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NEW ZEALAND DRILLERS FEDERATION INC.

New Zealand THE DRILLER

Official Publication of the New Zealand Drillers Federation Inc. SPRING 1983 No. 9

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37348

Spring Issue

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THE DRILLER

The Driller is the official publication of the New Zealand Drillers Federation Inc.

EDITORIAL
All editorial enquiries and articles should be sent to:
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Advertising Rates	
Full page	$200
Half page	$120
Quarter page	$75
Two colour	plus $40
Specified position	plus 20%
Classified	$3 col cm

Column size 26cm x 13.5 em

SUBSCRIPTIONS
Enquiries to:
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The Driller is published by Transport News Ltd on behalf of the New Zealand Drillers Federation.
Executive Editor: Mike Maryan
Editor: Alison Murray
The Driller is circulated free of charge to all members, employee members and associate members of the New Zealand Drillers Federation, to selected catchment authorities, territorial local regional water boards and government departments.

ISSN 0111-6754

Driller training takes shape

The NZ Technical Correspondence Institute has given its full support to the inclusion of a driller training scheme in its course programme.

At a recent meeting between the NZDF, the Ministers of Energy and Education, and the Technical Correspondence Institute, the concept of a training programme received a favourable response.

Although the financial arrangements for the proposed three-year correspondence course will still have to be sorted out, the TCI is keen to add a driller course to the 900 courses it currently runs.

The major cost of the course, to be modelled along similar lines to that of a motor mechanic trade certificate, is $28,000 — the fee for one full time tutor. Approval to adopt an Australian 15-module training package for New Zealand use is still being negotiated.

The TCI course will be able to take around 80 students a year and industry sources indicate that demand for these places will be high. Following an agreement to use the Australian modules and the resolution of financial arrangements, it is hoped the course will commence in either 1984 or 1985.

Water control laws reviewed

Two bills amending legislation on the control and use of New Zealand's water resources will come before Parliament before the end of this year's sitting.

The contents of the Amendment Bills to the Water and Soil Conservation Act 1967 and the Soil Conservation and Rivers Control Act 1941 have not been made public but, in view of the Government's increasing concern about New Zealand's water resources, it is expected that the amendments will bring in more stringent regulations regarding water use.

Drillers may be affected by these amendments as the two acts cover the right to take water for drilling operations, the right to dispose of waste fluids from drilling, the right to take and use water from a completed well, and the right to dispose of fluids from a completed well.

It is not yet known when the amendments will be made public.

New Zealand
THE DRILLER

This is the final issue for 1983. We wish our readers a merry Christmas and prosperous New Year. We'll be back in late February with 1984's Summer issue. Any material for this should be sent to us before 25 January 1984.

Permits needed

The Auckland Regional Water Board will shortly adopt by-laws affecting drillers in the Auckland area.

The by-laws will initially affect only the areas of Parakai and Waiwera and will require drillers to obtain permits before drilling, as is the case in many other areas of the country, according to the Water Board's manager Mr A.G. Dibble.

The Driller will print this by-law when it comes to hand.

Front Cover

A Keystone-type rig used by Dick Baylis in the Hawke's Bay for several years. The rig was powered by a 15hp Lister petrol motor and had a wooden derrick.

Dick Baylis is considered, by many, to be one of the grandfathers of New Zealand's drilling industry. His story appears on page 3.

Early drillers strike out

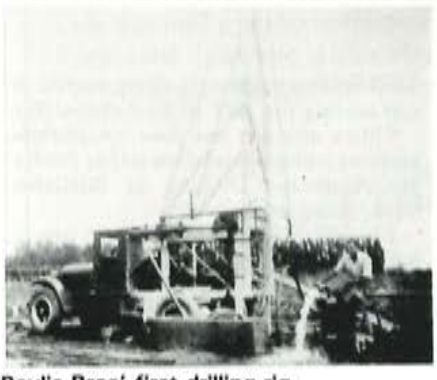
Dick Baylis looks back ...

Above: One of New Zealand's first hydraulically operated rotary and cable tool drilling rigs designed and built by Dick Baylis.

Baylis Brothers Ltd in Hawke's Bay has achieved a lot of firsts over the last 37 years.

The company was the first in New Zealand to manufacture and use a hydraulically operated combination rotary and cable drilling machine and its drillers carried out the first core investigation drilling in the Hawke's Bay region.

Director of the company Dick Baylis has always held a high profile in New Zealand's drilling industry and is possibly the only surviving NZDF member who took part in the formation of two earlier associations for New Zealand's drillers. Both associations, however, were short-lived and it wasn't until the 1970s that the present successful Federation was formed.



Baylis Bros' first drilling rig.

Dick Baylis was elected President of the present Federation at its third conference in Christchurch.

"It was at this conference that I was elected President, a very proud moment for me as I had been involved with trying to get this off the ground from as far back as 1947 — yes, 1947! I have amongst my possessions, the original copy of the Minutes of the NZ Waterwell and Structural Drillers Association Inc. dated 8 November 1947." He also kept his subs receipt for the grand sum of six pounds one shilling.

This first attempt to form a united body for drillers failed soon after and one of the reasons for this, Dick said, was the voting procedure. One rig equalled one vote giving some members a great advantage over the single rig operator.

