RML Newsletter round-up

NOVEMBER 2015

THE ELEPHANT IN THE ROOM

"Nothing can be said to be certain except death and taxes"

Benjamin Franklin.

The 'elephant' that I am talking about is the inherent risk and uncertainty that is involved in any activity which involves one doing something, getting out of bed for example! In an earlier note we mentioned a certainty that we have to live with; which is that unexpected things crop up frequently in design and construction (No coffee stains please - September). Designing and carrying out work in the ground and below ground can always surprise one even if you are armed with the best of site investigations.

Construction professionals, especially civil engineers, need a steady nerve and the ability to 'hold on' when all about them are losing theirs. It is one reason why civil engineering projects require supervision by an experienced civil engineer rather than a clerk of the works. On a recent important project in Norwich which we saw as a 'show piece' of the sustainable approach inherent in our design-and-build service, hired-in plant broke down repeatedly over the first few days. The delays to us making progress were potentially serious, but our adaptable and experienced resident engineer dealt with these unexpected but not unusual breakdowns. In the end all was well. Waving of arms on site and shouting down the phone from a few hundred miles away would have got us nowhere and was a lesson learnt by observing others a long time ago.

I would like to think that we never succumbed to this form of management. Leading from the front is a favourite approach of mine so far as management is concerned but, whilst it is exciting, the corollary is that one must be prepared to take responsibility for everything that happens. Some people find that difficult.

The elephant lives with us. We expect him to deliver surprises and occasionally some can be helpful and extremely welcome. By their nature surprises are difficult to anticipate otherwise they would not be surprises would they? What kind of unwelcome surprises am I talking about? Not changes in the weather, our weather changes on a daily basis. Earthquakes are rarely damaging in the UK, but storms and thunderstorms can create real difficulties on construction sites. Underground springs and watercourses can appear in excavations after having been missed in site investigations, as can cavities left by ancient iron-age miners. Some more modern miners have been known to create similar problems too. Rare plants can be a particular hazard on construction sites, a serious and time-consuming hazard to those wanting to press on with work. The rarities can be a double problem if nobody knew that they were there before construction began. Changes in the seasons can be problematic, an early Spring can affect the habits of all kinds of birds and hibernating beasties. Record drawings that are not record drawings at all but cruelly labelled as such do cause problems, unforeseen unnecessary problems. Famously, one set handed to us labelled 'As Constructed' still showed alternative constructions for highway pavements!

Early coal mining exposed during opencast mining

Self-ignition has been a problem with coal wastes.

I think that I have made my point, engineers are a special breed, and nothing fazes the best of the bunch.

A STITCH IN TIME…SAVES A LOT!

Last summer our sister company GroundCoverDBM was asked to visit a site to advise on the treatment of Japanese Knotweed in advance of work to develop new housing. The plan was to install drainage works including a substantial underground tank in land alongside the houses, but knotweed had been identified in the way of the excavations.

Japanese Knotweed growing across the site of the drainage works

GroundCover recommended advance excavation and removal of the knotweed-infested material, so that the drainage team had a free run at their works without risk of spreading the knotweed further. Knotweed is spread by the movement of rhizome fragments – tiny sections can sprout to form new plants, and so it should always be dealt with completely before earthworks start. But we heard no more.

Twelve months later we were contacted again because the drainage works had been carried out and now knotweed shoots were emerging in the disturbed area. The main contractor needed to deal with the problem

before installing car parking. We visited again and concluded that knotweed fragments could be present anywhere within the disturbed material. Removing all the disturbed fill around the new drainage system to ensure that all knotweed was dealt with was clearly impractical, not to say very expensive. We assessed the risk to the proposed car parking and recommended that a barrier system should be installed on the formation for the car park construction. Our team stripped the affected area to formation depth, and processed the excavated material using our **KLARO** system to eradicate the knotweed so that the soils could be re-used on site.

