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Publication Date	2005
Publisher	Meath Archaeological and Historical Society

# The geophysical survey of the M3 toll-motorway corridor: A prelude to Tara's destruction?

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(Published 2005: *Ríocht na Midhe*, Journal of the Meath Archaeological and Historical Society, XVI, 8-22)

## Abstract

*The geophysical survey of the 'emerging preferred route' of the M3 toll-motorway through the Tara/Skryne valley has identified a wealth of new archaeological monuments. Still greater numbers of sites have come to light during test trenching and more discoveries are anticipated before investigations are completed. This comes as no surprise as the proposed route effectively bisects the Royal Demesne of Tara – a long-recognised archaeological landscape of international importance. Irrespective of the number of archaeological monuments that will be destroyed in the path of the motorway, the chief concern remains the choice of route and the irreversible damage it will cause. In consideration of the financial, cultural and ethical issues at stake it is crucial that this poor planning decision is reversed and the other viable options reconsidered.*

## Introduction

For Ireland and Irish people throughout the world Tara has a unique archaeological, historical and cultural resonance. This place has a recognised pedigree of ceremonial and ritual activity stretching back over 6000 years (Newman, 1997). It is, therefore, quite literally, sacred ground. The cluster of earthworks on the hilltop ridge remains the focus of an integrated complex of monuments extending over the wider, surrounding, hinterland. This is what archaeologist and historians universally acknowledge as one of Ireland's, and indeed Europe's, most significant and important cultural landscapes. Its elevated sacred and political status endures to the present day and remains a potent symbol of our national and cultural identity.

Over the millennia the Hill of Tara served as a necropolis, a sanctuary and temple complex and, in addition, was the focus of royal ceremonial activity. It appears to have grown in importance with each successive phase of activity, to reach its zenith during the Iron Age - at a time when much of Britain and most of Europe was under Roman domination. In its immediate surroundings were the settlements, and by the later prehistoric period, a ring of strategically placed fortifications was built to guard and defend the 'sacred hill'. This is, in essence, Tara's core archaeological landscape as defined by those who created it. In the early medieval period the limits of this zone became more formally recognised as the *ferenn rí*g (royal demesne) of the kings of Tara, which is roughly equivalent in extent to the modern barony of Skryne (Bhreathnach, 1999). From the earliest historical records (around the 7<sup>th</sup> century A.D.) the Hill is acknowledged as the pre-eminent pagan sanctuary and centre of kingship in Ireland (Bhreathnach, this vol.). At this time all roads led to Tara and aspirations towards the high-kingship of

Ireland went hand-in-hand with holding the kingship of Tara. It was also central to St Patrick's conversion of the Irish to Christianity. It is this fascinating convergence of tangible archaeological remains illuminated by a significant corpus of historical documents that sets this landscape apart.

The proposed route of the M3 toll-motorway and its 32-acre floodlit interchange, if built as planned, will cut through the very heart of, "one of the richest and best known archaeological landscapes in Europe" (EIS, Vol. 4C, 3).

### **The 'Emerging Preferred Route'**

In the knowledge of the singular cultural importance and sensitivity of the Tara landscape it is hard to fathom that the National Roads Authority (NRA) and Meath County Council (MCC) could have contemplated a development of this scale and invasiveness through the Tara/Skryne valley. In this instance one would have thought that absolute priority would have been given to cultural heritage and environmental issues above all else and this specific route option avoided at all costs. Unforgivably, it was not and the route through the valley was quickly adopted as the so-called 'emerging preferred route'. This decision is all the more damning as unequivocal warnings were given by the NRA/MCCs own consultants of the folly of driving a motorway through the valley at the very earliest stages of the route selection process (Fenwick 2004, Bhreathnach *et al.* 2004). Shamefully, this expert advice was diluted to the point of impotency for inclusion in the Environmental Impact Statement (EIS). It would appear, therefore, that the EIS amounts to little more than an expensive and rather cynical exercise in 'window dressing'. The extraordinary results of the geophysical survey are a case in point.

### **Geophysical Surveys at Tara**

Archaeological geophysics has been defined as:

"The examination of the Earth's physical properties using non-invasive ground survey techniques to reveal buried archaeological features, sites and landscapes" (Gaffney and Gater 1993, 12).