The next attempt to set up an association was in 1948. Again, Dick Baylis was a founding member along with F Browning, J Forno, R Parkinson, and G Brown. Bob Parkinson was elected Chairman but this association's future was jeopardised when the Secretary "shot through with all our funds, about six hundred pounds", Dick said.

"The third time lucky and we have made it. Mr Hilton Prestney was the first President and in 1975 the first convention was held in Napier. This, I feel, was a great success and a major step in the forming of our present organisation."

Dick Baylis recently attended the annual conference of the National Waterwell & Drilling Association in Australia as a representative for the NZDF. He believes far more technology is involved in drilling today and the good old hit and miss days have passed.

Baylis Bros currently operates two drilling rigs, a Bucyrus 22W and a top drive combination rotary and cable machine. Two new US-made rigs have just been added to the Baylis stable and were delivered at the end of October.

Exhibition

An exhibition of groundwater equipment, technology and services will be held in conjunction with the international conference, "Groundwater and Man", being held at the University of NSW, Sydney from 5 to 9 December, 1983.

Supplier takes on new role

Russ Farquhar is one man trying to take the irritation out of irrigation.

After 13 years working with irrigation supply company A M Bisley Ltd Russ has started out on his own as an independent irrigation consultant. And he's quick to dispel two misconceptions. After taking a partisan view of irrigation marketing and selling Bisley's product line he is now no longer tied to specific brands. And, he's quick to point out, he is definitely not in competition with well drillers.

Operating as Independent Irrigation Consultants, based near Kaiapoi just north of Christchurch, Russ provides a consulting service to farmers and drillers alike.

"I provide advice on anything to do with water and its supply," says Russ, "from the initial planning and a basic feasibility study to overseeing the complete job. I'm not selling a product but I arrange for the most suitable equipment to be supplied... I'm not tied to any company.

"If a customer wants irrigation work performed, I consult with him before drilling and work out the size of the well, the flow rate, the site, power and hydraulics of the well and give an estimate of costs. I can also see that the well is drilled in accordance with accepted practices — a 'quality control' almost."

In 1979, Russ attended a welldrilling and groundwater training course held in Australia which he regards as very valuable in working on the Canterbury Plains. He was also a member of the NZDF Council until recently.

Russ first became interested in irrigation while studying for a diploma of agriculture at Lincoln College and when he finished at Lincoln he started work on the equipment supply side of the industry. At Bisleys, Russ ended up as product manager (water supply) and was responsible for technical sales.

Russ sees his role as a co-ordinating one... making sure that both driller and customer understand the job, and acting as a "go-between" to overcome the communication breakdowns which often plague on-farm drilling projects.

"It's not my intention to tell the driller how to drill the well," says Russ. "I wouldn't interfere where there was no problem, but if there was a dispute I could mediate.

"I see one of my roles as closing the communication gap which can exist between customer and driller on, say, the siting of the well where the customer may have picked a site and the well doesn't yield the expected flow rate. The driller is often blamed for the faults of the customer, after all you can't make water."

Russ Farquhar says he can ensure the customer is informed of the facts beforehand and thus wouldn't blame the driller if the result is less than satisfactory. He is working in a new area of consultancy and THE DRILLER asked him if his service had been accepted by the industry.

"Most people have been very sympathetic to the idea even though it's completely new," he says. "It will take a while to get off the ground. The initial reaction from drillers has been 'Oh no, another competitor', until I explain my role to them."

Russ Farquhar — not another competitor.

Work on NZ rig wanted

The Driller recently received the following letter from a Canadian driller seeking employment in New Zealand:

I am very interested in working in New Zealand. I am 28 years old and married with no children so therefore it would be very easy for us to re-locate.

I have three years experience on a B61 Mobile Auger doing soil testing in and around Edmonton, Alberta for Adder Drilling. The owner's name is Tim Herbert.

I have one year's experience on a 1250 Failing rotary rig doing coring and soil testing for BBT in Saskatoon, Sask.

I have also has one year's experience and am still employed on a Gus Pech rig for Anderson Drilling in Battleford, Sask. doing waterwells.

I would like to know if there are any jobs available for this type of work.

Ted Rennebohm,
21 9017 Panton Ave.,
North Battleford, Sask.
Canada. 59A 3J8.

Oil drillers need service permit

Although it may be some time before NZDF members take to the oil fields, the Ministry of Energy's Chief Petroleum Inspector Terry Thompson is interested in the work of the Drillers Federation.

He attended the recent NZDF annual conference because he believes: "Sooner or later, federation members will get into oil."

His work with the Ministry's Oil and Gas Division concerns the administration of the Petroleum Act which covers oil exploration, extraction and cross country pipelines. All petroleum prospecting and mining licences are processed by the Oil and Gas Division.

Terry Thompson is also following the NZDF's progress in setting up a driller training programme as his section is responsible for the issuing of Service Permits to petroleum drillers. A Service Permit is a certificate of competence to demonstrate the driller's knowledge of the drilling equipment and procedures. In particular he must know how to handle a kick (when the well discharges of its own accord) and be able to recognise signs of a blowout and know what to do if this occurs.

