OH(2) Sub No. 3

Recd From: KEVIN CULLEN

Date: 27/04/09 2.45pm

Re: Waste Licence Application W0231-01

Fingal Landfill

Submission to the Re-Opened EPA Oral Hearing

Bracken Court Hotel, Balbriggan, County Dublin.

27th April, 2009

I wish to make the following additional submission in relation to the Hydrogeological Risk Assessment that the Applicant has recently presented to the Agency.

Objection

My objection to the proposed landfill at Nevitt is based upon my assertion that the landfill footprint overlies an important groundwater resource contained in the underlying extensive sand and gravel deposits and limestone bedrock . It appears to me that the location of the landfill here is directly contrary to the principle of sustainability as promoted by EU and Irish environmental policy and legislation.

I believe that the Applicant's documentation that accompanied the Waste Licence Application and in particular the Applicant's EIS failed to adequately describe the extent of the underlying groundwater resource. I have therefore endeavoured to have the Agency inform itself as to the importance and value of the underlying groundwater resource so that any decision the Agency might make in relation to the Waste Licence Application would be based on the full hydrogeological picture rather than on the limited picture presented in Applicants documents.

I would like to believe that my presentation at the 2008 EPA Oral Hearing provided some useful information on the extent of the underlying resource and that that information would be useful to the Agency in arriving at its final determination of the Waste Licence Application.

Present Request for Further Information

The Agency's request of October 17th, 2008 of the Applicant for additional information must be placed in the context of;

i) The extensive documentation that accompanied the Waste Licence Application

ii) Numerous requests for clarification and additional information by the 1St Inspector

iii) An adjudication of the Licence Application and the issuing of a Provisional Licence

iv) A 2 week Oral Hearing

v) A review of all the information by the 2nd Inspector and his support team

Clearly, despite all the information presented by the Applicant to date the Agency felt the need to further delay its decision on the Waste Licence Application until the Applicant furnished information on the potential for and likely scale of groundwater contamination that would follow a leachate leak from the planned landfill facility.

There can be little doubt therefore that this issue is of considerable importance in the Agency's decision making process and that the Applicant's response will be assessed in this light. It is reasonable to presume that this request originated with the Inspector and his expert panel. I have no doubt therefore that you will want to report to the Agency that the Applicant's response has addressed this issue to your collective satisfaction.

You Mr. Inspector and your assistants will have to make up your own minds as to whether the Applicant's submission addresses the Agency's request for additional information and merits your recommendation to your Board. I hope that what I have to say might assist you in your deliberations.

Modelling Timeframe

In publishing this Hydrogeological Risk Assessment I can only presume that the Applicant is inviting us all, that is the general public, the Agency and the hydrogeological advisor to this Oral Hearing to accept that the Applicant has the capacity to predict conditions at the Nevitt site some 20,000 years from now.

These predictions are possible we are told using the LandSim computer package and a spread sheet issued by the UK Environment Agency. An investment of €500 to €1,000 apparently allows the Applicant to see some 20,000 years into the future...powerful tools indeed.

Appreciating A Twenty Thousand (20,000) Year Timeframe

When dealing with such large numbers such as 20,000 years I always like to relate them to something that I can readily understand. This allows me to appreciate and to feel comfortable with the concepts and scales involved.

For example when the American Government decided to inject a trillion dollars into their economy it was useful to get a handle on just how many million there is in a trillion. A US Senator came to my rescue when he advised that if one had spent a million dollars every single day since Jesus was born you would still not have spent a trillion dollars....in fact only c.$ 740,000Million or just c. 3 quarters of a trillion dollars. One can readily see from this simple exercise that a trillion dollars is an enormous amount of money.

In the same way, when the Applicant presented a model that could predict conditions at the planned Nevitt landfill site for 20,000 years into the future I thought it useful to get a handle on just how far in the future is 20,000 years.

My first port of call was the climatic modelling being undertaken by the Intergovernmental Panel on Climate Change(IPCC). Unfortunately, despite this group of scientists including some of the best scientific brains in the world they are having difficulty predicting things a measly 100 years from now.

Failing to get anywhere with mainline science I turned to science fiction. Perhaps man's imagination would provide guidance for the likely conditions on earth a bit beyond 100 years from now. Star Trek for example is set in the 23rd century, i.e. 200 years from now. And so if 'Warp Drives' come to pass in 200 years or so from now w future generations might shortly be travelling across the

universe.....but again nowhere near the Applicant's 20,000 years target, as you can see in my Figure 1.

Having failed to get any guidance on how long 20,000 years might be in the future I decided to look backwards into historical time to see if that would help me. Figure 2 illustrates my findings.

In the Irish context, a 1,000 years ago brings us to the Vikings, then to St. Patrick about 1,550 years ago and further back we have Newgrange at 5,000 years old. I would of course defer to Mr. Boyle's archaeological knowledge for the dating of developments that took place between the building of Newgrange and the arrival of Christianity into Ireland.

The bogs formed some 7,000 years ago, i.e. some 3,000 years after the ice caps left the island. Unfortunately it is not possible to go back as far as the Applicant's 20,000 years in Ireland as the island was covered by ice for the last 8,000 to 10,000 years of the 20,000 year span.

Turning to Europe we see that the Egyptian Dynasty roughly equates to Newgrange in Ireland with Newgrange being about 500 years older. Further back on the European mainland, which was not glaciated in the Pleistocene Period, we then pass through the 1st development of agriculture in Europe and further back to when humans were just hunter gatherers.

Putting the Applicants 20,000 years into human development terms we can see that this length of time lies beyond the stone age and equates to when it is generally believed that our ancestors evolved anatomically into modern man!

20,000 years is therefore a very long time indeed and I must admit way beyond my powers of comprehension. But not apparently beyond the Applicant's as we shall see later on.

Climatic Change to the 22nd Millennium

You will appreciate Mr. Inspector that the previous 20,000 years included such seismic global climatic changes as the melting of a continental ice cap about 10,000 years ago (Figure 3); not an insignificant or every day event you will accept I am sure.

The Applicant's model does of course allow for future climatic changes at Nevitt over the next 20,000 years. It does so by increasing the the 30 year annual average rainfall by 10%. It would appear that the Applicant is inviting the Agency to accept that the only change in the Irish climate from the present first decade of the 3rd Millennium all the way to the 22nd Millennium is a 10% increase in the average annual rainfall.

I must inform Irish Climate Analysis and Research Unit at Maynooth University of the Applicant's 20,000 year model so that they are not wasting their time making predictions for the coming 50 and 100 years with which to inform Government Policy on Climatic Change.

Population of Ireland in 20,000 years

Clearly it is impossible to even begin to estimate the population of Ireland in 20,000 years from now. Ireland's population has grown recently by 2% per annum. Allowing for a much reduced population growth rate of say 0.5% the country's population will reach 52 Million in 500 years and if this rate

continued for a further 500 years Ireland's population would exceed a staggering 600 Million in a 1,000 years hence. I wonder what the position will be in the Applicant's 20,000 year time frame ?

This simple exercise shows the absurdity of predicting events beyond a reasonable time limit when only a minimum number of variables are taken into account.

Agency's Request

The Agency's request of 17th October, 2008 was relatively straight forward and could be have been readily interpreted by the Applicant as;

Please indicate the likelihood of a leachate emission and in the event of a leachate emission the likely level of contamination by List I and/or List II substances of the groundwater below the landfill and at receptors located downgradient of the landfill. A very reasonable request I would suggest, and one that could so easily have been complied with by the Applicant if normal hydrogeological principles had been applied to interpreting and subsequently answering the Agency's request for further information.

