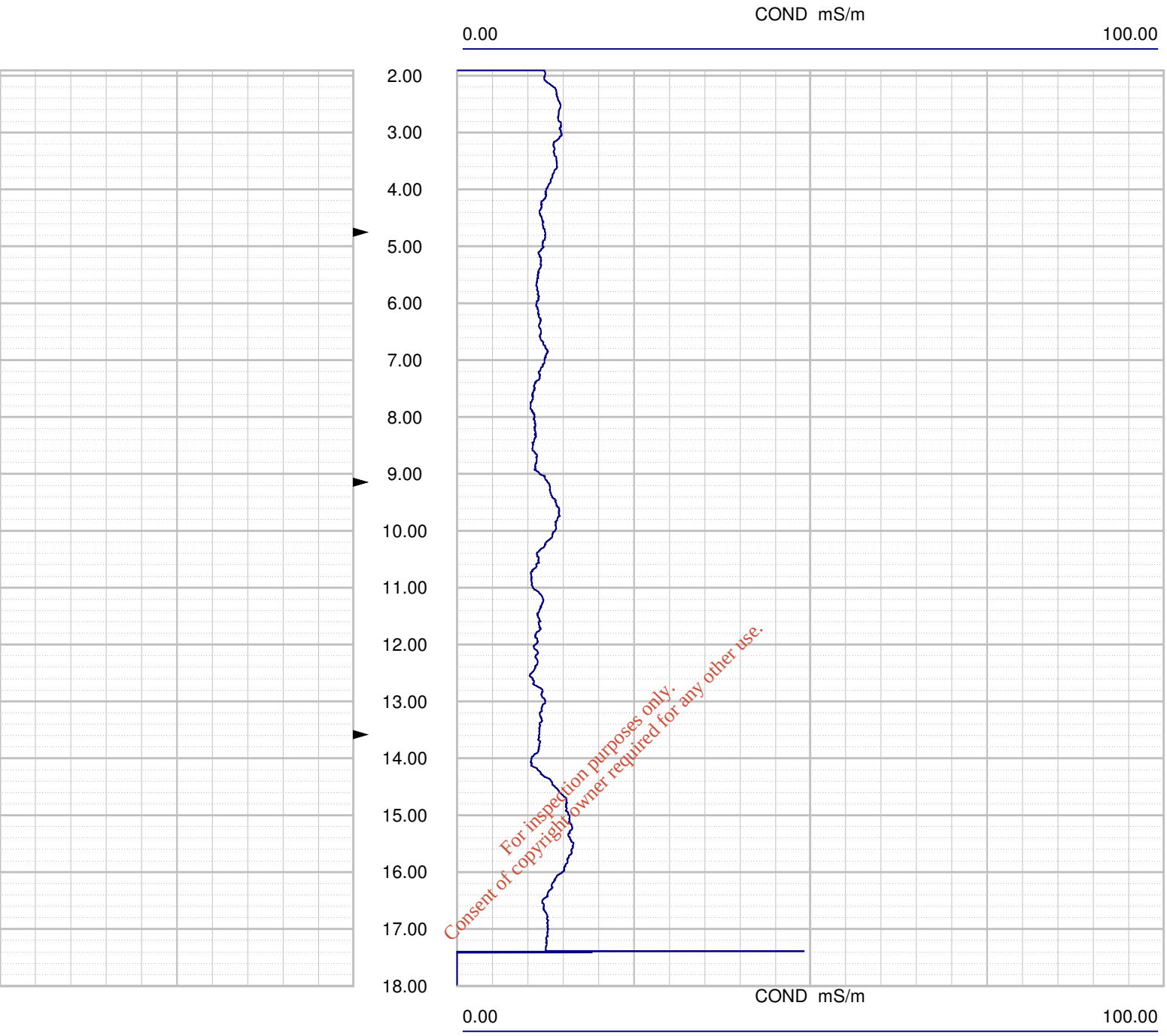
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	18.00	0.00	0.00
DEPTH LOGGER	18.00	0.00	0.00
LOG DEEPEST	18.00	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH19\BH19_IND..

INDS 3197



Depth: 1.00 m Date: 21 Nov 2012 Time: 09:53:53 File: "C:\Winlogger\Data\Murphy Environmental\BH19\BH19_INDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Temperature & Conductivity - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH19
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

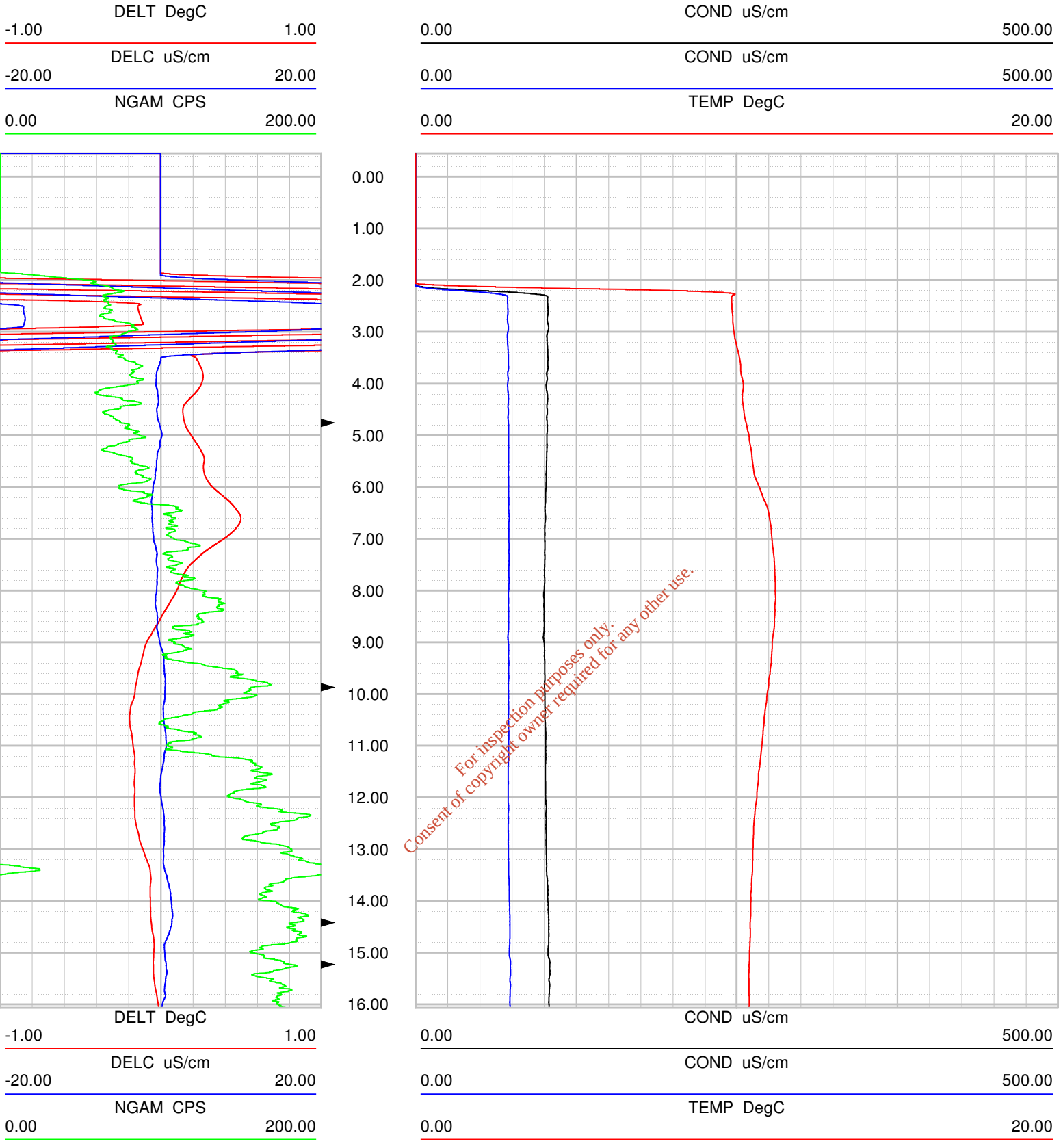
DATE	21 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	18.00	0.00	0.00
DEPTH LOGGER	18.00	0.00	0.00
LOG DEEPEST	18.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH19\BH19_TC..

TCDS 1365



Depth: 16.00 m Date: 21 Nov 2012 Time: 09:24:26 File: "C:\Winlogger\Data\Murphy Environmental\BH19\BH19_TCDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Induction - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH20
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

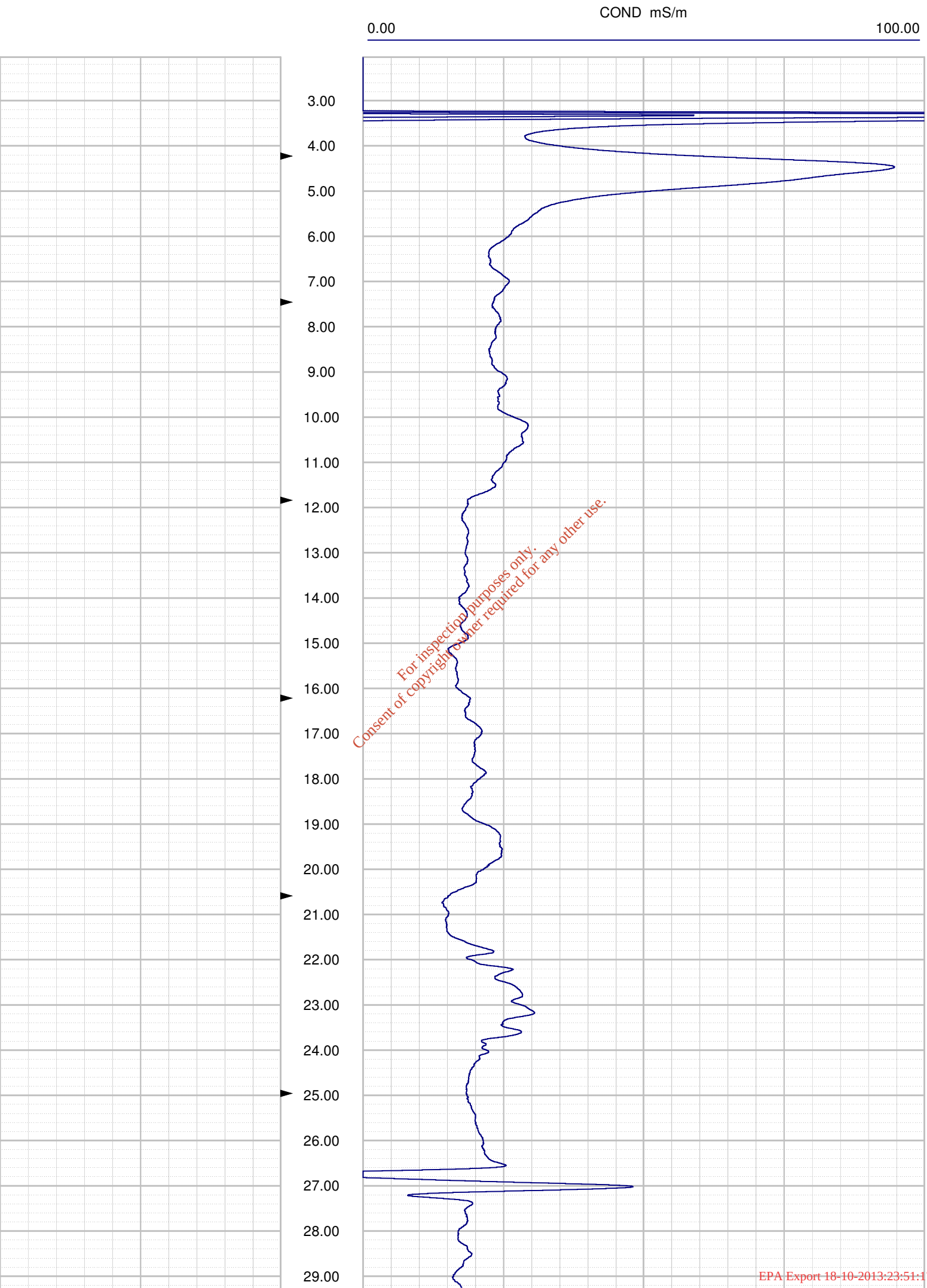
DATE	22 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	42.00	0.00	0.00
DEPTH LOGGER	42.00	0.00	0.00
LOG DEEPEST	42.00	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

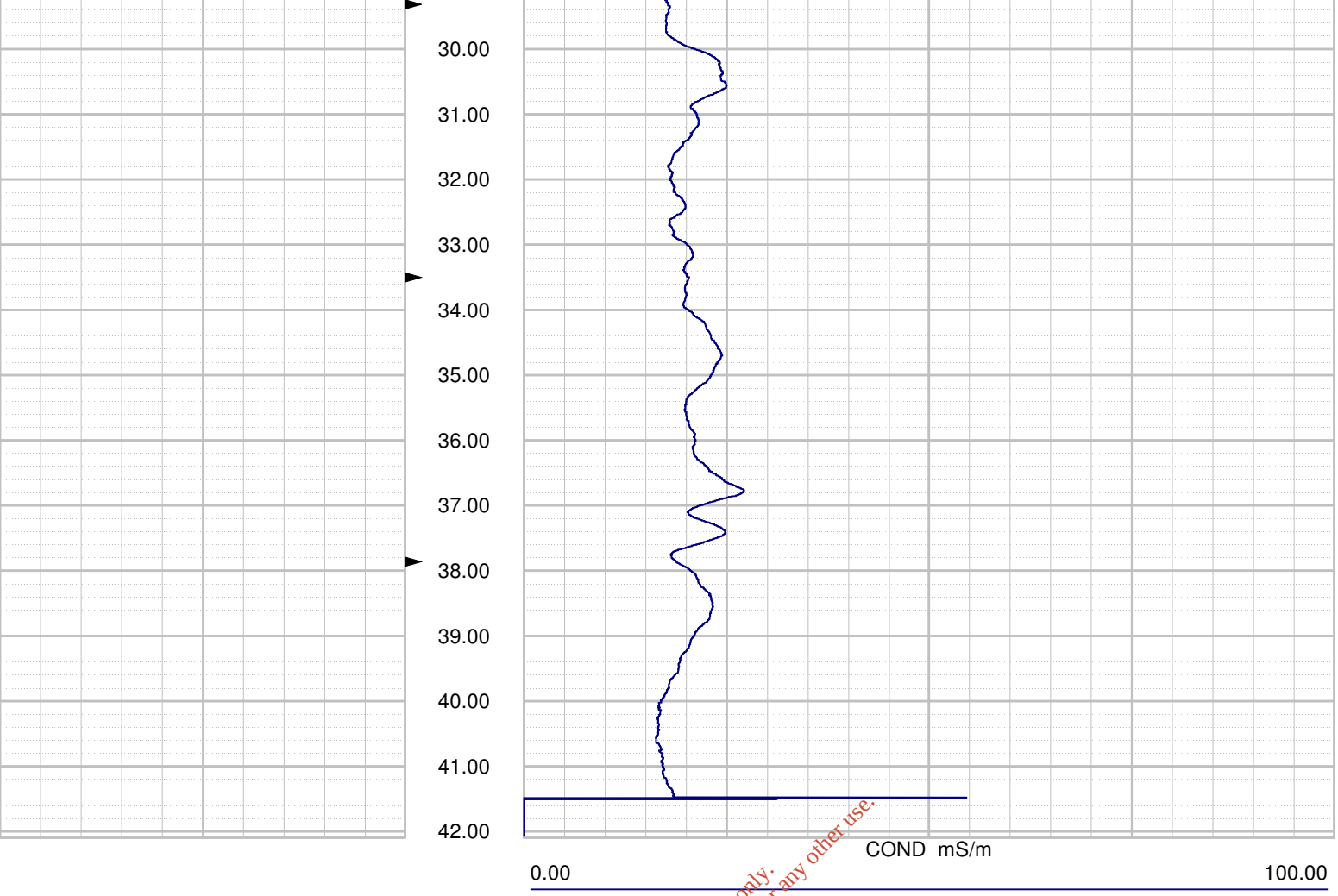
RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH20\BH20_IND..

INDS 3197





Depth: 2.00 m Date: 22 Nov 2012 Time: 10:19:23 File: "C:\Winlogger\Data\Murphy Environmental\BH20\BH20_INDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Downhole Geophysics - Existing BH

Temperature & Conductivity - 1:100

COMPANY	Murphy's Environmental Hollywood Ltd
WELL	BH20
FIELD	Murphy's Quarry
COUNTRY	Ireland
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	GL		DF 0.00
Drill Datum			GL 0.00

DATE	22 Nov 1	06 Nov 1	06 Nov 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	42.00	0.00	0.00
DEPTH LOGGER	42.00	0.00	0.00
LOG DEEPEST	42.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	IJ		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

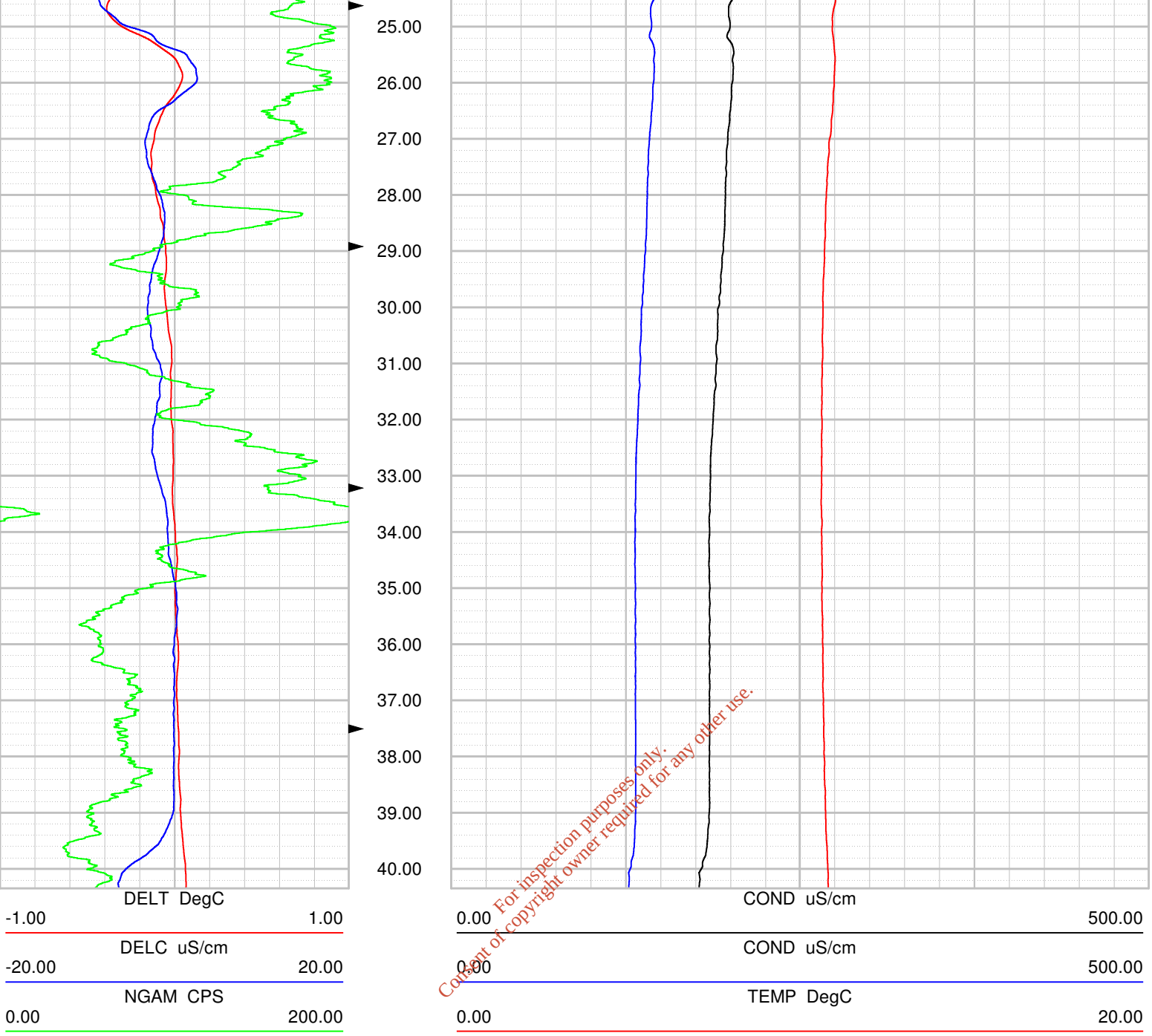
ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Winlogger\Data\Murphy Environmental\BH20\BH20_TC..

TCDS 1365

DELT DegC
-1.00 1.00
DELC uS/cm
-20.00 20.00
NGAM CPS
0.00 200.00

COND uS/cm
0.00 500.00
COND uS/cm
0.00 500.00
TEMP DegC
0.00 20.00



Depth: 40.00 m Date: 22 Nov 2012 Time: 09:59:42 File: "C:\Winlogger\Data\Murphy Environmental\BH20\BH20_TCDS.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Induction

COMPANY	Murphy's Environmental Holywood
WELL	BH24
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

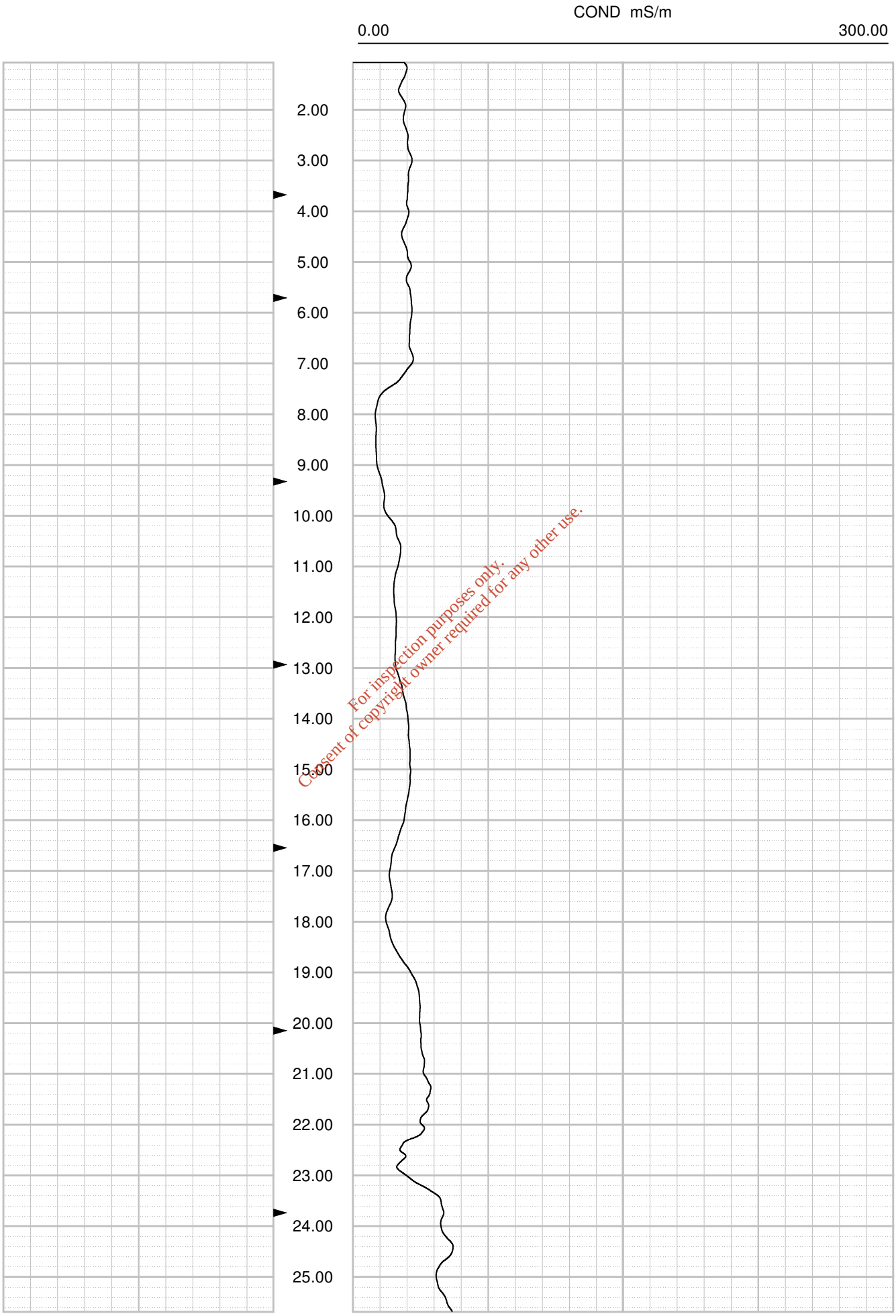
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

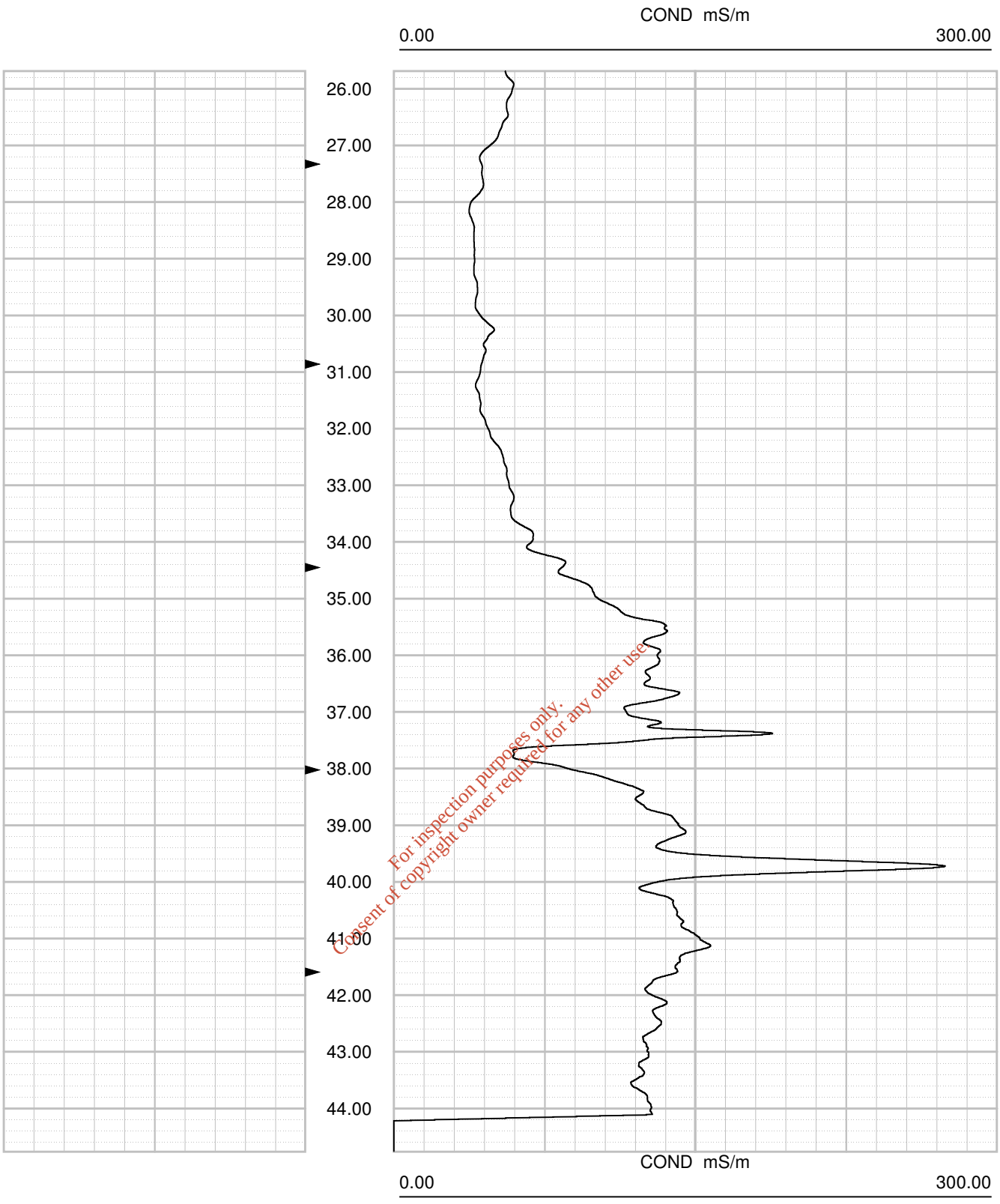
DATE	10 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	48.20	0.00	0.00
DEPTH LOGGER	44.78	0.00	0.00
LOG DEEPEST	44.78	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH24\BH24 IND..

ROBERTSON GEOLOGGING TECHNOLOGY





Depth: 1.00 m Date: 10 Jul 2013 Time: 10:36:05 File: "C:\Winlogger\Data\Murphy Enviromental\BH24\BH24 INDUCTION.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Temperature Conductivity

COMPANY	Murphy's Environmental Holywood
WELL	BH24
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

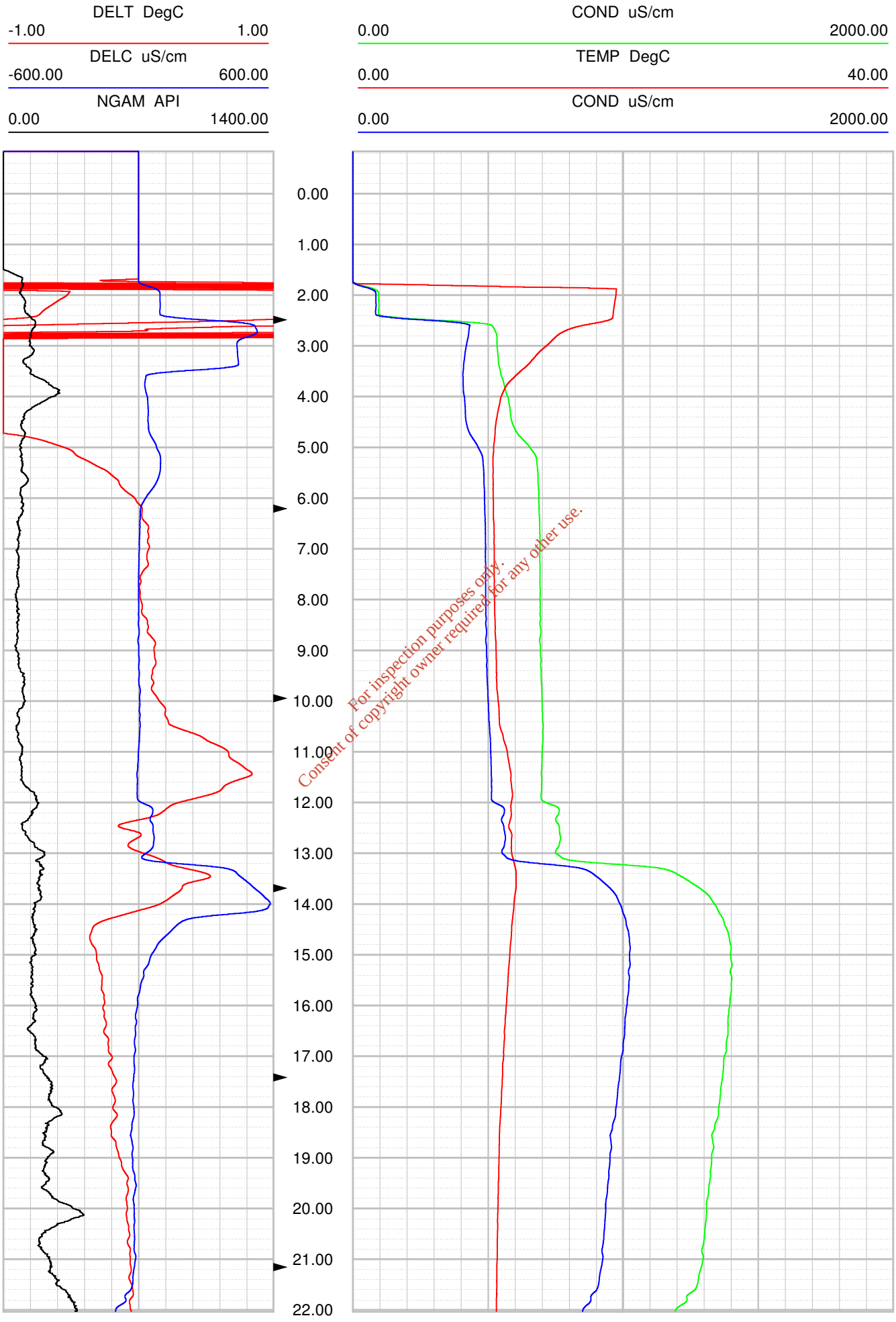
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

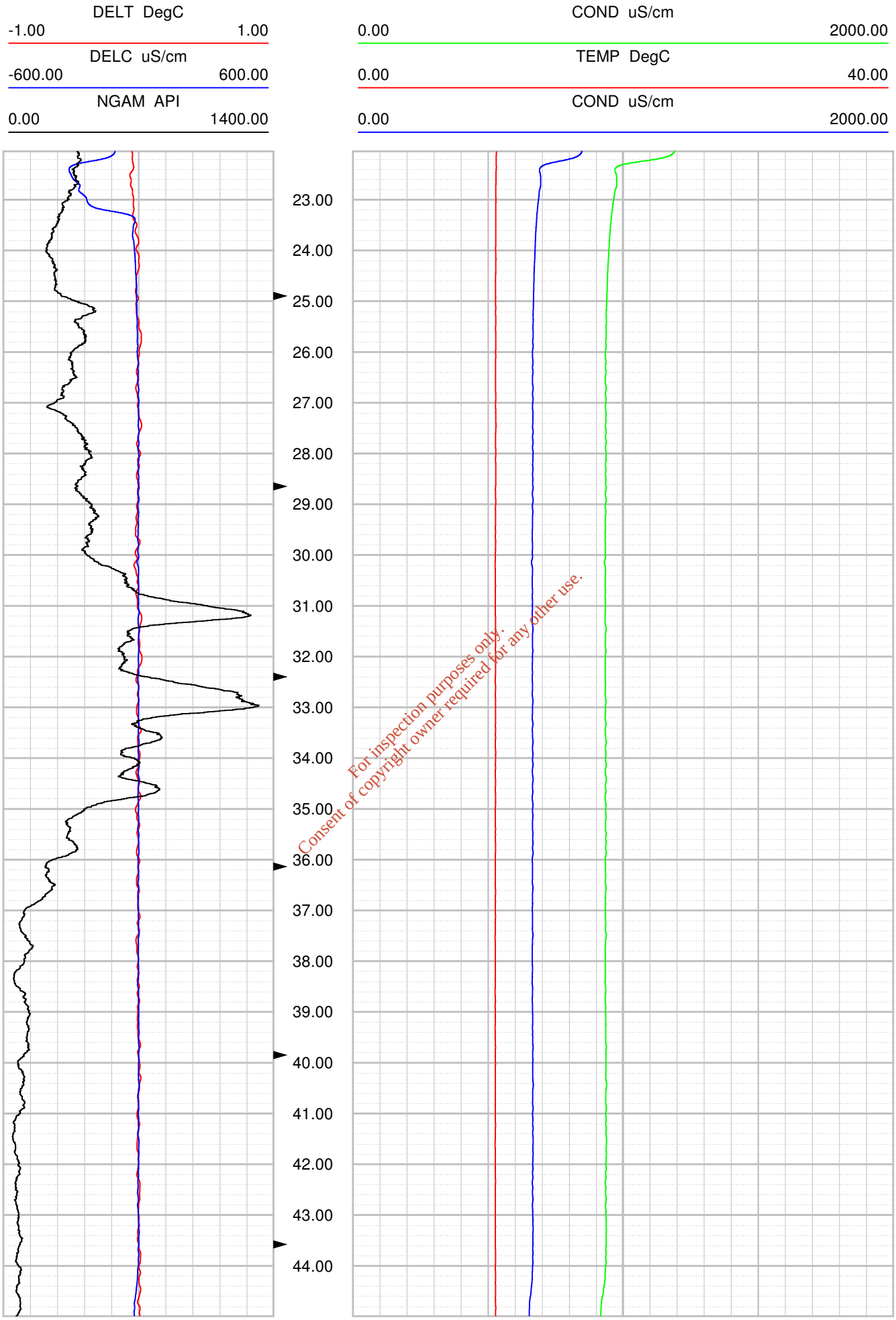
DATE	10 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	48.20	0.00	0.00
DEPTH LOGGER	45.00	0.00	0.00
LOG DEEPEST	45.00	0.00	0.00
LOG SHALLOW	-0.32	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	2.4		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH24\BH24 TE..

ROBERTSON GEOLOGGING TECHNOLOGY





DELT DegC		COND uS/cm	
-1.00	1.00	0.00	2000.00
DELC uS/cm		TEMP DegC	
-600.00	600.00	0.00	40.00
NGAM API		COND uS/cm	
0.00	1400.00	0.00	2000.00

DELT DegC		COND uS/cm	
-1.00	1.00	0.00	2000.00
DELC uS/cm		TEMP DegC	
-600.00	600.00	0.00	40.00
NGAM API		COND uS/cm	
0.00	1400.00	0.00	2000.00

Depth: 45.00 m Date: 10 Jul 2013 Time: 10:06:03 File: "C:\Winlogger\Data\Murphy Enviromental\BH24\BH24 TEMPERATURE CONDUCTIVITY.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Induction

COMPANY	Murphy's Environmental Holywood
WELL	BH25
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

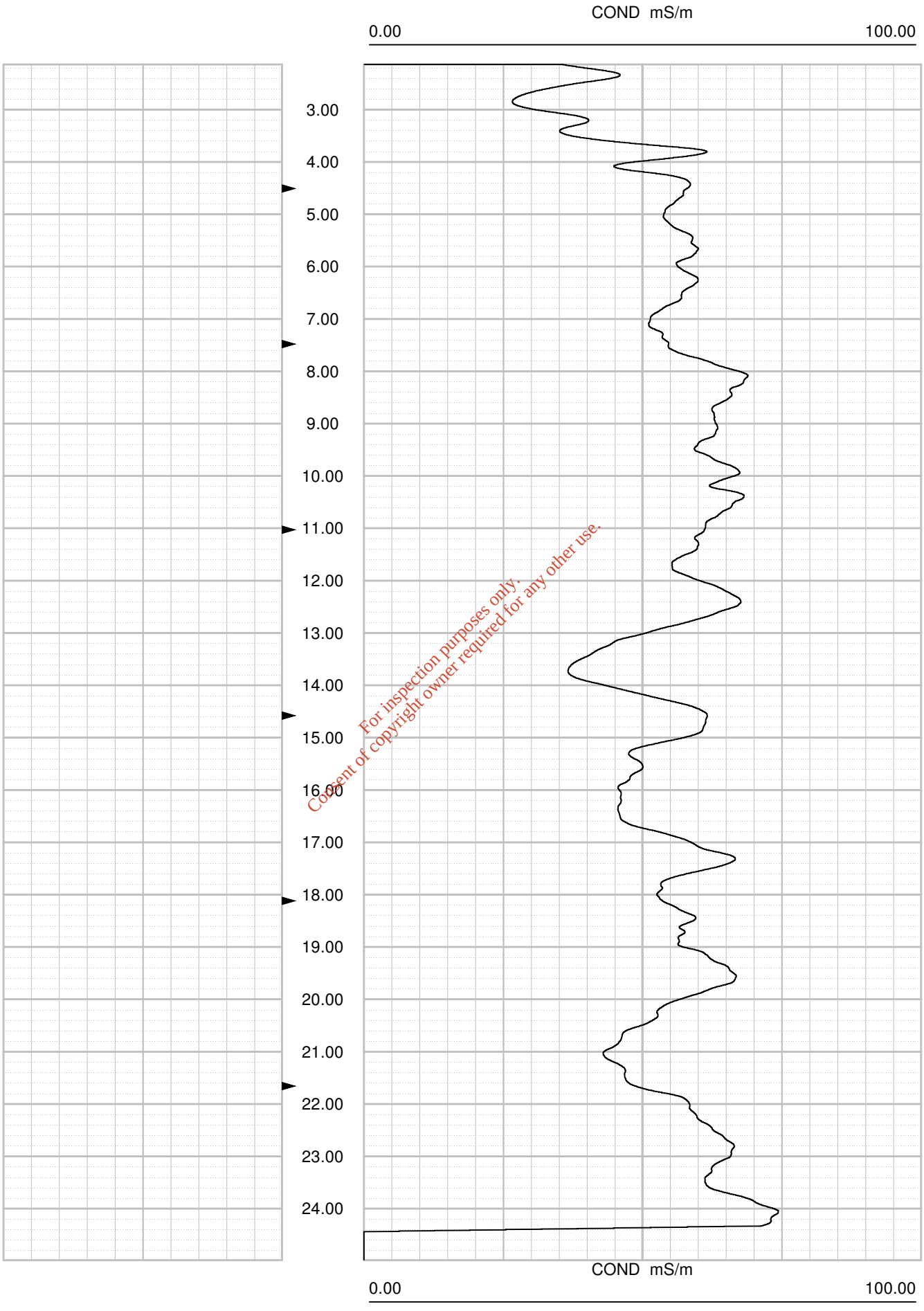
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

DATE	09 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	26.00	0.00	0.00
DEPTH LOGGER	25.00	0.00	0.00
LOG DEEPEST	25.00	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	0		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH25\BH25 IND..

ROBERTSON GEOLOGGING TECHNOLOGY



Depth: 2.00 m Date: 09 Jul 2013 Time: 17:52:44 File: "C:\Winlogger\Data\Murphy Enviromental\BH25\BH25 INDUCTION.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Temperature Conductivity

COMPANY	Murphy's Environmental Holywood
WELL	BH25
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

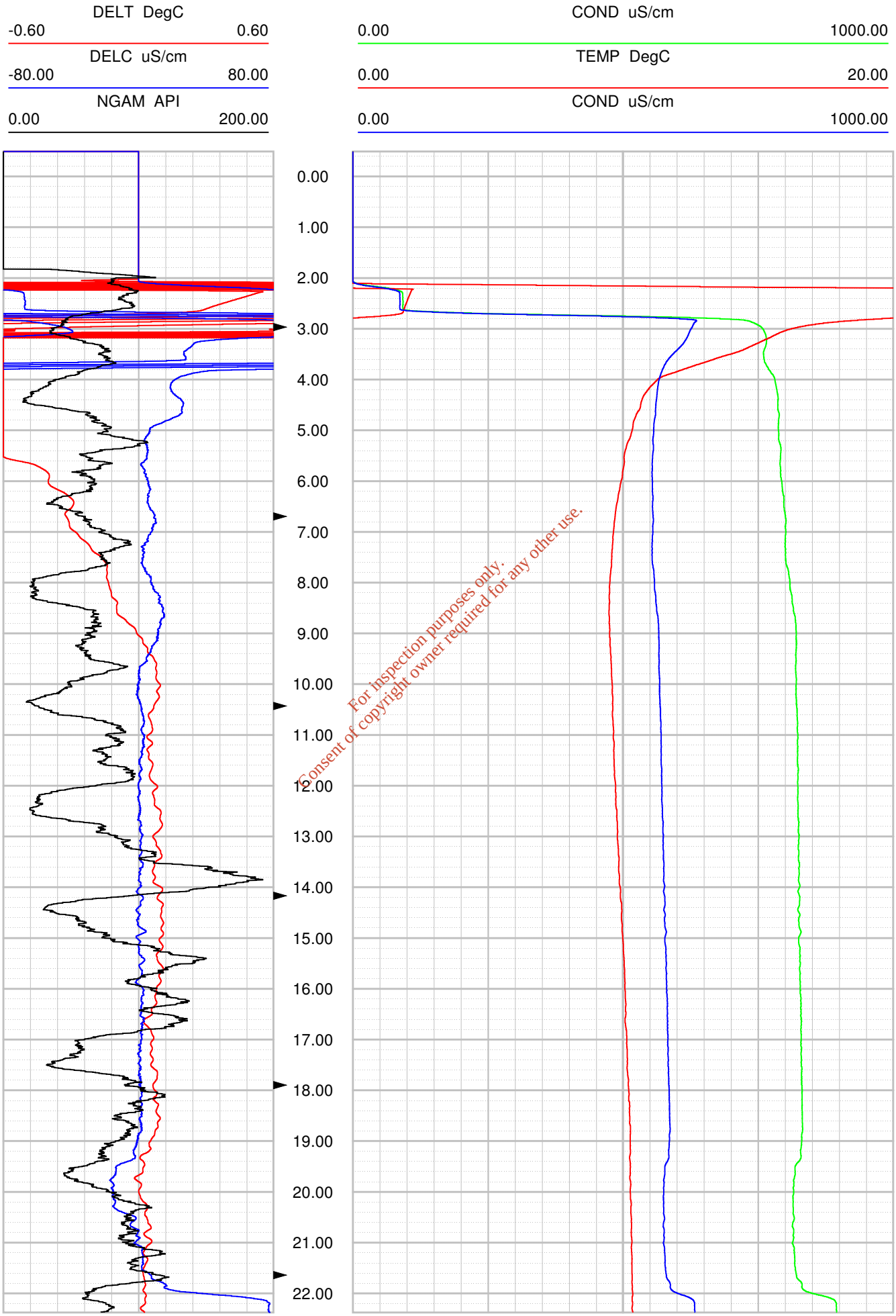
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

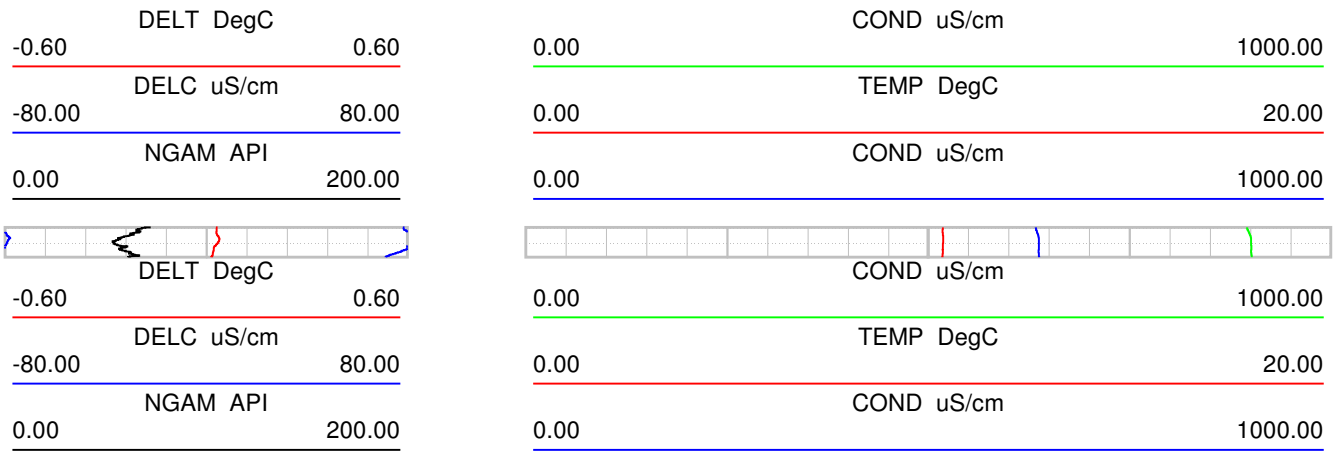
DATE	09 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	26.00	0.00	0.00
DEPTH LOGGER	0.00	0.00	0.00
LOG DEEPEST	22.76	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	2.6		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH25\BH25 TE..