A driller must have spent three years working up from drill hand on an oil rig before applying for a permit.

Although a NZDF training programme would be considerably different from the requirements for a Service Permit, Terry Thompson thinks the proposed programme using ready-made Australian modules is "the most logical and best approach." He hopes short block courses rather than a correspondence course will be offered.

Only rotary rigs are used in the search for oil, as deep as four miles down, and the equipment is more complex than that used in drilling for water. There are basic similarities between petroleum drilling and other forms of drilling but generally oil rigs are much larger. Most oil rigs have a minimum of five personnel and each stage of drilling requires close monitoring.

Andy McGregor, a drilling engineer with the Oil and Gas Division, also believes there are fundamental differences between petroleum drilling and the type of work normally carried out by the federation's members. "Another major difference is that well drillers usually go home each night to their family... with oil drilling, it's much more transient. One week they might be in Taranaki, the next somewhere else," he said.

In petroleum drilling, a variety of complex equipment is used which is unknown in waterwell operations. Things like a BOP (blowout preventer) stack used to control sudden wellbore pressures is just one of these.

Mud logging equipment, costing around $1500 a day to hire, is a feature of an oil site and ensures the mud has the correct balance of qualities for optimum results.

Petroleum inspectors pay regular visits to land drilling sites around New Zealand and all oil drilling operations must send the Ministry daily confidential reports by telex. A log of all accidents on the site must be kept and serious accidents reported to the Oil and Gas Division.

NZDF members will be better equipped to adapt to petroleum drilling once a recognised training scheme is established and Terry Thompson welcomes the progress being made by the Federation.

Nearly-new rigs becoming popular

One of the US rigs imported by Gordon Brown.

More imported drilling rigs are being brought into New Zealand as local drillers take advantage of low interest rates and a depressed industry in the States and Australia.

In the past, many New Zealanders built their own rigs, but advances in technology and the ability to buy second hand rigs overseas for good prices, is seeing this trend change.

NZDF Council member Gordon Brown brought back two rigs from the US earlier this year and he spoke to The Driller about his trip and his tips on buying machinery in the States.

Before flying out, he plotted out his itinerary in advance to take advantage of a domestic air pass which gives unlimited flying distance for six weeks anywhere in the US.

"The catches are you must preschedule before you leave New Zealand," he said. This means you have to plan where you are going in advance.

His advice is to include all possible flights even if you don't take them. For every flight not prescheduled, a flat rate of $20 is charged. He chose a central point and flew to and from there several times. Although the ticket states that you may not use the same airport twice, he found that most cities had two or three airports on the out skirts and commuted from these.

It's important to do some homework before leaving New Zealand, he said. "First, you must consider the work application. If you're buying hydraulic gear, then it pays to go and speak to someone with hydraulic equipment to show you what to look for."

Valuable contacts in the States can be found through the National Waterwell Journal and parts companies you have dealt with previously. Many of the best buys are found in the yards of finance companies, where anywhere between 20 and 30 repossessed drilling machines could be lying idle at any one time. Here, the salesman knows nothing about what he's selling, so it's up to the buyer to know what to look for.

"You have to become a five minute expert. I learnt so much in four to five weeks, it wasn't funny," he said. His search for a good drilling machine involved 36 flights to ten States in six weeks and in that time he looked at around 300 rigs.

He eventually bought two ten-year-old truck-mounted rigs which he knew could be upgraded and serviced. He found the companies he dealt with cooperative and points out that "you're always entitled to make an offer".

"As a rule of thumb it's easy to get up to 10 or 20 per cent discount on something that's traded or second hand," he said.

Another factor in buying a rig is shipping costs. Gordon Brown managed to win a case to have costs reduced for shipment to New Zealand during this trip. Initially, he was quoted $240 per cubic tonne for shipment to NZ while the cost to Australia was only $120. With the help of the manager of the Seaport Shipping Company in Portland, the New Zealand rates were reduced to the same as to Australia. Other NZ drillers wishing to import rigs should now be able to negotiate for this same rate but they need to be aware that it exists.

"Deck packs" or new container package rigs generally cost four or five times more that than the type of truck-mounted rigs he bought and he believes that Kiwi ingenuity shines when it comes to updating good second hand rigs complete with trucks. And, for the type of work that most New Zealand drillers do, these units are perfectly adequate.

Gordon Brown currently has one of his new rigs operating and the reduction in maintenance and fuel costs as well as a much faster working time has made it all worthwhile.

Chemicals clean up foul water

A range of new chemical products for use in the drilling industry, with particular reference to water well development is now available in New Zealand.

The two main items in the range manufactured in Australia by Chemdrex Industrial Chemicals and supplied by Dominion Construction are ALBA and ASCA 200.

Iron bacteria reduces well performance by creating slime, organic deposits and hard scale within the aquifer and on well screens, casings, pumps and discharge lines.

Chemdrex ALBA destroys iron bacteria, dissolves bacterial crusts, scale, and slime and holds sulphides and metallic oxides in suspension until pumped from the well, according to Dominion Construction.

When a new well is sunk in an area contaminated by iron bacteria, anti-bacterial treatments substantially lessens the time it takes for a well to become fully productive.