In short, it provides archaeologists with a non-invasive and cost-effective means of 'seeing beneath the soil' (Clark 1990).

Geophysical survey is by no means new to Tara. Indeed the very first archaeo-geophysical survey in Ireland is likely to have been conducted across the ramparts of Ráith an Ríg in 1952 by Professor Seán P. Ó Ríordáin with the help of Professors Nevin and Brindley - and the assistance of the youthful professor-to-be, Etienne Rynne (pers. comm.) – most probably using a Meggar Earth Tester electrical resistance meter (O'Brien 1993, 14). In more recent years extensive geophysical survey have been conducted on the hill of Tara under the auspices of the Discovery Programme. Initially during the early 1990's, Conor Newman, as Director of the Tara Survey, commissioned Geoquest Associates (Durham, England) to undertake electrical resistance and magnetometer surveys on selected parts of the hill

(Newman 1997). Latterly, between 1998 and 2002, the Discovery Programme, in collaboration with the Department of Archaeology, NUI, Galway, returned to examine areas of the Hill which had not previously been investigated (Fenwick and Newman 2004, 2002(a), 2002(b); Fenwick 2003). The results of those surveys proved to be extraordinarily successful in identifying a wealth of new archaeological monuments and features, most of which display little or no surface expression. This new information has enabled a significant progression of our understanding of the nature and complexity of Tara. It is a truly remarkable place.

Aware of the successful application of geophysics at Tara by the Discovery Programme and in the knowledge of the potential value of this technique in the evaluation of the motorway corridor, GSB Prospection (Bradford, England) were commissioned by Margaret Gowen and Co. Ltd. in 2000 to undertake the geophysical survey as part of the M3 archaeological assessment. Before reviewing the results of this geophysical survey it is necessary to digress for a moment to explain something of the basic principles behind geophysical survey, in addition to its scope and limitations.

### **Geophysical principles, scope and limitations.**

Geophysical images are not maps but pictures of differential physical properties of the soil and, as such, need to be interpreted to understand what they are saying. In many instances geophysical data does not produce a clear image in which archaeological monuments and features are easily identified and understood. If, for instance, a clearly defined pattern does not present itself its significance may simply be overlooked. Moreover, the effectiveness of a particular geophysical technique is, of course, dependant on a detectable contrast in physical property between a sub-surface archaeological feature and its surrounding medium or 'background' soil. If a sufficient contrast is not apparent, these sub-surface features will remain effectively invisible or 'transparent'. It is worth remembering, therefore, that simply because a monument or archaeological feature is not visible in a geophysical image does not necessarily mean it does not exist. For this reason a survey strategy that employs a number of complimentary geophysical methods, each measuring a different property of the soil (e.g. magnetometer and electrical resistance), has clear advantages over a survey dependant on just one single technique. Other factors to be taken into account in assessing the results of a geophysical survey are the methodology adopted and the resolution (i.e. the sample interval between individual readings) at which the survey is conducted. These factors will also have implications for the success in identifying potential archaeological features.

There are, therefore, many variables that need to be considered in designing a geophysical survey strategy but, in general, it can always be assumed that the numbers of archaeological monuments and features identified in any geophysical survey can be considered a minimum. Certainly, it can be expected that more will be found during subsequent excavation.

## **The geophysical Survey of the ‘emerging preferred route’**

Why was the geophysical survey implemented? Considering that the geophysical survey was conducted as early as 2000 one may be forgiven for assuming that its application was to inform the route selection process, to estimate the potential numbers of previously unrecorded sites and monuments along a particular route, and to identify other potential targets for test excavation. This was not the case.

The geophysical survey was confined to the corridor from Cannistown (4km south of Navan) to Dunshaughlin: the option identified as the ‘emerging preferred route’. None of the other potential route options were investigated and so this work did not inform the route selection process in any way. More curious still, particularly in the light of the extraordinary results that were obtained, the geophysical images and interpretation drawings are wholly omitted from the EIS. Only a brief ‘synopsis’ of the geophysical survey report is contained in the EIS, from which it is all-but-impossible to make an independent assessment of its findings.