ROBERTSON GEOLOGGING TECHNOLOGY





Depth: 22.00 m Date: 09 Jul 2013 Time: 17:34:35 File: "C:\Winlogger\Data\Murphy Enviromental\BH25\BH25 TEMPERATURE CONDUCTIVITY.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Induction

COMPANY	Murphy's Environmental Holywood
WELL	BH26
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

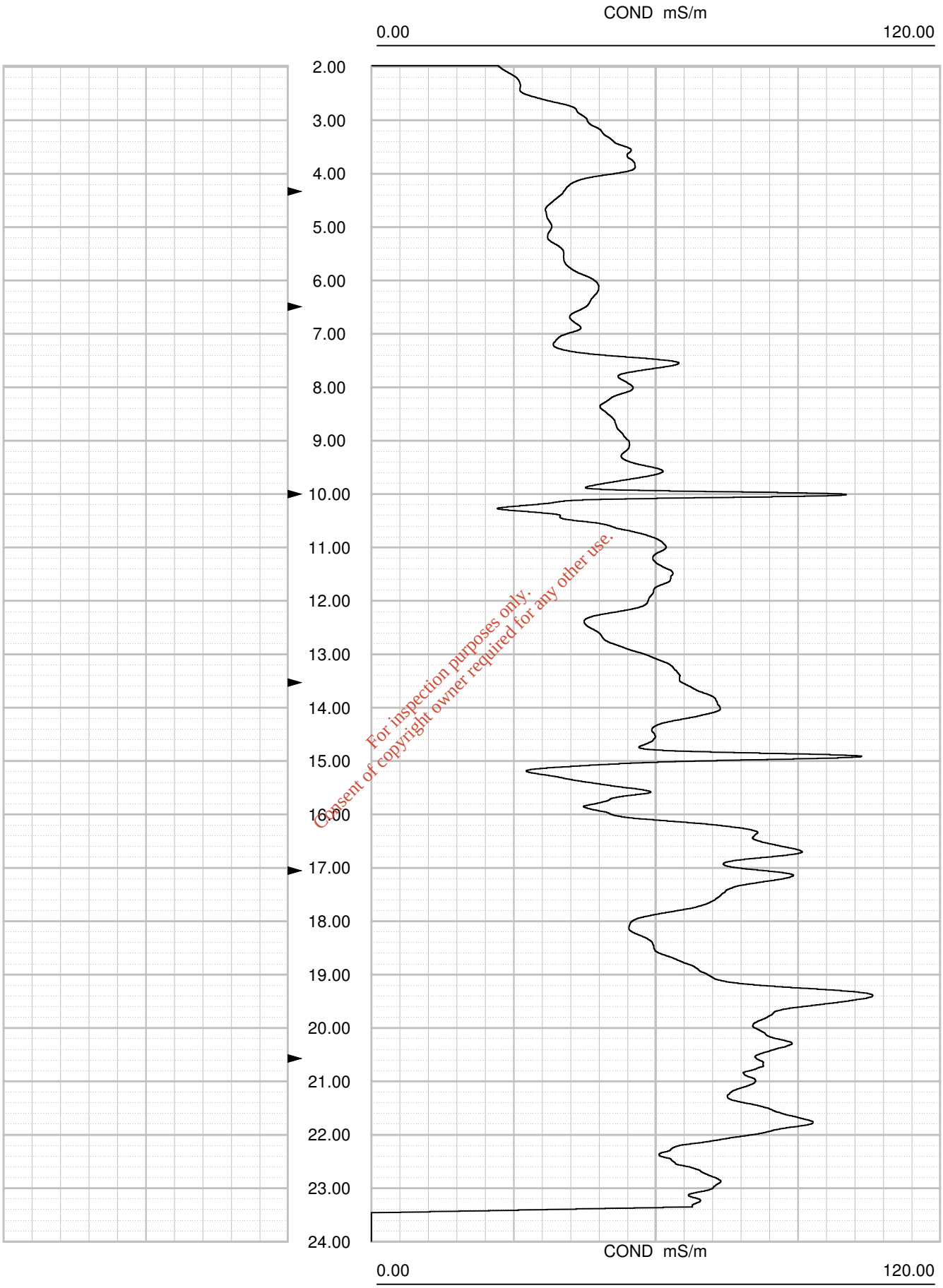
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

DATE	10 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	26.00	0.00	0.00
DEPTH LOGGER	24.01	0.00	0.00
LOG DEEPEST	24.01	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	2		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	BIT RECORD FROM	BIT RECORD TO	CASING RECORD SIZE	CASING RECORD WEIGHT	CASING RECORD FROM	CASING RECORD TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH26\BH26 IND..

ROBERTSON GEOLOGGING TECHNOLOGY



Depth: 1.00 m Date: 10 Jul 2013 Time: 11:33:08 File: "C:\Winlogger\Data\Murphy Enviromental\BH26\BH26 INDUCTION.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Temperature Conduvtivity

COMPANY	Murphy's Environmental Holywood
WELL	BH26
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

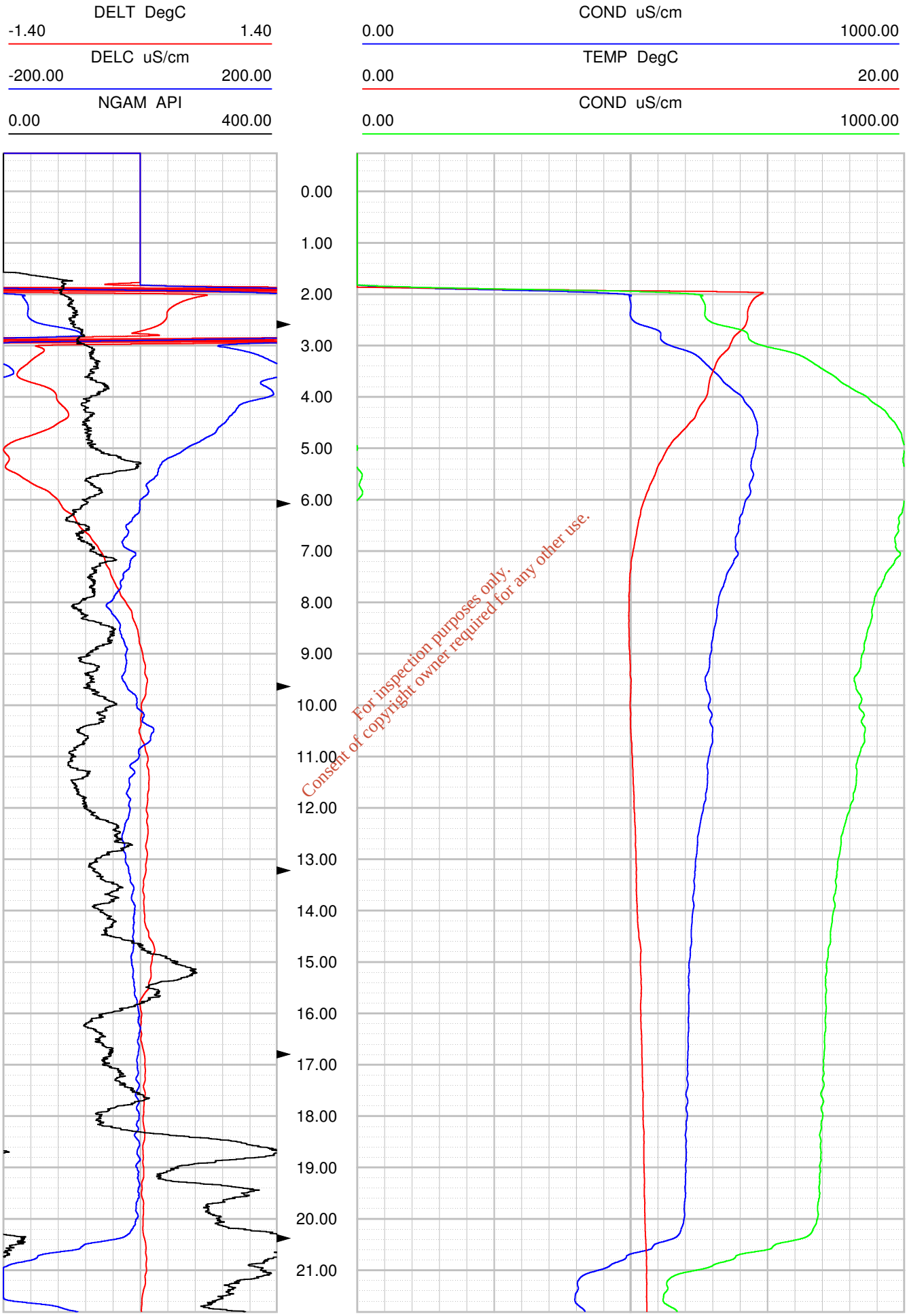
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

DATE	10 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	26.00	0.00	0.00
DEPTH LOGGER	0.00	0.00	0.00
LOG DEEPEST	21.82	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	1.8		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH26\BH26 TE..

ROBERTSON GEOLOGGING TECHNOLOGY



DELT DegC		DELT DegC	
-1.40	1.40	-1.40	1.40
DELC uS/cm		DELC uS/cm	
-200.00	200.00	-200.00	200.00
NGAM API		NGAM API	
0.00	400.00	0.00	400.00

COND uS/cm		COND uS/cm	
0.00	1000.00	0.00	1000.00
TEMP DegC		TEMP DegC	
0.00	20.00	0.00	20.00
COND uS/cm		COND uS/cm	
0.00	1000.00	0.00	1000.00

Depth: 21.00 m Date: 10 Jul 2013 Time: 11:15:46 File: "C:\Winlogger\Data\Murphy Enviromental\BH26\BH26 TEMPERATURE CONDUCTIVITY.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Induction

COMPANY	Murphy's Environmental Holywood
WELL	BH27
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

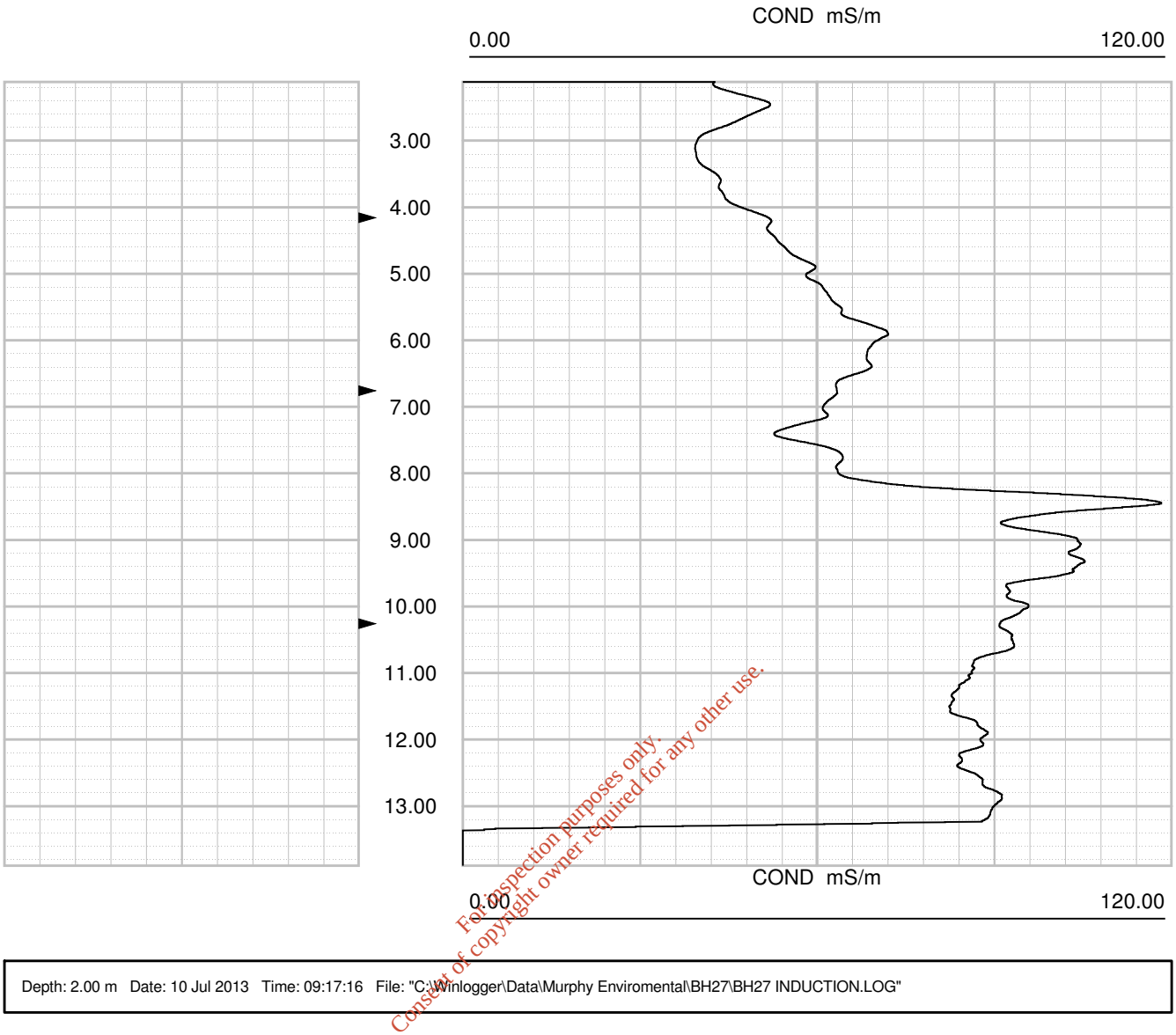
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

DATE	10 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	14.00	0.00	0.00
DEPTH LOGGER	13.90	0.00	0.00
LOG DEEPEST	13.90	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	3.6		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH27\BH27 IND..

ROBERTSON GEOLOGGING TECHNOLOGY



Depth: 2.00 m Date: 10 Jul 2013 Time: 09:17:16 File: "C:\Winlogger\Data\Murphy Enviromental\BH27\BH27 INDUCTION.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Temperature Conductivity

COMPANY	Murphy's Environmental Holywood
WELL	BH27
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

DATE	10 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	14.00	0.00	0.00
DEPTH LOGGER	0.00	0.00	0.00
LOG DEEPEST	11.68	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	3.6		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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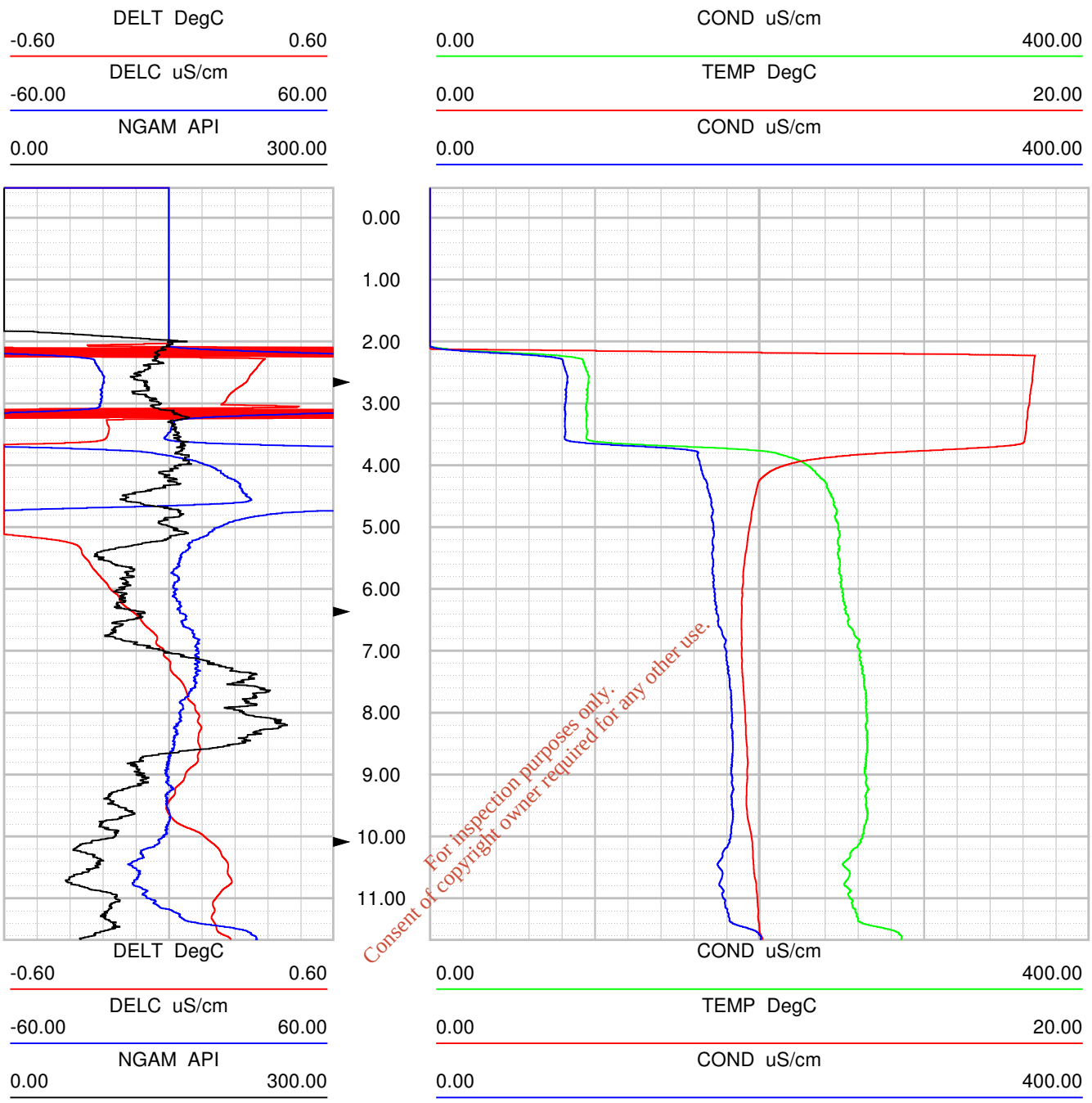
ROBERTSON GEOLOGGING TECHNOLOGY



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ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Induction

COMPANY	Murphy's Environmental Holywood
WELL	BH28
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

DATE	09 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	40.00	0.00	0.00
DEPTH LOGGER	40.05	0.00	0.00
LOG DEEPEST	40.05	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	23.8		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
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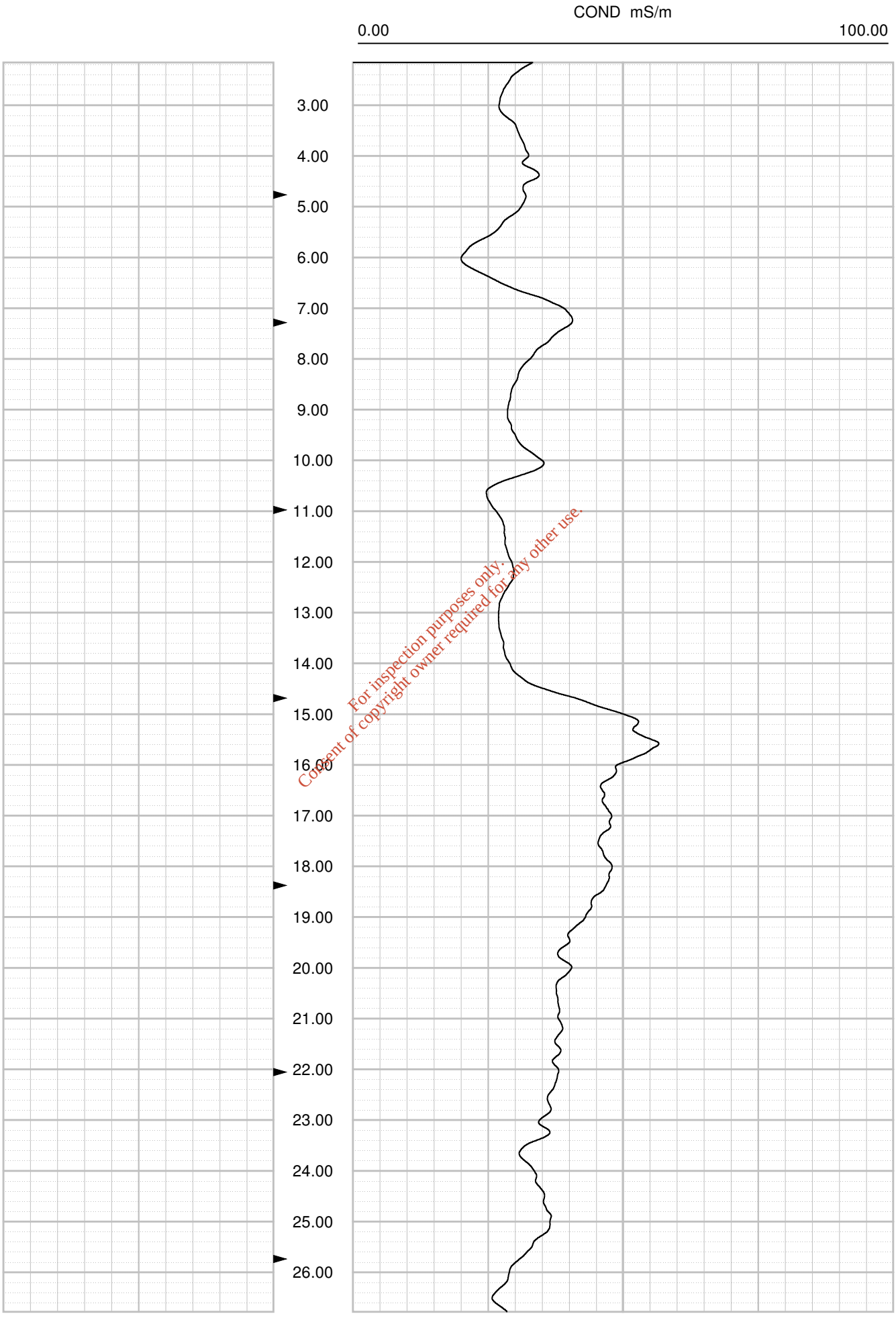
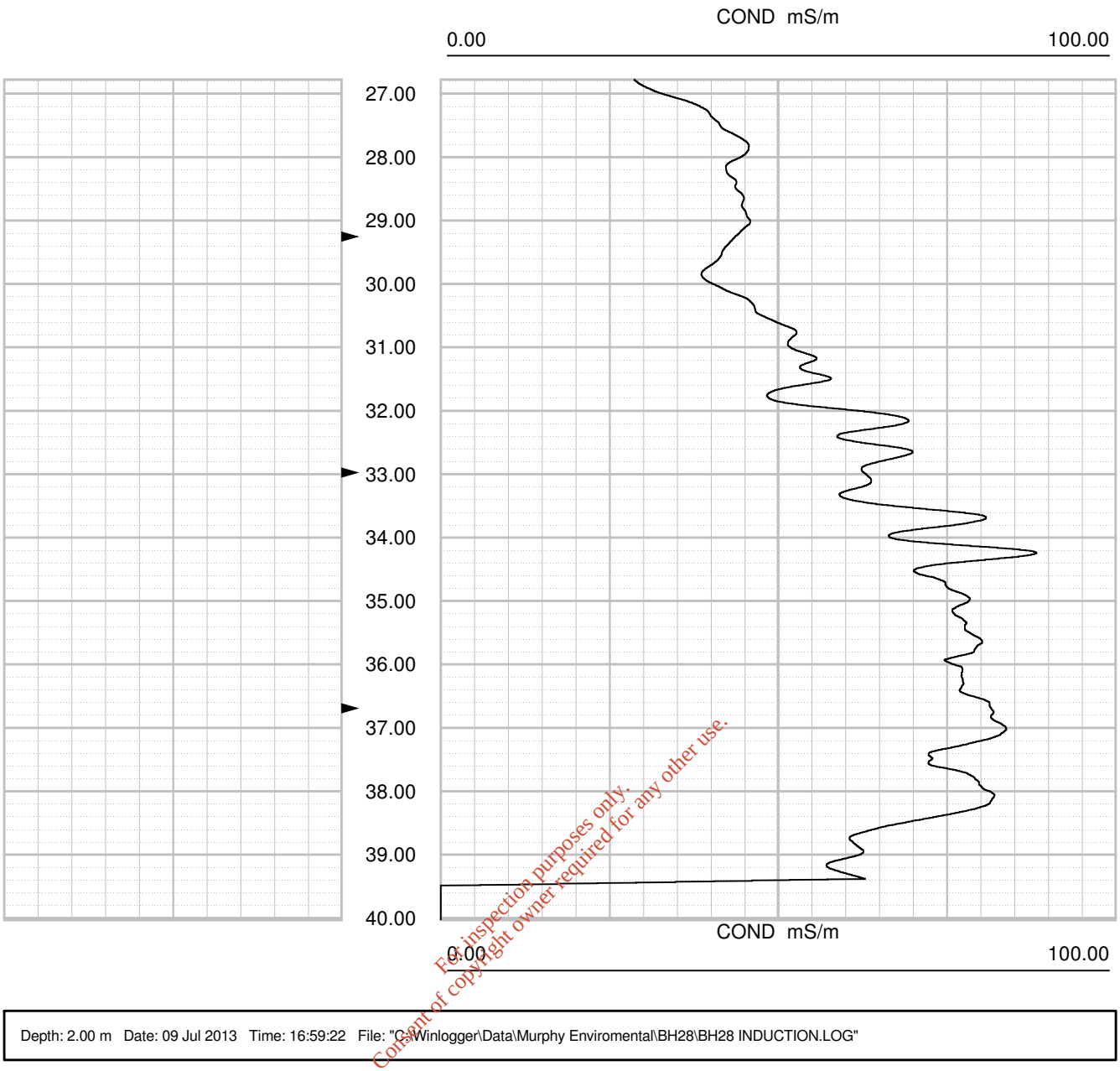
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH28\BH28 IND..

ROBERTSON GEOLOGGING TECHNOLOGY





Depth: 2.00 m Date: 09 Jul 2013 Time: 16:59:22 File: "C:\Winlogger\Data\Murphy Enviromental\BH28\BH28 INDUCTION.LOG"

ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Temperature Conductivity

COMPANY	Murphy's Environmental Holywood
WELL	BH28
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

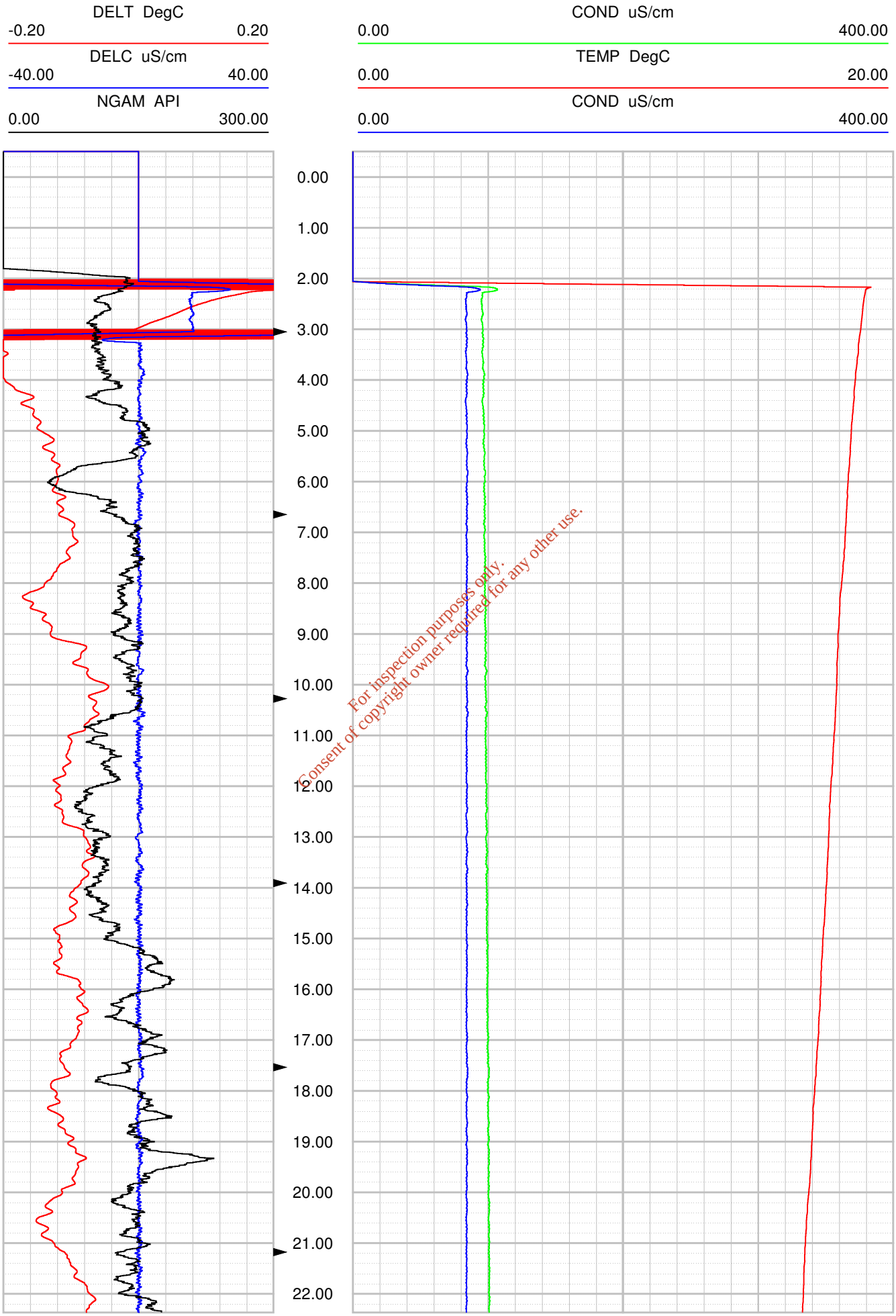
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

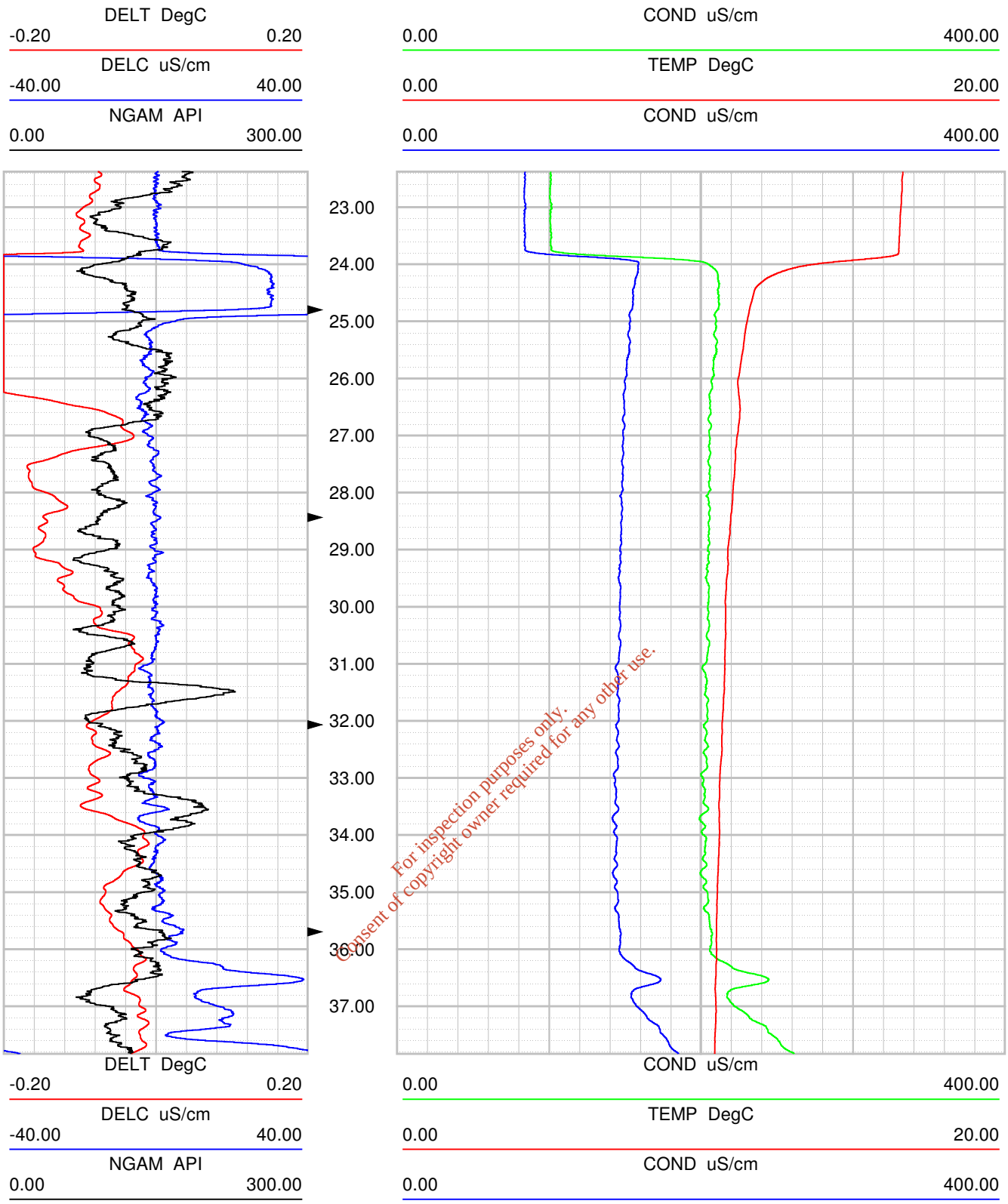
DATE	09 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	37.00	0.00	0.00
DEPTH LOGGER	0.00	0.00	0.00
LOG DEEPEST	37.84	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	23.8		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH28\BH28 TE..

ROBERTSON GEOLOGGING TECHNOLOGY





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ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Induction

COMPANY	Murphy's Environmental Holywood
WELL	BH29
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

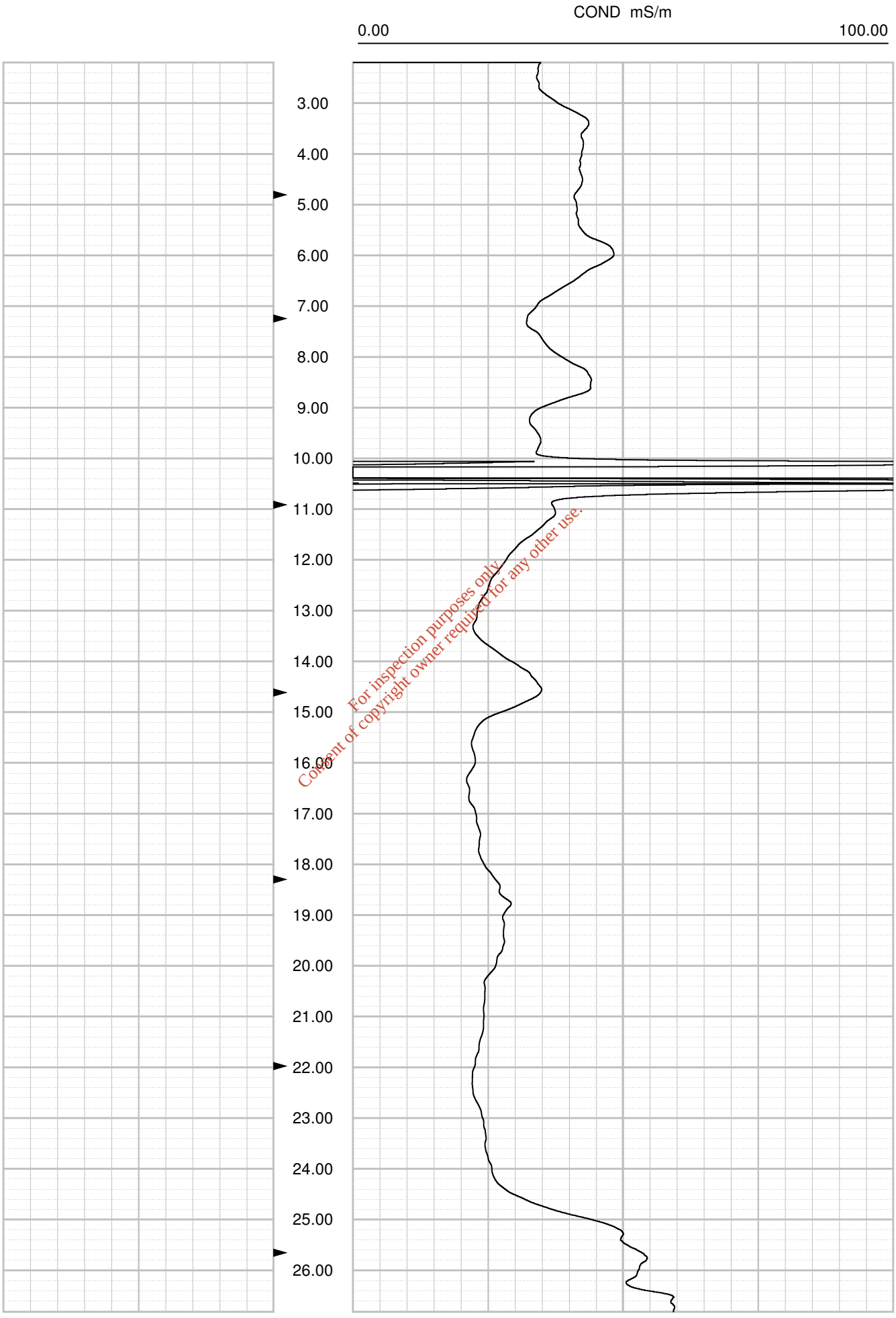
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

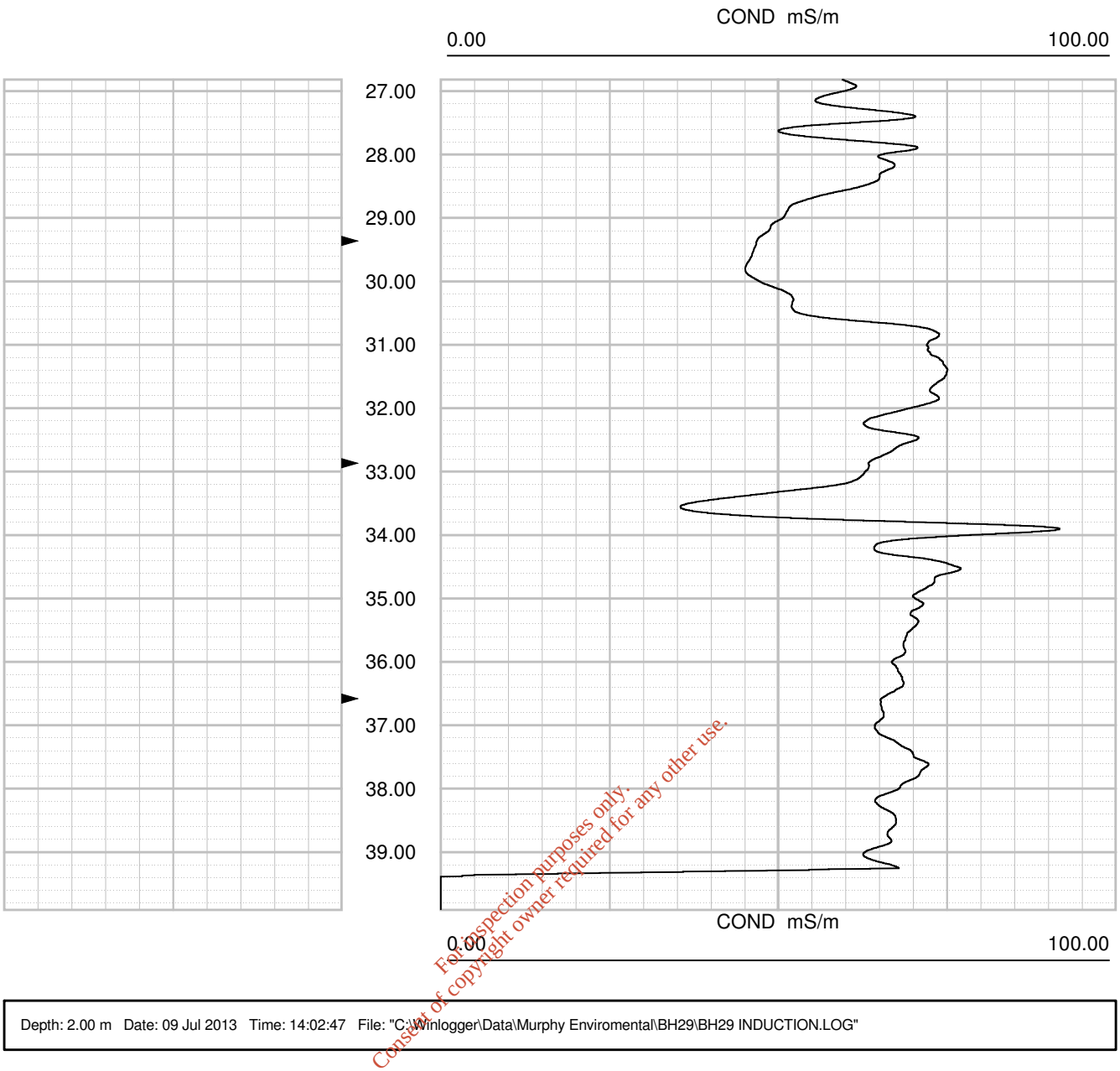
DATE	09 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	52.00	0.00	0.00
DEPTH LOGGER	39.93	0.00	0.00
LOG DEEPEST	39.93	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	22.1		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH29\BH29 IND..

ROBERTSON GEOLOGGING TECHNOLOGY





ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Temperature Conductivity

COMPANY	Murphy's Environmental Holywood
WELL	BH29
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

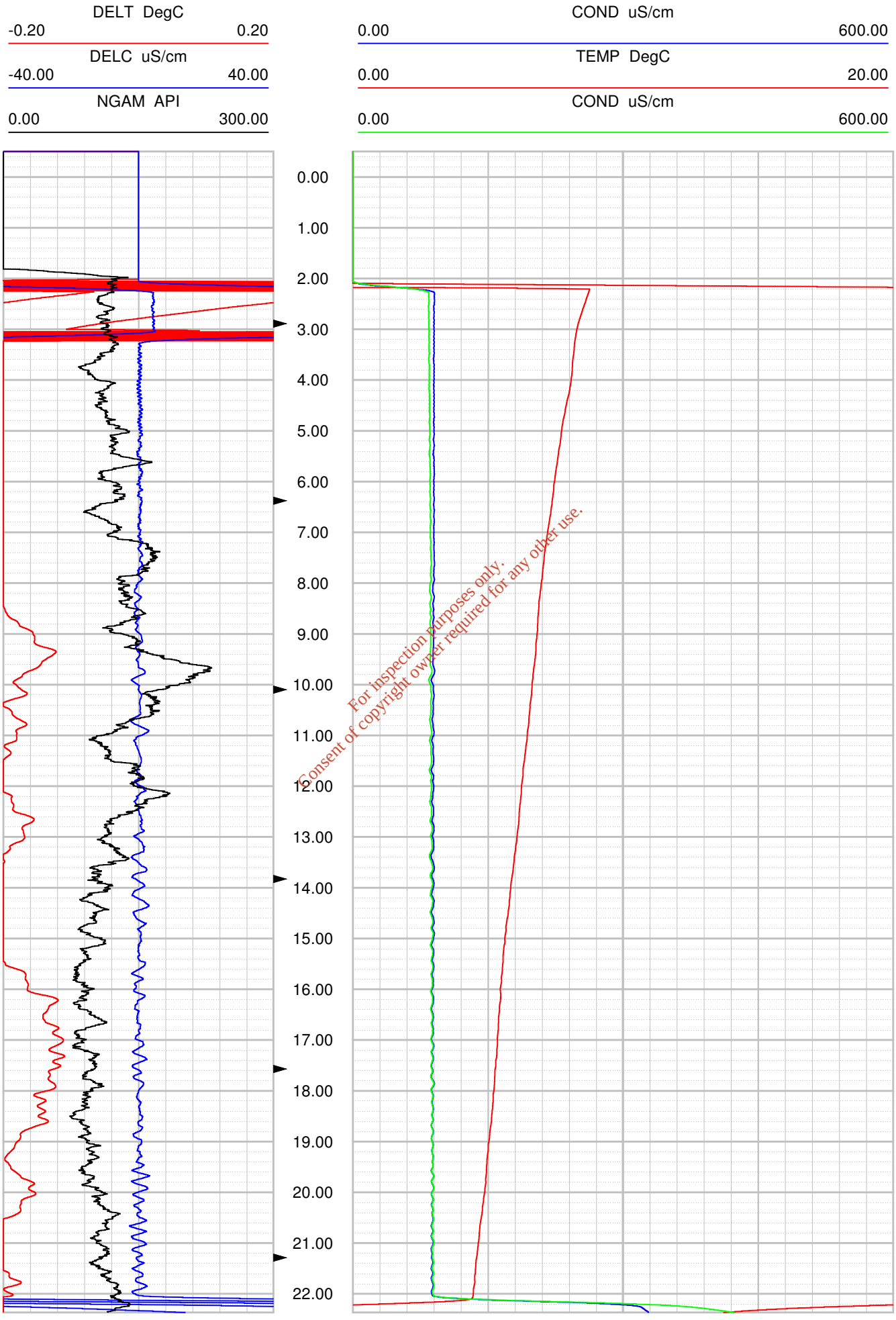
DATE	09 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	52.00	0.00	0.00
DEPTH LOGGER	0.00	0.00	0.00
LOG DEEPEST	37.68	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	22.1		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

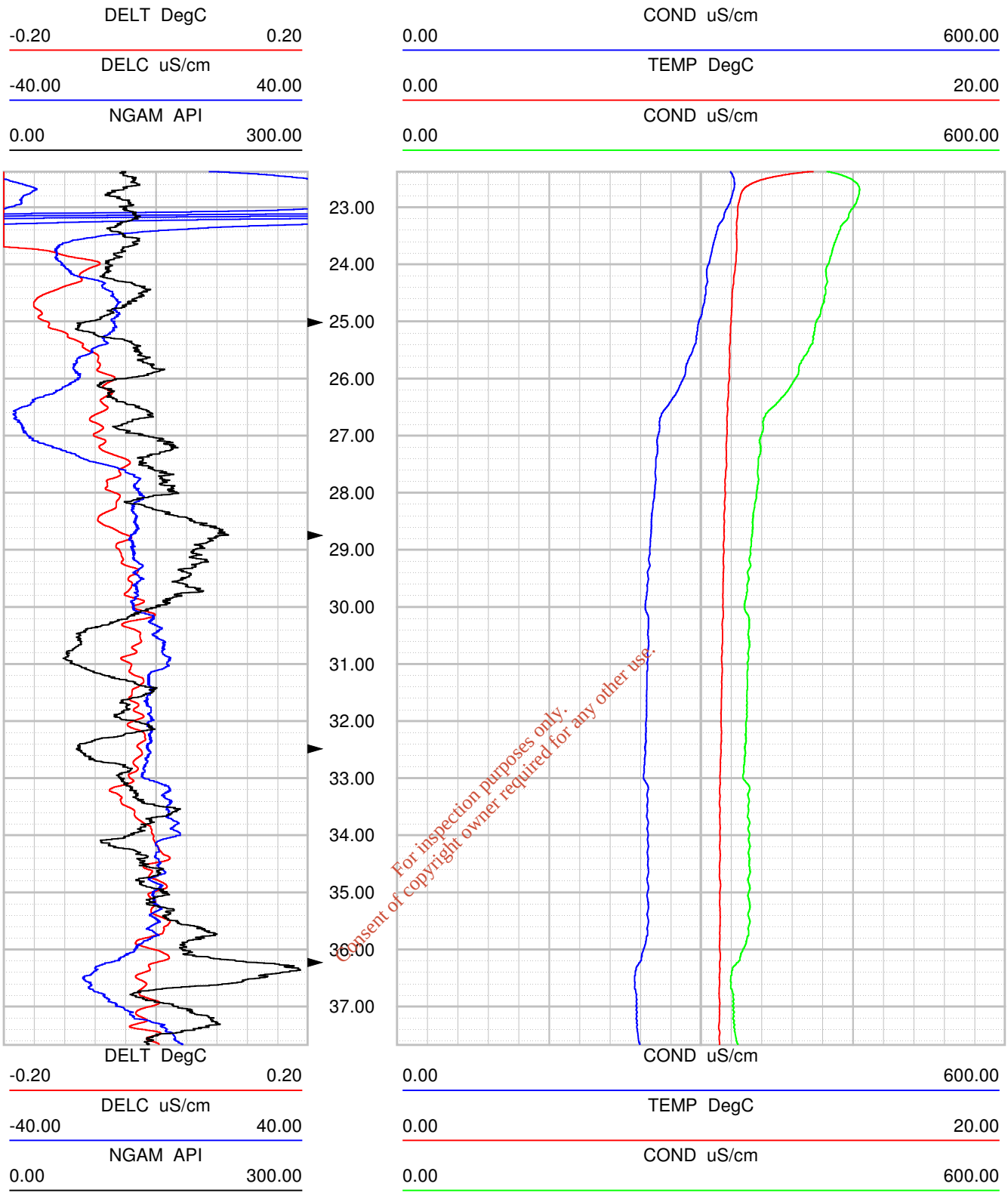
RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH29\BH29 TE..