In an established well which has become contaminated, destruction of the iron bacteria by treatment with ALBA, is claimed to restore water purity, remove scale and slime, and restore original flow rates and pump efficiency.

During treatment the chemical is poured or pumped into the well to produce a 5 per cent solution. This is followed by periodic surging or pump jugging for 36 hours to dislodge undissolved solids or scale. The well is then pumped to waste until PH and hardness tests indicate complete removal of residual acids and solids in suspension.

ASCA 200 is a chemical liquid concentrate for cleaning and developing existing and newly drilled water wells.

It is described as a non-ionic surfactant which disperses muds, fines and clays that otherwise restrict the free flow of water. The chemicals foaming action holds particles in suspension so they can be pumped clear.

Dominion Construction claim that Chemdrex's ASCA 200 removes soft iron oxide, bacteria, calcium and magnesium salts from the aquifer the well screens drill casings and pumps. Wells to be treated are dosed with 20 litres of the chemical for each 30 metres of well depth. Once the dose has been determined, the conentrate is diluted with 4 parts of water and poured into the well.

In a new well, the water is agitated for two to four hours by surging or swabbing. The well is then pumped out. When rehabilitating an old well, the solution is left in the well for two to seven days before pumping out.

The product is non-toxic, non-corrosive and non-flammable. It also can be used in conjunction with other well chemicals including ALBA, and wide experience in the United States and Australia to date, indicate that there is no residual effect on crops under irrigation.

The Driller's Dictionary

— A tongue-in-cheek guide

(Not in alphabetical order).

Weld: abbreviation for someone who drills wells (welldriller).

Skiving-off: when you take an afternoon off to play golf.

Pressure control: when the boss takes an afternoon off to play golf.

Drill fluid: brown organic liquid used extensively to lubricate drillers' throats after activities such as golf (see pressure control and skiving off above).

Slurry: what a driller does after using drill fluid.

Screen: what a driller's wife does when the driller comes back after a hard day using drill fluid and slurries.

Client: customer who pays his bills.

Rogue: customer who doesn't pay his bills (see also **#@!!, and %*###@!!!!)

Sod: piece of earth, also reason why things go wrong (as in Universal Law of –).

Bore: a non-driller talking about drilling.

Training: undefined term used to fill in gaps in conversation between two drillers.

Tool: what a driller feels like after drilling the hole 20 yards from the correct place.

Drill log: what drillers use to support the rig on uneven ground.

Backfill: what a driller might say to his mate ("I'll be back, Phil")

Rig: apparatus used for drilling (also what some drillers do to their balance sheets).

Mud pump: device for moving amounts of mud (also the draught taps at the Waikareni pub).

Bit care: treatment necessitated from a close encounter between a driller and the farmer's sheepdog.

Bottom hole clearing: what you have to do to the outside convenience.

Monkey: term of endearment from boss to worker.

B-----d: see Monkey.

Seismic: what a driller has to ascertain before telling an Irish joke to a crew which includes an Irishman.

Drill: tool or machine for boring holes or sinking wells, instruction or training in military exercises, small furrow for sowing seed in, machine for drilling seeds, coarse fabric, West African baboon.

A new spot welding gun and arc DC welding rectifier are two products recently introduced by an Auckland company.

P & MD Marketing are selling the KEL-ARC spot gun which will enable an operator to perform one-sided spot welds on light gauge steel. The gun is supplied with two nozzles: one for flat spots and the second for corner or gutter spots and according to the distributor costs under $95.

The rectifier is designed to work from a standard 230 volt power supply and weighs only 28kg. The current range on the unit is 5 to 115 amps and is fully adjustable within this range. Because of the DC output the machine will weld with most types of electrode and can be used for scratch start TIG.

Further information is available from P & MD Marketing, P.O. Box 51143, Pakuranga, Auckland. Tel 09 534 8722.

MWD chase hydro power

Power investigations on the Mohaka River is the main job at the moment for Ministry of Works and Development drillers based in Napier.

The district has one drilling unit with Larry Weller as driller and Peter Stack as his assistant. They are based at the Napier district laboratory.

The team is able to cope with most of the MWD's site investigation work for bridges, roads, buildings and other projects but is currently hard at work on the Mohaka with a materials' investigation.

Most of the work is done with the unit's truck-mounted Longyear 44 rig or an older Goldfields Cable tool rig. A small Jackro rig is used for rotary drilling work where access is difficult.

One rotary drilling contract for the Mohaka investigations was completed last year and a second is about to be let for 400 metres of core drilling and permeability testing. This permeability contract had to be advertised three times before any tenders were received.

The permeability contract is expected to be the final drilling contract in the feasibility study of three dam sites on the lower reaches of the Mohaka River. The study started in 1981 and is scheduled to finish next year.

Where have all the drillers gone?

Government-funded groundwater investigations have been hindered because not enough drillers have been available to do the work.

Dex Knowles, planning manager for the Water and Soil Division of the MWD, said: "Within the last 12 months at least five region's underground water investigations did not achieve their objectives because of the unavailability of drillers. There's been problems in at least three regions in the South Island. These could have been affected by the widespread droughts with the farm community desperate for water supplies."

"I know there's been difficulty in getting drillers as and when required. Perhaps one of the reasons is that our work is more time-consuming than routine hole bashing for land owners." He also said he acknowledged that investigation work was "messy".