Regenerating knotweed shoots emerging in disturbed material

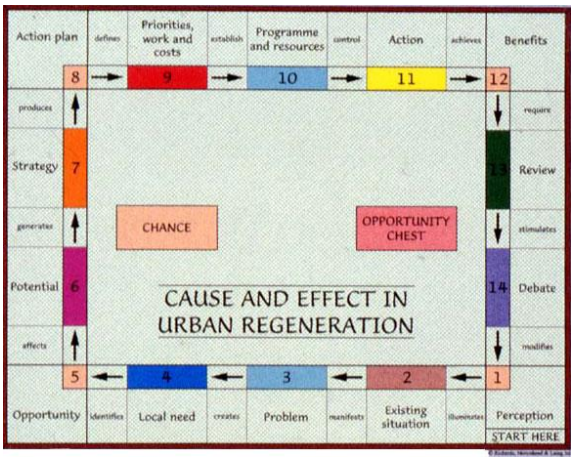
Fortunately the **KLARO** process is effective at any time of year and so the main works were not delayed by the knotweed problem. Spreading infested material had significantly increased the scale of that problem, but the combination of a pragmatic, risk-based approach and using our on-site **KLARO** system to avoid expensive landfilling meant that the financial 'damage' was limited.

But if timings had been a month or two later, the knotweed shoots would not have appeared until the next season by which time the main works would have been well under way. Remedial action would then have been much more disruptive and expensive.

A stitch in time saves nine….*but in any event the sooner you contact us the better!*

TWO THOUSAND WORDS

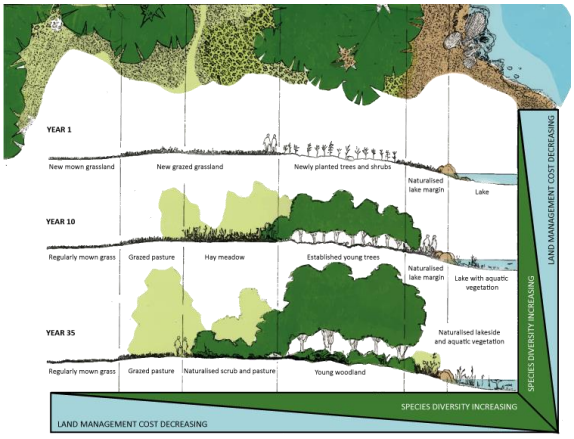
Some years ago, probably on a Friday afternoon, our MD Ivor Richards sat down and began to think about the causes and effects that were involved in the promotion and execution of projects involving land reclamation and landscape management. Ivor was seeking some way of illustrating by way of a diagram what his life's work was all about.



In the end Ivor produced two diagrams and they are reproduced below, one obviously based on a well-known format. He has only used them on rare occasions. You may recall that the diagram about Landscape Management was used just a month ago in September when Andrew was discussing landscape design and management and that has prompted the writing of this piece.

When Ivor showed these overheads as an afterthought in a workshop at a conference in St Louis in the USA they created a great deal of interest and had to be photocopied there and then for the audience of about 50

people. Ivor's reaction was that whilst the Americans liked the diagrams they were even more captivated with his Welsh accent and would not let him go without a full discussion of what the diagrams meant. His presentation over-ran the allotted time.



Principles of Landscape Management

Apparently a picture is worth 1000 words, which amount to just a couple of pages of text. The thinking and action that lies behind these two diagrams have filled a number of books and guidelines on good practice and equate to an understanding that has developed over 40 years.

These diagrams represent Ivor's conviction that talking about and explaining what one thinks and does is a fundamental part of being a professional. OK, standing up in front of an audience holds no terrors for him, quite the reverse in fact, since his school days he actually enjoys it.

THE PRINCIPLES OF LOW COST RECLAMATION

In a September email my colleague Andrew discussed 'Landscape design and management' and he mentioned RML's report to the Welsh Development Agency (WDA) which discussed and described a low cost approach to landscape design and management which was based on working with nature.

This newsletter is a follow-up to both Andrew's newsletter and mine of last month when I discussed *'Why work with nature'*.