1365

ROBERTSON GEOLOGGING TECHNOLOGY





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ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Induction

COMPANY	Murphy's Environmental Holywood
WELL	BH30
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

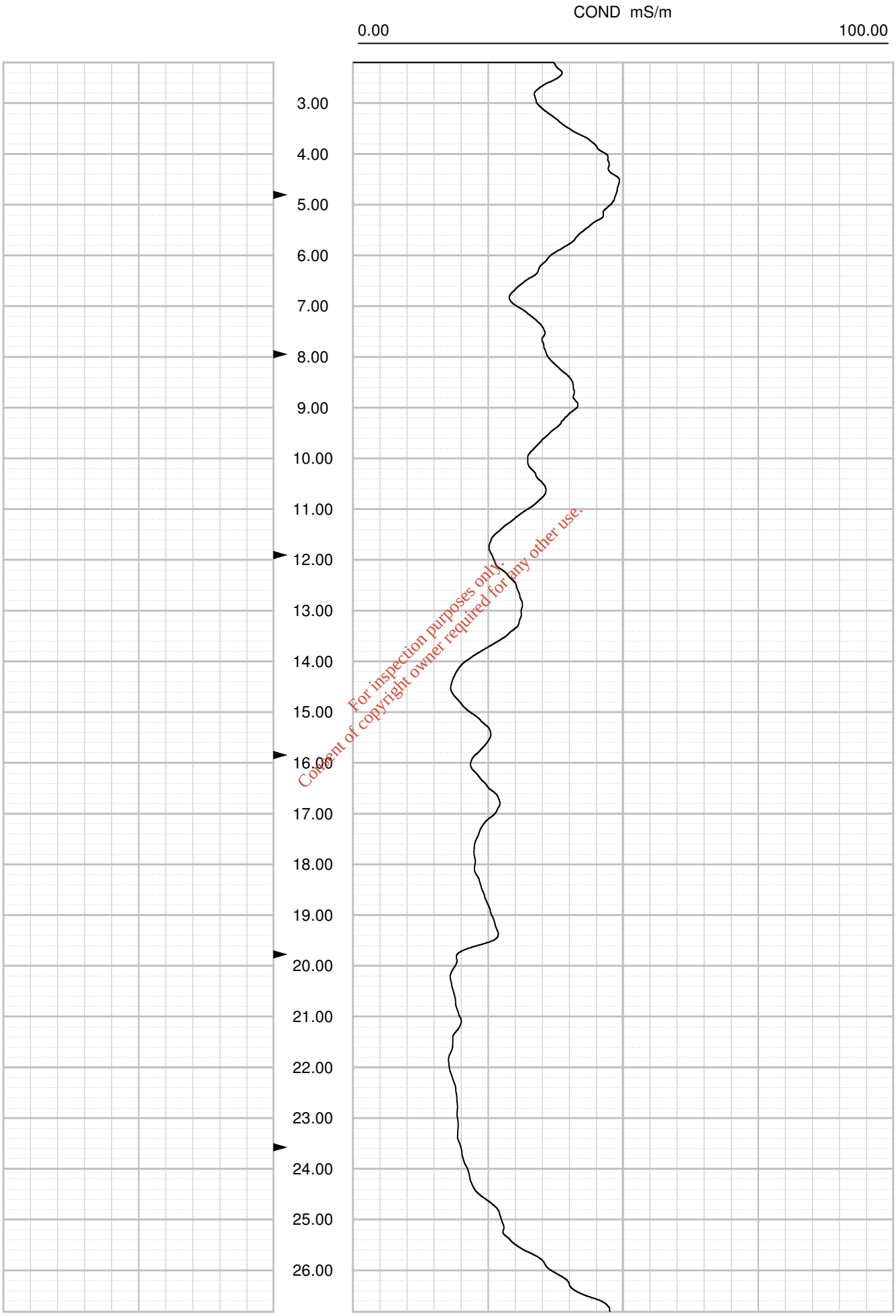
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

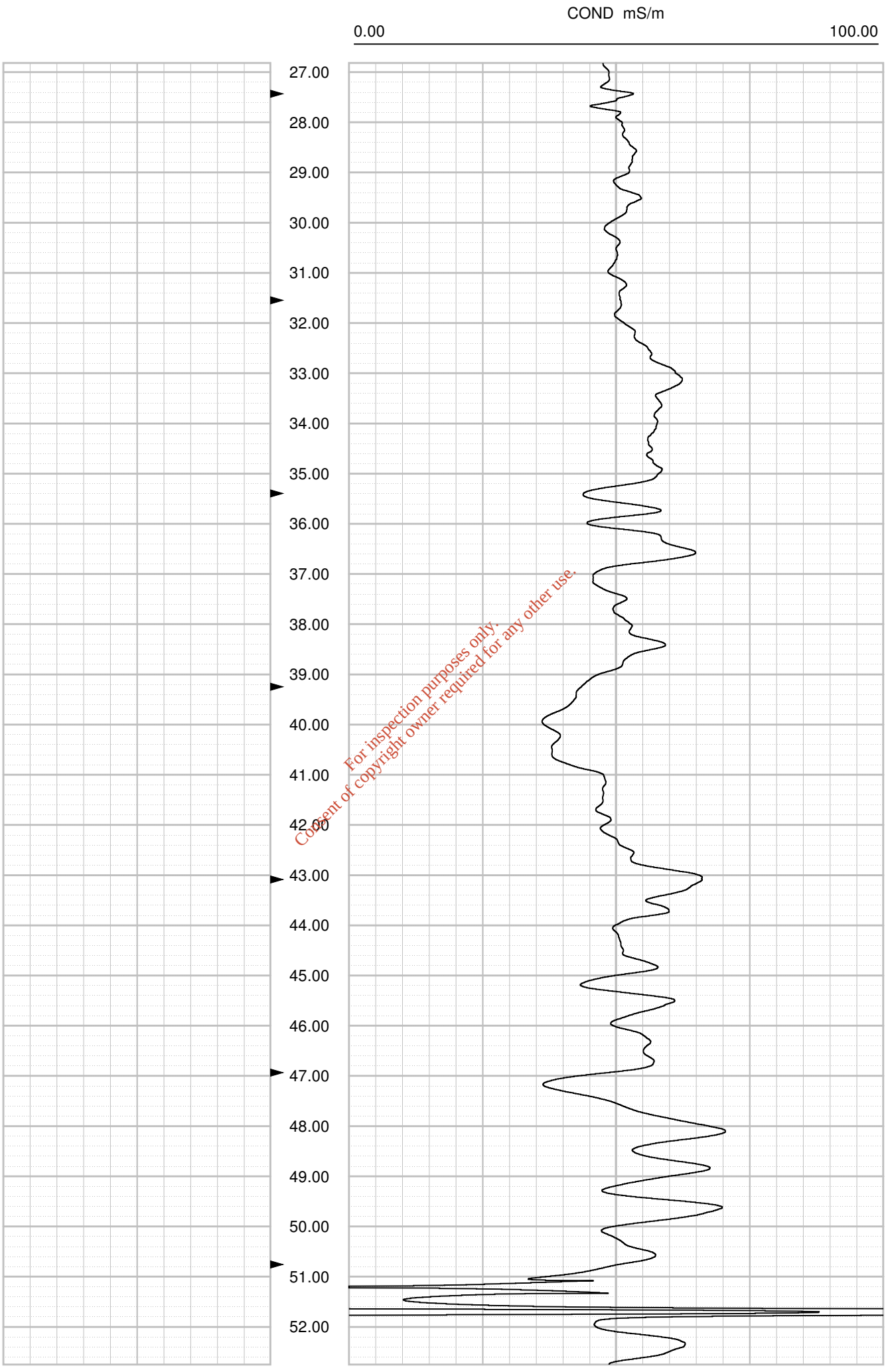
DATE	09 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	INDS		
DEPTH DRILLER	61.70	0.00	0.00
DEPTH LOGGER	61.02	0.00	0.00
LOG DEEPEST	61.02	0.00	0.00
LOG SHALLOW	2.50	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	22		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

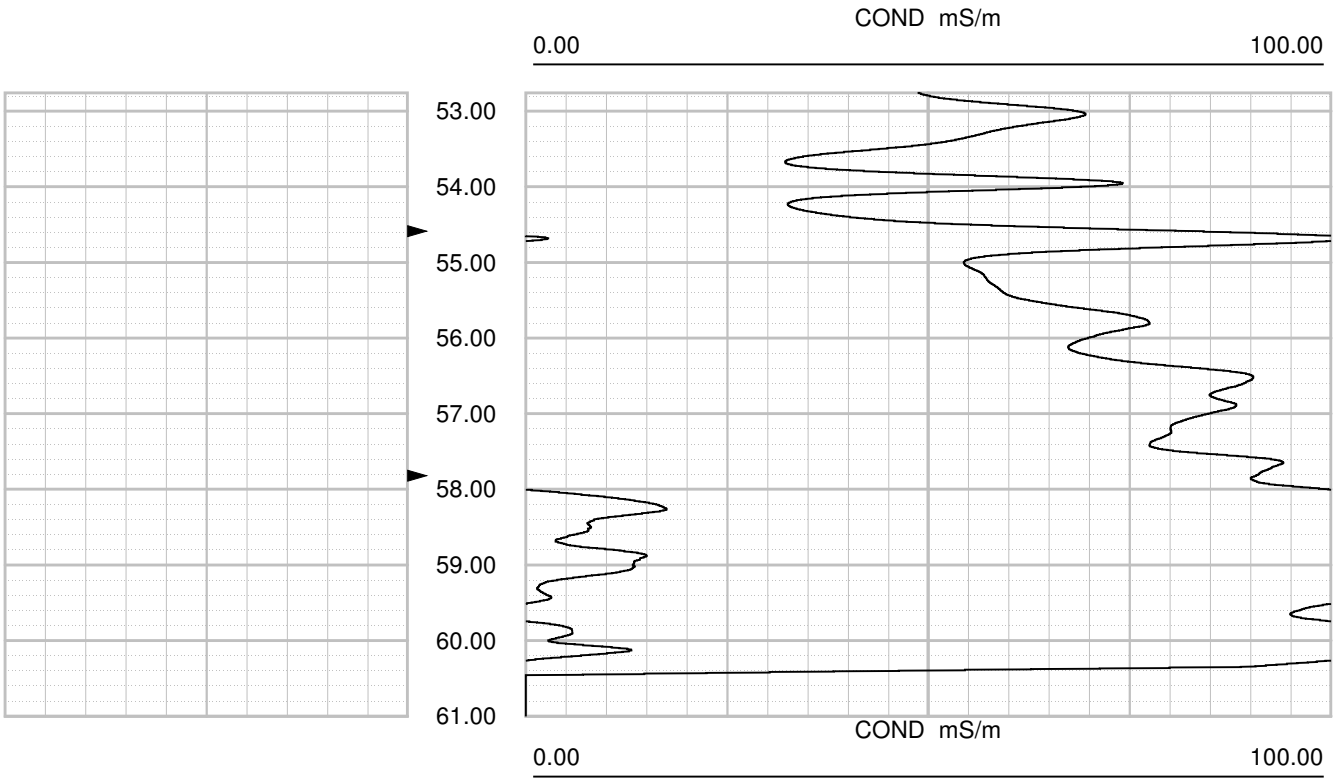
RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH30\BH30 IND..

ROBERTSON GEOLOGGING TECHNOLOGY







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ROBERTSON GEOLOGGING LIMITED

Integrated Waste Management Facility

Temperature Conductivity

COMPANY	Murphy's Environmental Holywood
WELL	BH30
FIELD	Murphy's Quarry
COUNTRY	
STATE	
COUNTY	Dublin
LAT.:	
LONG.:	

OTHER SERVICES

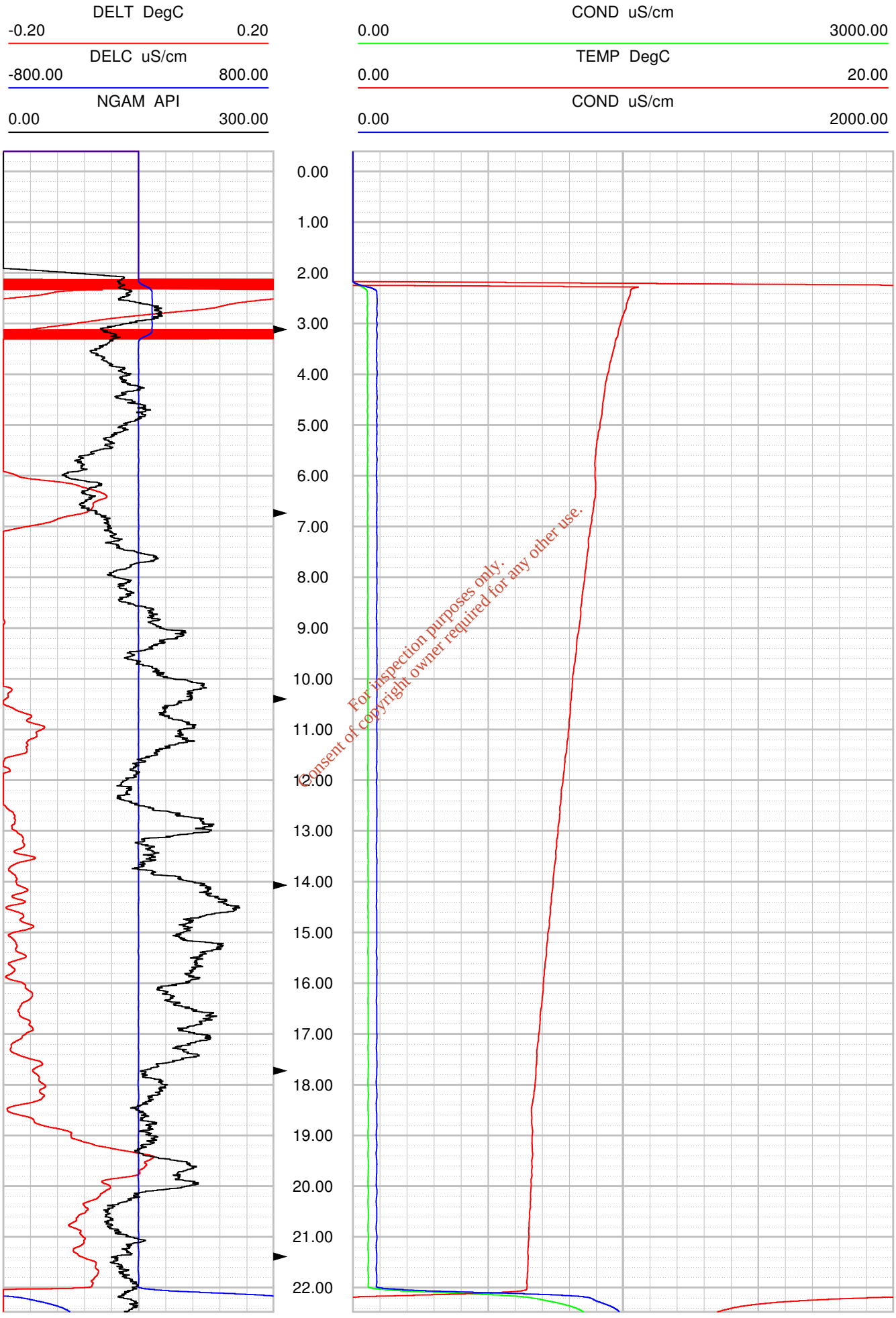
Perm. Datum	GL	Elev	KB 0.00
Log. Datum	Ground Level		DF 0.00
Drill Datum			GL 0.00

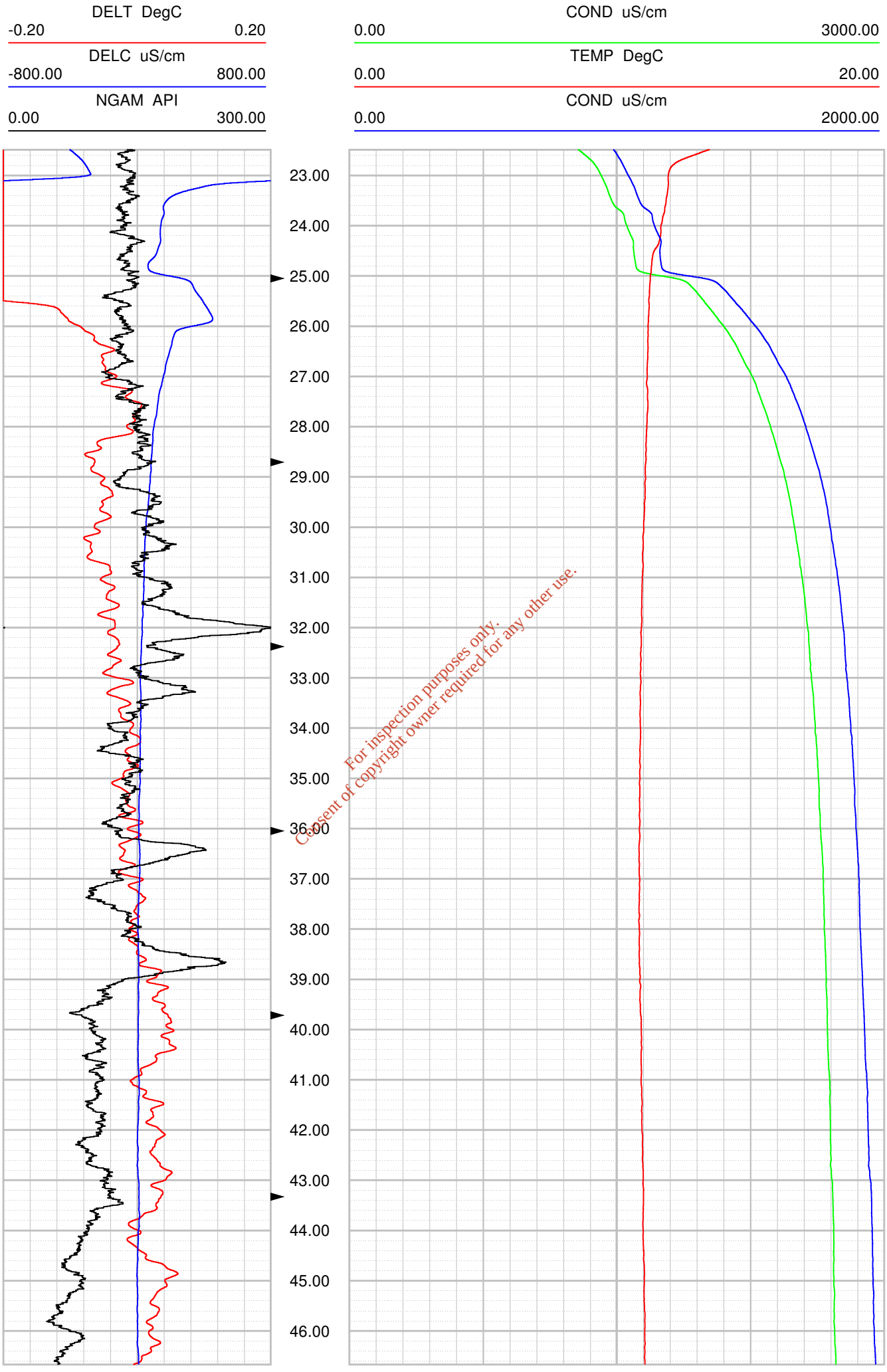
DATE	09 Jul 1	01 May 1	01 May 1
RUN#	0	0	0
TYPE OF LOG	TCDS		
DEPTH DRILLER	61.70	0.00	0.00
DEPTH LOGGER	0.00	0.00	0.00
LOG DEEPEST	59.24	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	Water		
SALINITY			
DENSITY			
LEVEL	22		
MAX TEMP ℃	0.00	0.00	0.00
RIG TIME			
RECORDED BY	RW		
WITNESSED BY			

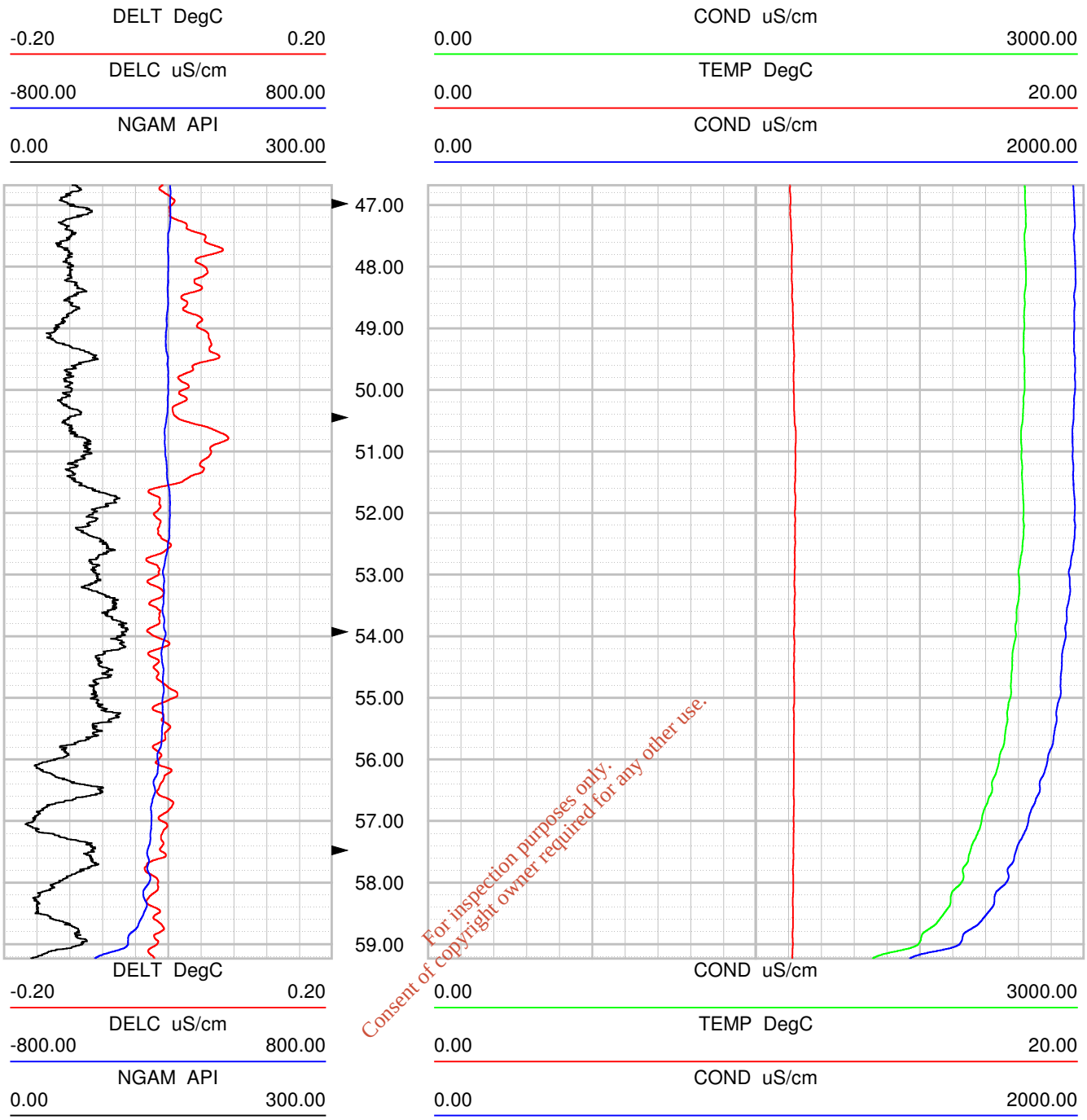
RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

REMARKS (C:\Winlogger\Data\Murphy Enviromental\Process\BH30\BH30 TE..

ROBERTSON GEOLOGGING TECHNOLOGY







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Appendix G

Palaeontology

PETROGRAPHY
KARST & CAVES
BIOSTRATIGRAPHY
GEOTHERMAL ENERGY

CONODATE GEOLOGY

7 Dundrum Business Park
Windy Arbour
Dublin 14, Ireland
email: conodate@mac.com

Report No. 2013/23

To Murphy Environmental Hollywood Ltd.

Report on
Drillcore samples from

MEHL -24, -30

Nag's Head
Holywood Great
Co. Fingal

EurGeol Gareth Ll. Jones
BSc, MSc, PGeo

25 September 2013

Introduction

Discussion was conducted over two MEHL drillcores MEHL-30, MEHL-24. 2 micropalæontology samples and 5 possible palynology samples were taken. These were processed and are reported below.

Summary Results

Sample	Depth(m)	Stage	Biozone	Fossils	Method
MEHL 24					
	40.7m	Viséan or younger		M	Paly
	44.4m	Viséan or younger		Pa	Paly
	46.7m	Viséan or younger		M	Paly
MEHL 30					
	56.7m	late Asbian – Brigantian	Cf6γ-δ	F	TS
	58.05m	Chadian – Brigantian or younger	Cf4-6 (+)	F	TS
	59.4m	Viséan or younger		M	Paly
	61.1m	Viséan or younger		M Sc	Paly

F = Foraminifera, M = Miospore, Pa= Palynomorph, Sc = Scolecodont;
HS = Hand Specimen, Paly = Palynology, TS = Thin Section.

Summary of Palynology Results

Palynomorphs exhibit a high Thermal Alteration Index (TAI) which makes identification near impossible.
WELL MEHL 24
40.70m, 44.0m, 46.70m All are Viséan or younger, with a high TAI and a palæoenvironment indicating possible marine with definite terrestial influence
WELL MEHL 30
59.40m , 61.10m. All are Viséan or younger, with a high TAI and a palæoenvironment indicating possible marine with definite terrestial influence, whilst 61.10m is definitely marine with terrestial influence.

Comment

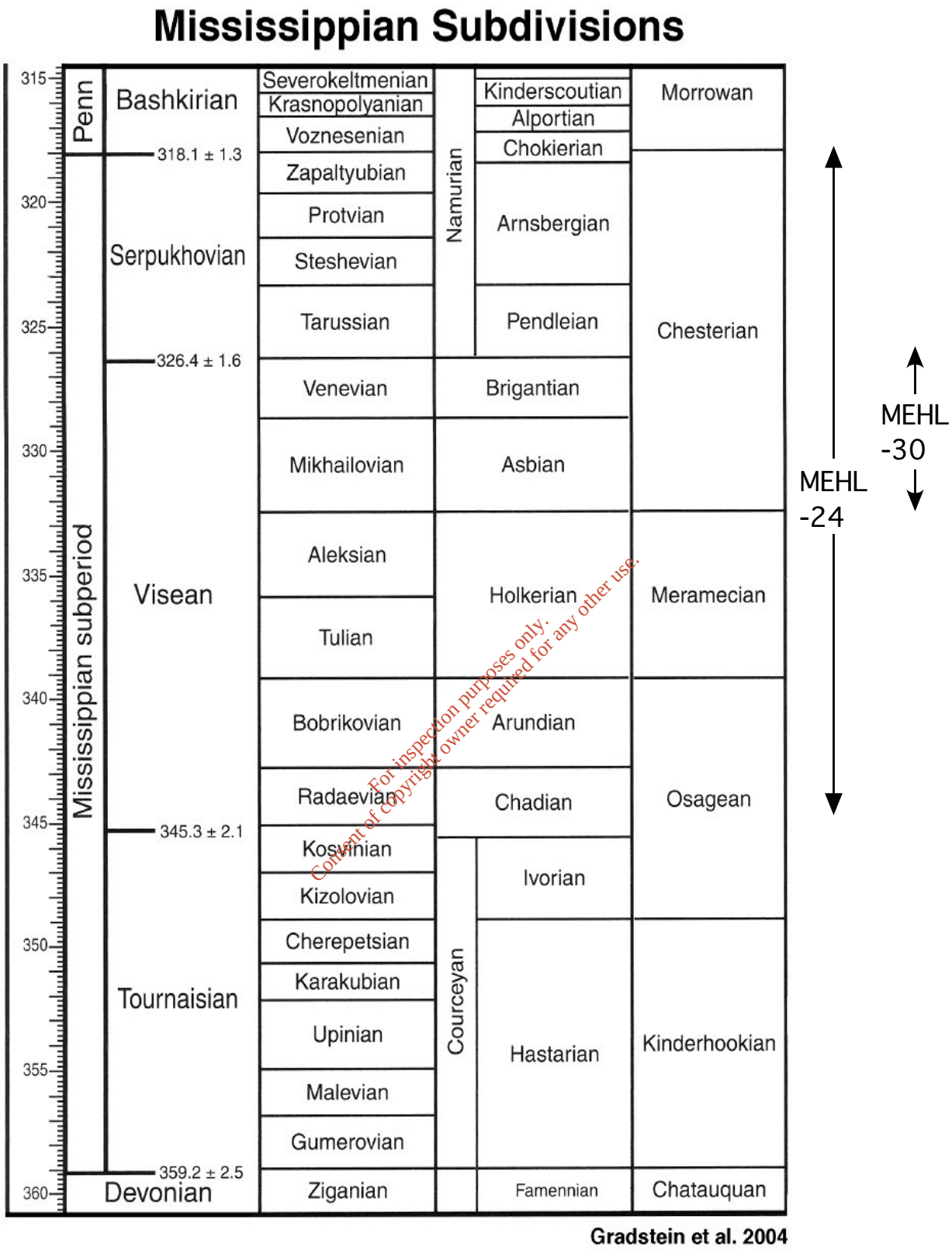
Micropalæontology results from MEHL 30 are late Asbian – Brigantian, consistent with the Loughshinny Formation. The palynology results are in line with these findings, confirming the marine setting for the shales interbedded with limestones

In MEHL 24 we agreed on the inherent problems with being definitive with the lithology. The palynology gives broad ranging Viséan or younger results, and indicate a strong terrestrial influence. This is in keeping with the younger lithologies of the Donore, Balrickard or Walshestown Formations.

MEHL DRILLCORE SAMPLING

MEHL-24 drillcore.
Samples taken at 40.7m, 44.4m, 46.7m.

MEHL-30 drillcore.
Samples taken at 56.7m, 58.05m, 59.4m, 61.1m



Position of drillcore samples relative to the Mississipian correlation chart

Detailed Micropalæontology and Petrography

MEHL 30 56.7m, 58.05m Thin Section

See Appendix I for Palynology Results
MEHL 24 40.7m, 44.4m, 46.7m
MEHL 30 59.4m, 61.1m

MEHL 30

56.7m

HAND SPECIMEN

Grey, fine-grained limestone and coarse-grained bioclastic limestone.

THIN SECTION

Petrography :

Medium-grained wackestone / packstone with gravel-grained bioclasts, occasional silicification of bioclasts. ~1mm calcite veins cross the lithology perpendicular to bedding

Bioclasts :

Gastropods, brachiopods, crinoids,

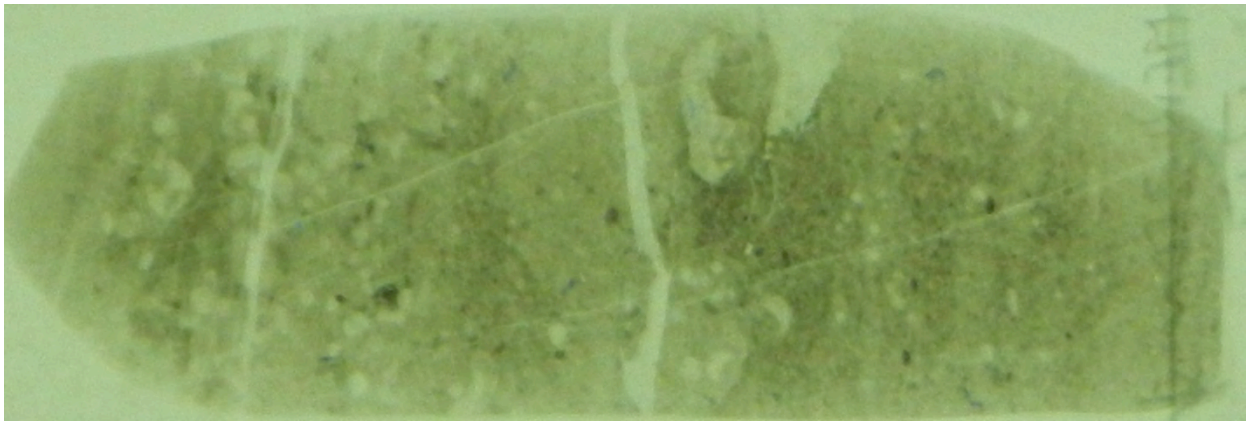
Foraminifera :

Archædiscids at angulatus stage, somewhat altered
Archædiscus aff. *varsanofievæ*
? Pseudoendothyra
Koskinotextularia ?cribriformis
? Quasiendothyra
Mediocris sp.
Pseudotaxis sp.
Endothyra sp.
Earlandia moderata

Calcispheres :

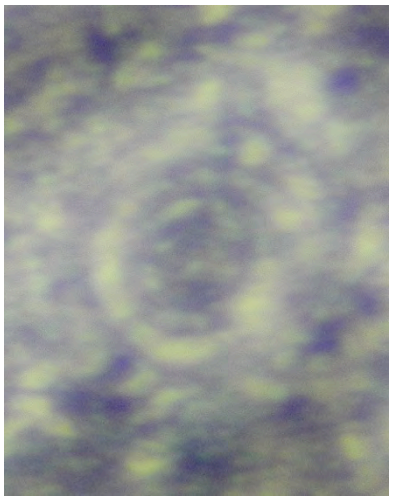
Archæsphæra sp. at spherical and tubal stages

Date : Cf6γ-δ, late Asbian – Brigantian

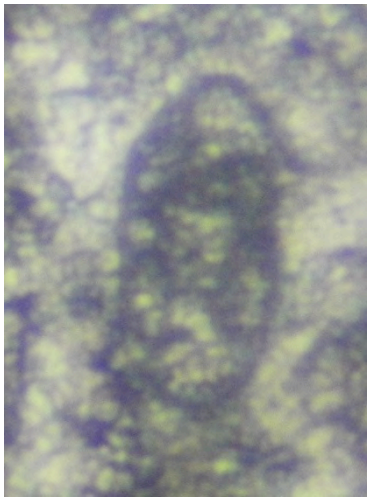


Thin section length 60mm

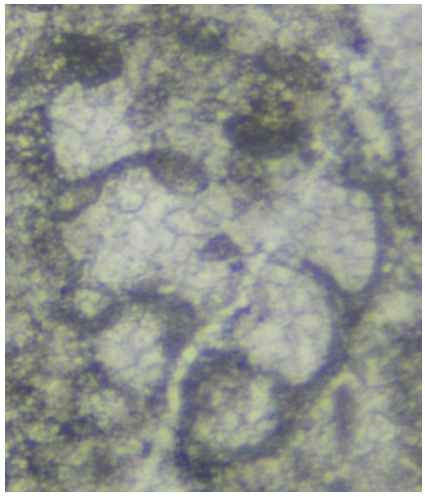
MEHL 30, 56.7m. Foraminiferal microphotographs



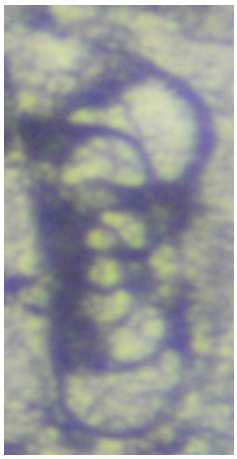
Archædiscus



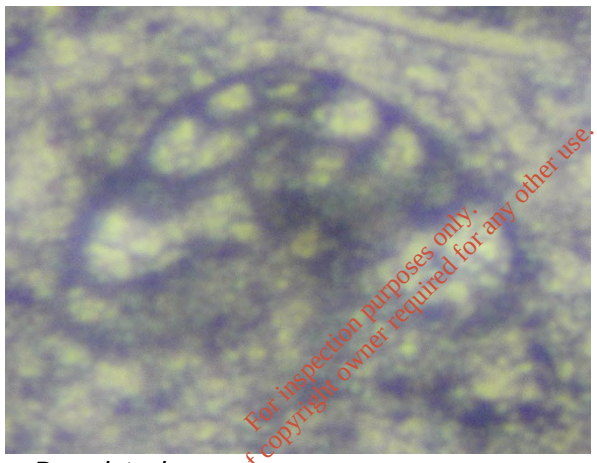
? Pseudoendothyra



Koskinotextularia

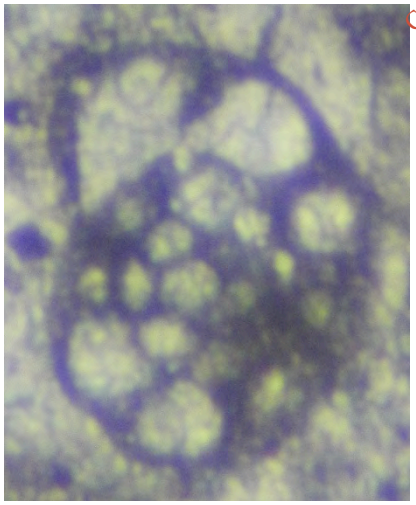


?Quasiendothyra

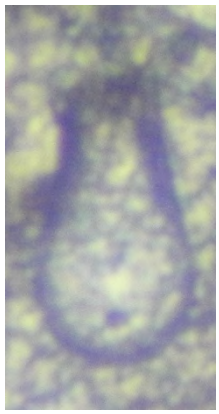


Pseudotaxis

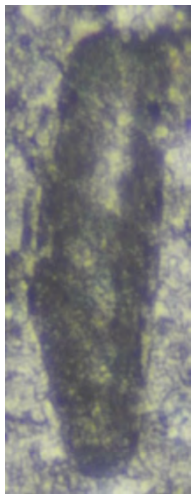
Endothya ?laxa



Endothyra



Earlandia minor



Earlandia vulgaris

MEHL 30

58.05m TS

HAND SPECIMEN

Medium-grey, fine-grained limestone with 9mm calcite vein.

THIN SECTION

Petrography :

Fine to medium- grained wackestone. A large calcite vein >5mm width at one end of the thin section, Fine <0.05mm calcite veins also present.

Bioclasts :

Bioclastic hash, crinoid, spicules, ostracods

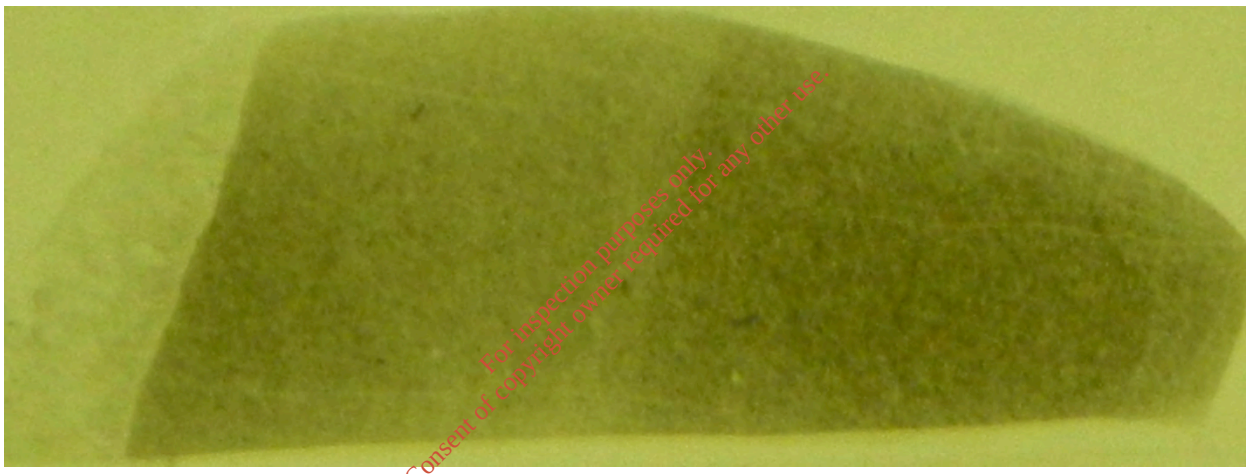
Foraminifera :

Very small and indistinct
Pseudoammodiscus sp.
Mediocris sp.
Multilocular foraminifer

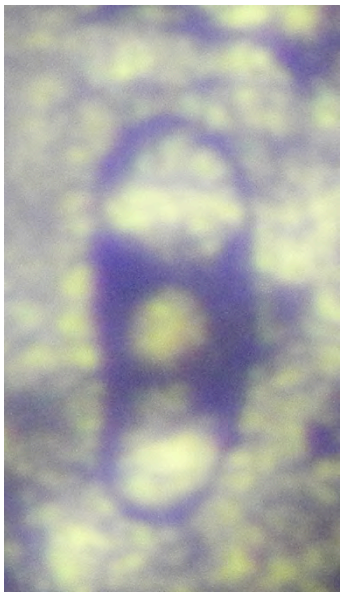
Calcispheres :

Archæsphæra sp. at spherical, tubal, post-diplospheric stages

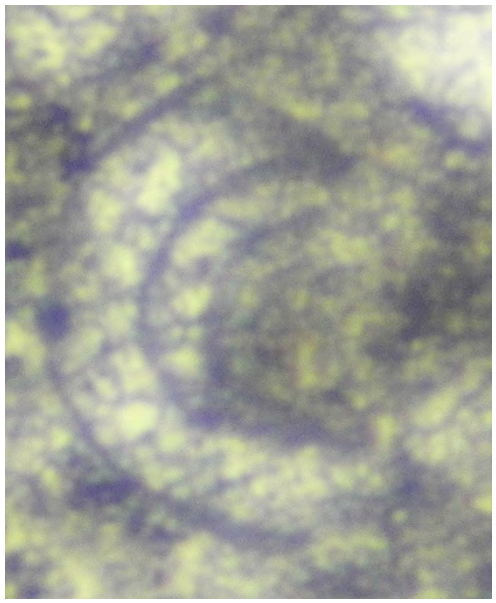
Date : Cf4-6 (+), Chadian – Brigantian or younger



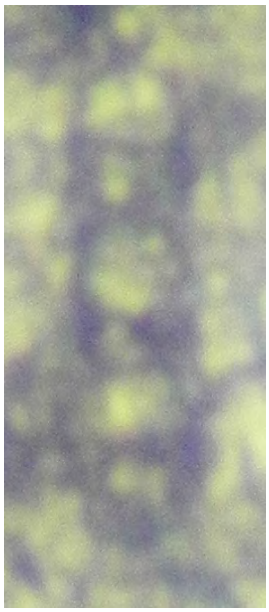
Thin section length 50mm



Mediocris



Pseudoammodiscus



Multilocular foraminifer

APPENDIX I

wellstrat
SERVICES LIMITED

REPORT NO. 620/0713/02

A PALYNOLOGICAL STUDY OF FIVE CORE SAMPLES FROM WELLS MEHL 24 AND MEHL 30, IRELAND

PREPARED FOR

CONODATE

AUGUST 2013

CONTENTS

1.0 INTRODUCTION

This report presents the results and interpretation of a palynological analysis of five core samples from two wells, MEHL 24 and MEHL 30, from Ireland; supplied by Conodate.

The samples analysed are as follows:

MEHL 24	40.70m core
MEHL 24	44.40m core
MEHL 24	46.70m core
MEHL 30	59.40m core
MEHL 30	61.10m core

The samples were given routine HF acid treatment to release the organic material. However, a single treatment had little effect on the samples so further treatment was undertaken. The organic residues were subsequently treated with nitric acid to act as an oxidation agent. Slides were prepared for microscopic examination.

As very few identifiable palynomorphs were recovered no distribution chart has been prepared. The recovered palynomorphs are listed in Section 4 of this report. Comments on the palynodebris are presented for each sample.

Personnel
Expert involved in this study:

James Keegan Project co-ordination, analysis and report preparation.

2.0 STRATIGRAPHICAL SUMMARIES

2.1 WELL MEHL 24

Age	Age
Carboniferous, Viséan or younger	40.70m core - 46.70m core

2.2 WELL MEHL 30

Age	Age
Carboniferous, Viséan or younger	59.40m core - 61.10m core

3.0 STRATIGRAPHICAL DISCUSSION

3.1 WELL MEHL 24

INTERVAL: 40.70m core - 46.70m core

AGE: Carboniferous, Viséan or younger.

PALAEOENVIRONMENT: Indeterminate. No marine palynomorphs were recorded. The identified palynomorphs are of terrestrial origin. The amount of black woody tissue would generally suggest a position close to a terrestrial source but not exclusively so. However, because of the high Thermal Alteration Index (TAI), as discussed below, the potential that saline forms occur within these samples cannot be totally excluded, accordingly an indeterminate palaeodepositional setting is assigned.

PALYNOLOGY: The palynomorphs recovered from these samples all have high maturity levels making identification problematic. Some of the palynomorphs also display poor preservation. The presence of single specimens of the miospore *Lycospora pusilla* at 40.70m core and 46.7m core indicates an age no older than Viséan. *L. pusilla* has a stratigraphical range of Viséan to basal Permian, although they are generally rare in the Permian. Rare poorly preserved miospores occur in all 3 samples from this interval. Abundant black sub-rounded - rounded material is present in all 3 samples. The general shape show similarities to palynomorphs, however, the possibility that they are rounded black woody material cannot be excluded. If palynomorphs they have a Thermal Alteration Index (TAI) of 7.

KEROGEN: Recovery of organic matter was good in these 3 samples. The samples yielded abundant palynomaceral 4 (P4, black wood) and degraded P4/saperopelic organic material (SOM). It is unclear if the degraded P4/SOM is the result of mechanical or bacterial breakdown.