Another major problem was in obtaining bore logs from drillers. The catchment authorities, who receive funding approval from the Water and Soil Division for investigation work, needed these to quantify the water resources in their regions. "There's a lack of bore logs in many instances which is costing us a considerable amount of money," Dex Knowles said. If bore logs were supplied to the authorities on a regular basis, the number of groundwater investigation wells could be reduced.

Around $1 million is being spent on groundwater investigation in New Zealand at present, he said.

The only two districts not currently receiving funding for groundwater investigation drilling from the Government are Northland and Westland.

Deep drilling in Hauraki is continuing as blueberry farmers cry out for better irrigation. Wells in this region are around 150 metres deep with one deep well down to 250 metres.

In the Lower Waikato an investigation programme is being carried out to quantify the water resources and there's also some research in the Waikato in relation to coal development. Authorities want to know how large open cast mines will affect the water resources and how much dewatering will be necessary in the pit area.

Continued investigations in the Bay of Plenty are now being concentrated around Papamoa and Katikati as the kiwifruit boom demands more water.

A $350,000 programme is under way in Poverty Bay to cope with an estimated 300 per cent increase in horticulture and also to provide water for the Gisborne Urban City Supply.

In Taranaki, the search for oil and gas goes on, and catchment authorities are alerted when oil drilling operations strike water. Investigation drilling is being carried out as well to locate water supplies for large-scale industry in the area.

Prospects of an irrigation scheme are being considered in the Wanganui region following the discovery of good deep underground water there.

The Manawatu region isn't of much concern to the Water and Soil Division as groundwater is abundant.

Droughts in Canterbury have sped up investigations in that region and a lot of work is underway there.

In the Waikato and Otago areas investigations are concentrated on the surface water resource although some underground work investigation is being carried out.

Southland's lignite fields are the centre of some groundwater investigation but generally the Southlanders "get enough out of the air", Dex Knowles said. Westland too is in the same boat.

Work is continuing on the Waimea Plains and a crash programme is underway in Motueka as part of a future management programme plan.

And that just about wraps it up.

Bore results look good

The first of two deep groundwater exploration bores in the Bay of Plenty has been completed showing a potentially high yield groundwater resource.

The bore, located southeast of Edgecumbe on the Rangataiki Plains was drilled by Garnham Well Drillers and supervised by Groundwater Consultants for the Bay of Plenty Catchment Commission.

The drilling and testing programme follows an extensive surface resistivity survey of the Plains carried out by Groundwater Consultants in March this year.

The test bore drilled to 200 metres has confirmed the results of the resistivity surveys and high yielding aquifers of good quality low iron water have been found at depth in parts of the Rangataiki Plains.

Groundwater Consultants now recommend that a large diameter test production bore be constructed beside the exploration bore. The bore completion report by Wayne Russell says: "Yields of 6,000 to 15,000 cubic metres are theoretically possible from a properly designed and constructed large diameter well tapping the deep aquifers."

The bore was drilled in steps so that samples could be taken at seven graduated levels. Sands and gravels were found down to 60 metres, then ignimbrite boulders and flows to 130 metres followed by grey and brown silts to 200 metres. The most productive aquifers were between 50 and 65 metres and 132 to 170 metres. Both were in coarse sands and gravels.

The ignimbrite seemed to have a poor permeability and may act as a semi-confining layer, the report said.

All groundwater sampled was fresh and the iron content was less than 0.1 mg/litre below 132 metres. Iron content in the groundwater sampled above 45 metres was 7.6 mg/1 but this level decreased with depth.

Further investigations are to be sited in the Papamoa and Katikati area.

Bore logs still scarce

Drillers in the Bay of Plenty region may have to obtain permits to drill if they don't comply with the Catchment Commission's request for bore logs.

At this year's annual NZDF Conference in Tauranga, Bay of Plenty Catchment Commission's chief executive officer Dale Revington warned drillers that unless bore logs were supplied to the commission "the Regional Water Board will be faced with no option but to introduce by-laws requiring all bores to be subject to prior licensing and more stringent control".

The expansion of horticulture in the region has increased demand for groundwater and the commission is currently carrying out a formal investigation of groundwater resources in the region.

Mr Revington said it seems likely that artificial recharging of the groundwater resource will be necessary as part of the management of the resource. To do this reliable data about the resource will be needed and the contribution from the drilling industry should be greater, he said.

Drilling a successful well

by Wayne Russell
Groundwater Consultants

It costs as much to drill a dry well as it does a successful well.

There is water under the earth's surface almost everywhere. Locating a successful bore, however, means determining where the water occurs under conditions that permit it to come into the well fast enough to be useful.

The movement of groundwater through rock is a natural process, subject to physical laws.

The ultimate source of groundwater is rainfall, but only a small portion of rainfall finds its way to an underground system. The largest portion of rainfall (60-70%) is lost back to the atmosphere through evaporation and transpiration.

A large portion of the rainfall (20-30%) is lost as surface runoff. This leaves 5-10% of the rainfall to enter the groundwater systems.