The geophysical methodology along the M3 toll-motorway corridor adopted a hierarchical survey strategy. This consisted of a programme of magnetic scanning followed by a more detailed magnetometer survey (using a Geoscan FM36 fluxgate gradiometer) in the hope of identifying areas of potential archaeological significance. Only one geophysical technique, therefore, was used on the geophysical survey of the M3 corridor and so the scope for detailed analysis and interpretation, which a number of techniques may have provided, is somewhat limited. This one-dimensional survey strategy will, of course, also have implications for the identification of potential archaeological targets as some may not possess detectable, let alone significantly recognisable, magnetic characteristics.

### **Magnetic Scanning**

In this instance the scanning methodology adopted involved walking in parallel lines (8 in total per field), spaced 10m apart, along the proposed road corridor while observing “fluctuations in the magnetic signal [...] in the instrument’s display panel” (EIS Vol. 4A, 167). The EIS further states that: “Variations in magnetic response that were thought to be of archaeological potential were identified at thirty sites along the route of the proposed road” (EIS Vol. 4A, 167). Clearly, scanning of this sort is a subjective procedure. No data is collected for later analysis, assessment or independent quality control and its success is dependant entirely on the competence, experience and on-the-spot judgement of the field operator.

One authoritative assessment of scanning states bluntly that:

“It should be stressed that ‘scanning out’ anomalies can be very difficult and [...] even experienced personnel may have limited success in detecting areas of interest, let alone individual anomalies” (Gaffney and Gater 2003, 93).

The authors of this statement are partners in GSB Prospection, the company that carried-out the geophysical survey along the proposed M3 corridor.

The subject of scanning has also been addressed in the National Roads Authority monograph series (No. 1) where it states:

“It should be recognised that scanning on lines 10m apart could result in a weak magnetic feature, perhaps up to 9m in diameter, not being resolved. If scanning without digital recording is carried out, it is not possible to produce a map or trace showing the instrument readings. This has implications for quality control and/or later analysis of the scanning survey.” (Barton 2003).

Magnetic scanning was implemented over a total of 105 hectares along the route of the proposed M3 toll-motorway corridor. The area to be occupied by the major floodlit interchange at Blundelstown, however, lying just 1000m from the Hill, was not investigated. Despite the obvious shortcomings of the preliminary scanning it did, nonetheless, succeed in identifying 30 areas of potential archaeological significance for detailed magnetic survey. The results of this detailed survey, covering some 26 hectares in total, are particularly significant.

### **Detailed Magnetometer Survey**

The GSB Prospection report (2000) presents a brief description of the aims, methodology, geophysical technique and survey results along with location maps, geophysical images and interpretation drawings (of the 30 detailed survey areas). The geophysical interpretation drawings can be ‘read’ using the key at the bottom of each page which itemises the various anomalies into specific categories (e.g. ‘Archaeology’, ‘?Archaeology’, ‘?Industrial’, ‘Trend’, ‘Ferrous’, etc.). The number of geophysical anomalies recognised by GSB geophysicists as potential archaeological sites, monuments and features (expressed as a fraction of the 30 detailed survey areas) is listed in the table below.

<i>Interpreted geophysical feature categories (as identified by GSB Prospection)</i>	<i>Numbers of Interpreted geophysical feature categories expressed as a fraction of the 30 detailed survey areas</i>
Archaeology	7 / 30 *
?Archaeology	26 / 30
Negative Linear Anomaly	21 / 30
?Industrial	2 / 30
Ferrous	30 / 30
Trend	26 / 30
Increased Magnetic Response	7 / 30

\* the proposed route of the motorway has been re-routed to avoid two of these monuments and to partially avoid a third.

The geophysicists, therefore, have identified unequivocal or suspected archaeologically significant geophysical anomalies (i.e. 'Archaeology' and '?Archaeology' categories) in no less than 26 of the 30 detailed survey areas. Interestingly, all 30 areas contained ferrous material (of indeterminate date and context).

The results of the geophysical survey are little short of spectacular. The clarity and detail contained in some of the geophysical images is remarkable. It requires little in the way of interpretation to appreciate the significance of these new sites and monuments. A number of these can be more accurately described as archaeological complexes (they are referred to as such in the EIS, Vol. 4A, Section E, subsection 13.3.3.3, p. 175) and cover areas between one and two hectares in extent (though in many instances the true extent of these remains unknown as many features continue beyond the limits of the detailed geophysical survey). Moreover, there is no guarantee that these complexes are unique among the 26 identified in terms of size, complexity or importance.