The WDA introduced the report entitled ***'Working with nature'*** in the following words, *"The aim was to develop practical and economical low-cost techniques and procedures for the reclamation of derelict land. Guidelines for reclamation are contained in this practical manual."*

Under my direction the original report appeared in 1982. This low cost approach was an early introduction to sustainable thinking and practice. It just seemed to be *'the right way to go'*. The first edition of the report was a *'best seller'* and the WDA called for a second enlarged edition in 1994. ***Working with nature, low cost land reclamation techniques, Richards, Moorehead and Laing Ltd, - published by the Welsh Development Agency 1994.***

In 1982 I concluded the report as follows, *"Reclamation in the recent past has been led by technological and financial considerations. Natural processes and community requirements should also now guide the process. In the end it is the need of the community and the environment which should guide us".*

1982 seems such a long time ago. What was the basis of the thinking behind this approach?

From my earliest involvement in land reclamation in August 1972 it had occurred to me that this work involved more than conventional civil engineers and civil engineering. By 1972 I had had 11 years of experience in civil engineering as a designer, manager and resident engineer and experienced the effect of industrial impact first hand at Aberfan. One of my first reclamation projects was at Braichgoch Slate Quarry, Corris. I had been asked to design a new length of trunk road through tips composed of slate waste, quite a novel idea at that time. The existing trunk road was well below standard and massive slate tips on the hillside appeared threatening. I saw no problems in using slate waste as general fill despite its 'platy' nature provided that it was crushed and compacted in layers of appropriate thickness using heavy plant. The earthworks contractor thought that working in wet weather actually proved to be an advantage which was in marked contrast to his experience of working with colliery waste. In the event we found that the slate tips were extremely porous and did not generate the volume of compacted fill that we expected. We had to increase volume of excavated material by as much as 25% in order to generate the necessary fill whereas we had found that colliery waste in tips reduced in volume by about 10% when compacted.

At the outset I appointed a landscape architect to provide advice on landscape design and began working with Professor Tony Bradshaw at Liverpool University on planting techniques in slate waste. I had put together the

makings of a multi-disciplined team of engineers, landscape architects and ecologists. The architects were well known to me and had been involved in very early work on an abandoned colliery site near Aberdare in South Wales whilst Tony Bradshaw was already recognised as an expert in the field of vegetation growth on mineral wastes.

In 1972 I already had my multi-disciplined team.

That August I found that one of Tony's researchers had planted one and two year old transplants in pockets of compost within the undisturbed slate waste tips at Talysarn in the Nantlle valley, another early reclamation scheme into which I was pitched. These transplants died because the pockets of compost dried out due to their small size. We also found that because of its coarseness, the surrounding slate did not provide a growing medium for any roots that tried to extend beyond the compost. This result demonstrated that the growing medium had to be such that roots could develop, and in this respect it was the structure of the soil that was the critical factor.

On an adjoining area at Talysarn my engineering colleagues had already spread litter from chicken houses onto crushed slate. This proved that an over-abundance of nutrients produced luxuriant growth of grass irrespective of the quantity used, the litter was used sparingly from this point on and was eventually discarded. The nutrient input provided by granular fertiliser proved to be easier to control and controlling fertiliser input was soon recognised as an important element in the management of vegetation, and anyway the smell of the litter was a bit off-putting too!

Corris was the first major reclamation scheme to be carried out at an abandoned slate quarry. At Corris we imported some soil and used this in relatively small areas to be planted with young trees. By far the larger part of the reclaimed site, about 95%, was dressed with 100mm of crushed slate which was placed on a surface which had been well crushed and tracked-over by machines. These areas were then sown with grass seed. The soil was placed on the layer of crushed slate and planted up with pioneer species, predominantly willow, birch and alder. Within a year or two the areas covered in crushed slate contained hundreds of thousands of young tree seedlings and a relatively sparse cover of grass. Seeds had been blown in from the planted-up areas as we had hoped would happen. It was very clear that soil in the commonly the accepted sense was not necessary for trees to grow successfully, especially if they were pioneers. In fact the seeds of weeds within the imported soil became quite an unwelcome feature as they germinated.

Soil, especially imported soil, would no longer be considered as appropriate for use in our reclamation schemes.