Once rainfall has soaked through the covering soil or clays, it then begins its movement towards its final destination, the sea, moving from areas of higher head (higher pressure) to areas of lower head (lower pressure). The purpose of the driller is to intercept this movement of water, which now can rightly be termed groundwater.

Zones of rock from which useful supplies of groundwater can be obtained are called aquifers. These are often separated by poor water producing zones of rock called aquicludes.

There are two types of aquifers recognised.

Unconfined aquifers are so called because the top of the aquifer, which is the water surface, is free to move. These are often called water table aquifers and are usually shallow systems occurring in loose sands or gravels.

Confined aquifers are zones of rock which are completely filled with groundwater and do not have a free water surface. When these aquifers are drilled, water will rise up the well above the top level of the aquifer, because the aquifer is pressurised.

Flowing Artesian wells occur when the pressure in the aquifer is sufficient to push the water up the bore to the surface.

Unconfined acquifers can occur when sand or gravels are overlain by silts and clays; when lava flows are covered by weathered ash; when fractured rocks have been subjected to deep weathering of the surface; and in many other geological situations.

One feature about confined aquifers is that the groundwater taken from the well must have infiltrated from rainfall into the system some distance away and at some higher level.

Where an aquifer is in contact with the ocean, sea water, because of its slightly greater density (and hence greater pressure for the same level) will move inland into the aquifer. The more water that is pumped from such an aquifer, the lower will the aquifer pressure become and hence the salt-water wedge will move further inland.

These are some of the principles that must be kept in mind when seeking to locate a site for a successful bore.

Many bores are sited simply by the driller taking his rig onto the client's property and drilling at a convenient location; convenient meaning that the rig can be got in, and more importantly got out, once the well is completed, or that the bore is adjacent to the power supply.

Other bores are sited on the advice of a water diviner.

Both these methods work satisfactorily in good groundwater areas but are less reliable in areas with complex hydrogeology.

Hydrogeologists locate groundwater through scientific observation and the application of their understanding of natural processes and physical laws.

In setting out to locate a successful bore, the hydrogeologist will search out all available data and may utilise direct and indirect investigation methods. For those who know how to read them, geological maps contain a great deal of data.

Aerial photographs provide a clearer picture of the topography of the district around a property, and from these more precise locations of contacts between different rock bodies or of fault and joint patterns, can sometimes be obtained.

Rocks exposed in road cuttings, slips, river channels and quarries in the district being investigated, are studied to complement information gathered from other sources.

Bore logs from other bores drilled in the areas being studied are an invaluable guide to subsurface conditions. A good log will include the following:-

- ☐ accurate location of the bore
- ☐ detailed description of the strata drilled and depths at which they were encountered
- ☐ types, diameters and depths of casings and how they have been sealed into the formations
- ☐ types, diameters, lengths, slot sizes and intervals of screens
- ☐ where water losses or gains occurred
- ☐ method of development
- ☐ where grout was used
- ☐ depth to standing water level
- ☐ results of any production testing i.e. pumping rate, pumping period, drawdown
- ☐ comments on quality of purity

I am aware many drillers consider bore information to be their property, but I believe this information in fact belongs to the client who has after all paid for it, and should be provided to the client at the completion of every bore.

There are two common ways in which the above data is recorded. A number of regional water boards including Auckland, Waikato Valley Authority, Bay of Plenty and possibly others, provide, free of charge to the driller, bore log sheets in triplicate (one for the driller, one for the client, one for the Water Board). These forms are now being used by a number of drillers.

The second method of recording data is the daily log sheet, in which is recorded all the work done, all the materials used, and the description of the strata drilled.

Further investigation methods where the available data is insufficient to allow a reliable prediction of a bore site, geophysical methods can be utilised. These methods all involve measuring some physical property from which the subsurface structure can be interpreted.

- ☐ Gravity methods are useful in locating large buried faults, thickness of alluvial fills in valleys, thickness of, or depth to, volcanic rock bodies.
- ☐ Magnetic methods can be used to estimate the extent and thickness of volcanic materials.
- ☐ Seismic methods are used to accurately measure the thickness of alluvial sediments and to locate buried faults in alluvial basins.

The above methods require expensive equipment for both measurement and data interpretation. By far the cheapest and most versatile geophysical method is resistivity.

This method not only measures the resistance of the rocks beneath the ground surface, but it also measures the resistance of the fluids contained in the pores within the rocks.

Changes of resistivity with depth can be related to particular rock types and water quality by a skilled operator.

The resistivity method involves passing an electrical current into the ground through two electrodes. The potential or voltage between the two current electrodes is measured and from this the resistivity is calculated.

By increasing the distance between the current electrodes, the resistance of the subsurface layers can be measured to greater depths. A penetration depth of approximately 500 metres would be obtained with a one kilometre separation of the current electrodes.

Interpretation of resistivity data is not a simple matter and requires experience and a certain amount of skill. Where other data is available, such as a bore log, then the interpretations of resistivity measurements over a wide area can be made with confidence.

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Tamrock rigs work State coal mines

CompAir have recently introduced into New Zealand the latest hydraulic drilling technology from Finland in the form of two TAMROCK DHHT Crawlers, which will be used in the removal of hard rock overburden from a coal seam for New Zealand State Coal Mines at Stockton.