But the Applicant chose, for some reason only best known to the Applicant, **not** to interpret the Agency's request along those lines. Instead the Applicant interpreted the Agency's request as;

'Evaluate the potential for leachate leakage and migration to groundwater within the aquifer unit beneath the site;'

The Agency's request exact was;

'Provide a probalistic quantitative risk assessment that evaluates the potential for leachate leakage/migration to groundwater below the proposed facility.'

I am confident that the difference between the request and the Applicant's interpretation is very apparent to the Inspector and to his advisors. Clearly, the Applicant's submission bears no relationship to the Agency's request and therefore must be rejected out of hand by the Agency .

That the Applicant choose to ignore the Agency's direct and simple request regarding possible leachate emissions to groundwater must indicate that the outcome was particularly detrimental to the Applicant's Waste Licence Application.

It is noteworthy that there is no reference to *'the aquifer unit beneath the site'* but only to groundwater in the Terms of Reference within the Applicant's Executive Summary. One might have reasonably have expected this critical distinction between the Agency's request and the Applicant's interpretation of that request to have been brought to the attention of the casual reader of the Executive Summary.

Mr. Inspector you might usefully inquire of the Applicant as to how the above interpretation of the Agency's came about and specifically was the modeller aware of the obvious difference between the Agency's request and the Applicant's interpretation of that request.

We are told that there has been no correspondence between the Applicant and the Agency on this matter since the Agency's letter of October 17th, 2008. You might be good enough to confirm that no

discussions or meetings either have taken place between the Agency and the Applicant on this matter also since October 17th, 2008. In the absence of any correspondence, discussions or meetings between the Agency and the Applicant since the issuing of the Agency's request of October 17th, 2008 it is reasonable to assume therefore that the interpretation of the Agency's request originated with the Applicant alone and therefore the consequences of the misinterpretation is the sole responsibility of the Applicant.

Council Directive 80/68/EEC of 17th December 1979

The Agency's request made no reference to the 'aquifer unit beneath the site but solely to 'groundwater' below the proposed facility. It did so because the Agency's request was founded on the requirements of the Council Directive 80/68/EEC of 17th December 1979 on the protection of groundwater against pollution caused by certain dangerous substances.

In Directive 80/68/EEC and in the Irish enacting legislation groundwater is defined as;

" groundwater" means all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil;

Most practitioners (i.e. those that I know anyway) take this to mean that all water below the water table is considered groundwater and therefore covered by the Groundwater Directive regardless of the nature or composition of the host strata.

At Nevitt, this situation is easily demonstrated by reference to the Applicant's Figure 6 of its Hydrogeological Risk Assessment. Council Directive 80/68/EEC of 17th December 1979 refers to the groundwater below the level of the water table shown in the clay deposit enclosing the landfill. Every drop of water below this level constitutes groundwater as defined in Council Directive 80/68/EEC of 17th December 1979 and the Irish enacting legislation.

The Agency simply wanted to know what would the effect of a leachate emission be on the groundwater below the water table (i.e. in the zone of saturation). As this groundwater is contained within the clay overburden the Agency wanted to know what would the effect be on groundwater within the clay overburden....a simple enough request but guess what ? In answering the Agency's request the Applicant firstly wants to ignore the **GROUNDWATER** in the clay overburden (supposedly because it is now 'perched') and then concocts a hydraulic scenario that envisages List 1 and List II substances migrating 10m downwards below the water table through the clay overburden to somehow impact on the **GROUNDWATER** within confined gravel/bedrock aquifer.

In this hydraulic scenario the migrating leachate has to travel down some 10m below the lowest level of the surrounding drainage network to encounter **GROUNDWATER** according to the Applicant's conceptual model. The possibility of lateral migration of the escaping leachate within the regional water table, which would be the normal situation in Ireland, was not even considered a remote possibility?

The situation envisaged by the Agency is absolutely normal as can be judged by descriptions of similar circumstances in England, Wales and Scotland where the relevant Landfill Risk Assessment guidance notes advise on the positioning of groundwater compliance points for List I substances;

'In sub-water table sites relying on an engineered under-liner collection system to remove water and/or leachate, the engineered collection layer/system is regarded as part of the landfill engineering system, and the water within it does not constitute groundwater. The compliance point for assessing the acceptability of any discharge will generally be taken as the groundwater in the (natural) strata immediately adjacent to the engineered barrier system and/or the point at which water abstracted from the engineered layer is discharged back into the environment.' page 18 UK Environment Agency's Hydrogeological Risk Assessments for Landfills.

Apparently the Applicant's Risk Assessment has been carried out in accordance with this UK guidance document. It would seem however that some of the most logical aspects of the guidance note have not, for some reason, not been applied to the hydrogeological conditions at Nevitt.

The Scottish Environment Protection Agency also recommends a similar logical approach in its Guidance Note;

Hydrogeological Risk assessment for Landfills and the Derivation of Control and Trigger Levels

'6.1 List 1 Substances

For List 1 Substances the compliance point should be at the point of entry into groundwater i.e. the base of the unsaturated zone beneath the site.'

You will note Mr. Inspector that the word 'aquifer' is not mentioned in either of these abstracts because as I have said it is universally accepted that **all waters** below the water table are groundwaters and covered by Council Directive 80/68/EEC of 17th December 1979 regardless of the nature or composition of the host strata.

The Agency has been told on numerous occasions by the Applicant that the construction of the Nevitt landfill will involve a under drainage system to lower the water table below the base of the liner system. As envisaged in both the above UK guidance notes it seems eminently logical and practical to locate the 1st groundwater compliance point immediately below the liner system, i.e. the **GROUNDWATER** in the clay overburden. But while such a simple and logical approach is recommended for sub water table situations in the UK such a proposal was not applied by the Applicant to the Nevitt site in response to the Agency's request. Rather, the Applicant's first compliance point is located a further 10m below the water table.

Perched Water Table

In reading the Applicant's Hydrogeological Risk Assessment one gets the impression, although it is not explicably stated, that the Applicant in describing the groundwater in the overburden as being 'perched' that it follows that this groundwater is somehow not covered by Council Directive 80/68/EEC of 17th December 1979.

It would appear that the concept of the water table in the clay overburden being **'perched'** is critical to the Applicant's conceptual Model underpinning the Hydrogeological Risk Assessment as it is emphasised as being so;

i) at 3 locations in one paragraph in the Executive Summary and

ii) at least 16 times in the main body of the February 2009 Report

It is quite remarkable that this apparent key characteristic of the overburden water table at the Nevitt site was not mentioned once in any of the over 100 borehole logs, nor in the technical paper on groundwater monitoring presented by the Applicant's consultants to an IAH international conference .

Nor was the concept of the water table in the overburden being perched indicated on any of the groundwater hydrographs presented in the EIS nor in the 72 groundwater hydrographs presented to the Agency in January 2007. Furthermore the Applicant goes on to describe in the January 2007 response the range of groundwater gradients between the water table in the clay overburden and the piezometric surface in the gravel/bedrock unit.

How is it possible to have a gradient if one of the water surfaces is perched relative to the other?

The commonly accepted description of a perched water table is where a local zone of saturation may exist at some level above(i.e. perched) the regional water table. As shown in the accompanying Figure 4, in this situation there is a dry zone (i.e. an unsaturated zone) beneath the perched water table with the regional water table located at some depth beneath the perched water table.

A perched water table is hydraulically isolated from the regional water table. Under these conditions a pumping test for example in the formations below the regional water table would have no impact on the perched water table level.