How then can one explain the repeated and consistent assertions of the NRA spokespersons in the press, radio and television, that the geophysical survey has found only three sites? Mr Brian Cullinane (NRA), for instance, made the following categorical statement in letters to the Irish Times and Irish Independent in February of 2004.

“For the record, two recorded sites are impacted along the entire 60km length of the route. Geophysical survey has found three further sites that the road will directly impact and fieldwalking surveys identified 15 further possible archaeological sites in the line of the route.”

This statement is not credible. Accepting the geophysical report at face value, there can be little doubt of the unusually high concentration of archaeological sites and monuments identified along this short stretch of the proposed motorway. Furthermore, taking into account the inherent shortfalls of the geophysical survey methodology, it is likely that it has identified only the tip of the iceberg. Would it not have been wise at this stage to reconsider this 'emerging preferred route' and look again at some of the alternative and equally viable options?

Irrespective of the NRA's conservative estimate, the geophysical survey, as it stands, has provided some independent means of assessing the archaeological prospectivity of the proposed route. It could also have provided a basis from which to formulate a predictive model of the expected numbers of sites and monuments that will be encountered. This potential, however, was not exploited. In this regard, a complete detailed geophysical survey or, at the very least, control surveys where magnetic scanning found nothing, should have been conducted at regular intervals. The application of other geophysical techniques (most particularly electrical resistance and magnetic susceptibility) could also have provided a better means by which to assess unresolved anomalies noted in the gradiometry data prior to test trenching. It goes without saying that best practice would recommend that test trenching be carried

out only after non-invasive survey techniques have been applied as the results of these can be used as a means to inform a programme of investigative excavation. Furthermore, a more extensive programme of geophysical survey (in consideration of the sensitivity of this landscape), even over the entire road-take corridor, would have been a comparatively inexpensive procedure.

### **‘Centreline’ test-trenching**

Extensive test trenching was implemented along the entire 60 kilometres of the proposed M3 toll-motorway between March and June of 2004. This procedure involves machine-digging a two metre wide trench along the centre of the road corridor with trenches to either side of this ‘centreline’ (to the edge of the road-take) at approximately 20m intervals. In surface area, this equates to about 10% of the road-take (Pl. 1). The trench is not trowel-cleaned but is simply examined by the monitoring archaeologist in its ‘raw’ state and if nothing of obvious archaeological significance is observed it is immediately back-filled. Despite its cost (two million euro in the case of the M3), this procedure remains little more than a random and rather blunt ‘testing’ procedure.

Though the information was to hand, the test trench methodology was not adapted as required to investigate specific geophysical targets, most particularly those identified as being of suspected archaeological significance. It would have been possible, indeed a relatively simple procedure, to identify the exact location of any geophysical anomaly for a surgically precise ‘keyhole’ test-excavation. Furthermore, the results of an investigative strategy such as this could prove useful as a reference archive of typical geophysical signatures whose source has been positively identified or verified. Similar geophysical signatures could therefore be more easily interpreted should they arise in subsequent surveys.

Again, the standard test trench methodology was imposed over sites, monuments and complexes already confirmed by other means. Surely these could otherwise have been avoided to prevent this entirely unnecessary damage. Best practice would recommend that any archaeological site should not be ‘tested’ in this manner. In the context of Tara it is inexcusable.

The question remains, if the geophysical survey was not used to inform the route selection process, or as a means to realistically estimate the expected numbers of sites that would be encountered, or as a means to inform the subsequent programme of test trenching, what was its purpose?

### **The results of the test trenching**

An interim report (May 2004) by Meath County Council concerning the archaeological component of the Dunshaughlin to Navan section of the M3 states that:

“To date approximately 28 archaeological sites have been confirmed or identified by the archaeological testing. 3 sites are large enclosure complexes, possible early medieval settlements, identified as archaeological sites in the EIS geophysical survey. 6 sites identified

as possible archaeological sites in the EIA geophysical survey have now been confirmed as archaeological sites by the testing. 19 sites are newly identified archaeological sites.”

This interim report, released at a time test trenching had not been completed, is, however, a more realistic projection of the actual impact of the proposed motorway corridor on the extant archaeological remains than some of the earlier NRA predictions. It fails to state, however, that the suspected archaeological sites identified in the geophysical survey were not investigated as a matter of course. It also fails to account for the ‘15 further possible archaeological sites’ identified during fieldwalking, mentioned in Mr Cullinane’s (NRA) letter to the press.