STRATIGRAPHICAL COMMENTS: A Carboniferous, no older than Viséan age is assigned by the absence of any possible identifiable Permian or younger forms and the presence of *L. pusilla* in 2 of the 3 microfloras.

3.2 WELL MEHL 30

INTERVAL: 59.40m core - 61.10m core

AGE: Carboniferous, Viséan or younger.

PALAEOENVIRONMENT: 59.40m core: Indeterminate. The identified palynomorphs are of terrestrial origin. The amount of black woody tissue would generally suggest a position close to a terrestrial source but not exclusively so. However, because of the high Thermal Alteration Index (TAI), as discussed below, the potential that saline forms occur within these samples cannot be totally excluded.

61.10m core: Marine, probably near shore.

PALYNOLOGY: As with the MEHL 24 well the palynomorphs recovered from these 2 samples have high maturity levels and some poor preservation making identification problematic. The presence of rare Densosporites spp. and ?Lycospora spp. at 59.40m core suggests a Carboniferous age and probably no older than Viséan. A definite *Lycospora pusilla* occurs at 61.10m together with rare Densosporites spp. indicates a Carboniferous, Viséan or younger age. Rare scolecodonts were recovered at 61.10m core, if *in situ* and not reworked, these suggest a marine palaeodepositional setting as scolecodonts are generally considered to occur in marine strata. Rare poorly preserved miospores occur in both microfloras with slightly greater numbers than in the MEHL 24 well. Abundant black sub-rounded - rounded material is also present in both samples. As with MEHL 24 well the general shape show similarities to palynomorphs, however, the possibility that they are rounded black woody material cannot be excluded. If palynomorphs they have a Thermal Alteration Index (TAI) of 7.

KEROGEN: Recovery of organic matter was good in both these samples. The samples yielded abundant palynomaceral 4 (P4, black wood) with subordinate degraded P4/SOM and rarer SOM. It is unclear if the degraded P4/SOM and SOM are the result of mechanical or bacterial breakdown.

4.0 PALYNOMORPH RECOVERY

4.1 WELL MEHL 24

4.1.1 Sample 40.70m core

Lycospora pusilla	1
Poorly preserved palynomorphs	9
Black sub-rounded - rounded material/?palynomorphs	190

4.1.2 Sample 44.40m core

Poorly preserved palynomorphs	12
Black sub-rounded - rounded material/?palynomorphs	188

4.1.3 Sample 46.70m core

Lycospora pusilla	1
Poorly preserved palynomorphs	8
Black sub-rounded - rounded material/?palynomorphs	80

4.2 WELL MEHL 30

4.2.1 Sample 59.40m core

Densosporites spp.	2
?*Lycospora* spp.	3
Poorly preserved palynomorphs	14
Black sub-rounded - rounded material / ?palynomorphs	88

4.2.2 Sample 61.10m core

Densosporites spp.	2
Lycospora pusilla	1
Poorly preserved palynomorphs	24
Scolecodont	2
Black sub-rounded - rounded material/?palynomorphs	171

Appendix H

Pumping Test

Contents

H Pumping test

H1.1 Outline

H1.1.1 Pumping test

Pumping tests are conducted to obtain information about the hydraulic characteristics of an aquifer. They involve pumping groundwater out of a well at a known pumping rate and monitoring groundwater levels in the pumping well and monitoring wells in the surrounding area. These values can then be substituted into an appropriate well-flow equation to obtain a value for the hydraulic conductivity of the aquifer.

Information about the aquifer can also be gained by measuring the recovery of water levels after pumping has ceased. It is often difficult to maintain a constant pumping rate during constant yield tests and in practice recovery tests are considered more reliable (Kruseman and de Ridder, 2000).

A pumping test was conducted in BH17 (the pumping well) at the MEHL site as part of the hydrogeological site investigation in July 2013. The pumping test was split into the following phases:

1. **Constant Rate Test 1** - An abandoned 6-hour constant rate discharge test on Tues, July 9, 2013;
2. A 16.5 hour recovery period between Tues and Wed, July 9 and 10, 2013;
3. **Constant Rate Test 2** - A 7-day constant rate discharge test commenced on Wed, July 10, 2013;
4. **Recovery Test** - A 24-hour recovery test on Wed, July 17, 2013.

H1.2 Site set up

The pumping test was set up and carried out by Seamus A. Kelly & Sons with staff from Arup on site to approve set up and to supervise the commencement of the constant yield test.

A 4" pump was installed to a depth of approximately 40 m below ground level in the pumping well, BH17. The pump had a nominal maximum output of ca. 600m^3/d. The pump was powered by a mobile diesel electrical generator. A pipe was run from the pumping well on the floor of the excavation to a settlement pond on the northern edge of the site, so that the discharge from the pumping test would not re-enter the aquifer in the vicinity of the observation boreholes and affect the water levels. The water in the settlement ponds eventually drains to the stream to the north of the site.

Groundwater monitoring was undertaken in all monitoring wells located on the site. Electronic data loggers were installed in the following wells: BH4A, BH05, BH06, BH08, BH09, BH10A, BH11A, BH12, BH13, BH14, BH15A, BH25, BH28, BH29 and BH30. The

loggers operate when submerged by recording the pressure of the column of water above the logger. The data is retrieved from the logger once it is removed from the well.

The electronic data loggers were targeted in the wells surrounding the site, where changes in groundwater levels were anticipated to be small and the level of accuracy required therefore greater. A barometric logger was also on site to record and correct for changes in barometric pressure. Accounting for changes in barometric pressure is important for the wells at distance from the pumping well (where the influence from pumping could be minimal) and where Barometric Efficiency (BE) is potentially high (changes in atmospheric pressure transferred to groundwater levels).

In case of failure of the loggers and to check that the loggers were recording true groundwater levels, manual measurements of the drawdown were also taken by staff from Seamus A. Kelly & Sons using a dipmeter. The data loggers were not removed between tests, therefore continuous data is available from the 9 to 18 July, 2013.

The drawdown in the other wells on site, namely; BH17, BH24, BH26 and BH27, were measured manually by staff from Seamus A. Kelly & Sons during the pumping tests.

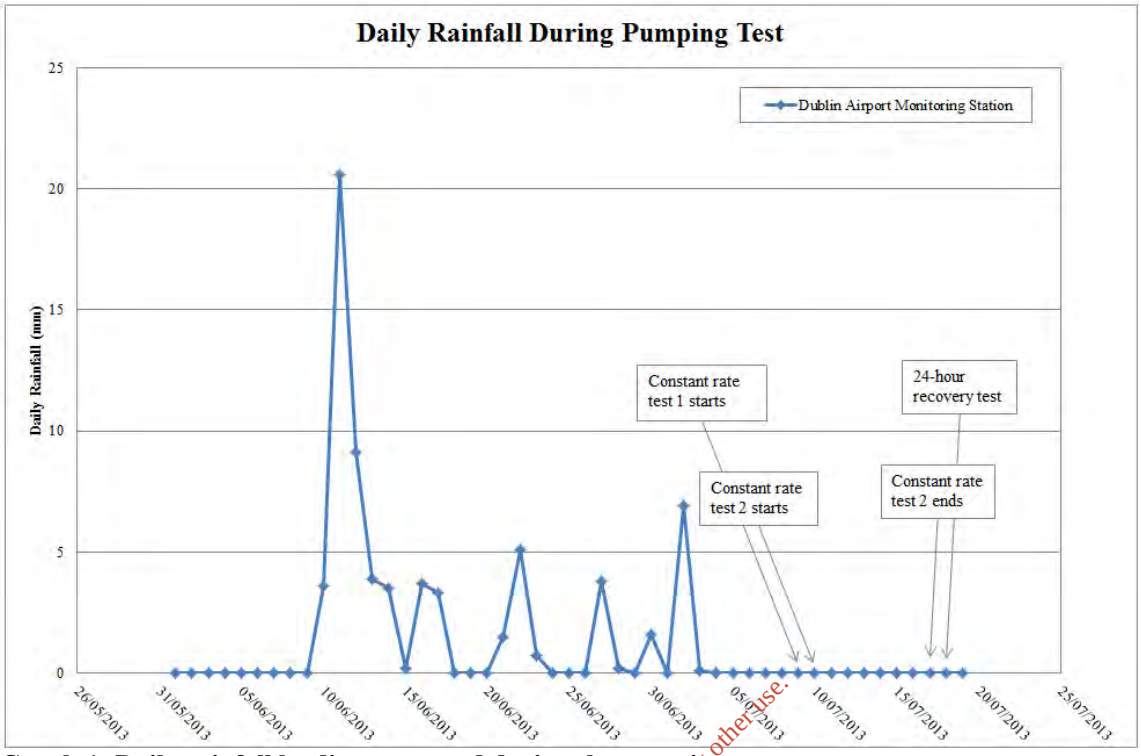
H1.3 Rainfall

Rainfall data recorded at Dublin Airport (ca. 18km from the site) in the time leading up to, and during the pumping tests is presented in Graph 1 below.

The data shows that in June (the month before the pumping test started) there was a substantial precipitation event at the beginning of the month from 10 to 14 June, 2013 where 40.7 mm of rain fell. This was followed by minimal interspersed precipitation events until the 3 July, 2013.

During the first failed 'Constant rate test 1', the second 7-day 'Constant rate test 2' and the 24-hour recovery test there was no precipitation.

Due to the generally dry weather in the months prior to the pumping test, soil moisture deficits would have been moderate. Evapotranspiration rates are high at this time of year also, so a relatively low proportion of the precipitation events have the potential to recharge the groundwater.



Graph 1: Daily rainfall leading up to and during the pumping test

Infiltration rates on the site are low indicating that there is low recharge potential in this area. However, in the south-eastern corner of the site, the water level is present at the surface due to the depth of excavation and recharge may occur in this small area. The groundwater level data recorded by manual dips carried out by Arup during the installation of the new monitoring wells does indicate that recharge did occur in some wells in the period prior to the start of the pumping test during June 2013.

H1.4 Data quality

The pump failed during the **Constant rate test 1** (originally planned to run for 7-days). Water levels were allowed to recover for 16.5 hours and recovery data recorded before starting the test again. The failed test provides information on the early stage response of the aquifer.

In order to assess the impact of the drawdown due to pumping, as will be described below, the well test data had to be corrected to remove the effect of the natural fluctuations in the water table.

H1.5 Data presentation

The raw manual water level data for the pumping test is presented in **Appendix H1 – H4**. Data analysis was only undertaken data from Constant Rate Test 2, however all raw data is presented.

The data is presented in Excel and is separated into 'Constant Rate Test 1' data (including the recovery period before the second pumping test started) and 'Constant Rate Test 2' data (including the recovery period after the second pumping test).

Analysis of the data was undertaken using graphs presented in Excel and using the programme AQTESOLV. All graphs used are presented in **Appendix H5** and **H6.**

H1.6 Data correction

The data was corrected for natural fluctuation in water levels (i.e. those fluctuations not related to the pumping). The data was corrected by calculating the rate of natural recession for each well from all the monitoring data available prior to the start of the pumping test along with data collected after the pumping test.

It is clear from the monitoring data that the groundwater levels across the site were in natural recession owing to the dry and sunny conditions throughout the pumping test. In general, natural fluctuation was measured over the period from May to June 2013 for the pre-existing monitoring wells and over the period of the hydrogeological site investigation for the newly constructed boreholes. The average recession was calculated as approximately 0.05 m for each well over the course of the testing period.

This correction was then applied to the maximum drawdown reached by each borehole after 10,080 minutes of pumping (the point immediately before the pump was switched off). This data correction is summarised and presented in **Table 1** below.

Table 1: Maximum drawdown during the pumping test corrected for natural water table fluctuations for each borehole.

BH ID	Lithology	Distance from centre of pumping well (m)	Drawdown after 10,080 mins (m)	Correction due to normal fluctuation (cm)	Corrected drawdown after 10,080 mins (m)	Comments
BH5	Namurian	324.90	0.96	0.05	0.91	
BH6	Namurian	525.95	0.02	-	0.02	Artesian but riser pipe in place to allow measurement
BH8	Namurian	322.50	0.18	0.05	0.13	
BH9	Namurian	362.98	0.22	0.05	0.17	
BH11A	Namurian	401.43	0.02	-	0.02	Borehole cover damaged and accurate readings difficult
BH13	Namurian	359.29	0.25	0.05	0.20	
BH16	Namurian	225.35	0.93	0.05	0.88	
BH19	Loughshinny Fm	108.05	0.74*	0.05	0.69	

BH ID	Lithology	Distance from centre of pumping well (m)	Drawdown after 10,080 mins (m)	Correction due to normal fluctuation (cm)	Corrected drawdown after 10,080 mins (m)	Comments
BH20	Namurian	120.21	1.2*	0.05	1.15	
BH24	Namurian	260.15	0.89*	0.05	0.84	
BH26	Namurian	119.70	0.84*	0.05	0.79	
BH27	Namurian	40.90	1.74*	0.05	1.69	
BH28	Namurian	125.16	0.92	0.05	0.87	
BH29	Namurian	202.99	1.07	0.05	1.02	
BH12	Loughshinny Fm	364.17	0.11	0.05	0.06	
BH4A	Loughshinny Fm	489.31	0.01	-	0.01	Artesian but riser pipe in place to allow measurement
BH10A	Loughshinny Fm	409.95	0.15	0.05	0.10	
BH14	Loughshinny Fm	398.74	0.20	0.05	0.15	
BH15a	Loughshinny Fm	153.73	0.38	0.05	0.33	
BH18	Loughshinny Fm	83.97	1.88	0.05	1.83	
BH25	Loughshinny Fm	152.01	0.28	0.05	0.23	
BH30	Loughshinny Fm	188.28	1.14*	0.05	1.09	
BH20	Namurian and Loughshinny	120.21	1.2*	0.05	1.15	

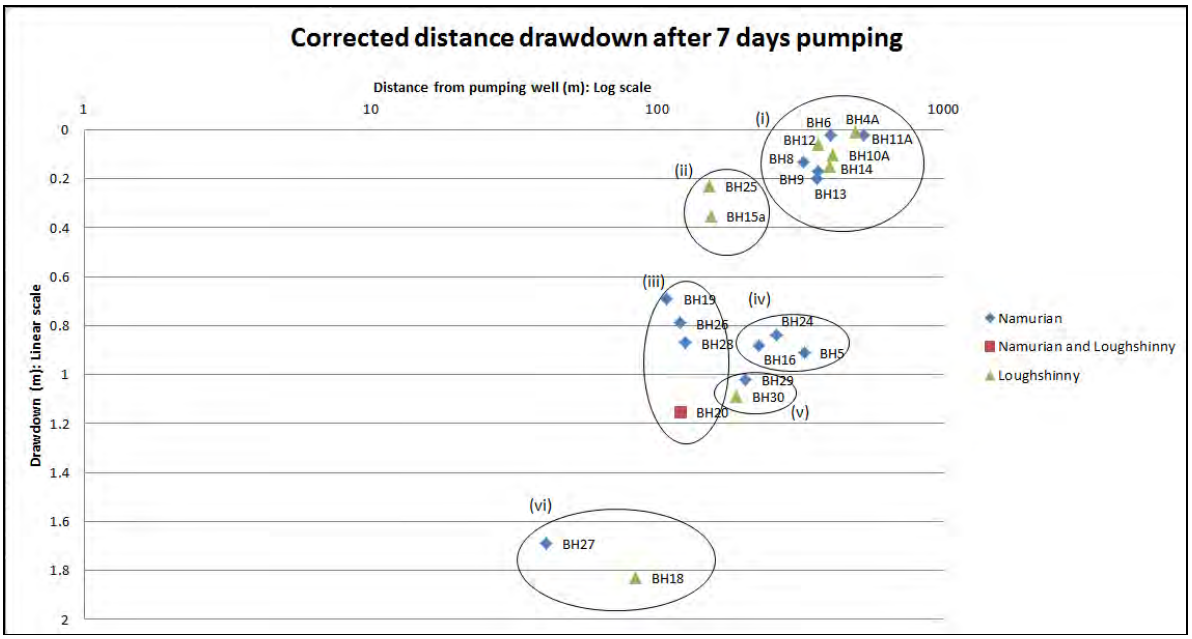
*Indicates total drawdown (m) calculated from dipmeter measurements

It can be seen in **Table 1** that once the correction was applied, the following boreholes were affected minimally by the pumping test: BH4A, BH6, BH8, BH9, BH10A, BH12, BH13 and BH14. It should be noted that BH4A, BH6 and BH11A are artesian. Riser pipes were installed in BH6 and BH4A to allow the measurement of groundwater levels before and during the pumping test. The head works of BH11A are damaged and the results likely to be unreliable.

H2 Distance-drawdown analysis

During initial compilation and examination of the constant rate well test data it was apparent that the response to pumping was quite different in some of the wells. A semi-log plot of the corrected observation well data showed a difference in response to pumping (a difference in slope) across the wells. This was subsequently confirmed by plotting the drawdown in each of the observation wells as a distance-drawdown plot as shown below in **Figure 5**.

Graph 2: Corrected distance-drawdown graph



This graph displays both those monitoring wells which have their response zone in the Namurian deposits and those which have their response zone in the Loughshinny Formation. **Figure 6** of the main report shows the location of all wells on the site relative to the geological faults which were mapped.

The following monitoring wells were affected by the pumping test and are featured in **Figure 5**: BH5, BH8, BH9, BH10a, BH12, BH13, BH14, BH15a, BH16, BH18, BH19, BH20 BH24, BH25, BH26, BH27, BH28, BH29 and BH30. As outlined in **Table 1**, BH4a, BH6, BH10a, BH11a, BH12, BH13 and BH14 exhibited negligible response to pumping.

From this graph, six groupings of monitoring wells can be identified which display similar hydrogeological properties. These are: (i) BH4a, BH6, BH10a, BH11a, BH12, BH13 and BH14, (ii) BH25 and BH15a, (iii) BH20, BH19, BH26 and BH28, (iv) BH5, BH16 and BH24, (v) BH29 and BH30, and (vi) BH27 and BH18.

Group (i)

These wells (BH4a, BH6, BH10a, BH11a, BH12, BH13 and BH14) are distributed around the site but were generally located too far from the pumping well to exhibit any influence of pumping over the course of the week.

Group (ii)

BH25 and BH15a are located to the south of BH17. BH25 is located on the eastern side of the N-S trending fault and BH17 is located on the western side of the N-S trending fault. Both wells are located to the south of the E-W trending faults.

The similarity in drawdown in these wells and their position on either side of the faults indicates that the N-S fault is not hindering groundwater flow as originally thought.

Less drawdown was observed in these wells than in some of the wells that are at a greater or similar distance (from the pumping well). This may indicate that the E-W fault may be hindering flow to some degree.

It should also be noted that the curve analysis discussed further on indicates that the drawdown in these wells is behaving differently.

Group (iii)

BH19, BH20, BH26 and BH28 have been grouped together due to their similar response to pumping. BH20 could also tentatively be grouped on its own as it does exhibit more drawdown than the other wells.

BH19, 20 and BH26 are located to the north of the E-W fault and the west of the N-S fault. BH28 is located to the south of the E-W fault and to the east of the N-S fault.

The similarities in the responses in these wells and their different locations relative to the faulting and the pumping well indicates that groundwater is being drawndown the faults during pumping.

Group (iv)

BH5, BH16 and BH24 are located to the north of the pumping well on the northern side of the E-W trending fault. BH5 and BH16 are located to the west of the N-S fault. BH24 is located to the east of the N-S fault on the map, however during drilling vertical fractures were encountered indicating this well may be in a fracture zone.

In the previous investigation BH16 and BH5 were also grouped together due to their similar behaviour during pumping and it was thought this was due to the presence of a shallow fracture zone. BH24 appears to be connected to this faulting during pumping as during pumping water appears to be moving through the faults.

Group (v)

BH29 and BH30 have a very similar slope to group (iv) but have been grouped separately because these wells were constructed as a well pairing. BH29 and BH30 are on the western side of the Apex mapped N-S trending fault.

Micropalaeontology confirmed that a Loughshinny contact was encountered at a depth of 55.7mbgl in BH30 (Jones, 2013). The response zone for BH30 was shortened to make a best attempt at ensuring that the well was sealed within the Loughshinny formation. There is an upward vertical hydraulic gradient between BH29 and BH30 indicating that a good seal was achieved.

BH29 and BH30 exhibit similar response to pumping indicating that during pumping groundwater is being drawdown in both formations and this is likely occurring via the faulting.

Group (vi)

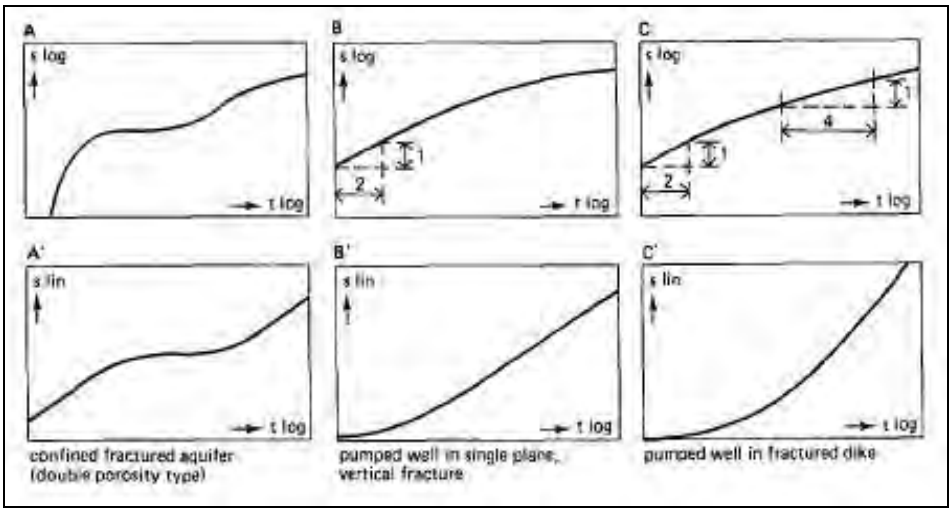
BH27 and BH18 are located to the southeast of BH17. They are both located to the south of the E-W faults and to the west of the N-S fault.

These wells exhibit far more drawdown than other wells (i.e. those in Group (iii)) which are located at a similar distance to the pumping well. This may indicate that the E-W fault is hindering flow or may be a function of the proximity of the wells to the faulting. A conservative analysis would be to assume that it is due to the proximity to the faulting.

H3 Curve analysis

The shape of a semi-log plot of drawdown versus time coupled with a log-log plot of drawdown versus time can often be a useful indicator of the type of aquifer the pump is abstracting water from. Graph 3 presents log-log and semi-log plots taken from Kruseman and De Ridder (2000) which indicates characteristic curves for a consolidated fractured aquifer under different types of hydraulic conditions.

Graph 3. Semi-log plots of theoretical time-drawdown relationships of consolidated fractured aquifers (from Kruseman and De Ridder, 2000)



Log-log and semi-log plots were created using the data recorded in the wells listed in **Table 2**. As this analysis is based on the shape of the curve alone, it is possible to use the uncorrected data since data correction involves removing a fixed value from the data and generates a similar shaped curve. Where data logger data was not available, manual data was used for this exercise.

The data from 'Constant Rate Test 2' was used for these plots and the graphs are presented in **Appendix H7**. The shapes of these curves were compared to those above from Kruseman and De Ridder (2000). The results of this analysis are summarised in **Table 2** below.

Table 2: Preliminary interpretation of aquifer type from log-log and semi-log plots

Borehole	Bedrock Fm. in which screened	Interpretation of diagnostic plots
BH5	Namurian deposits	Well located in a fracture zone
BH8	Namurian deposits	Well located in a fracture zone
BH9	Namurian deposits	Well located in a fracture zone
BH10A	Loughshinny Fm	Well located in a fracture zone
BH13	Namurian deposits	Well located in confined fractured aquifer
BH14	Loughshinny Fm.	Well located in a fracture zone
BH15a	Loughshinny Fm.	Well located in a fracture zone
BH16	Namurian deposits	Well located in confined fractured aquifer
BH18	Loughshinny Fm	Well located in confined fractured aquifer
BH19	Namurian deposits	Well located in confined fractured aquifer
BH20	Loughshinny and Namurian	Well located in confined fractured

		aquifer
BH24	Namurian deposits	Well located in confined fractured aquifer
BH25	Loughshinny Fm.	Well located in confined fractured aquifer
BH26	Namurian deposits	Well located in a fracture zone
BH27	Namurian deposits	Well located in confined fractured aquifer
BH28	Namurian deposits	Well located in a fracture zone
BH29	Namurian deposits	Well located in a fracture zone
BH30	Loughshinny Fm.	Well located in confined fractured aquifer

Overall, the shapes of the drawdown curves suggest a confined, densely fractured, consolidated aquifer of the double-porosity (fractures and matrix block) type (Kruseman & de Ridder, 2000).

H4 Constant rate discharge test analysis

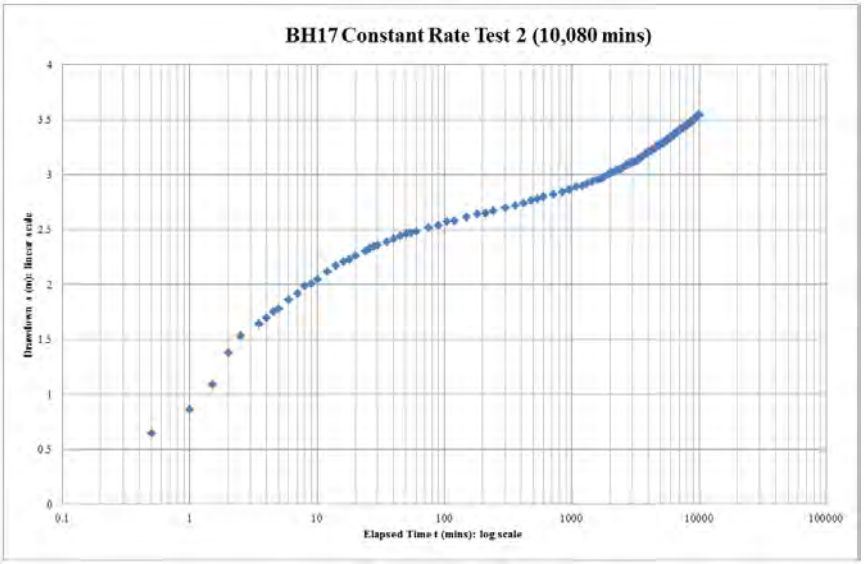
The data obtained from 'Constant Rate Test 2' is presented below. The 7-day constant yield test was designed to analyse the response of the aquifer system and ideally to reach steady state.

In 'Constant Rate Test 2' the pumping well was pumped at a constant rate of approximately 600m^3/d for (7 days). The water levels in the pumping well and monitoring wells were monitored regularly for the full length of the test and also for the recovery period. The discharge rate was monitored with a flow-meter and confirmed with a 75L bucket and stopwatch.

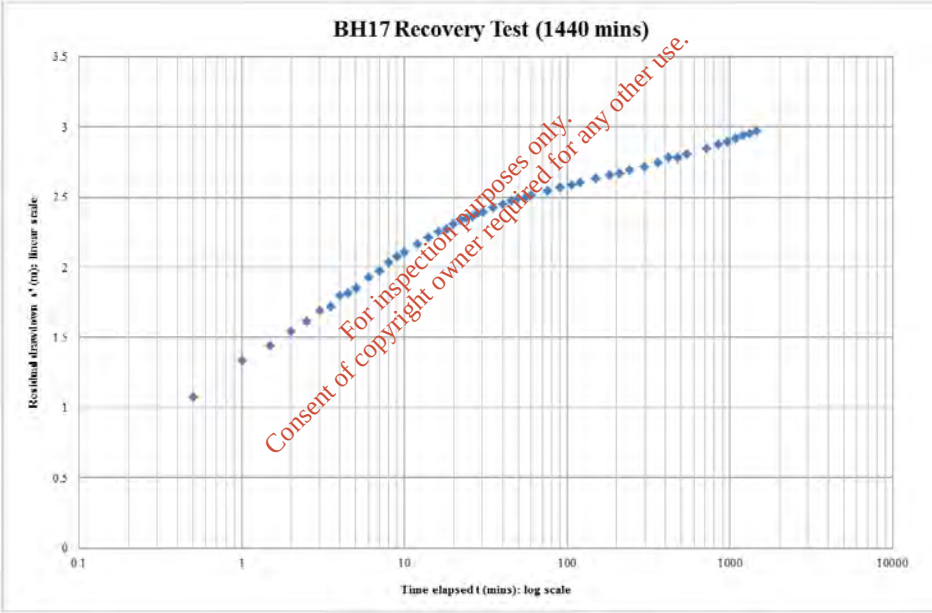
The monitoring wells which demonstrated drawdown during the pump test were analysed to assess their suitability for use in the constant rate analysis. However, based on the distance-drawdown analysis and the curve analysis, the data from none of these observation wells can be used. This is because of the influence of the two main faults and also because the fractured and broken areas of rock are skewing the drawdown data so it cannot be relied upon for calculations.

The drawdown in the pumping well continued throughout the test as shown on **Graph 4**. The gradient of the drawdown curve steadily flattens until after circa 1000 minutes of pumping, the gradient again steepens.

Graph 4. Semi-log plot of drawdown observed in pumping well



Graph 5. Semi-log plot of recovery observed in pumping well



The maximum recorded (uncorrected) drawdown in the pumping well (BH17) was 3.545m.

H4.1 Analysis

As outlined above, the data recorded in most of the monitoring wells is not suitable for use in the permeability calculations as it is being skewed by naturally occurring outside influences. For this reason only the data recorded in BH17 (the pumping well) and BH27 will be used for analysis. The data analysed was 'Constant Rate Test 2' and the recovery data from that constant rate test.

A number of methods of analysis have been applied to the data using the programme AQTESOLV including the Theis and Cooper-Jacob methods. The results of this analysis are summarised in **Table 3** below. The results for the 2010 testing were analysed using AquiferTest and are included in Table 5. The calculation sheets and graphs for the 2013 testing are presented in **Appendix H5** and **H6**.

Table 3: Summary of AQTESOLV and AquiferTest analyses.

Test		2010 phase of investigation				2013 phase of Investigation	
		Step 1	Steps 1-3	Constant Rate 2	Residual Drawdown	Constant Rate Test 2	Recovery Test
Duration (min)		60	180	2,880	2,880	10,080	1,440
Discharge Rate (m^3/d)		241	389.3 (avg)	600	600	600	600
Maximum Drawdown (m)		0.925	2.15	2.875	2.875	3.545	-
Recovery (m) (Residual drawdown s')							2.97
Specific Capacity ($m^3/d/m$)		261	-	209	209	169.25	-
Transmissivity (m^2/d)	Theis Steptest	117					
	Cooper-Jacob Steptest		190				
	Theis			145		214	
	Theis residual drawdown						221
	Cooper-Jacob time-drawdown			231		214	
	Theis Recovery		285		415		86

When data is taken from a pumping well, the transmissivity values obtained are likely to be less than or equal to 50% of the real values. The transmissivity values obtained from the late recovery data are likely to be closer to the true values.

The analysis indicates that the aquifer has a high permeability and transmissivity. However, as the majority of storage is likely to be in fractures (as outlined in the curve analysis) the use

of the aquifer as a long term groundwater resource in this area is likely to be limited despite the high permeability. It should be noted that specific capacity has reduced in the pumping well (**Table 5**) since the May 2010 testing.

H1 Constant rate test 1: BH17 manual data

SEAMUS KELLY WELL TESTING DATE: JULY 9,2013

BORE-HOLE LOCATION M.E.H.L WELL NO BH-17

COUNTY DUBLIN PUMP IN-TAKE 40M

PUMP TYPE 16GS75 DISCHARGE DISTANCE : 300M

DIA OF WELL 127MM CONSULTANT: ARUP

HEIGHT OF MEASUREMENT ABOVE TOP OF STEEL CASING : 0.63M

PERSONNEL CONDUCTING TEST: S.KELLY / P.KELLY

DATE	TIME	ELAPSED TIME MINS	WELL NO BH-17	WELL NO BH-27	METER	FLOW RATE LITRES PER SECOND
TUESDAY,JULY 9,2013	16:00	0	3.97	4.05	3090	
		0.5	4.73			5 L / S
		1	4.82			5.00 L / S FLOW INCREASED TO 6.00 L / S
		1.5	4.99			6.01 L / S
		2	5.15			5.95 L / S
		2.5	5.23			5.95 L / S FLOW INCREASED TO 6.55 L / S
		3	5.44			
		3.5	5.49			6.49 L / S
		4	5.6			6.47 L / S
		4.5	5.7			6.47 L / S FLOW INCREASED TO 7.03 L / S
		5	5.75			7.03 L / S
		6	5.84			7.02 L / S
		7	5.91			7.03 L / S
		8	5.96	4.045		7.02 L / S
		9	6			
		10	6.05			7.02 L / S
		12	6.12			
		14	6.17			7.02 L / S
		16	6.21			
		18	6.24			7.01 L / S
		20	6.27			
		22	6.295	4.065		7.01 L / S
		24	6.31			7.02 L / S
		26	6.34			7.02 L / S
		28	6.35			7.02 L / S
		30	6.365	4.085		7.02 L / S
		35	6.4			7.02 L / S
		40	6.4			7.02 L / S
		45	6.44			
		50	6.455	4.115		7.03 L / S
		55	6.465			7.03 L / S
		60	6.48	4.135		7.03 L / S
		75	6.51			7.03 L / S
		90	6.53	4.17		7.04 L / S
		105	6.565	4.185		7.04 L / S
		120	6.565	4.195		7.05 L / S
		150	6.595	4.22		7.06 L / S
		180	6.615	4.24		7.06 L / S
		210	6.63	4.26		7.05 L / S
		240	6.645			7.05 L / S
	21:00	5HRS	6.67	4.31	3216	7.02 L / S
		MOTOR FAILURE AT 21:54 , PUMP TEST ABANDONED				

H2 Constant rate test 2: BH17 manual data

SEAMUS KELLY WELL TESTING DATE: JULY 10,2013

BORE-HOLE LOCATION	M.E.H.L	WELL NO BH-17
COUNTY	DUBLIN	PUMP IN-TAKE 40M
PUMP TYPE	16GS75	DISCHARGE DISTANCE : 300M
DIA OF WELL	127MM	CONSULTANT: ARUP
HEIGHT OF MEASUREMENT ABOVE TOP OF STEEL CASING : 0.63M		RE-START OF 7 DAY TEST
PERSONNEL CONDUCTING TEST:	S.KELLY / P.KELLY	

DATE	TIME	ELAPSED TIME MINS	WELL NO BH-17	WELL NO BH-27	METER	FLOW RATE LITRES PER SECOND
WEDNESDAY,JULY 10,2013	14:30	0	3.95	4.16	3240	
		0.5	4.6			4.70 L / S OPENED TO 5.80 L / S
		1	4.81			5.8 L / S
		1.5	5.04			5.80 L / S OPENED TO 7.09 L /S
		2	5.33			7.05 L / S
		2.5	5.48			
		3	55.54			7.08 L / S
		3.5	5.59			7.08 L / S
		4	5.65			
		4.5	5.7			7.07 L / S
		5	5.73			7.08 L / S
		6	5.815			
		7	5.87			7.07 L / S
		8	5.94			
		9	5.96			7.05 L / S
		10	6		3244	7.03 L / S
		12	6.065			
		14	6.12			7.02 L / S
		16	6.155			7.028 L / S
		18	6.18			
		20	6.21			
		22		4.18		7.02 L / S
		24	6.255			
		26	6.28			
		28	6.295			7.015 L / S
		30	6.31	4.19	3252	7.013 L / S
		35	6.34			
		40	6.365			7.01 L / S
		45	6.39	4.215		7.01 L / S
		50	6.41			7 L / S
		55	6.42			
	15:30	60	6.435	4.235	3265	7.01 L / S
		75	6.465	4.25	3271	7 L / S
		90	6.49	4.26	3277	7.01 L / S
		105	6.52	4.28	3284	7.01 L / S
	16:30	120	6.53	4.295	3290	7.01 L / S
		150	6.565	4.315	3303	7 L / S
	17:30	180	6.59	4.335	3316	7 L / S
		210	6.6	4.35	3328	7 L / S
	18:30	240	6.62	4.365	3340	7 L / S
	19:30	5HRS	6.65	4.4	3366	7 L / S
	20:30	6HRS	6.665	4.425	3390	7 L / S
	21:30	7HRS	6.69	4.45	3416	7 L / S
	22:30	8HRS	6.715	4.48	3441	6.975 L / S

	23:30	9HRS	6.73	4.51	3466	6.96 L / S
THURSDAY,JULY 11,2013	00:30	10HRS	6.75	4.54		
	02:30	12HRS	6.77	4.61	3541	6.96 L / S
	04:30	14HRS	6.79	4.63	3592	6.96 L / S
	06:30	16HRS	6.81	4.66	3641	6.96 L / S
	08:30	18HRS	6.84	4.7	3691	6.96 L / S
	10:30	20HRS	6.85	4.74	3741	6.97 L / S
	12:30	22HRS	6.87	4.78	3791	6.98 L / S
	14:30	24HRS	6.89	4.81	3842	6.98 L / S
	16:30	26HRS	6.9	4.84	3893	6.98 L / S
	18:30	28HRS	6.91	4.875	3943	6.98 L / S
	20:30	30HRS	6.93	4.905	3992	6.97 L / S
	22:30	32HRS	6.95	4.94	4043	6.95 L / S
FRIDAY,JULY 12,2013	00:30	34HRS	6.97	4.97	4094	6.95 L / S
	02:30	36HRS	6.98	5	4145	6.96 L / S
	05:10	38H 40M	6.995	5.025	4210	6.97 L / S
	06:30	40HRS	7	5.05	4242	6.95 L / S
	08:30	42HRS	7.015	5.07	4294	6.96 L / S
	10:30	44HRS	7.03	5.09	4344	6.97 L / S
	12:30	46HRS	7.045	5.115	4393	6.97 L / S
	14:30	48HRS	7.055	5.135	4444	6.97 L / S
	16:30	50HRS	7.06	5.16	4493	6.98 L / S
	18:30	52HRS	7.07	5.175	4544	6.98 L / S
	20:30	54HRS	7.08	5.2	4594	6.96 L / S
	22:30	56HRS	7.09	5.22	4644	6.955 L / S
SATURDAY,JULY 13,2013	00:30	58HRS	7.1	5.24	4694	6.95 L / S
	02:30	60HRS	7.115	5.26	4744	6.96 L / S
	04:30	62HRS	7.13	5.28	4795	6.96 L / S
	06:30	64HRS	7.14	5.3	4844	6.95 L / S
	08:30	66HRS	7.15	5.32	4894	6.96 L / S
	10:30	68HRS	7.16	5.335	4944	6.99 L / S
	12:30	70HRS	7.17	5.35	4994	6.96 L / S
	14:30	72HRS	7.18	5.37	5044	6.97 L / S
	16:30	74HRS	7.19	5.385	5094	6.97 L / S
	18:30	76HRS	7.2	5.4	5145	6.96 L / S
	20:30	78HRS	7.21	5.415	5195	6.95 L / S
	22:30	80HRS	7.215	5.435	5245	6.94 L / S
SUNDAY,JULY 13,2013	00:30	82HRS	7.22	5.445	5295	6.94 L / S
	02:30	84HRS	7.23	5.46	5345	6.94 L / S
	04:30	86HRS	7.235	5.475	5395	6.93 L / S
	06:30	88HRS	7.24	5.49	5445	6.94 L / S
	08:30	90HRS	7.25	5.5	5495	6.93 L / S
	10:30	92HRS	7.26	5.515	5545	6.95 L / S
	12:30	94HRS	7.27	5.525	5595	6.96 L / S
	14:30	96HRS	7.28	5.535	5645	6.97 L / S
	16:30	98HRS	7.29	5.55	5696	6.97 L / S
	18:30	100HRS	7.29	5.56	5746	6.97 L / S
	20:30	102HRS	7.295	5.575	5798	6.97 L / S
	22:30	104HRS	7.3	5.585	5846	6.96 L / S
MONDAY,JULY 15,2013	00:30	106HRS	7.31	5.6	5897	6.94 L / S
	02:30	108HRS	7.32	5.61	5946	6.94 L / S
	04:30	110HRS	7.33	5.625	5998	6.94 L / S
	06:30	112HRS	7.335	5.635	6048	6.94 L / S
	08:30	114HRS	7.34	5.645	6096	6.94 L / S
	10:30	116HRS	7.35	5.66	6146	6.95 L / S
	12:30	118HRS	7.36	5.67	6196	6.94 L / S
	14:30	120HRS	7.365	5.68	6246	6.96 L / S
	16:30	122HRS	7.37	5.69	6296	6.96 L / S
	18:30	124HRS	7.375	5.695	6346	6.96 L / S
	20:30	126HRS	7.38	5.705	6397	6.95 L / S
	22:30	128HRS	7.385	5.72	6447	6.94 L / S
TUESDAY,JULY 16,2013	00:30	130HRS	7.39	5.73	6498	6.95 L / S
	02:30	132HRS	7.395	5.74	6549	6.94 L / S
	06:30	136HRS	7.41	5.755	6651	6.94 L / S

	08:30	138HRS	7.415	5.76	6696	6.94 L / S
	10:30	140HRS	7.42	5.77	6747	6.94 L / S
	12:30	142HRS	7.425	5.78	6796	6.96 L / S
	14:30	144HRS	7.43	5.79	6847	6.96 L / S
	16:30	146HRS	7.435	5.795	6897	6.96 L / S
	18:30	148HRS	7.445	5.805	6947	6.95 L / S
	20:30	150HRS	7.445	5.815	6996	6.95 L / S
	22:30	152HRS	7.45	5.82	7046	6.93 L / S
WEDNESDAY,JULY 17,2013	00:30	154HRS	7.46	5.83	7097	6.94 L / S
	02:30	156HRS	7.465	5.84	7147	6.94 L / S
	04:30	158HRS	7.475	5.85	7196	6.94 L / S
	06:30	160HRS	7.48	5.86	7246	6.94 L / S
	08:30	162HRS	7.485	5.87	7296	6.94 L / S
	10:30	164HRS	7.49	5.87	7347	6.95 L / S
	12:30	166HRS	7.49	5.88	7396	6.95 L / S
	14:30	168HRS	7.495	5.895	7445	6.96 L / S

H3 Recovery test: BH17 manual data

SEAMUS KELLY WELL TESTING DATE: JULY 17,2013

BORE-HOLE LOCATION	M.E.H.L	WELL NO BH-17
		RECOVERY AFTER 7 DAY TEST
COUNTY	DUBLIN	PUMP IN-TAKE 40M
PUMP TYPE	16GS75	DISCHARGE DISTANCE : 300M
DIA OF WELL	127MM	CONSULTANT: ARUP

HEIGHT OF MEASUREMENT ABOVE TOP OF STEEL CASING : 0.63M

PERSONNEL CONDUCTING TEST: S.KELLY / P.KELLY

DATE	TIME	ELAPSED TIME MINS	WELL NO BH-17	WELL NO BH-27	METER	FLOW RATE
WEDNESDAY,JULY 10,2013	14:30	0	7.495	5.895	7445	6.96 L / S
		0.5	6.42			
		1	6.16			
		1.5	6.05			
		2	5.95			
		2.5	5.88			
		3	5.81			
		3.5	5.77			
		4	5.7			
		4.5	5.68			
		5	5.645	5.895		
		6	5.57			
		7	5.52			
		8	5.46			
		9	5.42	5.895		
		10	5.39			
		12	5.33	5.884		
		14	5.28			
		16	5.24			
		18	5.22			
		20	5.19	5.872		
		22	5.16			
		24	5.145			
		26	5.13			
		28	5.11			
		30	5.1	5.854		
		35	5.07			
		40	5.045	5.84		
		45	5.025			
		50	5			
		55	4.995			
	15:30	60	4.985	5.815		
		75	4.95	5.8		
		90	4.93	5.79		
		105	4.91	5.775		
	16:30	120	4.895	5.765		
		150	4.86	5.75		
	17:30	180	4.84	5.73		
		210	4.825	5.715		
	18:30	240	4.805	5.695		
	19:30	5HRS	4.78	5.67		
	20:30	6HRS	4.75	5.645		

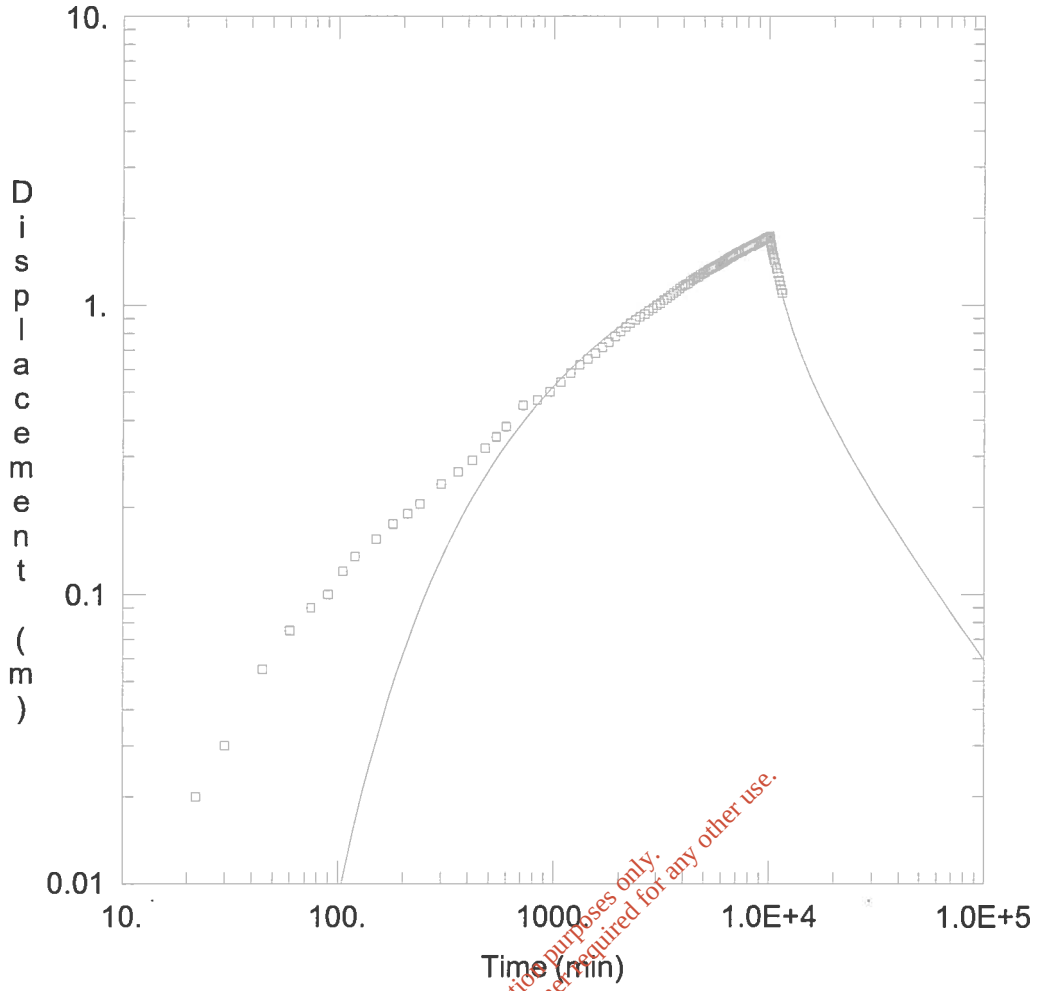
	21:30	7HRS	4.72	5.62		
	22:30	8HRS	4.72	5.595		
	23:30	9HRS	4.69	5.565		
THURSDAY,JULY 18,2013	00:30	10HRS				
	02:30	12HRS	4.65	5.5		
	04:30	14HRS	4.62	5.45		
	06:30	16HRS	4.6	5.415		
	08:30	18HRS	4.58	5.375		
	10:30	20HRS	4.55	5.33		
	12:30	22HRS	4.54	5.29		
	14:30	24HRS	4.525	5.26		