In summary, for a perched water table condition to be present at the Nevitt landfill site the following 3 conditions are required to be present;

i) a perched water table located above the regional water table

ii) a dry zone separating the perched water table from the underlying regional water table

iii) the perched water table being hydraulically disconnected from the regional water table

That the Applicant also subscribes to this accepted description of a perched water table is clearly set out at numerous locations within Volume 5 of the EIS as at;

Page 22, in quoting from the GSI's Bog of the Ring Modelling Report of March 2005

' Where there is thick, low permeability subsoils, 'perched' groundwater can develop. This situation arises when horizons within the subsoil become saturated due to very low permeability layers stopping further downward movement of recharging water. Beneath the low permeability layer the soil is dry. '

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' Shallow groundwater, perched above the regional water table, occurs within the sandy gravely horizons in the till, supported by the impervious clay horizons.'

Perched Water Table above the Regional Water Table

As indicated on the attached Figure 5 the numerous standpipes located in the clay overburden by the Applicant indicate the presence of a single regional water table at the Nevitt site and surrounding lands.

None of the shallow groundwater monitoring boreholes completed by the Applicant indicate or even suggest the presence of a perched water table either within or outside the landfill footprint.

Unsaturated Zone between the Perched Water Table and the Regional Water Table

As indicated on Figure 5 the wide range of depths at which the standpipes are located discounts the possible presence of a dry or unsaturated zone between the supposed perched water table and a lower regional water table.

Perched Water Table being Hydraulically Disconnected from the Regional Water Table

The reported responses of groundwater levels within the clay overburden to pumping tests, as outlined on page 35 of Volume 5 of the EIS, confirm that all the formations below the regional water table are hydraulically connected. The hydrograph from BSA3a (Figure 7) shows a direct connection with the pumping test carried out in the underlying gravel / bedrock unit and the water table in the clay overburden. BSA3a is over 500m away from the pumped wells. Is anyone suggesting that the water table in BSA3a is not the regional water table? Is the Applicant suggesting that the water table shown in BSA4 (Figure 6)located within the landfill footprint is not the regional water table ?

Relative Position of Landfill Base in relation to the Regional Water Table

As indicated on the Applicants Figure 6 of the February 2009 Report the base of the landfill will be everywhere below the regional water table. It is quite remarkable that no overburden water table map has been presented, as far as I am aware, by the Applicant to date despite the extensive overburden groundwater monitoring programme carried out by the Applicant. The Applicant reports monitoring some 25 monitoring wells located in the clay overburden. More than sufficient to prepare a regional water table map.

It appears to me that the planned drainage layer will have a sump level of around 30mOD and therefore will have a dramatic impact on the local drainage network which for the most part is higher than 30mOD.

EPA Definition for Groundwater

I suppose it was always possible that someone would want to declare water in a classical perched water table as not being groundwater under Council Directive 80/68/EEC of 17th December 1979. The Agency obviously saw this possibility and quite cleverly has allowed for such an interpretation through its recent definition of groundwater as;

'Water below the earth's surface, either stored in aquifers, in "perched" conditions above layers of impermeable soils, or in the unsaturated (vadose) zone above the aquifer.' EPA landfill Manual, December 2006.

Compliance With the Groundwater Directive and Protection of Groundwater Regulations (SI 41 of 1999)

The Applicant refers to the Protection of Groundwater Regulations (SI 41 of 1999) on page 38 of the Hydrogeological Risk Assessment. These Statutory Regulations also provide the following definitions;

"aquifer" means any stratum or combination of strata that stores or transmits groundwater;

It is clear from the above discussion that all waters below the regional water table at Nevitt are groundwaters as defined by SI 41 of 1999.

Furthermore, as the clay overburden both stores and transmits this groundwater the clay overburden is therefore an aquifer as defined by SI 41 of 1999.

The storing and movement of groundwater in the overburden deposits below the footprint is clearly shown by the Applicant's seasonal hydrograph (Figure 6) for the monitoring well BSA4 located in the southern part of the footprint. In this hydrograph the overburden aquifer is seen rapidly recharging with winter rainfall and then gradually discharging to the local drainage network during the summer and autumn periods. A similar picture occurs at BSA6 beneath the northern part of the footprint.

The BSA 4 hydrograph is a typical hydrograph from a water table aquifer. Therefore, even taking the Applicant's interpretation of the Agency's request as a reasonable proposition it is clear that the first aquifer beneath the site is in fact the clay overburden water table aquifer. The Applicant should therefore have addressed the potential impact of a leachate escape on the groundwater in this water table aquifer rather than focusing exclusively on the much deeper confined gravel/bedrock aquifer unit.

According to the Applicant, the water in the gravel/bedrock aquifer is **GROUNDWATER** but that the water in the overlying clay aquifer is just **WATER,** an absurd distinction I might respectively suggest.

It is clear from a comparison of the hydrographs from monitoring wells BSA4 (within the footprint) and BRC2 (Figure 8)and which are located in the clay overburden and the bedrock respectively that both are part of a single and continuous groundwater system. The hydrographs show an identical pattern of recharge and discharge with both the clay overburden and the underlying bedrock receiving recharge in wet periods and discharging to the local drainage network in drier periods.

To suggest that the these two groundwater systems are either separated physically or hydraulically is in my opinion contrary to all the information that the Applicant has so far placed in the public domain. The Applicant is therefore beholded to present the Agency with the field data that demonstrates the correctness of the Applicant's alternative assertion that these two groundwater bodies are;

i) physically separated (i.e. one is perched relative to the other) and

ii) hydraulically separated (i.e. by an intervening unsaturated zone)

iii) and that only the lower one contains Groundwater Directive and Protection of Groundwater Regulations (SI 41 of 1999)

Risk to Local Drainage Network

It is plainly obvious that in the event of a leachate escape in the vicinity of BSA4 there will an immediate contamination of the groundwater by List 1 substances without the protection of an intervening unsaturated subsoil. A direct discharge of List I substances to groundwater perhaps ?

As seen from the Applicant's BSA4 hydrograph (which is located in the lowest part of the footprint and therefore in the area of greatest vulnerability to leachate escape, ref. Applicant's Figure 6) any leachate discharge in the vicinity of BSA4 will firstly pollute the groundwater here and then move with the shallow groundwater with the potential to enter the local drainage network to the east and south of the footprint.

Drainage Layer

The installation of the groundwater drainage layer will lower the regional water table below the base of the landfill. The Applicant is therefore incorrect to state in Pathways on page 16 that 'groundwater levels within the clay will be above the level of leachate within the landfill during the operational lifetime of the site.' In fact, the leachate level will most likely exceed the reduced level of the regional water table for the greater part of the operational life of the site.

Extension of Modeling Timeframe to 100,000 Years

Mr. Inspector, I would finally like to draw your attention to the outputs from the Applicant's Diffusion Model and which are included as Appendix E2 of the Applicant's Hydrogeological Risk Assessment. Again, presumably by publishing this information the Applicant invites us to accept that the Applicant actually believes in the accuracy of the information presented on the graphs.

You will see from these graphs Mr. Inspector that not content with predicting the conditions at Nevitt a mere 20,000 years hence the Applicant appears sufficiently confident of predicting groundwater contaminant concentrations at the Nevitt site a further 80,000 years into the future , i.e. to 100,000 years from today or into the 102nd Millennium.