The TAMROCK ZOOMTRAK DHHT units purchased by the New Zealand contractor comprise a hydraulically driven crawler chassis powered by a 6 cylinder turbo charged Deutz engine with two driving speeds giving good tramming speeds combined with excellent rugged terrain manoeuvreability.

The well proven Hydraulic Drifter fitted to the rig is also powered by the same engine. This concept of using hydraulics instead of compressed air in drifter drilling has been proven to be a considerably cheaper energy source for drilling and is also a lighter user of drilling consumables.

These points combined with higher penetration speeds and ease of operation go a long way towards keeping major costs of projects down.

In the area of making the operations job easier and safer the units are fitted with mechanical rod handling and an air conditioned noise suppressed cab.

The so-called sophistication of this equipment often raises doubts in the minds of prospective users concerning serviceability. However when looked at carefully one will find throughout the complete system the only component that differs in principle from other pneumatic crawlers is the drifter. However drifters which are correctly designed are simple in construction and although require cleanliness during service are no less dirt tolerant than previously used hydraulic components.

One of TAMROCK's DHH series rigs.

Pump draws heat from cold water

Geothermal heat pumps that can extract heat from cold water and convert it into energy could be marketed by drilling companies in the future.

On his trip to the US earlier this year, Gordon Brown, manager of Rotorua Welldrilling Co, visited pump manufacturers in Oklahoma to look at the latest developments in pumps.

The geothermal heat pumps being manufactured there can convert 10 degrees C water to around zero degrees. The water is passed through a refrigeration unit and the heat extracted is converted into four times the amount of energy input of the unit. Gordon Brown believes that one application of the pump could be used to heat houses on farms with the waste water being fed into troughs or out into stormwater drains. These pumps are now becoming price competitive and drilling companies in the future could supply them to the user as part of a welldrilling contract.

Crawler rig sells well

Atlas Copco's compressed air powered crawler drill rig ROC 601 can now claim to be the world's most popular crawler drill.

Since the ROC 601 made its debut in 1968, more than 3000 units have been supplied to customers all over the world.

A number of successive improvement modifications have been carried out on the rock drills which the ROC 601 carries. The original and reliable BBE 57 was a universal rock drill and is the most common found on the ROC 601.

Two new rock drills, the COP 131 and COP 150, were developed by Atlas Copco and these are used for drilling holes up to 89 and 115 mm in diameter respectively, with the COP 131 undoubtedly the more widely used of the two.

In production drilling from the surface, a 76 mm drill bit is the dominant drilling diameter in current use all over the world. Here too the ROC 601, equipped with a COP 131 rock drill, has proved to be popular drilling equipment.

As a match to the company's range of drilling and mining equipment, Atlas Copco also provides an extended range of portable compressors.

The portable oil injected, rotary screw XA compressor range covers capacity needs from 28.6 1/s (61 cfm) to 425 1/s (901 cfm) with a normal effective working pressure of 7 bar.

The XA series compressors are air cooled and powered by a number of reliable diesel engine options, e.g. Deutz air-cooled or Cummins and GM water-cooled engines, with the XA 350 also being offered in an electrically powered version. The units are also produced in silenced types (down to 75 dB(A) — some even down to 70 dB(A) — ISO 2151 at 7 m standard).

The XA oil injected rotary screw compressor range was recently completed by newly designed models for higher efficiency and improved economy. Main features include a compact design, weight reduction and, by virtue of an improved screw element design, a 6% average increase in output capability.

Training manager appointed

The Australian Drilling Industry Training Committee has announced the appointment of Mr Colin Barden as Manager, Manpower Development.

The ADITC is a Government-sponsored organization founded in December, 1978, for the purpose of standardizing drilling procedures and providing specialised training courses for drilling contractors, drillers' offsiders, consultants, equipment suppliers and end-users in industry and agriculture.

The Training Committee has since established a Drilling Training Unit to provide a range of both practical and theoretical courses which may be conducted in the classroom, in the field or by correspondence.

Mr Barden, (36), has been associated with the drilling industry since completing his education. Much of his experience was gained overseas, particularly in the Middle East and the United States. He has held management, executive and training appointment positions in both private industry and Government.

Mr Barden will operate from the Drilling Training Unit facility presently located at Macquarie University, Sydney. In addition to management of the Unit, his responsibilities will include the marketing, promotion and development of the full range of training facilities provided for both Australian and overseas drillers.

Colin Barden, ADITC.

Drilling halted

Applications for water rights at Tikitere (near Rotorua), necessary to allow geothermal exploration drilling to go ahead, have been deferred.

The Minister of Works and Development has asked the National Water and Soil Conservation Authority to defer consideration of the application for water rights, with a view to them being heard at a later date, should policy allow such drilling, and should there be a need to explore the field.

In a joint statement today Mr Friedlander and Mr Birch said that the applications should be deferred because they appeared contrary to the spirit of the moratorium which has been placed on geothermal explorations in and around the Rotorua area.

The Ministers said that the moratorium precluded any drilling at Tikitere and that the moratorium should stay in place until after a review of geothermal policy is complete.

"By this time, a mechanism should be in place to decide on environmental and other conflicts over the use or preservation of the resource," the Ministers said.