H4 Summary drawdown data

BH ID >	Elevation >	Distance from BH17 (pumping well)	Manual Dip (8am - 10am 09/07/2013)	Manual Dip (12pm - 2pm 10/07/2013)	Manual Dip (12pm - 2:30pm 17/07/2017)	Total Drawdown (manual dip) 09/07/2013 - 17/07/2013	Total Drawdown (manual dip) 10/07/2013 - 17/07/2013	Pressure Transducer Rugged TROLL 100 (09/07/2013 10:00:00)	Pressure Transducer Rugged TROLL 100 (10/07/2013 14:29:00)	Pressure Transducer Rugged TROLL 100 (17/07/2013 14:30:00)	Total Drawdown (transducer data) 09/07/2013 - 17/07/2013	Total Drawdown (transducer data) 10/07/2013 - 17/07/2013
Unit >	m OD	m	m OD	m OD	m OD	m	m	m OD	m OD	m OD	m	m
BH4A	95.09	489.3	93.615	93.615	93.595	0.02	0.02	93.608	93.594	93.584	0.024	0.01
BH5	118.72	324.9	103.19	103.07	102.12	1.07	0.95	103.148	103.057	102.093	1.055	0.964
BH6	119.45	526.0	117.76	117.75	117.715	0.045	0.035	117.748	117.748	117.725	0.023	0.023
BH8	136.73	322.5	133.165	133.125	132.95	0.215	0.175	133.109	133.081	132.905	0.204	0.176
BH9	128.81	363.0	106.73	106.71	106.505	0.225	0.205	106.656	106.648	106.433	0.223	0.215
BH10A	137.14	410.0	101.36	101.34	101.185	0.175	0.155	101.214	101.215	101.064	0.15	0.151
BH11A	100.01	401.4	98.495	98.495	98.475	0.02	0.02	98.368	98.372	98.353	0.015	0.019
BH12	146.99	364.2	102.24	102.235	102.13	0.11	0.105	102.06	102.1	101.988	0.072	0.112
BH13	146.92	359.3	122.5	122.5	122.265	0.235	0.235	122.396	122.449	122.204	0.192	0.245
BH14	125.06	398.7	100.045	100.02	99.82	0.225	0.2	99.894	99.869	99.667	0.227	0.202
BH15a	106.29	153.7	101.075	101.05	100.68	0.395	0.37	101.073	101.066	100.691	0.382	0.375
BH16	105.16	225.4	103.19	103.12	102.19	1	0.93	N/A	N/A	N/A	N/A	N/A
BH17	105.69	0	102.35	102.37	98.825	3.525	3.545	N/A	N/A	N/A	N/A	N/A
BH18	111.04	84.0	102.43	102.3	100.425	2.005	1.875	N/A	N/A	N/A	N/A	N/A
BH19	105.61	108.0	103.355	103.28	102.54	0.815	0.74	N/A	N/A	N/A	N/A	N/A
BH20	105.28	120.21	102.79	102.72	101.52	1.27	1.2	N/A	N/A	N/A	N/A	N/A
BH24	106.23	260.1	103.14	103.05	102.16	0.98	0.89	N/A	N/A	N/A	N/A	N/A
BH25	105.41	152.0	102.23	102.22	101.925	0.305	0.295	102.165	102.246	101.966	0.199	0.28
BH26	105.23	119.7	103.25	103.17	102.33	0.92	0.84	N/A	N/A	N/A	N/A	N/A
BH27	106.58	40.9	102.53	102.42	100.685	1.845	1.735	N/A	N/A	N/A	N/A	N/A
BH28	125.88	125.2	101.46	101.425	100.5	0.96	0.925	101.2	101.249	100.325	0.875	0.924

BH29	123.72	203.0	101.02	100.955	99.85	1.17	1.105	100.87	100.84	99.773	1.097	1.067
BH30	124.27	188.3	101.945	101.885	100.745	1.2	1.14	101.816	99.943	99.611	2.205	0.332

H5 AQTESOLV plots



THEIS RECOVERY TEST

Data Set: C:\...\BH27 Theis Recover (pumping and recovery).aqt
Date: 07/31/13 Time: 18:14:33

PROJECT INFORMATION

Company: Ove Arup & Partners Ireland
Client: MEHL
Project: D6877
Location: Naul/Hollywood
Test Well: BH17
Test Date: 10/07/2013

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH17	315794.7	258003.1

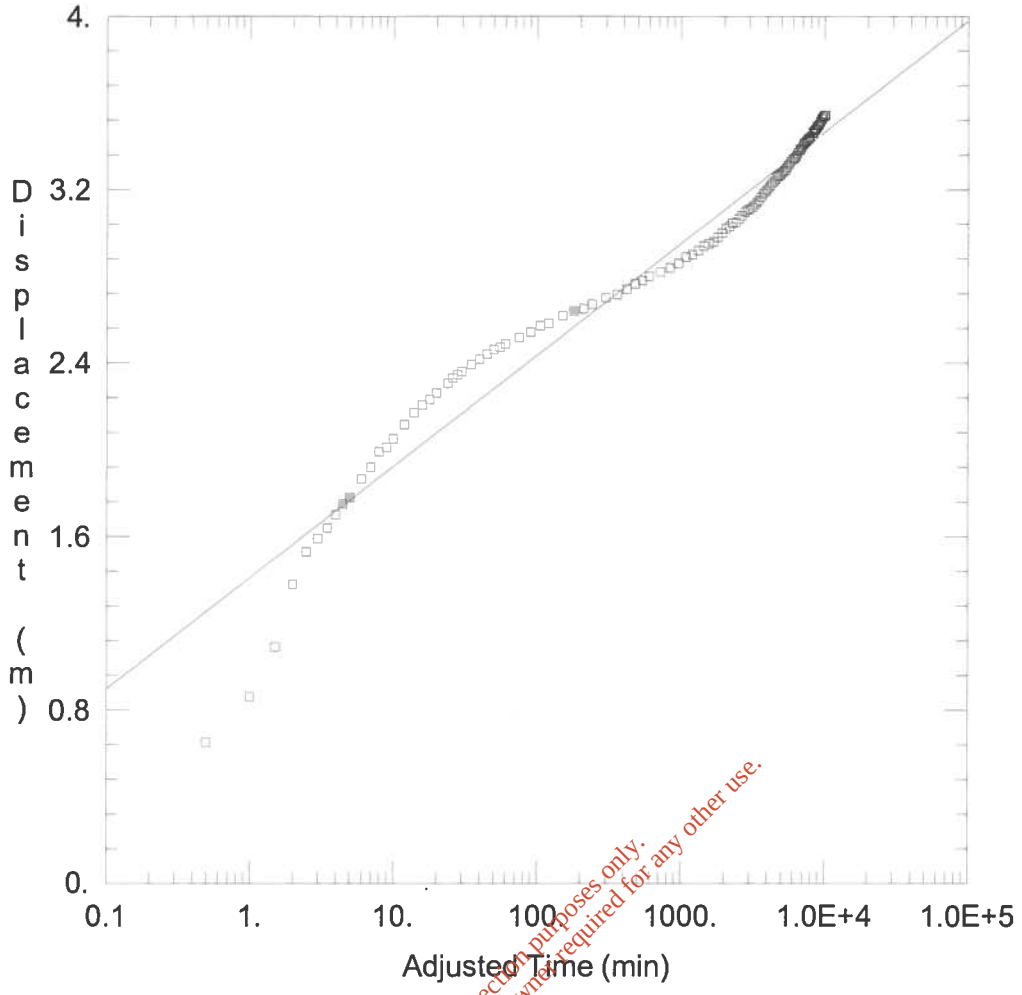
Observation Wells

Well Name	X (m)	Y (m)
BH27	315756.7	258018.21

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 86.02 m^2/day
S = 0.04058
Kz/Kr = 1.
b = 50. m



BH17 PUMPING TEST ANALYSIS

Data Set: C:\...\Cooper-Jacob Straight Line Automated Fit.aqt
Date: 07/31/13 Time: 18:24:44

PROJECT INFORMATION

Company: Ove Arup & Partners Ireland
Client: MEHL
Project: D6877
Location: Naul/Hollywood
Test Well: BH17
Test Date: 10/07/2013

AQUIFER DATA

Saturated Thickness: 50. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH17	0	0

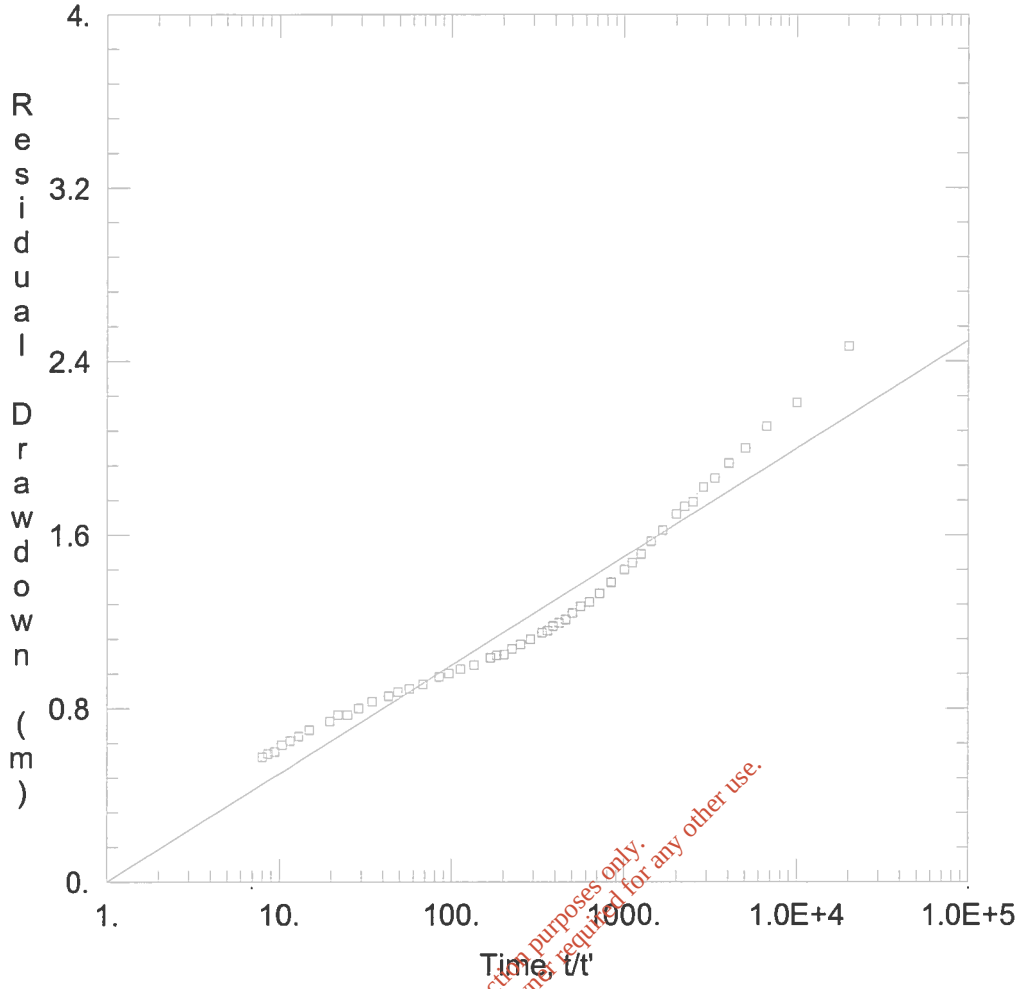
Observation Wells

Well Name	X (m)	Y (m)
BH17	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 214.2 m^2/day S = 0.108



BH17 PUMPING TEST INCL RECOVERY

Data Set:
Date: 07/31/13 Time: 18:48:14

PROJECT INFORMATION

Company: Ove Arup & Partners Ireland
Client: MEHL
Project: D6877
Location: Naul/Hollywood
Test Well: BH17
Test Date: 10/07/2013

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH17	0	0

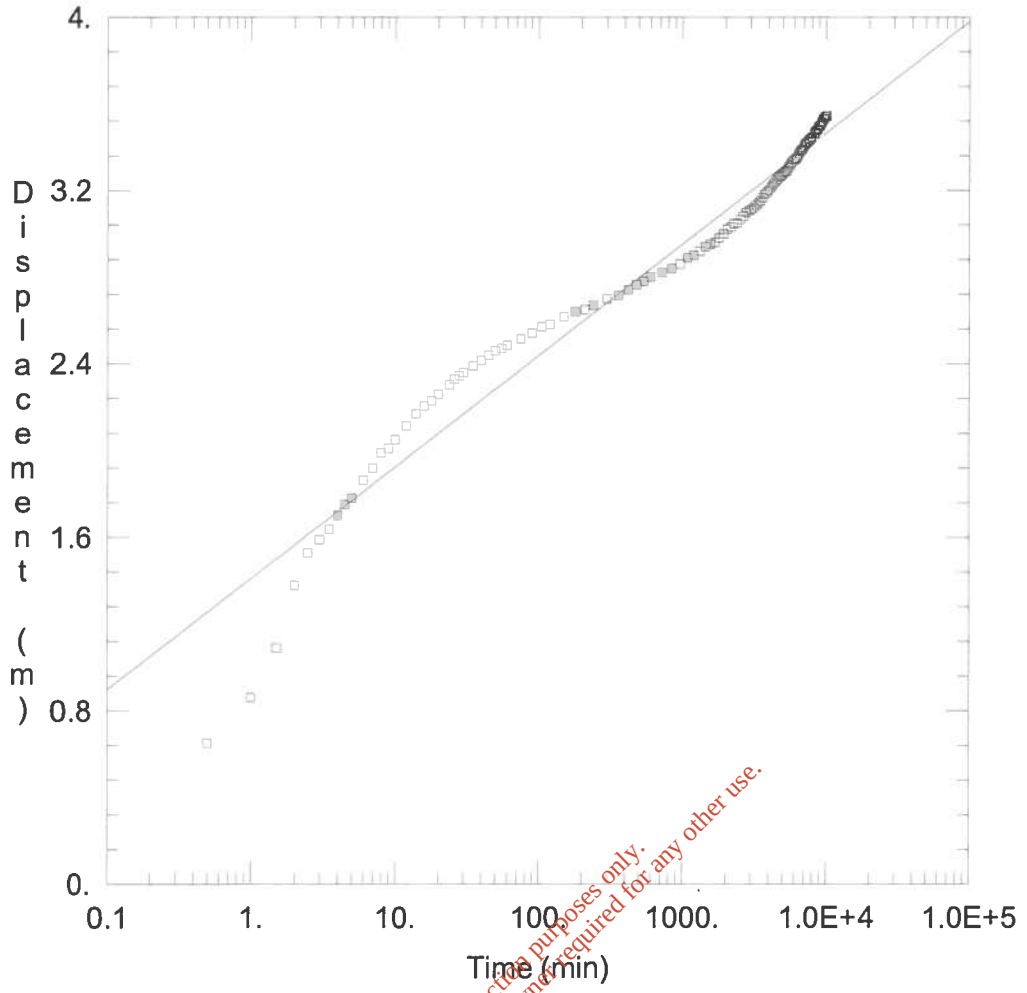
Observation Wells

Well Name	X (m)	Y (m)
BH17	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 220.6 m^2/day
S = 0.001
Kz/Kr = 1.
b = 50. m



BH17 PUMPING TEST ANALYSIS

Data Set: C:\Documents and Settings\Lee-A.Chambers\Desktop\Theis Automated Fit.aqt
Date: 07/31/13 Time: 18:26:11

PROJECT INFORMATION

Company: Ove Arup & Partners Ireland
Client: MEHL
Project: D6877
Location: Naul/Hollywood
Test Well: BH17
Test Date: 10/07/2013

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH17	0	0

Observation Wells

Well Name	X (m)	Y (m)
BH17	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

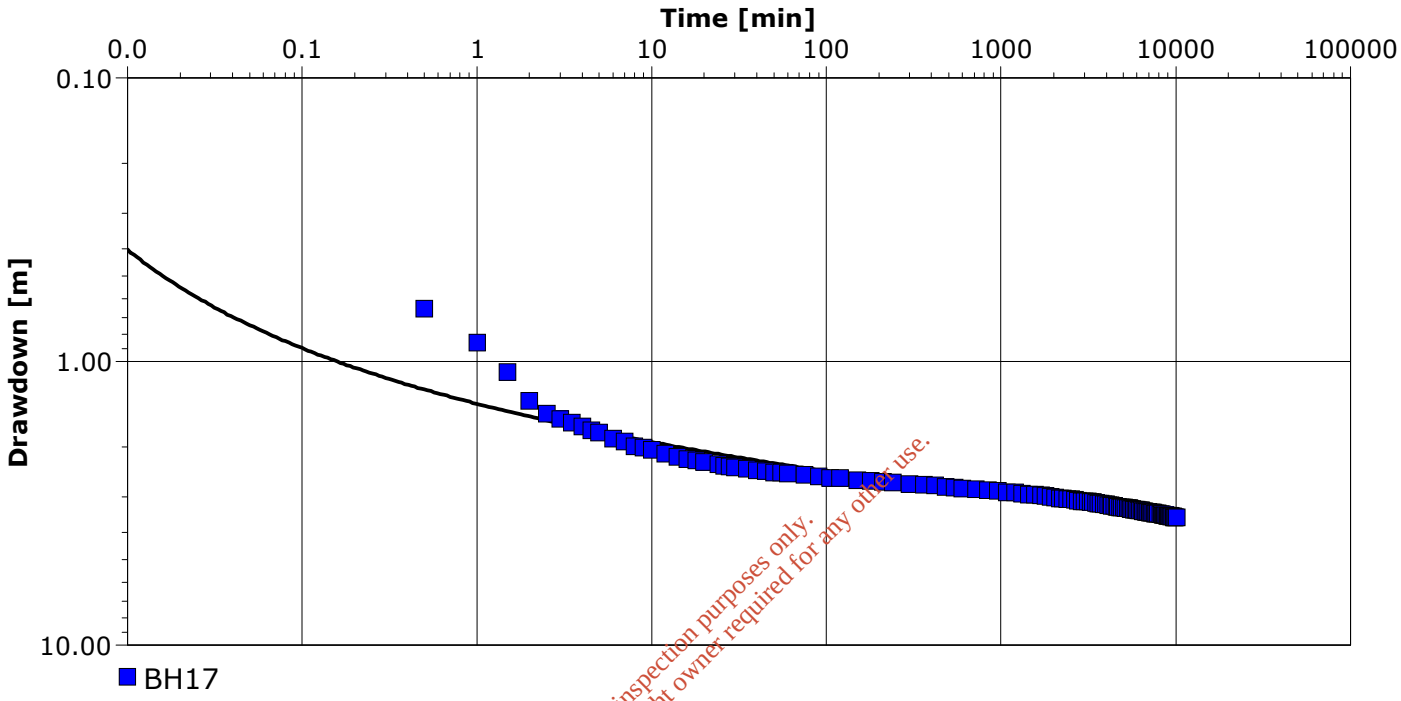
T = 214.2 m^2/day
S = 0.1079
Kz/Kr = 1.
b = 50. m

H6 AquiferTest plots

Ove Arup & Partners Ireland
50 Ringsend Road
Dublin 4
Ireland

Pumping Test Analysis Report	A7
Project: Article 16(1)	
Number: D6877	
Client: MEHL	

Location: Naul/Hollywood	Pumping Test: Constant Rate Test 2	Pumping Well: BH17
Test Conducted by: Lee Chambers		Test Date: 7/31/2013
Analysis Performed by: Lee Chambers	BH17 Constant Rate Test 2 Analysis	Analysis Date: 7/31/2013
Aquifer Thickness: 50.00 m	Discharge Rate: 601.3 [m³/d]	

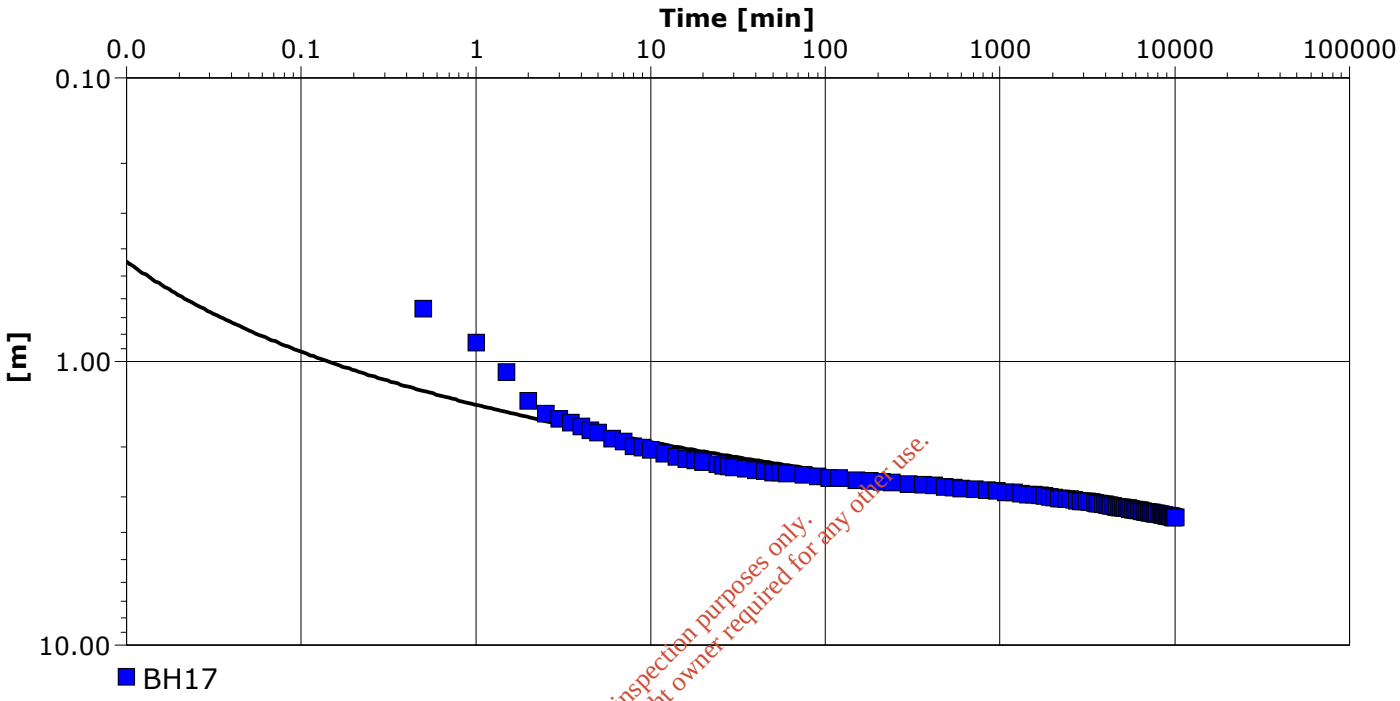


Calculation after Theis

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
BH17	2.14×10^{2}	4.28×10^{0}	1.08×10^{-1}	0.07	

Ove Arup & Partners Ireland 50 Ringsend Road Dublin 4 Ireland	**Pumping Test Analysis Report**	A7
	Project: Article 16(1)	
	Number: D6877	
	Client: MEHL	

Location: Naul/Hollywood	Pumping Test: Constant Rate Test 2	Pumping Well: BH17
Test Conducted by: Lee Chambers		Test Date: 7/31/2013
Analysis Performed by: Lee Chambers	BH17 Constant Rate Test 2 Analysis	Analysis Date: 7/31/2013
Aquifer Thickness: 50.00 m	Discharge Rate: 601.3 [m³/d]	



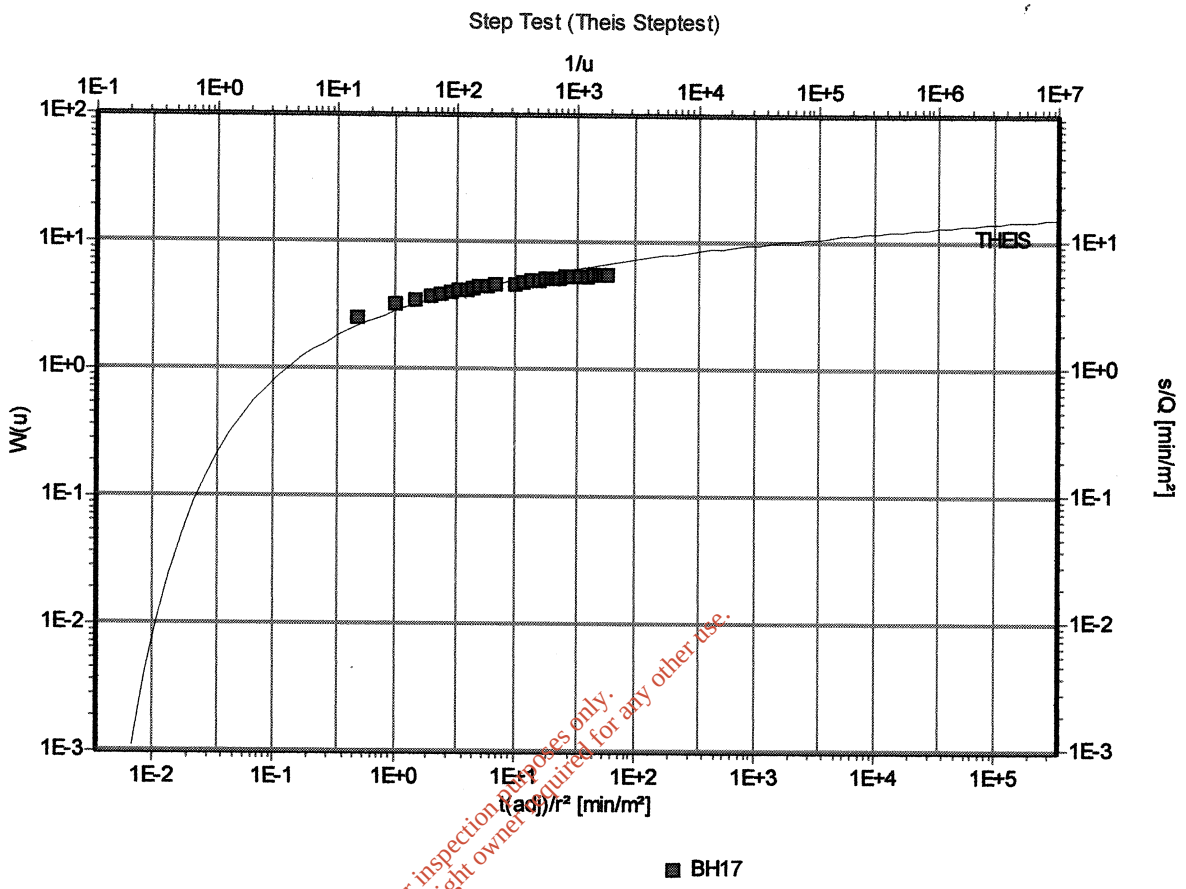
Calculation after Theis with Jacob Correction

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
BH17	2.26×10^{2}	4.52×10^{0}	8.37×10^{-2}	0.07	

Eugene Daly Associates
The Old Cottage, Drummin Lane,
Glen of the Downs, Co. Wicklow.
Phone: 01 2876319 Fax: 01 2872645

Pumping Test Analysis Report

Project:	Naul/Hollywood
No:	E09-15A
Client:	MEHL



Test name: **Step Test**

Analysis method: **Theis Steptest**

Analysis results:	Transmissivity:	1.17E+2 [m²/d]	Conductivity:	2.35E+0 [m/d]
	Storativity:	1.10E-2		
Test parameters:	Pumping well:	BH17	Aquifer thickness:	50 [m]
	Screen radius:	0.075 [m]	Confined aquifer	
	Screen length:	6 [m]		
	Casing radius:	0.125 [m]		
	Discharge rate:	241 [m³/d]		

Comments: Only the data for the first step is plotted.

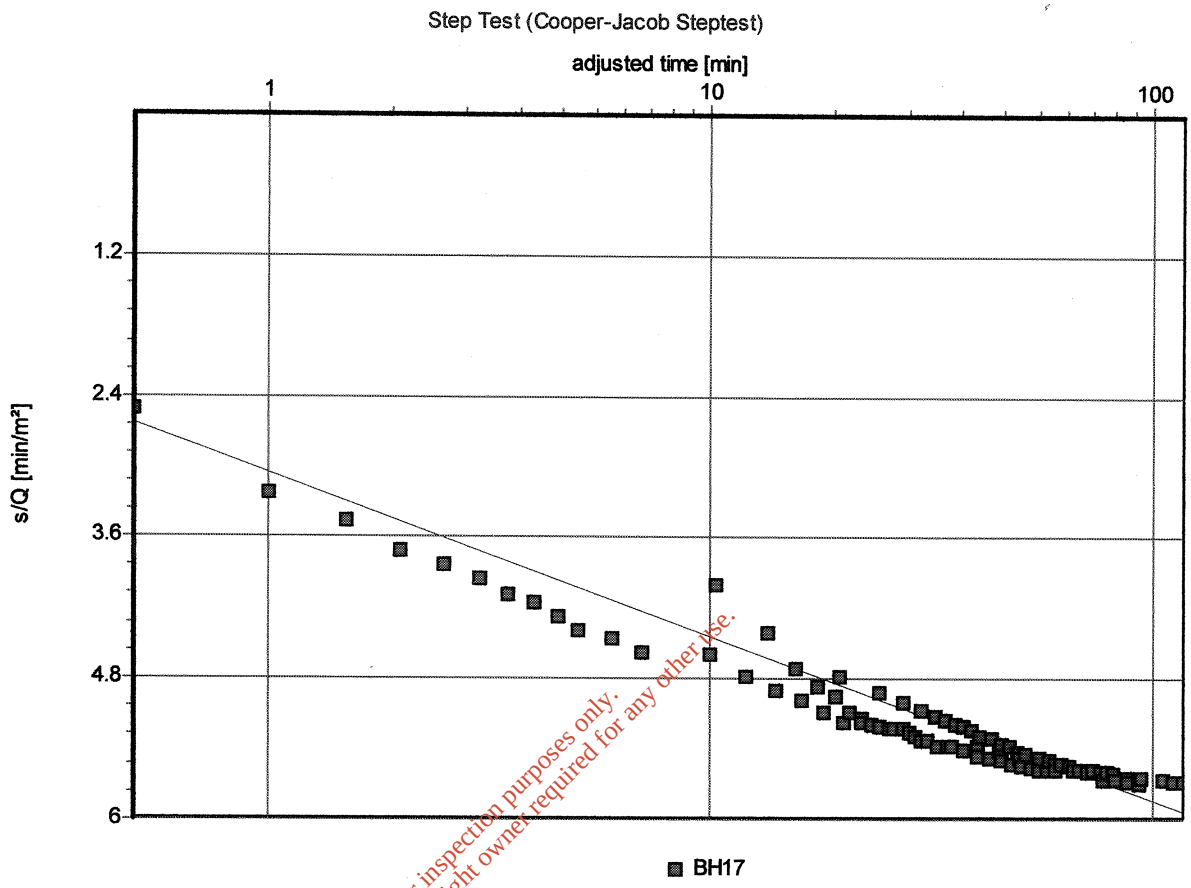
Evaluated by: TM

Date: 04/11/2010

Eugene Daly Associates
The Old Cottage, Drummin Lane,
Glen of the Downs, Co. Wicklow.
Phone: 01 2876319 Fax: 01 2872645

Pumping Test Analysis Report

Project:	Naul/Hollywood
No:	E09-15A
Client:	MEHL



Test name: **Step Test**

Analysis method: **Cooper-Jacob Steptest**

Analysis results:	Transmissivity:	1.90E+2 [m²/d]	Conductivity:	3.79E+0 [m/d]

Test parameters:	Pumping well:	BH17	Aquifer thickness:	50 [m]
	Screen radius:	0.075 [m]	Confined aquifer	
	Screen length:	6 [m]		
	Casing radius:	0.125 [m]		
	Discharge rate:	389.3 [m³/d]		

Comments:

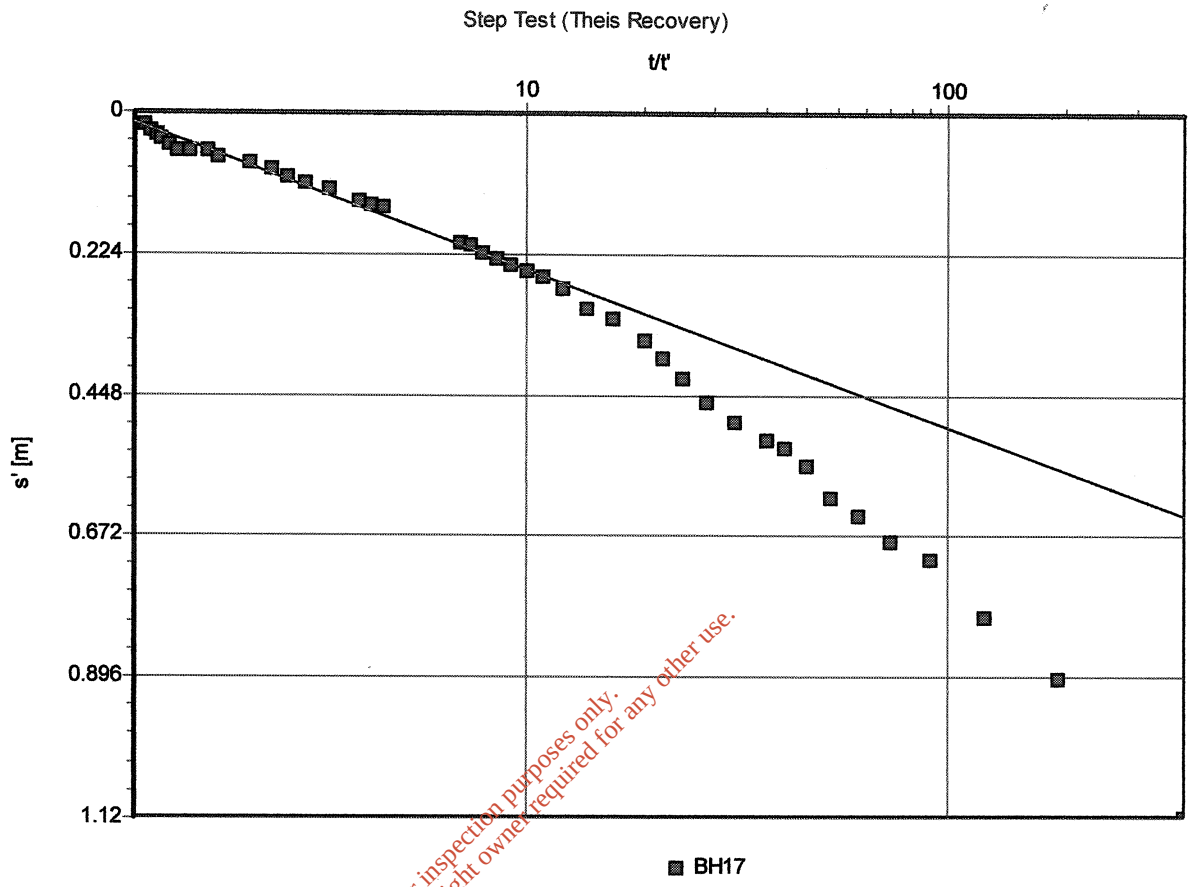
Evaluated by: TM

Date: 04/11/2010

Eugene Daly Associates
The Old Cottage, Drummin Lane,
Glen of the Downs, Co. Wicklow.
Phone: 01 2876319 Fax: 01 2872645

Pumping Test Analysis Report

Project:	Naul/Hollywood
No:	E09-15A
Client:	MEHL



Test name: **Step Test**

Analysis method: **Theis Recovery**

Analysis results:	Transmissivity:	2.85E+2 [m²/d]	Conductivity:	5.69E+0 [m/d]

Test parameters:	Pumping well:	BH17	Aquifer thickness:	50 [m]
	Screen radius:	0.075 [m]	Confined aquifer	
	Screen length:	6 [m]		
	Casing radius:	0.125 [m]		
	Discharge rate:	389.3 [m³/d]		
	Pump Time	180 [min]		

Comments:

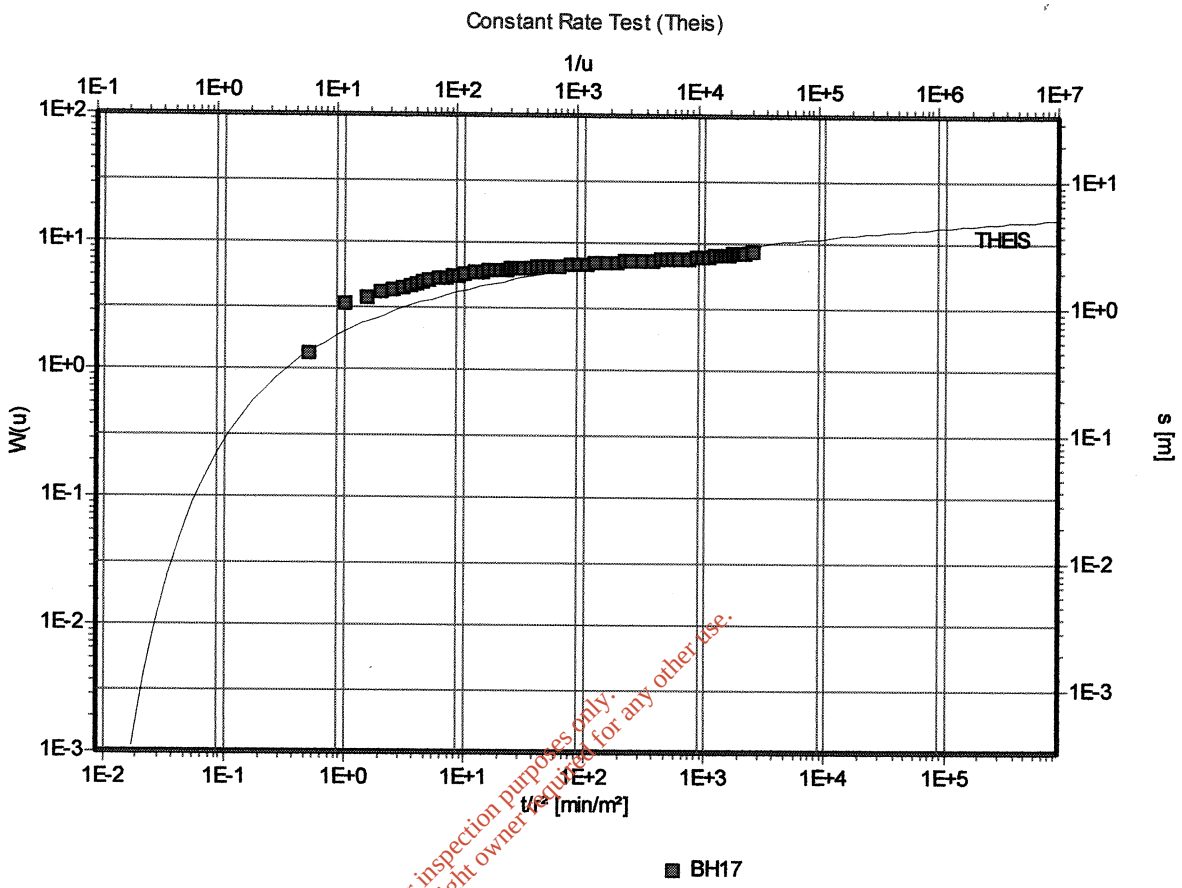
Evaluated by: TM

Date: 04/11/2010

Eugene Daly Associates
The Old Cottage, Drummin Lane,
Glen of the Downs, Co. Wicklow.
Phone: 01 2876319 Fax: 01 2872645

Pumping Test Analysis Report

Project:	Naul/Hollywood
No:	E09-15A
Client:	MEHL



Test name: **Constant Rate Test**

Analysis method: **Theis**

Analysis results:				
	Transmissivity:	1.45E+2 [m²/d]	Conductivity:	2.91E+0 [m/d]
	Storativity:	3.51E-2		

Test parameters:				
	Pumping well:	BH17	Aquifer thickness:	50 [m]
	Screen radius:	0.075 [m]	Confined aquifer	
	Screen length:	6 [m]		
	Casing radius:	0.125 [m]		
	Discharge rate:	600 [m³/d]		

Comments: All of the manually recorded data for the test is plotted.