Again, to put 100,000 years into context, *Homo sapiens sapiens* left Africa around 70,000 years ago to wipe out the inferior *Homo neanderthalensis* some 40,000 years ago. Homo *sapiens* had evolved into Homo *sapiens sapiens* in the millennia prior to the human exit from Africa. At 100,000 years ago poor old Ireland had to endure a further 90,000 years of being covered by ice.

The accuracy of the Applicants predictions at this future date in the 102nd Millennium is equally impressive as detailed in the Appendix E2 drawings.

For example, the picture for iron concentrations is particularly impressive indeed. Apparently some event is to happen 90,000 years or so from now. The present background concentration of iron in groundwater of around 0.01mg/l at Nevitt is set to increase, quite dramatically it would appear, after c.95,000 years by c.2.8x10^{-13}mg/l. In other words, the present concentration of iron in groundwater of 0.01mg/l will increase to 0.0100000000028mg/l....i.e. zero point zero one nine zeros 28 mg/l if I am interpreting the graph correctly.

No explanation or reason is given for this sudden , though I suggest somewhat difficult to measure, rise in iron concentrations in the groundwater at Nevitt in the 101st Millennium. As the 101st

Millennium is some time away the Agency could of course ask Dr. Who, the time traveler, to visit the Nevitt site at that distant time juncture and to report back on the reason for this predicted, but ever so slight, increase in iron concentrations in the groundwater at Nevitt. Unfortunately, I fear he may not have much to report as if the sea level continues to rise at even 1mm per year the entire Nevitt site will be under 20m of sea water in the 101st Millennium!

Conclusion

The Applicant has plainly refused to address the Agency's October 17th request. The Agency could now, as I have previously advocated, refuse the Waste Licence application on grounds of sustainability. Alternatively the Agency must request the Applicant to make another submission that directly addresses the core issue of the Agency's request of October 17th, 2008.

Any further request by the Agency must also direct the Applicant to;

i) correct the conceptual model regarding the perched water table in the overburden

ii) relocate the 1st Compliance Point to the position of the regional water table at BSA4

iii) relocate the 2nd groundwater Compliance point some distance downgradient of BSA4

iv) consider potential impacts of leachate migration on the drainage network downgradient of BSA4

v) furnish the numerical model and the revised geological map which were also sought by the Agency as far back as late 2006 but which were never delivered by the Applicant.

vi) Present a water table map with summer and winter levels using the 25 monitoring wells located in the clay overburden.

vii) Present a water table and piezometric maps indicating the impact of the drainage layer on the summer water table levels away from the footprint and in both the overburden and the underlying gravel bedrock aquifers.

viii) Report on the impact of the drainage layer on flows within the local drainage network and on groundwater levels at the nearby Bog of the Ring abstraction.

Let me finish by repeating the Agency's request of 17th October 2008;

'Provide a probalistic quantitative risk assessment that evaluates the potential for leachate leakage/migration to groundwater below the proposed facility.'

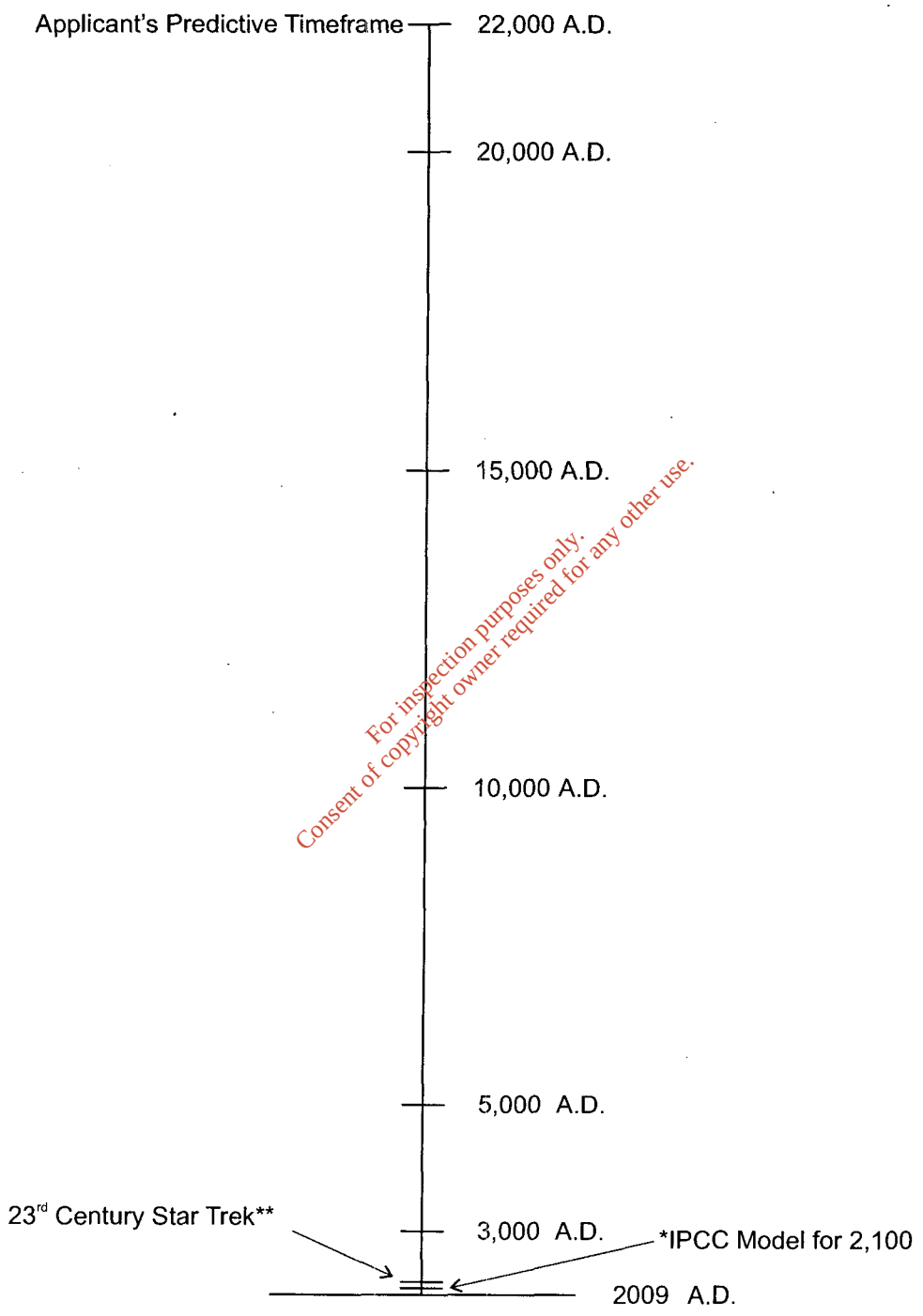
The Applicant's response to the Agency's request was to;

'Evaluate the potential for leachate leakage and migration to groundwater within the aquifer unit beneath the site;'

I can only reiterate my view , that the refusal of the Applicant to address the Agency's request regarding leachate emissions to ***groundwater below the proposed facility*** must mean that the outcome to the Agency's query is seriously detrimental to the Applicant's Waste Licence Application and therefore the Agency should now refuse the Waste Licence Application.