We had demonstrated that crushed slate would provide a suitable medium for sowing seeds and that crushed slate also would be a much better than uncrushed slate waste as a growing medium for young trees. We learned that these conditions could be produced using conventional civil engineering plant and crushing/grading equipment.

On our reclamation schemes involving coal waste we found that soil conditions were the reverse of what we found with very porous slate waste. We reported that over-compaction of coal waste was inhibiting plant growth. Young trees placed in planting pits which had been dug in conventionally compacted coal waste simply drowned in pits that became waterlogged. I commented on this mistaken approach in Understanding and reacting in May. Cultivation and loosening of the regraded and compacted coal waste to a depth which would allow a free-draining medium to be developed in-situ was essential if tree growth was to be successful. This new specification did demand that ingrained practices needed to be adapted. We had to persuade engineers to loosen to a depth that would accommodate healthy root systems the material which they had been compacting with enthusiasm. Persuasion had to turn to insistence on many occasions.

This early work and further trials with Tony formed the basis of the 1982 WDA report which I referred to earlier and was eagerly read throughout the civil engineering industry in the UK and widely copied in universities. The report discussed the philosophy of low cost reclamation as well as how the approach should be applied.

What we introduced were changes in civil engineering specifications and techniques that reduced the cost of revegetating land disturbed by civil engineers and at the same time greatly improved the quality of the result.

I will discuss the value of pioneer plants and the reliability of vegetation in future notes.

BUTTONS ARE LIKE….?

Many, many years ago (I was probably about 14 at the time) in my English class we were asked to write an essay on buttons. One of my class mates simply wrote that there were many kinds of buttons, round buttons, square buttons, oval buttons and so on and buttons of many colours, red ones, white ones, blue ones and so on and so on. His essay was short and informative but the English teacher said that it lacked a certain amount of lateral thinking, interest and style. I cannot remember what I wrote but I have never forgotten my classmate John's offering and the teacher's comments. However I do remember thinking in his defence that John's first language was Welsh. Reflecting on this now and in fairness to the teacher the topic did contain a certain degree of challenge.

As with buttons, there are many kind of slopes, slopes that are as varied as the materials of which they are composed. One can find steep slopes, shallow slopes, hard slopes, soft slopes, short slopes, long slopes and slopes facing north, south, east or west, need I go on!!

So what is important about slopes in civil engineering so far as vegetation is concerned?

The answer is……everything.

Failed slopes can be expensive to repair and a source of embarrassment. Slopes are everywhere and their essential 'must have' quality is stability. At depth this stability can be provided by exploiting geotechnical properties in a combination of engineering soil properties and slope angles. At the surface however a great many factors determine whether the surface is stable and able to withstand the erosive forces of rainfall and surface water run-off. On the surface it is the presence of appropriate vegetation that is the important factor that contributes to stability.

Demonstrations and trials on the Horseshoe Pass for Welsh Office Highways Department in 1985.

The treatment of slopes is discussed in some detail in the 1990 CIRIA report (re-printed in 2007) on the 'Use of vegetation in civil engineering'. N.J. Coppin I.G. Richards (2007) Use of vegetation in civil engineering, C708, CIRIA, London (ISBN: 978-0-86017-711-1). www.ciria.org

A very short summary of the sections in the report which deal with slopes would be as follows;

- Establishment and management of vegetation is critical,
- Choice of vegetation types and varieties is paramount,
- Slopes are inherently dangerous to work on, grassed slopes especially so,
- On slopes tracked vehicles are safer than wheeled ones,
- Slopes up to I in 3 are generally safe for most operations,
- Slopes steeper than 1 in 2 are best considered inaccessible and require special measures,
- Sharp changes in slope angles should be avoided, rounding at the top and bottom is good practice,
- Slopes may require cut-off drains to protect against surface erosion,
- Soil on slopes may require short-term protection against erosion, there are many methods available,
- Intermediate terraces can prove invaluable on long slopes,
- Seed, shrubs and trees can be introduced by a variety of methods.

I will discuss vegetation establishment and management in future newsletters.