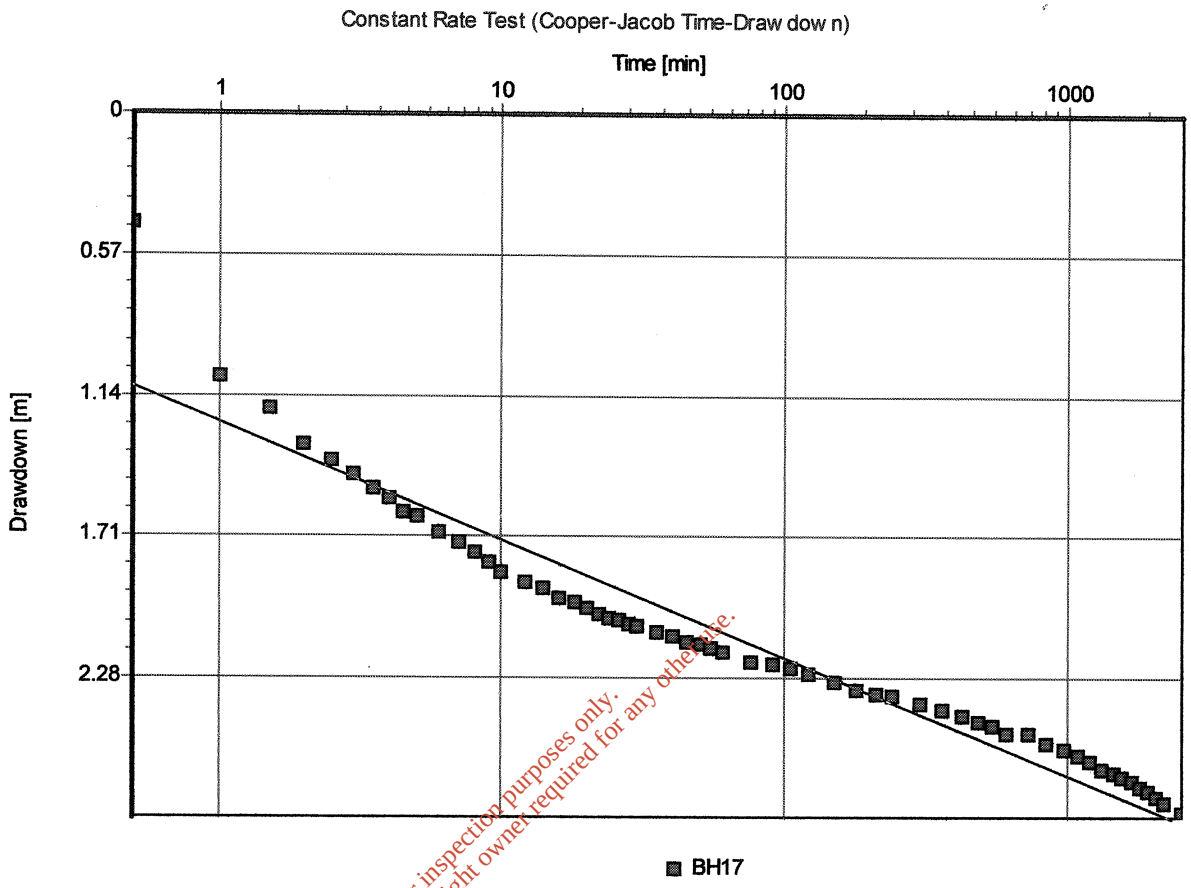
Evaluated by: TM

Date: 04/11/2010

Eugene Daly Associates
The Old Cottage, Drummin Lane,
Glen of the Downs, Co. Wicklow.
Phone: 01 2876319 Fax: 01 2872645

Pumping Test Analysis Report

Project:	Naul/Hollywood
No:	E09-15A
Client:	MEHL



Test name: **Constant Rate Test**

Analysis method: **Cooper-Jacob Time-Drawdown**

Analysis results:				
	Transmissivity:	2.31E+2 [m²/d]	Conductivity:	4.62E+0 [m/d]

Test parameters:				
	Pumping well:	BH17	Aquifer thickness:	50 [m]
	Screen radius:	0.075 [m]	Confined aquifer	
	Screen length:	6 [m]		
	Casing radius:	0.125 [m]		
	Discharge rate:	600 [m³/d]		

Comments:

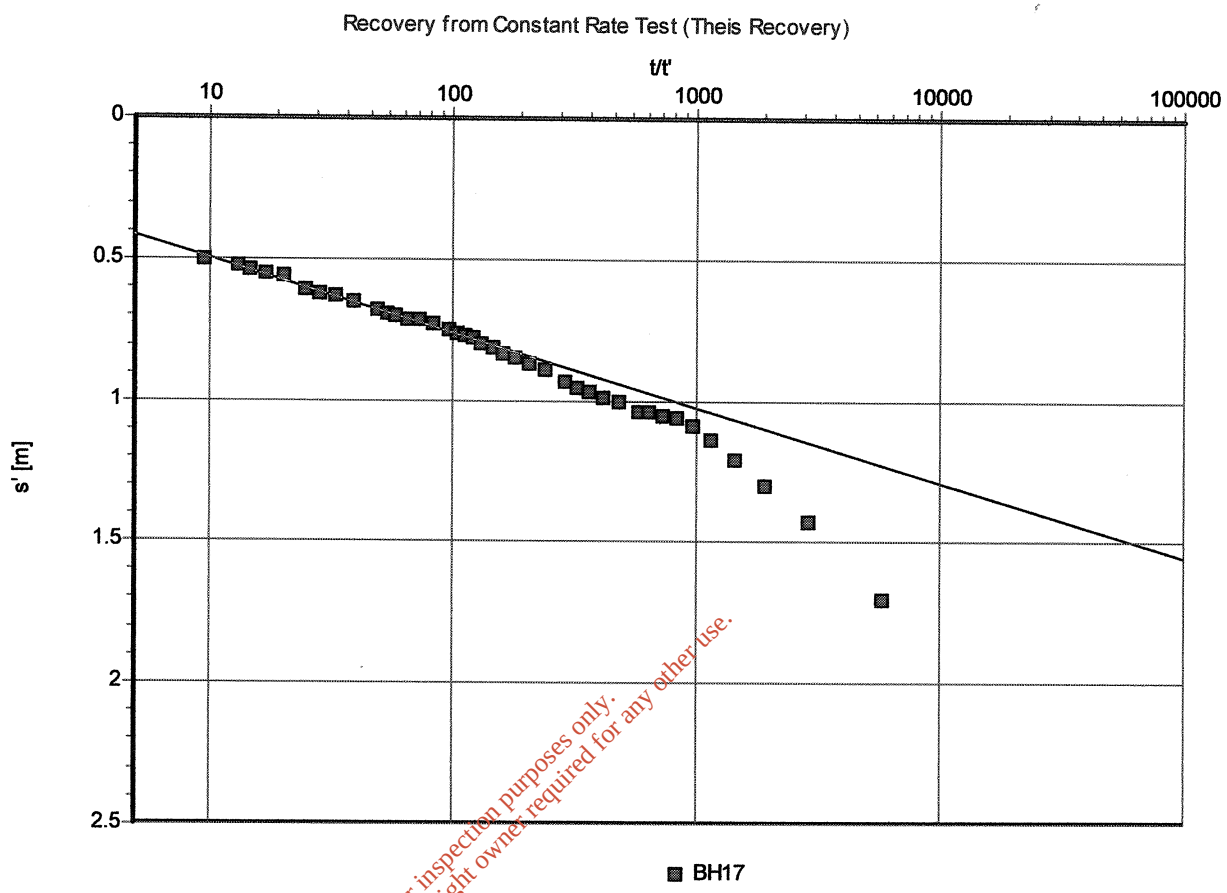
Evaluated by: TM

Date: 04/11/2010

Eugene Daly Associates
The Old Cottage, Drummin Lane,
Glen of the Downs, Co. Wicklow.
Phone: 01 2876319 Fax: 01 2872645

Pumping Test Analysis Report

Project:	Naul/Hollywood
No:	E09-15A
Client:	MEHL



Test name: **Recovery from Constant Rate Test**

Analysis method: **Theis Recovery**

Analysis results:	Transmissivity:	4.15E+2 [m²/d]	Conductivity:	8.30E+0 [m/d]

Test parameters:	Pumping well:	BH17	Aquifer thickness:	50 [m]
	Screen radius:	0.075 [m]	Confined aquifer	
	Screen length:	6 [m]		
	Casing radius:	0.125 [m]		
	Discharge rate:	600 [m³/d]		
	Pump Time	2880 [min]		

Comments:

Evaluated by: TM

Date: 04/11/2010

Ove Arup & Partners Ireland
50 Ringsend Road
Dublin 4
Ireland

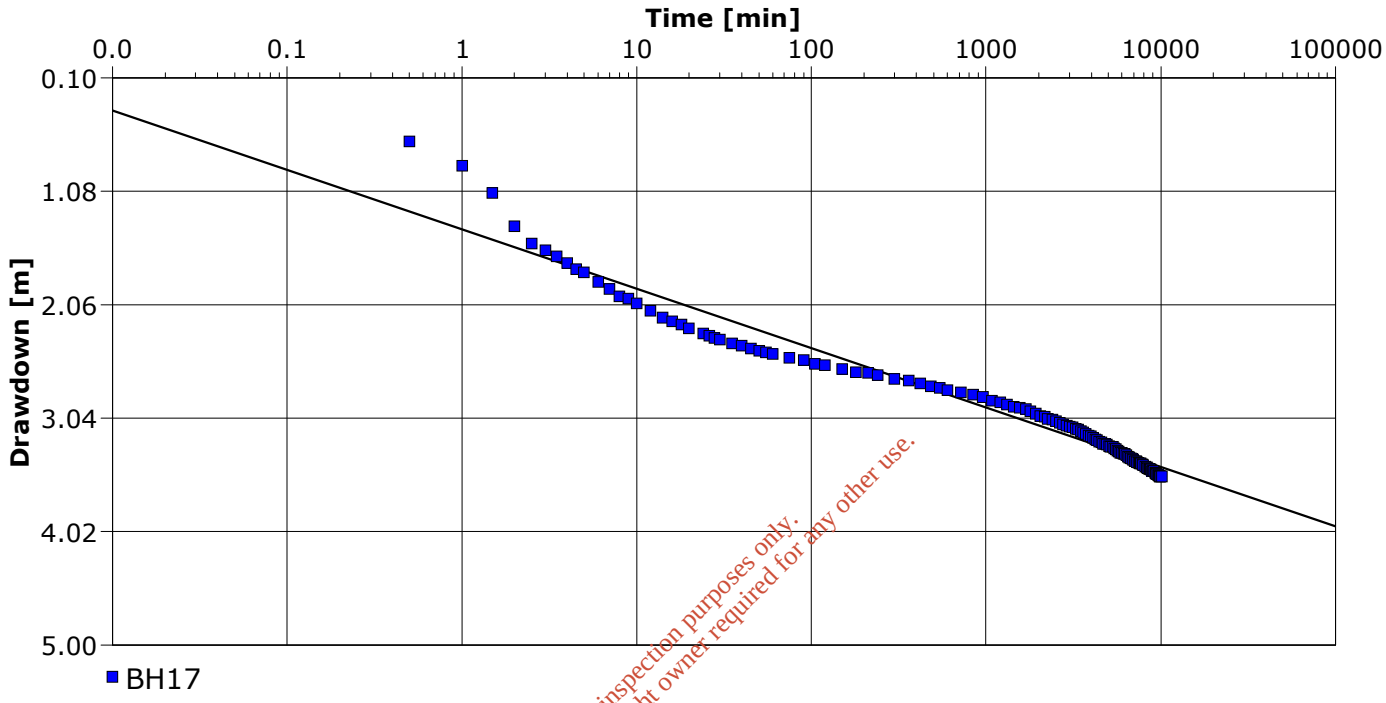
Pumping Test Analysis Report

Project: Article 16(1)

Number: D6877

Client: MEHL

Location: Naul/Hollywood	Pumping Test: Constant Rate Test 2	Pumping Well: BH17
Test Conducted by: Lee Chambers		Test Date: 7/31/2013
Analysis Performed by:	New analysis 2	Analysis Date: 7/31/2013
Aquifer Thickness: 50.00 m	Discharge Rate: 601.3 [m³/d]	



Calculation after Cooper & Jacob

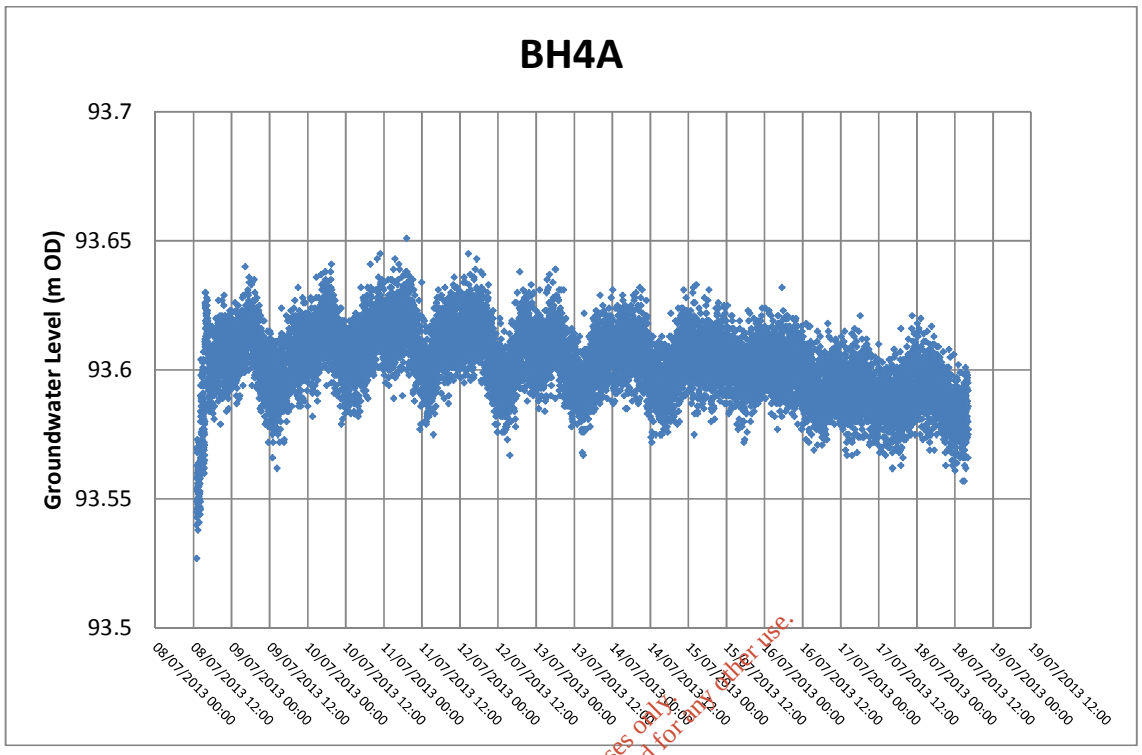
Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
BH17	2.14×10^{2}	4.28×10^{0}	1.08×10^{-1}	0.07	

H7 Curve analysis plots

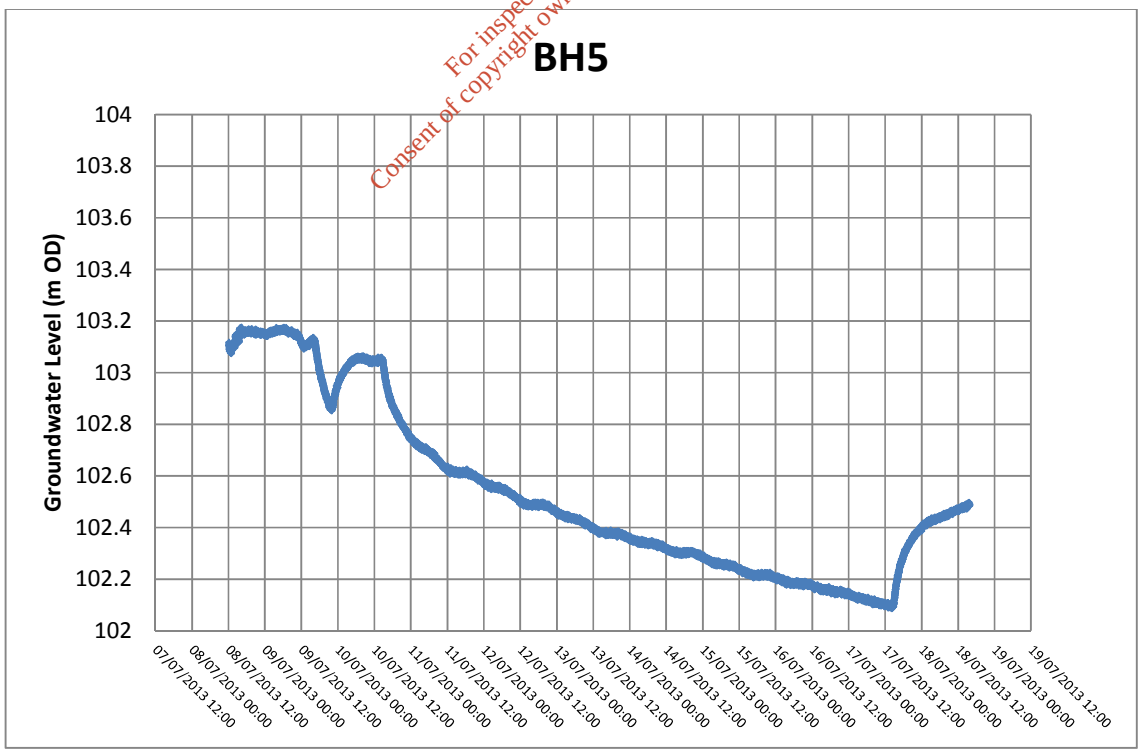
Appendix A9

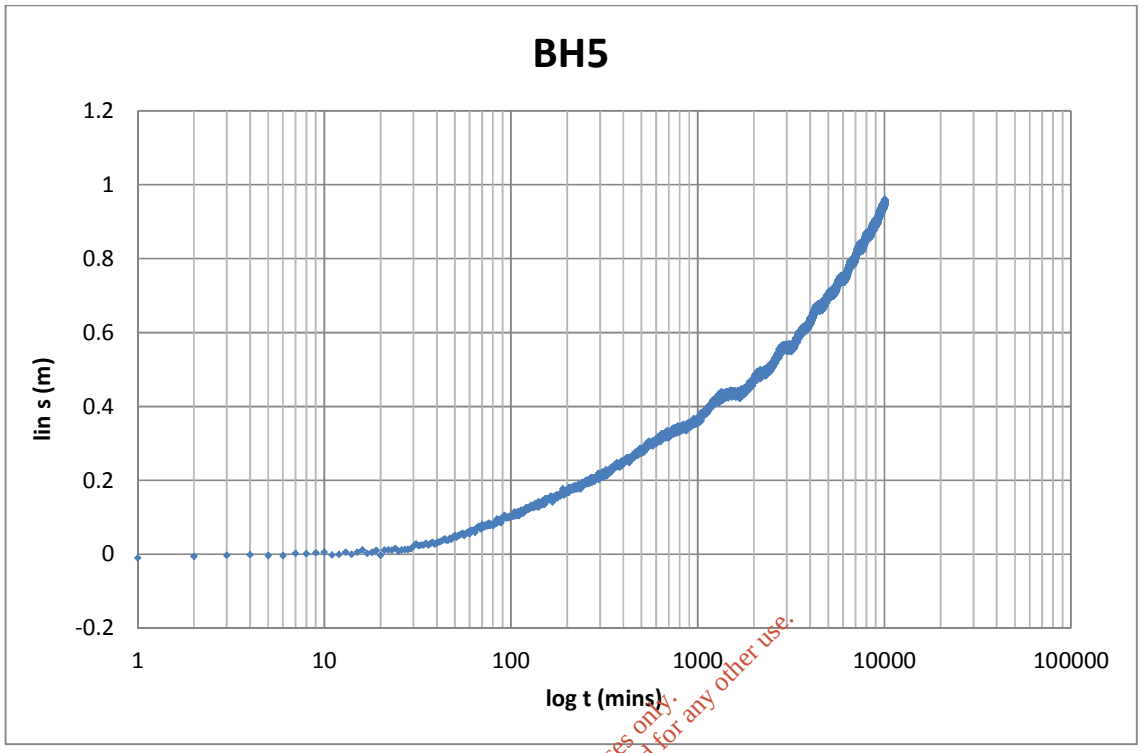
Groundwater level data, Log-log and semi-log plots for Constant Rate Test 2

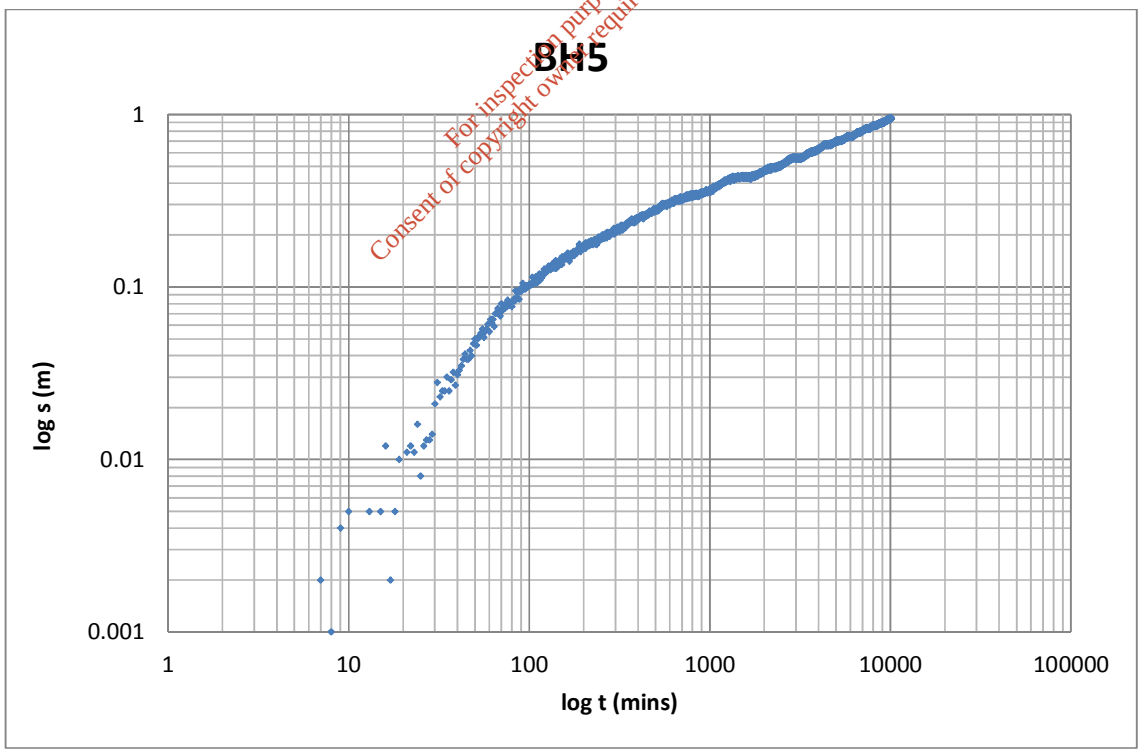
BH4A



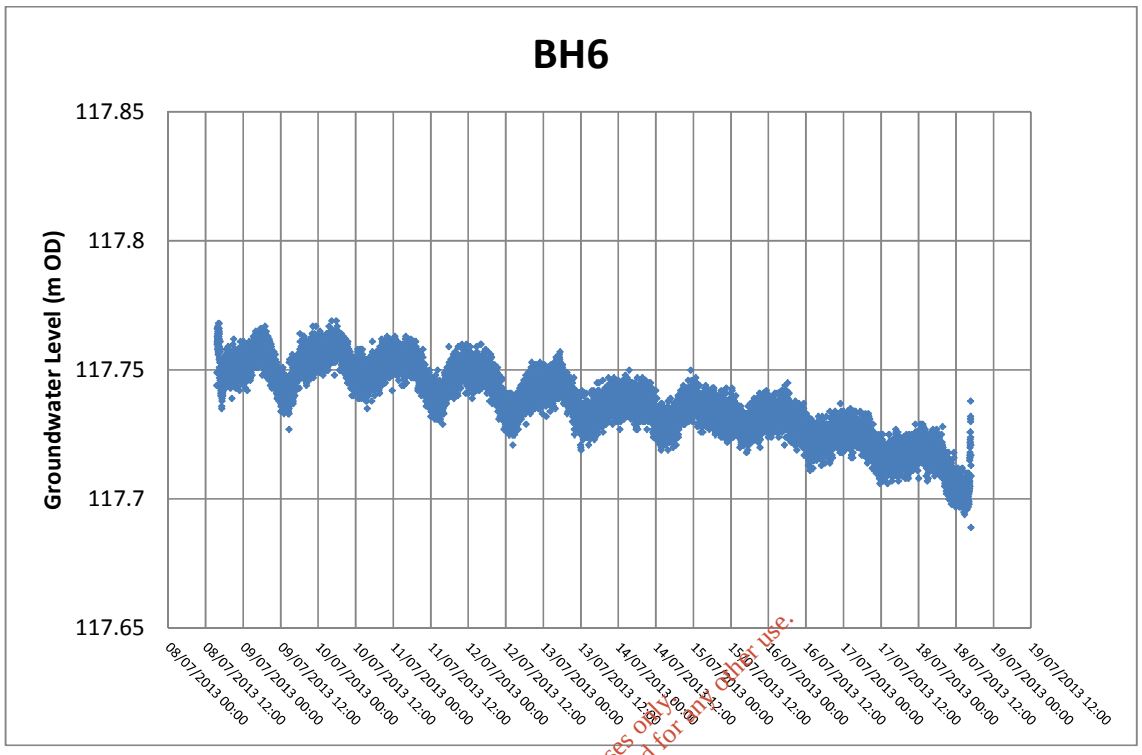
BH5



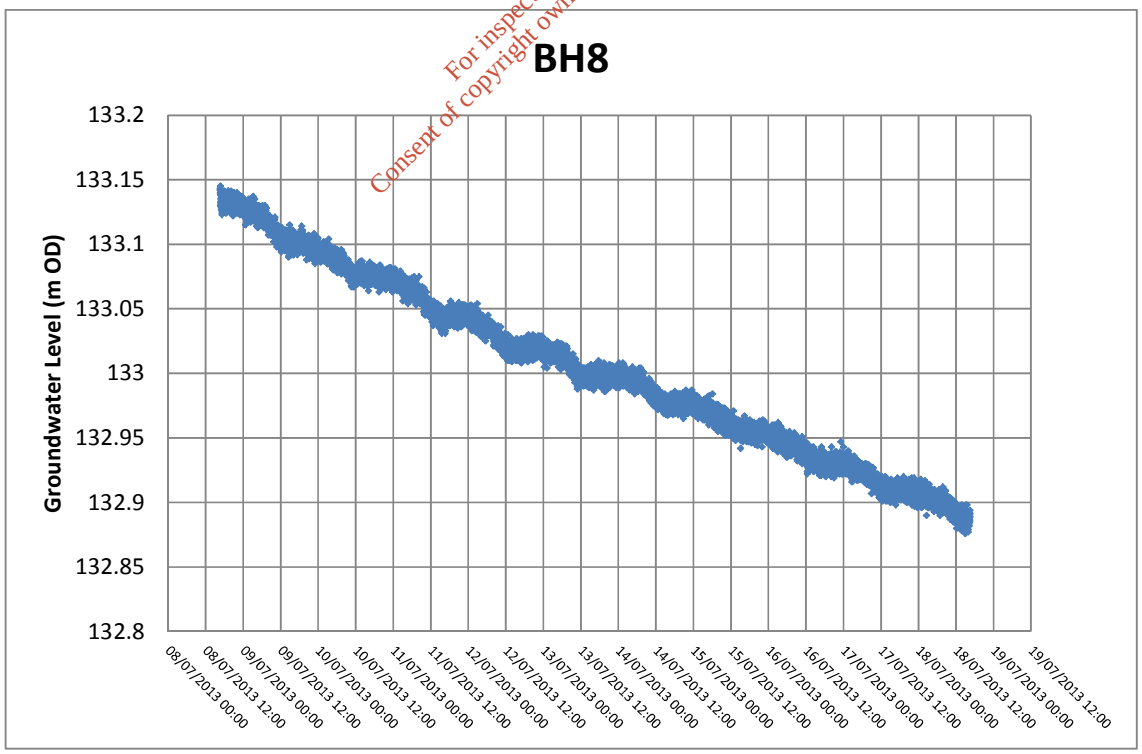


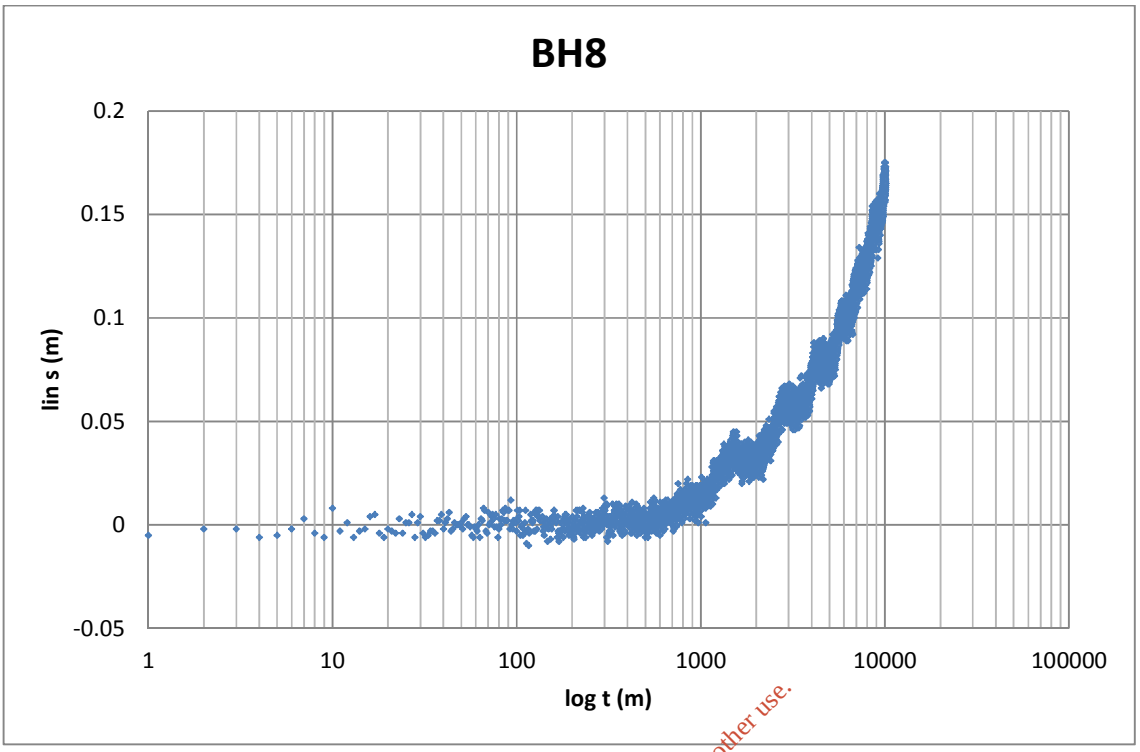


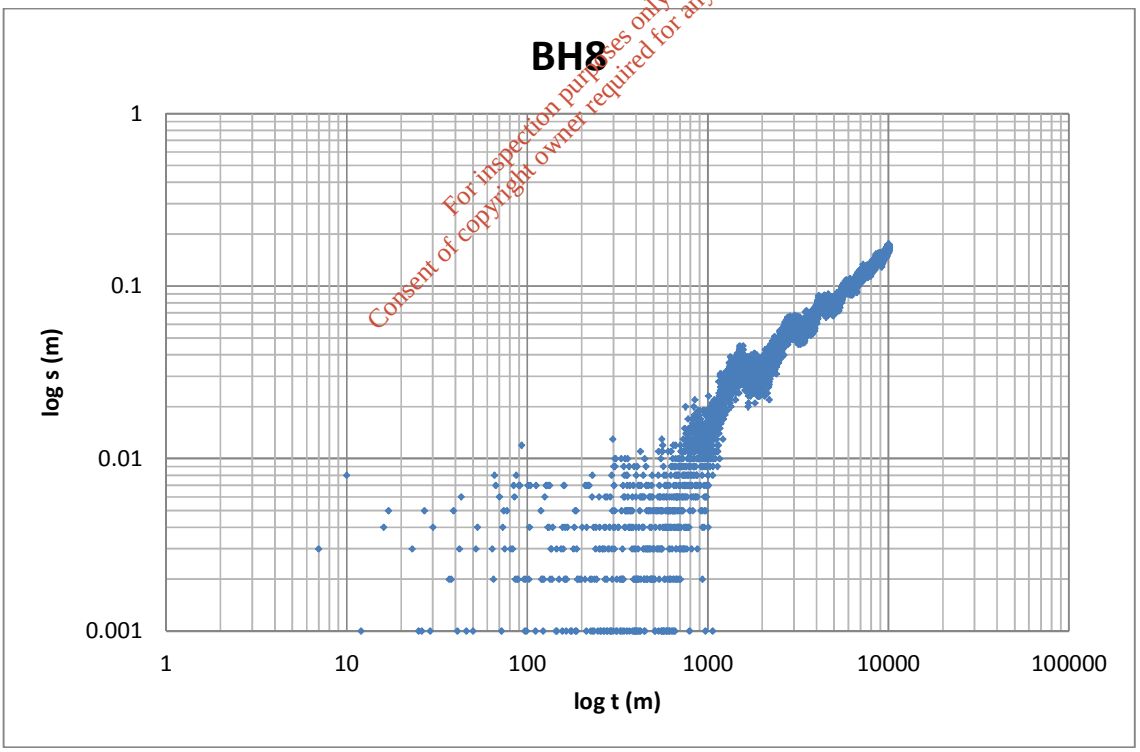
BH6



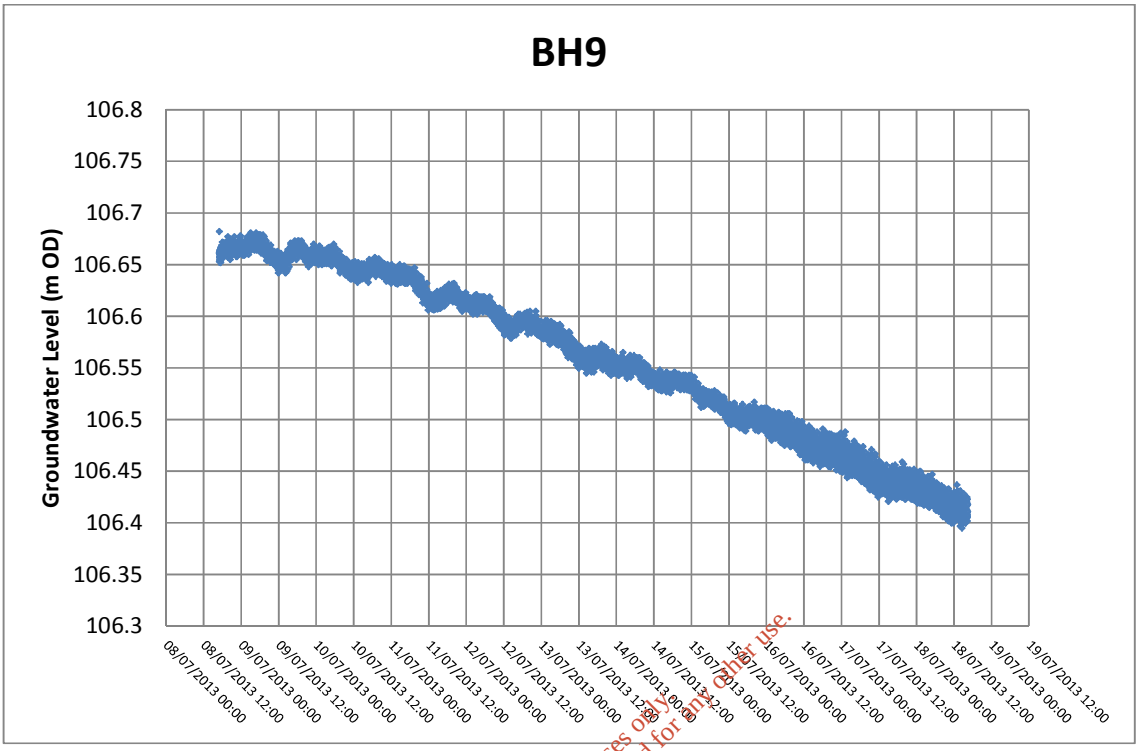
BH8

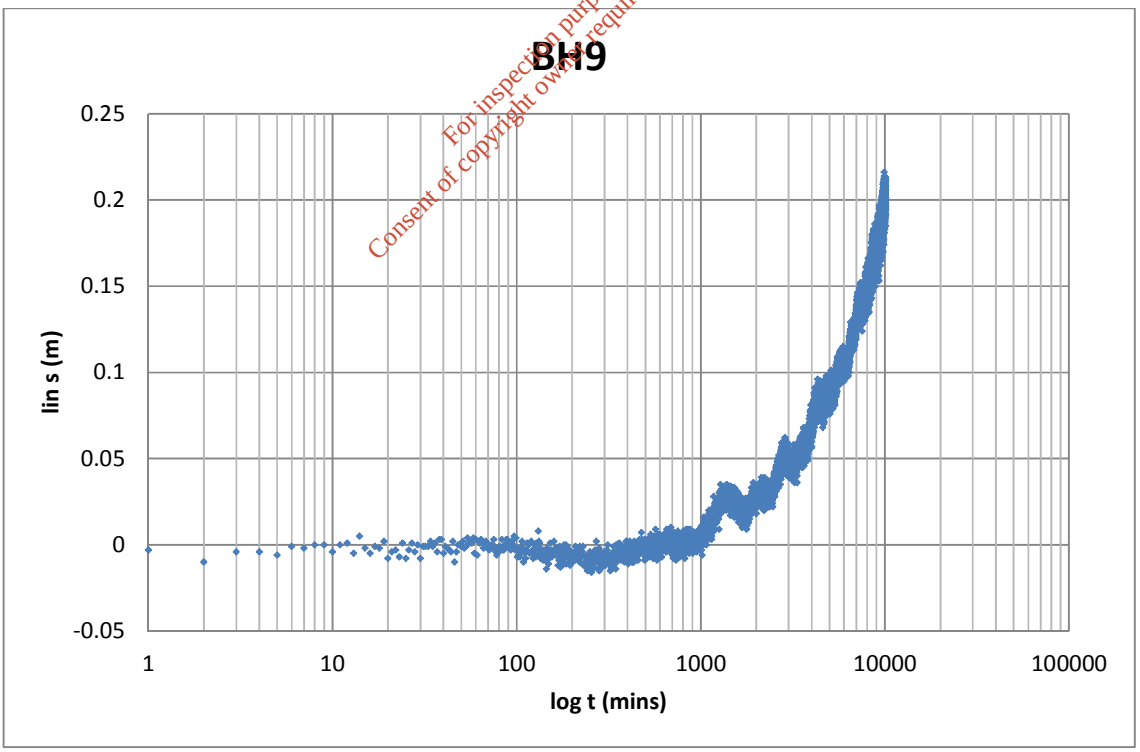


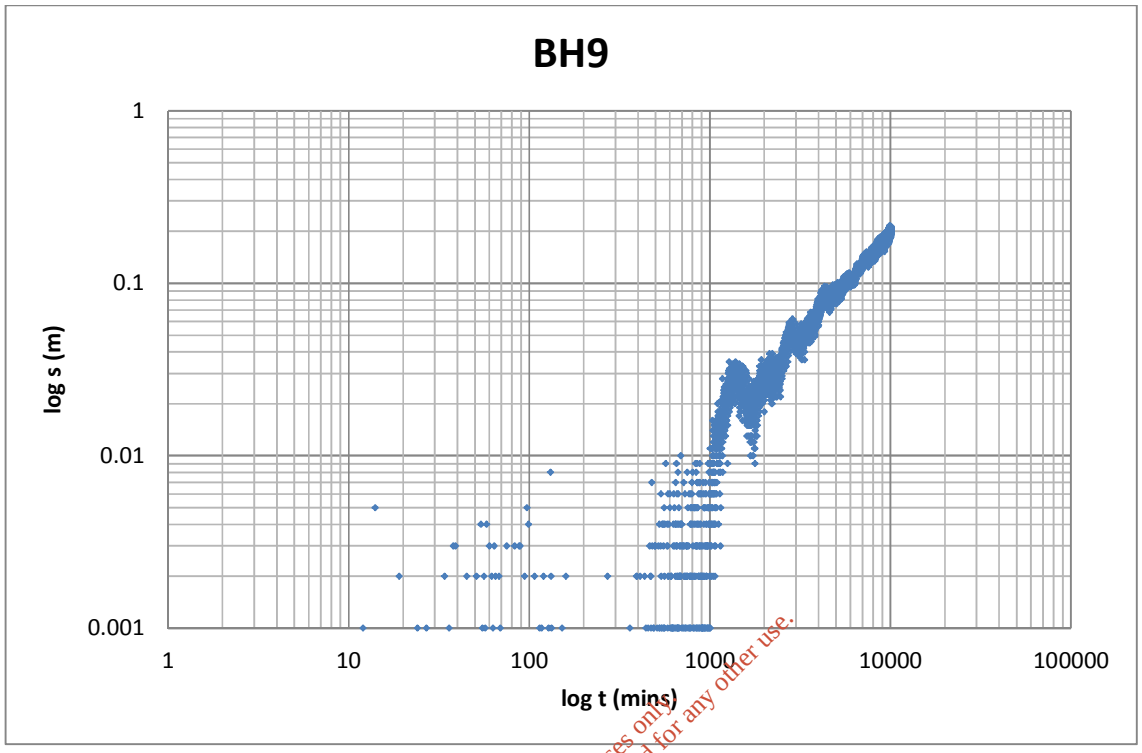




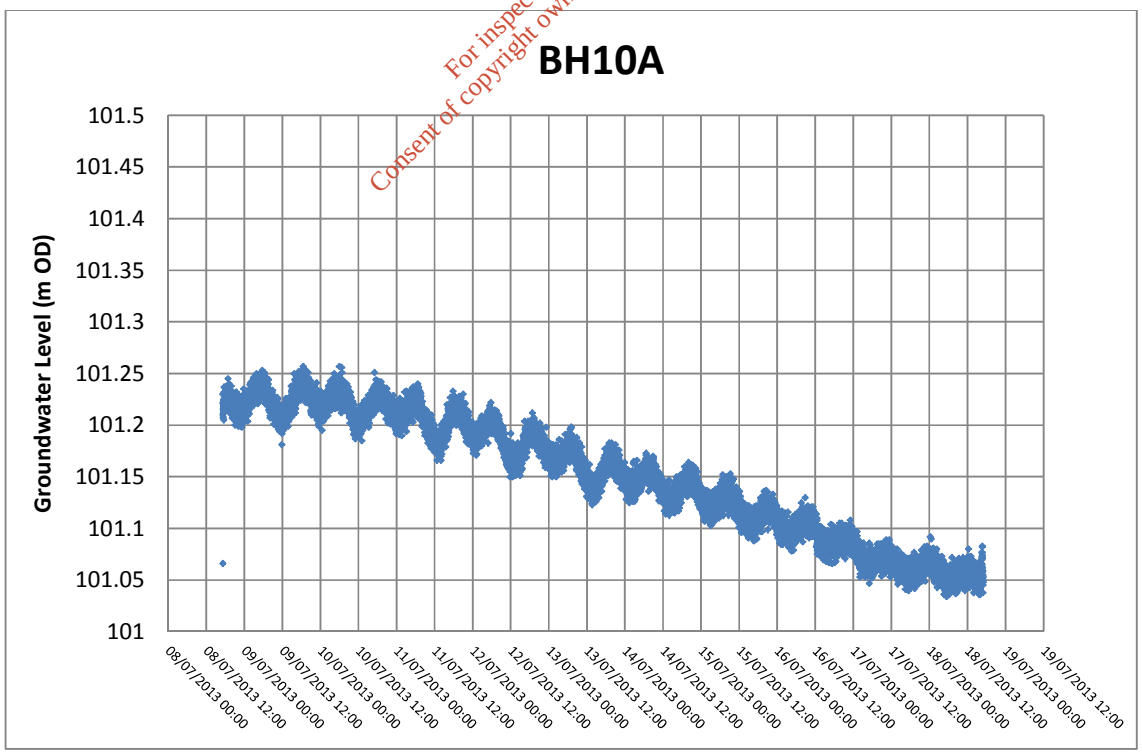
BH9

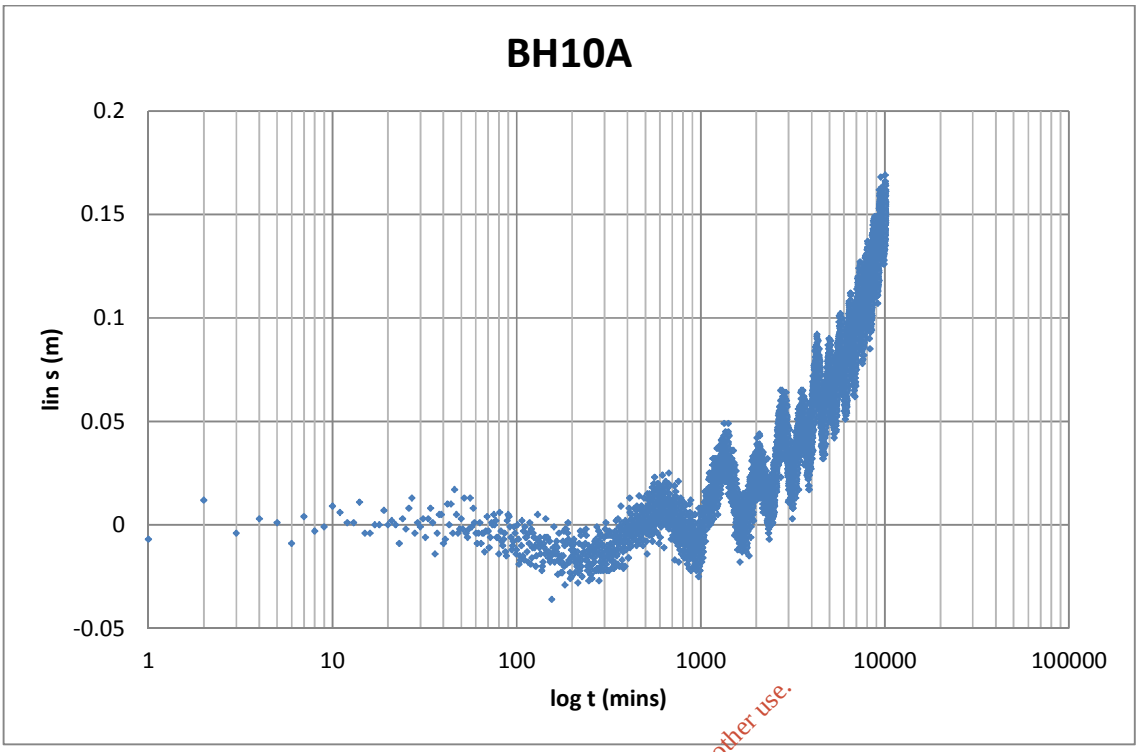


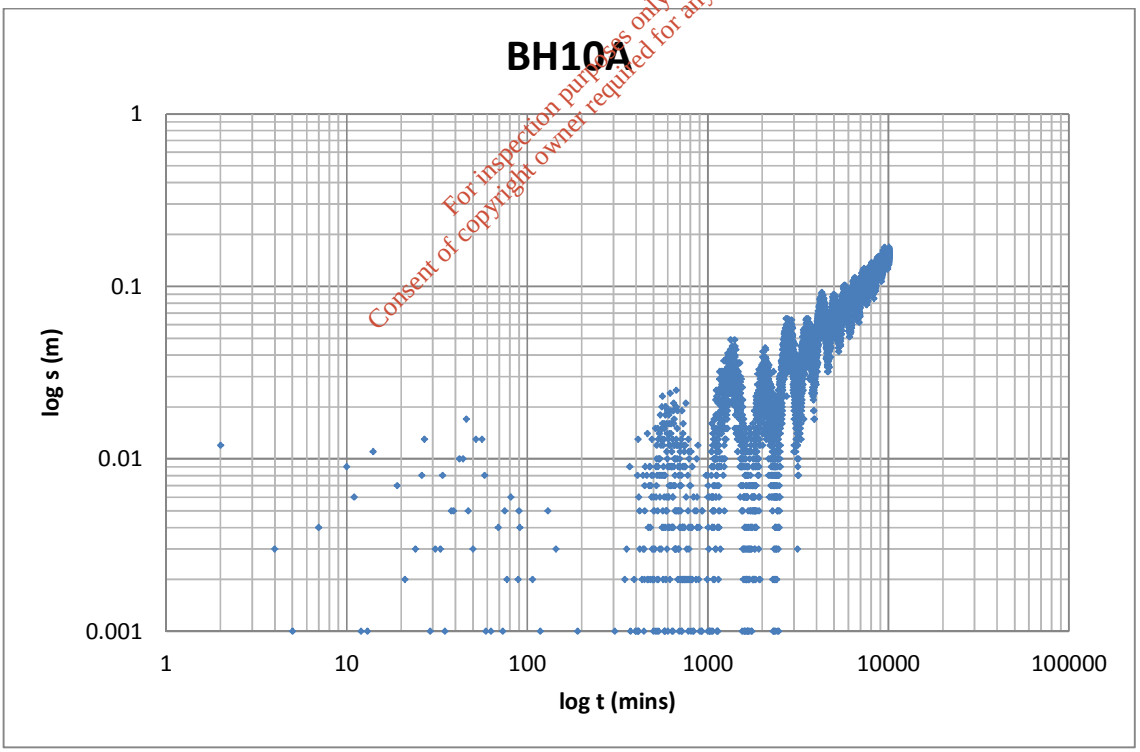




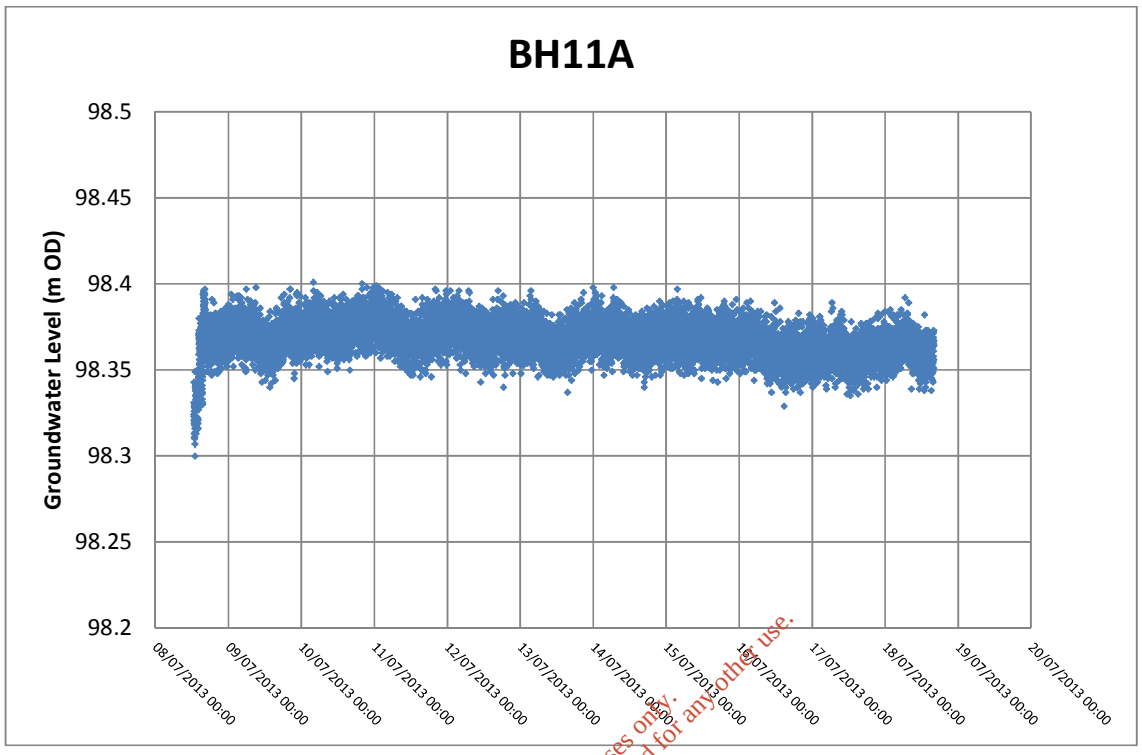
BH10A







BH11A



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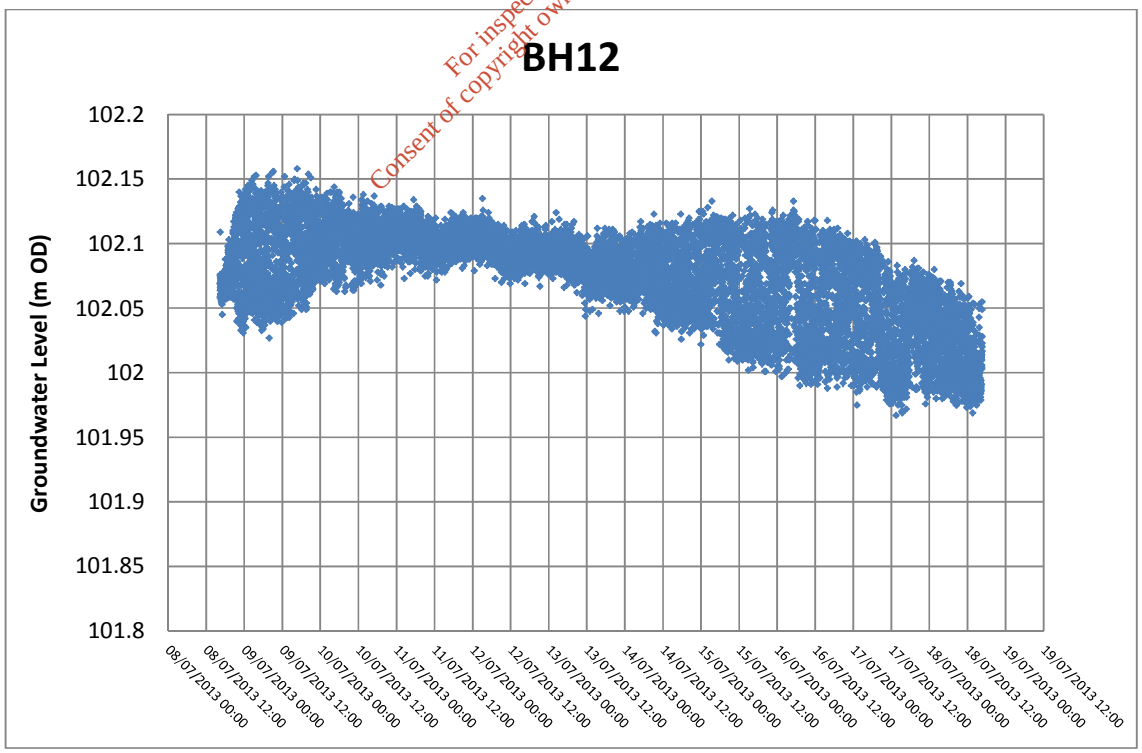