That ends by submission. EurGeol Kevin T. Cullen PGeo 27th April, 2009

Figure 1 - 20,000 Years into the Future



** 1st Warp Flight on 5th April 2063

* IPCC - Intergovermental Panel for Climate Change

Figure 2 - 20,000 Years into the Past

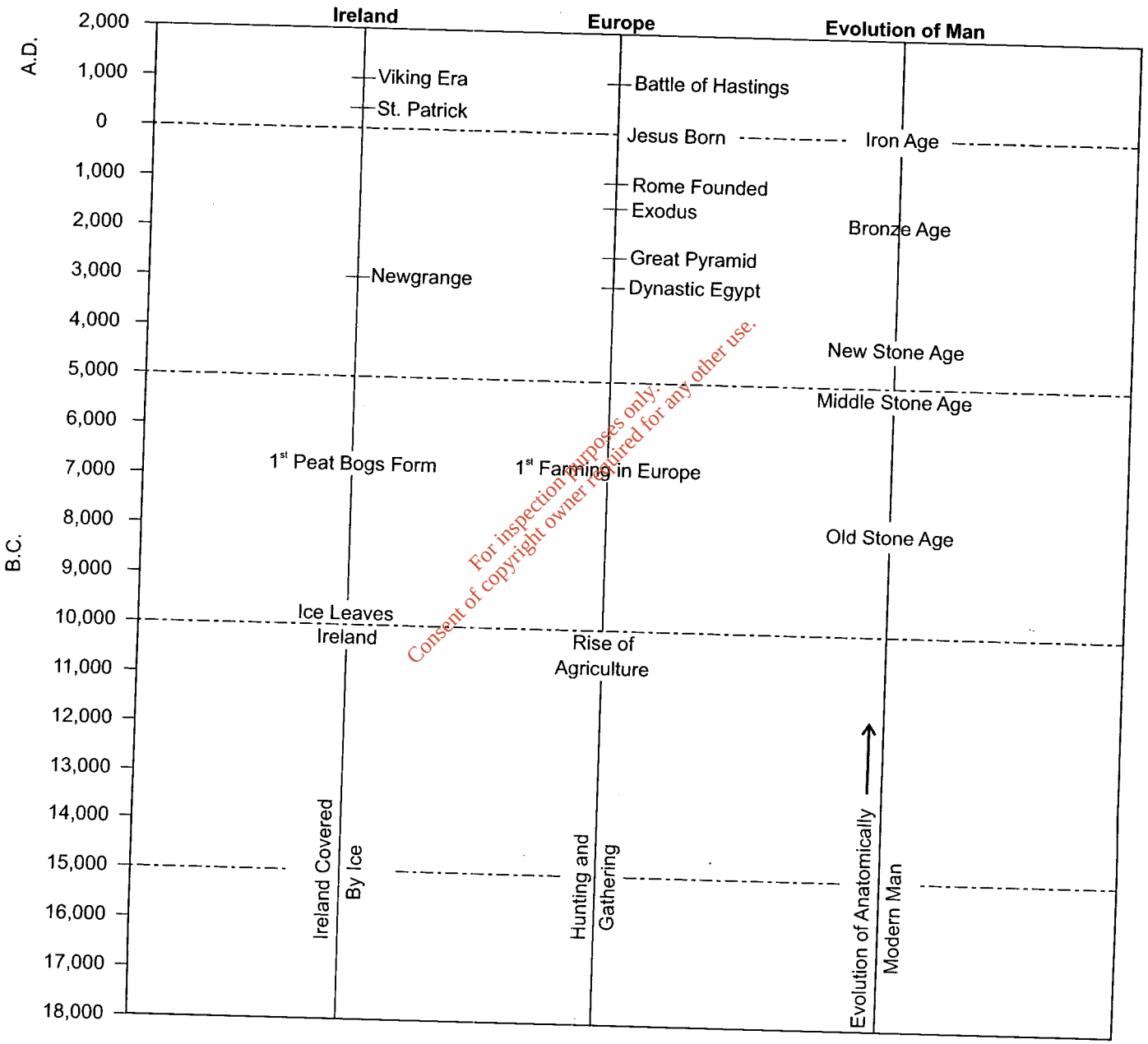


Figure 3

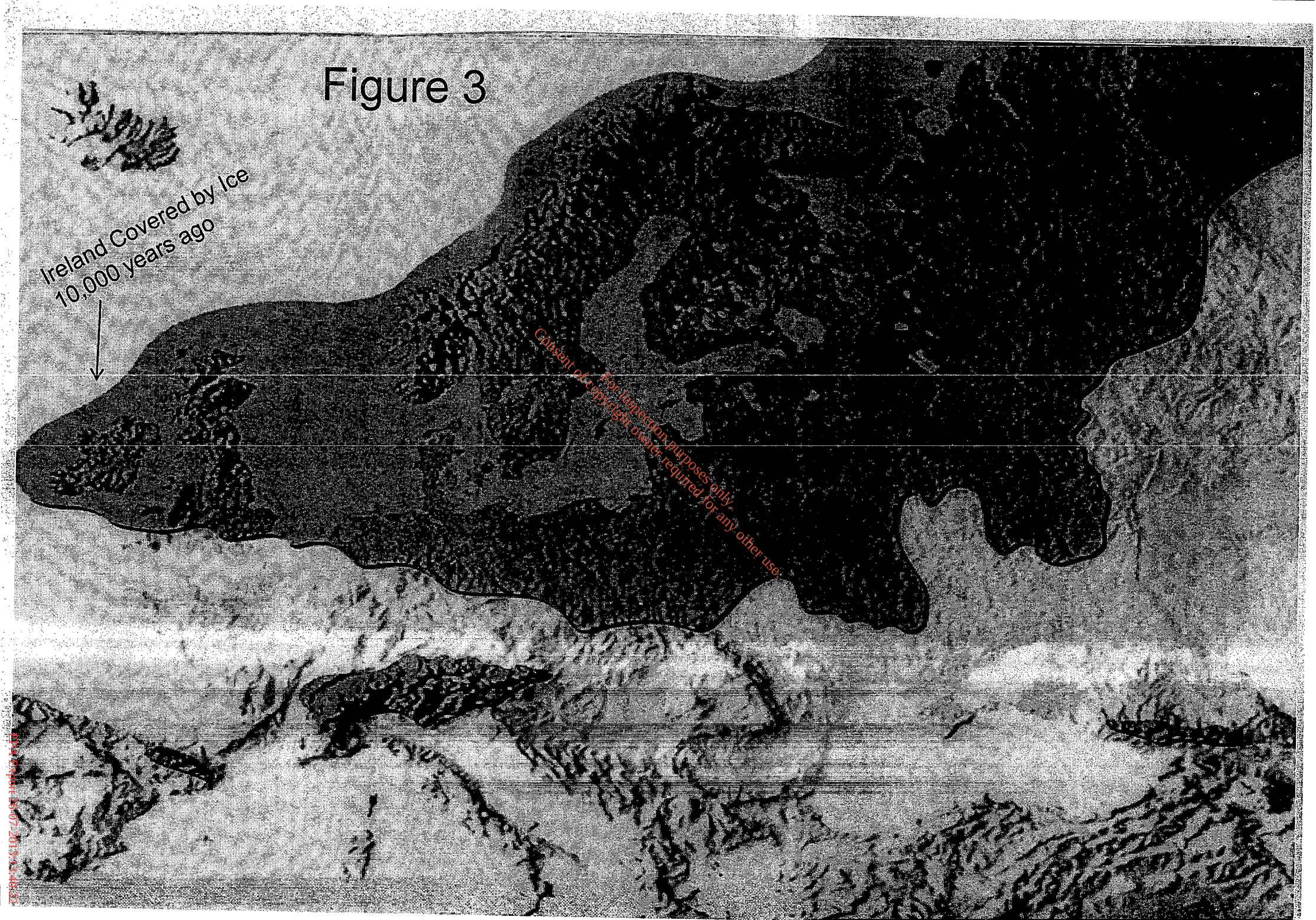