ESTONIAN OIL SHALE – PART 7

If you have read our previous emails about our adventures in Estonia you will know that Steve and I had a driver and 'fixer' called Veyli who drove us around in a small blue Moskvitch. Veyli helped us out several times when we were about to come unstuck.

One Friday we had been out for the day to meet an Estonian soil scientist at the mine so that we could discuss agricultural soil restoration methods. We had learnt that the huge old Soviet bulldozers were so heavy and their monstrous engines vibrated so much that the topsoil was squeezed out into a thin impervious layer in which nothing enjoyed growing. We stressed that a light approach would achieve better results.

It was a surprisingly summery, dry Friday afternoon as we drove back to Johvi somewhat later than planned. In the country gardens that we passed apples were being picked and firewood wood was being stacked for the coming winter. The little town centre was quiet, apart from a small group of shoppers gathered around the Kaubamarkt shopping centre. We had invited four of our Estonian colleagues to join us for a meal at the only local restaurant we knew about, called White Horse Tavern, located out in the country close to the main Tallinn to St Petersburg Road. It was the need to pay the restaurant bill that made us check our wallets in preparation. We didn't have enough cash and the banks were already closed!

After a rapid discussion we explained our problem to Arvi, our guide. "We must consult Veyli!" Quickly Arvi explained the situation in Estonian. Veyli looked at us thoughtfully for a moment. Then, with a sharp nod of the head he drove us quickly to a quiet suburb of the town. He parked on a tree-lined avenue, close to a small neatly kept white painted church and there was a brief quick-fire exchange of words in Estonian. Arvi did not look happy when Veyli slipped out of the car and hurried off down a path beside the church.

"Veyli says you will get money here. I don't like this, but do exactly as he says."

We sat quietly in the car under the shade of burgundy red maples and wondered what we might expect to happen in the next few minutes. The air was still and warm. Around the corner of the church came a short stocky old woman in a heavy coat, big boots and a head scarf. This babushka carried a birch broom and, starting in the dappled shade, she began to sweep piles of dry red leaves along the path towards the church. The only sound was the slow, regular scraping of the broom on the paving stones.

We were lulled and our conversation ceased. Then Veyli came back down the path. His face looked grim and he had his usual cigarette gripped between his teeth. He had a rolling gait and this just enhanced his roguish image. He opened my door of the car and gestured with a nod of the head for me to go with him. I did so, with several £10 and $10 notes stuffed into my pocket and wondering what lay in store for me around the corner of the church.

Veyli walked quickly and I followed, but the short walk along that path and past the old woman seemed to last a very long time. I suppose my blood was filled with adrenaline. The air was hot and still and smelled of the dust raised from the path. What was waiting for me beyond that corner?

Veyli stood at a dark door. He had knocked and waited for me to join him. For some reason a little dust devil spun a vortex of Maple leaves around us and then hurried off to hinder the old woman in her work. The door opened sharply. Inside was a dark corridor, so dark I couldn't even see who had opened the door. Did I see a weapon? I was ushered in and hurried down the corridor while Veyli remained outside. The door at the end

was pushed open and I was guided through. We were in a small dark office and my eyes were dazzled by the bright computer monitor. The air was thick with the smoke from spicy, scented Russian tobacco. I could make out a shrewd face lit by the computer monitor. Whoever it was looked up. I recognised a dog collar. He stood and smiled. "Good afternoon", he began, "Father Joosep Kirsipuu. I am Priest here. Veyli tells me you need some money?"

Relieved to find he was friendly, spoke good English, and was not a Russian hoodlum about to fleece me at gunpoint, I relaxed and smiled back. We shook hands. "Yes please. I am very grateful for your offer to help us."

He nodded and waved at the computer monitor, "I have been looking up exchange rates."

"I have Sterling or US Dollars." I explain.

"I like honest Sterling! You cannot trust Dollars." and we agreed a suitable exchange rate which I think probably helped him to fund his community projects.

As I walked back along the path to the car I could see Arvi looking relieved that I hadn't been abducted or mugged. Veyli looked pleased with himself as he dragged hard on his cigarette and started the engine. He had truly earning his meal at the White Horse that evening and he had enjoyed the little drama that he had created for us.

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