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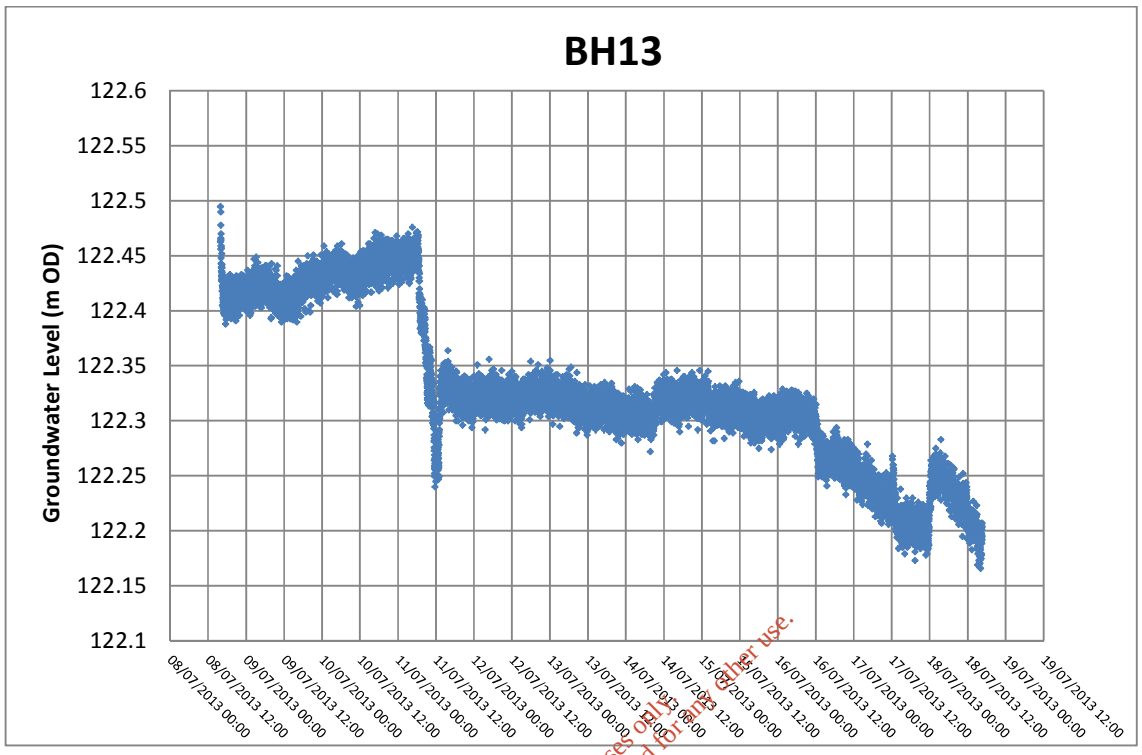
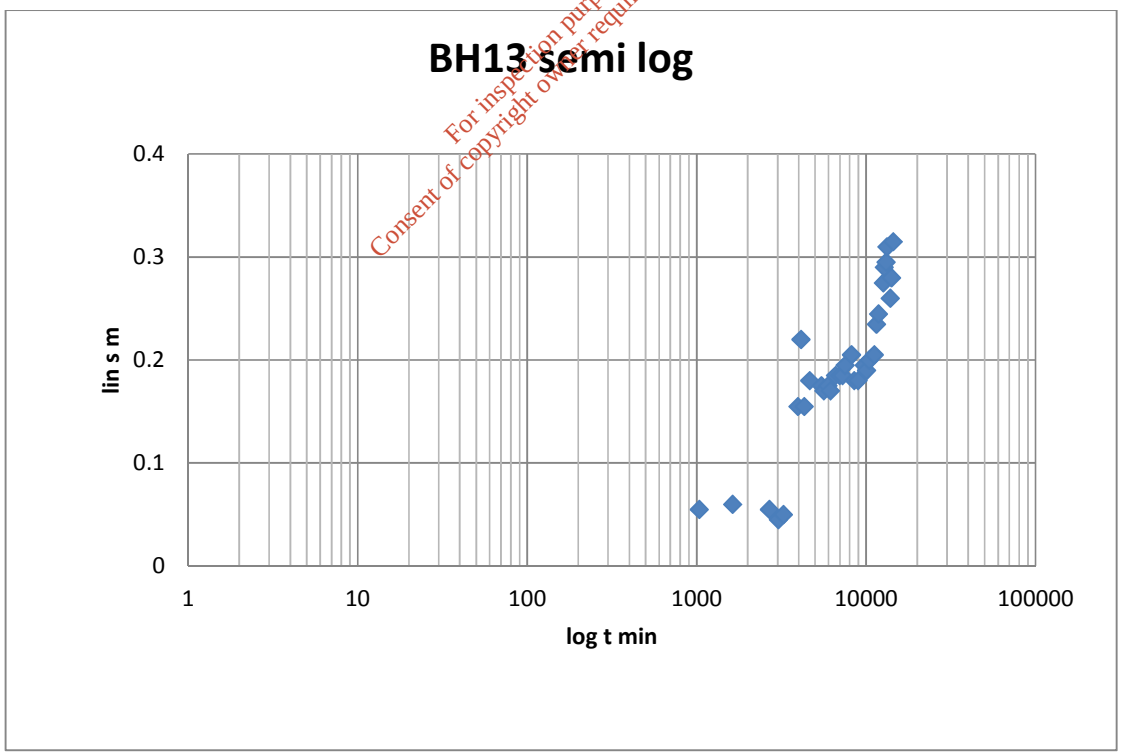
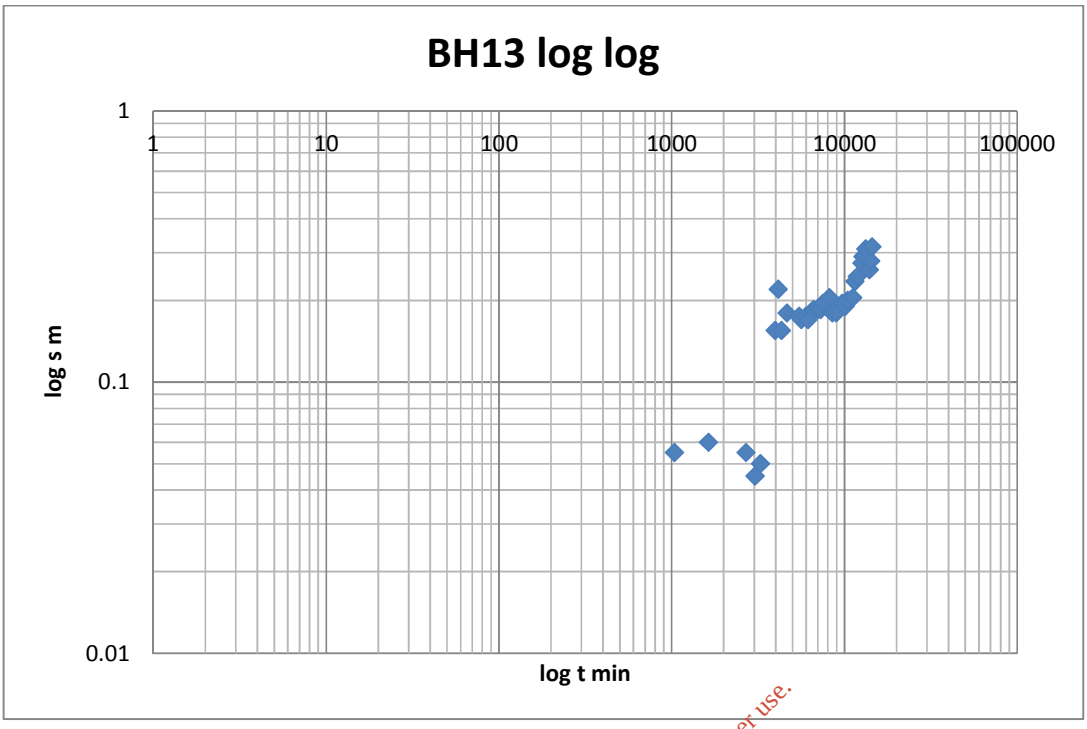
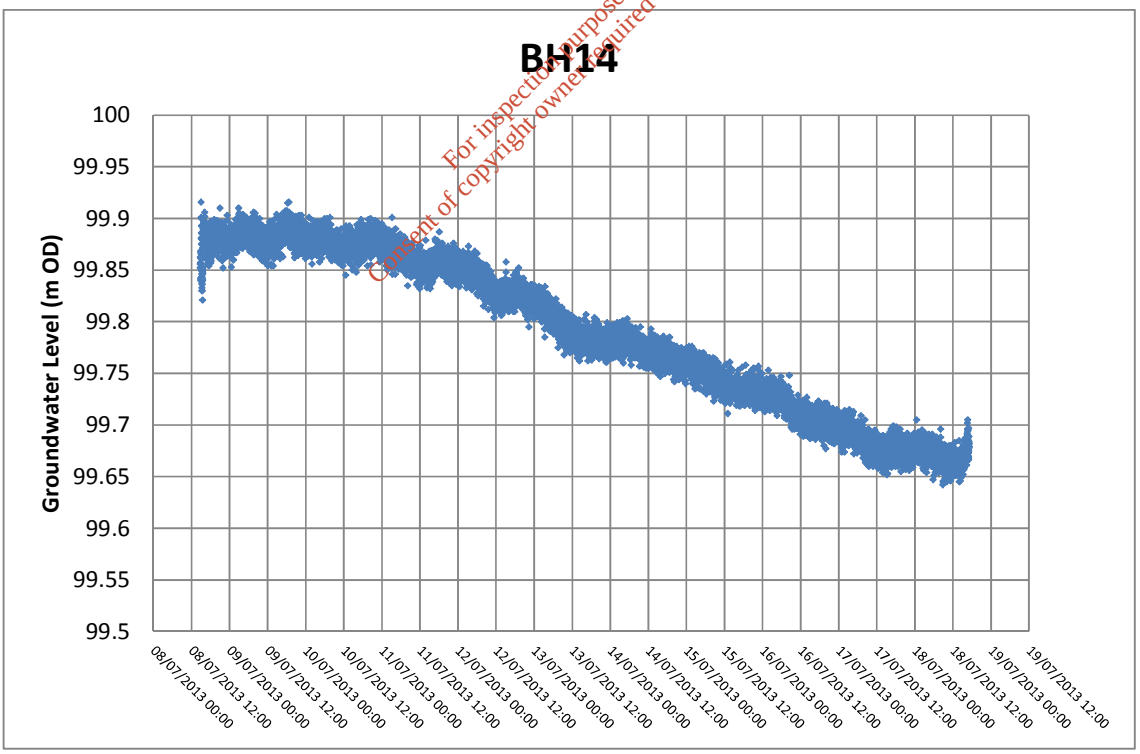
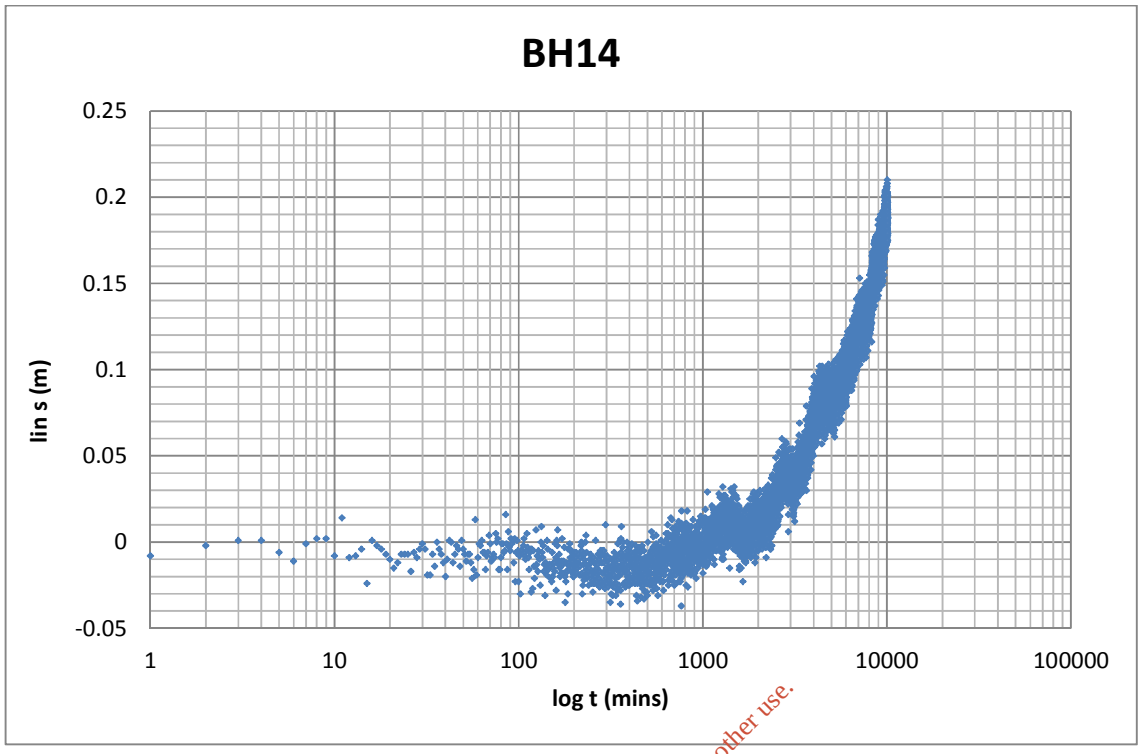


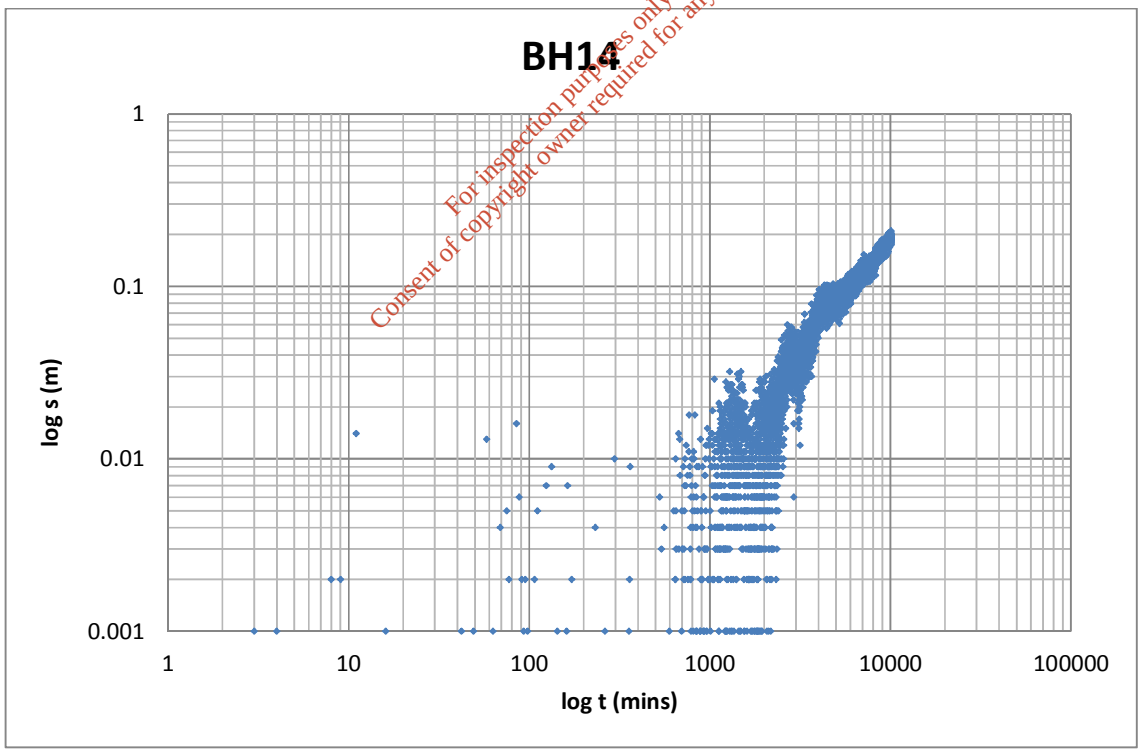




BH14







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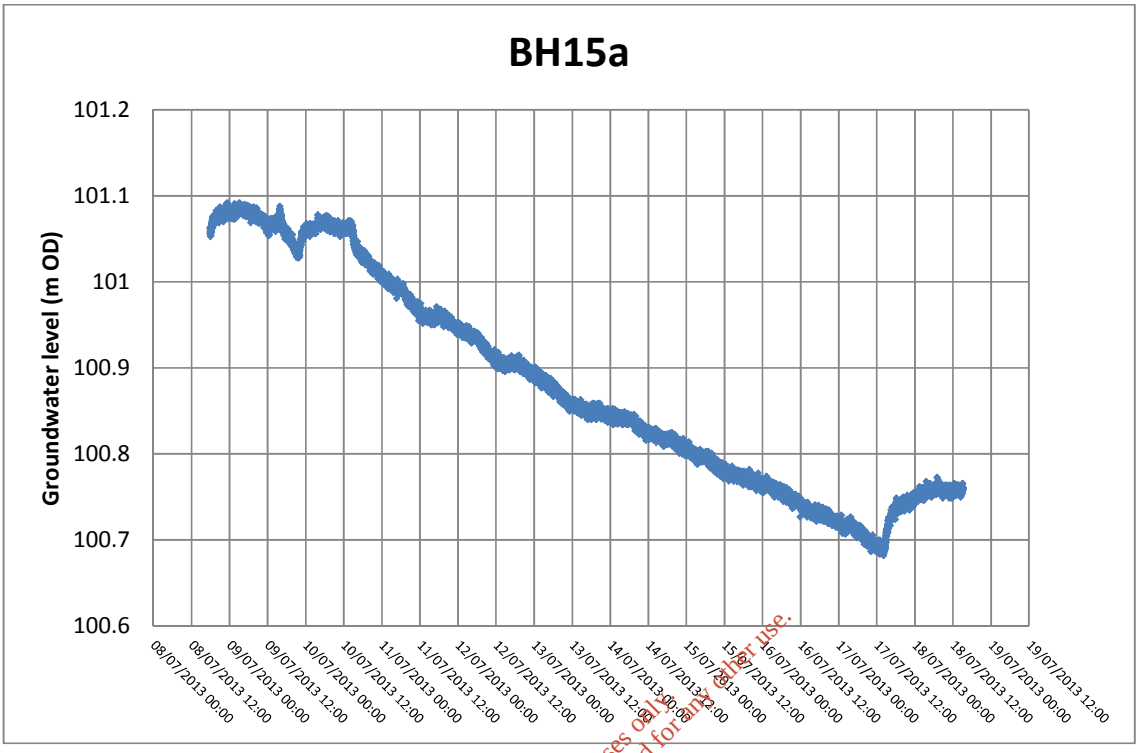

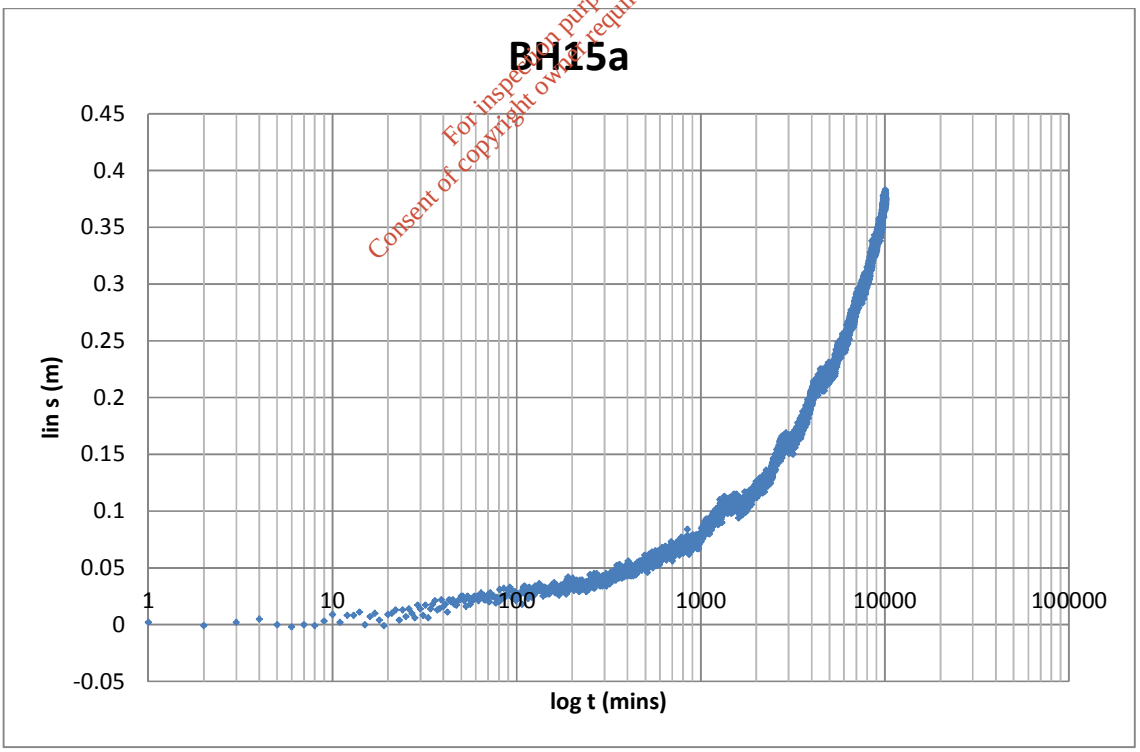

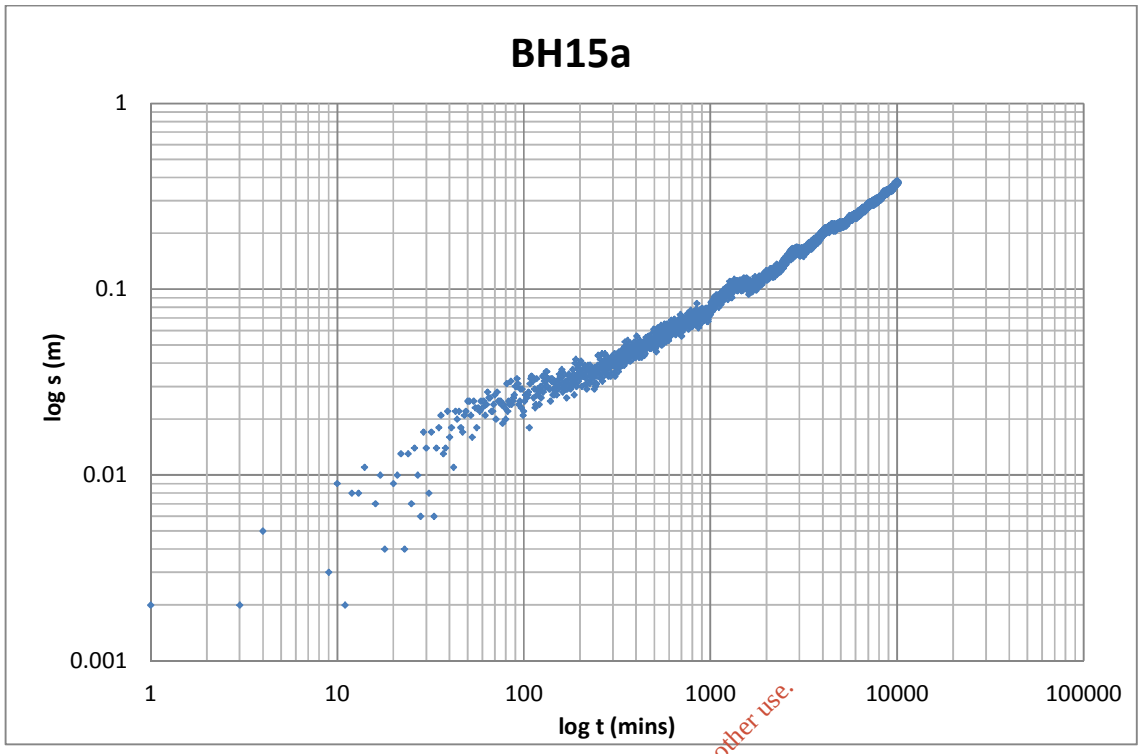

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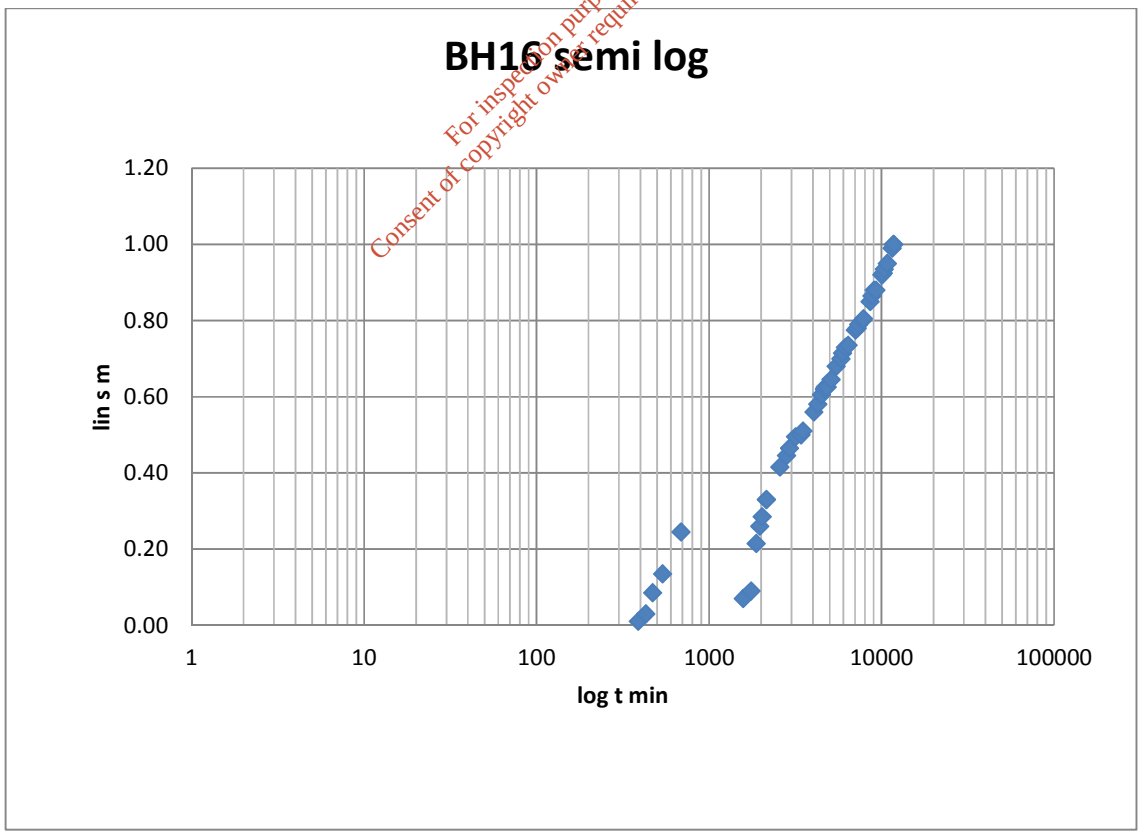

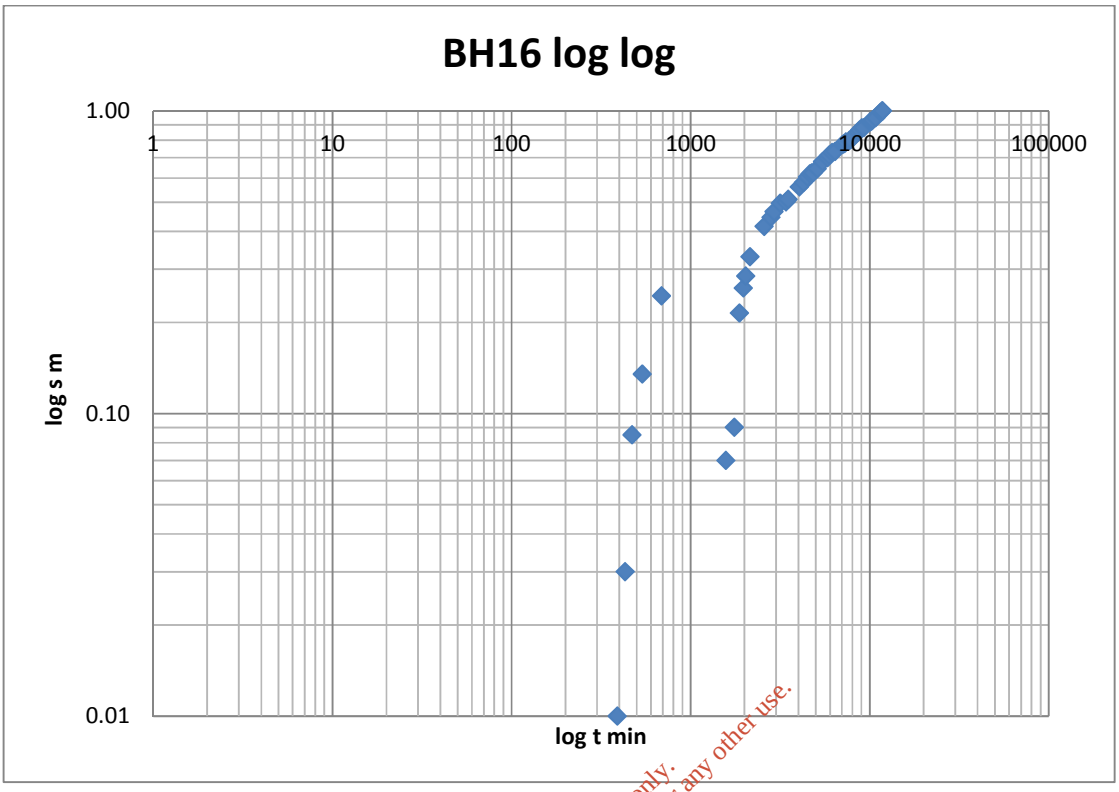

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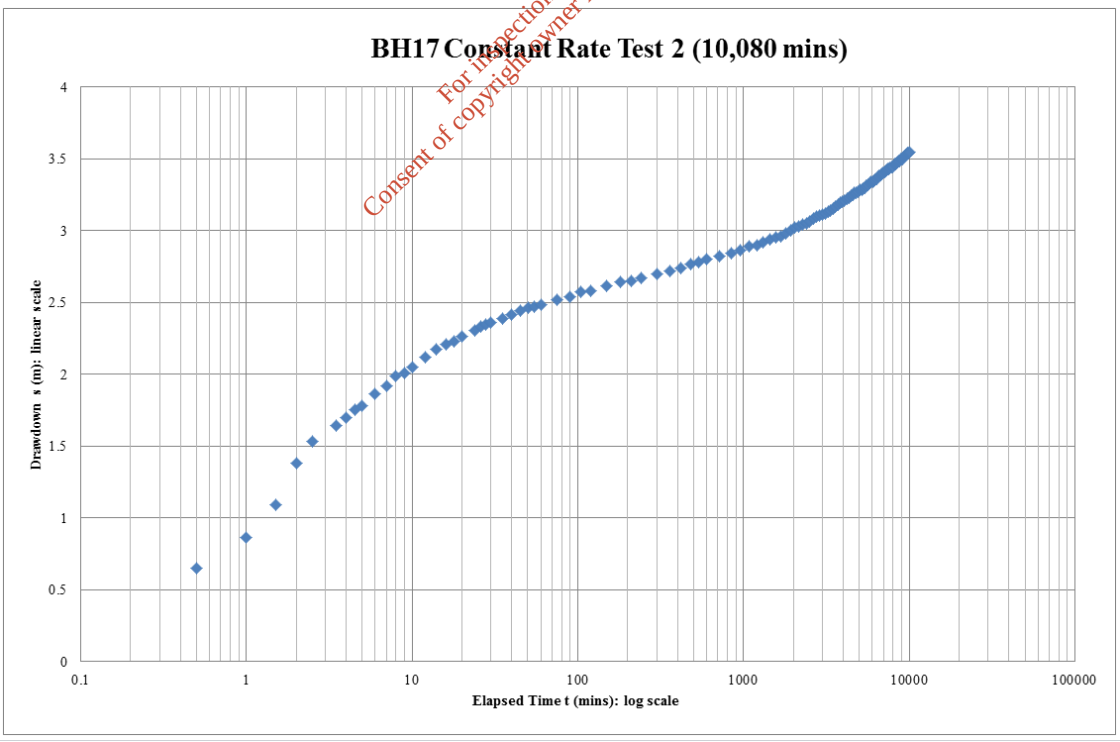

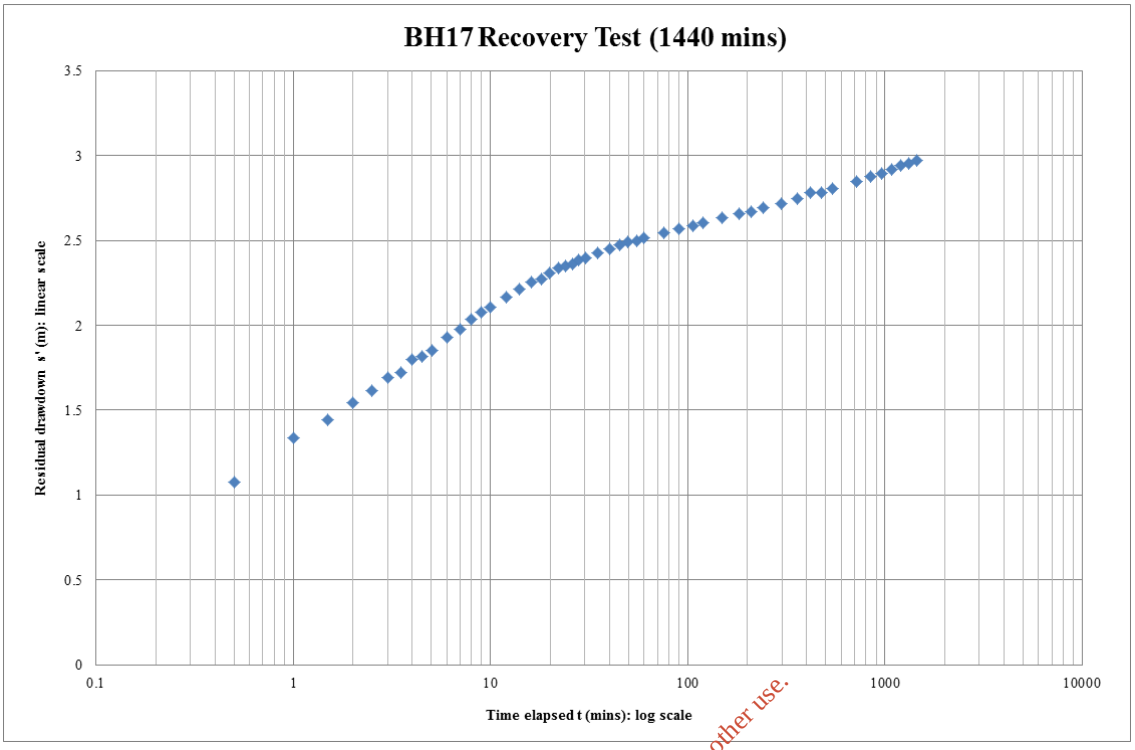

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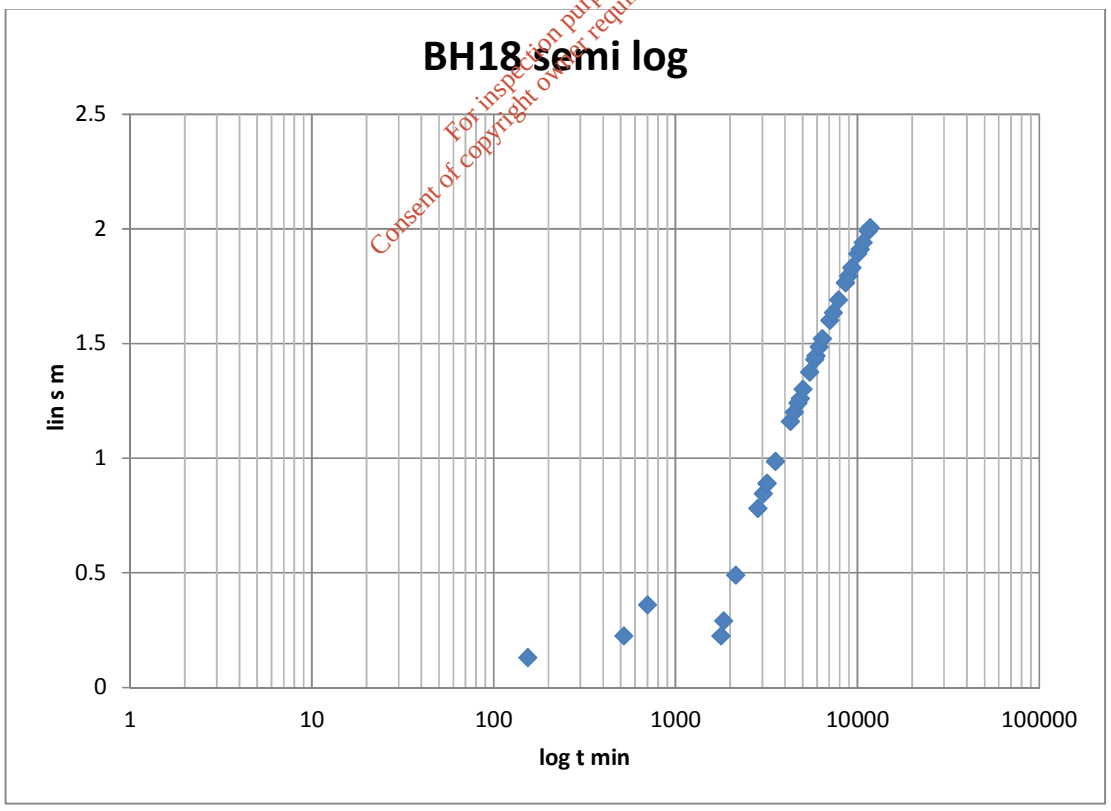

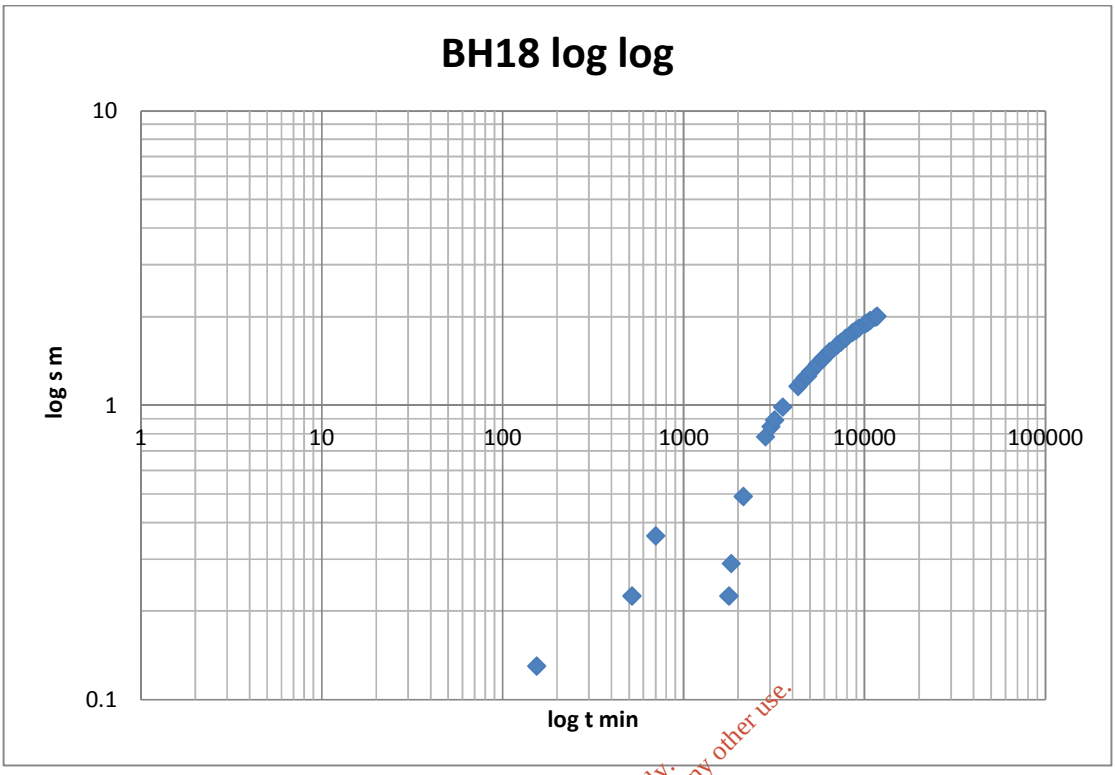

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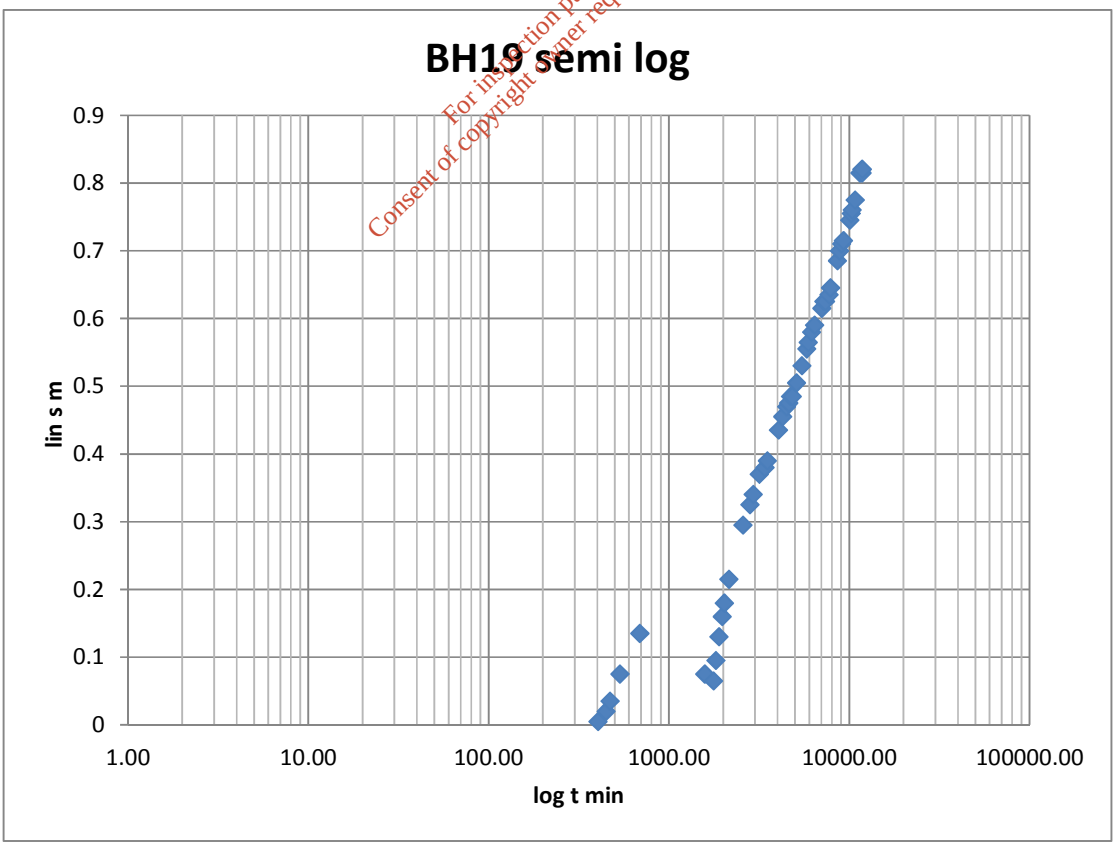
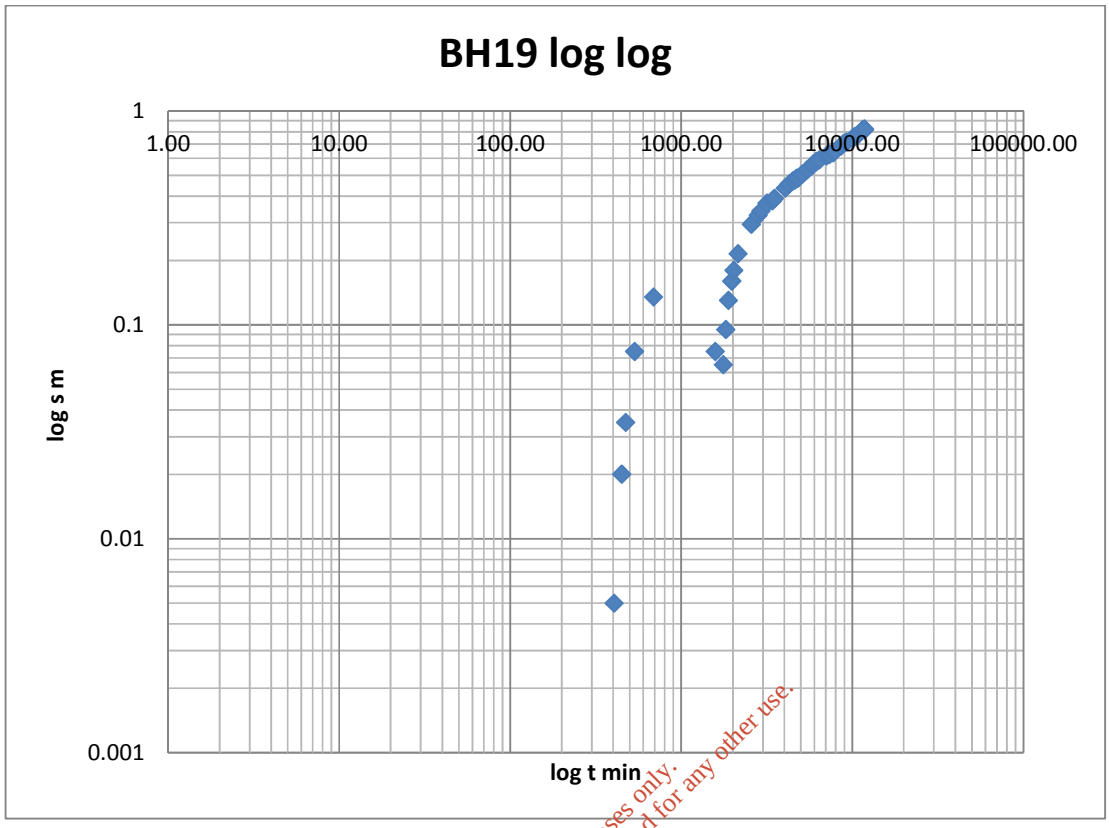
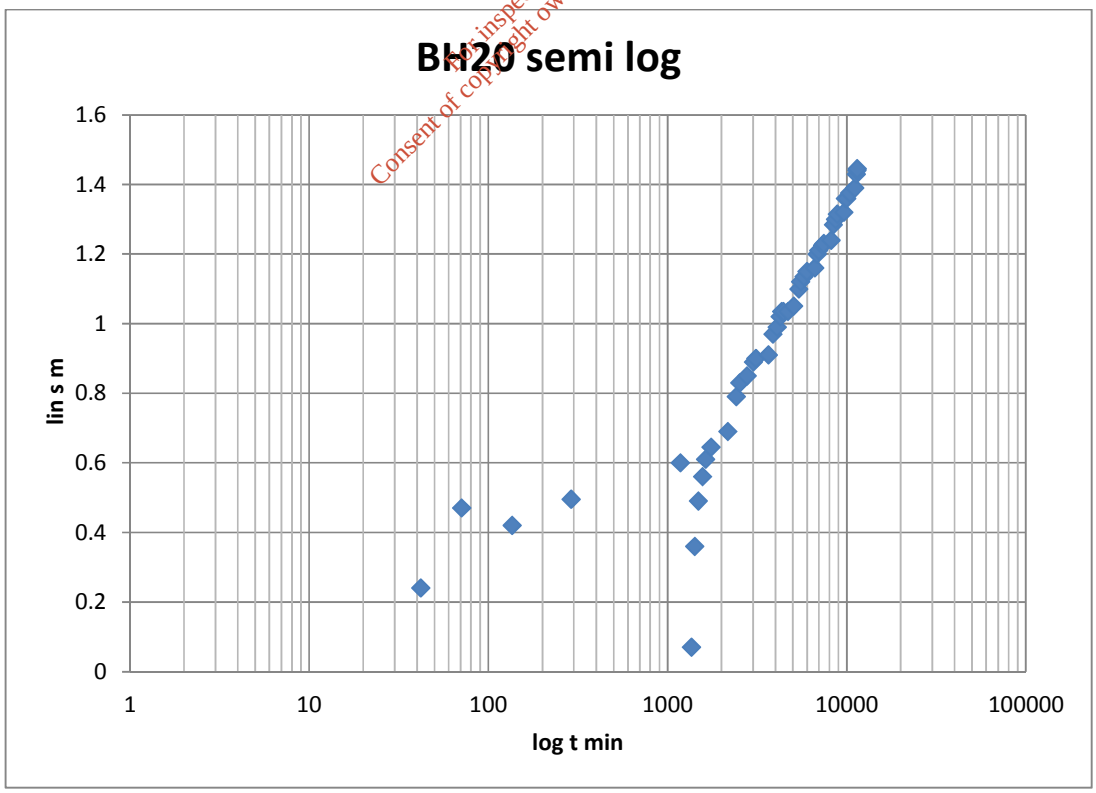
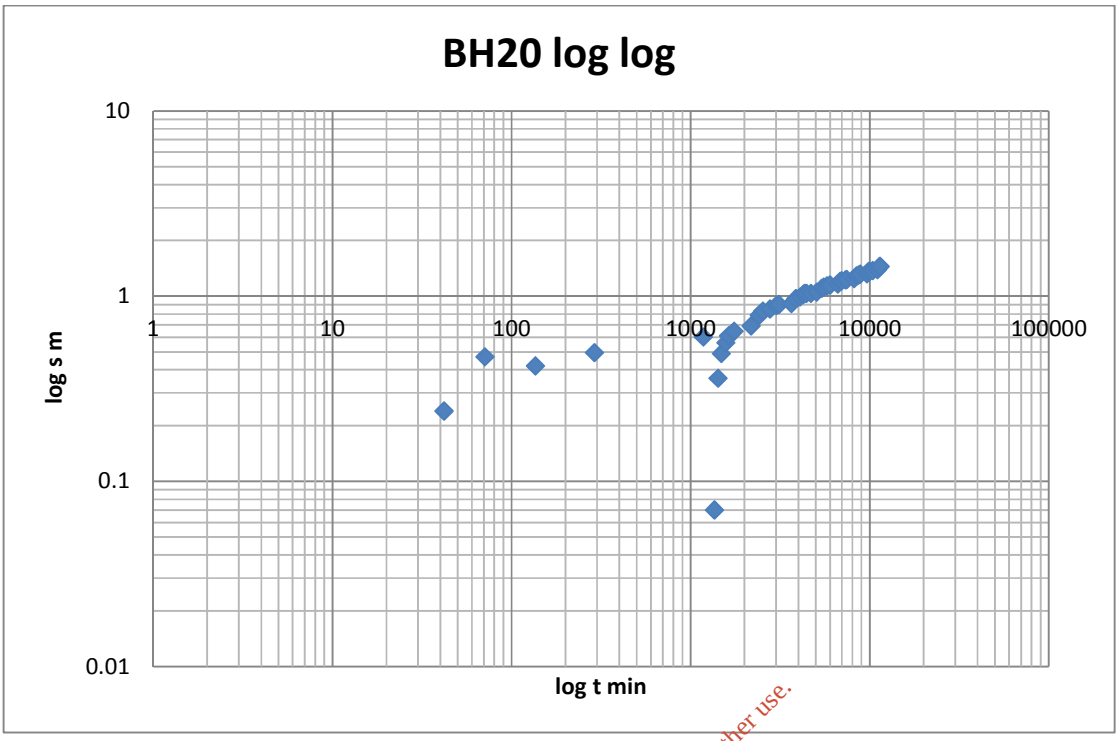