Government commissions coal study

British Mining Consultants (Australia) and Groundwater Consultants (NZ) have been appointed as consultants for a feasibility study on the proposed longwall production unit at the Huntly East underground coal mine.

The study will include an assessment of the options available for development of the mine. The Minister of Energy Mr Birch said that until now coal produced at Huntly East has come from the development of mine roadways.

"It is now the appropriate time to investigate in detail the main production method which will produce most of the coal over the life of the mine," he said.

"As with most other coal mining countries, longwall production units are favoured because of their ability to cope with poor conditions while maintaining very high productivities and minimising production costs."

Mr Birch said production from the first longwall unit should start at the beginning of 1986, after installation and commissioning in the last quarter of 1985.

Rigs modified to tackle tunnelling

A new tunnelling technique using a combination of percussion and rotary hydraulic rock drills has been given top marks by engineers working on the Stuttgart city railway in Germany.

The Atlas Copco rock drills — COP 1038HD percussion rock drill and COP 420R rotary rock drill — were used together with Atlas Copco's Promec TH470 hydraulic drilling rig to drive a particularly tricky section of the project known as the Hasenberg tunnel.

Here two Promec rigs were used to drive an access tunnel at an incline of about 15° and 450 metres in length. Two parallel single track tunnels were required; one section was excavated upwards and the other downwards.

The upwards section was driven using water flushing and the COP 1038HD. But due to tough rock conditions — gypsum with anhydrite strata — the downward section had to be drilled completely dry with air flushing and dust collecting.

In this relatively soft rock the COP 1038HD rock drill achieved a drilling rate of about 2.5 metres/min. In order to speed up drilling rate the possibility of using a rotary hydraulic rock drill COP 420R with the COP 1038HD hydraulic feed system was tested for the first time.

After modification to rotary drilling, drilling rate doubled to almost 5 metres/min. No problems occurred with bits when drilling in ordinary gypsum with air flushing, and no excessive heating occurred thanks to the good cooling effect of the flushing air.

With the two rotary rock drills about 70,000 m were drilled. At this point the anhydrite content increased more and more, and the drilling rate of the rotary drills decreased considerably as the rock became harder. Again, the system was modified, and drilling operation continued with the percussion COP 1038HD rock drill.

This is how the rigs were modified to rotary drilling: The COP 420R was connected to the rotation pump, and the rotation pressure was increased to 150 bar. With this pump a speed of 550 rpm was obtained at the drill rod.

On the feed the drill steel supports were replaced. The correct mounting plate for the COP 420R was fitted on the cradle. A hose set for the COP 420R was connected between the bracket on the feed and the rotary drill.

About 4-5 hours were needed for the complete modification of one boom.

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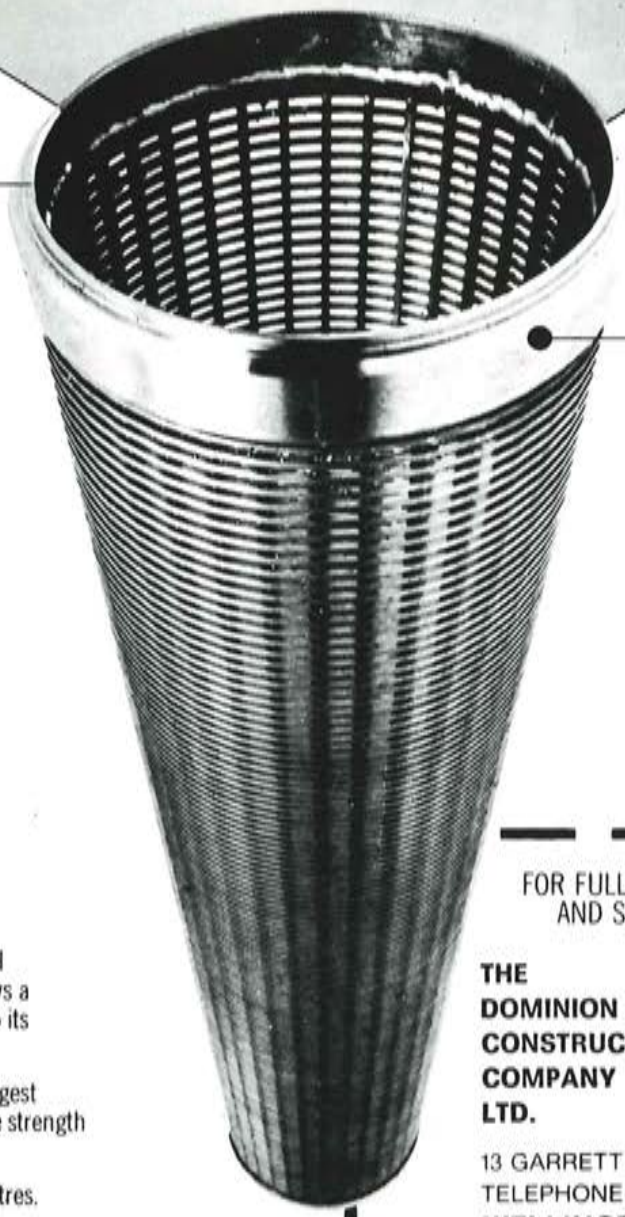

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