Figure 4 - Perched water table supported by stringers of clay-rich till

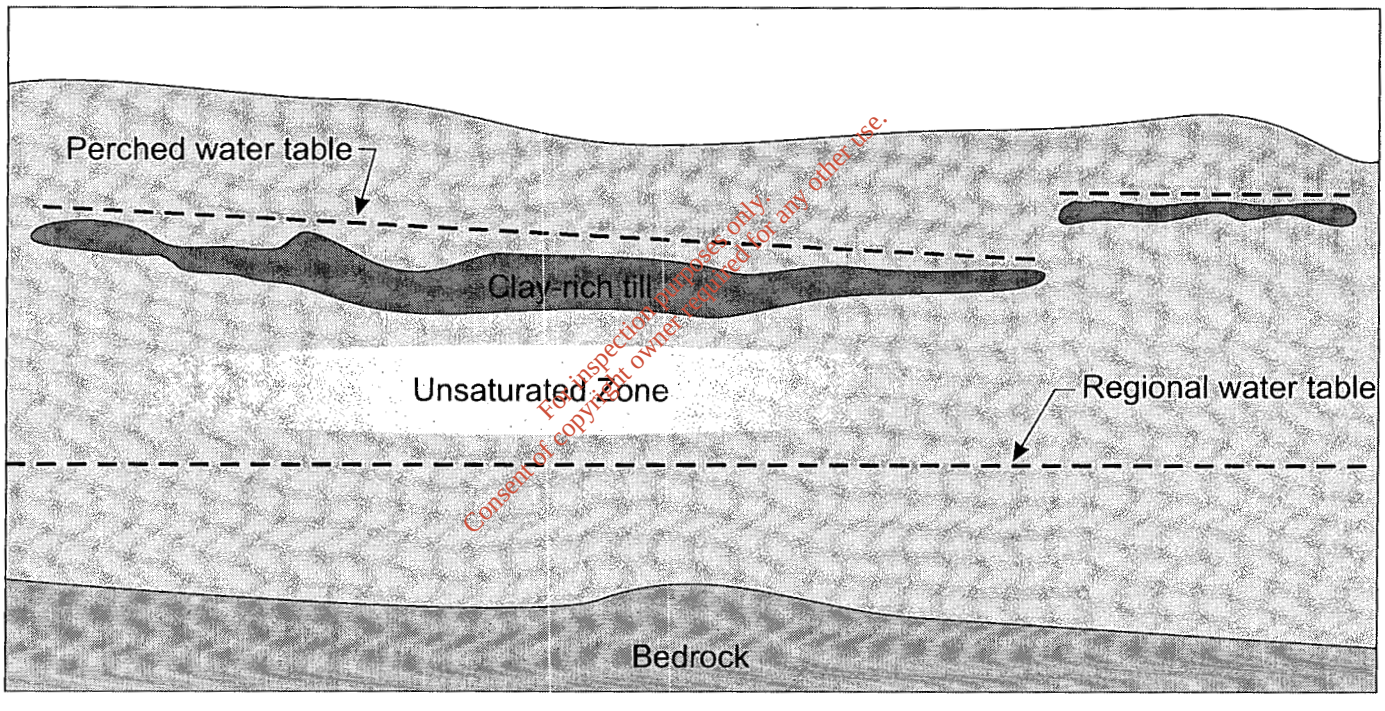
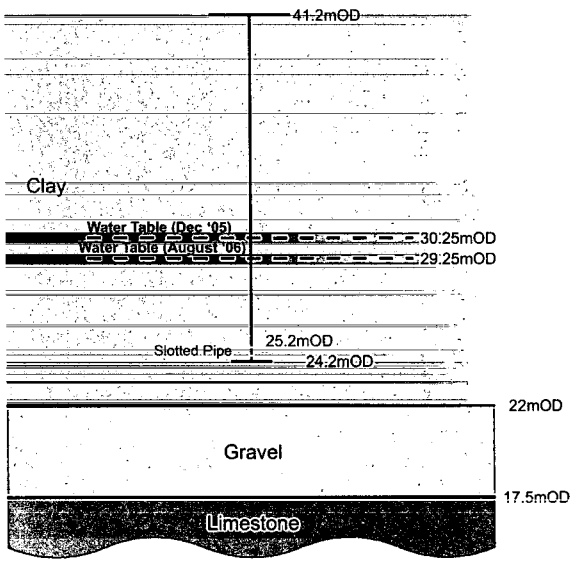
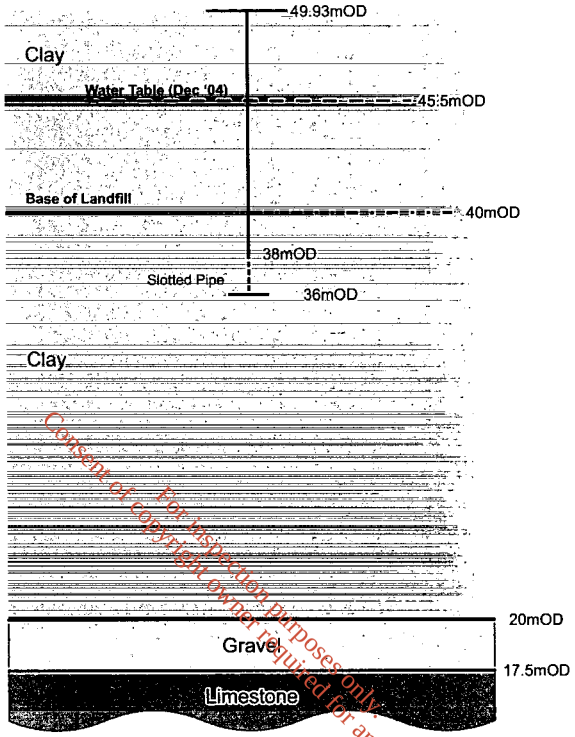


Figure 5 - Groundwater Levels at Nevitt

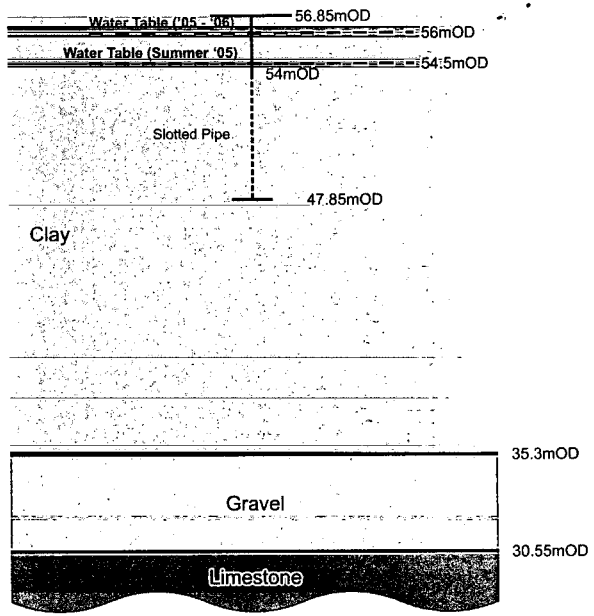
Borehole - BSA3(a)