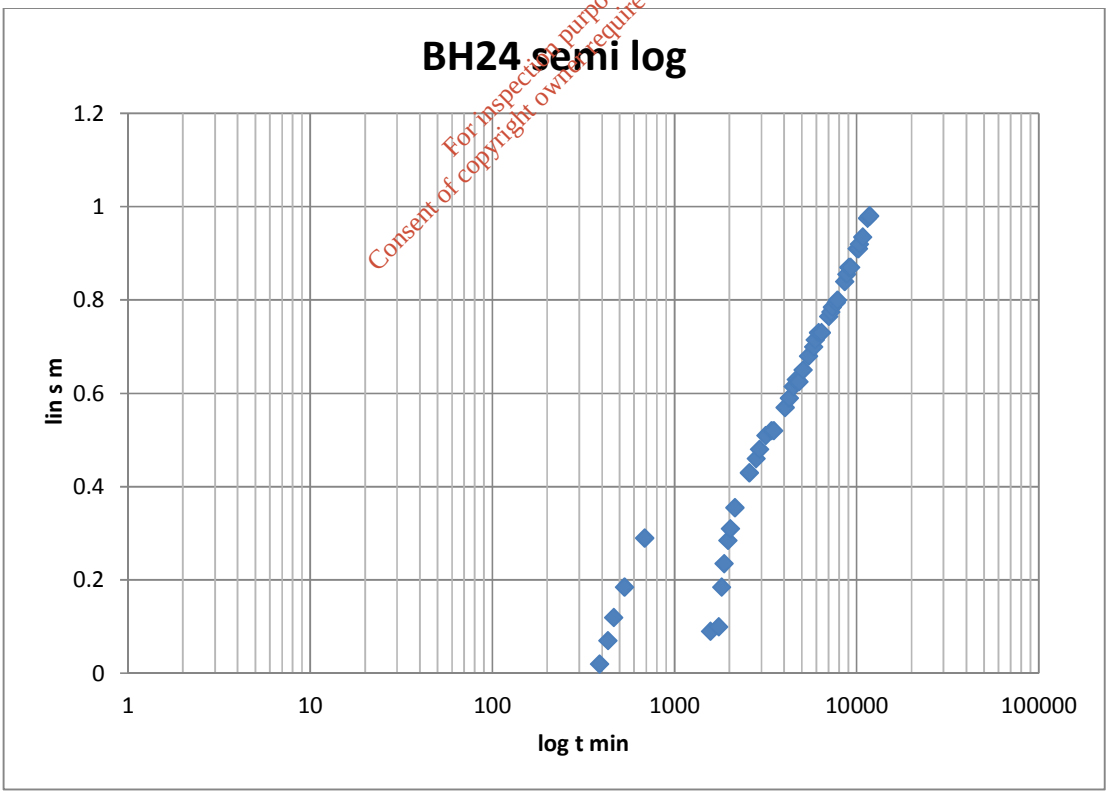


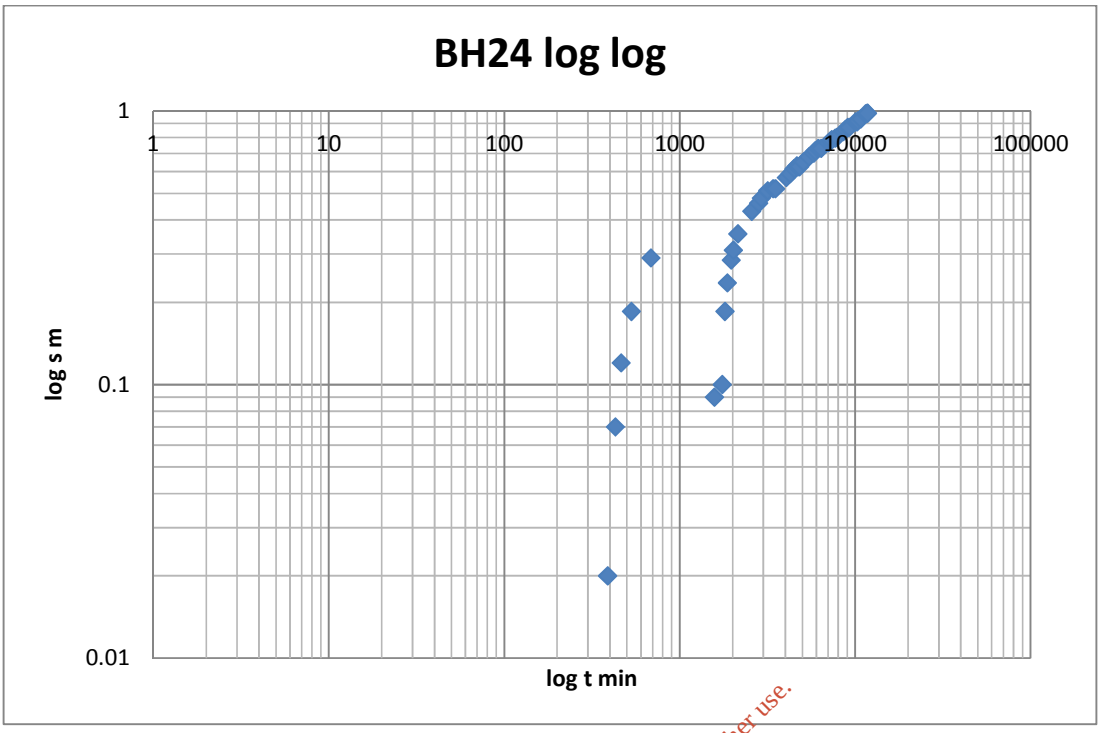
BH20





BH24





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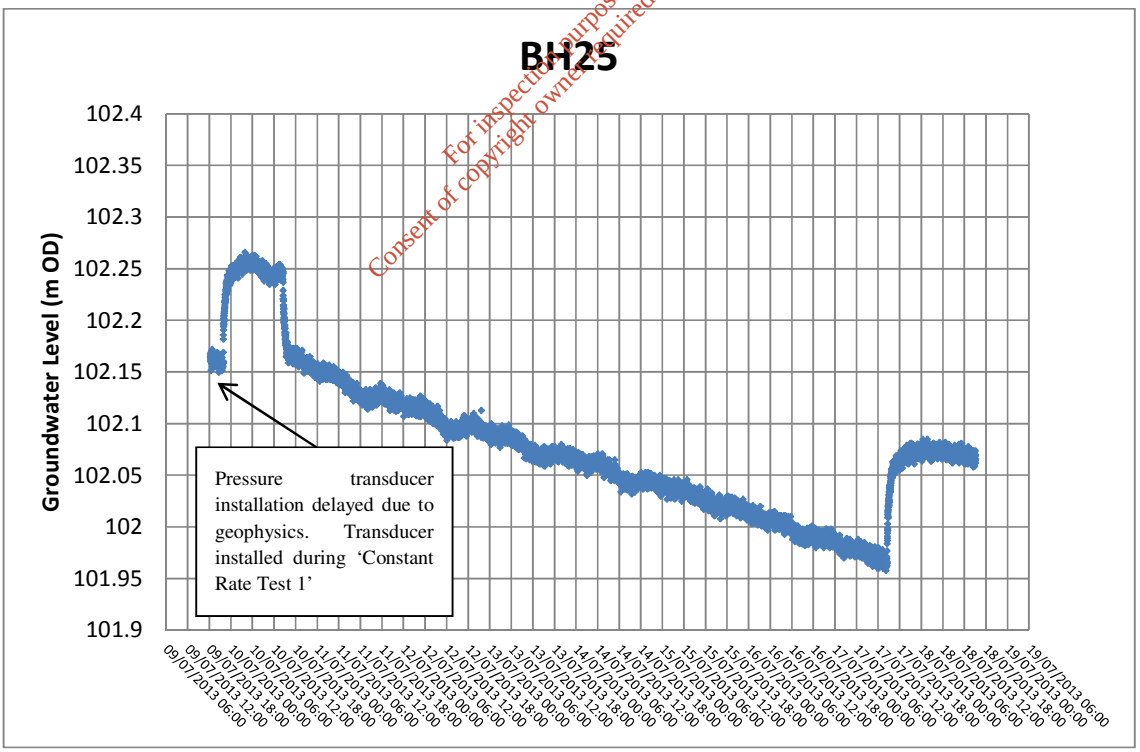

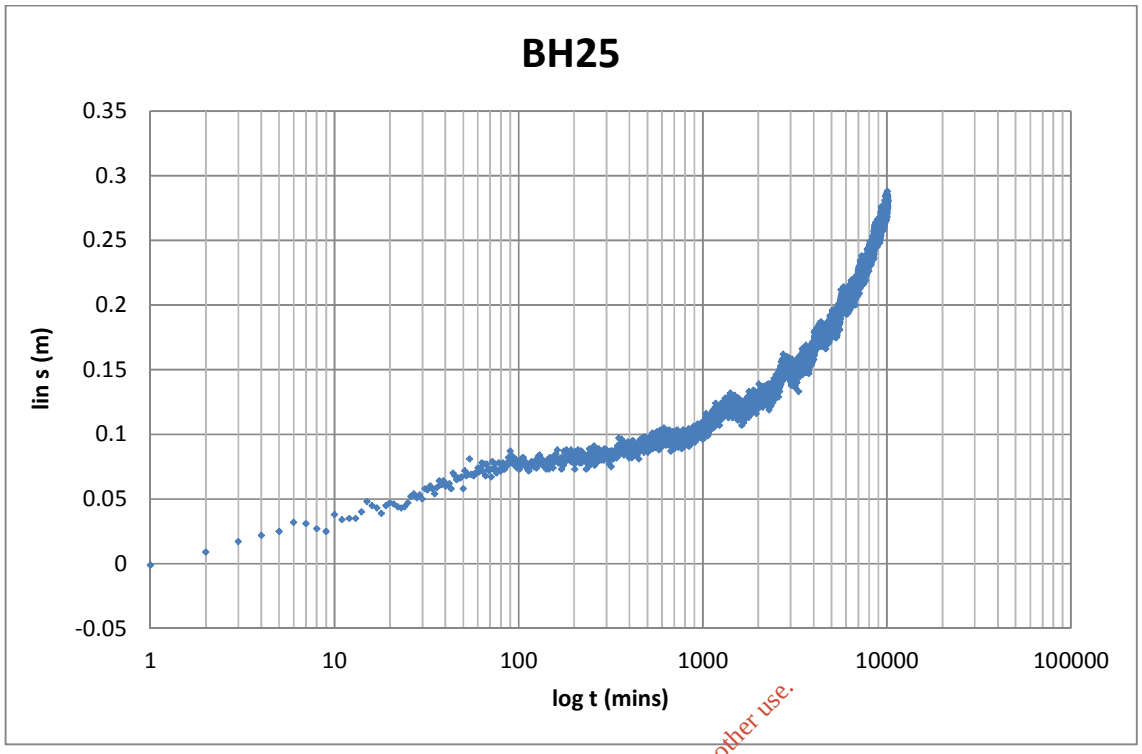

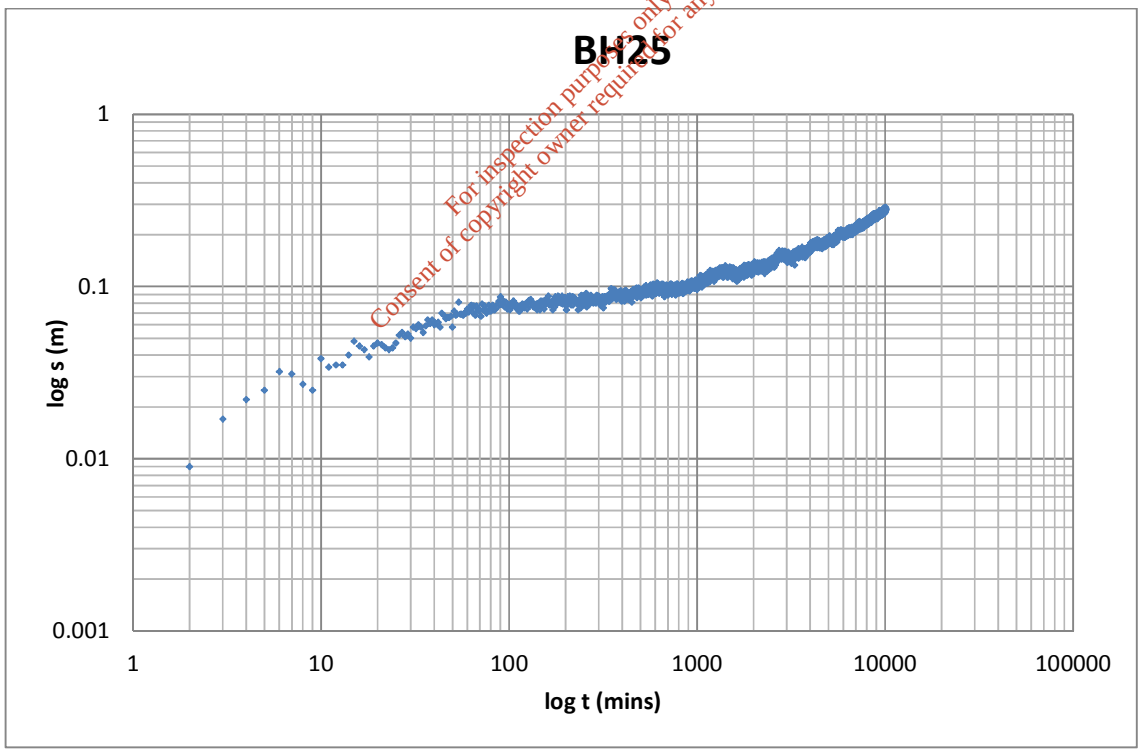

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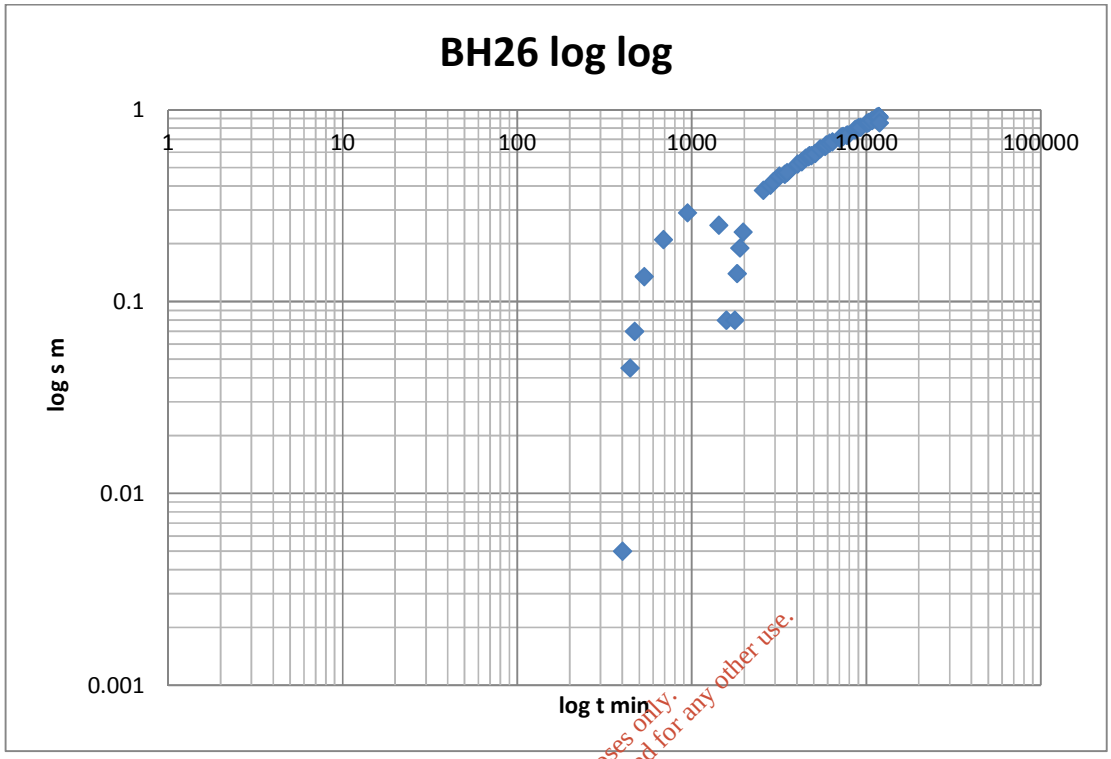

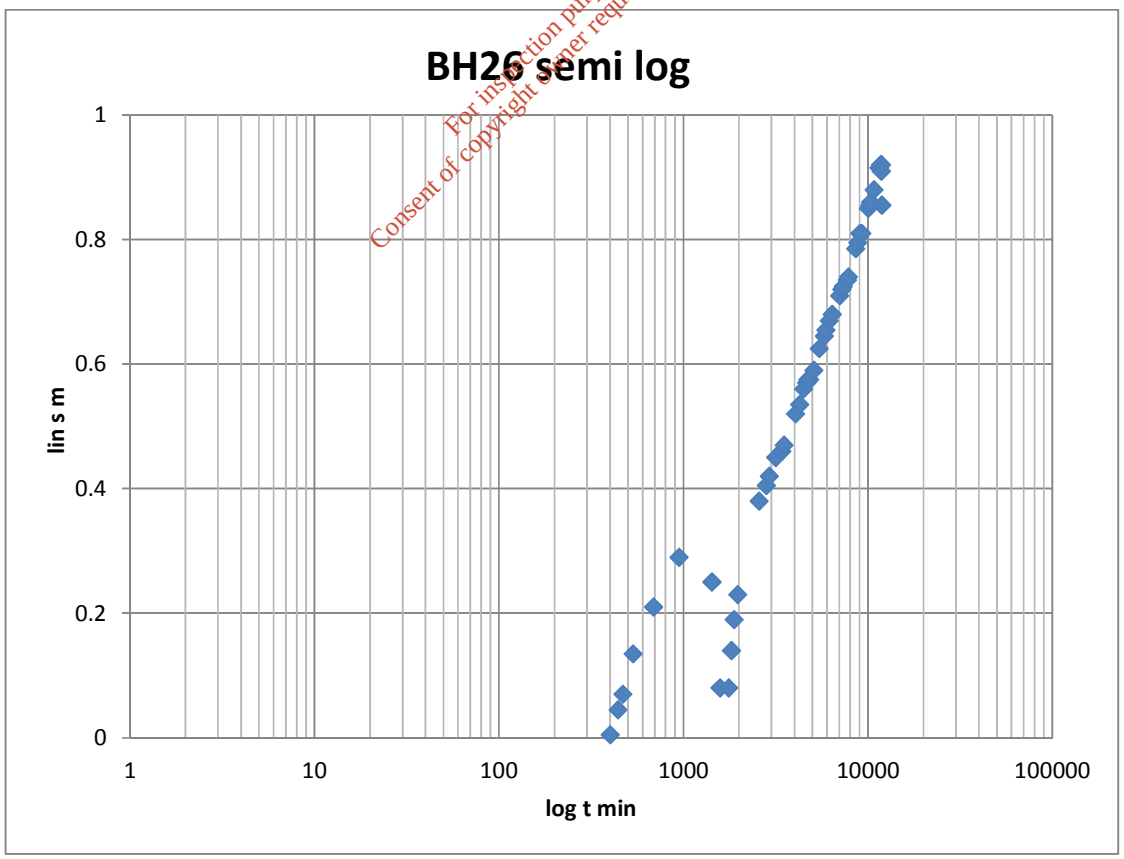

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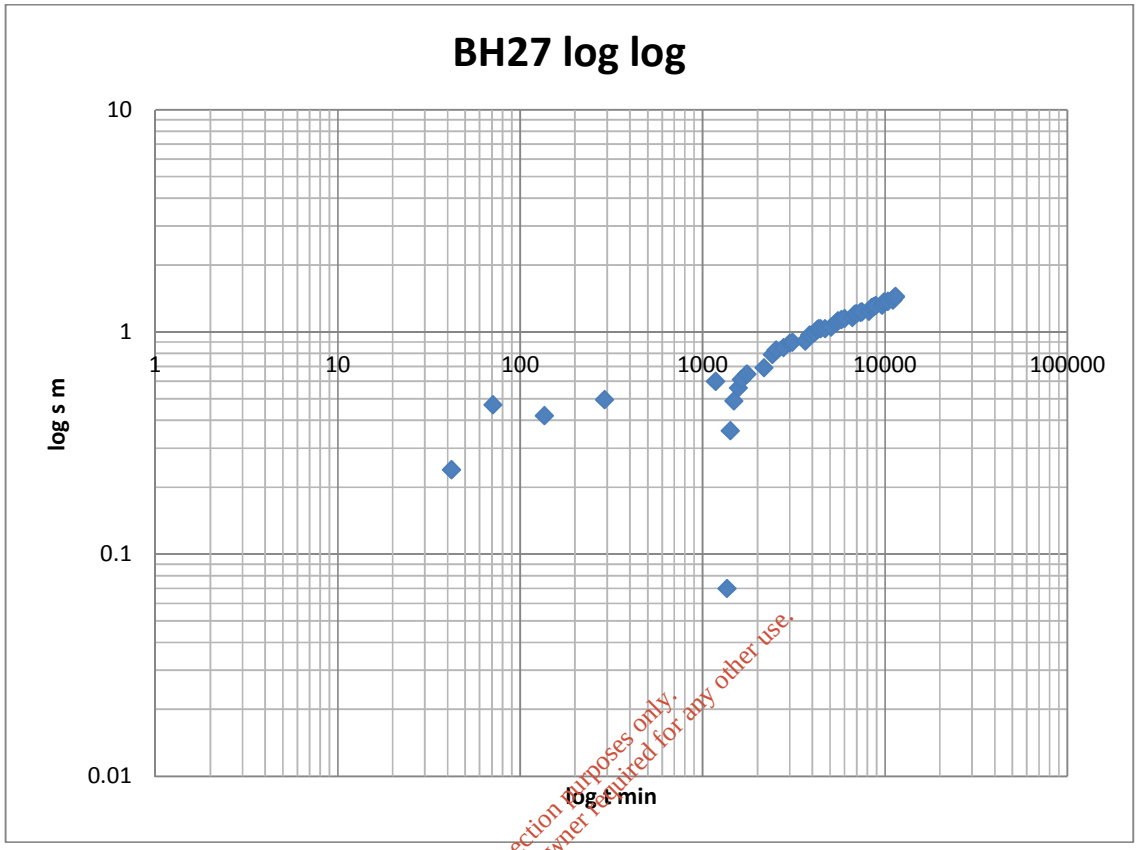

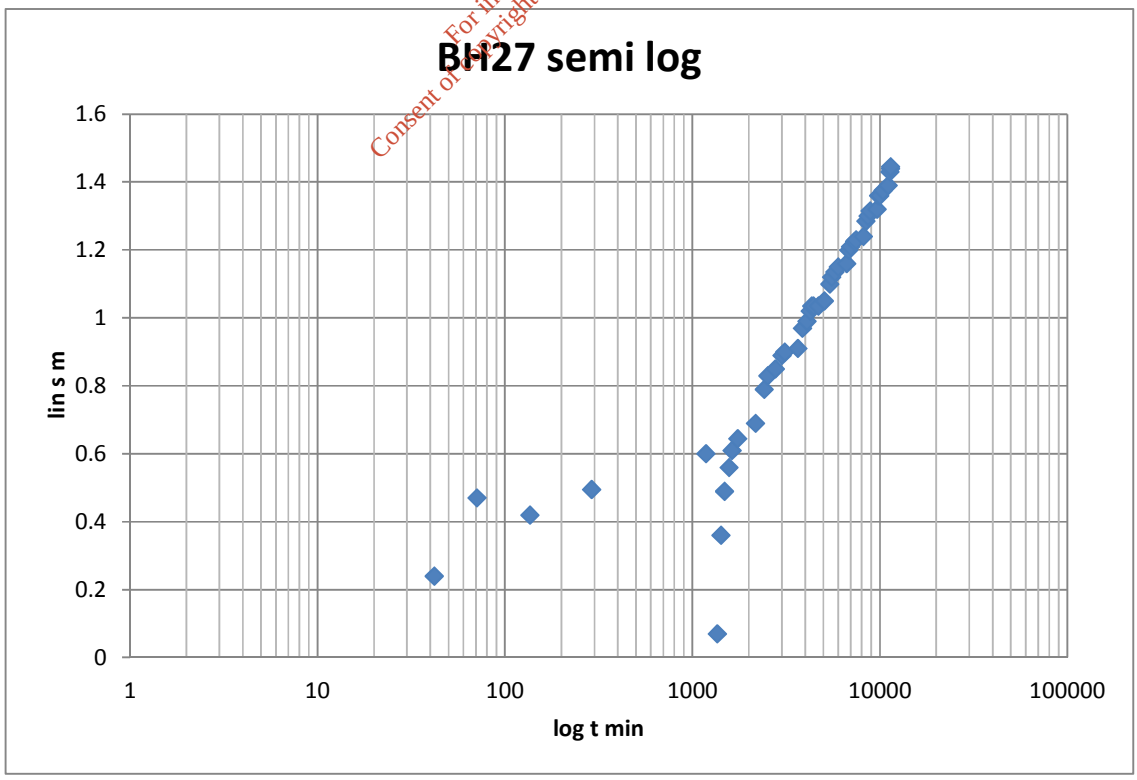

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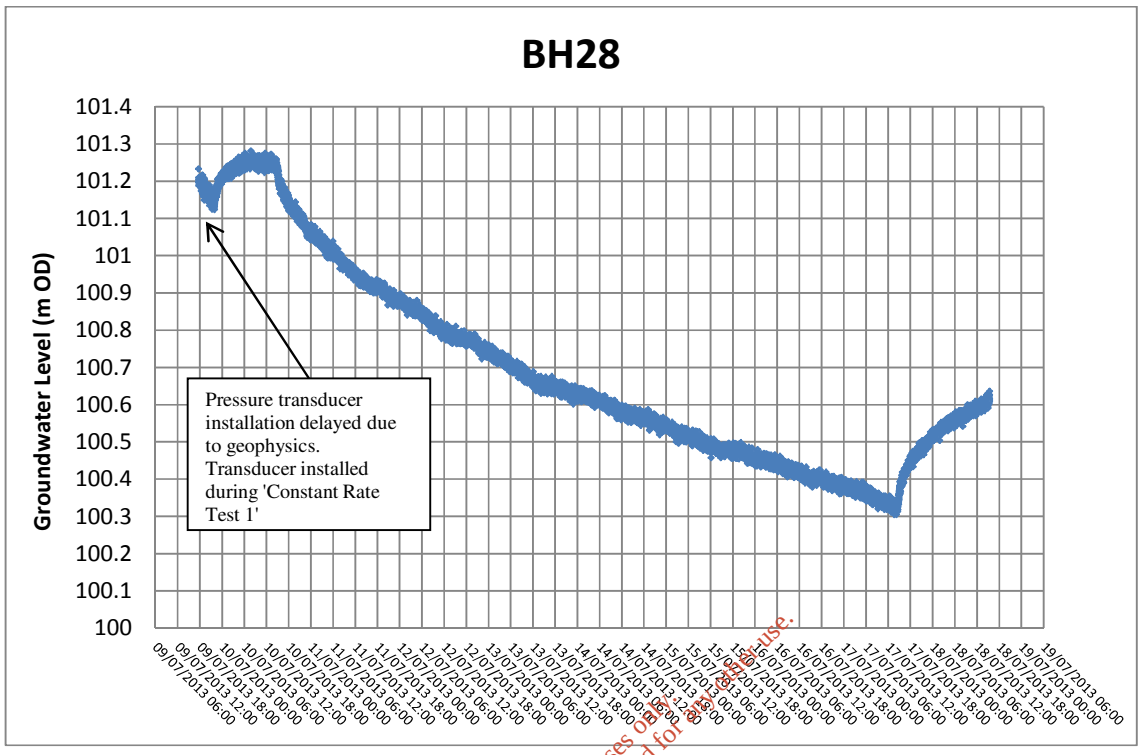

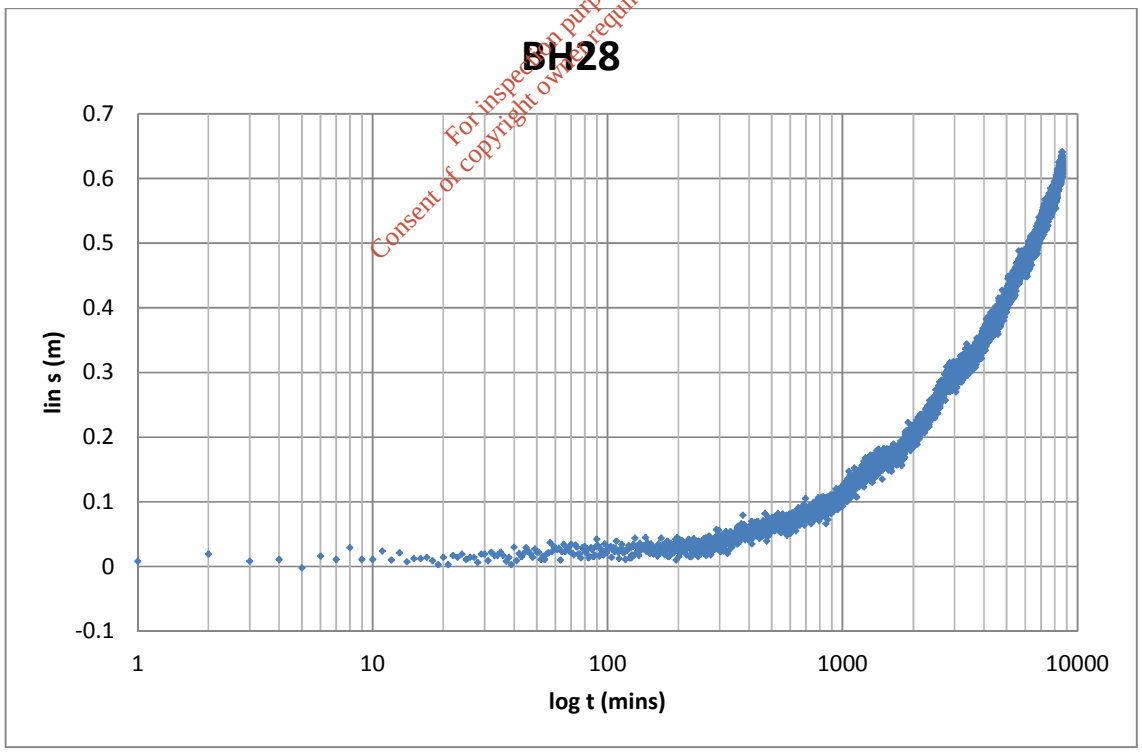

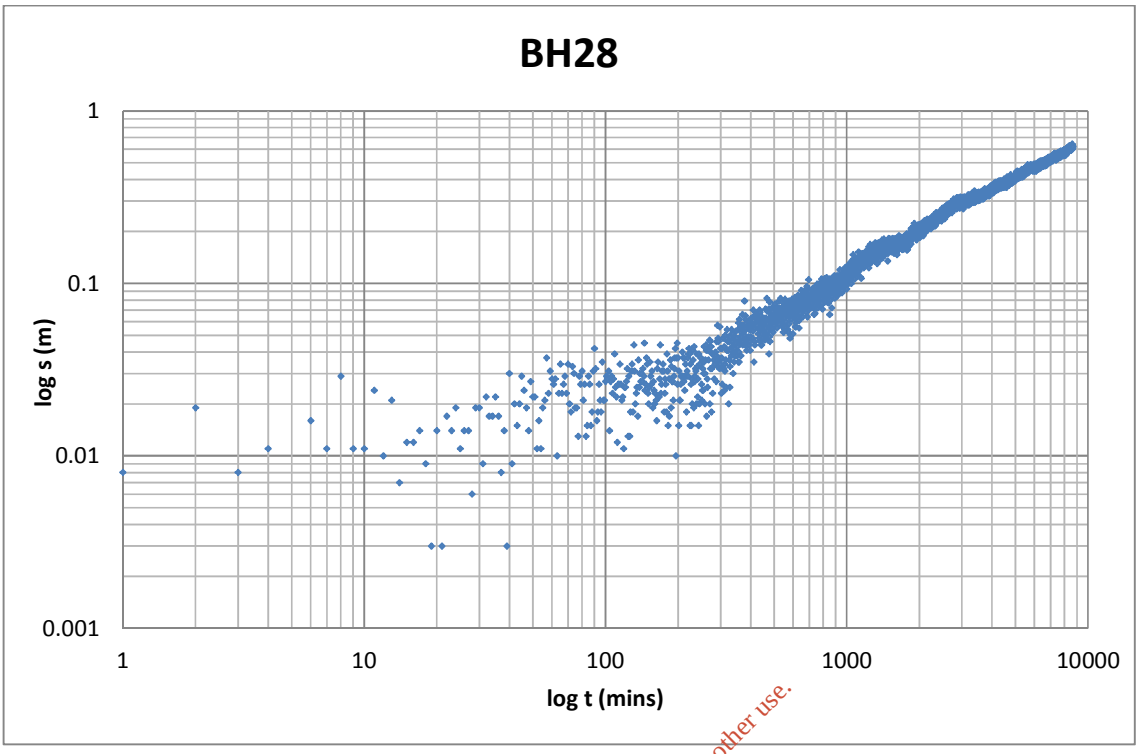

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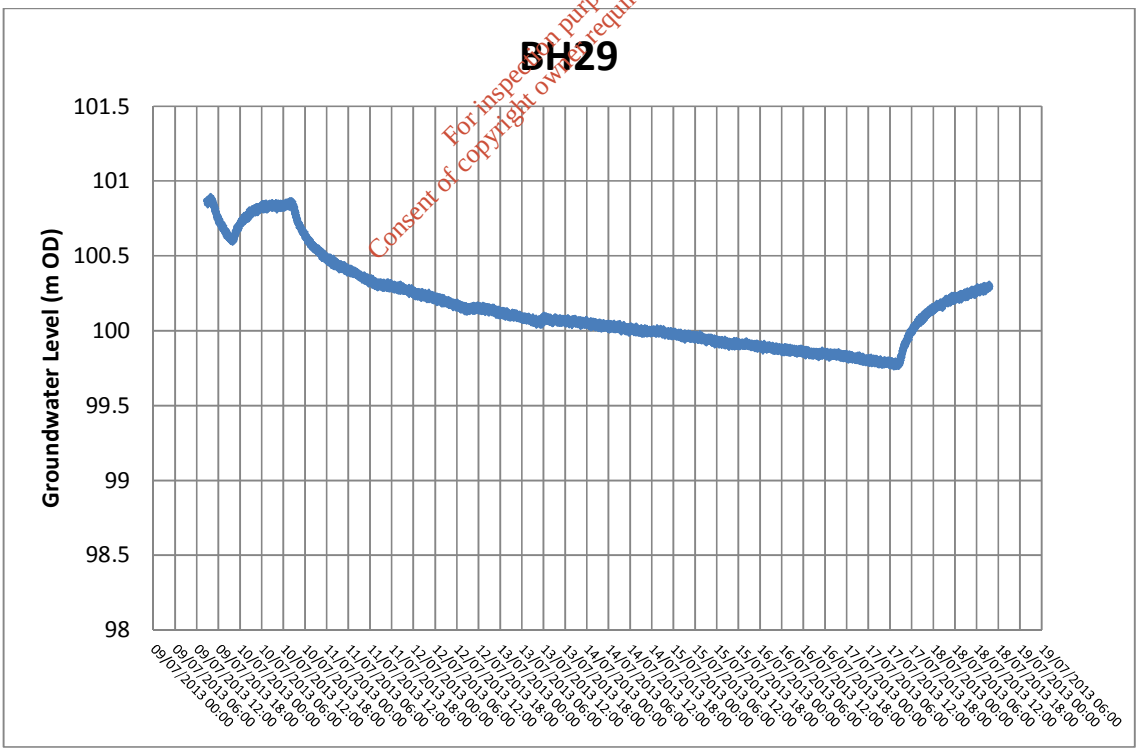

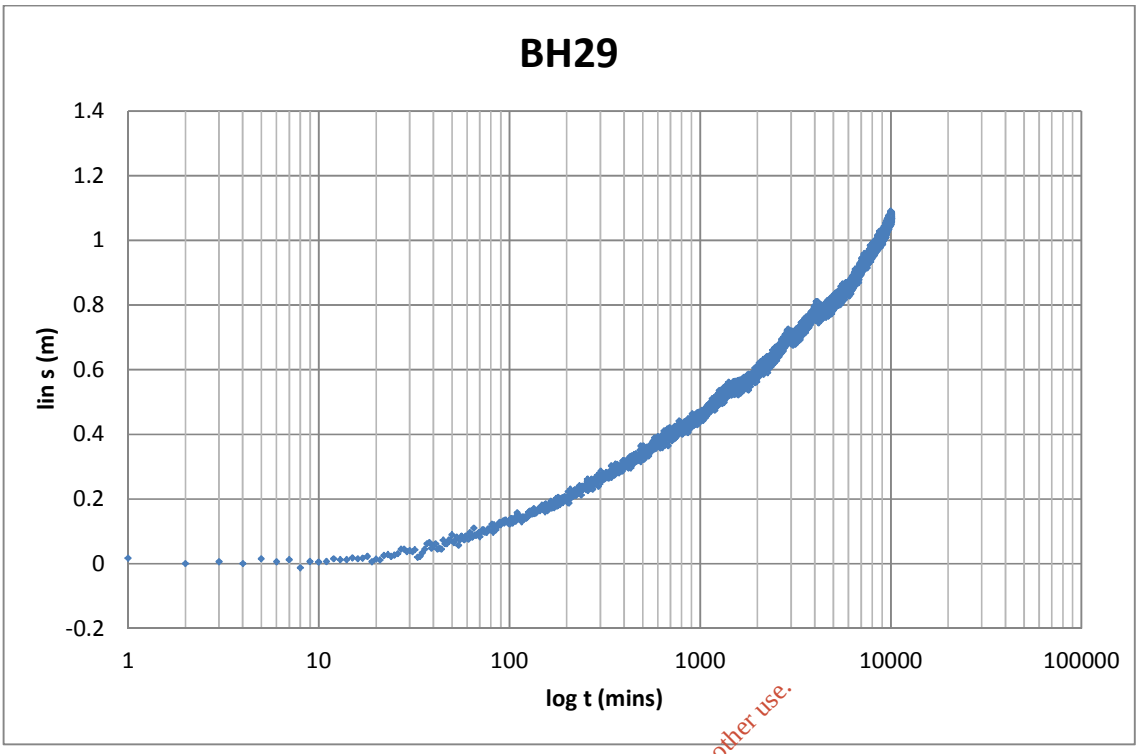

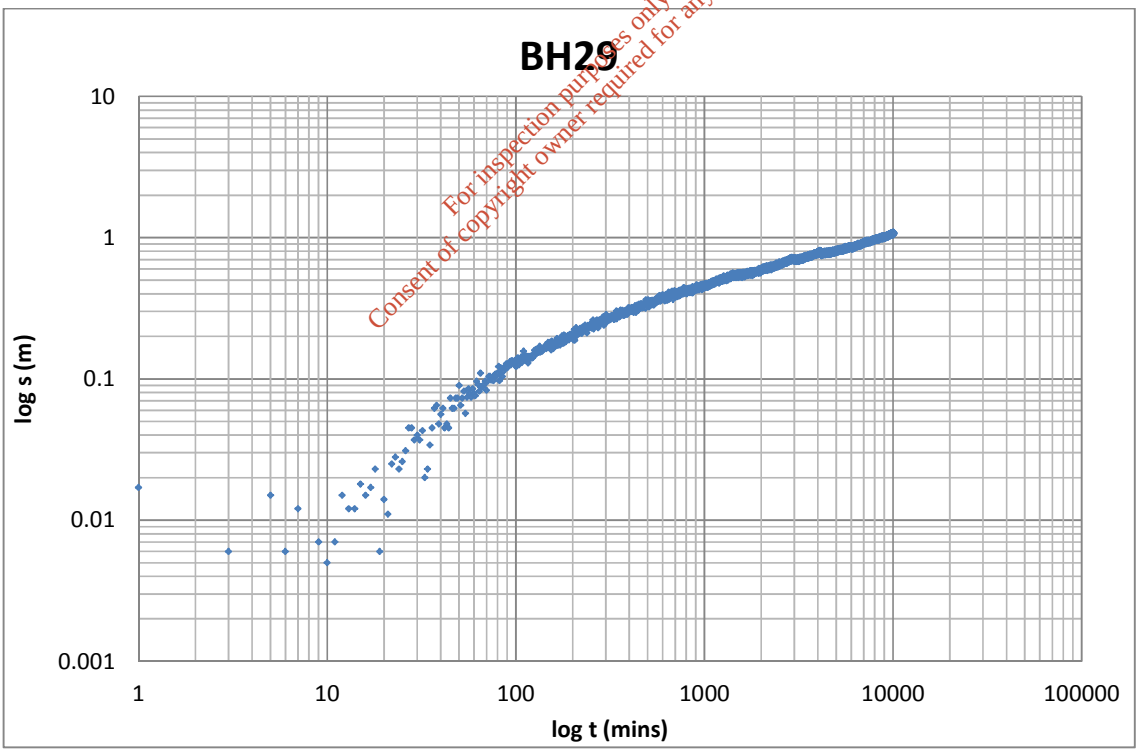

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