### **The cost of excavation**

Based on the information available it still remains difficult to accurately predict the number, size and complexity of archaeological monuments that will require full scientific excavation or, indeed, an estimate of the timescale its ‘resolution’ is likely to require. It goes without saying that the NRA’s prediction errs on the side of caution and remains very much a conservative underestimation.

The key issue remains to be seriously addressed: what percentage of the proposed motorway route and interchange will require full scientific excavation and how much is this likely to cost? It is hard to imagine the scale of the mammoth archaeological undertaking facing the NRA. To appreciate this, it is necessary to translate the figures into something more easily digested and understood.

Detailed geophysical survey was undertaken in 30 areas and covered a total of 26 hectares. This is equivalent in area to about 40 international standard football pitches. A combined total of 26 unequivocal and suspected archaeological sites and monuments were identified by this survey alone (irrespective of those confirmed and identified in the later programme of test trenching). If one imagines, at a very conservative estimate, that only a quarter of this 26 hectares will require full scientific excavation this still amounts in area to approximately 10 international standard football pitches. Assuming, for instance, a road-take width of say 65m, this is equivalent to a full kilometre of motorway having to be fully scientifically excavated. The programme of subsequent test trenching, however, has rendered this estimate obsolete.

As it stands, the current (if conservative) estimate of archaeological sites and monuments along the Navan to Dunshaughlin stretch of the motorway corridor has reached the grand total of 28. It is expected that further sites and monuments will be discovered during continued test-trenching<sup>1</sup> and topsoil stripping. On the basis of this upwardly revised figure, what combined total area will actually require full scientific excavation to the standards of ‘best archaeological practice’? Will it be 20

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<sup>1</sup> In the most recent announcement issued by Meath County Council’s archaeological officer on behalf of the NRA (21 September 2004) it was stated that the proposed route of the M3 toll-motorway between Dunshaughlin and Navan alone would now impact on a minimum of 38 sites, monuments and complexes - with an expectation of more during the topsoil-stripping and construction phase.

hectares, 16 hectares or as little as 12 hectares (i.e. just 20 international sized football pitches or 2km of motorway corridor 65m wide)?

It is abundantly clear at this stage that the cost of scientifically excavating (euphemistically termed 'resolving' or 'preserving by record') the monuments along this part of the proposed M3 motorway will stretch financial and logistical resources far beyond that first anticipated by the NRA (despite the warnings from their own archaeological consultants and other experts from the very outset). The cost in terms of irreparable damage to our national heritage, and to our international standing as guardians of European heritage, will be even greater. Moreover, it is likely that the 'resolution' of this extraordinary proliferation of sites and monuments, directly impacted by the toll-motorway, will arrest its progress (and that of its commuters) by months if not years. Facing this prospect, what options are open to the NRA/MCC?

### **The National Monuments (Amendment) Bill 2004**

The NRA has made no secret of its position regarding archaeological heritage. In their annual report (2004, 4), and more explicitly in their presentation to the Oireachtas Committee on the Environment (1<sup>st</sup> June 2004), they have called for a 'one stop shop' approval mechanism to overcome the various 'shortcomings in the procedural and regulatory environment' of the planning process within which they are obliged to operate. Part of the solution, as they see it, is a need for less public consultation, a grading system for archaeological sites and monuments (based on a table of perceived value and significance) and 'reform' of the 'outdated' National Monuments legislation. The Department of the Environment, Heritage and Local Government has effectively granted this request by amending the National Monuments legislation accordingly. This direct intervention was prompted largely by the impasse with regard to the completion of a link-road to the M50 motorway across part of the Carrickmines Castle site, classified as a national monument. This amendment, however, will also have wide-ranging implications for other major road developments should they impinge on archaeological sites and monuments – including those at Tara.

The amendments proposed will give the Minister new discretionary powers with regard to archaeological matters relating to road developments (subject to Environmental Impact Assessment). It states that:

“Any works of an archaeological nature that are carried out in respect of an approved road development shall be carried out in accordance with the directions of the Minister, which directions shall be issued following consultation by the Minister with the Director of the National Museum of Ireland.” (NM(A)B 2004 14A(2)).

Such decisions, however, can also take into 'consideration' matters of 'public interest'.