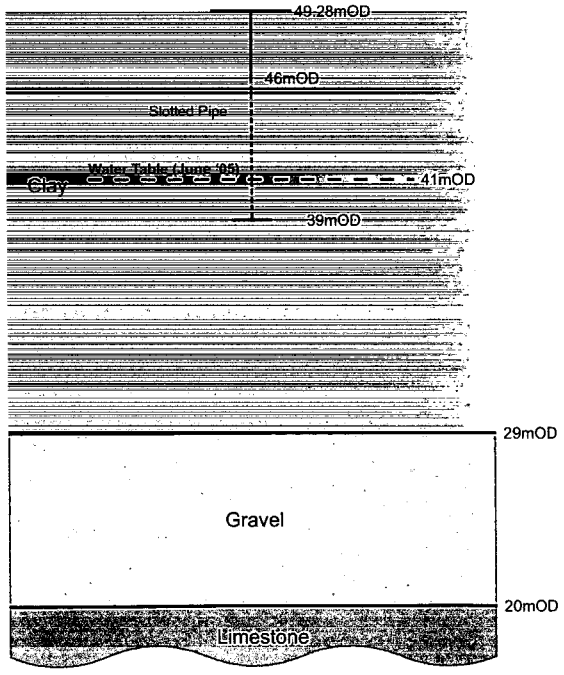
Borehole - BSA6



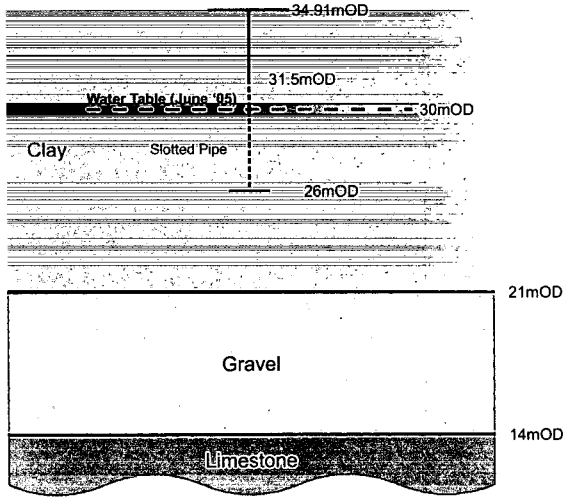
Borehole - ES02



Borehole - ES08



Borehole - GS02



Borehole - GS06

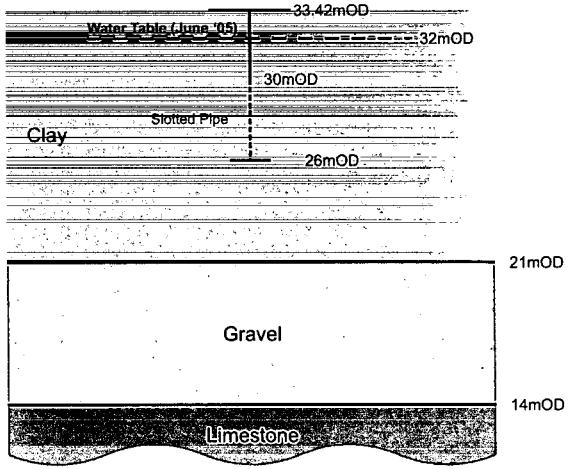


Figure 6 Groundwater Levels at BSA4 (CLAY)

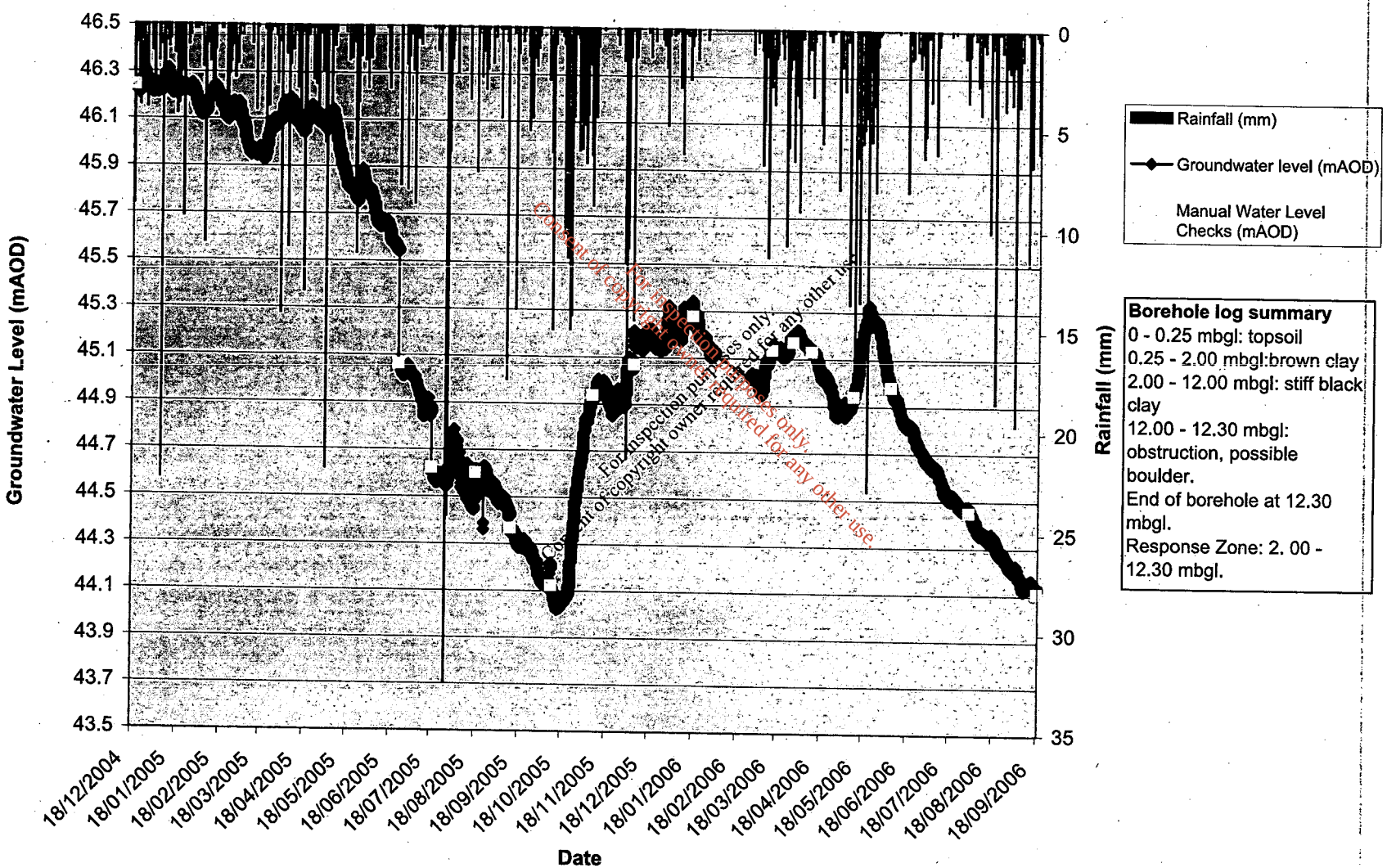
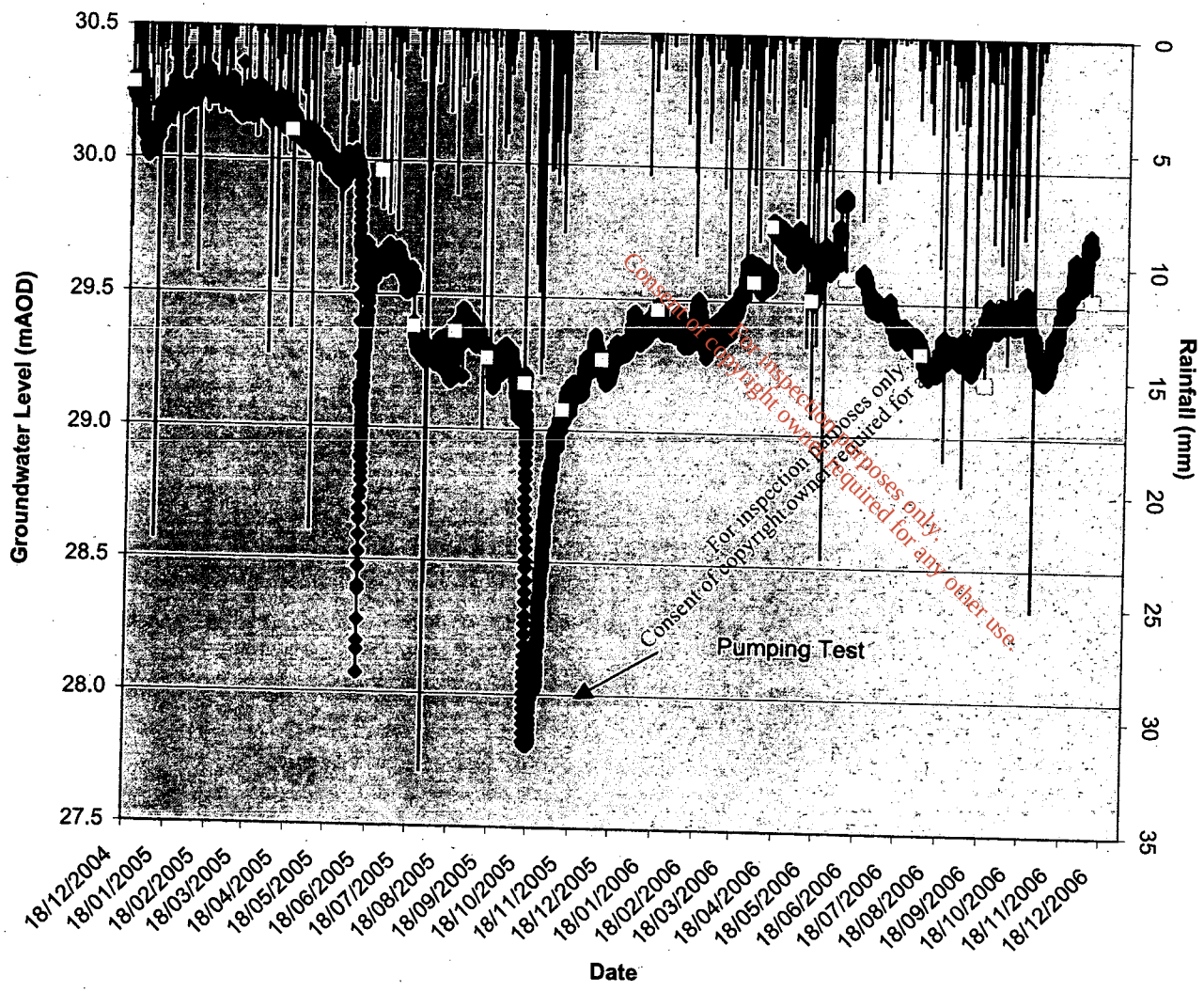