“in allowing the carrying out of works notwithstanding that such works may involve -

- (i) injury to or interference with the national monument concerned, or
- (ii) the destruction in whole or in part of the national monument concerned” (NM(A)B 14(2)(d))

In short, if deemed to be in the ‘public interest’, this amendment to the National Monuments legislation has made provision for the ‘destruction’ of a national monument to be a matter of Ministerial discretion. With the prospect of the introduction of a ‘grading’ system for archaeological sites and monuments the very real possibility now exists that certain monument classifications may be deemed unworthy of full scientific investigation and recording. In the case of the M3 toll-motorway (a public private partnership - PPP), will ‘cost benefit return’ be considered of greater concern to the ‘public interest’ than that of cultural heritage? This is a particularly disturbing prospect as many of the archaeological monuments lying in the path of the motorway corridor, though described as ‘ordinary’ by the NRA/MCC, may be considered to be of especial significance given the extraordinary context. This legislation may therefore provide the loophole necessary to complete the M3 toll-motorway and interchange (through the Tara / Skryne valley) within the NRA/MCC’s projected budget and time constraints – to the incalculable cost of Tara’s archaeological, cultural and historical legacy.

In the context of a recently published report by the Comptroller and Auditor General such cost-cutting measures, irrespective of the cultural or ethical price to be paid, have been given a greater impetus.

### **Conclusions**

“In the latest report from the Comptroller and Auditor General, a tale unfolds of breathtaking incompetence and mismanagement in an area vital to our economy, the road construction programme” (Irish Independent 30 June 2004).

In 1999 the National Development Plan proposed an investment of €5.6bn in the national road infrastructure. This was independently costed by the NRA at €7bn. By the end of 2003 the estimate stood at €16.4bn, an overrun of some €9.4bn (in excess of 134% of the NRA’s own projected costs). It would appear that the NRA are capable of digging themselves a bottomless pit into which to pour tax-payers money without taking into account the relatively minor financial aberration due to archaeological ‘issues’ that they choose to blame. Surely the prospect of further embarrassing and costly mistakes cannot be contemplated in future developments.

Nobody doubts that the implementation of a well-planned and integrated programme of infrastructural development is of the utmost importance to Ireland’s future economic well-being. Not only will it provide commuters with the means to travel greater distances in less time (for a nominal toll-charge) but it will also facilitate accelerated industrialisation and development along these corridors.

In the case of Tara the contentious issue is not limited to the large number of archaeological monuments that will be directly impacted (‘preserved by record’ or ‘destroyed’) but also to the fact that the motorway as planned will effectively bisect this ‘intact archaeological landscape’ (Margaret Gowen and Co. Ltd. 2000, paragraph 7.3). Unlike the current and established road system the four-lane motorway and major floodlit interchange will not respect the topographical contours of the landscape

but will be ramped or gouged through the valley as required to meet motorway construction standards. And, in subsequent years, industrial parks and housing estates will inevitably spring-up around the purpose built interchange at Blundelstown, a little over 1.5km to the north of Tara's 'Banqueting Hall'. If built as planned, no amount of mitigation or landscaping will ameliorate this damage, royal Meath's proud boast of being Ireland's heritage county will ring hollow and Tara, a place of national and international importance, will never be granted its rightful place among UNESCO world heritage sites.

There has been, of course, an easier way all along, and that is simply to heed the expert advice in the original consultants' reports and plan with appropriate sensitivity. Surely this approach should be considered preferable to tackling environment and heritage issues head-on whatever the cost – financial, cultural or ethical? It does not have to be a choice between the cultural integrity of Tara and the economic benefits of the toll-motorway. There are viable alternatives that can accommodate both. These can and must be reconsidered. It would seem, at this stage, that the dogged insistence and determination to build the motorway through the Tara/Skryne valley is fuelled more by embarrassment than any other factor - the embarrassment of knowing that a poor planning decision was made and the perceived 'appalling vista' of contemplating its reversal. This is wrong. It is time a courageous and enlightened stand is made to reverse this poor planning decision before it is too late. We simply cannot afford to get it wrong.

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National Monuments (Amendment) Bill 2004

**Illustrations:**



Pl.1 Aerial photograph, looking west-southwest, showing the scar of the test trenching through the townlands at Clowanstown and Ross situated to the southeast of the Hill of Tara.