Figure 7 Groundwater Levels at BSA3a (Clay)



Rainfall (mm)

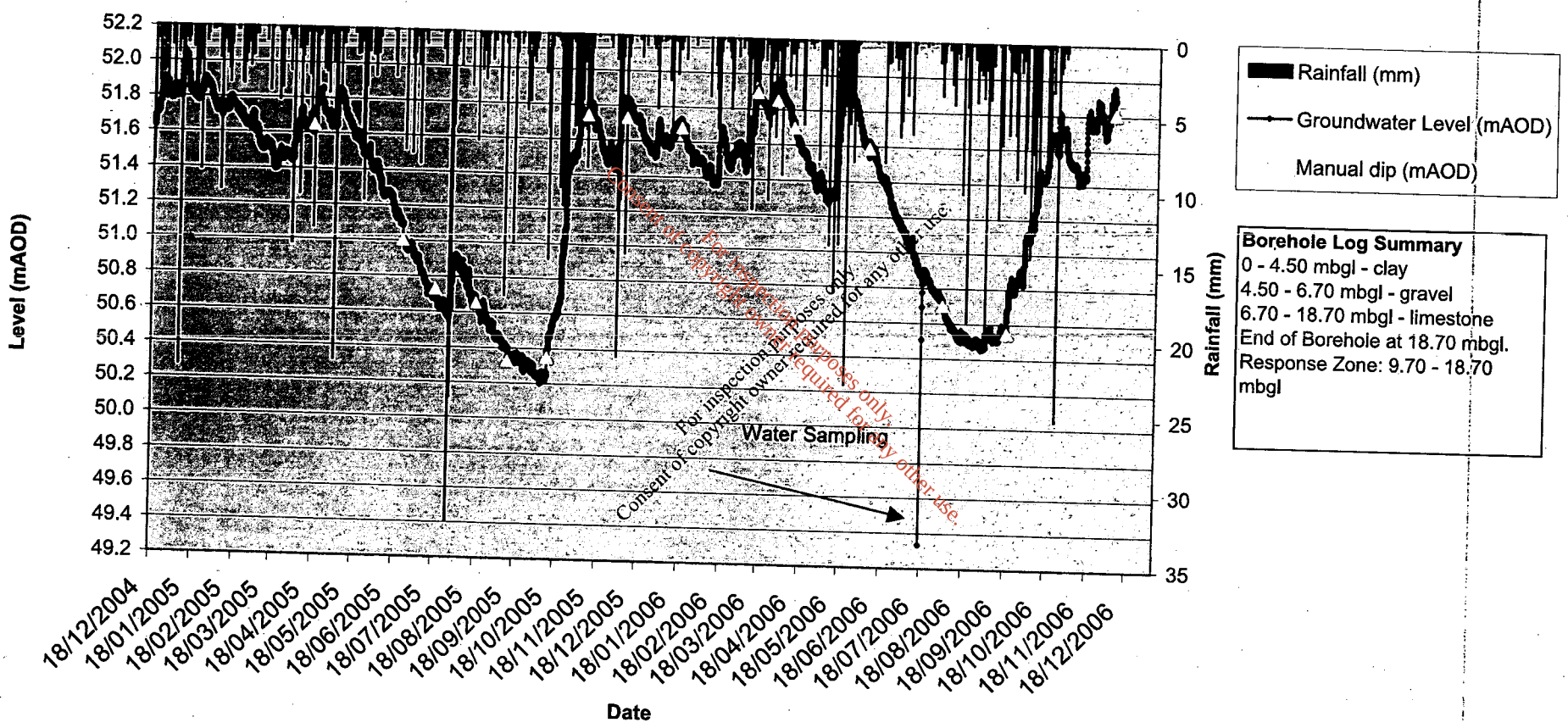
Groundwater level (mAOD)

Water Level Checks (mAOD)

Borehole log summary

0 - 0.40 mbgl: topsoil
0.40 - 2.40 mbgl: brown clay
2.40 - 10.50 mbgl: very stiff black clay
10.50 - 17.00 mbgl: very stiff brown clay
Borehole ends at 17.00 mbgl
Response Zone: 16.00 - 17.00 mbgl.

Figure 8 **Fingal Landfill**
BRC2 (Shallow Bedrock) Groundwater Level (mAOD)



MDR0303

BRC2